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April 21, 2004

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Dear Sir:

Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3
Docket Nos. STN 50-528/529/530
Annual Radioactive Effluent Release Report 2003

In accordance with PVNGS Technical Specification (TS) 5.6.3, enclosed please find the Annual Radioactive Effluent Release Report for 2003.

No commitments are being made to the NRC in this letter. If you have any questions, please contact Thomas N. Weber at (623) 393-5764.

Sincerely,

TNW/SAB for
SA Bauer

SAB/TNW/CJJ/kg

Enclosure

cc: B. S. Mallett
M. B. Fields
N. L. Salgado
A. V. Godwin

IE48

ENCLOSURE

Annual Radioactive Effluent Release Report 2003

PALO VERDE NUCLEAR GENERATING STATION
UNITS 1, 2 AND 3

2003

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

USNRC Docket No. STN 50-528/529/530
RCTSAI 1566

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INTRODUCTION

This report summarizes effluent and waste disposal source term data, meteorological data and doses from radioactive effluents for the Palo Verde Nuclear Generating Station (PVNGS) for the period of January through December 2003. The data presented meets the reporting requirements of Regulatory Guide 1.21 (Revision 1, June 1974) of the U.S. Nuclear Regulatory Commission and the PVNGS Technical Specifications.

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APPENDIX A

SOURCE TERMS
AND
EFFLUENT AND WASTE DISPOSAL REPORTS

Supplemental Information

1.0 REGULATORY LIMITS

1.1 Liquid Releases

1.1.1 PVNGS ODCM Requirement 3.2

The concentration of radioactive material discharged from secondary system liquid waste to the circulating water system shall be limited to:

5.0E-07 μCi/ml for the principal gamma emitters (except Ce-144)

3.0E-06 μCi/ml for Ce-144

1.0E-06 μCi/ml for I-131.

1.0E-03 μCi/ml for H-3

The concentration of radioactive material discharged from secondary system liquid waste to the onsite evaporation ponds shall be limited to:

2.0E-06 μCi/ml for Cs-134

2.0E-06 μCi/ml for Cs-137

The concentrations specified in 10 CFR Part 20.1001-20.2402, Appendix B, Table 2, Column 2, for all other isotopes

1.1.2 PVNGS ODCM Requirement 4.4

The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released, from each reactor unit, to areas at and beyond the SITE BOUNDARY shall be limited:

a. During any calendar quarter to less than or equal to 1.5 mrems to the total body and to less than or equal to 5 mrems to any organ, and

b. During any calendar year to less than or equal to 3 mrems to the total body and to less than or equal to 10 mrems to any organ.

1.2 Gaseous Releases

1.2.1 PVNGS ODCM Requirement 3.1

The dose rate due to radioactive materials released in gaseous effluents from the site shall be limited to the following:

a. For noble gases: Less than or equal to 500 mrems/yr to the total body and less than or equal to 3000 mrems/yr to the skin, and

b. For I-131 and I-133, for tritium, and for all radionuclides in particulate form with half-lives greater than 8 days: Less than or equal to 1500 mrems/yr to any organ.

1.2.2 PVNGS ODCM Requirement 4.1

The air dose due to noble gases released in gaseous effluents, from each reactor unit, to areas at and beyond the SITE BOUNDARY shall be limited to the following:

a. During any calendar quarter: Less than or equal to 5 mrads for gamma radiation and less than or equal to 10 mrads for beta radiation and,

b. During any calendar year: Less than or equal to 10 mrads for gamma radiation and less than or equal to 20 mrads for beta radiation.

1.2.3 PVNGS ODCM Requirement 4.2

The dose to a MEMBER OF THE PUBLIC from iodine-131, iodine-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released, from each reactor unit, to areas at and beyond the SITE BOUNDARY shall be limited to the following:

a. During any calendar quarter: Less than or equal to 7.5 mrems to any organ and,
b. During any calendar year: Less than or equal to 15 mrems to any organ.

1.2.4 PVNGS ODCM Requirement 4.3

The GASEOUS RADWASTE SYSTEM and the VENTILATION EXHAUST TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected gaseous effluent air doses due to gaseous effluent releases, from each reactor unit, from the site, when averaged over 31 days, would exceed 0.2 mrad for gamma radiation and 0.4 mrad for beta radiation. The VENTILATION EXHAUST TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected doses due to gaseous effluent releases, from each reactor unit, to areas at and beyond the SITE BOUNDARY when averaged over 31 days, would exceed 0.3 mrem to any organ of a MEMBER OF THE PUBLIC.

1.3 Total Dose

1.3.1 PVNGS ODCM Requirement 5.1

The annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC due to releases of radioactivity and to direct radiation from uranium fuel cycle sources shall be limited to less than or equal to 25 mrems to the total body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrems.

2.0 MAXIMUM PERMISSIBLE CONCENTRATIONS

Air: Release Concentrations are limited to dose rate limits described in section 1.2.1 of this report.

3.0 AVERAGE ENERGY

The average energy ($\overline{E}$) of the radionuclide mixture in releases of fission and activation gases is not applicable to PVNGS.

4.0 MEASUREMENTS AND APPROXIMATIONS OF TOTAL RADIOACTIVITY IN GASEOUS EFFLUENTS

For continuous releases, sampling is in accordance with PVNGS ODCM Table 3-1. Particulate and iodine radionuclides are sampled continuously at the Plant Vent and Fuel Building exhaust points. The particulate filters and charcoal cartridges are exchanged for analysis at least four times per month. Noble gas and tritium are sampled at least once per 31 days. The hourly average Radiation Monitoring System (RMS) effluent monitor readings are used, when available, to account for increases and decreases in noble gas concentrations between noble gas grab samples. The tritium concentration is assumed constant between sampling periods.

For batch releases, sampling is also in accordance with PVNGS ODCM Table 3-1. For containment purges, the noble gas concentration may be adjusted to account for decreases or increases in concentration during the purge using RMS readings. The volume of air released during the purge is determined using the exhaust fan rated flow rate. For Waste Gas Decay Tank releases, the volume released is corrected to standard pressure.

Effective January 1, 2003, Containment Purge release permits are updated by removing the permit pre-release particulate and iodine activity. This eliminates double accounting for the Containment Purge particulate and iodine activity at the Plant Vent but allows the particulate and iodine activity to be included in the Containment Purge pre-release dose projection.

The Lower Limit of Detection (LLD) of a measurement system is defined in Table 3 - 1 of the PVNGS ODCM. An average LLD for each radionuclide is provided in Table 3.

5.0 BATCH RELEASES

5.1 Gaseous.

Batch release durations are presented in Table 2.

5.2 Liquid

None.

6.0 ABNORMAL RELEASES

None.

7.0 OFFSITE DOSE CALCULATION MANUAL AND PROCESS CONTROL PROGRAM (PCP) REVISIONS

7.1 There were no revisions to the ODCM.

7.2 The Radwaste Process Control Program, 76DP-0RP03, Rev. 4, effective 6-10-04, was an administrative change made to the procedure governing the Process Control Program (PCP) to update position responsibilities based on changes in the Radiation Protection organization. The revision to the procedure governing the PCP did not make any changes to:

- any processing parameters that could alter the final waste form, or
- the purpose, scope, or intent of the PCP, or
- the PCP that would cause any inconsistencies with NRC Waste Form Technical Position Paper (Rev. 1, January 1991) or Branch Technical Position – Effluent Treatment Systems Branch 11-3, section II (Rev.2, July 1981).

The Radwaste Process Control Program, 76DP-0RP03, Rev. 4, is included in Appendix D.

8.0 EFFLUENTS AND SOLID WASTES

8.1 Gaseous Effluents

Gaseous effluent information is presented in Table 1 through Table 41. Included in these tables are summaries of the effluents and estimated total error.

8.2 Liquid Effluents

There were no liquid effluent releases beyond the Site Boundary from PVNGS.

8.3 Solid Waste

Solid waste shipments are summarized in Table 42.

9.0 MISCELLANEOUS INFORMATION

9.1 EVAPORATION PONDS

Releases made to the Evaporation Ponds are limited to the concentrations specified in PVNGS ODCM Requirement 3.2. The Evaporation Ponds were monitored in accordance with PVNGS ODCM Requirement 6.1.

The average historical evaporation is approximately 12 inches, per pond, for each of the first and fourth quarters, and 33 inches, per pond, for each of the second and third quarters. This equates to 3.09E+11 cc evaporated from Pond One for each of the first and fourth quarters and 8.50E+11 cc evaporated from Pond One for each of the second and third quarters. The amount evaporated from Pond Two is 2.89E+11 cc for each of the first and fourth quarters and 7.96E+11 cc for each of the second and third quarters. Using a site boundary X/Q of 5.0E-05 sec/m^3 for the evaporation ponds and equation 4-3 from the ODCM, the dose from the evaporation ponds to a hypothetical individual at the site boundary, for all pathways, is summarized in Table 1.

9.2 RADIATION MONITORING SYSTEM SETPOINT VERIFICATION

Current effluent monitor noble gas channel alert alarm setpoints are based on an assumed one per cent failed fuel source term. The current setpoints are more conservative than setpoints calculated using the actual noble gas source term presented in Table 38.

9.3 RCS RADIOIODINE (TRM T5.0.600)

There were no cases where primary coolant specific activity exceeded the Technical Specification 3.4.17 limits during the reporting period.

9.4 REPORT ADDENDUM

None.

10.0 DISCUSSION

10.1 Unit One

Unit One operated without a refueling outage.

Estimated number of fuel defects (source: INPO, CDE)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	0	0	0	0	0	0	1	1	1

10.2 Unit Two

Unit Two operated with a refueling outage (U2R11) from September 16, 2003 to December 15, 2003. This outage included Steam Generator replacement.

Estimated number of fuel defects (source: INPO, CDE)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	1	1	1	1	1	1	1	0	0	0

10.3 Unit Three

Unit Three operated a refueling outage (U3R10) from March 29, 2003 to April 30, 2003.

Estimated number of fuel defects (source: INPO, CDE)											
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1	1	0	0	0	0	0	0	0	0	0

10.4 General

PVNGS does not have a liquid release pathway. Removal of tritium is performed by operation of the Boric Acid Concentrator (BAC) in the release mode. Comparison of PVNGS annual tritium curies released to other utilities should be made only after summing both liquid and gaseous tritium curies released.

10.5 Summary

Dose for 2003 was primarily due to the release of tritium and radioiodines. Tritium production is approximately 1000 curies per Reactor Unit per year. In order to control plant tritium concentrations, tritium releases should match tritium production. For 2003, PVNGS released a total of 2440 curies of tritium (see Table 39).

Total dose from releases from all three Units for the year 2003 were greater than year 2002 mainly due to 770 more curies of tritium being released.

Table 1: Evaporation Pond Data					
Evaporation Pond 1	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year
Historical volume of water evaporated (ml)	3.09E+11	8.50E+11	8.50E+11	3.09E+11	
Tritium Concentration (uCi/cc)	7.74E-07	1.26E-06	1.09E-06	1.62E-06	
Tritium Curies	2.39E-01	1.07E+00	9.29E-01	5.00E-01	2.74E+00
Evaporation Pond 2	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year
Historical volume of water evaporated (ml)	2.89E+11	7.96E+11	7.96E+11	2.89E+11	
Tritium Concentration (uCi/cc)	1.13E-06	1.20E-06	1.49E-06	1.70E-06	
Tritium curies	3.26E-01	9.55E-01	1.18E+00	4.92E-01	2.96E+00
Dose (mRem)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year
Pond 1	3.32E-03	1.49E-02	1.29E-02	6.94E-03	3.80E-02
Pond 2	4.53E-03	1.32E-02	1.64E-02	6.83E-03	4.10E-02
Total	**7.84E-03**	**2.81E-02**	**2.93E-02**	**1.38E-02**	**7.90E-02**

Table 2: Batch Release Data			
All times are in hours	Unit 1	Unit 2	Unit 3
January - June			
Number of batch releases	29	29	40
Total time period for batch releases	419.19	466.26	1252.28
Maximum time period for a batch release	166.60	163.33	163.08
Average time period for a batch release	14.45	16.08	31.31
Minimum time period for a batch release	0.92	1.10	0.13
July - December			
Number of batch releases	33	47	36
Total time period for batch releases	289.44	2467.94	476.38
Maximum time period for a batch release	137.10	168.00	142.70
Average time period for a batch release	8.77	52.51	13.23
Minimum time period for a batch release	0.82	0.08	0.03
January - December			
Number of batch releases	62	76	76
Total time period for batch releases	708.64	2934.21	1728.66
Maximum time period for a batch release	166.60	168.00	163.08
Average time period for a batch release	11.43	38.61	22.75
Minimum time period for a batch release	0.82	0.08	0.03

Table 3: Units 1, 2 & 3 Gaseous Effluents Average Lower Limit Of Detection					
µCi/cc					
Nuclide	Continuous	Batch	Nuclide	Continuous	Batch
Antimony-122	2.20E-13	1.90E-11	Argon-41	4.50E-08	4.50E-08
Antimony-124	8.40E-14	1.70E-11	Krypton-85	7.40E-06	7.40E-06
Barium-140	3.40E-13	5.70E-11	Krypton-85m	2.20E-08	2.20E-08
Bromine-82	3.30E-13	1.40E-11	Krypton-87	5.70E-08	5.70E-08
Cerium-141	8.70E-14	3.10E-11	Krypton-88	7.40E-08	7.40E-08
Cerium-144	3.60E-13	6.50E-11	Xenon-125	2.20E-08	2.20E-08
Cesium-134	1.00E-13	2.60E-11	Xenon-127	2.10E-08	2.10E-08
Cesium-137	8.10E-14	1.70E-11	Xenon-131m	9.10E-07	9.10E-07
Cesium-138	5.20E-10	7.30E-10	Xenon-133	6.30E-08	6.30E-08
Chromium-51	6.90E-13	1.40E-10	Xenon-133m	1.90E-07	1.90E-07
Cobalt-58	8.50E-14	1.70E-11	Xenon-135	2.00E-08	2.00E-08
Cobalt-60	1.00E-13	1.90E-11	Xenon-135m	8.90E-08	8.90E-08
Iron-59	1.70E-13	3.20E-11	Xenon-138	2.00E-07	2.00E-07
Lanthanum-140	2.80E-13	2.10E-11	Iodine-131	8.00E-14	7.00E-12
Manganese-54	8.30E-14	1.70E-11	Iodine-132	6.60E-12	1.90E-11
Molybdenum-99	2.40E-13	2.80E-11	Iodine-133	4.70E-13	1.10E-11
Niobium-95	8.70E-14	1.80E-11	Iodine-134	5.90E-11	8.20E-11
Rubidium-88	1.90E-08	1.90E-08	Iodine-135	7.00E-12	5.50E-11
Ruthenium-103	7.40E-14	1.50E-11			
Strontium-89	2.15E-15	(1)			
Strontium-90	5.60E-16	(1)			
Tellurium-123m	6.60E-14	1.50E-11			
Tritium	3.80E-07	3.80E-07			
Zinc-65	1.90E-13	3.80E-11			
Zirconium-95	1.80E-13	4.10E-11			
Gross Alpha	3.60E-15	(1)			
(1) Not required for batch releases.					

Table 4: Unit 1 Gaseous Effluents - Summation Of All Releases							
	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total For Year	Est. Total Error % (1)
A. Fission & activation gases							
1. Total release	Ci	9.72E-02	1.01E-01	7.28E-01	1.55E-01	1.08E+00	3.54E+01
2. Average release rate for period	µCi/sec	1.25E-02	1.27E-02	9.26E-02	1.95E-02	3.42E-02	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	NA (2)	NA (2)	NA (2)	
B. Iodine 131							
1. Total Iodine 131	Ci	< LLD	1.06E-06	7.08E-06	< LLD	8.13E-06	3.32E+01
2. Average release rate for period	µCi/sec	< LLD	1.33E-07	9.00E-07	< LLD	2.58E-07	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	NA (2)	NA (2)	NA (2)	
C. Particulates							
1. Particulates with half- lives > 8 days	Ci	2.91E-08	< LLD	1.04E-06	< LLD	1.07E-06	3.43E+01
2. Average release rate for period	µCi/sec	3.74E-09	< LLD	1.32E-07	< LLD	3.39E-08	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	NA (2)	NA (2)	NA (2)	
4. Gross Alpha radioactivity	Ci	< LLD	< LLD	< LLD	< LLD	< LLD	
D. Tritium							
1. Total release	Ci	9.77E+00	2.17E+02	1.95E+02	1.13E+01	4.34E+02	3.85E+01
2. Average release rate for period	µCi/sec	1.26E+00	2.73E+01	2.48E+01	1.42E+00	1.38E+01	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	NA (2)	NA (2)	NA (2)	
(1) Estimated total error methodology is presented in Table 40.							
(2) See Table 11 for percent of ODCM Requirement limits.							

Table 5: Unit 1 Gaseous Effluents - Ground Level Releases - Continuous - Fission Gases and Iodines						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
1. Fission gases						
Ar-41	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-83m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-85	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-85m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-88	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-131m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-133	Ci	< LLD	< LLD	6.08E-01	< LLD	6.08E-01
Xe-133m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-135	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-135m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	< LLD	< LLD	6.08E-01	< LLD	6.08E-01
2. Iodines						
I-131	Ci	< LLD	1.06E-06	7.08E-06	< LLD	8.13E-06
I-132	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-133	Ci	< LLD	< LLD	2.12E-06	< LLD	2.12E-06
I-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-135	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	< LLD	1.06E-06	9.19E-06	< LLD	1.03E-05

Table 6: Unit 1 Gaseous Effluents - Ground Level Releases - Continuous - Particulates						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
3.Particulates						
Ag-110m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ba-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Br-82	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ce-141	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ce-144	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-57	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-58	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-60	Ci	< LLD	< LLD	1.04E-06	< LLD	1.04E-06
Cr-51	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Fe-59	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
La-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mn-54	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mo-99	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Nb-95	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Os-191	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Rb-88	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ru-103	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-124	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Se-75	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Te-123m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zn-65	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zr-95	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	< LLD	< LLD	1.04E-06	< LLD	1.04E-06
4.Tritium						
H-3	Ci	9.76E+00	7.36E+00	1.32E+01	1.13E+01	4.16E+01

Table 7: Unit 1 Gaseous Effluents - Ground Level Releases - Batch - Fission Gases and Iodines						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
1. Fission gases						
Ar-41	Ci	9.72E-02	9.94E-02	1.18E-01	1.44E-01	4.59E-01
Kr-83m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-85	Ci	< LLD	2.44E-04	< LLD	< LLD	2.44E-04
Kr-85m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-88	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-131m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-133	Ci	< LLD	1.01E-03	1.85E-03	1.02E-02	1.31E-02
Xe-133m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-135	Ci	< LLD	< LLD	< LLD	7.18E-05	7.18E-05
Xe-135m	Ci	< LLD	1.66E-04	< LLD	< LLD	1.66E-04
Xe-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	9.72E-02	1.01E-01	1.20E-01	1.55E-01	4.72E-01
2. Iodines						
I-131	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-132	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-133	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-135	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	< LLD	< LLD	< LLD	< LLD	< LLD

Table 8: Unit 1 Gaseous Effluents - Ground Level Releases - Batch - Particulates						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
3. Particulates						
Ag-110m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ba-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Br-82	Ci	5.85E-06	6.08E-07	< LLD	< LLD	6.45E-06
Ce-141	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ce-144	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-57	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-58	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-60	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cr-51	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Fe-59	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
La-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mn-54	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mo-99	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Nb-95	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Os-191	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Rb-88	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ru-103	Ci	2.91E-08	< LLD	< LLD	< LLD	2.91E-08
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-124	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Se-75	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sr-89	Ci	Note 1	Note 1	Note 1	Note 1	Note 1
Sr-90	Ci	Note 1	Note 1	Note 1	Note 1	Note 1
Te-123m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zn-65	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zr-95	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	5.87E-06	6.08E-07	< LLD	< LLD	6.48E-06
4.Tritium						
H-3	Ci	1.52E-02	2.10E+02	1.82E+02	7.70E-03	3.92E+02
Note 1 - Not required for batch releases						

Table 9: Unit 1 Gaseous Effluents - Continuous and Batch - Fission Gases and Iodines						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
1. Fission gases						
Ar-41	Ci	9.72E-02	9.94E-02	1.18E-01	1.44E-01	4.59E-01
Kr-83m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-85	Ci	< LLD	2.44E-04	< LLD	< LLD	2.44E-04
Kr-85m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-88	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-131m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-133	Ci	< LLD	1.01E-03	6.10E-01	1.02E-02	6.21E-01
Xe-133m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-135	Ci	< LLD	< LLD	< LLD	7.18E-05	7.18E-05
Xe-135m	Ci	< LLD	1.66E-04	< LLD	< LLD	1.66E-04
Xe-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	9.72E-02	1.01E-01	7.28E-01	1.55E-01	1.08E+00
2. Iodines						
I-131	Ci	< LLD	1.06E-06	7.08E-06	< LLD	8.13E-06
I-132	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-133	Ci	< LLD	< LLD	2.12E-06	< LLD	2.12E-06
I-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-135	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	< LLD	1.06E-06	9.19E-06	< LLD	1.03E-05

Table 10: Unit 1 Gaseous Effluents - Continuous and Batch - Particulates						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
3. Particulates						
Ag-110m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ba-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Br-82	Ci	5.85E-06	6.08E-07	< LLD	< LLD	6.45E-06
Ce-141	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ce-144	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-57	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-58	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-60	Ci	< LLD	< LLD	1.04E-06	< LLD	1.04E-06
Cr-51	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Fe-59	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
La-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mn-54	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mo-99	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Nb-95	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Os-191	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Rb-88	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ru-103	Ci	2.91E-08	< LLD	< LLD	< LLD	2.91E-08
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-124	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Se-75	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Te-123m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zn-65	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zr-95	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	5.87E-06	6.08E-07	1.04E-06	< LLD	7.52E-06
total > 8 days	Ci	2.91E-08	< LLD	1.04E-06	< LLD	1.07E-06
4.Tritium						
H-3	Ci	9.77E+00	2.17E+02	1.95E+02	1.13E+01	4.34E+02

Table 11: Unit 1 Radiation Doses At And Beyond The Site Boundary						
	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
Gamma Air Dose	mrad	2.55E-04	2.61E-04	3.70E-04	3.80E-04	1.27E-03
ODCM Req 4.1 Limit	mrad	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
% ODCM Limit	%	5.10E-03	5.22E-03	7.40E-03	7.60E-03	1.27E-02
Beta Air Dose	mrad	9.01E-05	9.25E-05	2.90E-04	1.37E-04	6.09E-04
ODCM Req 4.1 Limit	mrad	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
% ODCM Limit	%	9.01E-04	9.25E-04	2.90E-03	1.37E-03	3.05E-03
Maximum Organ Dose (excluding skin)	mrem	3.51E-03	7.80E-02	7.02E-02	4.07E-03	1.56E-01
Age		Teen	Teen	Teen	Teen	Teen
Organ		(1)	Thyroid	Thyroid	(1)	Thyroid
ODCM Req. 4.2 Limit	mrem	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
% ODCM Limit	%	4.68E-02	1.04E+00	9.36E-01	5.43E-02	1.04E+00

Calculations are based on parameters and methodologies of the ODCM using historical meteorology. Dose is calculated to a hypothetical individual. In contrast, Appendix C dose calculations are based on concurrent meteorology, a real individual, and only the actual pathways present.

Note 1 - All organs except Bone

Table 12: Unit 2 Gaseous Effluents - Summation Of All Releases							
	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total For Year	Est. Total Error % (1)
A. Fission & activation gases							
1. Total release	Ci	2.17E+00	4.44E+00	1.57E+01	6.92E+01	9.15E+01	3.54E+01
2. Average release rate for period	µCi/sec	2.79E-01	5.65E-01	1.98E+00	8.71E+00	2.90E+00	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	NA (2)	NA (2)	NA (2)	
B. Iodine 131							
1. Total Iodine 131	Ci	< LLD	< LLD	4.79E-04	5.91E-03	6.38E-03	3.32E+01
2. Average release rate for period	µCi/sec	< LLD	< LLD	6.03E-05	7.44E-04	2.02E-04	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	NA (2)	NA (2)	NA (2)	
C. Particulates							
1. Particulates with half- lives > 8 days	Ci	1.98E-06	< LLD	< LLD	7.23E-04	7.25E-04	3.43E+01
2. Average release rate for period	µCi/sec	2.55E-07	< LLD	< LLD	9.09E-05	2.30E-05	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	NA (2)	NA (2)	NA (2)	
4. Gross Alpha radioactivity	Ci	< LLD	< LLD	< LLD	< LLD	< LLD	
D. Tritium							
1. Total release	Ci	1.12E+02	2.76E+02	5.50E+02	1.88E+02	1.13E+03	3.85E+01
2. Average release rate for period	µCi/sec	1.44E+01	3.51E+01	6.92E+01	2.37E+01	3.58E+01	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	NA (2)	NA (2)	NA (2)	
(1) Estimated total error methodology is presented in Table 40.							
(2) See Table 19 for percent of ODCM Requirement limits.							

Table 13: Unit 2 Gaseous Effluents - Ground Level Releases - Continuous - Fission Gases and Iodines						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
1. Fission gases						
Ar-41	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-83m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-85	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-85m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-88	Ci	< LLD	8.34E-03	< LLD	< LLD	8.34E-03
Kr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-131m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-133	Ci	< LLD	5.70E-01	6.05E+00	4.41E+01	5.07E+01
Xe-133m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-135	Ci	< LLD	9.58E-03	5.80E-01	< LLD	5.90E-01
Xe-135m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	< LLD	5.88E-01	6.63E+00	4.41E+01	5.13E+01
2. Iodines						
I-131	Ci	< LLD	< LLD	4.79E-04	2.48E-03	2.96E-03
I-132	Ci	< LLD	< LLD	< LLD	1.67E-04	1.67E-04
I-133	Ci	< LLD	< LLD	1.01E-04	< LLD	1.01E-04
I-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-135	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	< LLD	< LLD	5.81E-04	2.65E-03	3.23E-03

Table 14: Unit 2 Gaseous Effluents - Ground Level Releases - Continuous - Particulates						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
3. Particulates						
Ag-110m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ba-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Br-82	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ce-141	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ce-144	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-57	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-58	Ci	< LLD	< LLD	< LLD	9.47E-05	9.47E-05
Co-60	Ci	< LLD	< LLD	< LLD	3.87E-05	3.87E-05
Cr-51	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Fe-59	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
La-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mn-54	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mo-99	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Nb-95	Ci	< LLD	< LLD	< LLD	1.24E-05	1.24E-05
Os-191	Ci	< LLD	< LLD	< LLD	2.69E-05	2.69E-05
Rb-88	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ru-103	Ci	< LLD	< LLD	< LLD	1.85E-06	1.85E-06
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-124	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Se-75	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Te-123m	Ci	1.98E-06	< LLD	< LLD	< LLD	1.98E-06
Zn-65	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zr-95	Ci	< LLD	< LLD	< LLD	4.00E-06	4.00E-06
total	Ci	1.98E-06	< LLD	< LLD	1.79E-04	1.81E-04
4. Tritium						
H-3	Ci	2.74E+01	5.19E+01	2.59E+01	2.48E+01	1.30E+02

Table 15: Unit 2 Gaseous Effluents - Ground Level Releases - Batch - Fission Gases and Iodines						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
1. Fission gases						
Ar-41	Ci	1.16E-01	1.48E-01	1.87E-01	1.41E-02	4.65E-01
Kr-83m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-85	Ci	8.53E-01	1.59E+00	5.24E+00	5.54E+00	1.32E+01
Kr-85m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-88	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-131m	Ci	2.20E-02	3.41E-02	1.48E-02	3.43E-02	1.05E-01
Xe-133	Ci	1.17E+00	2.07E+00	3.56E+00	1.96E+01	2.64E+01
Xe-133m	Ci	7.74E-03	8.44E-03	6.56E-03	< LLD	2.27E-02
Xe-135	Ci	2.73E-03	4.36E-03	1.79E-02	< LLD	2.50E-02
Xe-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-135m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	2.17E+00	3.86E+00	9.03E+00	2.52E+01	4.02E+01
2. Iodines						
I-131	Ci	< LLD	< LLD	< LLD	3.42E-03	3.42E-03
I-132	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-133	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-135	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	< LLD	< LLD	< LLD	3.42E-03	3.42E-03

Table 16: Unit 2 Gaseous Effluents - Ground Level Releases - Batch - Particulates						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
3. Particulates						
Ag-110m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ba-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Br-82	Ci	8.19E-06	< LLD	< LLD	< LLD	8.19E-06
Ce-141	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ce-144	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-57	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-58	Ci	< LLD	< LLD	< LLD	4.66E-04	4.66E-04
Co-60	Ci	< LLD	< LLD	< LLD	6.99E-05	6.99E-05
Cr-51	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Fe-59	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
La-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mn-54	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mo-99	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Nb-95	Ci	< LLD	< LLD	< LLD	8.56E-06	8.56E-06
Os-191	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Rb-88	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ru-103	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-124	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Se-75	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sr-89	Ci	Note 1	Note 1	Note 1	Note 1	Note 1
Sr-90	Ci	Note 1	Note 1	Note 1	Note 1	Note 1
Te-123m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zn-65	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zr-95	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	8.19E-06	< LLD	< LLD	5.44E-04	5.52E-04
4. Tritium						
H-3	Ci	8.44E+01	2.25E+02	5.24E+02	1.63E+02	9.96E+02
Note 1 - Not required for batch releases						

Table 17: Unit 2 Gaseous Effluents - Continuous and Batch - Fission Gases and Iodines						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
1. Fission gases						
Ar-41	Ci	1.16E-01	1.48E-01	1.87E-01	1.41E-02	4.65E-01
Kr-83m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-85	Ci	8.53E-01	1.59E+00	5.24E+00	5.54E+00	1.32E+01
Kr-85m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-88	Ci	< LLD	8.34E-03	< LLD	< LLD	8.34E-03
Kr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-131m	Ci	2.20E-02	3.41E-02	1.48E-02	3.43E-02	1.05E-01
Xe-133	Ci	1.17E+00	2.64E+00	9.61E+00	6.36E+01	7.70E+01
Xe-133m	Ci	7.74E-03	8.44E-03	6.56E-03	< LLD	2.27E-02
Xe-135	Ci	2.73E-03	1.39E-02	5.98E-01	< LLD	6.15E-01
Xe-135m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	2.17E+00	4.44E+00	1.57E+01	6.92E+01	9.15E+01
2. Iodines						
I-131	Ci	< LLD	< LLD	4.79E-04	5.91E-03	6.38E-03
I-132	Ci	< LLD	< LLD	< LLD	1.67E-04	1.67E-04
I-133	Ci	< LLD	< LLD	1.01E-04	< LLD	1.01E-04
I-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-135	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	< LLD	< LLD	5.81E-04	6.07E-03	6.65E-03

Table 18: Unit 2 Gaseous Effluents - Continuous and Batch - Particulates						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
3. Particulates						
Ag-110m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ba-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Br-82	Ci	8.19E-06	< LLD	< LLD	< LLD	8.19E-06
Ce-141	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ce-144	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-57	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-58	Ci	< LLD	< LLD	< LLD	5.60E-04	5.60E-04
Co-60	Ci	< LLD	< LLD	< LLD	1.09E-04	1.09E-04
Cr-51	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Fe-59	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
La-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mn-54	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mo-99	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Nb-95	Ci	< LLD	< LLD	< LLD	2.09E-05	2.09E-05
Os-191	Ci	< LLD	< LLD	< LLD	2.69E-05	2.69E-05
Rb-88	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ru-103	Ci	< LLD	< LLD	< LLD	1.85E-06	1.85E-06
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-124	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Se-75	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Te-123m	Ci	1.98E-06	< LLD	< LLD	< LLD	1.98E-06
Zn-65	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zr-95	Ci	< LLD	< LLD	< LLD	4.00E-06	4.00E-06
total	Ci	1.02E-05	< LLD	< LLD	7.23E-04	7.33E-04
total > 8 days	Ci	1.98E-06	< LLD	< LLD	7.23E-04	7.25E-04
4. Tritium						
H-3	Ci	1.12E+02	2.76E+02	5.50E+02	1.88E+02	1.13E+03

Table 19: Unit 2 Radiation Doses At And Beyond The Site Boundary						
	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
Gamma Air Dose	mrad	4.28E-04	7.06E-04	1.80E-03	6.41E-03	9.34E-03
ODCM Req 4.1 Limit	mrad	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
% ODCM Limit	%	8.56E-03	1.41E-02	3.60E-02	1.28E-01	9.34E-02
Beta Air Dose	mrad	9.36E-04	1.83E-03	6.33E-03	2.19E-02	3.10E-02
ODCM Req 4.1 Limit	mrad	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
% ODCM Limit	%	9.36E-03	1.83E-02	6.33E-02	2.19E-01	1.55E-01
Maximum Organ Dose (excluding skin)	mrem	4.01E-02	9.92E-02	2.03E-01	2.28E-01	4.83E-01
Age		Teen	Teen	Teen	Infant	Teen
Organ		(1)	(1)	Thyroid	Thyroid	Thyroid
ODCM Req. 4.2 Limit	mrem	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
% ODCM Limit	%	5.35E-01	1.32E+00	2.71E+00	3.04E+00	3.22E+00

Calculations are based on parameters and methodologies of the ODCM using historical meteorology. Dose is calculated to a hypothetical individual. In contrast, Appendix C dose calculations are based on concurrent meteorology, a real individual, and only the actual pathways present.

Note 1 - All organs except Bone

Table 20: Unit 3 Gaseous Effluents - Summation Of All Releases							
	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Total For Year	Est. Total Error % (1)
A. Fission & activation gases							
1. Total release	Ci	1.43E+01	8.43E+01	1.15E-01	1.54E-01	9.89E+01	3.54E+01
2. Average release rate for period	µCi/sec	1.84E+00	1.07E+01	1.45E-02	1.94E-02	3.14E+00	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	NA (2)	NA (2)	NA (2)	
B. Iodine 131							
1. Total Iodine 131	Ci	7.98E-04	5.21E-03	2.53E-06	< LLD	6.01E-03	3.32E+01
2. Average release rate for period	µCi/sec	1.03E-04	6.63E-04	3.18E-07	< LLD	1.91E-04	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	NA (2)	NA (2)	NA (2)	
C. Particulates							
1. Particulates with half- lives > 8 days	Ci	2.13E-09	2.13E-04	4.53E-05	8.05E-07	2.60E-04	3.43E+01
2. Average release rate for period	µCi/sec	2.74E-10	2.71E-05	5.70E-06	1.01E-07	8.24E-06	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	NA (2)	NA (2)	NA (2)	
4. Gross Alpha radioactivity	Ci	< LLD	< LLD	< LLD	< LLD	< LLD	
D. Tritium							
1. Total release	Ci	3.52E+02	2.44E+02	2.36E+02	4.64E+01	8.78E+02	3.85E+01
2. Average release rate for period	µCi/sec	4.53E+01	3.10E+01	2.97E+01	5.84E+00	2.78E+01	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	NA (2)	NA (2)	NA (2)	
(1) Estimated total error methodology is presented in Table 40.							
(2) See Table 27 for percent of ODCM Requirement limits.							

Table 21: Unit 3 Gaseous Effluents - Ground Level Releases - Continuous - Fission Gases and Iodines						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
1. Fission gases						
Ar-41	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-83m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-85	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-85m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-88	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-131m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-133	Ci	1.20E+01	3.34E+01	< LLD	< LLD	4.54E+01
Xe-133m	Ci	< LLD	3.54E-01	< LLD	< LLD	3.54E-01
Xe-135	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-135m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	1.20E+01	3.37E+01	< LLD	< LLD	4.58E+01
2. Iodines						
I-131	Ci	7.98E-04	5.21E-03	2.53E-06	< LLD	6.01E-03
I-132	Ci	< LLD	5.37E-04	< LLD	< LLD	5.37E-04
I-133	Ci	3.67E-04	2.80E-05	< LLD	< LLD	3.95E-04
I-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-135	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	1.17E-03	5.77E-03	2.53E-06	< LLD	6.94E-03

Table 22: Unit 3 Gaseous Effluents - Ground Level Releases - Continuous - Particulates						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
3. Particulates						
Ag-110m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ba-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Br-82	Ci	4.85E-06	< LLD	< LLD	< LLD	4.85E-06
Ce-141	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ce-144	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-57	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-58	Ci	< LLD	1.59E-04	4.27E-05	8.05E-07	2.03E-04
Co-60	Ci	< LLD	8.18E-06	< LLD	< LLD	8.18E-06
Cr-51	Ci	< LLD	1.39E-05	< LLD	< LLD	1.39E-05
Cs-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Fe-59	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
La-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mn-54	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mo-99	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Nb-95	Ci	< LLD	6.45E-06	< LLD	< LLD	6.45E-06
Os-191	Ci	< LLD	1.14E-05	< LLD	< LLD	1.14E-05
Rb-88	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ru-103	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-124	Ci	< LLD	2.46E-06	< LLD	< LLD	2.46E-06
Se-75	Ci	< LLD	1.33E-06	2.64E-06	< LLD	3.98E-06
Sr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Te-123m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zn-65	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zr-95	Ci	< LLD	1.05E-05	< LLD	< LLD	1.05E-05
total	Ci	4.85E-06	2.14E-04	4.53E-05	8.05E-07	2.65E-04
4. Tritium						
H-3	Ci	8.25E+00	7.30E+00	8.04E+01	4.63E+01	1.42E+02

Table 23: Unit 3 Gaseous Effluents - Ground Level Releases - Batch - Fission Gases and Iodines						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
1. Fission gases						
Ar-41	Ci	7.91E-01	7.89E-02	1.09E-01	1.54E-01	1.13E+00
Kr-83m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-85	Ci	5.40E-01	9.97E-01	< LLD	< LLD	1.54E+00
Kr-85m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-88	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-131m	Ci	2.93E-03	5.03E-01	< LLD	< LLD	5.06E-01
Xe-133	Ci	8.69E-01	4.81E+01	1.19E-04	< LLD	4.90E+01
Xe-133m	Ci	< LLD	3.14E-01	< LLD	< LLD	3.14E-01
Xe-135	Ci	3.30E-02	5.68E-01	6.39E-03	< LLD	6.07E-01
Xe-135m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	2.24E+00	5.06E+01	1.15E-01	1.54E-01	5.31E+01
2. Iodines						
I-131	Ci	1.14E-08	< LLD	< LLD	< LLD	1.14E-08
I-132	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-133	Ci	9.57E-09	< LLD	< LLD	< LLD	9.57E-09
I-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-135	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	2.09E-08	< LLD	< LLD	< LLD	2.09E-08

Table 24: Unit 3 Gaseous Effluents - Ground Level Releases - Batch - Particulates						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
3. Particulates						
Ag-110m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ba-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Br-82	Ci	1.48E-05	6.28E-06	< LLD	< LLD	2.11E-05
Ce-141	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ce-144	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-57	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-58	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-60	Ci	< LLD	6.25E-08	< LLD	< LLD	6.25E-08
Cr-51	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-134	Ci	1.09E-09	< LLD	< LLD	< LLD	1.09E-09
Cs-137	Ci	1.04E-09	< LLD	< LLD	< LLD	1.04E-09
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Fe-59	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
La-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mn-54	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mo-99	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Nb-95	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Os-191	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Rb-88	Ci	1.87E-06	< LLD	< LLD	< LLD	1.87E-06
Ru-103	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-124	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Se-75	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sr-89	Ci	Note 1	Note 1	Note 1	Note 1	Note 1
Sr-90	Ci	Note 1	Note 1	Note 1	Note 1	Note 1
Te-123m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zn-65	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zr-95	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	1.67E-05	6.34E-06	< LLD	< LLD	2.30E-05
4. Tritium						
H-3	Ci	3.43E+02	2.36E+02	1.56E+02	3.76E-02	7.36E+02
Note 1 - Not required for batch releases						

Table 25: Unit 3 Gaseous Effluents - Continuous and Batch - Fission Gases and Iodines						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
1. Fission gases						
Ar-41	Ci	7.91E-01	7.89E-02	1.09E-01	1.54E-01	1.13E+00
Kr-83m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-85	Ci	5.40E-01	9.97E-01	< LLD	< LLD	1.54E+00
Kr-85m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-88	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-131m	Ci	2.93E-03	5.03E-01	< LLD	< LLD	5.06E-01
Xe-133	Ci	1.29E+01	8.15E+01	1.19E-04	< LLD	9.44E+01
Xe-133m	Ci	< LLD	6.68E-01	< LLD	< LLD	6.68E-01
Xe-135	Ci	3.30E-02	5.68E-01	6.39E-03	< LLD	6.07E-01
Xe-135m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	1.43E+01	8.43E+01	1.15E-01	1.54E-01	9.89E+01
2. Iodines						
I-131	Ci	7.98E-04	5.21E-03	2.53E-06	< LLD	6.01E-03
I-132	Ci	< LLD	5.37E-04	< LLD	< LLD	5.37E-04
I-133	Ci	3.67E-04	2.80E-05	< LLD	< LLD	3.95E-04
I-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-135	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	1.17E-03	5.77E-03	2.53E-06	< LLD	6.94E-03

Table 26: Unit 3 Gaseous Effluents - Continuous and Batch - Particulates						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
3. Particulates						
Ag-110m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ba-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Br-82	Ci	1.96E-05	6.28E-06	< LLD	< LLD	2.59E-05
Ce-141	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ce-144	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-57	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-58	Ci	< LLD	1.59E-04	4.27E-05	8.05E-07	2.03E-04
Co-60	Ci	< LLD	8.25E-06	< LLD	< LLD	8.25E-06
Cr-51	Ci	< LLD	1.39E-05	< LLD	< LLD	1.39E-05
Cs-134	Ci	1.09E-09	< LLD	< LLD	< LLD	1.09E-09
Cs-137	Ci	1.04E-09	< LLD	< LLD	< LLD	1.04E-09
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Fe-59	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
La-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mn-54	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mo-99	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Nb-95	Ci	< LLD	6.45E-06	< LLD	< LLD	6.45E-06
Os-191	Ci	< LLD	1.14E-05	< LLD	< LLD	1.14E-05
Rb-88	Ci	1.87E-06	< LLD	< LLD	< LLD	1.87E-06
Ru-103	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-124	Ci	< LLD	2.46E-06	< LLD	< LLD	2.46E-06
Se-75	Ci	< LLD	1.33E-06	2.64E-06	< LLD	3.98E-06
Sr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Te-123m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zn-65	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zr-95	Ci	< LLD	1.05E-05	< LLD	< LLD	1.05E-05
total	Ci	2.15E-05	2.20E-04	4.53E-05	8.05E-07	2.88E-04
total > 8 days	Ci	2.13E-09	2.13E-04	4.53E-05	8.05E-07	2.60E-04
4. Tritium						
H-3	Ci	3.52E+02	2.44E+02	2.36E+02	4.64E+01	8.78E+02

Table 27: Unit 3 Radiation Doses At And Beyond The Site Boundary						
	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
Gamma Air Dose	mrad	3.39E-03	8.73E-03	2.89E-04	4.05E-04	1.28E-02
ODCM Req 4.1 Limit	mrad	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
% ODCM Limit	%	6.78E-02	1.75E-01	5.78E-03	8.10E-03	1.28E-01
Beta Air Dose	mrad	4.88E-03	2.56E-02	1.05E-04	1.43E-04	3.08E-02
ODCM Req 4.1 Limit	mrad	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
% ODCM Limit	%	4.88E-02	2.56E-01	1.05E-03	1.43E-03	1.54E-01
Maximum Organ Dose (excluding skin)	mrem	1.36E-01	2.15E-01	8.48E-02	1.66E-02	3.97E-01
Age		Teen	Infant	Teen	Teen	Child
Organ		Thyroid	Thyroid	Thyroid	Lung	Thyroid
ODCM Req. 4.2 Limit	mrem	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
% ODCM Limit	%	1.81E+00	2.87E+00	1.13E+00	2.21E-01	2.65E+00

Calculations are based on parameters and methodologies of the ODCM using historical meteorology. Dose is calculated to a hypothetical individual. In contrast, Appendix C dose calculations are based on concurrent meteorology, a real individual, and only the actual pathways present.

Table 28: Units 1, 2, and 3 Gaseous Effluents - Continuous - Fission Gases and Iodines - Total By Quarter						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
1. Fission gases						
Ar-41	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-83m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-85	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-85m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-88	Ci	< LLD	8.34E-03	< LLD	< LLD	8.34E-03
Kr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-131m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-133	Ci	1.20E+01	3.40E+01	6.66E+00	4.41E+01	9.67E+01
Xe-133m	Ci	< LLD	3.54E-01	< LLD	< LLD	3.54E-01
Xe-135	Ci	< LLD	9.58E-03	5.80E-01	< LLD	5.90E-01
Xe-135m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	1.20E+01	3.43E+01	7.24E+00	4.41E+01	9.77E+01
2. Iodines						
I-131	Ci	7.98E-04	5.21E-03	4.89E-04	2.48E-03	8.98E-03
I-132	Ci	< LLD	5.37E-04	< LLD	1.67E-04	7.03E-04
I-133	Ci	3.67E-04	2.80E-05	1.04E-04	< LLD	4.99E-04
I-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-135	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	1.17E-03	5.77E-03	5.92E-04	2.65E-03	1.02E-02

Table 29: Units 1, 2, and 3 Gaseous Effluents - Continuous - Particulates - Total By Quarter						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
3. Particulates						
Ag-110m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ba-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Br-82	Ci	4.85E-06	< LLD	< LLD	< LLD	4.85E-06
Ce-141	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ce-144	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-57	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-58	Ci	< LLD	1.59E-04	4.27E-05	9.55E-05	2.98E-04
Co-60	Ci	< LLD	8.18E-06	1.04E-06	3.87E-05	4.79E-05
Cr-51	Ci	< LLD	1.39E-05	< LLD	< LLD	1.39E-05
Cs-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Fe-59	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
La-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mn-54	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mo-99	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Nb-95	Ci	< LLD	6.45E-06	< LLD	1.24E-05	1.88E-05
Os-191	Ci	< LLD	1.14E-05	< LLD	2.69E-05	3.84E-05
Rb-88	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ru-103	Ci	< LLD	< LLD	< LLD	1.85E-06	1.85E-06
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-124	Ci	< LLD	2.46E-06	< LLD	< LLD	2.46E-06
Se-75	Ci	< LLD	1.33E-06	2.64E-06	< LLD	3.98E-06
Sr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Te-123m	Ci	1.98E-06	< LLD	< LLD	< LLD	1.98E-06
Zn-65	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zr-95	Ci	< LLD	1.05E-05	< LLD	4.00E-06	1.45E-05
total	Ci	6.83E-06	2.14E-04	4.64E-05	1.79E-04	4.46E-04
4. Tritium						
H-3	Ci	4.54E+01	6.66E+01	1.19E+02	8.25E+01	3.14E+02

Table 30: Units 1, 2, and 3 Gaseous Effluents - Batch - Fission Gases and Iodines - Total By Quarter						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
1. Fission gases						
Ar-41	Ci	1.00E+00	3.27E-01	4.13E-01	3.13E-01	2.06E+00
Kr-83m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-85	Ci	1.39E+00	2.59E+00	5.24E+00	5.54E+00	1.48E+01
Kr-85m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-88	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-131m	Ci	2.50E-02	5.37E-01	1.48E-02	3.43E-02	6.11E-01
Xe-133	Ci	2.04E+00	5.02E+01	3.56E+00	1.96E+01	7.54E+01
Xe-133m	Ci	7.74E-03	3.23E-01	6.56E-03	< LLD	3.37E-01
Xe-135	Ci	3.58E-02	5.72E-01	2.43E-02	7.18E-05	6.32E-01
Xe-135m	Ci	< LLD	1.66E-04	< LLD	< LLD	1.66E-04
Xe-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	4.50E+00	5.46E+01	9.26E+00	2.55E+01	9.38E+01
2. Iodines						
I-131	Ci	1.14E-08	< LLD	< LLD	3.42E-03	3.42E-03
I-132	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-133	Ci	9.57E-09	< LLD	< LLD	< LLD	9.57E-09
I-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-135	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	2.09E-08	< LLD	< LLD	3.42E-03	3.42E-03

Table 31: Units 1, 2, and 3 Gaseous Effluents - Batch - Particulates - Total By Quarter						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
3. Particulates						
Ag-110m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ba-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Br-82	Ci	2.88E-05	6.89E-06	< LLD	< LLD	3.57E-05
Ce-141	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ce-144	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-57	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-58	Ci	< LLD	< LLD	< LLD	4.66E-04	4.66E-04
Co-60	Ci	< LLD	6.25E-08	< LLD	6.99E-05	7.00E-05
Cr-51	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Cs-134	Ci	1.09E-09	< LLD	< LLD	< LLD	1.09E-09
Cs-137	Ci	1.04E-09	< LLD	< LLD	< LLD	1.04E-09
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Fe-59	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
La-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mn-54	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mo-99	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Nb-95	Ci	< LLD	< LLD	< LLD	8.56E-06	8.56E-06
Os-191	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Rb-88	Ci	1.87E-06	< LLD	< LLD	< LLD	1.87E-06
Ru-103	Ci	2.91E-08	< LLD	< LLD	< LLD	2.91E-08
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-124	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Se-75	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sr-89	Ci	Note 1	Note 1	Note 1	Note 1	Note 1
Sr-90	Ci	Note 1	Note 1	Note 1	Note 1	Note 1
Te-123m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zn-65	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zr-95	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	3.07E-05	6.95E-06	< LLD	5.44E-04	5.82E-04
4. Tritium						
H-3	Ci	4.28E+02	6.71E+02	8.62E+02	1.63E+02	2.12E+03
Note 1 - Not required for batch releases						

Table 32: Units 1, 2, and 3 Gaseous Effluents - Continuous and Batch - Fission Gases and Iodines - Total By Quarter						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
1. Fission gases						
Ar-41	Ci	1.00E+00	3.27E-01	4.13E-01	3.13E-01	2.06E+00
Kr-83m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-85	Ci	1.39E+00	2.59E+00	5.24E+00	5.54E+00	1.48E+01
Kr-85m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-88	Ci	< LLD	8.34E-03	< LLD	< LLD	8.34E-03
Kr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Kr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-131m	Ci	2.50E-02	5.37E-01	1.48E-02	3.43E-02	6.11E-01
Xe-133	Ci	1.41E+01	8.42E+01	1.02E+01	6.36E+01	1.72E+02
Xe-133m	Ci	7.74E-03	6.76E-01	6.56E-03	< LLD	6.91E-01
Xe-135	Ci	3.58E-02	5.82E-01	6.05E-01	7.18E-05	1.22E+00
Xe-135m	Ci	< LLD	1.66E-04	< LLD	< LLD	1.66E-04
Xe-137	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	1.65E+01	8.89E+01	1.65E+01	6.95E+01	1.91E+02
2. Iodines						
I-131	Ci	7.98E-04	5.21E-03	4.89E-04	5.91E-03	1.24E-02
I-132	Ci	< LLD	5.37E-04	< LLD	1.67E-04	7.03E-04
I-133	Ci	3.67E-04	2.80E-05	1.04E-04	< LLD	4.99E-04
I-134	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
I-135	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
total	Ci	1.17E-03	5.77E-03	5.92E-04	6.07E-03	1.36E-02

Table 33: Units 1, 2, and 3 Gaseous Effluents - Continuous and Batch - Particulates - Total By Quarter						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
3. Particulates						
Ag-110m	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ba-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Br-82	Ci	3.37E-05	6.89E-06	< LLD	< LLD	4.06E-05
Ce-141	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Ce-144	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-57	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Co-58	Ci	< LLD	1.59E-04	4.27E-05	5.61E-04	7.63E-04
Co-60	Ci	< LLD	8.25E-06	1.04E-06	1.09E-04	1.18E-04
Cr-51	Ci	< LLD	1.39E-05	< LLD	< LLD	1.39E-05
Cs-134	Ci	1.09E-09	< LLD	< LLD	< LLD	1.09E-09
Cs-137	Ci	1.04E-09	< LLD	< LLD	< LLD	1.04E-09
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Fe-59	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
La-140	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mn-54	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Mo-99	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Nb-95	Ci	< LLD	6.45E-06	< LLD	2.09E-05	2.74E-05
Os-191	Ci	< LLD	1.14E-05	< LLD	2.69E-05	3.84E-05
Rb-88	Ci	1.87E-06	< LLD	< LLD	< LLD	1.87E-06
Ru-103	Ci	2.91E-08	< LLD	< LLD	1.85E-06	1.87E-06
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sb-124	Ci	< LLD	2.46E-06	< LLD	< LLD	2.46E-06
Se-75	Ci	< LLD	1.33E-06	2.64E-06	< LLD	3.98E-06
Sr-89	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Sr-90	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Te-123m	Ci	1.98E-06	< LLD	< LLD	< LLD	1.98E-06
Zn-65	Ci	< LLD	< LLD	< LLD	< LLD	< LLD
Zr-95	Ci	< LLD	1.05E-05	< LLD	4.00E-06	1.45E-05
total	Ci	3.76E-05	2.21E-04	4.64E-05	7.23E-04	1.03E-03
total > 8 days	Ci	2.02E-06	2.14E-04	4.64E-05	7.23E-04	9.86E-04
4. Tritium						
H-3	Ci	4.73E+02	7.37E+02	9.81E+02	2.46E+02	2.44E+03

Table 34: Units 1, 2 and 3 Gaseous Effluents- Continuous - Fission Gases and Iodine - Total By Unit					
Nuclides Released	Unit	Unit 1	Unit 2	Unit 3	Total Units 1, 2 and 3
1. Fission gases					
Ar-41	Ci	< LLD	< LLD	< LLD	< LLD
Kr-83m	Ci	< LLD	< LLD	< LLD	< LLD
Kr-85	Ci	< LLD	< LLD	< LLD	< LLD
Kr-85m	Ci	< LLD	< LLD	< LLD	< LLD
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD
Kr-88	Ci	< LLD	8.34E-03	< LLD	8.34E-03
Kr-89	Ci	< LLD	< LLD	< LLD	< LLD
Kr-90	Ci	< LLD	< LLD	< LLD	< LLD
Xe-131m	Ci	< LLD	< LLD	< LLD	< LLD
Xe-133	Ci	6.08E-01	5.07E+01	4.54E+01	9.67E+01
Xe-133m	Ci	< LLD	< LLD	3.54E-01	3.54E-01
Xe-135	Ci	< LLD	5.90E-01	< LLD	5.90E-01
Xe-135m	Ci	< LLD	< LLD	< LLD	< LLD
Xe-137	Ci	< LLD	< LLD	< LLD	< LLD
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD
total	Ci	6.08E-01	5.13E+01	4.58E+01	9.77E+01
2. Iodines					
I-131	Ci	8.13E-06	2.96E-03	6.01E-03	8.98E-03
I-132	Ci	< LLD	1.67E-04	5.37E-04	7.03E-04
I-133	Ci	2.12E-06	1.01E-04	3.95E-04	4.99E-04
I-134	Ci	< LLD	< LLD	< LLD	< LLD
I-135	Ci	< LLD	< LLD	< LLD	< LLD
total	Ci	1.03E-05	3.23E-03	6.94E-03	1.02E-02

Table 35: Units 1, 2 and 3 Gaseous Effluents- Continuous - Particulates - Total By Unit					
Nuclides Released	Unit	Unit 1	Unit 2	Unit 3	Total Units 1, 2 and 3
3. Particulates					
Ag-110m	Ci	< LLD	< LLD	< LLD	< LLD
Ba-140	Ci	< LLD	< LLD	< LLD	< LLD
Br-82	Ci	< LLD	< LLD	4.85E-06	4.85E-06
Ce-141	Ci	< LLD	< LLD	< LLD	< LLD
Ce-144	Ci	< LLD	< LLD	< LLD	< LLD
Co-57	Ci	< LLD	< LLD	< LLD	< LLD
Co-58	Ci	< LLD	9.47E-05	2.03E-04	2.98E-04
Co-60	Ci	1.04E-06	3.87E-05	8.18E-06	4.79E-05
Cr-51	Ci	< LLD	< LLD	1.39E-05	1.39E-05
Cs-134	Ci	< LLD	< LLD	< LLD	< LLD
Cs-137	Ci	< LLD	< LLD	< LLD	< LLD
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD
Fe-59	Ci	< LLD	< LLD	< LLD	< LLD
La-140	Ci	< LLD	< LLD	< LLD	< LLD
Mn-54	Ci	< LLD	< LLD	< LLD	< LLD
Mo-99	Ci	< LLD	< LLD	< LLD	< LLD
Nb-95	Ci	< LLD	1.24E-05	6.45E-06	1.88E-05
Os-191	Ci	< LLD	2.69E-05	1.14E-05	3.84E-05
Rb-88	Ci	< LLD	< LLD	< LLD	< LLD
Ru-103	Ci	< LLD	1.85E-06	< LLD	1.85E-06
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD
Sb-124	Ci	< LLD	< LLD	2.46E-06	2.46E-06
Se-75	Ci	< LLD	< LLD	3.98E-06	3.98E-06
Sr-89	Ci	< LLD	< LLD	< LLD	< LLD
Sr-90	Ci	< LLD	< LLD	< LLD	< LLD
Te-123m	Ci	< LLD	1.98E-06	< LLD	1.98E-06
Zn-65	Ci	< LLD	< LLD	< LLD	< LLD
Zr-95	Ci	< LLD	4.00E-06	1.05E-05	1.45E-05
total	Ci	1.04E-06	1.81E-04	2.65E-04	4.46E-04
4. Tritium					
H-3	Ci	4.16E+01	1.30E+02	1.42E+02	3.14E+02

Table 36: Units 1, 2 and 3 Gaseous Effluents- Batch - Fission Gases and Iodine - Total By Unit					
Nuclides Released	Unit	Unit 1	Unit 2	Unit 3	Total Units 1, 2 and 3
1. Fission gases					
Ar-41	Ci	4.59E-01	4.65E-01	1.13E+00	2.06E+00
Kr-83m	Ci	< LLD	< LLD	< LLD	< LLD
Kr-85	Ci	2.44E-04	1.32E+01	1.54E+00	1.48E+01
Kr-85m	Ci	< LLD	< LLD	< LLD	< LLD
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD
Kr-88	Ci	< LLD	< LLD	< LLD	< LLD
Kr-89	Ci	< LLD	< LLD	< LLD	< LLD
Kr-90	Ci	< LLD	< LLD	< LLD	< LLD
Xe-131m	Ci	< LLD	1.05E-01	5.06E-01	6.11E-01
Xe-133	Ci	1.31E-02	2.64E+01	4.90E+01	7.54E+01
Xe-133m	Ci	< LLD	2.27E-02	3.14E-01	3.37E-01
Xe-135	Ci	7.18E-05	2.50E-02	6.07E-01	6.32E-01
Xe-135m	Ci	1.66E-04	< LLD	< LLD	1.66E-04
Xe-137	Ci	< LLD	< LLD	< LLD	< LLD
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD
total	Ci	4.72E-01	4.02E+01	5.31E+01	9.38E+01
2. Iodines					
I-131	Ci	< LLD	3.42E-03	1.14E-08	3.42E-03
I-132	Ci	< LLD	< LLD	< LLD	< LLD
I-133	Ci	< LLD	< LLD	9.57E-09	9.57E-09
I-134	Ci	< LLD	< LLD	< LLD	< LLD
I-135	Ci	< LLD	< LLD	< LLD	< LLD
total	Ci	< LLD	3.42E-03	2.09E-08	3.42E-03

Table 37: Units 1, 2 and 3 Gaseous Effluents- Batch - Particulates - Total By Unit					
Nuclides Released	Unit	Unit 1	Unit 2	Unit 3	Total Units 1,2 and 3
3. Particulates					
Ag-110m	Ci	< LLD	< LLD	< LLD	< LLD
Ba-140	Ci	< LLD	< LLD	< LLD	< LLD
Br-82	Ci	6.45E-06	8.19E-06	2.11E-05	3.57E-05
Ce-141	Ci	< LLD	< LLD	< LLD	< LLD
Ce-144	Ci	< LLD	< LLD	< LLD	< LLD
Co-57	Ci	< LLD	< LLD	< LLD	< LLD
Co-58	Ci	< LLD	4.66E-04	< LLD	4.66E-04
Co-60	Ci	< LLD	6.99E-05	6.25E-08	7.00E-05
Cr-51	Ci	< LLD	< LLD	< LLD	< LLD
Cs-134	Ci	< LLD	< LLD	1.09E-09	1.09E-09
Cs-137	Ci	< LLD	< LLD	1.04E-09	1.04E-09
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD
Fe-59	Ci	< LLD	< LLD	< LLD	< LLD
La-140	Ci	< LLD	< LLD	< LLD	< LLD
Mn-54	Ci	< LLD	< LLD	< LLD	< LLD
Mo-99	Ci	< LLD	< LLD	< LLD	< LLD
Nb-95	Ci	< LLD	8.56E-06	< LLD	8.56E-06
Os-191	Ci	< LLD	< LLD	< LLD	< LLD
Rb-88	Ci	< LLD	< LLD	1.87E-06	1.87E-06
Ru-103	Ci	2.91E-08	< LLD	< LLD	2.91E-08
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD
Sb-124	Ci	< LLD	< LLD	< LLD	< LLD
Se-75	Ci	< LLD	< LLD	< LLD	< LLD
Sr-89	Ci	Note 1	Note 1	Note 1	Note 1
Sr-90	Ci	Note 1	Note 1	Note 1	Note 1
Te-123m	Ci	< LLD	< LLD	< LLD	< LLD
Zn-65	Ci	< LLD	< LLD	< LLD	< LLD
Zr-95	Ci	< LLD	< LLD	< LLD	< LLD
total	Ci	6.48E-06	5.52E-04	2.30E-05	5.82E-04
4. Tritium					
H-3	Ci	3.92E+02	9.96E+02	7.36E+02	2.12E+03
Note 1 - Not required for batch releases					

Table 38: Units 1, 2 and 3 Gaseous Effluents- Continuous and Batch - Fission Gases and Iodine - Total By Unit					
Nuclides Released	Unit	Unit 1	Unit 2	Unit 3	Total Units 1, 2 and 3
1. Fission gases					
Ar-41	Ci	4.59E-01	4.65E-01	1.13E+00	2.06E+00
Kr-83m	Ci	< LLD	< LLD	< LLD	< LLD
Kr-85	Ci	2.44E-04	1.32E+01	1.54E+00	1.48E+01
Kr-85m	Ci	< LLD	< LLD	< LLD	< LLD
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD
Kr-88	Ci	< LLD	8.34E-03	< LLD	8.34E-03
Kr-89	Ci	< LLD	< LLD	< LLD	< LLD
Kr-90	Ci	< LLD	< LLD	< LLD	< LLD
Xe-131m	Ci	< LLD	1.05E-01	5.06E-01	6.11E-01
Xe-133	Ci	6.21E-01	7.70E+01	9.44E+01	1.72E+02
Xe-133m	Ci	< LLD	2.27E-02	6.68E-01	6.91E-01
Xe-135	Ci	7.18E-05	6.15E-01	6.07E-01	1.22E+00
Xe-135m	Ci	1.66E-04	< LLD	< LLD	1.66E-04
Xe-137	Ci	< LLD	< LLD	< LLD	< LLD
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD
total	Ci	1.08E+00	9.15E+01	9.89E+01	1.91E+02
2. Iodines					
I-131	Ci	8.13E-06	6.38E-03	6.01E-03	1.24E-02
I-132	Ci	< LLD	1.67E-04	5.37E-04	7.03E-04
I-133	Ci	2.12E-06	1.01E-04	3.95E-04	4.99E-04
I-134	Ci	< LLD	< LLD	< LLD	< LLD
I-135	Ci	< LLD	< LLD	< LLD	< LLD
total	Ci	1.03E-05	6.65E-03	6.94E-03	1.36E-02

Table 39: Units 1, 2 and 3 Gaseous Effluents - Continuous and Batch - Particulates - Total By Unit					
Nuclides Released	Unit	Unit 1	Unit 2	Unit 3	Total Units 1, 2 and 3
3. Particulates					
Ag-110m	Ci	< LLD	< LLD	< LLD	< LLD
Ba-140	Ci	< LLD	< LLD	< LLD	< LLD
Br-82	Ci	6.45E-06	8.19E-06	2.59E-05	4.06E-05
Ce-141	Ci	< LLD	< LLD	< LLD	< LLD
Ce-144	Ci	< LLD	< LLD	< LLD	< LLD
Co-57	Ci	< LLD	< LLD	< LLD	< LLD
Co-58	Ci	< LLD	5.60E-04	2.03E-04	7.63E-04
Co-60	Ci	1.04E-06	1.09E-04	8.25E-06	1.18E-04
Cr-51	Ci	< LLD	< LLD	1.39E-05	1.39E-05
Cs-134	Ci	< LLD	< LLD	1.09E-09	1.09E-09
Cs-137	Ci	< LLD	< LLD	1.04E-09	1.04E-09
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD
Fe-59	Ci	< LLD	< LLD	< LLD	< LLD
La-140	Ci	< LLD	< LLD	< LLD	< LLD
Mn-54	Ci	< LLD	< LLD	< LLD	< LLD
Mo-99	Ci	< LLD	< LLD	< LLD	< LLD
Nb-95	Ci	< LLD	2.09E-05	6.45E-06	2.74E-05
Os-191	Ci	< LLD	2.69E-05	1.14E-05	3.84E-05
Rb-88	Ci	< LLD	< LLD	1.87E-06	1.87E-06
Ru-103	Ci	2.91E-08	1.85E-06	< LLD	1.87E-06
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD
Sb-124	Ci	< LLD	< LLD	2.46E-06	2.46E-06
Se-75	Ci	< LLD	< LLD	3.98E-06	3.98E-06
Sr-89	Ci	< LLD	< LLD	< LLD	< LLD
Sr-90	Ci	< LLD	< LLD	< LLD	< LLD
Te-123m	Ci	< LLD	1.98E-06	< LLD	1.98E-06
Zn-65	Ci	< LLD	< LLD	< LLD	< LLD
Zr-95	Ci	< LLD	4.00E-06	1.05E-05	1.45E-05
total	Ci	7.52E-06	7.33E-04	2.88E-04	1.03E-03
total > 8 days	Ci	1.07E-06	7.25E-04	2.60E-04	9.86E-04
4. Tritium					
H-3	Ci	4.34E+02	1.13E+03	8.78E+02	2.44E+03

Table 40:
Estimation of Total Percent Error

The estimated total error is calculated as follows:

Total Percent Error = $(E_1^2 + E_2^2 + E_3^2 + ... + E_n^2)^{1/2}$

Where E_n = Percent error associated with each contributing parameter.

Parameters contributing to errors in the measurement of gaseous effluents; process flow rates, sample collection, analytical counting and tank volumes.

The following values (%) were used for error calculations.

Fission & Act gases	I-131	Particulates	Tritium	
25	25	25	25	Sample counting error
10	10	10	10	Counting system calibration error
5	5	5	5	Counting system source error
20	N/A	N/A	N/A	Temperature/volume correction error
10	10	10	10	Process flow measuring device (1)
N/A	15	15	15	Sample flow measuring device
N/A	5	N/A	N/A	Iodine collection efficiency error
N/A	N/A	10	N/A	Plateout error
N/A	N/A	N/A	20	Bubbler collection efficiency error
N/A	N/A	N/A	2	Sample volume transfer error (pipette)
N/A	N/A	N/A	2	Sample volume error (graduate)
Note 1 - % of full scale				

Table 41: Effluent Monitoring Instrumentation Out Of Service Greater Than 30 Days				
Unit	Instrument	Date span of inoperability	Cause of inoperability	Explanation
NONE				

Table 42:
Solid Waste Summary

A. Solid Waste Shipped Offsite For Burial Or Disposal (not irradiated fuel)

1.0 Type of Waste	Unit	Jan-Dec	estimated total error %
1.a. Spent resin, filters, evaporator bottoms, etc.	m^3	7.23E+01	N/A
	Ci	1.26E+03	2.50E+01
1.b. Dry compressible waste, contaminated equipment, etc.	m^3	3.04E+02	N/A
	Ci	8.95E+00	2.50E+01
1.c. Irradiated components, fuel rods, etc.	m^3	0.00E+00	N/A
	Ci	0.00E+00	N/A
1.d. Other	m^3	0.00E+00	N/A
	Ci	0.00E+00	N/A
Volume and activity for dry compressible waste, contaminated equipment, etc., includes PVNGS waste disposed of after being processed by a volume reduction facility. Volume for waste shipped to the Envirocare Bulk Facility is calculated from waste volume not container disposal volume.			

2.0 Principal Radionuclides

2.a Estimate of major nuclide concentrations for spent resins, filter, evaporator bottoms, etc.			
Waste Class	Nuclide Name	Percent Abundance	Curies
A	Fe-55	4.56E+01	1.31E+01
A	Ni-63	2.44E+01	7.00E+00
A	Co-60	1.05E+01	3.03E+00
A	C-14	6.09E+00	1.75E+00
A	Cs-137	3.43E+00	9.85E-01
A	H-3	2.76E+00	7.92E-01
A	Co-58	2.51E+00	7.20E-01
A	Sb-125	1.68E+00	4.82E-01
A	Cs-134	1.45E+00	4.17E-01
A	Mn-54	5.74E-01	1.65E-01
A	Ag-110m	4.32E-01	1.24E-01
A	Ni-59	2.00E-01	5.76E-02
A	Sb-124	1.02E-01	2.93E-02
A	Pu-241	9.47E-02	2.72E-02
A	Co-57	5.64E-02	1.62E-02
A	Ce-144	3.09E-02	8.88E-03
A	Nb-95	2.22E-02	6.37E-03
A	Zr-95	2.10E-02	6.04E-03
A	Sr-90	1.42E-02	4.09E-03
A	Cr-51	1.17E-02	3.37E-03
A	Sn-113	1.17E-02	3.36E-03
A	Cm-243	3.00E-03	8.62E-04
A	Pu-238	2.71E-03	7.78E-04
A	Zn-65	2.03E-03	5.82E-04
A	Am-241	1.59E-03	4.58E-04
A	Te-123m	1.37E-03	3.93E-04
A	Tc-99	9.99E-04	2.87E-04
A	Pu-239	9.54E-04	2.74E-04
A	Cm-242	6.93E-04	1.99E-04
A	Nb-94	2.72E-04	7.82E-05
A	Eu-154	3.55E-05	1.02E-05
A	Sr-89	2.66E-05	7.63E-06
A	Pu-242	4.63E-06	1.33E-06
A	Fe-59	4.35E-07	1.25E-07
		Total	2.87E+01

2.b Estimate of major nuclide concentrations for spent resins, filter, evaporator bottoms, etc.			
Waste Class	Nuclide Name	Percent Abundance	Curies
B	Ni-63	2.67E+01	1.41E+02
B	Cs-137	2.53E+01	1.34E+02
B	Fe-55	1.78E+01	9.40E+01
B	Cs-134	1.46E+01	7.72E+01
B	Co-58	7.17E+00	3.79E+01
B	Co-60	6.26E+00	3.31E+01
B	Mn-54	1.14E+00	6.02E+00
B	Sb-125	3.69E-01	1.95E+00
B	C-14	1.89E-01	1.00E+00
B	Ni-59	1.71E-01	9.02E-01
B	Sr-90	1.14E-01	6.02E-01
B	Co-57	8.74E-02	4.62E-01
B	Sb-124	5.26E-02	2.78E-01
B	H-3	4.35E-02	2.30E-01
B	Pu-241	1.52E-02	8.03E-02
B	Sr-89	9.40E-03	4.97E-02
B	Ce-144	5.71E-03	3.02E-02
B	Ag-110m	2.42E-03	1.28E-02
B	Pu-238	5.81E-04	3.07E-03
B	Cm-243	4.16E-04	2.20E-03
B	Tc-99	2.95E-04	1.56E-03
B	Am-241	2.82E-04	1.49E-03
B	Pu-239	1.81E-04	9.58E-04
B	Cm-242	7.26E-05	3.84E-04
		Total	5.29E+02

2.c Estimate of major nuclide concentrations for spent resins, filter, evaporator bottoms, etc.			
Waste Class	Nuclide Name	Percent Abundance	Curies
C	Ni-63	4.54E+01	3.18E+02
C	Fe-55	2.33E+01	1.63E+02
C	Cs-137	9.74E+00	6.83E+01
C	Co-60	8.55E+00	5.99E+01
C	Cs-134	4.47E+00	3.13E+01
C	H-3	2.93E+00	2.05E+01
C	Co-58	1.66E+00	1.16E+01
C	Sb-125	9.34E-01	6.55E+00
C	C-14	9.18E-01	6.44E+00
C	Ni-59	6.34E-01	4.45E+00
C	Mn-54	3.28E-01	2.30E+00
C	Ag-110m	1.90E-01	1.33E+00
C	Sr-90	1.90E-01	1.33E+00
C	Co-57	1.85E-01	1.30E+00
C	Zr-95	1.82E-01	1.28E+00
C	Te-123m	1.21E-01	8.47E-01
C	Ce-144	1.06E-01	7.44E-01
C	Pu-241	7.60E-02	5.33E-01
C	Sb-124	6.27E-02	4.39E-01
C	Nb-95	3.11E-02	2.18E-01
C	Ru-106	1.47E-02	1.03E-01
C	Sn-113	1.22E-02	8.57E-02
C	Cr-51	1.18E-02	8.30E-02
C	Pu-239	4.07E-03	2.85E-02
C	Tc-99	3.64E-03	2.55E-02
C	Ce-141	2.16E-03	1.52E-02
C	Fe-59	1.43E-03	1.00E-02
C	Pu-238	1.29E-03	9.05E-03
C	Ru-103	8.97E-04	6.29E-03
C	Cm-243	7.20E-04	5.04E-03
C	Am-241	6.28E-04	4.40E-03
C	Cm-242	3.85E-04	2.70E-03
C	Sr-89	1.84E-04	1.29E-03
C	Hf-181	2.98E-05	2.09E-04
C	I-129	1.64E-06	1.15E-05
C	Pu-242	7.05E-07	4.94E-06
		Total	7.01E+02

2.d Estimate of major nuclide concentrations for dry compressible waste, contaminated equipment, etc.			
Waste Class	Nuclide Name	Percent Abundance	Curies
A	Fe-55	5.61E+01	2.09E+00
A	Co-58	1.69E+01	6.29E-01
A	Co-60	8.51E+00	3.16E-01
A	Ni-63	4.35E+00	1.62E-01
A	Cr-51	4.12E+00	1.53E-01
A	Zr-95	3.13E+00	1.16E-01
A	Nb-95	2.69E+00	9.98E-02
A	Mn-54	1.20E+00	4.45E-02
A	Fe-59	6.03E-01	2.24E-02
A	Sb-125	5.66E-01	2.10E-02
A	H-3	4.75E-01	1.77E-02
A	Sb-124	3.75E-01	1.40E-02
A	Sn-113	2.00E-01	7.45E-03
A	Co-57	1.54E-01	5.74E-03
A	C-14	1.48E-01	5.50E-03
A	Ce-144	9.80E-02	3.64E-03
A	Te-123m	7.59E-02	2.82E-03
A	Ag-110m	6.33E-02	2.35E-03
A	Ru-103	5.64E-02	2.10E-03
A	Pu-241	4.21E-02	1.57E-03
A	Ni-59	3.20E-02	1.19E-03
A	Hf-181	1.76E-02	6.55E-04
A	Zn-65	1.42E-02	5.29E-04
A	Ce-141	1.16E-02	4.33E-04
A	Cs-137	7.06E-03	2.62E-04
A	Sr-89	4.37E-03	1.62E-04
A	Cs-134	3.90E-03	1.45E-04
A	Cm-242	3.55E-03	1.32E-04
A	Sr-90	3.13E-03	1.17E-04
A	Pu-238	1.02E-03	3.80E-05
A	Tc-99	1.01E-03	3.75E-05
A	Cm-243	9.19E-04	3.42E-05
A	Am-241	4.73E-04	1.76E-05
A	Pu-239	4.18E-04	1.55E-05
A	I-129	1.72E-04	6.40E-06
A	PU-242	6.27E-07	2.33E-08
		Total	3.72E+00

2.e Estimate of major nuclide concentrations for dry compressible waste, contaminated equipment, etc.			
Waste Class	Nuclide Name	Percent Abundance	Curies
C	Fe-55	4.88E+01	2.55E+00
C	Co-58	3.00E+01	1.57E+00
C	Co-60	8.21E+00	4.30E-01
C	Ni-63	7.45E+00	3.90E-01
C	Mn-54	1.36E+00	7.10E-02
C	Sb-125	1.05E+00	5.50E-02
C	Sb-124	6.95E-01	3.64E-02
C	Zr-95	5.19E-01	2.72E-02
C	Cr-51	5.12E-01	2.68E-02
C	Co-57	2.40E-01	1.26E-02
C	H-3	2.35E-01	1.23E-02
C	Nb-95	2.29E-01	1.20E-02
C	Fe-59	1.87E-01	9.78E-03
C	Zn-65	1.45E-01	7.59E-03
C	C-14	1.16E-01	6.05E-03
C	Ni-59	1.03E-01	5.37E-03
C	Sn-113	8.09E-02	4.23E-03
C	Te-123m	6.91E-02	3.62E-03
C	Ru-103	9.13E-03	4.78E-04
C	Pu-241	8.62E-03	4.51E-04
C	Ce-144	7.44E-03	3.89E-04
C	Ag-110m	4.85E-03	2.54E-04
C	Cs-137	2.33E-03	1.22E-04
C	Tc-99	9.42E-04	4.93E-05
C	Sr-89	4.40E-04	2.30E-05
C	Cm-242	3.16E-04	1.66E-05
C	Sr-90	2.98E-04	1.56E-05
C	Ce-141	2.73E-04	1.43E-05
C	Cm-243/244	2.42E-04	1.27E-05
C	Pu-238	2.06E-04	1.08E-05
C	Am-241	9.57E-05	5.01E-06
C	Pu-239/240	6.63E-05	3.47E-06
C	Hf-181	4.70E-07	2.46E-08
C	Pu-242	4.64E-07	2.43E-08
		Total	5.23E+00

3.0 Solid Waste Disposition
3.a

Shipments	Shipper	Mode Of Transportation	Destination
11	APS	Truck	Barnwell, SC
9	APS	Truck	Envirocare, UT (Bulk)
7	APS	Truck	Envirocare (Containerized)
7	ATG	Truck	Envirocare, UT (Bulk)
17	GTS	Truck	Envirocare, UT (Bulk)
8	GTS	Truck	Envirocare (Containerized)
32	GTS	Rail	Envirocare, UT (Bulk)

3.b Irradiated Fuel Shipments: None

3.c Supplemental Information (This section includes PVNGS and Vendor supplied containers):

Number of Containers	Container Volume ft^3	Type of Waste	Container Type	Solidification Agent
6	132.4	Resin	EL-142	None
4	202.2	Resin	ES-210	None
3	18.8	Filters	Nuhic-55	None
1	51.2	Filters	EL-50	None
1	18.8	Filters / Dry Active Waste	Nuhic-55	None
1	51.2	Filters / Dry Active Waste	EL-50	None
126	7.5	Concentrate	Drum	None
1	11.6	Concentrate	Drum	None
14	7.5	Dry Active Waste	Drum	None
17	11.6	Dry Active Waste	Drum	None
2	90.9	Dry Active Waste	B-25	None
35	678	Dry Active Waste	Intermodal	None
25	1040	Dry Active Waste	20' Sealand	None

4.0 Changes to Processes and/or Equipment

4.a The Radwaste Process Control Program, 76DP-0RP03, Rev. 4, is included in Appendix D.

4.b No major changes were made to installed plant equipment.

4.c No major changes were made to installed plant equipment, therefore, predicted release or quantity of solid waste generated, remain unchanged as addressed in the UFSAR.

4.d No major changes were made to installed plant equipment, therefore, predicted exposure to the public and general population, remain unchanged as addressed in the UFSAR.

APPENDIX B

METEOROLOGY

JOINT FREQUENCY DISTRIBUTION TABLES

The tables presented in this section are results obtained from processing the hourly meteorological data collected at the Palo Verde Nuclear Generating Station for the period of January - December 2003. The joint frequency distribution (JFD) tables represent the frequency, in terms of the number of observations, that a particular wind speed, wind direction, and stability category occurred simultaneously. On a quarterly, semiannual and annual basis, the JFDs were produced for 35-foot wind speed and wind direction by atmospheric stability class corresponding to the seven Pasquill stability categories, and for wind speed and wind direction for all stability classes combined. Atmospheric stability was classified per Regulatory Guide 1.23, using the 200-foot to 35-foot temperature difference (delta T).

In accordance with NUREG-0133, the batch releases for the year were considered as "long term," since the batch releases are sufficiently random in both time of day and duration. Consequently, the JFDs for the batch releases for all quarters are the same as for the continuous releases.

Discussion

A summary of 2003 Joint Frequency Distribution (JFD) shows a somewhat typical, but variable year. Of the 8760 hours available, only 9 hours of data were lost for a 99.9% data recovery.

The average 35 foot wind speed was 6.4 mph. Distribution of directions was spread over the compass with a predominant direction (3 sectors of 22.5 degrees each) centered on southwest (33.8%). A secondary maximum of three sectors centered on the north contained 27.6% of the total. Southwesterly flow winds averaged higher speeds with the most frequent speed at 10.0 mph. With the northerly directions, the highest frequency occurred at 4.0 mph.

Stability class summary:

Overall stable conditions (E,F,G) dominated, with extremely stable (G) conditions occurring during 25.7% of the hours.

Stability class E, F, G, (stable categories) 59.0%.
Stability class G, (extremely stable) 25.7%.
Stability class A, B, C, (unstable categories) 21.9%.
Stability class D, (neutral category) 19.1%.

Light northerly flow is most likely for stable conditions, while unstable atmospheres are usually associated with faster southwesterly winds. This distribution is typical of moderate altitude dry climates.

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 1/01/2003 TO 3/31/2003

*** 1ST QRTR ***

STABILITY CLASS A

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.51- 5.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5.51- 6.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6.51- 8.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8.51-11.50	0	3	1	0	0	0	0	0	0	0	1	0	0	1	0	0	6
11.51-14.50	0	3	0	1	0	0	0	0	0	0	2	0	0	0	0	1	7
14.51-20.50	0	0	0	2	1	0	0	0	0	1	1	0	0	5	0	4	14
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	4
TOTAL	0	6	1	3	1	0	0	0	0	1	4	0	0	8	2	5	31

STABILITY CLASS B

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
4.51- 5.50	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
5.51- 6.50	0	2	1	2	0	0	0	0	1	0	1	0	1	0	0	1	9
6.51- 8.50	0	0	3	2	1	0	0	1	2	0	0	2	0	0	3	1	15
8.51-11.50	0	0	0	3	1	0	0	2	0	0	5	7	1	0	0	1	20
11.51-14.50	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	3
14.51-20.50	1	0	1	0	0	0	0	0	0	0	0	1	0	4	0	0	7
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	2	5	8	2	0	0	3	4	3	6	10	2	4	3	3	56

STABILITY CLASS C

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	1	0	1	0	0	1	0	1	0	0	0	0	4
3.51- 4.50	1	0	0	0	0	0	0	2	4	3	0	1	0	0	0	0	11
4.51- 5.50	2	4	3	1	1	1	0	1	3	3	4	2	1	0	1	1	28
5.51- 6.50	1	1	7	2	2	2	0	0	2	3	3	4	2	0	0	2	31
6.51- 8.50	0	1	6	3	0	3	4	0	5	2	5	3	0	0	1	1	34
8.51-11.50	1	1	0	1	0	0	0	0	0	1	1	2	1	0	0	0	8
11.51-14.50	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	3
14.51-20.50	0	0	0	0	0	0	0	0	0	0	1	0	0	3	0	1	5
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	5	7	17	7	4	6	5	3	14	13	14	15	4	3	2	5	124

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 1/01/2003 TO 3/31/2003

*** 1ST QRTR ***

STABILITY CLASS D

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	2	3	2	1	1	2	1	3	1	3	2	4	2	3	2	1	33
2.51- 3.50	4	5	4	8	5	2	3	8	6	20	10	8	9	3	8	10	113
3.51- 4.50	7	15	5	7	2	2	0	2	11	24	17	16	7	5	8	3	131
4.51- 5.50	8	4	5	2	2	2	0	2	6	4	5	6	6	1	5	2	60
5.51- 6.50	1	4	6	3	1	0	2	0	2	3	4	3	2	5	1	5	42
6.51- 8.50	0	2	4	5	5	3	3	1	7	3	7	4	3	2	4	2	55
8.51-11.50	1	1	0	3	5	7	2	2	0	3	4	3	2	1	1	1	36
11.51-14.50	0	0	0	1	3	0	0	1	5	0	2	5	2	1	0	1	21
14.51-20.50	1	0	0	1	6	0	0	0	0	1	0	3	0	3	1	1	17
>20.50	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	3
TOTAL	24	34	26	31	31	18	11	19	38	61	51	52	33	25	31	26	511

STABILITY CLASS E

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
1.51- 2.50	3	0	0	0	0	1	0	2	2	1	2	9	4	6	6	0	36
2.51- 3.50	7	6	3	2	1	1	0	3	6	1	6	3	6	6	9	3	63
3.51- 4.50	4	3	3	0	0	1	2	2	4	7	5	4	5	2	2	5	49
4.51- 5.50	2	1	2	0	2	0	0	1	3	4	3	3	1	2	3	4	31
5.51- 6.50	2	2	1	2	1	0	0	1	4	4	2	3	5	1	4	3	35
6.51- 8.50	3	8	2	0	1	0	0	4	5	11	11	1	10	1	2	4	63
8.51-11.50	1	4	2	2	2	6	2	1	1	7	6	5	3	7	4	3	56
11.51-14.50	2	0	1	4	3	4	1	0	1	0	0	1	0	6	0	6	29
14.51-20.50	1	0	0	2	3	2	1	0	0	0	0	0	0	1	0	1	11
>20.50	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL	25	24	14	13	13	15	6	14	26	35	36	29	34	32	30	29	375

STABILITY CLASS F

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2
1.51- 2.50	2	1	1	0	1	0	1	1	0	2	1	3	8	3	7	1	32
2.51- 3.50	8	6	1	3	1	1	1	1	5	0	4	5	11	15	11	16	89
3.51- 4.50	13	1	2	1	2	0	0	0	1	2	2	6	9	7	9	7	62
4.51- 5.50	8	4	3	1	0	0	1	0	2	2	7	3	3	0	6	9	49
5.51- 6.50	3	1	1	1	1	1	0	0	0	5	2	2	1	3	2	5	28
6.51- 8.50	6	2	3	1	0	0	0	0	0	1	4	4	3	2	2	4	32
8.51-11.50	1	4	2	2	0	0	0	0	0	2	1	1	2	1	2	3	21
11.51-14.50	0	7	0	0	0	0	0	0	0	0	0	0	0	1	0	1	9
14.51-20.50	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	41	27	13	9	5	2	3	2	8	14	21	24	38	32	39	47	325

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 1/01/2003 TO 3/31/2003

*** 1ST QRTR ***

STABILITY CLASS G

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1.51- 2.50	11	1	3	0	0	0	0	2	0	1	1	2	7	9	8	10	55
2.51- 3.50	37	10	4	3	2	3	0	2	0	0	5	10	7	16	33	59	191
3.51- 4.50	51	22	5	3	3	0	1	0	1	1	2	5	4	8	24	56	186
4.51- 5.50	63	22	4	1	0	1	0	1	0	0	2	1	2	1	10	42	150
5.51- 6.50	41	25	1	1	0	0	0	0	0	0	0	1	1	0	4	12	86
6.51- 8.50	25	15	5	0	0	0	0	0	0	0	0	0	1	1	0	7	54
8.51-11.50	2	6	3	0	0	0	0	0	0	0	0	0	0	0	1	1	13
11.51-14.50	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	231	102	25	8	5	4	1	5	1	2	10	19	22	35	80	187	737

STABILITY CLASS ALL

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	4
1.51- 2.50	18	5	6	1	2	3	2	8	3	7	6	18	21	21	23	12	156
2.51- 3.50	56	27	12	16	10	7	5	14	17	22	25	27	33	40	61	88	460
3.51- 4.50	76	41	15	12	7	3	3	6	21	37	26	32	25	22	43	71	440
4.51- 5.50	83	35	17	5	5	4	1	5	15	13	21	15	13	4	25	58	319
5.51- 6.50	48	35	17	11	5	3	2	1	9	15	12	13	12	9	11	28	231
6.51- 8.50	34	28	23	11	7	6	7	6	19	17	27	14	17	6	12	19	253
8.51-11.50	6	19	8	11	8	13	4	5	1	13	18	18	9	10	8	9	160
11.51-14.50	2	11	2	6	6	4	1	1	6	3	4	8	2	8	0	9	73
14.51-20.50	3	1	1	5	10	2	1	0	0	2	2	4	0	16	1	7	55
>20.50	0	0	0	1	1	0	0	0	0	0	0	0	0	3	3	0	8
TOTAL	327	202	101	79	61	45	26	46	91	129	142	149	133	139	187	302	2159

TOTAL NUMBER OF OBSERVATIONS: 2160
TOTAL NUMBER OF VALID OBSERVATIONS: 2159
TOTAL NUMBER OF MISSING OBSERVATIONS: 1
PERCENT DATA RECOVERY FOR THIS PERIOD: 100.0 %
MEAN WIND SPEED FOR THIS PERIOD: 5.6 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
1.44	2.59	5.74	23.67	17.37	15.05	34.14

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	0	6	1	3	1	0	0	0	0	1	4	0	0	8	2	5	0
B	1	2	5	8	2	0	0	3	4	3	6	10	2	4	3	3	0
C	5	7	17	7	4	6	5	3	14	13	14	15	4	3	2	5	0
D	24	34	26	31	31	18	11	19	38	61	51	52	33	25	31	26	0
E	25	24	14	13	13	15	6	14	26	35	36	29	34	32	30	29	0
F	41	27	13	9	5	2	3	2	8	14	21	24	38	32	39	47	0
G	231	102	25	8	5	4	1	5	1	2	10	19	22	35	80	187	0
TOTAL	327	202	101	79	61	45	26	46	91	129	142	149	133	139	187	302	0

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 4/01/2003 TO 6/30/2003

*** 2ND QRTR ***

STABILITY CLASS A

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	2
4.51- 5.50	0	0	0	0	0	1	0	1	7	1	0	0	0	0	0	0	10
5.51- 6.50	0	0	0	0	0	0	2	3	9	8	3	2	0	1	0	0	28
6.51- 8.50	0	0	0	2	2	2	4	3	8	21	38	5	3	3	0	0	91
8.51-11.50	0	0	0	1	8	2	1	0	7	32	54	18	7	0	0	0	130
11.51-14.50	0	0	0	0	4	0	2	0	4	23	39	6	5	3	2	1	89
14.51-20.50	0	0	0	2	2	0	0	0	3	12	33	1	0	3	0	0	56
>20.50	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
TOTAL	0	0	1	5	16	5	9	7	38	98	168	32	15	10	2	1	407

STABILITY CLASS B

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	2
4.51- 5.50	0	0	0	0	2	0	3	9	15	13	3	4	1	1	0	0	51
5.51- 6.50	0	0	1	0	0	2	2	8	19	6	10	3	1	1	0	0	53
6.51- 8.50	0	0	1	1	4	3	4	6	8	7	14	2	4	3	1	0	58
8.51-11.50	0	0	0	1	2	0	0	0	4	3	8	4	2	0	1	0	25
11.51-14.50	0	0	0	0	1	0	0	0	0	1	10	2	0	0	1	0	15
14.51-20.50	0	0	0	0	2	0	0	0	0	1	6	1	0	0	0	0	10
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	2	2	11	5	9	24	47	31	51	16	8	5	3	0	214

STABILITY CLASS C

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	3
3.51- 4.50	0	0	0	0	0	0	2	4	5	7	1	3	1	0	0	0	23
4.51- 5.50	0	0	0	1	0	1	1	5	16	7	2	5	0	1	2	1	42
5.51- 6.50	0	0	0	4	0	1	0	5	5	10	7	3	1	1	0	0	37
6.51- 8.50	0	0	0	1	1	0	0	0	3	2	9	5	1	2	0	0	24
8.51-11.50	0	0	1	2	0	1	0	0	0	3	6	4	1	0	1	0	19
11.51-14.50	0	0	0	0	0	0	0	0	0	1	2	2	0	1	0	0	6
14.51-20.50	0	0	0	0	2	0	0	0	0	1	1	2	0	0	0	0	6
>20.50	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTAL	0	0	1	8	3	3	3	15	29	33	29	24	4	5	3	1	161

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 4/01/2003 TO 6/30/2003

*** 2ND QRTR ***

STABILITY CLASS D

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
1.51- 2.50	1	0	1	2	0	0	1	5	0	1	1	1	2	1	1	1	18
2.51- 3.50	2	2	0	3	1	0	6	3	6	4	3	2	2	2	1	0	37
3.51- 4.50	1	1	5	2	1	3	2	0	3	6	8	5	0	0	2	1	40
4.51- 5.50	1	2	0	1	0	0	2	1	5	5	3	3	1	1	0	1	26
5.51- 6.50	1	0	1	0	0	2	1	1	0	4	4	3	1	1	0	1	20
6.51- 8.50	0	1	0	1	0	0	1	2	0	1	7	3	3	2	0	0	21
8.51-11.50	0	0	0	0	2	3	0	1	0	1	13	9	5	0	2	0	36
11.51-14.50	0	0	0	1	2	0	0	0	0	3	13	10	1	1	1	0	32
14.51-20.50	0	0	0	0	1	0	0	0	0	7	11	5	2	0	0	0	26
>20.50	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	2
TOTAL	6	6	7	10	8	8	13	13	14	34	63	41	17	8	7	4	259

STABILITY CLASS E

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	2	0	2	0	0	0	0	0	0	0	2	1	3	1	2	0	13
2.51- 3.50	7	3	0	1	0	0	0	1	2	2	4	3	5	1	3	3	35
3.51- 4.50	5	1	2	0	0	0	0	1	2	5	5	8	2	2	1	3	37
4.51- 5.50	2	0	2	1	0	0	1	2	0	2	4	1	2	0	0	0	17
5.51- 6.50	0	0	1	0	0	0	0	0	0	9	3	5	3	1	0	1	23
6.51- 8.50	0	0	1	0	0	1	1	1	4	13	13	13	0	2	0	2	51
8.51-11.50	1	0	2	0	1	3	1	1	1	27	51	34	6	2	2	1	133
11.51-14.50	0	0	0	1	0	1	2	0	1	17	32	15	3	1	0	0	73
14.51-20.50	0	0	0	1	1	0	0	0	1	6	10	2	0	0	0	0	21
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	17	4	10	4	2	5	5	6	11	81	124	82	24	10	8	10	403

STABILITY CLASS F

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
1.51- 2.50	0	1	0	0	0	0	0	0	1	1	0	4	0	2	2	1	12
2.51- 3.50	4	2	1	1	0	0	1	2	0	1	1	1	5	4	1	7	31
3.51- 4.50	8	4	1	1	0	2	1	3	1	4	5	13	9	8	4	1	65
4.51- 5.50	0	1	0	0	1	0	0	4	2	5	8	8	7	0	3	2	41
5.51- 6.50	1	0	1	0	0	0	0	1	0	9	12	4	7	1	2	0	38
6.51- 8.50	1	1	0	0	0	1	0	0	2	12	35	17	13	2	2	0	86
8.51-11.50	2	1	0	1	1	0	0	0	1	15	22	15	2	0	0	0	60
11.51-14.50	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
14.51-20.50	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	16	10	3	4	2	3	2	10	8	47	83	62	44	17	14	11	336

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 4/01/2003 TO 6/30/2003

*** 2ND QRTR ***

STABILITY CLASS G

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
1.51- 2.50	2	1	0	0	1	0	0	1	0	0	2	1	1	4	3	2	18
2.51- 3.50	14	8	1	2	1	0	0	0	1	3	3	1	3	5	12	18	72
3.51- 4.50	36	17	3	3	0	0	1	0	0	1	2	3	5	7	6	37	121
4.51- 5.50	33	16	7	2	1	0	1	2	0	1	3	4	2	4	8	19	103
5.51- 6.50	10	9	4	0	0	0	0	0	0	0	0	3	1	3	2	7	39
6.51- 8.50	9	12	5	1	0	0	0	0	0	1	3	2	1	0	3	5	42
8.51-11.50	3	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	7
11.51-14.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	108	66	21	8	3	0	2	3	2	6	13	14	13	23	34	88	404

STABILITY CLASS ALL

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	1	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	4
1.51- 2.50	5	2	3	2	1	0	1	6	1	2	5	7	6	8	8	4	61
2.51- 3.50	27	15	2	7	2	0	7	7	9	11	12	7	15	12	17	28	178
3.51- 4.50	50	23	12	6	1	5	6	9	12	24	21	32	17	17	13	42	290
4.51- 5.50	36	19	9	5	4	2	8	24	45	34	23	25	13	7	13	23	290
5.51- 6.50	12	9	8	4	0	5	5	18	33	46	39	23	14	9	4	9	238
6.51- 8.50	10	14	7	6	7	7	10	12	25	57	119	47	25	14	6	7	373
8.51-11.50	6	4	4	5	14	9	2	2	13	81	154	84	23	2	6	1	410
11.51-14.50	0	0	0	2	7	1	4	0	6	45	96	35	9	6	4	1	216
14.51-20.50	0	0	0	4	8	0	0	0	4	27	61	11	2	3	0	0	120
>20.50	0	0	0	0	1	0	0	0	0	2	1	0	0	0	0	0	4
TOTAL	147	86	45	41	45	29	43	78	149	330	531	271	125	78	71	115	2184

TOTAL NUMBER OF OBSERVATIONS: 2184
TOTAL NUMBER OF VALID OBSERVATIONS: 2184
TOTAL NUMBER OF MISSING OBSERVATIONS: 0
PERCENT DATA RECOVERY FOR THIS PERIOD: 100.0 %
MEAN WIND SPEED FOR THIS PERIOD: 7.6 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
18.64	9.80	7.37	11.86	18.45	15.38	18.50

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	0	0	1	5	16	5	9	7	38	98	168	32	15	10	2	1	0
B	0	0	2	2	11	5	9	24	47	31	51	16	8	5	3	0	0
C	0	0	1	8	3	3	3	15	29	33	29	24	4	5	3	1	0
D	6	6	7	10	8	8	13	13	14	34	63	41	17	8	7	4	0
E	17	4	10	4	2	5	5	6	11	81	124	82	24	10	8	10	0
F	16	10	3	4	2	3	2	10	8	47	83	62	44	17	14	11	0
G	108	66	21	8	3	0	2	3	2	6	13	14	13	23	34	88	0
TOTAL	147	86	45	41	45	29	43	78	149	330	531	271	125	78	71	115	0

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 1/01/2003 TO 6/30/2003

*** 1ST SEMI ***

STABILITY CLASS A

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	2
4.51- 5.50	0	0	0	0	0	1	0	1	7	1	0	0	0	0	0	0	10
5.51- 6.50	0	0	0	0	0	0	2	3	9	8	3	2	0	1	0	0	28
6.51- 8.50	0	0	0	2	2	2	4	3	8	21	38	5	3	3	0	0	91
8.51-11.50	0	3	1	1	8	2	1	0	7	32	55	18	7	1	0	0	136
11.51-14.50	0	3	0	1	4	0	2	0	4	23	41	6	5	3	2	2	96
14.51-20.50	0	0	0	4	3	0	0	0	3	13	34	1	0	8	0	4	70
>20.50	0	0	0	0	0	0	0	0	0	0	1	0	0	2	2	0	5
TOTAL	0	6	2	8	17	5	9	7	38	99	172	32	15	18	4	6	438

STABILITY CLASS B

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	3
4.51- 5.50	0	0	0	0	2	0	3	9	16	13	3	4	1	1	0	0	52
5.51- 6.50	0	2	2	2	0	2	2	8	20	6	11	3	2	1	0	1	62
6.51- 8.50	0	0	4	3	5	3	4	7	10	7	14	4	4	3	4	1	73
8.51-11.50	0	0	0	4	3	0	0	2	4	3	13	11	3	0	1	1	45
11.51-14.50	0	0	0	0	1	0	0	0	0	4	10	2	0	0	1	0	18
14.51-20.50	1	0	1	0	2	0	0	0	0	1	6	2	0	4	0	0	17
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	2	7	10	13	5	9	27	51	34	57	26	10	9	6	3	270

STABILITY CLASS C

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	1	0	1	1	0	2	1	1	0	0	0	0	7
3.51- 4.50	1	0	0	0	0	0	2	6	9	10	1	4	1	0	0	0	34
4.51- 5.50	2	4	3	2	1	2	1	6	19	10	6	7	1	1	3	2	70
5.51- 6.50	1	1	7	6	2	3	0	5	7	13	10	7	3	1	0	2	68
6.51- 8.50	0	1	6	4	1	3	4	0	8	4	14	8	1	2	1	1	58
8.51-11.50	1	1	1	3	0	1	0	0	0	4	7	6	2	0	1	0	27
11.51-14.50	0	0	1	0	0	0	0	0	0	1	2	4	0	1	0	0	9
14.51-20.50	0	0	0	0	2	0	0	0	0	1	2	2	0	3	0	1	11
>20.50	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTAL	5	7	18	15	7	9	8	18	43	46	43	39	8	8	5	6	285

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 1/01/2003 TO 6/30/2003

*** 1ST SEMI ***

STABILITY CLASS D

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
1.51- 2.50	3	3	3	3	1	2	2	8	1	4	3	5	4	4	3	2	51
2.51- 3.50	6	7	4	11	6	2	9	11	12	24	13	10	11	5	9	10	150
3.51- 4.50	8	16	10	9	3	5	2	2	14	30	25	21	7	5	10	4	171
4.51- 5.50	9	6	5	3	2	2	2	3	11	9	8	9	7	2	5	3	86
5.51- 6.50	2	4	7	3	1	2	3	1	2	7	8	6	3	6	1	6	62
6.51- 8.50	0	3	4	6	5	3	4	3	7	4	14	7	6	4	4	2	76
8.51-11.50	1	1	0	3	7	10	2	3	0	4	17	12	7	1	3	1	72
11.51-14.50	0	0	0	2	5	0	0	1	5	3	15	15	3	2	1	1	53
14.51-20.50	1	0	0	1	7	0	0	0	0	8	11	8	2	3	1	1	43
>20.50	0	0	0	0	2	0	0	0	0	1	0	0	0	1	1	0	5
TOTAL	30	40	33	41	39	26	24	32	52	95	114	93	50	33	38	30	770

STABILITY CLASS E

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
1.51- 2.50	5	0	2	0	0	1	0	2	2	1	4	10	7	7	8	0	49
2.51- 3.50	14	9	3	3	1	1	0	4	8	3	10	6	11	7	12	6	98
3.51- 4.50	9	4	5	0	0	1	2	3	6	12	10	12	7	4	3	8	86
4.51- 5.50	4	1	4	1	2	0	1	3	3	6	7	4	3	2	3	4	48
5.51- 6.50	2	2	2	2	1	0	0	1	4	13	5	8	8	2	4	4	58
6.51- 8.50	3	8	3	0	1	1	1	5	9	24	24	14	10	3	2	6	114
8.51-11.50	2	4	4	2	3	9	3	2	2	34	57	39	9	9	6	4	189
11.51-14.50	2	0	1	5	3	5	3	0	2	17	32	16	3	7	0	6	102
14.51-20.50	1	0	0	3	4	2	1	0	1	6	10	2	0	1	0	1	32
>20.50	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL	42	28	24	17	15	20	11	20	37	116	160	111	58	42	38	39	778

STABILITY CLASS F

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1	3
1.51- 2.50	2	2	1	0	1	0	1	1	1	3	1	7	8	5	9	2	44
2.51- 3.50	12	8	2	4	1	1	2	3	5	1	5	6	16	19	12	23	120
3.51- 4.50	21	5	3	2	2	2	1	3	2	6	7	19	18	15	13	8	127
4.51- 5.50	8	5	3	1	1	0	1	4	4	7	15	11	10	0	9	11	90
5.51- 6.50	4	1	2	1	1	1	0	1	0	14	14	6	8	4	4	5	66
6.51- 8.50	7	3	3	1	0	1	0	0	2	13	39	21	16	4	4	4	118
8.51-11.50	3	5	2	3	1	0	0	0	1	17	23	16	4	1	2	3	81
11.51-14.50	0	7	0	0	0	0	0	0	1	0	0	0	0	1	0	1	10
14.51-20.50	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	57	37	16	13	7	5	5	12	16	61	104	86	82	49	53	58	661

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 1/01/2003 TO 6/30/2003

*** 1ST SEMI ***

STABILITY CLASS G

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3
1.51- 2.50	13	2	3	0	1	0	0	3	0	1	3	3	8	13	11	12	73
2.51- 3.50	51	18	5	5	3	3	0	2	1	3	8	11	10	21	45	77	263
3.51- 4.50	87	39	8	6	3	0	2	0	1	2	4	8	9	15	30	93	307
4.51- 5.50	96	38	11	3	1	1	1	3	0	1	5	5	4	5	18	61	253
5.51- 6.50	51	34	5	1	0	0	0	0	0	0	0	4	2	3	6	19	125
6.51- 8.50	34	27	10	1	0	0	0	0	0	1	3	2	2	1	3	12	96
8.51-11.50	5	9	4	0	0	0	0	0	0	0	0	0	0	0	1	1	20
11.51-14.50	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	339	168	46	16	8	4	3	8	3	8	23	33	35	58	114	275	1141

STABILITY CLASS ALL

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	2	0	0	0	0	0	0	0	1	1	1	0	2	0	0	1	8
1.51- 2.50	23	7	9	3	3	3	3	14	4	9	11	25	27	29	31	16	217
2.51- 3.50	83	42	14	23	12	7	12	21	26	33	37	34	48	52	78	116	638
3.51- 4.50	126	64	27	18	8	8	9	15	33	61	47	64	42	39	56	113	730
4.51- 5.50	119	54	26	10	9	6	9	29	60	47	44	40	26	11	38	81	609
5.51- 6.50	60	44	25	15	5	8	7	19	42	61	51	36	26	18	15	37	469
6.51- 8.50	44	42	30	17	14	13	17	18	44	74	146	61	42	20	18	26	626
8.51-11.50	12	23	12	16	22	22	6	7	14	94	172	102	32	12	14	10	570
11.51-14.50	2	11	2	8	13	5	5	1	12	48	100	43	11	14	4	10	289
14.51-20.50	3	1	1	9	18	2	1	0	4	29	63	15	2	19	1	7	175
>20.50	0	0	0	1	2	0	0	0	0	2	1	0	0	3	3	0	12
TOTAL	474	288	146	120	106	74	69	124	240	459	673	420	258	217	258	417	4343

TOTAL NUMBER OF OBSERVATIONS: 4344
TOTAL NUMBER OF VALID OBSERVATIONS: 4343
TOTAL NUMBER OF MISSING OBSERVATIONS: 1
PERCENT DATA RECOVERY FOR THIS PERIOD: 100.0 %
MEAN WIND SPEED FOR THIS PERIOD: 6.6 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
10.09	6.22	6.56	17.73	17.91	15.22	26.27

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	0	6	2	8	17	5	9	7	38	99	172	32	15	18	4	6	0
B	1	2	7	10	13	5	9	27	51	34	57	26	10	9	6	3	0
C	5	7	18	15	7	9	8	18	43	46	43	39	8	8	5	6	0
D	30	40	33	41	39	26	24	32	52	95	114	93	50	33	38	30	0
E	42	28	24	17	15	20	11	20	37	116	160	111	58	42	38	39	0
F	57	37	16	13	7	5	5	12	16	61	104	86	82	49	53	58	0
G	339	168	46	16	8	4	3	8	3	8	23	33	35	58	114	275	0
TOTAL	474	288	146	120	106	74	69	124	240	459	673	420	258	217	258	417	0

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 7/01/2003 TO 9/30/2003

*** 3RD QRTR ***

STABILITY CLASS A

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.51- 5.50	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2
5.51- 6.50	0	0	0	0	1	0	0	1	3	4	2	7	3	0	0	0	21
6.51- 8.50	0	0	0	0	2	0	0	1	2	5	38	29	9	4	0	0	90
8.51-11.50	0	1	0	0	0	0	1	0	3	12	35	29	19	3	2	0	105
11.51-14.50	0	0	0	0	0	0	0	0	0	1	6	1	2	0	0	0	10
14.51-20.50	0	0	0	0	0	0	0	0	0	2	5	0	0	0	0	0	7
>20.50	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
TOTAL	0	1	0	0	3	0	1	2	8	26	87	66	34	7	2	0	237

STABILITY CLASS B

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	3
4.51- 5.50	0	1	0	1	0	2	1	4	3	2	9	5	2	1	0	0	31
5.51- 6.50	0	0	1	2	1	0	0	0	11	11	9	9	5	0	0	0	49
6.51- 8.50	2	0	0	0	2	3	1	1	4	6	29	9	10	1	0	0	68
8.51-11.50	1	0	1	0	2	1	0	0	1	1	11	11	5	2	1	1	38
11.51-14.50	2	0	0	0	1	0	0	0	0	0	3	1	0	2	1	0	10
14.51-20.50	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	1	4
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	5	1	3	3	6	6	2	6	21	21	61	36	22	6	2	2	203

STABILITY CLASS C

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
3.51- 4.50	0	1	1	0	0	0	2	3	3	5	3	3	1	1	3	2	28
4.51- 5.50	2	1	2	0	1	1	3	4	6	13	7	10	2	3	1	3	59
5.51- 6.50	3	0	0	3	0	2	0	2	6	12	6	10	1	2	0	2	49
6.51- 8.50	0	2	2	2	2	2	3	3	5	7	7	8	9	2	0	2	56
8.51-11.50	0	0	0	0	0	2	0	1	2	0	2	6	2	1	3	0	19
11.51-14.50	0	0	0	0	0	0	0	0	1	1	3	0	0	1	0	0	6
14.51-20.50	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	5	4	5	5	3	7	8	13	23	39	28	37	16	10	7	9	219

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 7/01/2003 TO 9/30/2003

*** 3RD QRTR ***

STABILITY CLASS D

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	1	1	1	0	0	0	1	1	0	0	1	2	0	1	2	2	13
2.51- 3.50	7	2	1	1	2	4	4	1	4	8	2	5	2	4	4	1	52
3.51- 4.50	1	5	2	1	1	2	3	2	4	9	9	5	2	3	2	2	53
4.51- 5.50	3	6	4	3	2	1	4	2	4	5	9	9	5	5	3	2	67
5.51- 6.50	2	3	1	2	1	1	2	0	3	1	11	9	5	1	0	2	44
6.51- 8.50	1	5	2	2	2	1	1	5	3	5	16	9	11	3	2	1	69
8.51-11.50	2	4	1	2	3	1	1	2	2	8	16	7	5	5	6	1	66
11.51-14.50	0	0	0	0	2	0	1	0	0	9	8	4	1	1	1	0	27
14.51-20.50	0	1	0	1	2	4	0	1	2	12	4	1	0	0	0	1	29
>20.50	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTAL	17	27	12	12	15	14	17	14	22	58	76	51	31	23	20	12	421

STABILITY CLASS E

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
1.51- 2.50	4	1	1	1	0	0	1	0	0	0	1	2	0	0	4	1	16
2.51- 3.50	10	1	1	1	0	1	1	0	1	3	2	3	11	5	6	3	49
3.51- 4.50	4	3	3	0	1	0	4	0	1	6	10	7	7	6	5	4	61
4.51- 5.50	2	4	0	0	4	2	0	2	4	7	22	8	5	2	2	2	66
5.51- 6.50	2	1	1	1	1	0	0	1	4	7	17	14	4	2	4	2	61
6.51- 8.50	1	6	4	2	1	4	2	3	4	14	33	17	5	4	2	2	104
8.51-11.50	0	3	2	1	3	6	3	0	2	22	38	24	9	4	5	6	128
11.51-14.50	0	1	2	0	5	0	0	0	2	7	13	2	0	1	2	0	35
14.51-20.50	0	0	0	0	0	1	0	1	3	7	2	0	2	0	0	0	16
>20.50	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2
TOTAL	23	20	14	6	16	15	11	7	21	73	138	77	43	25	30	20	539

STABILITY CLASS F

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	2
1.51- 2.50	2	1	1	1	0	0	1	0	2	1	3	6	1	1	4	4	28
2.51- 3.50	4	5	0	3	1	5	0	1	3	2	4	3	2	5	4	10	52
3.51- 4.50	6	3	0	3	0	1	1	1	2	3	4	7	8	4	6	8	57
4.51- 5.50	5	0	0	0	0	0	0	0	1	9	13	7	3	4	2	6	50
5.51- 6.50	0	3	1	0	0	1	0	1	0	2	10	8	4	1	3	4	38
6.51- 8.50	3	2	2	1	0	0	0	0	2	8	20	11	6	1	4	0	60
8.51-11.50	0	0	2	1	0	0	0	0	0	1	3	6	2	1	2	0	18
11.51-14.50	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	20	14	6	9	1	9	2	3	11	26	57	49	26	17	25	32	307

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 7/01/2003 TO 9/30/2003

*** 3RD QRTR ***

STABILITY CLASS G

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
1.51- 2.50	2	5	3	0	0	0	0	0	0	0	1	5	1	2	2	4	25
2.51- 3.50	12	6	2	0	2	0	1	0	1	1	2	2	2	6	11	7	55
3.51- 4.50	21	6	3	0	0	4	1	1	0	2	1	0	4	1	12	22	78
4.51- 5.50	29	9	3	0	0	0	0	0	0	0	1	1	1	1	4	4	53
5.51- 6.50	19	4	1	0	0	0	0	0	0	0	0	1	0	0	4	0	29
6.51- 8.50	4	10	4	0	0	0	0	0	0	1	3	0	0	1	1	2	26
8.51-11.50	0	0	3	1	0	0	0	0	0	1	0	0	0	0	0	0	5
11.51-14.50	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	2
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	87	40	19	1	2	4	2	2	1	6	8	9	8	11	35	39	274

STABILITY CLASS ALL

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	1	0	0	0	1	0	1	0	1	0	0	4
1.51- 2.50	9	8	6	2	0	0	3	1	2	1	6	15	2	4	12	11	82
2.51- 3.50	33	14	4	5	5	10	6	2	9	14	10	13	18	20	25	21	209
3.51- 4.50	32	18	9	4	2	7	11	8	12	25	27	22	22	15	28	38	280
4.51- 5.50	41	21	9	4	7	6	8	12	18	37	61	40	19	16	12	17	328
5.51- 6.50	26	11	5	8	4	4	2	5	27	37	55	58	22	6	11	10	291
6.51- 8.50	11	25	14	7	9	10	7	13	20	46	146	83	50	16	9	7	473
8.51-11.50	3	8	9	5	8	10	5	3	10	45	105	83	42	16	19	8	379
11.51-14.50	2	1	2	0	8	1	1	1	4	18	33	8	3	5	5	0	92
14.51-20.50	0	1	1	1	2	5	0	2	5	23	11	2	2	0	0	2	57
>20.50	0	0	0	0	1	1	0	0	0	2	1	0	0	0	0	0	5
TOTAL	157	107	59	36	46	55	43	47	107	249	455	325	180	99	121	114	2200

TOTAL NUMBER OF OBSERVATIONS: 2208
TOTAL NUMBER OF VALID OBSERVATIONS: 2200
TOTAL NUMBER OF MISSING OBSERVATIONS: 8
PERCENT DATA RECOVERY FOR THIS PERIOD: 99.6 %
MEAN WIND SPEED FOR THIS PERIOD: 6.8 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
10.77	9.23	9.95	19.14	24.50	13.95	12.45

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	0	1	0	0	3	0	1	2	8	26	87	66	34	7	2	0	0
B	5	1	3	3	6	6	2	6	21	21	61	36	22	6	2	2	0
C	5	4	5	5	3	7	8	13	23	39	28	37	16	10	7	9	0
D	17	27	12	12	15	14	17	14	22	58	76	51	31	23	20	12	0
E	23	20	14	6	16	15	11	7	21	73	138	77	43	25	30	20	0
F	20	14	6	9	1	9	2	3	11	26	57	49	26	17	25	32	0
G	87	40	19	1	2	4	2	2	1	6	8	9	8	11	35	39	0
TOTAL	157	107	59	36	46	55	43	47	107	249	455	325	180	99	121	114	0

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 10/01/2003 TO 12/31/2003

*** 4TH QRTR ***

STABILITY CLASS A

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.51- 5.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5.51- 6.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6.51- 8.50	0	0	0	1	0	2	0	1	0	0	0	1	0	0	0	0	5
8.51-11.50	0	0	0	0	1	0	1	0	1	2	5	0	0	0	0	0	10
11.51-14.50	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	3
14.51-20.50	0	0	2	1	0	0	0	0	1	4	0	0	3	1	3	1	16
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	2	2	1	2	1	1	2	6	7	1	3	2	3	1	34

STABILITY CLASS B

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2
4.51- 5.50	0	0	0	1	1	0	1	1	1	2	1	0	0	0	0	0	8
5.51- 6.50	0	0	0	0	0	3	1	0	2	0	2	0	0	0	0	0	8
6.51- 8.50	0	0	0	1	11	7	2	2	5	1	0	2	0	0	0	0	31
8.51-11.50	0	1	0	0	6	2	0	1	1	1	6	1	1	2	1	1	24
11.51-14.50	0	0	1	2	2	2	0	0	1	0	1	0	1	2	2	2	16
14.51-20.50	0	0	2	1	0	0	0	0	2	0	0	0	0	1	1	0	7
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	1	3	5	20	14	4	4	12	4	10	3	3	5	5	3	96

STABILITY CLASS C

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	3
3.51- 4.50	0	0	0	2	1	1	3	2	4	0	0	3	1	0	0	0	17
4.51- 5.50	0	0	2	0	3	4	2	4	4	5	4	0	1	0	0	0	29
5.51- 6.50	0	1	2	3	2	7	0	2	4	1	2	4	0	1	0	0	29
6.51- 8.50	0	0	6	2	1	11	1	0	0	0	3	0	0	1	0	1	26
8.51-11.50	0	0	1	1	5	1	0	0	1	3	3	3	1	0	0	1	20
11.51-14.50	0	0	1	0	0	0	0	0	0	0	0	0	0	1	2	1	5
14.51-20.50	0	0	0	1	0	0	0	0	0	1	0	0	0	0	2	0	4
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	1	12	9	12	24	6	8	14	11	12	10	3	3	4	3	133

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 10/01/2003 TO 12/31/2003

*** 4TH QRTR ***

STABILITY CLASS D

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1.51- 2.50	2	1	2	2	1	3	4	2	5	4	3	3	1	2	2	1	38
2.51- 3.50	8	10	5	3	1	8	8	8	10	14	15	4	3	5	4	4	110
3.51- 4.50	1	13	7	7	7	4	8	3	11	10	11	4	4	1	1	5	97
4.51- 5.50	1	1	5	3	8	7	3	4	7	11	8	2	2	1	3	0	66
5.51- 6.50	1	3	1	4	3	6	1	1	6	4	5	3	1	2	0	0	41
6.51- 8.50	0	2	0	4	3	9	1	2	1	4	12	4	1	2	1	2	48
8.51-11.50	0	1	1	2	9	10	1	0	1	1	4	3	1	1	2	0	37
11.51-14.50	0	1	2	3	10	0	0	0	0	2	2	0	3	1	3	0	27
14.51-20.50	0	0	0	1	5	0	0	0	0	10	1	0	1	1	1	0	20
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	14	32	23	29	47	47	26	20	41	60	61	23	17	16	17	12	485

STABILITY CLASS E

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	1	0	0	0	0	0	0	0	1	0	1	1	0	1	0	5
1.51- 2.50	6	1	1	5	2	0	1	2	1	1	2	3	4	5	2	1	37
2.51- 3.50	5	1	4	3	2	3	3	2	3	4	2	4	2	2	4	2	46
3.51- 4.50	2	1	5	2	4	1	1	0	2	6	2	5	5	3	1	1	41
4.51- 5.50	2	1	0	1	2	3	0	0	1	2	2	3	6	2	5	3	33
5.51- 6.50	0	1	3	3	1	1	1	2	1	0	6	5	0	0	3	1	28
6.51- 8.50	2	0	3	3	2	1	0	0	1	3	10	4	2	3	5	0	39
8.51-11.50	0	1	1	1	1	4	1	0	5	3	9	3	3	1	5	0	38
11.51-14.50	2	0	0	0	2	2	1	0	2	5	0	0	1	1	5	6	27
14.51-20.50	1	0	2	0	4	0	0	0	1	1	0	1	1	5	0	0	16
>20.50	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
TOTAL	20	7	22	18	20	15	8	6	17	26	33	29	25	22	31	14	313

STABILITY CLASS F

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	3
1.51- 2.50	8	1	1	3	1	1	0	0	1	2	2	0	4	6	9	2	41
2.51- 3.50	9	7	5	1	1	1	1	5	1	2	0	4	5	10	11	12	75
3.51- 4.50	8	7	4	2	1	1	1	1	2	3	4	2	4	3	5	11	59
4.51- 5.50	5	2	1	1	2	1	0	0	0	3	1	5	3	2	3	3	32
5.51- 6.50	2	3	1	1	0	0	0	0	0	0	2	2	1	4	5	5	26
6.51- 8.50	5	2	5	2	0	0	0	1	0	6	8	3	4	2	3	2	43
8.51-11.50	6	4	2	0	0	0	0	0	0	0	1	1	0	4	3	8	29
11.51-14.50	1	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4
14.51-20.50	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	44	29	19	11	5	4	3	7	5	16	18	17	21	31	39	44	313

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 10/01/2003 TO 12/31/2003

*** 4TH QRTR ***

STABILITY CLASS G

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	1	0	0	0	0	0	0	0	0	0	1	0	1	0	2	2	7
1.51- 2.50	21	14	6	2	2	0	0	3	4	3	3	3	6	7	17	19	110
2.51- 3.50	64	38	10	1	2	0	1	0	2	1	3	6	6	5	27	48	214
3.51- 4.50	88	46	9	2	2	1	1	1	0	0	3	0	1	1	20	40	215
4.51- 5.50	61	33	8	0	0	0	0	0	0	1	1	1	1	2	6	29	143
5.51- 6.50	24	27	4	1	1	0	0	0	0	0	1	0	1	1	0	8	68
6.51- 8.50	19	11	3	1	0	0	0	0	0	0	2	0	0	0	0	7	43
8.51-11.50	9	16	2	0	0	0	0	0	0	0	0	0	0	0	0	7	34
11.51-14.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	287	185	42	7	7	1	2	4	6	5	14	10	16	16	72	160	834

STABILITY CLASS ALL

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	2	1	0	0	0	0	1	0	1	1	1	1	2	0	3	3	16
1.51- 2.50	37	17	10	12	6	4	5	7	11	10	10	9	15	20	30	23	226
2.51- 3.50	87	56	24	8	6	12	13	15	17	22	20	18	16	22	46	66	448
3.51- 4.50	99	67	25	15	15	8	14	7	19	19	20	14	16	8	28	57	431
4.51- 5.50	69	37	16	6	16	15	6	9	13	24	17	11	13	7	17	35	311
5.51- 6.50	27	35	11	12	7	17	3	5	13	5	18	14	3	8	8	14	200
6.51- 8.50	26	15	17	14	17	30	4	6	7	14	35	14	7	8	9	12	235
8.51-11.50	15	23	7	4	22	17	3	1	9	10	28	11	6	8	11	17	192
11.51-14.50	3	3	4	6	14	4	1	0	3	7	5	0	5	6	12	9	82
14.51-20.50	1	1	6	4	9	0	0	0	4	16	1	1	5	8	7	1	64
>20.50	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
TOTAL	366	255	123	81	112	107	50	50	97	128	155	93	88	95	171	237	2208

TOTAL NUMBER OF OBSERVATIONS: 2208
TOTAL NUMBER OF VALID OBSERVATIONS: 2208
TOTAL NUMBER OF MISSING OBSERVATIONS: 0
PERCENT DATA RECOVERY FOR THIS PERIOD: 100.0 %
MEAN WIND SPEED FOR THIS PERIOD: 5.5 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
1.54	4.35	6.02	21.97	14.18	14.18	37.77

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	0	0	2	2	1	2	1	1	2	6	7	1	3	2	3	1	0
B	0	1	3	5	20	14	4	4	12	4	10	3	3	5	5	3	0
C	1	1	12	9	12	24	6	8	14	11	12	10	3	3	4	3	0
D	14	32	23	29	47	47	26	20	41	60	61	23	17	16	17	12	0
E	20	7	22	18	20	15	8	6	17	26	33	29	25	22	31	14	0
F	44	29	19	11	5	4	3	7	5	16	18	17	21	31	39	44	0
G	287	185	42	7	7	1	2	4	6	5	14	10	16	16	72	160	0
TOTAL	366	255	123	81	112	107	50	50	97	128	155	93	88	95	171	237	0

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 7/01/2003 TO 12/31/2003

*** 2ND SEMI ***

STABILITY CLASS A

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4.51- 5.50	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2
5.51- 6.50	0	0	0	0	1	0	0	1	3	4	2	7	3	0	0	0	21
6.51- 8.50	0	0	0	1	2	2	0	2	2	5	38	30	9	4	0	0	95
8.51-11.50	0	1	0	0	1	0	2	0	4	14	40	29	19	3	2	0	115
11.51-14.50	0	0	0	0	0	0	0	0	0	1	8	1	2	1	0	0	13
14.51-20.50	0	0	2	1	0	0	0	0	1	6	5	0	3	1	3	1	23
>20.50	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	2
TOTAL	0	1	2	2	4	2	2	3	10	32	94	67	37	9	5	1	271

STABILITY CLASS B

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	0	0	0	0	1	2	0	0	0	1	0	1	0	5
4.51- 5.50	0	1	0	2	1	2	2	5	4	4	10	5	2	1	0	0	39
5.51- 6.50	0	0	1	2	1	3	1	0	13	11	11	9	5	0	0	0	57
6.51- 8.50	2	0	0	1	13	10	3	3	9	7	29	11	10	1	0	0	99
8.51-11.50	1	1	1	0	8	3	0	1	2	2	17	12	6	4	2	2	62
11.51-14.50	2	0	1	2	3	2	0	0	1	0	4	1	1	4	3	2	26
14.51-20.50	0	0	3	1	0	0	0	0	2	1	0	1	0	1	1	1	11
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	5	2	6	8	26	20	6	10	33	25	71	39	25	11	7	5	299

STABILITY CLASS C

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	1	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	4
3.51- 4.50	0	1	1	2	1	1	5	5	7	5	3	6	2	1	3	2	45
4.51- 5.50	2	1	4	0	4	5	5	8	10	18	11	10	3	3	1	3	88
5.51- 6.50	3	1	2	6	2	9	0	4	10	13	8	14	1	3	0	2	78
6.51- 8.50	0	2	8	4	3	13	4	3	5	7	10	8	9	3	0	3	82
8.51-11.50	0	0	1	1	5	3	0	1	3	3	5	9	3	1	3	1	39
11.51-14.50	0	0	1	0	0	0	0	0	1	1	3	0	0	2	2	1	11
14.51-20.50	0	0	0	1	0	0	0	0	0	2	0	0	0	0	2	0	5
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	6	5	17	14	15	31	14	21	37	50	40	47	19	13	11	12	352

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 7/01/2003 TO 12/31/2003

*** 2ND SEMI ***

STABILITY CLASS D

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
1.51- 2.50	3	2	3	2	1	3	5	3	5	4	4	5	1	3	4	3	51
2.51- 3.50	15	12	6	4	3	12	12	9	14	22	17	9	5	9	8	5	162
3.51- 4.50	2	18	9	8	8	6	11	5	15	19	20	9	6	4	3	7	150
4.51- 5.50	4	7	9	6	10	8	7	6	11	16	17	11	7	6	6	2	133
5.51- 6.50	3	6	2	6	4	7	3	1	9	5	16	12	6	3	0	2	85
6.51- 8.50	1	7	2	6	5	10	2	7	4	9	28	13	12	5	3	3	117
8.51-11.50	2	5	2	4	12	11	2	2	3	9	20	10	6	6	8	1	103
11.51-14.50	0	1	2	3	12	0	1	0	0	11	10	4	4	2	4	0	54
14.51-20.50	0	1	0	2	7	4	0	1	2	22	5	1	1	1	1	1	49
>20.50	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTAL	31	59	35	41	62	61	43	34	63	118	137	74	48	39	37	24	906

STABILITY CLASS E

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	1	0	0	0	0	0	0	0	1	0	1	1	1	1	0	6
1.51- 2.50	10	2	2	6	2	0	2	2	1	1	3	5	4	5	6	2	53
2.51- 3.50	15	2	5	4	2	4	4	2	4	7	4	7	13	7	10	5	95
3.51- 4.50	6	4	8	2	5	1	5	0	3	12	12	12	12	9	6	5	102
4.51- 5.50	4	5	0	1	6	5	0	2	5	9	24	11	11	4	7	5	99
5.51- 6.50	2	2	4	4	2	1	1	3	5	7	23	19	4	2	7	3	89
6.51- 8.50	3	6	7	5	3	5	2	3	5	17	43	21	7	7	7	2	143
8.51-11.50	0	4	3	2	4	10	4	0	7	25	47	27	12	5	10	6	166
11.51-14.50	2	1	2	0	7	2	1	0	4	12	13	2	1	2	7	6	62
14.51-20.50	1	0	2	0	4	1	0	1	4	8	2	1	3	5	0	0	32
>20.50	0	0	3	0	1	1	0	0	0	0	0	0	0	0	0	0	5
TOTAL	43	27	36	24	36	30	19	13	38	99	171	106	68	47	61	34	852

STABILITY CLASS F

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	1	1	0	1	0	0	1	0	0	0	1	5
1.51- 2.50	10	2	2	4	1	1	1	0	3	3	5	6	5	7	13	6	69
2.51- 3.50	13	12	5	4	2	6	1	6	4	4	4	7	7	15	15	22	127
3.51- 4.50	14	10	4	5	1	2	2	2	4	6	8	9	12	7	11	19	116
4.51- 5.50	10	2	1	1	2	1	0	0	1	12	14	12	6	6	5	9	82
5.51- 6.50	2	6	2	1	0	1	0	1	0	2	12	10	5	5	8	9	64
6.51- 8.50	8	4	7	3	0	0	0	1	2	14	28	14	10	3	7	2	103
8.51-11.50	6	4	4	1	0	0	0	0	0	1	4	7	2	5	5	8	47
11.51-14.50	1	2	0	1	0	1	0	0	1	0	0	0	0	0	0	0	6
14.51-20.50	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	64	43	25	20	6	13	5	10	16	42	75	66	47	48	64	76	620

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 7/01/2003 TO 12/31/2003

*** 2ND SEMI ***

STABILITY CLASS G

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	1	0	0	0	0	0	0	0	0	1	1	0	1	0	2	2	8
1.51- 2.50	23	19	9	2	2	0	0	3	4	3	4	8	7	9	19	23	135
2.51- 3.50	76	44	12	1	4	0	2	0	3	2	5	8	8	11	38	55	269
3.51- 4.50	109	52	12	2	2	5	2	2	0	2	4	0	5	2	32	62	293
4.51- 5.50	90	42	11	0	0	0	0	0	0	1	2	2	2	3	10	33	196
5.51- 6.50	43	31	5	1	1	0	0	0	0	0	1	1	1	1	4	8	97
6.51- 8.50	23	21	7	1	0	0	0	0	0	1	5	0	0	1	1	9	69
8.51-11.50	9	16	5	1	0	0	0	0	0	1	0	0	0	0	0	7	39
11.51-14.50	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	2
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	374	225	61	8	9	5	4	6	7	11	22	19	24	27	107	199	1108

STABILITY CLASS ALL

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	2	1	0	0	0	1	1	0	1	2	1	2	2	1	3	3	20
1.51- 2.50	46	25	16	14	6	4	8	8	13	11	16	24	17	24	42	34	308
2.51- 3.50	120	70	28	13	11	22	19	17	26	36	30	31	34	42	71	87	657
3.51- 4.50	131	85	34	19	17	15	25	15	31	44	47	36	38	23	56	95	711
4.51- 5.50	110	58	25	10	23	21	14	21	31	61	78	51	32	23	29	52	639
5.51- 6.50	53	46	16	20	11	21	5	10	40	42	73	72	25	14	19	24	491
6.51- 8.50	37	40	31	21	26	40	11	19	27	60	181	97	57	24	18	19	708
8.51-11.50	18	31	16	9	30	27	8	4	19	55	133	94	48	24	30	25	571
11.51-14.50	5	4	6	6	22	5	2	1	7	25	38	8	8	11	17	9	174
14.51-20.50	1	2	7	5	11	5	0	2	9	39	12	3	7	8	7	3	121
>20.50	0	0	3	0	1	1	0	0	0	2	1	0	0	0	0	0	8
TOTAL	523	362	182	117	158	162	93	97	204	377	610	418	268	194	292	351	4408

TOTAL NUMBER OF OBSERVATIONS: 4416
TOTAL NUMBER OF VALID OBSERVATIONS: 4408
TOTAL NUMBER OF MISSING OBSERVATIONS: 8
PERCENT DATA RECOVERY FOR THIS PERIOD: 99.8 %
MEAN WIND SPEED FOR THIS PERIOD: 6.1 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
6.15	6.78	7.99	20.55	19.33	14.07	25.14

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	0	1	2	2	4	2	2	3	10	32	94	67	37	9	5	1	0
B	5	2	6	8	26	20	6	10	33	25	71	39	25	11	7	5	0
C	6	5	17	14	15	31	14	21	37	50	40	47	19	13	11	12	0
D	31	59	35	41	62	61	43	34	63	118	137	74	48	39	37	24	0
E	43	27	36	24	36	30	19	13	38	99	171	106	68	47	61	34	0
F	64	43	25	20	6	13	5	10	16	42	75	66	47	48	64	76	0
G	374	225	61	8	9	5	4	6	7	11	22	19	24	27	107	199	0
TOTAL	523	362	182	117	158	162	93	97	204	377	610	418	268	194	292	351	0

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 1/01/2003 TO 12/31/2003

*** ANNUAL ***

STABILITY CLASS A

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	2
4.51- 5.50	0	0	0	0	0	1	0	1	7	2	0	0	1	0	0	0	12
5.51- 6.50	0	0	0	0	1	0	2	4	12	12	5	9	3	1	0	0	49
6.51- 8.50	0	0	0	3	4	4	4	5	10	26	76	35	12	7	0	0	186
8.51-11.50	0	4	1	1	9	2	3	0	11	46	95	47	26	4	2	0	251
11.51-14.50	0	3	0	1	4	0	2	0	4	24	49	7	7	4	2	2	109
14.51-20.50	0	0	2	5	3	0	0	0	4	19	39	1	3	9	3	5	93
>20.50	0	0	0	0	0	0	0	0	0	1	2	0	0	2	2	0	7
TOTAL	0	7	4	10	21	7	11	10	48	131	266	99	52	27	9	7	709

STABILITY CLASS B

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3.51- 4.50	0	0	0	1	0	0	0	2	3	0	0	0	1	0	1	0	8
4.51- 5.50	0	1	0	2	3	2	5	14	20	17	13	9	3	2	0	0	91
5.51- 6.50	0	2	3	4	1	5	3	8	33	17	22	12	7	1	0	1	119
6.51- 8.50	2	0	4	4	18	13	7	10	19	14	43	15	14	4	4	1	172
8.51-11.50	1	1	1	4	11	3	0	3	6	5	30	23	9	4	3	3	107
11.51-14.50	2	0	1	2	4	2	0	0	1	4	14	3	1	4	4	2	44
14.51-20.50	1	0	4	1	2	0	0	0	2	2	6	3	0	5	1	1	28
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	6	4	13	18	39	25	15	37	84	59	128	65	35	20	13	8	569

STABILITY CLASS C

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1.51- 2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.51- 3.50	1	0	0	0	1	0	1	1	1	3	1	1	1	0	0	0	11
3.51- 4.50	1	1	1	2	1	1	7	11	16	15	4	10	3	1	3	2	79
4.51- 5.50	4	5	7	2	5	7	6	14	29	28	17	17	4	4	4	5	158
5.51- 6.50	4	2	9	12	4	12	0	9	17	26	18	21	4	4	0	4	146
6.51- 8.50	0	3	14	8	4	16	8	3	13	11	24	16	10	5	1	4	140
8.51-11.50	1	1	2	4	5	4	0	1	3	7	12	15	5	1	4	1	66
11.51-14.50	0	0	2	0	0	0	0	0	1	2	5	4	0	3	2	1	20
14.51-20.50	0	0	0	1	2	0	0	0	0	3	2	2	0	3	2	1	16
>20.50	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTAL	11	12	35	29	22	40	22	39	80	96	83	86	27	21	16	18	637

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 1/01/2003 TO 12/31/2003

*** ANNUAL ***

STABILITY CLASS D

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
1.51- 2.50	6	5	6	5	2	5	7	11	6	8	7	10	5	7	7	5	102
2.51- 3.50	21	19	10	15	9	14	21	20	26	46	30	19	16	14	17	15	312
3.51- 4.50	10	34	19	17	11	11	13	7	29	49	45	30	13	9	13	11	321
4.51- 5.50	13	13	14	9	12	10	9	9	22	25	25	20	14	8	11	5	219
5.51- 6.50	5	10	9	9	5	9	6	2	11	12	24	18	9	9	1	8	147
6.51- 8.50	1	10	6	12	10	13	6	10	11	13	42	20	18	9	7	5	193
8.51-11.50	3	6	2	7	19	21	4	5	3	13	37	22	13	7	11	2	175
11.51-14.50	0	1	2	5	17	0	1	1	5	14	25	19	7	4	5	1	107
14.51-20.50	1	1	0	3	14	4	0	1	2	30	16	9	3	4	2	2	92
>20.50	0	0	0	0	2	0	0	0	0	2	0	0	0	1	1	0	6
TOTAL	61	99	68	82	101	87	67	66	115	213	251	167	98	72	75	54	1676

STABILITY CLASS E

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	1	0	0	0	0	0	0	0	1	1	1	1	1	1	0	7
1.51- 2.50	15	2	4	6	2	1	2	4	3	2	7	15	11	12	14	2	102
2.51- 3.50	29	11	8	7	3	5	4	6	12	10	14	13	24	14	22	11	193
3.51- 4.50	15	8	13	2	5	2	7	3	9	24	22	24	19	13	9	13	188
4.51- 5.50	8	6	4	2	8	5	1	5	8	15	31	15	14	6	10	9	147
5.51- 6.50	4	4	6	6	3	1	1	4	9	20	28	27	12	4	11	7	147
6.51- 8.50	6	14	10	5	4	6	3	8	14	41	67	35	17	10	9	8	257
8.51-11.50	2	8	7	4	7	19	7	2	9	59	104	66	21	14	16	10	355
11.51-14.50	4	1	3	5	10	7	4	0	6	29	45	18	4	9	7	12	164
14.51-20.50	2	0	2	3	8	3	1	1	5	14	12	3	3	6	0	1	64
>20.50	0	0	3	1	1	1	0	0	0	0	0	0	0	0	0	0	6
TOTAL	85	55	60	41	51	50	30	33	75	215	331	217	126	89	99	73	1630

STABILITY CLASS F

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	0	0	0	0	0	1	1	0	1	0	0	1	2	0	0	2	8
1.51- 2.50	12	4	3	4	2	1	2	1	4	6	6	13	13	12	22	8	113
2.51- 3.50	25	20	7	8	3	7	3	9	9	5	9	13	23	34	27	45	247
3.51- 4.50	35	15	7	7	3	4	3	5	6	12	15	28	30	22	24	27	243
4.51- 5.50	18	7	4	2	3	1	1	4	5	19	29	23	16	6	14	20	172
5.51- 6.50	6	7	4	2	1	2	0	2	0	16	26	16	13	9	12	14	130
6.51- 8.50	15	7	10	4	0	1	0	1	4	27	67	35	26	7	11	6	221
8.51-11.50	9	9	6	4	1	0	0	0	1	18	27	23	6	6	7	11	128
11.51-14.50	1	9	0	1	0	1	0	0	2	0	0	0	0	1	0	1	16
14.51-20.50	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	121	80	41	33	13	18	10	22	32	103	179	152	129	97	117	134	1281

ARIZONA PUBLIC SERVICE CO. - PALO VERDE NUCLEAR GENERATING STATION

JOINT FREQUENCY DISTRIBUTION FOR THE PERIOD 1/01/2003 TO 12/31/2003

*** ANNUAL ***

STABILITY CLASS G

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH
JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION IN HOURS AT 35.00 FEET

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	3	0	0	0	0	0	0	0	1	1	1	0	1	0	2	2	11
1.51- 2.50	36	21	12	2	3	0	0	6	4	4	7	11	15	22	30	35	208
2.51- 3.50	127	62	17	6	7	3	2	2	4	5	13	19	18	32	83	132	532
3.51- 4.50	196	91	20	8	5	5	4	2	1	4	8	8	14	17	62	155	600
4.51- 5.50	186	80	22	3	1	1	1	3	0	2	7	7	6	8	28	94	449
5.51- 6.50	94	65	10	2	1	0	0	0	0	0	1	5	3	4	10	27	222
6.51- 8.50	57	48	17	2	0	0	0	0	0	2	8	2	2	2	4	21	165
8.51-11.50	14	25	9	1	0	0	0	0	0	1	0	0	0	0	1	8	59
11.51-14.50	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	3
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	713	393	107	24	17	9	7	14	10	19	45	52	59	85	221	474	2249

STABILITY CLASS ALL

SPEED (MPH)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
CALM																	0
.76- 1.50	4	1	0	0	0	1	1	0	2	3	2	2	4	1	3	4	28
1.51- 2.50	69	32	25	17	9	7	11	22	17	20	27	49	44	53	73	50	525
2.51- 3.50	203	112	42	36	23	29	31	38	52	69	67	65	82	94	149	203	1295
3.51- 4.50	257	149	61	37	25	23	34	30	64	105	94	100	80	62	112	208	1441
4.51- 5.50	229	112	51	20	32	27	23	50	91	108	122	91	58	34	67	133	1248
5.51- 6.50	113	90	41	35	16	29	12	29	82	103	124	108	51	32	34	61	960
6.51- 8.50	81	82	61	38	40	53	28	37	71	134	327	158	99	44	36	45	1334
8.51-11.50	30	54	28	25	52	49	14	11	33	149	305	196	80	36	44	35	1141
11.51-14.50	7	15	8	14	35	10	7	2	19	73	138	51	19	25	21	19	463
14.51-20.50	4	3	8	14	29	7	1	2	13	68	75	18	9	27	8	10	296
>20.50	0	0	3	1	3	1	0	0	0	4	2	0	0	3	3	0	20
TOTAL	997	650	328	237	264	236	162	221	444	836	1283	838	526	411	550	768	8751

TOTAL NUMBER OF OBSERVATIONS: 8760
TOTAL NUMBER OF VALID OBSERVATIONS: 8751
TOTAL NUMBER OF MISSING OBSERVATIONS: 9
PERCENT DATA RECOVERY FOR THIS PERIOD: 99.9 %
MEAN WIND SPEED FOR THIS PERIOD: 6.4 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
8.10	6.50	7.28	19.15	18.63	14.64	25.70

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	0	7	4	10	21	7	11	10	48	131	266	99	52	27	9	7	0
B	6	4	13	18	39	25	15	37	84	59	128	65	35	20	13	8	0
C	11	12	35	29	22	40	22	39	80	96	83	86	27	21	16	18	0
D	61	99	68	82	101	87	67	66	115	213	251	167	98	72	75	54	0
E	85	55	60	41	51	50	30	33	75	215	331	217	126	89	99	73	0
F	121	80	41	33	13	18	10	22	32	103	179	152	129	97	117	134	0
G	713	393	107	24	17	9	7	14	10	19	45	52	59	85	221	474	0
TOTAL	997	650	328	237	264	236	162	221	444	836	1283	838	526	411	550	768	0

APPENDIX C

DOSE CALCULATIONS

GASEOUS EFFLUENT DOSE CALCULATIONS

Doses to the maximum individual and the surrounding population resulting from the release of radioactive material in gaseous effluents from the Palo Verde Nuclear Generating Station were calculated using the GASPAR computer program. The radionuclides considered in the dose calculations were Tritium, Iodine-131, Iodine-132, Iodine-133, Iodine-135, all noble gases, and particulates having a half-life greater than eight days and for which dose factors are contained in NUREG-0172. Locations selected for individual dose calculations included for each sector, the site boundary, and within five miles, if present, the nearest residence, the nearest garden, and the nearest milk animal. GASPAR implements the radiological dose models of Regulatory Guide 1.109 to determine the radiation exposure to man from four principal atmospheric exposure pathways: plume, ground deposition, inhalation, and ingestion. Doses to the maximum individual and the population were calculated as a function of age group and pathway for significant body organs.

Table 43 presents the doses on a quarterly, semiannual and annual basis for the Energy Information Center. An occupancy factor of 1.0 (implying continuous occupancy over the entire year) was considered for the Energy Information Center and the exposure pathways considered to calculate its doses were plume, ground deposition, and inhalation.

Table 44 presents the population dose.

Table 45 summarizes the individual doses and compares the result to PVNGS ODCM Requirement limits. The site boundary and residence locations for which data are presented represent the highest annual doses.

Based on results obtained by placing TLDs on the site boundary in each sector, the net dose for this reporting period, from direct-radiation, (plume and ground deposition) from all three units was indistinguishable from preoperational values of 8 - 14 μR/hr (17 - 30 mR/Std Qtr).

There were no liquid effluents associated with the operation of this facility.

Dose Calculation Models

The GASPAR computer code was used to evaluate the radiological consequences of the routine release of gaseous effluents. GASPAR implements the dose calculational methodologies of Regulatory Guide 1.109, Revision 1.

Source terms for each quarter are combined with station-specific demographic data and each quarter's atmospheric diffusion estimates for gaseous dose calculations.

Atmospheric diffusion estimates are generated by the XOQDOQ computer code using onsite meteorological data as input. Additional input to GASPAR includes the following site-specific data:

0 to 5 mile nearest residence, milk animal and garden in each of the 16 compass sectors, based on the 2003 Land Use Census.

0 to 10 mile population distribution based on the State of Arizona - Maricopa County, Offsite Emergency Response Plan for Palo Verde Nuclear Generating Station, January 2004, Emergency Response Operations, Appendix 4: Residents in the Plume Exposure Pathway Emergency Planning Zone (Survey Information - July 2003).

The 10 to 50 mile population distribution from the PVNGS UFSAR, Figure 2.1-11.

The population distribution of metropolitan Phoenix greater than 50 miles from PVNGS, based on the 1980 federal census results, is conservatively included in the 40 to 50 mile sectors (NE=123; ENE=140,097; E=621,130; ESE=8,392).

Absolute humidity of 6.0 g/m^3 from the PVNGS UFSAR, Table 2.3-16.

The fraction of the year that vegetables are grown (0.667) from the PVNGS ER-OL, Section 2.1.3.4, Table 2.1-8.

The fraction of daily feed derived from pasture while on pasture (0.35) and length of grazing season for milk animals beyond 5 miles (0.75) from the PVNGS ER-OL, Section 2.1.3.4.3.

The fraction of daily feed derived from pasture while on pasture (0.05) and length of grazing season for meat animals (0.25) from the PVNGS ER-OL, Section 2.1.3.4.4.

There were three (3) milk animal (goat or cow) locations within five (5) miles. For calculational purposes these milk animals are assumed to be fed 100% on pasture grass during the year.

Other values used for input to GASPAR are default values from Regulatory Guide 1.109, Revision 1.

Table 43:
Doses To Special Locations For 2003

ENERGY INFORMATION CENTER LOCATED ONSITE 0.45 MILE S FROM UNIT 1, 0.29 MILE SSE FROM UNIT 2 AND 0.20 MILE ESE FROM UNIT 3

(MREM)	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
1ST QUARTER								
ADULT	4.05E-01	4.05E-01	5.59E-03	4.05E-01	4.05E-01	4.11E-01	4.05E-01	4.12E-01
TEEN	4.08E-01	4.08E-01	5.60E-03	4.08E-01	4.08E-01	4.15E-01	4.08E-01	4.15E-01
CHILD	3.62E-01	3.62E-01	5.60E-03	3.62E-01	3.62E-01	3.69E-01	3.62E-01	3.69E-01
INFANT	2.11E-01	2.10E-01	5.60E-03	2.11E-01	2.11E-01	2.18E-01	2.10E-01	2.17E-01
2ND QUARTER								
ADULT	3.35E-01	3.35E-01	5.98E-03	3.35E-01	3.35E-01	3.51E-01	3.35E-01	3.46E-01
TEEN	3.38E-01	3.38E-01	5.99E-03	3.38E-01	3.38E-01	3.58E-01	3.38E-01	3.48E-01
CHILD	2.99E-01	2.99E-01	6.01E-03	2.99E-01	2.99E-01	3.21E-01	2.99E-01	3.10E-01
INFANT	1.74E-01	1.74E-01	5.99E-03	1.75E-01	1.75E-01	1.94E-01	1.75E-01	1.85E-01
1ST SEMI-ANNUAL								
ADULT	7.40E-01	7.40E-01	1.16E-02	7.40E-01	7.40E-01	7.62E-01	7.40E-01	7.58E-01
TEEN	7.46E-01	7.46E-01	1.16E-02	7.46E-01	7.46E-01	7.73E-01	7.46E-01	7.63E-01
CHILD	6.61E-01	6.61E-01	1.16E-02	6.61E-01	6.61E-01	6.90E-01	6.61E-01	6.79E-01
INFANT	3.85E-01	3.84E-01	1.16E-02	3.85E-01	3.85E-01	4.12E-01	3.84E-01	4.02E-01
3RD QUARTER								
ADULT	4.11E-01	4.11E-01	1.86E-03	4.11E-01	4.11E-01	4.13E-01	4.11E-01	4.16E-01
TEEN	4.13E-01	4.13E-01	1.87E-03	4.13E-01	4.13E-01	4.16E-01	4.13E-01	4.18E-01
CHILD	3.65E-01	3.65E-01	1.87E-03	3.65E-01	3.65E-01	3.68E-01	3.65E-01	3.70E-01
INFANT	2.11E-01	2.11E-01	1.87E-03	2.11E-01	2.11E-01	2.13E-01	2.11E-01	2.16E-01
4TH QUARTER								
ADULT	2.68E-01	2.68E-01	1.77E-02	2.68E-01	2.68E-01	3.30E-01	2.69E-01	2.98E-01
TEEN	2.71E-01	2.71E-01	1.77E-02	2.71E-01	2.71E-01	3.46E-01	2.72E-01	3.00E-01
CHILD	2.41E-01	2.41E-01	1.78E-02	2.41E-01	2.41E-01	3.24E-01	2.42E-01	2.71E-01
INFANT	1.46E-01	1.46E-01	1.78E-02	1.46E-01	1.46E-01	2.22E-01	1.46E-01	1.65E-01
2ND SEMI-ANNUAL								
ADULT	6.79E-01	6.79E-01	1.96E-02	6.79E-01	6.79E-01	7.43E-01	6.80E-01	7.14E-01
TEEN	6.84E-01	6.84E-01	1.96E-02	6.84E-01	6.84E-01	7.62E-01	6.85E-01	7.18E-01
CHILD	6.07E-01	6.07E-01	1.97E-02	6.07E-01	6.07E-01	6.93E-01	6.08E-01	6.41E-01
INFANT	3.58E-01	3.58E-01	1.96E-02	3.58E-01	3.58E-01	4.36E-01	3.58E-01	3.81E-01
ANNUAL								
ADULT	1.42E+00	1.42E+00	3.11E-02	1.42E+00	1.42E+00	1.51E+00	1.42E+00	1.47E+00
TEEN	1.43E+00	1.43E+00	3.12E-02	1.43E+00	1.43E+00	1.53E+00	1.43E+00	1.48E+00
CHILD	1.27E+00	1.27E+00	3.13E-02	1.27E+00	1.27E+00	1.38E+00	1.27E+00	1.32E+00
INFANT	7.43E-01	7.42E-01	3.12E-02	7.43E-01	7.43E-01	8.48E-01	7.42E-01	7.83E-01

Table 44:
Integrated Population Dose for 2003

JAN - MAR

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	5.55E-03 .09%	5.55E-03 .09%	5.55E-03 97.94%	5.55E-03 .09%	5.55E-03 .09%	5.55E-03 .09%	5.55E-03 .09%	2.38E-02 .37%
GROUND	2.47E-06 .00%	2.47E-06 .00%	2.47E-06 .04%	2.47E-06 .00%	2.47E-06 .00%	2.47E-06 .00%	2.47E-06 .00%	2.99E-06 .00%
INHAL	1.64E+00 25.36%	1.64E+00 25.36%	5.22E-05 .92%	1.64E+00 25.37%	1.64E+00 25.37%	1.66E+00 25.51%	1.64E+00 25.36%	1.64E+00 25.29%
VEGET	4.08E+00 63.25%	4.08E+00 63.25%	5.43E-05 .96%	4.08E+00 63.24%	4.08E+00 63.24%	4.10E+00 63.13%	4.08E+00 63.25%	4.08E+00 63.07%
COW MILK	5.28E-01 8.19%	5.28E-01 8.19%	7.78E-06 .14%	5.28E-01 8.19%	5.28E-01 8.19%	5.31E-01 8.18%	5.28E-01 8.19%	5.28E-01 8.17%
MEAT	2.01E-01 3.11%	2.01E-01 3.11%	1.11E-08 .00%	2.01E-01 3.11%	2.01E-01 3.11%	2.01E-01 3.09%	2.01E-01 3.11%	2.01E-01 3.11%
TOTAL	6.45E+00	6.45E+00	5.67E-03	6.45E+00	6.45E+00	6.49E+00	6.45E+00	6.47E+00
(1) PER CAPITA DOSE (REM)	3.29E-06	3.29E-06	2.89E-09	3.29E-06	3.29E-06	3.31E-06	3.29E-06	3.30E-06

APR - JUN

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.07E-02 .38%	2.07E-02 .38%	2.07E-02 96.89%	2.07E-02 .38%	2.07E-02 .38%	2.07E-02 .36%	2.07E-02 .38%	7.76E-02 1.39%
GROUND	1.23E-04 .00%	1.23E-04 .00%	1.23E-04 .58%	1.23E-04 .00%	1.23E-04 .00%	1.23E-04 .00%	1.23E-04 .00%	1.46E-04 .00%
INHAL	1.58E+00 28.56%	1.58E+00 28.56%	1.96E-04 .92%	1.58E+00 28.56%	1.58E+00 28.56%	1.66E+00 28.91%	1.58E+00 28.56%	1.58E+00 28.27%
VEGET	3.28E+00 59.52%	3.28E+00 59.52%	2.89E-04 1.35%	3.28E+00 59.52%	3.28E+00 59.52%	3.40E+00 59.25%	3.28E+00 59.52%	3.28E+00 58.91%
COW MILK	4.88E-01 8.84%	4.88E-01 8.84%	5.59E-05 .26%	4.88E-01 8.84%	4.88E-01 8.84%	5.09E-01 8.88%	4.88E-01 8.84%	4.88E-01 8.75%
MEAT	1.49E-01 2.70%	1.49E-01 2.70%	4.79E-08 .00%	1.49E-01 2.70%	1.49E-01 2.70%	1.49E-01 2.60%	1.49E-01 2.70%	1.49E-01 2.67%
TOTAL	5.52E+00	5.52E+00	2.14E-02	5.52E+00	5.52E+00	5.74E+00	5.52E+00	5.57E+00
(1) PER CAPITA DOSE (REM)	2.82E-06	2.82E-06	1.09E-08	2.82E-06	2.82E-06	2.93E-06	2.82E-06	2.84E-06

Table 44: (continued)
Integrated Population Dose for 2003

JAN - JUN

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.63E-02 .22%	2.63E-02 .22%	2.63E-02 97.11%	2.63E-02 .22%	2.63E-02 .22%	2.63E-02 .21%	2.63E-02 .22%	1.01E-01 .84%
GROUND	1.26E-04 .00%	1.26E-04 .00%	1.26E-04 .46%	1.26E-04 .00%	1.26E-04 .00%	1.26E-04 .00%	1.26E-04 .00%	1.49E-04 .00%
INHAL	3.21E+00 26.84%	3.21E+00 26.84%	2.49E-04 .92%	3.21E+00 26.84%	3.21E+00 26.84%	3.32E+00 27.11%	3.21E+00 26.84%	3.21E+00 26.67%
VEGET	7.36E+00 61.53%	7.36E+00 61.53%	3.44E-04 1.27%	7.36E+00 61.53%	7.36E+00 61.53%	7.50E+00 61.31%	7.36E+00 61.53%	7.36E+00 61.14%
COW MILK	1.02E+00 8.49%	1.02E+00 8.49%	6.37E-05 .24%	1.02E+00 8.49%	1.02E+00 8.49%	1.04E+00 8.51%	1.02E+00 8.49%	1.02E+00 8.44%
MEAT	3.50E-01 2.92%	3.50E-01 2.92%	5.89E-08 .00%	3.50E-01 2.92%	3.50E-01 2.92%	3.50E-01 2.86%	3.50E-01 2.92%	3.50E-01 2.91%
TOTAL	1.20E+01	1.20E+01	2.71E-02	1.20E+01	1.20E+01	1.22E+01	1.20E+01	1.20E+01
(1) PER CAPITA DOSE (REM)	6.13E-06	6.13E-06	1.38E-08	6.13E-06	6.13E-06	6.23E-06	6.13E-06	6.13E-06

JUL - SEP

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.44E-03 .04%	2.44E-03 .04%	2.44E-03 96.91%	2.44E-03 .04%	2.44E-03 .04%	2.44E-03 .04%	2.44E-03 .04%	1.82E-02 .31%
GROUND	2.29E-05 .00%	2.29E-05 .00%	2.29E-05 .91%	2.29E-05 .00%	2.29E-05 .00%	2.29E-05 .00%	2.29E-05 .00%	2.70E-05 .00%
INHAL	1.75E+00 29.97%	1.75E+00 29.97%	1.59E-05 .63%	1.75E+00 29.97%	1.75E+00 29.97%	1.76E+00 29.97%	1.75E+00 29.97%	1.75E+00 29.88%
VEGET	3.44E+00 58.78%	3.44E+00 58.78%	3.20E-05 1.27%	3.44E+00 58.78%	3.44E+00 58.78%	3.45E+00 58.77%	3.44E+00 58.78%	3.44E+00 58.62%
COW MILK	5.21E-01 8.90%	5.21E-01 8.90%	7.08E-06 .28%	5.21E-01 8.90%	5.21E-01 8.90%	5.24E-01 8.91%	5.21E-01 8.90%	5.21E-01 8.87%
MEAT	1.36E-01 2.32%	1.36E-01 2.32%	5.12E-09 .00%	1.36E-01 2.32%	1.36E-01 2.32%	1.36E-01 2.31%	1.36E-01 2.32%	1.36E-01 2.32%
TOTAL	5.86E+00	5.86E+00	2.52E-03	5.86E+00	5.86E+00	5.88E+00	5.86E+00	5.87E+00
(1) PER CAPITA DOSE (REM)	2.99E-06	2.99E-06	1.29E-09	2.99E-06	2.99E-06	3.00E-06	2.99E-06	3.00E-06

Table 44: (continued)
Integrated Population Dose for 2003

OCT - DEC

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.72E-02 .58%	1.72E-02 .58%	1.72E-02 93.31%	1.72E-02 .58%	1.72E-02 .58%	1.72E-02 .53%	1.72E-02 .58%	7.34E-02 2.41%
GROUND	5.88E-04 .02%	5.88E-04 .02%	5.88E-04 3.19%	5.88E-04 .02%	5.88E-04 .02%	5.88E-04 .02%	5.88E-04 .02%	6.91E-04 .02%
INHAL	6.12E-01 20.51%	6.12E-01 20.50%	2.53E-04 1.37%	6.12E-01 20.51%	6.12E-01 20.51%	7.19E-01 22.15%	6.13E-01 20.54%	6.12E-01 20.12%
VEGET	2.07E+00 69.24%	2.07E+00 69.24%	3.56E-04 1.93%	2.07E+00 69.24%	2.07E+00 69.24%	2.21E+00 67.99%	2.07E+00 69.21%	2.07E+00 67.96%
COW MILK	1.97E-01 6.61%	1.97E-01 6.61%	3.68E-05 .20%	1.97E-01 6.61%	1.97E-01 6.61%	2.11E-01 6.51%	1.97E-01 6.60%	1.97E-01 6.48%
MEAT	9.10E-02 3.05%	9.10E-02 3.05%	6.35E-08 .00%	9.10E-02 3.05%	9.10E-02 3.05%	9.10E-02 2.80%	9.10E-02 3.05%	9.10E-02 2.99%
TOTAL	2.98E+00	2.98E+00	1.84E-02	2.98E+00	2.98E+00	3.25E+00	2.98E+00	3.04E+00
(1) PER CAPITA DOSE (REM)	1.52E-06	1.52E-06	9.39E-09	1.52E-06	1.52E-06	1.66E-06	1.52E-06	1.55E-06

JUL - DEC

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.96E-02 .22%	1.96E-02 .22%	1.96E-02 93.74%	1.96E-02 .22%	1.96E-02 .22%	1.96E-02 .22%	1.96E-02 .22%	9.15E-02 1.03%
GROUND	6.10E-04 .01%	6.10E-04 .01%	6.10E-04 2.91%	6.10E-04 .01%	6.10E-04 .01%	6.10E-04 .01%	6.10E-04 .01%	7.18E-04 .01%
INHAL	2.37E+00 26.77%	2.37E+00 26.77%	2.69E-04 1.28%	2.37E+00 26.77%	2.37E+00 26.77%	2.48E+00 27.18%	2.37E+00 26.78%	2.37E+00 26.56%
VEGET	5.51E+00 62.31%	5.51E+00 62.31%	3.88E-04 1.85%	5.51E+00 62.31%	5.51E+00 62.31%	5.66E+00 62.05%	5.51E+00 62.30%	5.51E+00 61.80%
COW MILK	7.18E-01 8.12%	7.18E-01 8.12%	4.39E-05 .21%	7.18E-01 8.12%	7.18E-01 8.12%	7.35E-01 8.06%	7.18E-01 8.12%	7.18E-01 8.06%
MEAT	2.27E-01 2.57%	2.27E-01 2.57%	6.86E-08 .00%	2.27E-01 2.57%	2.27E-01 2.57%	2.27E-01 2.49%	2.27E-01 2.57%	2.27E-01 2.55%
TOTAL	8.84E+00	8.84E+00	2.09E-02	8.84E+00	8.84E+00	9.12E+00	8.84E+00	8.91E+00
(1) PER CAPITA DOSE (REM)	4.51E-06	4.51E-06	1.07E-08	4.51E-06	4.51E-06	4.66E-06	4.51E-06	4.55E-06

Table 44: (continued)
Integrated Population Dose for 2003

JAN - DEC

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	4.59E-02	4.59E-02	4.59E-02	4.59E-02	4.59E-02	4.59E-02	4.59E-02	1.93E-01
	.22%	.22%	95.64%	.22%	.22%	.22%	.22%	.92%
GROUND	7.36E-04	7.36E-04	7.36E-04	7.36E-04	7.36E-04	7.36E-04	7.36E-04	8.67E-04
	.00%	.00%	1.53%	.00%	.00%	.00%	.00%	.00%
INHAL	5.58E+00	5.58E+00	5.17E-04	5.58E+00	5.58E+00	5.80E+00	5.58E+00	5.58E+00
	26.81%	26.81%	1.08%	26.81%	26.81%	27.14%	26.81%	26.62%
VEGET	1.29E+01	1.29E+01	7.32E-04	1.29E+01	1.29E+01	1.32E+01	1.29E+01	1.29E+01
	61.86%	61.86%	1.52%	61.86%	61.86%	61.62%	61.85%	61.42%
COW MILK	1.73E+00	1.73E+00	1.08E-04	1.73E+00	1.73E+00	1.78E+00	1.73E+00	1.73E+00
	8.33%	8.33%	.22%	8.33%	8.33%	8.31%	8.33%	8.28%
MEAT	5.77E-01	5.77E-01	1.28E-07	5.77E-01	5.77E-01	5.77E-01	5.77E-01	5.77E-01
	2.77%	2.77%	.00%	2.77%	2.77%	2.70%	2.77%	2.75%
TOTAL	2.08E+01	2.08E+01	4.80E-02	2.08E+01	2.08E+01	2.14E+01	2.08E+01	2.10E+01
(1) PER CAPITA DOSE (REM)	1.06E-05	1.06E-05	2.45E-08	1.06E-05	1.06E-05	1.09E-05	1.06E-05	1.07E-05

Note 1: Personrem total divided by 50-mile population of 1,959,000

Table 45: Summary of Individual Doses for 2003						
	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
Gamma Air Dose	**mrad**	**3.85E-03**	**4.63E-03**	**8.28E-04**	**8.68E-03**	**1.80E-02**
ODCM Req. 4.1 Limit	mrad	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
% ODCM Limit	%	7.70E-02	9.26E-02	1.66E-02	1.74E-01	1.80E-01
Beta Air Dose	**mrad**	**6.02E-03**	**1.33E-02**	**2.38E-03**	**2.71E-02**	**4.88E-02**
ODCM Req. 4.1 Limit	mrad	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
% ODCM Limit	%	6.02E-02	1.33E-01	2.38E-02	2.71E-01	2.44E-01
Maximum Individual						
Total Body	mrem	2.43E-03	2.73E-03	5.21E-04	5.13E-03	1.08E-02
Skin	mrem	5.49E-03	7.96E-03	1.88E-03	1.63E-02	3.16E-02
Site Boundary Location						
Unit 1	miles	1.87 S	1.87 S	1.87 S	1.87 S	1.87 S
Unit 2	miles	1.68 S	1.68 S	1.68 S	1.68 S	1.68 S
Unit 3	miles	1.46 S	1.46 S	1.46 S	1.46 S	1.46 S
Maximum Organ Dose (excluding skin)	Age	Teen	Infant	Child	Teen	Child
	Organ	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
	mrem	**1.30E-01**	**3.10E-01**	**2.60E-01**	**1.07E-01**	**6.55E-01**
ODCM Req. 4.2 Limit	mrem	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
% ODCM Limit (1)	%	1.73E+00	4.13E+00	3.47E+00	1.43E+00	4.37E+00
Location						
Unit 1	miles	2.84 S	3.68 NE	1.46 NNE	2.84 S	3.68 NE
Unit 2	miles	2.68 S	3.91 NE	1.68 NNE	2.68 S	3.91 NE
Unit 3	miles	2.48 S	4.12 NE	1.90 NNE	2.48 S	4.12 NE
Organ dose from tritium only for Unit 2 location above	**mrem**	**1.26E-01**	**1.27E-01**	**2.58E-01**	**8.25E-02**	**5.32E-01**
Fraction of organ dose from tritium only for Unit 2 location above (2)	%	96.92	40.97	99.23	77.10	81.22
X/Q for Unit 2 location above	sec/m^3	6.23E-06	7.53E-07	1.29E-06	8.20E-06	6.15E-07
D/Q for Unit 2 location above	m^{-2}	2.20E-09	2.08E-09	4.59E-09	2.41E-09	1.26E-09

Note 1: ODCM Requirement 5.1 has higher limits than ODCM Requirement 4.2, therefore the percent of limits are more conservative based on ODCM Requirement 4.2 than on ODCM Requirement 5.1.

Note 2: Fraction of dose from tritium varies mainly due to the ratio of tritium to iodine curies released (see Tables 32 and 33) and changes in X/Q and D/Q for each quarter.

APPENDIX D

PROCESS CONTROL PROGRAM

The purpose of this procedure is to describe the Process Control Program (PCP) used at Palo Verde Nuclear Generating Station (PVNGS) to process various radioactive "wet wastes", including resin slurries, evaporator bottoms, and filter cartridges. This procedure also describes the procedural controls governing revisions to the PCP, delineates criteria used to evaluate the reportability of changes made to the PCP, and describes the reporting requirements.

Procedure Level of Use is Information

Effective Date: June 10, 2003

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1.0 PURPOSE and SCOPE

1.1 Purpose (RCTS 032630-01)

1.1.1 This procedure describes the Process Control Program (PCP) at Palo Verde Nuclear Generating Station (PVNGS) for processing radioactive wet waste. This plant-specific PCP establishes a set of process parameters which provide boundary conditions within which reasonable assurance can be given that the processed waste will contain essentially zero free liquid and have appropriate waste form characteristics. (Branch Technical Position ETSB 11-3)

- Technical Requirements Manual, section 5.0.500.17, states, "The purpose of the Process Control Program is to contain the current formulas, sampling, analyses, test, and determinations to be made to ensure that processing and packaging of solid radioactive wastes based on demonstrated processing of actual or simulated wet solid wastes will be accomplished in such a way as to assure compliance with 10 CFR Parts 20, 61, and 71, State regulations, burial ground requirements, and other requirements governing the disposal of solid radioactive waste."

1.1.2 Complete waste processing and absence of free liquid prior to shipment is assured by the implementation of a process control program consistent with the recommendations of Branch Technical Position ETSB 11-3. (UFSAR 11.4.2.3.1)

1.1.3 The program will comply with applicable federal and Arizona state regulations. Implementation of the PCP will be in accordance with applicable portions of the PVNGS Quality Assurance program.

1.1.4 This PCP should be implemented to maintain any potential radiation exposure to plant personnel to "as low as is reasonably achievable" (ALARA) levels, in accordance with 75DP-0RP03, "ALARA Program Overview."

1.2 Scope

1.2.1 This program applies to processing of radioactive wet waste using plant-installed systems, plant portable processing systems, and vendor provided portable processing systems at PVNGS.

1.2.2 The process control program does not apply to radioactive waste that is shipped off site for additional processing prior to disposal.

2.0 RESPONSIBILITIES

2.1 The Vice President, Nuclear Production

Ensure the performance of a review by a qualified individual/organization of changes to the Process Control Program (PCP).

2.2 The Director, Radiation Protection

2.2.1 Review and approve any reportable changes to the Process Control Program. (UFSAR 13.5.2.2.E)

2.2.2 Ensure that reportable changes to the PCP are forwarded to the Plant Review Board (PRB) for review and acceptance prior to implementation. (UFSAR 13.4.2.6.h)

2.3 Radiological Services Department Leader (RSDL)

2.3.1 Implement the Radwaste Process Control Program.

2.3.2 Provide an independent review of proposed changes to the Process Control Program.

2.3.3 Make changes to the PCP as necessary to maintain compliance with State and Federal Regulations, Licensing commitments, and burial site requirements.

2.3.4 Report changes to the Process Control Program to the NRC in the Annual Radioactive Effluent Release Report for the period in which they were made. This submittal should contain: (UFSAR 13.5.2.2.E)

- Sufficiently detailed information to totally support the rationale for the change without benefit of additional or supplemental information;
- A determination that the change did not reduce the overall conformance of the processed waste product to existing criteria for solid wastes.

2.3.5 Monitoring the activities of vendor personnel to assure vendor compliance with the Process Control Program and the PVNGS Quality Assurance Program.

2.3.6 Review and approve vendor radioactive waste processing procedures through the PVNGS procedure approval process.

2.3.7 Ensuring personnel under his control are fully aware of, and operate equipment in compliance with, the Process Control Program.

2.3.8 Establish and maintain records documenting the PCP periodic reviews, revision technical reviews, records of the review and evaluation of changes to the PCP, and PCP implementing procedures.

3.0 PROCESS CONTROL PROGRAM

3.1 Description

The process control program (PCP) consists of the procedures and processes by which processing and packaging of low-level radioactive wet waste is accomplished and which provide reasonable assurance of compliance with low-level waste requirements. While other procedures may be used in the course of processing and packaging the affected waste types, only those identified in this procedure are considered to be within the scope of the PCP. (CRDR 981853-06)

3.1.1 PCP Procedures:

- 76DP-0RP03, Radwaste Process Control Program
- 76RP-0RW05, Packaging and Classification of Radioactive Waste
- 76RP-0RW08, High Integrity Container Setup and Closure
- 76RP-0RW09, Transfer, Storage, and Processing of Radioactive Filters
- 76RP-0RW12, PVNGS Resin Drying System
- Any vendor procedure used in processing or packaging wet waste

3.1.2 PCP Processes

- Dehydration (evaporation), such as with evaporator concentrates
- Dewatering and/or drying, such as with bead resin
- Packaging any radioactive material in a High Integrity Container

3.1.3 Wet Waste Types

The various wet waste types within the scope of the PCP at PVNGS are:

- Evaporator concentrates from a forced recirculation evaporator.
- Radioactive bead resin waste.
- Radioactive spent filter cartridges.
- Radioactive sludge.
- Other miscellaneous wet wastes, as determined by R.P. supervision.

3.2 Precautions and Prerequisites

3.2.1 The radiological requirements necessary for implementing the Process Control Program are contained in 75DP-0RP01, " RP Program Overview " and the other procedures of the RP program. (RCTS 032648-01)

3.2.2 All radioactive wet waste processing will be accomplished in accordance with approved procedures.

3.2.3 The final waste product of all wet waste processing evolutions must be verified by a PVNGS representative. (IEN 87-07)

3.2.4 Waste generators are allowed to stabilize Class B & C waste by placing waste in a High Integrity Container (HIC) provided there is an associated topical report that has been approved by the NRC or for which a Certificate of Compliance, or other State Approval document, has been issued. (IEN 89-27)

3.2.5 Waste generators who use polyethylene containers for the disposal of Class B and Class C waste should either: (IEN 89-27)

- Place and ship the polyethylene container in an approved HIC, or
- obtain assurance and documentation from the disposal site operator that structural stability consistent with Part 61 will be provided at the site.

3.2.6 When packaging wet waste in a HIC, the effects of transportation on the amount of drainable liquid that might be present should be considered. (BTP on Waste Form, Rev.1, 1/91)

3.3 Process Parameters (CRDR 981853-06)

3.3.1 Proper waste characteristics for Class A wet waste will be assured by adhering to the conditions prescribed in applicable procedure(s).

3.3.2 For Class B and Class C waste, a portable processing system may be used in accordance with approved operating procedures and a 10 CFR 61 Topical Report approved by the NRC, the burial facility, or its regulating agency.

3.3.3 Evaporator Concentrates – complete processing of the waste batch and absence of free liquid is assured by meeting the time and temperature requirements specified in operating procedures for the equipment used to process concentrates for burial.

3.3.4 Ion exchange resins may be dewatered in accordance with the Process Control Program and a 10 CFR 61 Topical Report approved by the NRC, the burial facility, or its regulating agency. The parameters specified in the topical report ensure the final waste product will have appropriate waste form characteristics.

3.3.5 Radioactive spent filters, and other appropriate radioactive material, may be placed in an approved High Integrity Container for disposal, in accordance with approved procedures and the container Certificate of Compliance (C of C).

3.4 Vendors

3.4.1 Vendor operating procedures will undergo the same review and approval process as PVNGS procedures.

3.4.2 Vendor activities will be monitored to assure vendor compliance with the Process Control Program and the PVNGS Quality Assurance Program

3.4.3 If vendor processing is utilized, a PVNGS representative will verify proper processing of the waste product in accordance with the PCP, the vendor's operating procedure, and a 10 CFR 61 Topical Report approved by the NRC, if applicable.

3.5 Waste Sampling

3.5.1 Sampling requirements for the various wet waste streams are contained in 76RP-0RW03, Waste Stream Sampling and Database Maintenance.

3.6 Stability Requirement

The waste class of radioactive wet waste should be evaluated in accordance with 76RP-0RW05, "Packaging and Classification of Radioactive Waste," prior to packaging to ensure meeting the stability specifications of 10CFR61.56, "Waste characteristics," and the Branch Technical Position ETSB 11-3 (Revision 2, July 1981).

3.7 Process Control Program Revisions

3.7.1 Reportable change(s) to the Process Control Program consist of the following: (CRDR 981853-05)

3.7.1.1 Any change in processing parameters that could cause an alteration in the final waste product characteristics (e.g., change in: minimum dewatering/drying times or temperatures, processing time or temperature for concentrate evaporation, etc.);

3.7.1.2 Any change to the purpose, scope, or intent of the PCP;

3.7.1.3 Any change to the PCP that causes inconsistencies with the NRC Waste Form Technical Position Paper (Rev. 1, January 1991), or Branch Technical Position - Effluent Treatment Systems Branch 11-3, section II (Rev. 2, July 1981).

3.7.2 Document the evaluation of changes to any affected process on Appendix A, "PCP Revision Notice," and attach to requested procedure changes. Documentation for reportable change(s) to the PCP shall include the following:

3.7.2.1 Sufficient details to totally support the rationale for the change;

3.7.2.2 A determination that the change did not reduce the conformance of the final waste product to existing criteria for waste disposal.

3.7.3 The Radiological Services Department Leader shall review the proposed Process Control Program change(s), including the determination of reportability. Documentation will be as follows:

3.7.3.1 If the proposed revision does not meet any of the criteria in step 3.7.1, then the change is not reportable and the appropriate box on Appendix A will be marked and the form signed by the RSDL. The RSDL will sign for approval of the procedure revision indicating his concurrence that the revision is not reportable.

3.7.3.2 If the proposed revision is reportable, then the RSDL will mark the appropriate box on Appendix A and sign to indicate approval.

3.7.4 For changes that are determined to be reportable, forward the Process Control Program revision package to PRB for review and acceptance. (UFSAR 13.4.2.6.h)

3.7.4.1 After receiving review and acceptance from the PRB, forward the package to the Director, Radiation Protection for approval of the revision. (UFSAR 13.5.2.2.E)

3.7.5 Copies of the following documents should be maintained on file by Radiological Engineering:

- Appendix A, "PCP Revision Notice "
- Cross-Discipline Reviews, if applicable
- Any associated 10 CFR 50.59 reviews and evaluations

3.8 Record Retention

3.8.1 Records of reviews performed for changes made to the PCP shall be retained for the duration of the operating license, or the requirements of the insurer, whichever is greater. (UFSAR 17.2.6.4.1 (A)(14))

3.8.2 Turnover applicable records to NIRM in accordance with the appropriate turnover instructions.

4.0 DEFINITIONS and ABBREVIATIONS

4.1 Definitions

4.1.1 **Approved High Integrity Container** - A container used to provide the long-term stability requirement of 10 CFR 61. Approval is verified by reviewing a copy of the "Certificate of Compliance" prior to the container's use and maintaining the C of C on file during and subsequent to the container's use.

4.1.2 **Batch** - An isolated quantity of waste feed to be processed having essentially constant physical and chemical characteristics.

4.1.3 **Certificate of Compliance** (C of C) – for containers, an approval document, normally issued by the burial state licensing authority, which approves the listed container for use as a burial container. It also prescribes handling requirements and conditions for use.

4.1.4 **Low Level Radioactive Waste** (LLW)

4.1.4.1 Those low-level radioactive wastes containing source, special nuclear, or by-product material that are acceptable for disposal in a near surface land disposal facility.

4.1.4.2 Radioactive waste that contains no hazardous materials as defined in RCRA.

4.1.4.3 Radioactive waste not classified as high-level radioactive waste, transuranic waste or spent nuclear fuel.

4.1.5 **Process Control Program** (PCP) - A program that provides assurance that the methods used for processing wet low-level radioactive waste will result in a waste form that is acceptable for disposal at a licensed land disposal facility in accordance with 10 CFR 61 requirements.

4.1.6 **Reportable** - For the purposes of this procedure, means that the change meets listed requirements; therefore, PRB review is required and reporting is mandated in the Annual Radioactive Effluent Release Report.

4.1.7 **Stability** - As used in this document, "stability" means structural stability. A structurally stable waste form will generally maintain its physical dimensions and its form under expected disposal conditions. Stability can be provided by the waste form itself, processing the waste into a stable waste form, or placing the waste into a disposal container or structure that provides stability.

4.1.8 **Waste Form** - usually refers to the stability of processed waste: stable waste form or unstable waste form. Also applied to physical state of waste (i.e., liquid, solid, gas).

4.2 Abbreviations

4.2.1 **ALARA** - As Low As Reasonably Achievable

4.2.2 **BTP** – Branch Technical Position

4.2.3 **HIC** - High Integrity Container

4.2.4 **PCP** - Process Control Program

4.2.5 **PRB** –Plant Review Board

4.2.6 **RCRA** - Resource Conservation and Recovery Act

4.2.7 **RSDL** – Radiological Services Department Leader

5.0 REFERENCES

5.1 Implementing

5.1.1 75DP-0RP01, RP Program Overview

5.1.2 75DP-0RP03, ALARA Program Overview (RCTS 032633-01)

5.1.3 76RP-0RW05, Packaging and Classification of Radioactive Waste

5.1.4 76RP-0RW03, Waste Stream Sampling and Database Maintenance

5.1.5 Palo Verde Nuclear Generating Station Technical Requirements Manual Section 5.0.500.17.

5.1.6 Palo Verde Nuclear Generating Station updated Final Safety Analysis Report, Sections 11.4, 12.1, 12.3, 13.4, 13.5, and 17.2. (RCTS 032632-01)

5.1.7 USNRC Branch Technical Position ETSB 11-3, Rev 2, July 1981 "Design Guidance for Solid Radioactive Waste Management Systems Installed in Light Water Cooled Nuclear Power Reactor Plants." (RCTS 032636-01)

5.1.8 NRC Technical Position on Waste Form, Rev 1, January 1991.

5.1.9 NRC Information Notice 89-27, "Limitations on the Use of Waste Forms and High Integrity Containers for the Disposal of Low-Level Radioactive Waste," March 8, 1989.

5.1.10 NRC Information Notice 87-07, 2/3/87, "Quality Control of Onsite Dewatering / Solidification Operations by Outside Contractors."

5.2 Developmental

5.2.1 93DP-0LC07, 10 CFR 50.59 and 72.48 Screenings and Evaluations

5.2.2 10 CFR 20, "Standards for Protection Against Radiation"

5.2.3 10 CFR 61, "Licensing Requirements for Land Disposal of Radioactive Waste" (RCTS 032637-01)

5.2.4 10 CFR 71, "Packaging and Transportation of Radioactive Material"

5.2.5 49 CFR Subchapter C, "Hazardous Materials Regulations"

5.2.6 "Quality Assurance During The Operations Phase," UFSAR 17.2 (RCTS 032634-01)

5.2.7 NUREG-0472, Rev 2, July 1979, "Radiological Effluent Technical Specification for PWRs"

5.2.8 NUREG-1301, Rev.0, 4/91, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Control for Pressurized Water Reactors"

5.2.9 NUREG 0800, Rev 2, July 1981 U.S. NRC Standard Review Plan 11.4, "Solid Waste Management Systems," (RCTS 032635-01)

5.2.10 Reg Guide 1.2.1 - Measuring, Evaluating and Reporting Radioactivity in Solid Waste and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water Nuclear Power Plants, Rev. 1.

5.2.11 IE Circular 80-18, 10 CFR 50.59, Safety Evaluation for Changes to Radioactive Waste Treatment Systems

5.2.12 Commitment Action Tracking System

Partition	Commitment Number	Action Number	Procedure Section
RCTS	032632	01	5.1.6
RCTS	032633	01	5.1.2
RCTS	032634	01	5.2.6
RCTS	032635	01	5.2.9
RCTS	032636	01	5.1.7
RCTS	032637	01	5.2.3
RCTS	032648	01	3.2.1
CRDR	981853	05	3.7.1
CRDR	981853	06	3.1, 3.3

6.0 APPENDICES

Appendix A – PCP Revision Notice

PCP Revision Notice

Date: _____ Page _____ of _____

Originator: _____ Ext.: _____

Description and Justification of Revision: (*Ensure the following items are addressed*)
(*UFSAR 13.5.2.2.E*)

1. Sufficient information to support the change together with the appropriate analyses or evaluations justifying the change(s), and
2. A determination that the change will maintain the overall conformance of the solidified waste product to existing requirements of Federal, State, or other applicable regulations.

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☐ Revision is reportable - Requires PRB review, R.P. Director approval, and reporting in the annual Radioactive Effluent Release Report.

☐ Revision is NOT reportable - PRB review, R.P. Director approval, and reporting in the annual Radioactive Effluent Release Report are not required.

Approved By: _____ Date: _____

Radiological Services Department Leader

Use additional pages as required.

76DP-0RP03, Appendix-A