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Arizona Public Service
PALO VERDE NUCLEAR GENERATING STATION
P.O. BOX 52034 PHOENIX, ARIZONA 85072-2034

102-03671-WLS/SAB/PMB
April 11, 1996

WILLIAM L. STEWART
EXECUTIVE VICE PRESIDENT
NUCLEAR

U. S. Nuclear Regulatory Commission
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Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS)**
Units 1, 2, and 3
Docket Nos. STN 50-528/529/530
Annual Radioactive Effluent Release Report for 1995 and
Offsite Dose Calculation Manual (ODCM), Revisions 9 and 10

In accordance with PVNGS Technical Specifications 6.9.1.8 and 6.14, enclosed please find the Annual Radioactive Effluent Release Report for 1995 and the ODCM, Revisions 9 and 10, for PVNGS Units 1, 2, and 3.

Should you have any questions, please contact Scott A. Bauer at (602) 393-5978.

Sincerely,

James M Levine for WLS

WLS/SAB/PMB/pb

Enclosure

cc: L. J. Callan (all with enclosure)
K. E. Johnston
K. E. Perkins
C. R. Thomas

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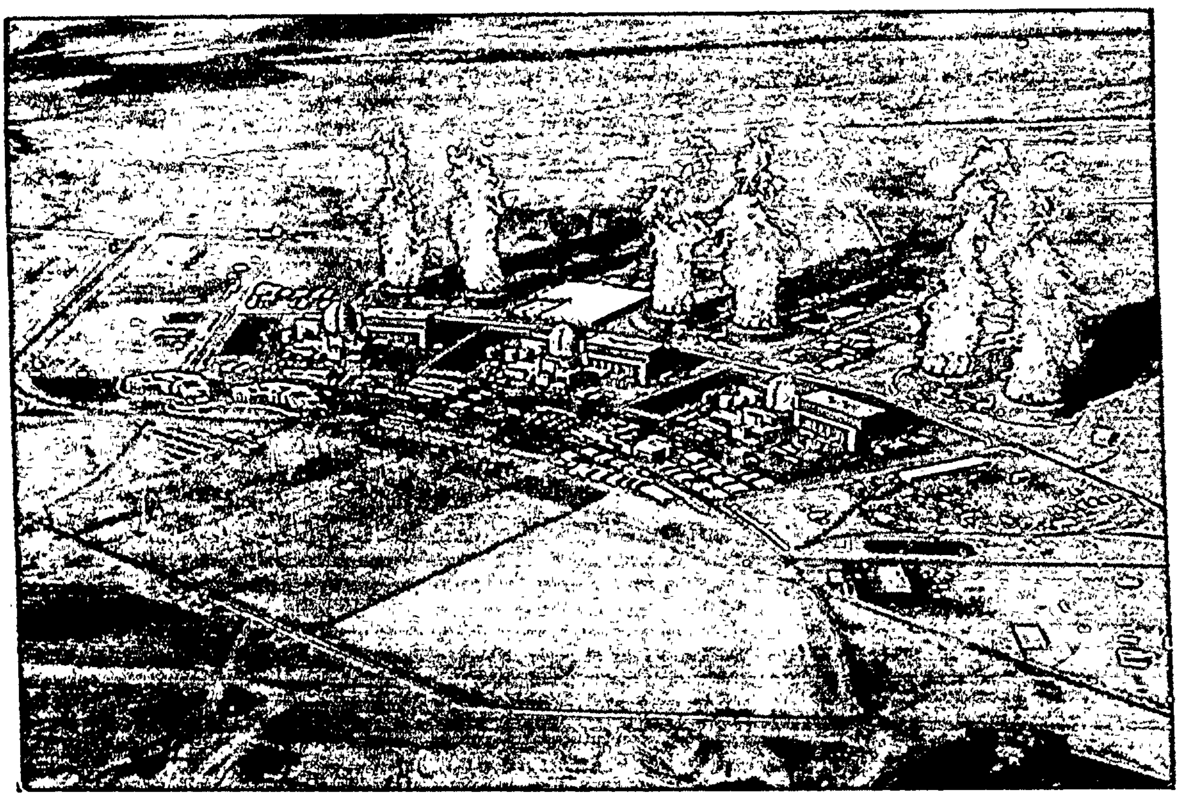
PALO VERDE NUCLEAR GENERATING STATION
UNITS 1, 2, AND 3

1995

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

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



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INTRODUCTION

This report summarizes meteorological data and doses from radioactive effluents for the Palo Verde Nuclear Generating Station (PVNGS) for the period of January through December 1995. 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.

The report is organized into five parts. Appendix A presents the effluent and waste disposal source term data. Appendix B presents a summary of onsite meteorological data for the report period. Appendix C presents the radiological doses from gaseous radioactive effluents. Appendix D contains revision 9, of the Offsite Dose Calculation Manual (ODCM), Appendix E contains revision 10, of the Offsite Dose Calculation Manual (ODCM).

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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 20.1001-20.2401, 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 ($\bar{E}$) 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 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 is 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.

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 ODCM, revision 9, was effective January 27, 1995 and is included as appendix D.

7.2 ODCM, revision 10, was effective December 6, 1995 and is included as appendix E.

7.3 There were no revisions to the PCP (76PR-9RW01).

8.0 EFFLUENTS AND SOLID WASTES

8.1 Gaseous Effluents

Gaseous effluent information is presented in Tables 1 through 31. Included in these tables are summaries of the effluents and estimated total error.

8.2 Liquid Effluents

There were no liquid effluents from the PVNGS site.

8.3 Solid Waste

Solid waste shipments are summarized in Table 32.

9.0 MISCELLANEOUS INFORMATION

9.1 EVAPORATION PONDS

Releases made to the Evaporation Ponds are limited, at the Chemical Waste Neutralizer tank, 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 1 for each of the first and fourth quarters and 8.50E+11 cc evaporated from Pond 1 for each of the second and third quarters. The amount evaporated from Pond 2 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 on the following page.

9.2 REPORT ADDENDUM

None.

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)	6.84E-07	8.19E-07	7.16E-07	7.51E-07	
Tritium Curies	2.11E-01	6.96E-01	6.09E-01	2.32E-01	1.75E+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)	1.08E-06	1.03E-06	8.64E-07	8.84E-07	
Tritium curies	3.12E-01	8.20E-01	6.88E-01	2.55E-01	2.08E+00
Dose (mRem)	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year
Pond 1	2.93E-03	9.65E-03	8.45E-03	3.22E-03	2.43E-02
Pond 2	4.33E-03	1.14E-02	9.54E-03	3.54E-03	2.88E-02
Total	7.25E-03	2.10E-02	1.80E-02	6.75E-03	5.31E-02

Table 2: Batch Release Data			
All times are in hours	Unit 1	Unit 2	Unit 3
January - June			
Number of batch releases	50	65	39
Total time period for batch releases	1939.80	2335.16	681.22
Maximum time period for a batch release	168.00	173.52	149.50
Average time period for a batch release	38.80	35.93	17.47
Minimum time period for a batch release	0.05	0.01	0.08
July - December			
Number of batch releases	41	34	45
Total time period for batch releases	774.90	729.97	2111.16
Maximum time period for a batch release	157.11	161.25	168.00
Average time period for a batch release	18.90	21.47	46.91
Minimum time period for a batch release	0.03	0.12	0.12
January - December			
Number of batch releases	91	99	84
Total time period for batch releases	2714.70	3065.12	2792.38
Maximum time period for a batch release	168.00	173.52	168.00
Average time period for a batch release	29.83	30.96	33.24
Minimum time period for a batch release	0.03	0.01	0.08

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-131m	9.10E-07	9.10E-07
Cesium-134	1.00E-13	2.60E-11	Xenon-133	6.30E-08	6.30E-08
Cesium-137	8.10E-14	1.70E-11	Xenon-133m	1.90E-07	1.90E-07
Cesium-138	5.20E-10	7.30E-10	Xenon-135	2.00E-08	2.00E-08
Chromium-51	6.90E-13	1.40E-10	Xenon-135m	8.90E-08	8.90E-08
Cobalt-58	8.50E-14	1.70E-11	Xenon-138	2.00E-07	2.00E-07
Cobalt-60	1.00E-13	1.90E-11	Iodine-131	8.00E-14	7.00E-12
Iron-59	1.70E-13	3.20E-11	Iodine-132	6.60E-12	1.90E-11
Lanthanum-140	2.80E-13	2.10E-11	Iodine-133	4.70E-13	1.10E-11
Manganese-54	8.30E-14	1.70E-11	Iodine-134	5.90E-11	8.20E-11
Molybdenum-99	2.40E-13	2.80E-11	Iodine-135	7.00E-12	5.50E-11
Niobium-95	8.70E-14	1.80E-11			
Rubidium-88	1.90E-08	1.90E-08			
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	5.59E+01	8.03E+01	2.81E+01	1.83E+01	1.83E+02	3.54E+01
2. Average release rate for period	µCi/sec	7.19E+00	1.02E+01	3.54E+00	2.30E+00	5.79E+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	6.11E-05	2.59E-03	3.66E-05	5.71E-05	2.74E-03	3.32E+01
2. Average release rate for period	µCi/sec	7.86E-06	3.29E-04	4.60E-06	7.18E-06	8.70E-05	
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	9.36E-06	3.26E-04	9.26E-06	4.95E-06	3.50E-04	3.43E+01
2. Average release rate for period	µCi/sec	1.20E-06	4.15E-05	1.17E-06	6.23E-07	1.11E-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	1.28E+02	4.74E+01	6.72E+01	6.51E+01	3.08E+02	3.85E+01
2. Average release rate for period	µCi/sec	1.65E+01	6.03E+00	8.45E+00	8.19E+00	9.76E+00	
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 24.							
(2) See Table 9 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	1.12E+00	<LLD	<LLD	<LLD	1.12E+00
Kr-85	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Kr-85m	Ci	4.50E-01	<LLD	<LLD	<LLD	4.50E-01
Kr-87	Ci	3.36E-01	<LLD	<LLD	<LLD	3.36E-01
Kr-88	Ci	4.04E-01	<LLD	3.72E-01	<LLD	7.76E-01
Xe-131m	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Xe-133	Ci	3.85E+01	3.13E+01	2.03E+01	1.12E+01	1.01E+02
Xe-133m	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Xe-135	Ci	1.02E+01	3.04E+00	6.82E+00	6.40E+00	2.65E+01
Xe-135m	Ci	1.96E-01	<LLD	<LLD	<LLD	1.96E-01
Xe-138	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
total	Ci	5.12E+01	3.43E+01	2.75E+01	1.76E+01	1.31E+02
2. Iodines						
I-131	Ci	4.10E-05	1.85E-03	3.59E-05	5.29E-05	1.98E-03
I-132	Ci	<LLD	4.50E-03	<LLD	<LLD	4.50E-03
I-133	Ci	6.48E-05	4.73E-05	2.18E-05	1.96E-05	1.54E-04
I-135	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
total	Ci	1.06E-04	6.40E-03	5.77E-05	7.25E-05	6.63E-03

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	0.00E+00
Ba-140	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Br-82	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Ce-144	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Co-58	Ci	<LLD	1.77E-05	<LLD	<LLD	1.77E-05
Co-60	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Cr-51	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Cs-134	Ci	<LLD	<LLD	1.39E-07	<LLD	1.39E-07
Cs-137	Ci	6.92E-07	<LLD	<LLD	5.47E-07	1.24E-06
Cs-138	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Fe-59	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
La-140	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Mn-54	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Nb-95	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Os-191	Ci	<LLD	4.82E-05	<LLD	<LLD	4.82E-05
Rb-88	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Ru-103	Ci	<LLD	6.78E-05	<LLD	<LLD	6.78E-05
Ru-106	Ci	<LLD	3.82E-05	<LLD	<LLD	3.82E-05
Sb-122	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Sb-124	Ci	<LLD	1.46E-05	1.44E-07	<LLD	1.47E-05
Sb-125	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Se-75	Ci	6.20E-06	4.97E-05	8.98E-06	4.18E-06	6.91E-05
Sr-89	Ci	8.50E-07	<LLD	<LLD	<LLD	8.50E-07
Sr-90	Ci	4.66E-07	1.15E-07	<LLD	<LLD	5.81E-07
Te-123m	Ci	1.11E-06	6.98E-07	<LLD	<LLD	1.81E-06
Zn-65	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Zr-95	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
total	Ci	9.32E-06	2.37E-04	9.26E-06	4.73E-06	2.60E-04
4.Tritium						
H-3	Ci	1.57E+01	2.26E+00	5.10E+00	3.43E+00	2.65E+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	5.70E-01	3.86E-02	1.28E-01	1.31E-01	8.68E-01
Kr-85	Ci	2.38E+00	4.67E+00	4.96E-01	5.12E-01	8.06E+00
Kr-85m	Ci	3.74E-03	2.29E-03	< LLD	< LLD	6.03E-03
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Kr-88	Ci	6.35E-03	4.39E-03	< LLD	< LLD	1.07E-02
Xe-131m	Ci	4.02E-02	6.62E-01	1.48E-03	2.77E-03	7.06E-01
Xe-133	Ci	1.58E+00	4.05E+01	5.77E-02	3.41E-02	4.22E+01
Xe-133m	Ci	2.77E-02	5.97E-02	< LLD	< LLD	8.74E-02
Xe-135	Ci	1.11E-01	7.17E-02	8.01E-04	1.02E-04	1.84E-01
Xe-135m	Ci	< LLD	8.75E-06	< LLD	< LLD	8.75E-06
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
total	Ci	4.72E+00	4.60E+01	6.84E-01	6.80E-01	5.21E+01
2. Iodines						
I-131	Ci	2.01E-05	7.35E-04	6.93E-07	4.13E-06	7.60E-04
I-132	Ci	3.20E-06	2.19E-03	< LLD	3.68E-07	2.19E-03
I-133	Ci	3.52E-05	1.18E-05	2.60E-06	5.87E-06	5.55E-05
I-135	Ci	1.31E-06	< LLD	< LLD	< LLD	1.31E-06
total	Ci	5.98E-05	2.94E-03	3.29E-06	1.04E-05	3.01E-03

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	0.00E+00
Ba-140	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Br-82	Ci	2.80E-05	7.83E-06	9.02E-06	8.32E-06	5.32E-05
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Ce-144	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Co-58	Ci	<LLD	5.71E-06	<LLD	<LLD	5.71E-06
Co-60	Ci	<LLD	3.99E-05	<LLD	<LLD	3.99E-05
Cr-51	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Cs-134	Ci	4.67E-08	1.12E-07	<LLD	2.22E-07	3.81E-07
Cs-137	Ci	<LLD	2.19E-07	<LLD	<LLD	2.19E-07
Cs-138	Ci	4.79E-05	<LLD	<LLD	<LLD	4.79E-05
Fe-59	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
La-140	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Mn-54	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Nb-95	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Os-191	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Rb-88	Ci	6.18E-04	<LLD	<LLD	<LLD	6.18E-04
Ru-103	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Ru-106	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Sb-122	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Sb-124	Ci	<LLD	4.29E-05	<LLD	<LLD	4.29E-05
Sb-125	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Se-75	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Sr-89	Ci	(1)	(1)	(1)	(1)	0.00E+00
Sr-90	Ci	(1)	(1)	(1)	(1)	0.00E+00
Te-123m	Ci	<LLD	1.29E-07	<LLD	<LLD	1.29E-07
Zn-65	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Zr-95	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
total	Ci	6.94E-04	9.68E-05	9.02E-06	8.54E-06	8.08E-04
4. Tritium						
H-3	Ci	1.12E+02	4.51E+01	6.21E+01	6.17E+01	2.81E+02
Note 1 - Not required for batch releases						

Table 9: 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	1.67E-02	9.02E-03	7.66E-03	4.94E-03	3.83E-02
ODCM Req 4.1 Limit	mrad	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
% ODCM Limit	%	3.34E-01	1.80E-01	1.53E-01	9.87E-02	3.83E-01
Beta Air Dose	mrad	2.35E-02	2.63E-02	1.15E-02	8.18E-03	6.95E-02
ODCM Req 4.1 Limit	mrad	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
% ODCM Limit	%	2.35E-01	2.63E-01	1.15E-01	8.18E-02	3.47E-01
Maximum Organ Dose (excluding skin)	mrem	3.18E-01	1.68E-01	1.67E-01	1.62E-01	8.15E-01
Age		Child	Child	Child	Child	Child
Organ		Thyroid	Thyroid	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	%	4.24E+00	2.24E+00	2.22E+00	2.16E+00	5.43E+00

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

Table 10:
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	1.21E+02	1.74E-01	1.18E+00	1.62E-01	1.22E+02	3.54E+01
2. Average release rate for period	µCi/sec	1.55E+01	2.21E-02	1.48E-01	2.04E-02	3.88E+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	6.63E-03	1.32E-05	< LLD	< LLD	6.64E-03	3.32E+01
2. Average release rate for period	µCi/sec	8.53E-04	1.68E-06	< LLD	< LLD	2.11E-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	4.80E-04	1.44E-05	3.38E-06	7.62E-07	4.99E-04	3.43E+01
2. Average release rate for period	µCi/sec	6.18E-05	1.84E-06	4.25E-07	9.58E-08	1.58E-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	9.78E+01	2.46E+01	9.75E+01	2.31E+01	2.43E+02	3.85E+01
2. Average release rate for period	µCi/sec	1.26E+01	3.13E+00	1.23E+01	2.91E+00	7.71E+00	
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 24.							
(2) See Table 15 for percent of ODCM Requirement limits.							

Table 11: 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						
Argon-41	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Ar-41	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Kr-85	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Kr-85m	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Kr-88	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Xe-131m	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Xe-133	Ci	7.46E+01	< LLD	< LLD	< LLD	7.46E+01
Xe-133m	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Xe-135	Ci	1.45E+00	< LLD	< LLD	< LLD	1.45E+00
Xe-135m	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
total	Ci	7.61E+01	0.00E+00	0.00E+00	0.00E+00	7.61E+01
2. Iodines						
I-131	Ci	2.45E-03	1.32E-05	< LLD	< LLD	2.46E-03
I-132	Ci	1.45E-03	< LLD	< LLD	< LLD	1.45E-03
I-133	Ci	4.35E-05	< LLD	< LLD	< LLD	4.35E-05
I-135	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
total	Ci	3.94E-03	1.32E-05	0.00E+00	0.00E+00	3.96E-03

Table 12: 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	1.46E-06	< LLD	< LLD	< LLD	1.46E-06
Ba-140	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Br-82	Ci	7.36E-06	< LLD	< LLD	< LLD	7.36E-06
Ce-141	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Ce-144	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Co-58	Ci	5.10E-05	3.27E-06	< LLD	< LLD	5.43E-05
Co-60	Ci	8.46E-06	< LLD	< LLD	< LLD	8.46E-06
Cr-51	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Cs-134	Ci	< LLD	2.35E-06	< LLD	< LLD	2.35E-06
Cs-137	Ci	4.05E-06	< LLD	< LLD	< LLD	4.05E-06
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Fe-59	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
La-140	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Mn-54	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Mo-99	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Nb-95	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Os-191	Ci	6.81E-05	< LLD	< LLD	< LLD	6.81E-05
Rb-88	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Ru-103	Ci	1.49E-05	< LLD	< LLD	< LLD	1.49E-05
Ru-106	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Sb-124	Ci	6.75E-06	2.44E-06	< LLD	< LLD	9.19E-06
Sb-125	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Se-75	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Sr-89	Ci	< LLD	6.68E-07	2.56E-06	< LLD	3.23E-06
Sr-90	Ci	8.70E-08	1.85E-07	< LLD	< LLD	2.72E-07
Te-123m	Ci	< LLD	< LLD	< LLD	7.58E-07	7.58E-07
Zn-65	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Zr-95	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
total	Ci	1.62E-04	8.91E-06	2.56E-06	7.58E-07	1.74E-04
4. Tritium						
H-3	Ci	6.88E+00	2.72E+00	4.99E+00	2.42E+00	1.70E+01

Table 13:
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	3.01E-01	1.23E-01	1.16E-01	1.11E-01	6.51E-01
Kr-85	Ci	2.37E+00	<LLD	9.65E-01	<LLD	3.34E+00
Kr-85m	Ci	6.82E-03	<LLD	<LLD	<LLD	6.82E-03
Kr-87	Ci	1.08E-02	<LLD	<LLD	<LLD	1.08E-02
Kr-88	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Xe-131m	Ci	2.87E-01	<LLD	9.22E-04	<LLD	2.88E-01
Xe-133	Ci	4.06E+01	4.99E-02	9.62E-02	5.07E-02	4.08E+01
Xe-133m	Ci	9.60E-03	<LLD	1.22E-04	<LLD	9.72E-03
Xe-135	Ci	1.40E+00	1.25E-03	7.32E-04	4.07E-04	1.40E+00
Xe-135m	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Xe-138	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
total	Ci	4.50E+01	1.74E-01	1.18E+00	1.62E-01	4.65E+01
2. Iodines						
I-131	Ci	4.18E-03	<LLD	<LLD	<LLD	4.18E-03
I-132	Ci	3.60E-04	<LLD	<LLD	<LLD	3.60E-04
I-133	Ci	2.68E-03	1.13E-07	<LLD	<LLD	2.68E-03
I-135	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
total	Ci	7.22E-03	1.13E-07	0.00E+00	0.00E+00	7.22E-03

Table 14: 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	1.13E-08	<LLD	<LLD	<LLD	1.13E-08
Ba-140	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Br-82	Ci	4.86E-04	1.35E-05	1.25E-05	1.20E-05	5.24E-04
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Ce-144	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Co-58	Ci	4.60E-08	<LLD	<LLD	<LLD	4.60E-08
Co-60	Ci	2.90E-04	2.50E-09	<LLD	3.86E-09	2.90E-04
Cr-51	Ci	1.62E-07	<LLD	<LLD	<LLD	1.62E-07
Cs-134	Ci	2.08E-08	<LLD	<LLD	<LLD	2.08E-08
Cs-137	Ci	4.07E-08	<LLD	<LLD	<LLD	4.07E-08
Cs-138	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Fe-59	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
La-140	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Mn-54	Ci	1.99E-05	<LLD	<LLD	<LLD	1.99E-05
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Nb-95	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Os-191	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Rb-88	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Ru-103	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Ru-106	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Sb-122	Ci	3.41E-10	<LLD	<LLD	<LLD	3.41E-10
Sb-124	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Sb-125	Ci	9.94E-09	<LLD	<LLD	<LLD	9.94E-09
Se-75	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Sr-89	Ci	(1)	(1)	(1)	(1)	0.00E+00
Sr-90	Ci	(1)	(1)	(1)	(1)	0.00E+00
Tc-123m	Ci	1.60E-05	5.52E-06	8.16E-07	<LLD	2.23E-05
Zn-65	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Zr-95	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
total	Ci	8.12E-04	1.90E-05	1.33E-05	1.20E-05	8.57E-04
4. Tritium						
H-3	Ci	9.09E+01	2.19E+01	9.25E+01	2.07E+01	2.26E+02
Note 1 - Not required for batch releases						

Table 15: 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	1.39E-02	3.28E-04	3.18E-04	2.97E-04	1.48E-02
ODCM Req 4.1 Limit	mrad	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
% ODCM Limit	%	2.77E-01	6.56E-03	6.37E-03	5.94E-03	1.48E-01
Beta Air Dose	mrad	3.79E-02	1.29E-04	6.68E-04	1.18E-04	3.88E-02
ODCM Req 4.1 Limit	mrad	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
% ODCM Limit	%	3.79E-01	1.29E-03	6.68E-03	1.18E-03	1.94E-01
Maximum Organ Dose (excluding skin)	mrem	3.77E-01	6.10E-02	2.41E-01	5.71E-02	7.36E-01
Age		Child	Child	Child	Child	Child
Organ		Thyroid	Thyroid	Lung	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	%	5.02E+00	8.13E-01	3.21E+00	7.62E-01	4.91E+00

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

Table 16:
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	1.29E-01	1.79E-01	1.81E-01	2.05E+01	2.10E+01	3.54E+01
2. Average release rate for period	µCi/sec	1.66E-02	2.28E-02	2.27E-02	2.58E+00	6.66E-01	
3. Percent of ODCM Requirement limit	%	NA (2)	NA (2)	NA (2)	NA (2)	NA (2)	
B. Iodine 131							
1. Total Iodine 131	Ci	3.28E-06	3.35E-07	< LLD	2.05E-04	2.09E-04	3.32E+01
2. Average release rate for period	µCi/sec	4.22E-07	4.26E-08	< LLD	2.58E-05	6.62E-06	
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	5.69E-07	< LLD	< LLD	7.02E-04	7.03E-04	3.43E+01
2. Average release rate for period	µCi/sec	7.32E-08	< LLD	< LLD	8.83E-05	2.23E-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	8.97E+01	1.27E+02	1.69E+02	2.46E+02	6.32E+02	3.85E+01
2. Average release rate for period	µCi/sec	1.15E+01	1.62E+01	2.13E+01	3.09E+01	2.00E+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 24.							
(2) See Table 21 for percent of ODCM Requirement limits.							

Table 17:
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	0.00E+00
Kr-85	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Kr-85m	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Kr-87	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Kr-88	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Xe-131m	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Xe-133	Ci	<LLD	<LLD	<LLD	7.14E+00	7.14E+00
Xe-133m	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Xe-135	Ci	<LLD	<LLD	<LLD	9.15E-01	9.15E-01
Xe-135m	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Xe-138	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
total	Ci	0.00E+00	0.00E+00	0.00E+00	8.06E+00	8.06E+00
2. Iodines						
I-131	Ci	1.91E-06	3.35E-07	<LLD	1.77E-04	1.79E-04
I-132	Ci	<LLD	<LLD	<LLD	5.22E-04	5.22E-04
I-133	Ci	<LLD	<LLD	<LLD	1.40E-05	1.40E-05
I-135	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
total	Ci	1.91E-06	3.35E-07	0.00E+00	7.13E-04	7.15E-04

Table 18: 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	0.00E+00
Ba-140	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Br-82	Ci	<LLD	<LLD	<LLD	1.35E-05	1.35E-05
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Ce-144	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Co-58	Ci	<LLD	<LLD	<LLD	2.19E-04	2.19E-04
Co-60	Ci	<LLD	<LLD	<LLD	2.60E-05	2.60E-05
Cr-51	Ci	<LLD	<LLD	<LLD	1.32E-04	1.32E-04
Cs-134	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Cs-137	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Cs-138	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Fe-59	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
La-140	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Mn-54	Ci	<LLD	<LLD	<LLD	1.14E-05	1.14E-05
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Nb-95	Ci	<LLD	<LLD	<LLD	2.19E-05	2.19E-05
Os-191	Ci	<LLD	<LLD	<LLD	5.41E-05	5.41E-05
Rb-88	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Ru-103	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Ru-106	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Sb-122	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Sb-124	Ci	<LLD	<LLD	<LLD	1.43E-05	1.43E-05
Sb-125	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Se-75	Ci	<LLD	<LLD	<LLD	2.14E-06	2.14E-06
Sr-89	Ci	5.13E-07	<LLD	<LLD	<LLD	5.13E-07
Sr-90	Ci	5.62E-08	<LLD	<LLD	<LLD	5.62E-08
Te-123m	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Zn-65	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Zr-95	Ci	<LLD	<LLD	<LLD	6.25E-06	6.25E-06
total	Ci	5.69E-07	0.00E+00	0.00E+00	5.01E-04	5.01E-04
4. Tritium						
H-3	Ci	1.70E+00	4.31E-01	4.56E+00	1.76E+01	2.43E+01

Table 19: 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	9.87E-02	9.68E-02	1.14E-01	4.50E-01	7.60E-01
Kr-85	Ci	1.14E-02	4.59E-02	2.31E-02	1.54E-01	2.34E-01
Kr-85m	Ci	< LLD	< LLD	< LLD	1.62E-02	1.62E-02
Kr-87	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Kr-88	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Xe-131m	Ci	7.50E-04	< LLD	< LLD	2.62E-01	2.63E-01
Xe-133	Ci	1.80E-02	3.62E-02	4.34E-02	1.13E+01	1.14E+01
Xe-133m	Ci	< LLD	< LLD	< LLD	8.07E-02	8.07E-02
Xe-135	Ci	1.05E-04	< LLD	1.03E-04	2.20E-01	2.20E-01
Xe-135m	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Xe-138	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
total	Ci	1.29E-01	1.79E-01	1.81E-01	1.25E+01	1.30E+01
2. Iodines						
I-131	Ci	1.37E-06	< LLD	< LLD	2.76E-05	2.90E-05
I-132	Ci	6.76E-08	< LLD	< LLD	< LLD	6.76E-08
I-133	Ci	< LLD	< LLD	< LLD	1.90E-06	1.90E-06
I-135	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
total	Ci	1.44E-06	0.00E+00	0.00E+00	2.95E-05	3.09E-05

Table 20: 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	0.00E+00
Ba-140	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Br-82	Ci	1.15E-05	1.11E-05	1.24E-05	3.73E-04	4.08E-04
Ce-141	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Ce-144	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Co-58	Ci	<LLD	<LLD	<LLD	2.06E-08	2.06E-08
Co-60	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Cr-51	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Cs-134	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Cs-137	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Cs-138	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Fe-59	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
La-140	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Mn-54	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Mo-99	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Nb-95	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Os-191	Ci	<LLD	<LLD	<LLD	2.15E-04	2.15E-04
Rb-88	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Ru-103	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Ru-106	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Sb-122	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Sb-124	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Sb-125	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Se-75	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Sr-89	Ci	(1)	(1)	(1)	(1)	0.00E+00
Sr-90	Ci	(1)	(1)	(1)	(1)	0.00E+00
Te-123m	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Zn-65	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Zr-95	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
total	Ci	1.15E-05	1.11E-05	1.24E-05	5.88E-04	6.23E-04
4. Tritium						
H-3	Ci	8.80E+01	1.27E+02	1.64E+02	2.29E+02	6.08E+02
Note 1 - Not required for batch releases						

Table 21: 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	2.61E-04	2.58E-04	3.04E-04	3.66E-03	4.48E-03
ODCM Req 4.1 Limit	mrad	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
% ODCM Limit	%	5.22E-03	5.16E-03	6.09E-03	7.32E-02	4.48E-02
Beta Air Dose	mrad	1.03E-04	1.26E-04	1.31E-04	6.88E-03	7.24E-03
ODCM Req 4.1 Limit	mrad	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
% ODCM Limit	%	1.03E-03	1.26E-03	1.31E-03	6.88E-02	3.62E-02
Maximum Organ Dose (excluding skin)	mrem	2.22E-01	3.15E-01	4.17E-01	6.13E-01	1.57E+00
Age		Child	Child	Child	Child	Child
Organ		Thyroid	Thyroid	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	%	2.96E+00	4.20E+00	5.55E+00	8.18E+00	1.04E+01

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

Table 22: Units 1, 2, and 3 Gaseous Effluents - Continuous - Fission Gases and Iodines						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
1. Fission gases						
Ar-41	Ci	1.12E+00	< LLD	< LLD	< LLD	1.12E+00
Kr-85	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Kr-85m	Ci	4.50E-01	< LLD	< LLD	< LLD	4.50E-01
Kr-87	Ci	3.36E-01	< LLD	< LLD	< LLD	3.36E-01
Kr-88	Ci	4.04E-01	< LLD	3.72E-01	< LLD	7.76E-01
Xe-131m	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Xe-133	Ci	1.13E+02	3.13E+01	2.03E+01	1.83E+01	1.83E+02
Xe-133m	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Xe-135	Ci	1.16E+01	3.04E+00	6.82E+00	7.31E+00	2.88E+01
Xe-135m	Ci	1.96E-01	< LLD	< LLD	< LLD	1.96E-01
total	Ci	1.27E+02	3.43E+01	2.75E+01	2.56E+01	2.15E+02
2. Iodines						
I-131	Ci	2.49E-03	1.87E-03	3.59E-05	2.30E-04	4.63E-03
I-132	Ci	1.45E-03	4.50E-03	< LLD	5.22E-04	6.47E-03
I-133	Ci	1.08E-04	4.73E-05	2.18E-05	3.37E-05	2.11E-04
I-135	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
total	Ci	4.05E-03	6.42E-03	5.77E-05	7.86E-04	1.13E-02

Table 23: Units 1, 2, and 3 Gaseous Effluents - Continuous - Particulates						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
3. Particulates						
Ag-110m	Ci	1.46E-06	< LLD	< LLD	< LLD	1.46E-06
Br-82	Ci	7.36E-06	< LLD	< LLD	1.35E-05	2.09E-05
Co-58	Ci	5.10E-05	2.10E-05	< LLD	2.19E-04	2.91E-04
Co-60	Ci	8.46E-06	< LLD	< LLD	2.60E-05	3.45E-05
Cr-51	Ci	< LLD	< LLD	< LLD	1.32E-04	1.32E-04
Cs-134	Ci	< LLD	2.35E-06	1.39E-07	< LLD	2.49E-06
Cs-137	Ci	4.74E-06	< LLD	< LLD	5.47E-07	5.29E-06
Cs-138	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Mn-54	Ci	< LLD	< LLD	< LLD	1.14E-05	1.14E-05
Nb-95	Ci	< LLD	< LLD	< LLD	2.19E-05	2.19E-05
Os-191	Ci	6.81E-05	4.82E-05	< LLD	5.41E-05	1.70E-04
Rb-88	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Ru-103	Ci	1.49E-05	6.78E-05	< LLD	< LLD	8.27E-05
Ru-106	Ci	< LLD	3.82E-05	< LLD	< LLD	3.82E-05
Sb-122	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Sb-124	Ci	6.75E-06	1.70E-05	1.44E-07	1.43E-05	3.82E-05
Sb-125	Ci	< LLD	< LLD	< LLD	< LLD	0.00E+00
Se-75	Ci	6.20E-06	4.97E-05	8.98E-06	6.32E-06	7.12E-05
Sr-89	Ci	1.36E-06	6.68E-07	2.56E-06	< LLD	4.59E-06
Sr-90	Ci	6.09E-07	3.01E-07	< LLD	< LLD	9.10E-07
Te-123m	Ci	1.11E-06	6.98E-07	< LLD	7.58E-07	2.57E-06
Zr-95	Ci	< LLD	< LLD	< LLD	6.25E-06	6.25E-06
total	Ci	1.72E-04	2.46E-04	1.18E-05	5.06E-04	9.36E-04
4. Tritium						
H-3	Ci	2.42E+01	5.41E+00	1.47E+01	2.35E+01	6.78E+01

Table 24: Units 1, 2, and 3 Gaseous Effluents - Batch - Fission Gases and Iodines						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
1. Fission gases						
Ar-41	Ci	9.69E-01	2.58E-01	3.58E-01	6.92E-01	2.28E+00
Kr-85	Ci	4.77E+00	4.72E+00	1.48E+00	6.66E-01	1.16E+01
Kr-85m	Ci	1.06E-02	2.29E-03	<LLD	1.62E-02	2.91E-02
Kr-87	Ci	1.08E-02	<LLD	<LLD	<LLD	1.08E-02
Kr-88	Ci	6.35E-03	4.39E-03	<LLD	<LLD	1.07E-02
Xe-131m	Ci	3.28E-01	6.62E-01	2.40E-03	2.65E-01	1.26E+00
Xe-133	Ci	4.22E+01	4.05E+01	1.97E-01	1.14E+01	9.43E+01
Xe-133m	Ci	3.73E-02	5.97E-02	1.22E-04	8.07E-02	1.78E-01
Xe-135	Ci	1.51E+00	7.29E-02	1.64E-03	2.21E-01	1.81E+00
Xe-135m	Ci	<LLD	8.75E-06	<LLD	<LLD	8.75E-06
total	Ci	4.98E+01	4.63E+01	2.04E+00	1.33E+01	1.12E+02
2. Iodines						
I-131	Ci	4.20E-03	7.35E-04	6.93E-07	3.17E-05	4.97E-03
I-132	Ci	3.63E-04	2.19E-03	<LLD	3.68E-07	2.55E-03
I-133	Ci	2.71E-03	1.20E-05	2.60E-06	7.77E-06	2.73E-03
I-135	Ci	1.31E-06	<LLD	<LLD	<LLD	1.31E-06
total	Ci	7.27E-03	2.94E-03	3.29E-06	3.98E-05	1.03E-02

Table 25: Units 1, 2, and 3 Gaseous Effluents - Batch - Particulates						
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
3. Particulates						
Ag-110m	Ci	1.13E-08	<LLD	<LLD	<LLD	1.13E-08
Br-82	Ci	5.26E-04	3.24E-05	3.39E-05	3.93E-04	9.85E-04
Co-58	Ci	4.60E-08	5.71E-06	<LLD	2.06E-08	5.78E-06
Co-60	Ci	2.90E-04	3.99E-05	<LLD	3.86E-09	3.30E-04
Cr-51	Ci	1.62E-07	<LLD	<LLD	<LLD	1.62E-07
Cs-134	Ci	6.75E-08	1.12E-07	<LLD	2.22E-07	4.02E-07
Cs-137	Ci	4.07E-08	2.19E-07	<LLD	<LLD	2.60E-07
Cs-138	Ci	4.79E-05	<LLD	<LLD	<LLD	4.79E-05
Mn-54	Ci	1.99E-05	<LLD	<LLD	<LLD	1.99E-05
Nb-95	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Os-191	Ci	<LLD	<LLD	<LLD	2.15E-04	2.15E-04
Rb-88	Ci	6.18E-04	<LLD	<LLD	<LLD	6.18E-04
Ru-103	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Ru-106	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Sb-122	Ci	3.41E-10	<LLD	<LLD	<LLD	3.41E-10
Sb-124	Ci	<LLD	4.29E-05	<LLD	<LLD	4.29E-05
Sb-125	Ci	9.94E-09	<LLD	<LLD	<LLD	9.94E-09
Se-75	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
Sr-89	Ci	(1)	(1)	(1)	(1)	0.00E+00
Sr-90	Ci	(1)	(1)	(1)	(1)	0.00E+00
Te-123m	Ci	1.60E-05	5.65E-06	8.16E-07	<LLD	2.25E-05
Zr-95	Ci	<LLD	<LLD	<LLD	<LLD	0.00E+00
total	Ci	1.52E-03	1.27E-04	3.47E-05	6.08E-04	2.29E-03
4. Tritium						
H-3	Ci	2.91E+02	1.94E+02	3.19E+02	3.11E+02	1.12E+03
Note 1 - Not required for batch releases						

Table 26:
Units 1, 2, and 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	2.09E+00	2.58E-01	3.58E-01	6.92E-01	3.40E+00
Kr-85	Ci	4.77E+00	4.72E+00	1.48E+00	6.66E-01	1.16E+01
Kr-85m	Ci	4.61E-01	2.29E-03	<LLD	1.62E-02	4.79E-01
Kr-87	Ci	3.47E-01	<LLD	<LLD	<LLD	3.47E-01
Kr-88	Ci	4.10E-01	4.39E-03	3.72E-01	<LLD	7.86E-01
Xe-131m	Ci	3.28E-01	6.62E-01	2.40E-03	2.65E-01	1.26E+00
Xe-133	Ci	1.55E+02	7.19E+01	2.05E+01	2.97E+01	2.77E+02
Xe-133m	Ci	3.73E-02	5.97E-02	1.22E-04	8.07E-02	1.78E-01
Xe-135	Ci	1.31E+01	3.11E+00	6.82E+00	7.53E+00	3.06E+01
Xe-135m	Ci	1.96E-01	8.75E-06	<LLD	<LLD	1.96E-01
total	Ci	1.77E+02	8.07E+01	2.95E+01	3.89E+01	3.26E+02
2. Iodines						
I-131	Ci	6.69E-03	2.60E-03	3.66E-05	2.62E-04	9.59E-03
I-132	Ci	1.81E-03	6.69E-03	<LLD	5.22E-04	9.02E-03
I-133	Ci	2.82E-03	5.93E-05	2.44E-05	4.14E-05	2.95E-03
I-135	Ci	1.31E-06	<LLD	<LLD	<LLD	1.31E-06
total	Ci	1.13E-02	9.35E-03	6.10E-05	8.25E-04	2.16E-02

Table 27: Units 1, 2, and 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	1.47E-06	<LLD	<LLD	<LLD	1.47E-06
Br-82	Ci	5.33E-04	3.24E-05	3.39E-05	4.06E-04	1.01E-03
Co-58	Ci	5.10E-05	2.67E-05	<LLD	2.19E-04	2.97E-04
Co-60	Ci	2.98E-04	3.99E-05	<LLD	2.60E-05	3.64E-04
Cr-51	Ci	1.62E-07	<LLD	<LLD	1.32E-04	1.32E-04
Cs-134	Ci	6.75E-08	2.46E-06	1.39E-07	2.22E-07	2.89E-06
Cs-137	Ci	4.78E-06	2.19E-07	<LLD	5.47E-07	5.55E-06
Cs-138	Ci	4.79E-05	<LLD	<LLD	<LLD	4.79E-05
Mn-54	Ci	1.99E-05	<LLD	<LLD	1.14E-05	3.13E-05
Nb-95	Ci	<LLD	<LLD	<LLD	2.19E-05	2.19E-05
Os-191	Ci	6.81E-05	4.82E-05	<LLD	2.69E-04	3.85E-04
Rb-88	Ci	6.18E-04	<LLD	<LLD	<LLD	6.18E-04
Ru-103	Ci	1.49E-05	6.78E-05	<LLD	<LLD	8.27E-05
Ru-106	Ci	<LLD	3.82E-05	<LLD	<LLD	3.82E-05
Sb-122	Ci	3.41E-10	<LLD	<LLD	<LLD	3.41E-10
Sb-124	Ci	6.75E-06	5.99E-05	1.44E-07	1.43E-05	8.11E-05
Sb-125	Ci	9.94E-09	<LLD	<LLD	<LLD	9.94E-09
Se-75	Ci	6.20E-06	4.97E-05	8.98E-06	6.32E-06	7.12E-05
Sr-89	Ci	1.36E-06	6.68E-07	2.56E-06	<LLD	4.59E-06
Sr-90	Ci	6.09E-07	3.01E-07	<LLD	<LLD	9.10E-07
Te-123m	Ci	1.71E-05	6.35E-06	8.16E-07	7.58E-07	2.50E-05
Zr-95	Ci	<LLD	<LLD	<LLD	6.25E-06	6.25E-06
total	Ci	1.69E-03	3.73E-04	4.65E-05	1.11E-03	3.22E-03
4. Tritium						
H-3	Ci	3.16E+02	1.99E+02	3.33E+02	3.35E+02	1.18E+03

Table 28: Units 1, 2 and 3 Gaseous Effluents- Fission Gases and Iodine - Total for Year					
Nuclides Released	Unit	Unit 1	Unit 2	Unit 3	Total Units 1,2 and 3
1. Fission gases					
Ar-41	Ci	1.99E+00	6.50E-01	7.59E-01	3.40E+00
Kr-85	Ci	8.06E+00	3.34E+00	2.35E-01	1.16E+01
Kr-85m	Ci	4.56E-01	6.82E-03	1.62E-02	4.79E-01
Kr-87	Ci	3.36E-01	1.08E-02	<LLD	3.47E-01
Kr-88	Ci	7.87E-01	<LLD	<LLD	7.87E-01
Xe-131m	Ci	7.06E-01	2.88E-01	2.63E-01	1.26E+00
Xe-133	Ci	1.43E+02	1.15E+02	1.85E+01	2.77E+02
Xe-133m	Ci	8.74E-02	9.72E-03	8.07E-02	1.78E-01
Xe-135	Ci	2.66E+01	2.85E+00	1.14E+00	3.06E+01
Xe-135m	Ci	1.96E-01	<LLD	<LLD	1.96E-01
Xe-138	Ci	<LLD	<LLD	<LLD	0.00E+00
total	Ci	1.82E+02	1.22E+02	2.10E+01	3.25E+02
2. Iodines					
I-131	Ci	2.74E-03	6.64E-03	2.09E-04	9.59E-03
I-132	Ci	6.69E-03	1.81E-03	5.22E-04	9.02E-03
I-133	Ci	2.09E-04	2.72E-03	1.59E-05	2.94E-03
I-135	Ci	1.31E-06	<LLD	<LLD	1.31E-06
total	Ci	9.64E-03	1.12E-02	7.47E-04	2.16E-02

Table 29: Units 1, 2 and 3 Gaseous Effluents - Particulates - Total for Year					
Nuclides Released	Unit	Unit 1	Unit 2	Unit 3	Total Units 1,2 and 3
3. Particulates					
Ag-110m	Ci	<LLD	1.47E-06	<LLD	1.47E-06
Ba-140	Ci	<LLD	<LLD	<LLD	0.00E+00
Br-82	Ci	5.31E-05	5.32E-04	4.21E-04	1.01E-03
Ce-141	Ci	<LLD	<LLD	<LLD	0.00E+00
Ce-144	Ci	<LLD	<LLD	<LLD	0.00E+00
Co-58	Ci	2.34E-05	5.43E-05	2.19E-04	2.97E-04
Co-60	Ci	3.99E-05	2.98E-04	2.60E-05	3.64E-04
Cr-51	Ci	<LLD	1.62E-07	1.32E-04	1.32E-04
Cs-134	Ci	5.19E-07	2.37E-06	<LLD	2.89E-06
Cs-137	Ci	1.46E-06	4.09E-06	<LLD	5.55E-06
Cs-138	Ci	4.79E-05	<LLD	<LLD	4.79E-05
Fe-59	Ci	<LLD	<LLD	<LLD	0.00E+00
La-140	Ci	<LLD	<LLD	<LLD	0.00E+00
Mn-54	Ci	<LLD	1.99E-05	1.14E-05	3.13E-05
Mo-99	Ci	<LLD	<LLD	<LLD	0.00E+00
Nb-95	Ci	<LLD	<LLD	2.19E-05	2.19E-05
Os-191	Ci	4.82E-05	6.81E-05	2.69E-04	3.85E-04
Rb-88	Ci	6.18E-04	<LLD	<LLD	6.18E-04
Ru-103	Ci	6.78E-05	1.49E-05	<LLD	8.27E-05
Ru-106	Ci	3.82E-05	<LLD	<LLD	3.82E-05
Sb-122	Ci	<LLD	3.41E-10	<LLD	3.41E-10
Sb-124	Ci	5.76E-05	9.19E-06	1.43E-05	8.11E-05
Sb-125	Ci	<LLD	9.94E-09	<LLD	9.94E-09
Se-75	Ci	6.91E-05	<LLD	2.14E-06	7.12E-05
Sr-89	Ci	8.50E-07	3.23E-06	5.13E-07	4.59E-06
Sr-90	Ci	5.81E-07	2.72E-07	5.62E-08	9.09E-07
Te-123m	Ci	1.94E-06	2.31E-05	<LLD	2.50E-05
Zn-65	Ci	<LLD	<LLD	<LLD	0.00E+00
Zr-95	Ci	<LLD	<LLD	6.25E-06	6.25E-06
total	Ci	1.07E-03	1.00E-03	1.12E-03	3.22E-03
4. Tritium					
H-3	Ci	3.08E+02	2.43E+02	6.32E+02	1.18E+03
Grand total	Ci	4.90E+02	3.65E+02	6.53E+02	1.51E+03

Table 30:
Estimation of Total Percent Error

The estimated total error is calculated as follows:

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

Where E_n = Percent error associated with each contributing parameter.

Parameters contributing to errors in the measurement of gaseous effluents are; 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
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)

Table 31: Effluent Monitoring Instrumentation Out Of Service Greater Than 30 Days				
Unit	Instrument	Date span of inoperability	Cause of inoperability	Explanation
		NONE		

Table 32:
Solid Waste Summary

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

1.0 Type of Waste	Unit	Jan-Jun	Jul-Dec	estimated total error %
1.a. Spent resin, filters, sludges, evaporator bottoms, etc.	m^3	0.00E+00	0.00E+00	N/A
	Ci	0.00E+00	0.00E+00	2.50E+01
1.b. Dry compressible waste, contaminated equipment, etc.	m^3	0.00E+00	0.00E+00	N/A
	Ci	0.00E+00	0.00E+00	2.50E+01
1.c. Irradiated components, fuel rods, etc.	m^3	0.00E+00	0.00E+00	N/A
	Ci	0.00E+00	0.00E+00	N/A
1.d. Other (Absorbed chemical cleaning waste)	m^3	0.00E+00	4.21E+02	N/A
	Ci	0.00E+00	9.65E-01	2.50E+01
Volume and activity for dry compressible waste, contaminated equipment, etc., includes PVNGS waste disposed of after being processed by a volume reduction facility.				

2.0 Principal Radionuclides

2.a Estimate of major nuclide concentration for spent resins, filter sludges, evaporator bottoms, etc. None shipped.

2.b Estimate of major nuclide concentration for dry compressible waste, contaminated equipment, etc. None shipped.

2.c Estimate of major nuclide concentration for absorbed chemical cleaning waste. None shipped.

3.0 Solid Waste Disposition
3.a.

SHIPMENTS	SHIPPER	MODE OF TRANSPORTATION	DESTINATION
21	APS	TRUCK	Envirocare of Utah

3.b. Irradiated Fuel Shipments: None

3.c. Supplemental Information - This section includes PVNGS and vendor provided containers.

NUMBER OF CONTAINERS	CONTAINER VOLUME FT3	TYPE OF WASTE	CONTAINER TYPE	SOLIDIFICATION AGENT
6	98.6	Absorbed Chemical Cleaning Waste	Strong Tight	NONE
167	102.1	Absorbed Chemical Cleaning Waste	Strong Tight	NONE

4.0 Changes to Processes and/or Equipment

4.a The Process Control Program has not been revised during this report period.

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 FSAR.

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 FSAR.

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 1995. 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 1995 were considered as "long term," since for each quarter, the sum of the batch release periods for each unit exceeded 150 hours. Consequently, the JFDs for the batch releases for all quarters are the same as for the continuous releases.

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: JAN - MAR
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/95 - 3/31/95

1st QTR 95

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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
5.51- 6.50	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
6.51- 8.50	0	1	1	1	1	0	0	1	0	0	0	0	0	1	0	0	6
8.51-11.50	0	0	1	2	0	1	0	0	1	0	0	2	1	3	2	0	13
11.51-14.50	0	0	0	0	0	0	0	0	1	0	0	0	3	2	3	0	9
14.51-20.50	0	0	0	0	0	0	0	0	1	5	5	0	0	2	0	0	13
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1	1	2	3	1	1	0	1	3	5	5	2	5	8	5	0	43

STABILITY CLASS B

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	1	2	3	0	0	0	0	0	1	0	2	1	0	0	1	1	12
5.51- 6.50	0	0	0	0	1	1	0	1	0	3	3	0	1	0	2	1	13
6.51- 8.50	0	0	0	1	0	1	0	1	1	2	0	2	1	1	0	1	11
8.51-11.50	0	0	3	1	3	4	0	0	0	0	3	1	1	0	0	0	16
11.51-14.50	0	1	2	0	0	2	0	0	0	0	0	2	0	0	2	0	9
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	3	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	1	3	8	2	4	8	0	2	2	5	8	9	3	1	5	3	64

STABILITY CLASS C

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	1	3	0	2	1	1	0	0	0	0	0	0	1	0	0	9
3.51- 4.50	1	1	2	1	2	3	4	4	3	2	0	2	0	0	1	0	26
4.51- 5.50	0	0	9	5	2	2	1	1	2	3	6	0	1	1	1	1	35
5.51- 6.50	1	0	4	1	2	1	0	2	0	0	4	0	0	0	0	0	15
6.51- 8.50	0	2	2	1	2	1	1	1	0	2	5	2	0	0	3	1	23
8.51-11.50	0	0	3	2	2	4	0	1	1	2	3	0	1	3	0	0	22
11.51-14.50	0	0	0	1	3	3	0	0	0	0	3	0	0	1	0	0	11
14.51-20.50	0	0	0	3	4	0	0	0	0	0	1	2	0	0	0	0	10
>20.50	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3
TOTAL	2	4	23	14	19	15	7	9	6	9	22	9	2	6	5	2	154

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: JAN - MAR
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/95 - 3/31/95

1st QTR 95

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	1	0	0	0	1
1.51- 2.50	2	2	2	0	0	0	4	7	5	5	3	3	10	3	3	5	54
2.51- 3.50	7	6	2	6	3	6	4	7	13	12	15	10	10	7	10	8	126
3.51- 4.50	6	9	6	9	4	2	2	1	11	17	10	3	4	3	7	7	101
4.51- 5.50	4	4	4	5	2	6	0	0	6	15	5	4	5	2	2	6	70
5.51- 6.50	3	2	8	0	3	1	1	3	3	3	1	1	2	0	1	2	34
6.51- 8.50	0	5	4	5	6	7	0	2	5	1	6	0	1	0	0	5	47
8.51-11.50	0	1	1	5	6	8	1	4	0	2	7	3	2	1	2	1	44
11.51-14.50	0	0	0	1	2	3	0	0	4	8	7	4	1	1	1	0	32
14.51-20.50	0	0	0	1	3	1	0	0	4	10	7	2	0	0	1	0	29
>20.50	0	0	0	0	0	0	0	0	0	0	1	3	0	0	1	0	5
TOTAL	22	29	27	32	29	34	12	24	51	73	62	33	36	17	28	34	543

STABILITY CLASS E

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	1	0	0	0	0	0	0	0	0	0	0	1
1.51- 2.50	2	3	4	1	0	2	2	2	2	5	2	3	4	3	8	3	46
2.51- 3.50	6	4	2	4	1	0	0	0	4	4	5	4	2	5	6	9	56
3.51- 4.50	4	5	3	2	3	0	2	2	1	6	6	3	7	2	3	3	52
4.51- 5.50	2	5	4	2	1	1	0	1	5	2	6	3	8	1	3	4	48
5.51- 6.50	1	2	4	0	1	3	1	0	2	1	1	0	2	0	4	1	23
6.51- 8.50	3	3	1	0	1	1	1	3	7	5	14	6	1	1	2	3	52
8.51-11.50	2	0	1	3	3	5	4	2	11	2	8	1	3	6	6	0	57
11.51-14.50	0	1	1	0	3	4	3	1	2	2	4	2	2	0	1	0	26
14.51-20.50	0	0	0	0	2	3	1	0	1	1	1	3	0	0	0	0	12
>20.50	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
TOTAL	20	23	20	12	15	20	14	11	35	28	47	26	29	18	33	23	374

STABILITY CLASS F

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	1	0	0	0	0	1	0	0	0	0	0	0	2
1.51- 2.50	9	0	1	3	0	2	1	0	0	1	3	3	4	2	5	3	37
2.51- 3.50	9	7	4	2	1	2	0	0	1	1	3	4	4	11	22	25	96
3.51- 4.50	10	8	7	2	0	0	0	0	1	0	2	4	5	4	12	14	69
4.51- 5.50	10	6	5	1	0	0	0	0	0	3	5	0	1	0	6	8	45
5.51- 6.50	6	4	1	2	0	0	1	0	3	1	4	2	3	1	4	1	33
6.51- 8.50	2	2	2	1	0	0	1	0	0	5	6	0	1	3	7	6	36
8.51-11.50	3	4	3	1	1	0	1	1	1	2	3	1	0	0	1	1	23
11.51-14.50	0	2	1	0	1	0	0	0	0	0	1	0	1	0	0	0	6
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	49	33	24	12	4	4	4	1	6	14	27	14	19	21	57	58	347

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: JAN - MAR
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/95 - 3/31/95

1st QTR 95

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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
1.51- 2.50	7	14	5	0	4	0	0	0	0	1	0	2	1	5	6	15	60
2.51- 3.50	46	18	5	2	5	1	0	0	0	3	5	2	9	13	22	41	172
3.51- 4.50	70	19	8	2	1	0	1	0	1	1	0	1	2	6	15	40	167
4.51- 5.50	35	30	6	1	0	0	0	0	0	0	2	3	1	0	6	27	111
5.51- 6.50	20	12	2	1	0	0	0	0	0	0	1	1	1	1	0	4	43
6.51- 8.50	27	12	3	1	0	0	0	0	0	0	2	0	0	0	2	2	49
8.51-11.50	5	9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	15
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	210	115	30	7	10	1	1	0	1	5	10	9	14	25	51	130	619

STABILITY CLASS ALL

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	1	0	0	1	1	0	0	0	1	0	0	1	0	0	1	6
1.51- 2.50	20	19	12	4	4	4	7	9	7	12	8	11	19	13	22	26	197
2.51- 3.50	68	36	16	14	12	10	5	7	18	20	28	20	25	37	60	83	459
3.51- 4.50	91	42	26	16	10	5	9	7	17	26	18	13	18	15	38	64	415
4.51- 5.50	53	47	31	14	5	9	1	2	14	23	26	11	16	4	19	47	322
5.51- 6.50	31	20	19	4	7	6	3	6	8	8	14	4	10	2	11	9	162
6.51- 8.50	32	25	13	10	10	10	3	8	13	15	33	10	4	6	14	18	224
8.51-11.50	10	14	13	14	15	22	6	8	14	8	24	8	8	13	11	2	190
11.51-14.50	0	4	4	2	9	12	3	1	7	10	15	8	7	4	7	0	93
14.51-20.50	0	0	0	4	9	4	1	0	6	16	14	10	0	2	1	0	67
>20.50	0	0	0	0	0	0	0	0	0	0	1	7	0	0	1	0	9
TOTAL	305	208	134	82	82	83	38	48	104	139	181	102	108	96	184	250	2144

1st QTR 95

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH

TOTAL NUMBER OF OBSERVATIONS: 2160
TOTAL NUMBER OF VALID OBSERVATIONS: 2144
TOTAL NUMBER OF MISSING OBSERVATIONS: 16
PERCENT DATA RECOVERY FOR THIS PERIOD: 99.3 %
MEAN WIND SPEED FOR THIS PERIOD: 5.7 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
2.01	2.99	7.18	25.33	17.44	16.18	28.87

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	1	1	2	3	1	1	0	1	3	5	5	2	5	8	5	0	0
B	1	3	8	2	4	8	0	2	2	5	8	9	3	1	5	3	0
C	2	4	23	14	19	15	7	9	6	9	22	9	2	6	5	2	0
D	22	29	27	32	29	34	12	24	51	73	62	33	36	17	28	34	0
E	20	23	20	12	15	20	14	11	35	28	47	26	29	18	33	23	0
F	49	33	24	12	4	4	4	1	6	14	27	14	19	21	57	58	0
G	210	115	30	7	10	1	1	0	1	5	10	9	14	25	51	130	0
TOTAL	305	208	134	82	82	83	38	48	104	139	181	102	108	96	184	250	0

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: APR - JUN
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 4/ 1/95 - 6/30/95

2nd QTR 95

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	2	0	0	1	0	0	1	2	0	1	1	1	0	0	0	9
5.51- 6.50	1	2	1	0	2	0	0	2	5	2	1	0	3	3	1	1	24
6.51- 8.50	2	2	1	4	3	3	2	3	10	14	24	10	3	2	3	3	89
8.51-11.50	1	2	2	2	5	0	0	3	6	36	58	24	5	6	3	0	153
11.51-14.50	1	0	0	0	1	0	0	1	3	13	30	12	7	6	3	0	77
14.51-20.50	0	0	0	0	0	0	0	0	1	12	37	12	2	9	2	0	75
>20.50	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	0	4
TOTAL	5	8	4	6	12	3	2	10	27	78	152	59	21	28	12	4	431

STABILITY CLASS B

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	1	0	1	1	0	0	0	0	0	2	1	0	1	0	0	0	7
4.51- 5.50	0	0	2	0	2	1	1	1	7	5	3	0	2	0	0	0	24
5.51- 6.50	2	1	1	0	5	1	1	5	17	17	8	6	1	0	1	0	66
6.51- 8.50	0	0	0	4	0	2	1	5	22	9	20	7	2	2	0	0	74
8.51-11.50	0	0	1	0	0	0	0	1	3	7	14	3	6	0	1	0	36
11.51-14.50	0	0	0	0	0	0	0	0	0	3	8	4	1	3	0	1	20
14.51-20.50	1	0	0	0	0	0	0	0	0	1	3	2	0	1	1	0	9
>20.50	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
TOTAL	4	1	5	5	7	4	3	12	49	44	58	22	13	6	3	1	237

STABILITY CLASS C

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	1	0	2	0	1	0	0	0	0	0	1	0	0	0	0	5
3.51- 4.50	1	0	0	2	0	1	1	1	2	0	2	2	0	0	0	0	12
4.51- 5.50	0	2	0	2	1	3	2	2	13	9	3	2	0	0	2	2	43
5.51- 6.50	1	0	1	2	0	1	1	3	12	4	1	2	2	0	0	1	31
6.51- 8.50	2	0	0	2	0	0	1	2	7	5	12	1	0	0	0	1	33
8.51-11.50	0	0	0	1	1	0	0	1	0	4	8	3	0	1	0	1	20
11.51-14.50	0	0	0	0	0	0	0	0	0	1	5	1	0	1	0	0	8
14.51-20.50	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	5
>20.50	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	2
TOTAL	4	3	1	11	2	6	5	9	35	24	33	13	4	2	2	5	159

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: APR - JUN
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 4/ 1/95 - 6/30/95

2nd QTR 95

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	0	1	2	2	2	0	1	1	1	1	2	0	1	0	16
2.51- 3.50	1	1	5	3	4	2	2	0	5	2	5	3	2	1	1	4	41
3.51- 4.50	3	3	1	1	1	0	1	5	1	4	5	4	2	0	1	2	34
4.51- 5.50	2	2	1	1	1	0	2	1	2	4	4	2	0	2	2	0	26
5.51- 6.50	0	0	2	0	2	0	0	1	4	1	6	0	3	0	0	0	19
6.51- 8.50	0	0	0	1	1	0	0	0	0	2	11	6	1	1	3	1	27
8.51-11.50	1	0	0	0	0	0	0	0	3	9	21	8	4	1	0	1	48
11.51-14.50	0	0	0	0	0	0	0	1	0	3	9	9	1	4	4	1	32
14.51-20.50	0	0	0	0	0	0	0	0	2	10	7	12	2	1	2	0	36
>20.50	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	3
TOTAL	8	7	9	7	11	4	7	8	18	38	70	45	17	10	14	9	282

STABILITY CLASS E

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	0	0	1	1	0	0	2	1	0	3	1	1	0	3	3	18
2.51- 3.50	3	3	3	0	0	0	0	0	0	3	3	2	2	4	4	2	29
3.51- 4.50	3	1	0	0	0	1	0	0	2	2	7	6	2	0	1	1	26
4.51- 5.50	3	0	3	2	1	1	0	0	1	8	13	5	0	1	1	3	42
5.51- 6.50	2	1	2	1	1	0	0	1	3	4	13	9	3	1	0	0	41
6.51- 8.50	1	0	0	1	2	0	1	2	3	20	33	16	9	5	1	2	96
8.51-11.50	1	0	0	2	2	1	1	1	1	29	50	22	3	5	3	3	124
11.51-14.50	0	0	0	1	0	0	0	0	0	17	19	9	1	6	5	5	63
14.51-20.50	0	0	0	0	0	0	0	0	0	1	2	2	0	2	0	0	7
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	15	5	8	8	7	3	2	6	11	84	143	72	21	24	18	19	446

STABILITY CLASS F

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	1	1	0	0	0	0	0	0	0	1	2	5	0	2	0	14
2.51- 3.50	4	2	1	1	0	0	0	0	0	1	1	5	6	4	5	4	34
3.51- 4.50	6	3	0	2	0	0	0	0	1	5	9	8	10	2	3	3	52
4.51- 5.50	1	3	0	1	0	0	0	1	2	8	8	5	7	1	3	2	42
5.51- 6.50	2	0	0	0	0	0	0	0	0	7	17	8	5	2	1	3	45
6.51- 8.50	0	0	1	0	0	0	0	0	1	12	35	21	10	2	4	4	90
8.51-11.50	0	0	0	0	0	0	0	0	0	6	23	10	1	2	0	1	43
11.51-14.50	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	2	5
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	15	9	3	4	0	0	0	1	4	39	97	59	44	13	18	19	325

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: APR - JUN
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 4/ 1/95 - 6/30/95

2nd QTR 95

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	0	0	0	0	0	1	0	1
1.51- 2.50	2	1	0	1	0	0	0	0	0	1	1	3	0	1	1	3	14
2.51- 3.50	12	4	1	3	2	0	2	0	0	0	0	3	3	3	7	11	51
3.51- 4.50	24	14	2	2	1	0	1	0	0	1	3	2	5	2	8	17	82
4.51- 5.50	25	24	4	2	0	0	0	0	1	1	2	0	4	2	0	13	78
5.51- 6.50	15	10	0	1	0	0	1	0	0	0	1	1	2	1	1	3	36
6.51- 8.50	10	9	1	0	0	0	0	0	0	0	2	1	0	0	0	6	29
8.51-11.50	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	3
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	88	62	8	9	3	0	4	0	1	4	11	10	14	9	18	53	294

STABILITY CLASS ALL

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	1	0	1
1.51- 2.50	7	3	1	3	3	2	2	2	2	2	6	7	8	1	7	6	62
2.51- 3.50	20	11	10	9	6	3	4	0	5	6	9	14	13	12	17	21	160
3.51- 4.50	38	21	4	8	2	2	3	6	6	14	27	22	20	4	13	23	213
4.51- 5.50	31	33	10	8	6	5	5	6	28	35	34	15	14	6	8	20	264
5.51- 6.50	23	14	7	4	10	2	3	12	41	35	47	26	19	7	4	8	262
6.51- 8.50	15	11	3	12	6	5	5	12	43	62	137	62	25	12	11	17	438
8.51-11.50	3	2	3	5	8	1	1	6	13	92	176	70	19	15	7	6	427
11.51-14.50	1	0	0	1	1	0	0	2	3	37	74	35	10	20	12	9	205
14.51-20.50	1	0	0	0	0	0	0	0	4	25	50	29	5	13	5	0	132
>20.50	0	0	0	0	0	0	0	0	0	3	4	0	1	2	0	0	10
TOTAL	139	95	38	50	42	20	23	46	145	311	564	280	134	92	85	110	2174

2nd QTR 95

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH

TOTAL NUMBER OF OBSERVATIONS: 2184
TOTAL NUMBER OF VALID OBSERVATIONS: 2174
TOTAL NUMBER OF MISSING OBSERVATIONS: 10
PERCENT DATA RECOVERY FOR THIS PERIOD: 99.5 %
MEAN WIND SPEED FOR THIS PERIOD: 7.8 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
19.83	10.90	7.31	12.97	20.52	14.95	13.52

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	5	8	4	6	12	3	2	10	27	78	152	59	21	28	12	4	0
B	4	1	5	5	7	4	3	12	49	44	58	22	13	6	3	1	0
C	4	3	1	11	2	6	5	9	35	24	33	13	4	2	2	5	0
D	8	7	9	7	11	4	7	8	18	38	70	45	17	10	14	9	0
E	15	5	8	8	7	3	2	6	11	84	143	72	21	24	18	19	0
F	15	9	3	4	0	0	0	1	4	39	97	59	44	13	18	19	0
G	88	62	8	9	3	0	4	0	1	4	11	10	14	9	18	53	0
TOTAL	139	95	38	50	42	20	23	46	145	311	564	280	134	92	85	110	0

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: JAN - JUN
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/95 - 6/30/95

1st SEMIANNUAL

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	1	2	0	0	1	0	0	1	2	0	1	1	1	0	0	0	10
5.51- 6.50	1	2	1	0	2	0	0	2	5	2	1	0	4	3	1	1	25
6.51- 8.50	2	3	2	5	4	3	2	4	10	14	24	10	3	3	3	3	95
8.51-11.50	1	2	3	4	5	1	0	3	7	36	58	26	6	9	5	0	166
11.51-14.50	1	0	0	0	1	0	0	1	4	13	30	12	10	8	6	0	86
14.51-20.50	0	0	0	0	0	0	0	0	2	17	42	12	2	11	2	0	88
>20.50	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	0	4
TOTAL	6	9	6	9	13	4	2	11	30	83	157	61	26	36	17	4	474

STABILITY CLASS B

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	1	0	1	1	0	0	0	0	0	2	1	0	1	0	0	0	7
4.51- 5.50	1	2	5	0	2	1	1	1	8	5	5	1	2	0	1	1	36
5.51- 6.50	2	1	1	0	6	2	1	6	17	20	11	6	2	0	3	1	79
6.51- 8.50	0	0	0	5	0	3	1	6	23	11	20	9	3	3	0	1	85
8.51-11.50	0	0	4	1	3	4	0	1	3	7	17	4	7	0	1	0	52
11.51-14.50	0	1	2	0	0	2	0	0	0	3	8	6	1	3	2	1	29
14.51-20.50	1	0	0	0	0	0	0	0	0	1	3	5	0	1	1	0	12
>20.50	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
TOTAL	5	4	13	7	11	12	3	14	51	49	66	31	16	7	8	4	301

STABILITY CLASS C

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	2	3	2	2	2	1	0	0	0	0	1	0	1	0	0	14
3.51- 4.50	2	1	2	3	2	4	5	5	5	2	2	4	0	0	1	0	38
4.51- 5.50	0	2	9	7	3	5	3	3	15	12	9	2	1	1	3	3	78
5.51- 6.50	2	0	5	3	2	2	1	5	12	4	5	2	2	0	0	1	46
6.51- 8.50	2	2	2	3	2	1	2	3	7	7	17	3	0	0	3	2	56
8.51-11.50	0	0	3	3	3	4	0	2	1	6	11	3	1	4	0	1	42
11.51-14.50	0	0	0	1	3	3	0	0	0	1	8	1	0	2	0	0	19
14.51-20.50	0	0	0	3	4	0	0	0	1	1	2	3	1	0	0	0	15
>20.50	0	0	0	0	0	0	0	0	0	0	1	3	1	0	0	0	5
TOTAL	6	7	24	25	21	21	12	18	41	33	55	22	6	8	7	7	313

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: JAN - JUN
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/95 - 6/30/95

1st SEMIANNUAL

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	1	0	0	0	1
1.51- 2.50	3	3	2	1	2	2	6	7	6	6	4	4	12	3	4	5	70
2.51- 3.50	8	7	7	9	7	8	6	7	18	14	20	13	12	8	11	12	167
3.51- 4.50	9	12	7	10	5	2	3	6	12	21	15	7	6	3	8	9	135
4.51- 5.50	6	6	5	6	3	6	2	1	8	19	9	6	5	4	4	6	96
5.51- 6.50	3	2	10	0	5	1	1	4	7	4	7	1	5	0	1	2	53
6.51- 8.50	0	5	4	6	7	7	0	2	5	3	17	6	2	1	3	6	74
8.51-11.50	1	1	1	5	6	8	1	4	3	11	28	11	6	2	2	2	92
11.51-14.50	0	0	0	1	2	3	0	1	4	11	16	13	2	5	5	1	64
14.51-20.50	0	0	0	1	3	1	0	0	6	20	14	14	2	1	3	0	65
>20.50	0	0	0	0	0	0	0	0	0	2	2	3	0	0	1	0	8
TOTAL	30	36	36	39	40	38	19	32	69	111	132	78	53	27	42	43	825

STABILITY CLASS E

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	1	0	0	0	0	0	0	0	0	0	0	1
1.51- 2.50	4	3	4	2	1	2	2	4	3	5	5	4	5	3	11	6	64
2.51- 3.50	9	7	5	4	1	0	0	0	4	7	8	6	4	9	10	11	85
3.51- 4.50	7	6	3	2	3	1	2	2	3	8	13	9	9	2	4	4	78
4.51- 5.50	5	5	7	4	2	2	0	1	6	10	19	8	8	2	4	7	90
5.51- 6.50	3	3	6	1	2	3	1	1	5	5	14	9	5	1	4	1	64
6.51- 8.50	4	3	1	1	3	1	2	5	10	25	47	22	10	6	3	5	148
8.51-11.50	3	0	1	5	5	6	5	3	12	31	58	23	6	11	9	3	181
11.51-14.50	0	1	1	1	3	4	3	1	2	19	23	11	3	6	6	5	89
14.51-20.50	0	0	0	0	2	3	1	0	1	2	3	5	0	2	0	0	19
>20.50	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
TOTAL	35	28	28	20	22	23	16	17	46	112	190	98	50	42	51	42	820

STABILITY CLASS F

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	1	0	0	0	0	1	0	0	0	0	0	0	2
1.51- 2.50	11	1	2	3	0	2	1	0	0	1	4	5	9	2	7	3	51
2.51- 3.50	13	9	5	3	1	2	0	0	1	2	4	9	10	15	27	29	130
3.51- 4.50	16	11	7	4	0	0	0	0	2	5	11	12	15	6	15	17	121
4.51- 5.50	11	9	5	2	0	0	0	1	2	11	13	5	8	1	9	10	87
5.51- 6.50	8	4	1	2	0	0	1	0	3	8	21	10	8	3	5	4	78
6.51- 8.50	2	2	3	1	0	0	1	0	1	17	41	21	11	5	11	10	126
8.51-11.50	3	4	3	1	1	0	1	1	1	8	26	11	1	2	1	2	66
11.51-14.50	0	2	1	0	1	0	0	0	0	0	4	0	1	0	0	2	11
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	64	42	27	16	4	4	4	2	10	53	124	73	63	34	75	77	672

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: JAN - JUN
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/95 - 6/30/95

1st SEMIANNUAL

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	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	3
1.51- 2.50	9	15	5	1	4	0	0	0	0	2	1	5	1	6	7	18	74
2.51- 3.50	58	22	6	5	7	1	2	0	0	3	5	5	12	16	29	52	223
3.51- 4.50	94	33	10	4	2	0	2	0	1	2	3	3	7	8	23	57	249
4.51- 5.50	60	54	10	3	0	0	0	0	1	1	4	3	5	2	6	40	189
5.51- 6.50	35	22	2	2	0	0	1	0	0	0	2	2	3	2	1	7	79
6.51- 8.50	37	21	4	1	0	0	0	0	0	0	4	1	0	0	2	8	78
8.51-11.50	5	9	1	0	0	0	0	0	0	1	2	0	0	0	0	0	18
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	298	177	38	16	13	1	5	0	2	9	21	19	28	34	69	183	913

STABILITY CLASS ALL

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	1	0	0	1	1	0	0	0	1	0	0	1	0	1	1	7
1.51- 2.50	27	22	13	7	7	6	9	11	9	14	14	18	27	14	29	32	259
2.51- 3.50	88	47	26	23	18	13	9	7	23	26	37	34	38	49	77	104	619
3.51- 4.50	129	63	30	24	12	7	12	13	23	40	45	35	38	19	51	87	628
4.51- 5.50	84	80	41	22	11	14	6	8	42	58	60	26	30	10	27	67	586
5.51- 6.50	54	34	26	8	17	8	6	18	49	43	61	30	29	9	15	17	424
6.51- 8.50	47	36	16	22	16	15	8	20	56	77	170	72	29	18	25	35	662
8.51-11.50	13	16	16	19	23	23	7	14	27	100	200	78	27	28	18	8	617
11.51-14.50	1	4	4	3	10	12	3	3	10	47	89	43	17	24	19	9	298
14.51-20.50	1	0	0	4	9	4	1	0	10	41	64	39	5	15	6	0	199
>20.50	0	0	0	0	0	0	0	0	0	3	5	7	1	2	1	0	19
TOTAL	444	303	172	132	124	103	61	94	249	450	745	382	242	188	269	360	4318

1st SEMIANNUAL

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH

TOTAL NUMBER OF OBSERVATIONS: 4344
TOTAL NUMBER OF VALID OBSERVATIONS: 4318
TOTAL NUMBER OF MISSING OBSERVATIONS: 26
PERCENT DATA RECOVERY FOR THIS PERIOD: 99.4 %
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
10.98	6.97	7.25	19.11	18.99	15.56	21.14

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	6	9	6	9	13	4	2	11	30	83	157	61	26	36	17	4	0
B	5	4	13	7	11	12	3	14	51	49	66	31	16	7	8	4	0
C	6	7	24	25	21	21	12	18	41	33	55	22	6	8	7	7	0
D	30	36	36	39	40	38	19	32	69	111	132	78	53	27	42	43	0
E	35	28	28	20	22	23	16	17	46	112	190	98	50	42	51	42	0
F	64	42	27	16	4	4	4	2	10	53	124	73	63	34	75	77	0
G	298	177	38	16	13	1	5	0	2	9	21	19	28	34	69	183	0
TOTAL	444	303	172	132	124	103	61	94	249	450	745	382	242	188	269	360	0

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: JUL - SEP
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 7/ 1/95 - 9/30/95

3rd QTR 95

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	1	0	1	0	0	0	0	0	0	4	1	0	0	2	1	10
5.51- 6.50	1	0	1	0	3	1	2	4	3	6	7	3	1	1	1	0	34
6.51- 8.50	2	1	2	5	3	6	5	8	7	21	34	31	14	3	1	0	143
8.51-11.50	0	0	0	2	10	7	3	3	7	28	27	24	14	3	1	0	129
11.51-14.50	0	0	0	0	3	1	1	0	1	6	13	10	1	1	1	0	38
14.51-20.50	1	0	0	0	0	1	0	0	0	1	12	6	1	0	1	0	23
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	4	2	3	8	19	16	11	15	18	62	97	75	31	8	7	1	377

STABILITY CLASS B

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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3.51- 4.50	1	1	0	0	0	1	0	2	0	1	2	0	3	1	0	0	12
4.51- 5.50	0	2	1	0	3	0	0	0	10	3	4	3	4	4	0	3	37
5.51- 6.50	0	0	0	1	0	6	2	4	13	25	11	3	8	1	2	0	76
6.51- 8.50	3	0	3	3	0	5	6	8	17	18	9	6	5	1	1	0	85
8.51-11.50	0	0	0	3	5	3	3	3	2	3	5	6	5	1	0	0	39
11.51-14.50	0	0	0	0	2	0	0	1	0	2	2	0	2	0	0	0	9
14.51-20.50	0	0	0	0	1	0	0	0	0	0	1	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	4	3	5	7	11	15	11	18	42	52	34	18	27	8	3	3	261

STABILITY CLASS C

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	1	0	0	1	0	1	1	0	0	0	0	2	0	0	0	0	6
3.51- 4.50	1	2	1	1	1	1	1	1	5	9	1	3	1	0	0	0	28
4.51- 5.50	2	2	2	1	0	0	1	0	7	12	7	2	2	1	0	2	41
5.51- 6.50	0	0	0	0	0	0	1	6	17	5	6	3	1	0	0	0	39
6.51- 8.50	0	0	2	0	0	0	1	6	3	7	1	4	1	2	0	0	27
8.51-11.50	0	0	0	0	2	0	0	0	2	3	7	1	2	0	0	0	17
11.51-14.50	1	0	0	0	3	0	0	1	0	1	2	0	0	0	0	0	8
14.51-20.50	0	0	0	0	0	0	0	0	0	5	2	1	0	0	0	0	8
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	5	4	5	3	6	2	5	14	34	42	26	16	7	3	0	2	174

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: JUL - SEP
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 7/ 1/95 - 9/30/95

3rd QTR 95

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	0	1	1	0	2	0	0	2	0	0	1	0	0	1	0	2	10
2.51- 3.50	8	4	1	3	7	0	0	1	3	5	1	2	4	3	3	1	46
3.51- 4.50	3	2	1	3	2	0	1	2	5	3	4	4	3	1	3	4	41
4.51- 5.50	2	4	2	1	0	0	1	1	4	8	4	9	3	2	2	1	44
5.51- 6.50	1	1	0	2	1	1	1	2	3	3	4	6	3	2	1	2	33
6.51- 8.50	2	0	2	3	0	1	1	2	4	6	5	5	2	1	1	0	35
8.51-11.50	1	0	0	5	3	5	2	3	0	9	11	11	5	3	1	1	60
11.51-14.50	0	1	1	1	8	2	2	2	2	5	12	9	2	2	1	1	51
14.51-20.50	1	1	1	0	3	1	0	2	0	5	10	3	1	0	0	0	28
>20.50	0	0	0	0	3	1	0	0	2	0	0	0	0	0	0	0	6
TOTAL	18	14	9	18	29	11	8	17	23	44	52	49	23	15	12	12	354

STABILITY CLASS E

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	1	1	0	1	0	0	0	0	0	1	4	0	3	4	3	20
2.51- 3.50	6	1	1	1	1	3	0	1	1	6	7	3	3	0	3	2	39
3.51- 4.50	3	4	0	3	2	1	1	1	5	6	8	2	2	2	6	1	47
4.51- 5.50	2	2	1	0	0	1	0	3	3	9	14	10	0	1	2	2	50
5.51- 6.50	0	4	1	0	0	0	0	4	7	9	19	9	2	1	1	2	59
6.51- 8.50	2	6	2	0	3	5	2	3	3	12	24	16	12	6	2	1	99
8.51-11.50	1	2	4	2	3	6	9	3	1	13	38	18	7	3	0	1	111
11.51-14.50	2	0	0	7	14	7	0	1	0	4	12	3	0	1	0	0	51
14.51-20.50	0	0	1	0	15	0	0	0	0	0	2	1	0	0	1	0	20
>20.50	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL	18	21	11	13	39	23	12	16	20	59	125	66	26	17	19	12	497

STABILITY CLASS F

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	2	1	1	0	0	1	0	2	1	0	0	0	1	3	4	18
2.51- 3.50	6	5	3	0	2	0	1	0	3	2	7	2	5	4	6	4	50
3.51- 4.50	10	3	3	3	0	2	1	1	0	5	8	5	6	1	6	10	64
4.51- 5.50	3	3	2	0	1	0	1	0	2	4	3	8	5	3	3	1	39
5.51- 6.50	1	5	1	0	0	0	1	0	3	4	9	2	4	0	5	1	36
6.51- 8.50	3	4	2	2	0	0	0	0	5	10	11	9	3	3	1	1	54
8.51-11.50	0	0	2	1	1	1	1	0	0	2	6	3	3	1	1	1	23
11.51-14.50	0	0	1	2	0	0	0	0	0	0	0	0	1	0	0	0	4
14.51-20.50	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	25	22	15	10	4	3	6	1	15	28	44	29	27	13	25	23	290

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: JUL - SEP
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 7/ 1/95 - 9/30/95

3rd QTR 95

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	0	0	0	0	0	0	0	0
1.51- 2.50	1	2	0	0	0	0	0	0	0	0	0	1	4	0	3	1	12
2.51- 3.50	13	6	1	0	1	0	1	0	0	1	1	4	5	4	7	18	62
3.51- 4.50	25	10	2	0	0	0	0	0	0	1	1	3	1	6	7	13	69
4.51- 5.50	21	10	4	2	0	0	0	0	0	0	0	1	0	3	4	4	49
5.51- 6.50	13	7	1	1	0	0	0	0	0	2	3	1	1	1	3	3	36
6.51- 8.50	5	9	2	1	0	0	0	0	0	0	1	0	0	1	1	3	23
8.51-11.50	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	4
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	78	46	11	4	1	0	1	0	0	4	6	10	11	15	25	43	255

STABILITY CLASS ALL

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	5	6	3	1	3	0	1	2	2	1	2	5	4	5	10	10	60
2.51- 3.50	34	16	7	5	11	4	3	2	7	14	16	13	17	11	19	25	204
3.51- 4.50	43	22	7	10	5	5	4	7	15	25	24	17	16	11	22	28	261
4.51- 5.50	30	24	12	5	4	1	3	4	26	36	36	34	14	14	13	14	270
5.51- 6.50	16	17	4	4	4	8	7	20	46	54	59	27	20	6	13	8	313
6.51- 8.50	17	20	15	14	6	17	15	27	39	74	85	71	37	17	7	5	466
8.51-11.50	2	4	7	13	24	22	18	12	12	58	94	63	36	11	3	4	383
11.51-14.50	3	1	2	10	30	10	3	5	3	18	41	22	6	4	2	1	161
14.51-20.50	2	1	2	1	19	2	0	2	0	11	27	11	2	0	2	1	83
>20.50	0	1	0	0	3	1	0	0	2	0	0	0	0	0	0	0	7
TOTAL	152	112	59	63	109	70	54	81	152	291	384	263	152	79	91	96	2208

3rd QTR 95

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH

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: 7.2 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
17.07	11.82	7.88	16.03	22.51	13.13	11.55

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	4	2	3	8	19	16	11	15	18	62	97	75	31	8	7	1	0
B	4	3	5	7	11	15	11	18	42	52	34	18	27	8	3	3	0
C	5	4	5	3	6	2	5	14	34	42	26	16	7	3	0	2	0
D	18	14	9	18	29	11	8	17	23	44	52	49	23	15	12	12	0
E	18	21	11	13	39	23	12	16	20	59	125	66	26	17	19	12	0
F	25	22	15	10	4	3	6	1	15	28	44	29	27	13	25	23	0
G	78	46	11	4	1	0	1	0	0	4	6	10	11	15	25	43	0
TOTAL	152	112	59	63	109	70	54	81	152	291	384	263	152	79	91	96	0

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: OCT - DEC
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 10/ 1/95 - 12/31/95

4th QTR 95

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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4.51- 5.50	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
5.51- 6.50	0	2	1	3	0	2	1	0	0	0	0	0	0	0	0	0	9
6.51- 8.50	0	1	3	6	2	1	1	0	0	0	1	1	0	0	0	0	16
8.51-11.50	1	0	0	1	2	1	0	0	0	0	2	1	0	1	0	1	10
11.51-14.50	1	0	0	0	0	0	0	0	0	0	0	1	1	0	2	1	6
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	4
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	2	5	4	10	4	5	2	0	0	0	3	3	1	1	4	4	48

STABILITY CLASS B

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	1	0	0	0	0	1
3.51- 4.50	1	0	1	2	1	2	1	0	0	0	1	1	1	1	0	1	13
4.51- 5.50	1	0	4	3	3	3	0	0	0	0	3	1	0	0	0	0	18
5.51- 6.50	0	6	7	4	1	1	0	2	2	1	1	1	0	1	0	0	27
6.51- 8.50	0	3	7	3	9	4	4	3	0	3	1	1	1	0	0	0	39
8.51-11.50	1	1	0	5	5	0	0	0	0	2	2	3	0	0	0	0	19
11.51-14.50	0	0	0	1	1	0	0	0	0	1	0	0	0	1	1	0	5
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	3	10	19	18	20	10	5	5	2	7	8	8	2	3	1	2	123

STABILITY CLASS C

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	1	2	2	0	0	1	1	1	0	3	1	2	0	1	0	0	15
3.51- 4.50	1	3	3	3	0	2	5	2	2	6	2	1	1	0	1	1	33
4.51- 5.50	0	5	8	7	3	1	3	7	2	12	6	3	1	0	4	2	64
5.51- 6.50	0	3	7	2	3	3	2	4	6	2	6	3	2	0	1	0	44
6.51- 8.50	0	2	3	7	3	0	0	2	2	1	2	0	1	1	0	1	25
8.51-11.50	0	0	0	6	4	1	0	0	0	1	2	1	0	1	0	0	16
11.51-14.50	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
14.51-20.50	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	2	15	23	26	15	8	11	16	12	25	19	10	5	4	6	4	201

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: OCT - DEC
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 10/ 1/95 - 12/31/95

4th QTR 95

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	1	0	0	0	0	0	0	0	1
1.51- 2.50	2	1	0	0	3	2	3	7	6	7	9	3	2	3	2	0	50
2.51- 3.50	3	0	3	2	3	3	7	14	21	18	12	9	10	2	6	5	118
3.51- 4.50	3	5	5	2	3	3	3	9	17	17	7	0	2	4	0	2	82
4.51- 5.50	2	3	5	3	0	0	0	3	9	12	9	4	2	2	2	1	57
5.51- 6.50	0	1	2	0	0	0	0	1	4	1	3	3	0	0	1	1	17
6.51- 8.50	0	1	2	2	0	1	0	0	2	5	1	1	0	4	0	0	19
8.51-11.50	0	0	1	3	2	1	4	2	0	0	3	2	2	0	0	0	20
11.51-14.50	0	0	0	0	4	2	0	1	3	0	1	0	0	1	2	0	14
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	10	11	18	12	15	12	17	37	63	60	45	22	18	16	14	9	379

STABILITY CLASS E

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	1	1	0	1	0	0	0	0	1	0	1	6
1.51- 2.50	1	0	1	0	3	2	0	1	1	5	7	5	9	4	6	2	47
2.51- 3.50	4	2	1	4	0	0	1	3	5	4	4	3	1	1	4	3	40
3.51- 4.50	6	2	1	1	0	0	1	2	4	1	2	1	0	2	5	5	33
4.51- 5.50	0	1	0	1	0	0	1	1	3	6	4	2	2	1	0	1	23
5.51- 6.50	2	1	0	0	0	0	0	0	2	1	1	3	1	0	2	3	16
6.51- 8.50	0	0	1	1	1	1	0	1	3	5	4	2	4	2	1	0	26
8.51-11.50	0	2	0	2	1	1	1	0	2	0	3	2	3	6	2	1	26
11.51-14.50	0	0	0	0	1	0	1	0	0	2	0	0	0	4	2	0	10
14.51-20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	14	8	4	9	6	5	6	8	21	24	25	18	20	22	23	16	229

STABILITY CLASS F

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	1	0	0	0	0	0	0	1	0	2	0	1	5
1.51- 2.50	6	2	0	1	0	0	0	1	0	0	4	1	8	6	7	8	44
2.51- 3.50	9	7	2	0	2	0	0	0	1	1	1	3	5	5	10	5	51
3.51- 4.50	4	2	4	1	1	0	0	2	3	0	1	1	2	7	7	4	39
4.51- 5.50	3	1	0	1	0	0	0	0	2	3	3	4	0	1	7	8	33
5.51- 6.50	2	0	0	0	0	0	0	1	0	1	0	1	3	1	3	6	18
6.51- 8.50	1	0	2	0	0	0	0	0	0	1	4	1	3	2	0	2	16
8.51-11.50	1	1	0	0	0	0	0	0	0	2	1	0	1	1	3	2	12
11.51-14.50	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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	27	13	8	3	4	0	0	4	6	8	14	12	22	25	37	37	220

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: OCT - DEC
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 10/ 1/95 - 12/31/95

4th QTR 95

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	2	0	0	0	3	2	1	9
1.51- 2.50	15	13	4	1	1	0	1	1	0	4	3	10	12	14	18	29	126
2.51- 3.50	61	29	9	2	3	1	1	2	1	4	5	4	15	22	37	76	272
3.51- 4.50	105	32	4	1	2	1	1	0	0	2	0	2	5	10	37	75	277
4.51- 5.50	83	24	3	1	1	0	0	0	2	0	1	0	4	3	8	37	167
5.51- 6.50	43	23	0	0	0	0	0	0	0	0	0	0	0	0	3	10	79
6.51- 8.50	18	25	3	0	0	0	0	0	0	0	1	0	1	0	1	3	52
8.51-11.50	9	4	1	0	0	0	0	0	0	1	0	0	0	0	0	0	15
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	335	150	24	5	7	2	3	3	3	13	10	16	37	52	106	231	997

STABILITY CLASS ALL

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	1	1	1	0	2	2	0	1	0	6	2	3	21
1.51- 2.50	24	16	5	2	7	4	4	10	7	16	23	19	31	27	33	39	267
2.51- 3.50	78	40	17	8	8	5	10	20	28	30	23	22	31	31	57	89	497
3.51- 4.50	120	45	18	10	7	8	11	15	26	26	13	6	11	24	50	88	478
4.51- 5.50	89	35	20	16	7	5	4	11	18	33	26	14	9	7	21	49	364
5.51- 6.50	47	36	17	9	4	6	3	8	14	6	11	11	6	2	10	20	210
6.51- 8.50	19	32	21	19	15	7	5	6	7	15	14	6	10	9	2	6	193
8.51-11.50	12	8	2	17	14	4	5	2	2	6	13	9	6	9	5	4	118
11.51-14.50	2	0	0	2	7	2	1	1	3	3	1	1	1	6	7	2	39
14.51-20.50	0	0	0	0	1	0	0	0	0	0	0	0	0	2	4	3	10
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	393	212	100	83	71	42	44	73	107	137	124	89	105	123	191	303	2197

4th QTR 95

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH

TOTAL NUMBER OF OBSERVATIONS: 2208
TOTAL NUMBER OF VALID OBSERVATIONS: 2197
TOTAL NUMBER OF MISSING OBSERVATIONS: 11
PERCENT DATA RECOVERY FOR THIS PERIOD: 99.5 %
MEAN WIND SPEED FOR THIS PERIOD: 4.7 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
2.18	5.60	9.15	17.25	10.42	10.01	45.38

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	2	5	4	10	4	5	2	0	0	0	3	3	1	1	4	4	0
B	3	10	19	18	20	10	5	5	2	7	8	8	2	3	1	2	0
C	2	15	23	26	15	8	11	16	12	25	19	10	5	4	6	4	0
D	10	11	18	12	15	12	17	37	63	60	45	22	18	16	14	9	0
E	14	8	4	9	6	5	6	8	21	24	25	18	20	22	23	16	0
F	27	13	8	3	4	0	0	4	6	8	14	12	22	25	37	37	0
G	335	150	24	5	7	2	3	3	3	13	10	16	37	52	106	231	0
TOTAL	393	212	100	83	71	42	44	73	107	137	124	89	105	123	191	303	0

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: JUL - DEC
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 7/ 1/95 - 12/31/95

2nd SEMIANNUAL

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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4.51- 5.50	0	2	0	1	0	1	0	0	0	0	4	1	0	0	2	1	12
5.51- 6.50	1	2	2	3	3	3	3	4	3	6	7	3	1	1	1	0	43
6.51- 8.50	2	2	5	11	5	7	6	8	7	21	35	32	14	3	1	0	159
8.51-11.50	1	0	0	3	12	8	3	3	7	28	29	25	14	4	1	1	139
11.51-14.50	1	0	0	0	3	1	1	0	1	6	13	11	2	1	3	1	44
14.51-20.50	1	0	0	0	0	1	0	0	0	1	12	6	1	0	3	2	27
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	6	7	7	18	23	21	13	15	18	62	100	78	32	9	11	5	425

STABILITY CLASS B

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	1	0	0	0	0	0	0	0	0	1	0	0	0	0	2
3.51- 4.50	2	1	1	2	1	3	1	2	0	1	3	1	4	2	0	1	25
4.51- 5.50	1	2	5	3	6	3	0	0	10	3	7	4	4	4	0	3	55
5.51- 6.50	0	6	7	5	1	7	2	6	15	26	12	4	8	2	2	0	103
6.51- 8.50	3	3	10	6	9	9	10	11	17	21	10	7	6	1	1	0	124
8.51-11.50	1	1	0	8	10	3	3	3	2	5	7	9	5	1	0	0	58
11.51-14.50	0	0	0	1	3	0	0	1	0	3	2	0	2	1	1	0	14
14.51-20.50	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	3
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	7	13	24	25	31	25	16	23	44	59	42	26	29	11	4	5	384

STABILITY CLASS C

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	2	2	2	1	0	2	2	1	0	3	1	4	0	1	0	0	21
3.51- 4.50	2	5	4	4	1	3	6	3	7	15	3	4	2	0	1	1	61
4.51- 5.50	2	7	10	8	3	1	4	7	9	24	13	5	3	1	4	4	105
5.51- 6.50	0	3	7	2	3	3	3	10	23	7	12	6	3	0	1	0	83
6.51- 8.50	0	2	5	7	3	0	1	8	5	8	3	4	2	3	0	1	52
8.51-11.50	0	0	0	6	6	1	0	0	2	4	9	2	2	1	0	0	33
11.51-14.50	1	0	0	1	4	0	0	1	0	1	2	0	0	0	0	0	10
14.51-20.50	0	0	0	0	1	0	0	0	0	5	2	1	0	1	0	0	10
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	7	19	28	29	21	10	16	30	46	67	45	26	12	7	6	6	375

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: JUL - DEC
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 7/ 1/95 - 12/31/95

2nd SEMIANNUAL

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	1	0	0	0	0	0	0	0	1
1.51- 2.50	2	2	1	0	5	2	3	9	6	7	10	3	2	4	2	2	60
2.51- 3.50	11	4	4	5	10	3	7	15	24	23	13	11	14	5	9	6	164
3.51- 4.50	6	7	6	5	5	3	4	11	22	20	11	4	5	5	3	6	123
4.51- 5.50	4	7	7	4	0	0	1	4	13	20	13	13	5	4	4	2	101
5.51- 6.50	1	2	2	2	1	1	1	3	7	4	7	9	3	2	2	3	50
6.51- 8.50	2	1	4	5	0	2	1	2	6	11	6	6	2	5	1	0	54
8.51-11.50	1	0	1	8	5	6	6	5	0	9	14	13	7	3	1	1	80
11.51-14.50	0	1	1	1	12	4	2	3	5	5	13	9	2	3	3	1	65
14.51-20.50	1	1	1	0	3	1	0	2	0	5	10	3	1	0	1	0	29
>20.50	0	0	0	0	3	1	0	0	2	0	0	0	0	0	0	0	6
TOTAL	28	25	27	30	44	23	25	54	86	104	97	71	41	31	26	21	733

STABILITY CLASS E

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	1	1	0	1	0	0	0	0	1	0	1	6
1.51- 2.50	3	1	2	0	4	2	0	1	1	5	8	9	9	7	10	5	67
2.51- 3.50	10	3	2	5	1	3	1	4	6	10	11	6	4	1	7	5	79
3.51- 4.50	9	6	1	4	2	1	2	3	9	7	10	3	2	4	11	6	80
4.51- 5.50	2	3	1	1	0	1	1	4	6	15	18	12	2	2	2	3	73
5.51- 6.50	2	5	1	0	0	0	0	4	9	10	20	12	3	1	3	5	75
6.51- 8.50	2	6	3	1	4	6	2	4	6	17	28	18	16	8	3	1	125
8.51-11.50	1	4	4	4	4	7	10	3	3	13	41	20	10	9	2	2	137
11.51-14.50	2	0	0	7	15	7	1	1	0	6	12	3	0	5	2	0	61
14.51-20.50	0	0	1	0	15	0	0	0	0	0	2	1	0	1	2	0	22
>20.50	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
TOTAL	32	29	15	22	45	28	18	24	41	83	150	84	46	39	42	28	726

STABILITY CLASS F

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	1	0	0	0	0	0	0	1	0	2	0	1	5
1.51- 2.50	8	4	1	2	0	0	1	1	2	1	4	1	8	7	10	12	62
2.51- 3.50	15	12	5	0	4	0	1	0	4	3	8	5	10	9	16	9	101
3.51- 4.50	14	5	7	4	1	2	1	3	3	5	9	6	8	8	13	14	103
4.51- 5.50	6	4	2	1	1	0	1	0	4	7	6	12	5	4	10	9	72
5.51- 6.50	3	5	1	0	0	0	1	1	3	5	9	3	7	1	8	7	54
6.51- 8.50	4	4	4	2	0	0	0	0	5	11	15	10	6	5	1	3	70
8.51-11.50	1	1	2	1	1	1	1	0	0	4	7	3	4	2	4	3	35
11.51-14.50	1	0	1	2	0	0	0	0	0	0	0	0	1	0	0	1	6
14.51-20.50	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	52	35	23	13	8	3	6	5	21	36	58	41	49	38	62	60	510

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: JUL - DEC
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 7/ 1/95 - 12/31/95

2nd SEMIANNUAL

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	2	0	0	0	3	2	1	9
1.51- 2.50	16	15	4	1	1	0	1	1	0	4	3	11	16	14	21	30	138
2.51- 3.50	74	35	10	2	4	1	2	2	1	5	6	8	20	26	44	94	334
3.51- 4.50	130	42	6	1	2	1	1	0	0	3	1	5	6	16	44	88	346
4.51- 5.50	104	34	7	3	1	0	0	0	2	0	1	1	4	6	12	41	216
5.51- 6.50	56	30	1	1	0	0	0	0	0	2	3	1	1	1	6	13	115
6.51- 8.50	23	34	5	1	0	0	0	0	0	0	2	0	1	1	2	6	75
8.51-11.50	9	6	2	0	0	0	0	0	0	1	0	0	0	0	0	1	19
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	413	196	35	9	8	2	4	3	3	17	16	26	48	67	131	274	1252

STABILITY CLASS ALL

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	1	1	1	0	2	2	0	1	0	6	2	3	21
1.51- 2.50	29	22	8	3	10	4	5	12	9	17	25	24	35	32	43	49	327
2.51- 3.50	112	56	24	13	19	9	13	22	35	44	39	35	48	42	76	114	701
3.51- 4.50	163	67	25	20	12	13	15	22	41	51	37	23	27	35	72	116	739
4.51- 5.50	119	59	32	21	11	6	7	15	44	69	62	48	23	21	34	63	634
5.51- 6.50	63	53	21	13	8	14	10	28	60	60	70	38	26	8	23	28	523
6.51- 8.50	36	52	36	33	21	24	20	33	46	89	99	77	47	26	9	11	659
8.51-11.50	14	12	9	30	38	26	23	14	14	64	107	72	42	20	8	8	501
11.51-14.50	5	1	2	12	37	12	4	6	6	21	42	23	7	10	9	3	200
14.51-20.50	2	1	2	1	20	2	0	2	0	11	27	11	2	2	6	4	93
>20.50	0	1	0	0	3	1	0	0	2	0	0	0	0	0	0	0	7
TOTAL	545	324	159	146	180	112	98	154	259	428	508	352	257	202	282	399	4405

2nd SEMIANNUAL

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH

TOTAL NUMBER OF OBSERVATIONS: 4416
TOTAL NUMBER OF VALID OBSERVATIONS: 4405
TOTAL NUMBER OF MISSING OBSERVATIONS: 11
PERCENT DATA RECOVERY FOR THIS PERIOD: 99.8 %
MEAN WIND SPEED FOR THIS PERIOD: 6.0 MPH
TOTAL NUMBER OF OBSERVATIONS WITH BACKUP DATA: 0

PERCENTAGE OCCURRENCE OF STABILITY CLASSES

A	B	C	D	E	F	G
9.65	8.72	8.51	16.64	16.48	11.58	28.42

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	6	7	7	18	23	21	13	15	18	62	100	78	32	9	11	5	0
B	7	13	24	25	31	25	16	23	44	59	42	26	29	11	4	5	0
C	7	19	28	29	21	10	16	30	46	67	45	26	12	7	6	6	0
D	28	25	27	30	44	23	25	54	86	104	97	71	41	31	26	21	0
E	32	29	15	22	45	28	18	24	41	83	150	84	46	39	42	28	0
F	52	35	23	13	8	3	6	5	21	36	58	41	49	38	62	60	0
G	413	196	35	9	8	2	4	3	3	17	16	26	48	67	131	274	0
TOTAL	545	324	159	146	180	112	98	154	259	428	508	352	257	202	282	399	0

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: JAN - DEC
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/95 - 12/31/95

*** 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	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
4.51- 5.50	1	4	0	1	1	1	0	1	2	0	5	2	1	0	2	1	22
5.51- 6.50	2	4	3	3	5	3	3	6	8	8	8	3	5	4	2	1	68
6.51- 8.50	4	5	7	16	9	10	8	12	17	35	59	42	17	6	4	3	254
8.51-11.50	2	2	3	7	17	9	3	6	14	64	87	51	20	13	6	1	305
11.51-14.50	2	0	0	0	4	1	1	1	5	19	43	23	12	9	9	1	130
14.51-20.50	1	0	0	0	0	1	0	0	2	18	54	18	3	11	5	2	115
>20.50	0	0	0	0	0	0	0	0	0	1	1	0	0	2	0	0	4
TOTAL	12	16	13	27	36	25	15	26	48	145	257	139	58	45	28	9	899

STABILITY CLASS B

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	1	0	0	0	0	0	0	0	0	1	0	0	0	0	2
3.51- 4.50	3	1	2	3	1	3	1	2	0	3	4	1	5	2	0	1	32
4.51- 5.50	2	4	10	3	8	4	1	1	18	8	12	5	6	4	1	4	91
5.51- 6.50	2	7	8	5	7	9	3	12	32	46	23	10	10	2	5	1	182
6.51- 8.50	3	3	10	11	9	12	11	17	40	32	30	16	9	4	1	1	209
8.51-11.50	1	1	4	9	13	7	3	4	5	12	24	13	12	1	1	0	110
11.51-14.50	0	1	2	1	3	2	0	1	0	6	10	6	3	4	3	1	43
14.51-20.50	1	0	0	0	1	0	0	0	0	1	4	5	0	1	1	1	15
>20.50	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
TOTAL	12	17	37	32	42	37	19	37	95	108	108	57	45	18	12	9	685

STABILITY CLASS C

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	2	4	5	3	2	4	3	1	0	3	1	5	0	2	0	0	35
3.51- 4.50	4	6	6	7	3	7	11	8	12	17	5	8	2	0	2	1	99
4.51- 5.50	2	9	19	15	6	6	7	10	24	36	22	7	4	2	7	7	183
5.51- 6.50	2	3	12	5	5	5	4	15	35	11	17	8	5	0	1	1	129
6.51- 8.50	2	4	7	10	5	1	3	11	12	15	20	7	2	3	3	3	108
8.51-11.50	0	0	3	9	9	5	0	2	3	10	20	5	3	5	0	1	75
11.51-14.50	1	0	0	2	7	3	0	1	0	2	10	1	0	2	0	0	29
14.51-20.50	0	0	0	3	5	0	0	0	1	6	4	4	1	1	0	0	25
>20.50	0	0	0	0	0	0	0	0	0	0	1	3	1	0	0	0	5
TOTAL	13	26	52	54	42	31	28	48	87	100	100	48	18	15	13	13	688

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: JAN - DEC
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/95 - 12/31/95

*** 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	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	2
1.51- 2.50	5	5	3	1	7	4	9	16	12	13	14	7	14	7	6	7	130
2.51- 3.50	19	11	11	14	17	11	13	22	42	37	33	24	26	13	20	18	331
3.51- 4.50	15	19	13	15	10	5	7	17	34	41	26	11	11	8	11	15	258
4.51- 5.50	10	13	12	10	3	6	3	5	21	39	22	19	10	8	8	8	197
5.51- 6.50	4	4	12	2	6	2	2	7	14	8	14	10	8	2	3	5	103
6.51- 8.50	2	6	8	11	7	9	1	4	11	14	23	12	4	6	4	6	128
8.51-11.50	2	1	2	13	11	14	7	9	3	20	42	24	13	5	3	3	172
11.51-14.50	0	1	1	2	14	7	2	4	9	16	29	22	4	8	8	2	129
14.51-20.50	1	1	1	1	6	2	0	2	6	25	24	17	3	1	4	0	94
>20.50	0	0	0	0	3	1	0	0	2	2	2	3	0	0	1	0	14
TOTAL	58	61	63	69	84	61	44	86	155	215	229	149	94	58	68	64	1558

STABILITY CLASS E

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	2	1	0	1	0	0	0	0	1	0	1	7
1.51- 2.50	7	4	6	2	5	4	2	5	4	10	13	13	14	10	21	11	131
2.51- 3.50	19	10	7	9	2	3	1	4	10	17	19	12	8	10	17	16	164
3.51- 4.50	16	12	4	6	5	2	4	5	12	15	23	12	11	6	15	10	158
4.51- 5.50	7	8	8	5	2	3	1	5	12	25	37	20	10	4	6	10	163
5.51- 6.50	5	8	7	1	2	3	1	5	14	15	34	21	8	2	7	6	139
6.51- 8.50	6	9	4	2	7	7	4	9	16	42	75	40	26	14	6	6	273
8.51-11.50	4	4	5	9	9	13	15	6	15	44	99	43	16	20	11	5	318
11.51-14.50	2	1	1	8	18	11	4	2	2	25	35	14	3	11	8	5	150
14.51-20.50	0	0	1	0	17	3	1	0	1	2	5	6	0	3	2	0	41
>20.50	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2
TOTAL	67	57	43	42	67	51	34	41	87	195	340	182	96	81	93	70	1546

STABILITY CLASS F

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	2	0	0	0	0	1	0	1	0	2	0	1	7
1.51- 2.50	19	5	3	5	0	2	2	1	2	2	8	6	17	9	17	15	113
2.51- 3.50	28	21	10	3	5	2	1	0	5	5	12	14	20	24	43	38	231
3.51- 4.50	30	16	14	8	1	2	1	3	5	10	20	18	23	14	28	31	224
4.51- 5.50	17	13	7	3	1	0	1	1	6	18	19	17	13	5	19	19	159
5.51- 6.50	11	9	2	2	0	0	2	1	6	13	30	13	15	4	13	11	132
6.51- 8.50	6	6	7	3	0	0	1	0	6	28	56	31	17	10	12	13	196
8.51-11.50	4	5	5	2	2	1	2	1	1	12	33	14	5	4	5	5	101
11.51-14.50	1	2	2	2	1	0	0	0	0	0	4	0	2	0	0	3	17
14.51-20.50	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2
>20.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	116	77	50	29	12	7	10	7	31	89	182	114	112	72	137	137	1182

JOINT FREQUENCY DISTRIBUTION ANALYSIS - 1995: JAN - DEC
SITE IDENTIFIER: PVNGS
DATA PERIOD EXAMINED: 1/ 1/95 - 12/31/95

*** 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	1	1	0	0	0	0	0	0	0	2	0	0	0	3	3	2	12
1.51- 2.50	25	30	9	2	5	0	1	1	0	6	4	16	17	20	28	48	212
2.51- 3.50	132	57	16	7	11	2	4	2	1	8	11	13	32	42	73	146	557
3.51- 4.50	224	75	16	5	4	1	3	0	1	5	4	8	13	24	67	145	595
4.51- 5.50	164	88	17	6	1	0	0	0	3	1	5	4	9	8	18	81	405
5.51- 6.50	91	52	3	3	0	0	1	0	0	2	5	3	4	3	7	20	194
6.51- 8.50	60	55	9	2	0	0	0	0	0	0	6	1	1	1	4	14	153
8.51-11.50	14	15	3	0	0	0	0	0	0	2	2	0	0	0	0	1	37
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	711	373	73	25	21	3	9	3	5	26	37	45	76	101	200	457	2165

STABILITY CLASS ALL

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	1	0	0	2	2	1	0	2	3	0	1	1	6	3	4	28
1.51- 2.50	56	44	21	10	17	10	14	23	18	31	39	42	62	46	72	81	586
2.51- 3.50	200	103	50	36	37	22	22	29	58	70	76	69	86	91	153	218	1320
3.51- 4.50	292	130	55	44	24	20	27	35	64	91	82	58	65	54	123	203	1367
4.51- 5.50	203	139	73	43	22	20	13	23	86	127	122	74	53	31	61	130	1220
5.51- 6.50	117	87	47	21	25	22	16	46	109	103	131	68	55	17	38	45	947
6.51- 8.50	83	88	52	55	37	39	28	53	102	166	269	149	76	44	34	46	1321
8.51-11.50	27	28	25	49	61	49	30	28	41	164	307	150	69	48	26	16	1118
11.51-14.50	6	5	6	15	47	24	7	9	16	68	131	66	24	34	28	12	498
14.51-20.50	3	1	2	5	29	6	1	2	10	52	91	50	7	17	12	4	292
>20.50	0	1	0	0	3	1	0	0	2	3	5	7	1	2	1	0	26
TOTAL	989	627	331	278	304	215	159	248	508	878	1253	734	499	390	551	759	8723

*** ANNUAL ***

STABILITY BASED ON: DELTA T BETWEEN 200.0 AND 35.0 FEET
WIND MEASURED AT: 35.0 FEET
WIND THRESHOLD AT: .75 MPH

TOTAL NUMBER OF OBSERVATIONS: 8760
TOTAL NUMBER OF VALID OBSERVATIONS: 8723
TOTAL NUMBER OF MISSING OBSERVATIONS: 37
PERCENT DATA RECOVERY FOR THIS PERIOD: 99.6 %
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
10.31	7.85	7.89	17.86	17.72	13.55	24.82

DISTRIBUTION OF WIND DIRECTION VS STABILITY

	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	CALM
A	12	16	13	27	36	25	15	26	48	145	257	139	58	45	28	9	0
B	12	17	37	32	42	37	19	37	95	108	108	57	45	18	12	9	0
C	13	26	52	54	42	31	28	48	87	100	100	48	18	15	13	13	0
D	58	61	63	69	84	61	44	86	155	215	229	149	94	58	68	64	0
E	67	57	43	42	67	51	34	41	87	195	340	182	96	81	93	70	0
F	116	77	50	29	12	7	10	7	31	89	182	114	112	72	137	137	0
G	711	373	73	25	21	3	9	3	5	26	37	45	76	101	200	457	0
TOTAL	989	627	331	278	304	215	159	248	508	878	1253	734	499	390	551	759	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 33 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 34 presents the population dose.

Table 35 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 indistingushable 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 1995 Land Use Census.
>
> 0 to 10 mile population distribution based on the Maricopa County Department of Emergency Management, Emergency Response Manual, Annex B - PVNGS Emergency Procedures, Appendix 11, page 152, April 1994.
>
> The 10 to 50 mile population distribution from the PVNGS UFSAR, Figure 2.1-10.
>
> 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 no milk animals located within 5 miles.

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

Table 33:
Doses To Special Locations For 1995

ENERGY INFORMATION CENTER LOCATED ONSITE 0.44 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	3.61E-01	3.61E-01	7.02E-02	3.61E-01	3.61E-01	4.39E-01	3.62E-01	4.55E-01
TEEN	3.64E-01	3.63E-01	7.02E-02	3.64E-01	3.64E-01	4.60E-01	3.66E-01	4.56E-01
CHILD	3.29E-01	3.29E-01	7.03E-02	3.29E-01	3.29E-01	4.37E-01	3.31E-01	4.23E-01
INFANT	2.19E-01	2.19E-01	7.02E-02	2.19E-01	2.19E-01	3.18E-01	2.20E-01	3.13E-01
2ND QUARTER								
ADULT	6.25E-02	6.25E-02	6.86E-03	6.25E-02	6.26E-02	7.21E-02	6.27E-02	7.54E-02
TEEN	6.29E-02	6.29E-02	6.87E-03	6.30E-02	6.30E-02	7.47E-02	6.33E-02	7.58E-02
CHILD	5.63E-02	5.63E-02	6.88E-03	5.64E-02	5.64E-02	6.95E-02	5.67E-02	6.93E-02
INFANT	3.54E-02	3.53E-02	6.87E-03	3.54E-02	3.54E-02	4.74E-02	3.56E-02	4.83E-02
1ST SEMI-ANNUAL								
ADULT	4.24E-01	4.24E-01	7.70E-02	4.24E-01	4.24E-01	5.11E-01	4.25E-01	5.30E-01
TEEN	4.26E-01	4.25E-01	7.71E-02	4.27E-01	4.27E-01	5.34E-01	4.29E-01	5.32E-01
CHILD	3.86E-01	3.86E-01	7.72E-02	3.86E-01	3.86E-01	5.07E-01	3.88E-01	4.92E-01
INFANT	2.55E-01	2.54E-01	7.71E-02	2.55E-01	2.55E-01	3.65E-01	2.56E-01	3.61E-01
3RD QUARTER								
ADULT	1.17E-01	1.17E-01	5.85E-03	1.17E-01	1.17E-01	1.17E-01	1.17E-01	1.25E-01
TEEN	1.17E-01	1.17E-01	5.85E-03	1.17E-01	1.17E-01	1.18E-01	1.17E-01	1.26E-01
CHILD	1.04E-01	1.04E-01	5.85E-03	1.04E-01	1.04E-01	1.05E-01	1.04E-01	1.13E-01
INFANT	6.26E-02	6.26E-02	5.85E-03	6.26E-02	6.26E-02	6.28E-02	6.26E-02	7.10E-02
4TH QUARTER								
ADULT	3.48E-01	3.48E-01	1.94E-02	3.48E-01	3.48E-01	3.49E-01	3.48E-01	3.75E-01
TEEN	3.49E-01	3.49E-01	1.95E-02	3.49E-01	3.49E-01	3.52E-01	3.50E-01	3.77E-01
CHILD	3.11E-01	3.11E-01	1.95E-02	3.11E-01	3.11E-01	3.15E-01	3.11E-01	3.39E-01
INFANT	1.88E-01	1.88E-01	1.95E-02	1.88E-01	1.88E-01	1.91E-01	1.88E-01	1.13E-01
2ND SEMI-ANNUAL								
ADULT	4.64E-01	4.64E-01	2.53E-02	4.64E-01	4.64E-01	4.66E-01	4.64E-01	5.00E-01
TEEN	4.67E-01	4.67E-01	2.53E-02	4.67E-01	4.67E-01	4.70E-01	4.68E-01	5.03E-01
CHILD	4.16E-01	4.16E-01	2.53E-02	4.16E-01	4.16E-01	4.19E-01	4.16E-01	4.52E-01
INFANT	2.50E-01	2.50E-01	2.53E-02	2.50E-01	2.50E-01	2.53E-01	2.50E-01	1.84E-01
ANNUAL								
ADULT	8.88E-01	8.88E-01	1.02E-01	8.88E-01	8.88E-01	9.78E-01	8.89E-01	1.03E+00
TEEN	8.93E-01	8.92E-01	1.02E-01	8.93E-01	8.93E-01	1.00E+00	8.97E-01	1.03E+00
CHILD	8.02E-01	8.02E-01	1.03E-01	8.02E-01	8.02E-01	9.26E-01	8.04E-01	9.44E-01
INFANT	5.05E-01	5.05E-01	1.02E-01	5.05E-01	5.05E-01	6.19E-01	5.06E-01	5.45E-01

Table 34:
Integrated Population Dose for 1995

JAN-MAR 1995

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	3.39E-02	3.39E-02	3.39E-02	3.39E-02	3.39E-02	3.39E-02	3.39E-02	1.23E-01
	1.13%	1.13%	93.48%	1.13%	1.13%	1.04%	1.13%	3.97%
GROUND	1.39E-03	1.39E-03	1.39E-03	1.39E-03	1.39E-03	1.39E-03	1.39E-03	1.64E-03
	.05%	.05%	3.83%	.05%	.05%	.04%	.05%	.05%
INHAL	5.18E-01	5.18E-01	2.49E-04	5.18E-01	5.18E-01	6.03E-01	5.19E-01	5.18E-01
	17.24%	17.24%	.69%	17.24%	17.25%	18.43%	17.27%	16.74%
VEGET	2.15E+00	2.15E+00	6.67E-04	2.15E+00	2.15E+00	2.31E+00	2.15E+00	2.15E+00
	71.58%	71.58%	1.84%	71.58%	71.58%	70.70%	71.55%	69.52%
COW MILK	1.98E-01	1.98E-01	5.88E-05	1.98E-01	1.98E-01	2.18E-01	1.98E-01	1.98E-01
	6.59%	6.59%	.16%	6.59%	6.59%	6.66%	6.59%	6.40%
MEAT	1.02E-01	1.03E-01	8.47E-07	1.02E-01	1.02E-01	1.03E-01	1.02E-01	1.02E-01
	3.41%	3.41%	.00%	3.41%	3.41%	3.13%	3.41%	3.31%
TOTAL	3.00E+00	3.00E+00	3.63E-02	3.00E+00	3.00E+00	3.27E+00	3.00E+00	3.09E+00
(1) PER CAPITA DOSE (REM)	1.53E-06	1.53E-06	1.85E-08	1.53E-06	1.53E-06	1.67E-06	1.53E-06	1.58E-06

APR-JUN 1995

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.63E-02	1.63E-02	1.63E-02	1.63E-02	1.63E-02	1.63E-02	1.63E-02	6.46E-02
	1.29%	1.29%	95.55%	1.29%	1.29%	1.20%	1.29%	4.96%
GROUND	3.42E-04	3.42E-04	3.42E-04	3.42E-04	3.42E-04	3.42E-04	3.42E-04	4.03E-04
	.03%	.03%	2.01%	.03%	.03%	.03%	.03%	.03%
INHAL	3.59E-01	3.59E-01	1.08E-04	3.59E-01	3.59E-01	3.94E-01	3.60E-01	3.59E-01
	28.60%	28.59%	.64%	28.61%	28.61%	28.99%	28.64%	27.54%
VEGET	7.16E-01	7.16E-01	2.67E-04	7.16E-01	7.16E-01	7.74E-01	7.16E-01	7.16E-01
	57.04%	57.04%	1.57%	57.04%	57.04%	56.91%	57.01%	54.92%
COW MILK	1.34E-01	1.34E-01	3.44E-05	1.34E-01	1.34E-01	1.45E-01	1.34E-01	1.34E-01
	10.65%	10.64%	.20%	10.65%	10.65%	10.68%	10.64%	10.25%
MEAT	2.99E-02	3.02E-02	5.30E-06	2.99E-02	2.99E-02	2.99E-02	2.99E-02	2.99E-02
	2.38%	2.40%	.03%	2.38%	2.38%	2.20%	2.38%	2.29%
TOTAL	1.26E+00	1.26E+00	1.70E-02	1.26E+00	1.26E+00	1.36E+00	1.26E+00	1.30E+00
(1) PER CAPITA DOSE (REM)	6.43E-07	6.43E-07	8.68E-09	6.43E-07	6.43E-07	6.94E-07	6.43E-07	6.64E-07

Table 34: (continued)
Integrated Population Dose for 1995

JAN-JUN 1995

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	5.02E-02 1.18%	5.02E-02 1.18%	5.02E-02 94.14%	5.02E-02 1.18%	5.02E-02 1.18%	5.02E-02 1.08%	5.02E-02 1.18%	1.87E-01 4.26%
GROUND	1.73E-03 .04%	1.73E-03 .04%	1.73E-03 3.25%	1.73E-03 .04%	1.73E-03 .04%	1.73E-03 .04%	1.73E-03 .04%	2.04E-03 .05%
INHAL	8.77E-01 20.59%	8.77E-01 20.59%	3.58E-04 .67%	8.77E-01 20.59%	8.77E-01 20.59%	9.97E-01 21.53%	8.79E-01 20.62%	8.77E-01 19.94%
VEGET	2.87E+00 67.30%	2.87E+00 67.30%	9.34E-04 1.75%	2.87E+00 67.29%	2.87E+00 67.29%	3.09E+00 66.66%	2.87E+00 67.27%	2.87E+00 65.19%
COW MILK	3.32E-01 7.79%	3.32E-01 7.79%	9.32E-05 .17%	3.32E-01 7.79%	3.32E-01 7.79%	3.63E-01 7.84%	3.32E-01 7.78%	3.32E-01 7.54%
MEAT	1.32E-01 3.11%	1.33E-01 3.11%	6.14E-06 .01%	1.32E-01 3.11%	1.32E-01 3.11%	1.32E-01 2.86%	1.32E-01 3.11%	1.32E-01 3.01%
TOTAL	4.26E+00	4.26E+00	5.33E-02	4.26E+00	4.26E+00	4.63E+00	4.26E+00	4.40E+00
(1) PER CAPITA DOSE (REM)	2.17E-06	2.17E-06	2.72E-08	2.17E-06	2.17E-06	2.36E-06	2.17E-06	2.25E-06

JUL-SEP 1995

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	6.49E-03 .34%	6.49E-03 .34%	6.49E-03 99.47%	6.49E-03 .34%	6.49E-03 .34%	6.49E-03 .34%	6.49E-03 .34%	2.37E-02 1.25%
GROUND	6.92E-07 .00%	6.92E-07 .00%	6.92E-07 .01%	6.92E-07 .00%	6.92E-07 .00%	6.92E-07 .00%	6.92E-07 .00%	8.11E-07 .00%
INHAL	5.20E-01 27.59%	5.20E-01 27.59%	1.74E-06 .03%	5.20E-01 27.59%	5.20E-01 27.59%	5.20E-01 27.59%	5.20E-01 27.59%	5.20E-01 27.34%
VEGET	1.11E+00 59.17%	1.11E+00 59.17%	3.10E-05 .47%	1.11E+00 59.17%	1.11E+00 59.17%	1.12E+00 59.17%	1.11E+00 59.17%	1.11E+00 58.63%
COW MILK	1.97E-01 10.44%	1.97E-01 10.44%	9.99E-07 .02%	1.97E-01 10.44%	1.97E-01 10.44%	1.97E-01 10.44%	1.97E-01 10.44%	1.97E-01 10.35%
MEAT	4.63E-02 2.45%	4.63E-02 2.45%	1.67E-08 .00%	4.63E-02 2.45%	4.63E-02 2.45%	4.63E-02 2.45%	4.63E-02 2.45%	4.63E-02 2.43%
TOTAL	1.88E+00	1.88E+00	6.52E-03	1.88E+00	1.88E+00	1.89E+00	1.88E+00	1.90E+00
(1) PER CAPITA DOSE (REM)	9.60E-07	9.60E-07	3.33E-09	9.60E-07	9.60E-07	9.65E-07	9.60E-07	9.70E-07

Table 34: (continued)
Integrated Population Dose for 1995

OCT-DEC 1995

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	1.79E-02 .31%	1.79E-02 .31%	1.79E-02 99.00%	1.79E-02 .31%	1.79E-02 .31%	1.79E-02 .31%	1.79E-02 .31%	6.30E-02 1.08%
GROUND	1.36E-04 .00%	1.36E-04 .00%	1.36E-04 .75%	1.36E-04 .00%	1.36E-04 .00%	1.36E-04 .00%	1.36E-04 .00%	1.60E-04 .00%
INHAL	1.25E+00 21.47%	1.25E+00 21.47%	2.03E-05 .11%	1.25E+00 21.47%	1.25E+00 21.47%	1.25E+00 21.54%	1.25E+00 21.48%	1.25E+00 21.31%
VEGET	3.86E+00 66.62%	3.86E+00 66.62%	2.16E-05 .12%	3.86E+00 66.62%	3.86E+00 66.62%	3.87E+00 66.57%	3.86E+00 66.61%	3.86E+00 66.10%
COW MILK	4.84E-01 8.34%	4.84E-01 8.34%	2.50E-06 .01%	4.84E-01 8.34%	4.84E-01 8.34%	4.84E-01 8.33%	4.84E-01 8.34%	4.84E-01 8.27%
MEAT	1.89E-01 3.26%	1.89E-01 3.26%	5.62E-08 .00%	1.89E-01 3.26%	1.89E-01 3.26%	1.89E-01 3.25%	1.89E-01 3.26%	1.89E-01 3.24%
TOTAL	5.80E+00	5.80E+00	1.81E-02	5.80E+00	5.80E+00	5.82E+00	5.80E+00	5.85E+00
(1) PER CAPITA DOSE (REM)	2.96E-06	2.96E-06	9.24E-09	2.96E-06	2.96E-06	2.97E-06	2.96E-06	2.99E-06

JUL-DEC 1995

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	2.44E-02 .32%	2.44E-02 .32%	2.44E-02 99.13%	2.44E-02 .32%	2.44E-02 .32%	2.44E-02 .32%	2.44E-02 .32%	8.68E-02 1.12%
GROUND	1.37E-04 .00%	1.37E-04 .00%	1.37E-04 .56%	1.37E-04 .00%	1.37E-04 .00%	1.37E-04 .00%	1.37E-04 .00%	1.61E-04 .00%
INHAL	1.77E+00 22.97%	1.77E+00 22.97%	2.20E-05 .09%	1.77E+00 22.97%	1.77E+00 22.97%	1.77E+00 23.02%	1.77E+00 22.98%	1.77E+00 22.79%
VEGET	4.98E+00 64.79%	4.98E+00 64.79%	5.25E-05 .21%	4.98E+00 64.79%	4.98E+00 64.79%	4.99E+00 64.75%	4.98E+00 64.79%	4.98E+00 64.27%
COW MILK	6.80E-01 8.85%	6.80E-01 8.85%	3.50E-06 .01%	6.80E-01 8.85%	6.80E-01 8.85%	6.81E-01 8.85%	6.80E-01 8.85%	6.80E-01 8.78%
MEAT	2.35E-01 3.06%	2.35E-01 3.06%	7.29E-08 .00%	2.35E-01 3.06%	2.35E-01 3.06%	2.35E-01 3.06%	2.35E-01 3.06%	2.35E-01 3.04%
TOTAL	7.69E+00	7.69E+00	2.46E-02	7.69E+00	7.69E+00	7.70E+00	7.69E+00	7.75E+00
(1) PER CAPITA DOSE (REM)	3.93E-06	3.93E-06	1.26E-08	3.93E-06	3.93E-06	3.93E-06	3.93E-06	3.96E-06

Table 34: (continued)
Integrated Population Dose for 1995

JAN-DEC 1995

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	7.46E-02 .62%	7.46E-02 .62%	7.46E-02 95.71%	7.46E-02 .62%	7.46E-02 .62%	7.46E-02 .60%	7.46E-02 .62%	2.74E-01 2.26%
GROUND	1.87E-03 .02%	1.87E-03 .02%	1.87E-03 2.40%	1.87E-03 .02%	1.87E-03 .02%	1.87E-03 .02%	1.87E-03 .02%	2.20E-03 .02%
INHAL	2.64E+00 22.12%	2.64E+00 22.12%	3.80E-04 .49%	2.64E+00 22.12%	2.64E+00 22.12%	2.77E+00 22.46%	2.64E+00 22.14%	2.64E+00 21.76%
VEGET	7.85E+00 65.68%	7.85E+00 65.68%	9.86E-04 1.27%	7.85E+00 65.68%	7.85E+00 65.68%	8.08E+00 65.47%	7.85E+00 65.67%	7.85E+00 64.60%
COW MILK	1.01E+00 8.47%	1.01E+00 8.47%	9.67E-05 .12%	1.01E+00 8.47%	1.01E+00 8.47%	1.04E+00 8.47%	1.01E+00 8.47%	1.01E+00 8.33%
MEAT	3.68E-01 3.08%	3.68E-01 3.08%	6.22E-06 .01%	3.68E-01 3.08%	3.68E-01 3.08%	3.68E-01 2.98%	3.68E-01 3.08%	3.68E-01 3.03%
TOTAL	1.19E+01	1.19E+01	7.79E-02	1.19E+01	1.19E+01	1.23E+01	1.19E+01	1.21E+01
(1) PER CAPITA DOSE (REM)	6.07E-06	6.07E-06	3.98E-08	6.07E-06	6.07E-06	6.28E-06	6.07E-06	6.18E-06

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

Table 35: Summary of Individual Doses for 1995						
	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Year total
Gamma Air Dose	mrad	2.60E-02	3.26E-03	2.62E-03	1.18E-02	4.36E-02
ODCM Req. 4.1 Limit	mrad	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
% ODCM Limit	%	5.20E-01	6.52E-02	5.24E-02	2.36E-01	4.36E-01
Beta Air Dose	mrad	5.41E-02	9.20E-03	3.94E-03	2.07E-02	8.78E-02
ODCM Req. 4.1 Limit	mrad	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
% ODCM Limit	%	5.41E-01	9.20E-02	3.94E-02	2.07E-01	4.39E-01
Maximum Individual						
Total Body	mrem	1.61E-02	1.96E-03	1.68E-03	7.45E-03	2.72E-02
Skin	mrem	4.20E-02	5.96E-03	4.09E-03	1.90E-02	7.09E-02
Location						
Unit 1	miles	1.87 S	0.66 NNE	0.66 NNE	1.87 S	1.87 S
Unit 2	miles	1.68 S	0.83 NNE	0.83 NNE	1.68 S	1.68 S
Unit 3	miles	1.46 S	1.05 NNE	1.05 NNE	1.46 S	1.46 S
Maximum Organ Dose (excluding skin)	Age	Teen	Child	Child	Teen	Child
	Organ	Thyroid	Thyroid	Thyroid	Thyroid	Thyroid
	mrem	6.41E-02	3.54E-02	4.05E-02	8.24E-02	1.89E-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)	%	8.55E-01	4.72E-01	5.40E-01	1.10E+00	1.26E+00
Location						
Unit 1	miles	4.93 S	2.68 ENE	2.68 ENE	4.93 S	2.39 NNE
Unit 2	miles	4.76 S	2.87 ENE	2.87 ENE	4.76 S	2.60 NNE
Unit 3	miles	4.54 S	3.02 ENE	3.02 ENE	4.54 S	2.82 NNE
Organ dose from tritium only, at controlling location	mrem	4.68E-02	3.11E-02	4.00E-02	7.87E-02	1.74E-01
Fraction of organ dose from tritium only, at controlling location	%	7.30E+01	8.79E+01	9.88E+01	9.55E+01	9.21E+01

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.

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APPENDIX D

ODCM, Revision 9

OFFSITE DOSE CALCULATION MANUAL
PALO VERDE NUCLEAR GENERATING STATION
UNITS 1, 2 AND 3

REVISION 9

Originator	K KUTNER	Date	1-10-95
Tech. Reviewer	Thomas W. M...	Date	1-11-95
Director, Site Chemistry		Date	1/17/95
PRB		Date	1-18-95
Plant Manager		Date	1-18-95

Effective Date 1-27-95

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1.0 INTRODUCTION

The Offsite Dose Calculation Manual (ODCM) implements the program elements which are required by the Administrative Controls section of the Technical Specifications, Section 6.8.4.g. Radioactive Effluent Controls Program, and Section 6.8.4.h. Radiological Environmental Monitoring Program at the Palo Verde Nuclear Generating Station (PVNGS) for Unit 1, Unit 2 and Unit 3. The ODCM is defined in Technical Specifications, Section 1.18 and in the Definitions in Appendix C of this manual. The ODCM contains the operational requirements, the surveillance requirements, and actions required if the operational requirements are not met for the Radioactive Effluent Controls Program and the Radiological Environmental Monitoring Program to assure compliance with 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR Part 50. The Technical Specifications, Section 3/4.0, also apply to the ODCM. Substitute the word "Requirements" for "Limiting Condition for Operation." It should be noted that the hot and cold shutdown and operability requirements in Technical Specification 3.0.3 and 3.0.4 do not apply to any of the requirements contained in this ODCM. The ODCM also contains descriptions of the information that should be included in the Annual Radiological Environmental Operating Report and the Annual Radioactive Effluent Release Report required by Technical Specifications Section 6.9.1.7 and 6.9.1.8.

The ODCM provides the parameters and methodology to be used in calculating offsite doses resulting from radioactive effluents, in the calculation of gaseous effluent monitor Alarm/Trip Setpoints, and in the conduct of the Radiological Environmental Monitoring Program. Included are methods for determining air, whole body, and organ dose at the controlling location due to plant effluents to assure compliance with the regulatory requirements detailed in the ODCM. Methods are included for performing dose projections to assure compliance with the gaseous treatment system operability sections of the ODCM. The ODCM utilizes information from NRC Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," October 1977, and NRC NUREG 0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants;" October 1978. NUREG 0133 utilizes some of the key information in Regulatory Guide 1.109 to provide methods which were used in the preparation of the radiological effluent Technical Specifications and which have now been transferred to the ODCM in accordance with NRC Generic Letter 89-01, "Implementation of Programmatic Controls for Radiological Effluent Technical Specifications in the Administrative Controls Section of the Technical Specifications and the Relocation of Procedural Details of RETS to the Offsite Dose Calculation Manual or to the Process Control Program," January 31, 1989, and NUREG 1301, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors," Generic Letter 89-01, Supplement No. 1, April 1991. Further guidance for the implementation of the new 10 CFR part 20, effective January 1, 1994, was obtained from the Federal Register, Vol. 58, December 23, 1993. It is recognized that this is only draft guidance, however, it is the only guidance for referencing the new 10 CFR 20 in the ODCM.

1.1 Liquid Effluent Pathways

Dose calculation methodology for liquid effluents is not included in this manual due to the desert location of the plant, the hydrology of the area, and the fact that there are no liquid releases to areas at or beyond the SITE BOUNDARY during normal operation. All liquid discharges to the onsite evaporation ponds are controlled by Section 3.2. The impact of postulated accidental seepages on the groundwater system, and in particular on the existing wells located in the 5-mile zone around the site area has been calculated and analyzed in Section 2.4.13.3 of the PVNGS FSAR.

If plant operating conditions become such that the likelihood of a liquid effluent pathway is created, then dose calculation methodology for this pathway will be added to this manual.

1.2 Gaseous Effluent Pathways

All gaseous effluents are treated as ground level releases and are considered to be "long-term" as discussed in NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants." This includes the containment purge and Waste Gas Decay Tank releases as well as the normal ventilation system and condenser vacuum exhaust releases. All releases are either greater than 500 hours in duration or are made at random, not depending upon atmospheric conditions or time of day. The releases are lumped together and calculated as an entity. Historical annual average X/Q values are used throughout this manual for all gaseous effluent setpoint and dose calculations. Airborne releases are further subdivided into two subclasses:

1.2.1 Iodine-131, Iodine-133, Tritium and Radionuclides in Particulate Form with Half-lives Greater than Eight Days

In this model, a controlling location is identified for assessing the maximum exposure to a MEMBER OF THE PUBLIC for the various pathways and to critical organs. Infant exposure occurs through inhalation and any actual milk pathway. Child, teenager and adult exposure derives from inhalation, consumed vegetation pathways, and any actual milk and meat pathways. Dose to each of the seven organs listed in Regulatory Guide 1.109 (bone, liver, total body, thyroid, kidney, lung and GI-LLI) are computed from individual nuclide contributions in each sector. The largest of the organ doses in any sector is compared to 10 CFR 50, Appendix I design objectives. The release rates of these nuclides will be converted to instantaneous dose rates for comparison to the limits of 10 CFR 20.

1.2.2 Noble Gases

The air dose from both the beta and gamma radiation component of the noble gases will be assessed and compared to the 10 CFR 50, Appendix I design objectives. The noble gas release rate will be converted to instantaneous dose rates for comparison to the limits of 10 CFR 20.

Section 2.0 of this manual discusses the methodology to be used in determining effluent monitor alarm/trip setpoints to assure compliance with the 10 CFR Part 20 limits as implemented in Section 3.0. Section 4.0 discusses the methods to assure releases are As Low As Reasonably Achievable (ALARA) in accordance with Appendix I to 10 CFR Part 50. Methods are described in Section 5.0 for determining the annual cumulative dose to a MEMBER OF THE PUBLIC from gaseous effluents and direct radiation to assure compliance with 40 CFR Part 190.

The requirements for the Annual Radiological Effluent Release Report and the Radiological Environmental Monitoring Program, including the Annual Land Use Census and the Interlaboratory Comparison Program, and the Annual Environmental Report are described in Sections 6.0 and 7.0 of this manual.

1.3 Nuisance Pathways

This section addresses the potential release pathways which should not contribute more than 10% of the doses evaluated in this manual. Table 1-1 lists examples of potential release pathways. The ODCM methodology for calculation of doses will be applied to an applicable release pathway if a likely potential arises for contributing more than 10% of the doses evaluated in this manual.

TABLE 1-1

NUISANCE PATHWAYS

(EXAMPLES)

Evaporation Pond

Cooling Towers

Laundry/Decon Building Exhaust

Unmonitored Secondary System Steam Vents/Reliefs

Turbine Building Ventilation Exhaust

Unmonitored Tank Atmospheric Vents

Dry Active Waste Processing and Storage (DAWPS) Building

Respirator Cleaning Facility

Secondary Side Decontamination Equipment

1.4 Meteorology

Historical annual average atmospheric dispersion (X/Q) and deposition(D/Q) data, based on nine years of meteorological data, and given in Table 3-2 for each of the three nuclear generating units are used to demonstrate compliance with the ODCM Requirements. These Requirements include:

Section 2.0	Gaseous Effluent Monitor Setpoints;
Section 3.0	Gaseous and Liquid Effluent - Dose Rate
Section 4.0	Gaseous and Liquid Effluent - Dose
Section 5.0	Total Dose and Dose to Public Onsite

Sections 2.0 and 3.0 specify utilizing the highest X/Q or D/Q meteorological dispersion parameter at the Site Boundary for any of the three units as applicable. Using the highest dispersion parameter for any of the units provides a conservative assumption to assure compliance with the higher 10 CFR Part 20 limits.

Section 4.0 specifies utilizing the highest X/Q at the Site Boundary for the particular unit, from Table 3-2 for noble gases. The highest X/Q and D/Q are utilized for the particular unit's releases as applicable for gases other than noble gases (iodines, particulates, and tritium) for the controlling pathway's location (site boundary using Table 3-2 or other controlling locations using Table 4-16).

Section 5.0 specifies utilizing the highest X/Q for the particular unit's releases at the controlling location from Table 4-16 for noble gases. The highest X/Q and D/Q are utilized for the particular unit's releases as applicable for gases other than noble gases at the controlling pathway's location using Table 4-16.

Section 7.0 requires that the meteorological conditions concurrent with the time of release of radioactive materials in gaseous effluents, as determined by sampling frequency and measurement, shall be used for determining the gaseous pathway doses.

2.0 GASEOUS EFFLUENT MONITOR SETPOINTS

2.1 Requirements: Gaseous Monitors

The radioactive gaseous effluent monitoring instrumentation channels shown in Table 2-1 shall be OPERABLE with their alarm/trip setpoints set to ensure that the dose requirements in Section 3.0 are not exceeded. The alarm/trip setpoints of these channels shall be determined and adjusted in accordance with the methodology and parameters in Section 2.1.2.

Applicability: As shown in Table 2-1.

Action:

a. With the low range radioactive gaseous effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above Requirement, immediately suspend the release of radioactive gaseous effluents monitored by the affected channel, or declare the channel inoperable, or change the setpoint so it is acceptably conservative.

b. With less than the minimum number of radioactive gaseous effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 2-1. Restore the inoperable instrumentation to OPERABLE status within 30 days or, if unsuccessful, explain in the next Annual Radioactive Effluent Release Report why this inoperability was not corrected within the time specified.

2.1.1 Surveillance Requirements:

a. Each radioactive gaseous effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and CHANNEL FUNCTIONAL TEST operations at the frequencies shown in Table 2-2.

TABLE 2-1

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
1. GASEOUS RADWASTE SYSTEM			
a. Noble Gas Activity Monitor - Providing Alarm and Automatic Termination of Release #RU-12	1	#	35
b. Flow Rate Monitor	1	#	36
2. NOT USED			
3. DELETED			
4. PLANT VENT SYSTEM			
A. Low Range Monitors			
a. Noble Gas Activity Monitor #RU-143	1	*	37
b. Iodine Sampler	1	*	40
c. Particulate Sampler	1	*	40
d. Flow Rate Monitor	1	*	36
e. Sampler Flow Rate Measuring Device	1	*	36
B. High Range Monitors			
a. Noble Gas Activity Monitor #RU-144	1	*	42
b. Iodine Sampler	1	*	42
c. Particulate Sampler	1	*	42
d. Sampler Flow Rate Measuring Device	1	*	42

TABLE 2-1 (Continued)

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
5. FUEL BUILDING VENTILATION SYSTEM			
A. Low Range Monitors			
a. Nobel Gas Activity Monitor #RU-145	1	##	37, 41
b. Iodine Sampler	1	##	40
c. Particulate Sample	1	##	40
d. Flow Rate Monitor	1	##	36
e. Sampler Flow Rate Measuring Device	1	##	36
B. High Range Monitors			
a. Noble Gas Activity Monitor #RU-146	1	##	42
b. Iodine Sampler	1	##	42
c. Particulate Sample	1	##	42
d. Sampler Flow Rate Measuring Device	1	##	42

Table 2-1 (Continued)

TABLE NOTATION

* At all times.
** During GASEOUS RADWASTE SYSTEM operation
*** Whenever the condenser air removal system is in operation, or whenever turbine glands are being supplied with steam from sources other than the auxiliary boiler(s).
\# During waste gas release.
\#\# In MODES 1, 2, 3, and 4 or when irradiated fuel is in the fuel storage pool.

ACTION 35 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, the contents of the tank(s) may be released to the environment provided that prior to initiating the release:

a. At least two independent samples of the tanks contents are analyzed, and

b. At least two technically qualified members of the facility staff independently verify the release rate calculations and discharge valve lineup;

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION 36 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided the flow rate is estimated at least once per 4 hours.

ACTION 37 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided the actions of (a) or (b) or (c) are performed:

a. Initiate the Preplanned Alternate Sampling Program to monitor the appropriate parameter(s).

b. Place moveable air monitors in-line.

c. Either take grab samples at least once per 12 hours, OR obtain gas channel monitor readings locally at least once per 12 hours if the channel is functional locally but inoperable due to loss of communication with the minicomputer. The surveillance requirements of Section 2.1.1 must be performed at the required frequencies for the channel to be functional locally.

ACTION 38 - NOT USED

ACTION 39 - NOT USED

ACTION 40 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via the effected pathway may continue provided samples are continuously collected with auxiliary sampling equipment as required in Table 3-1 within one hour after the channel has been declared inoperable.

ACTION 41 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirements, comply with the ACTIONS of Technical Specification 3.9.12 or operate the fuel building essential ventilation system while moving irradiated fuel.

Table 2-1 (Continued)

TABLE NOTATION

ACTION 42 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement restore the channel to OPERABLE status within 72 hours or:

a. Initiate the Preplanned Alternate Sampling Program to monitor the appropriate parameter(s) when it is needed.

b. Prepare and submit a Special Report to the Commission pursuant to Technical Specification 6.9.2 within 30 days following the event outlining the action(s) taken, the cause of the inoperability, and the plans and schedule for restoring the system to OPERABLE status.

NOTE: Action item numbering and instrument numbering are the same as in the Technical Specifications from which this section was taken to avoid potential confusion. Thus not all action item numbers will be found in this ODCM.

TABLE 2-2

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST	MODE IN WHICH SURVEILLANCE IS REQUIRED
1. GASEOUS RADWASTE SYSTEM					
a. Noble Gas Activity Monitor - Providing Alarm and Automatic Termination of Release RU-12	P	P(7)	R(3)	Q(1),(2),P###	#
b. Flow Rate Monitor	P	N.A.	R	Q,P###	#
2. DELETED					
3. DELETED					
4. PLANT VENT SYSTEM (RU-143 and RU-144)					
a. Noble Gas Activity Monitor	D(5)	M(7)	R(3)	Q(2)	*
b. Iodine Sampler	N.A.	N.A.	N.A.	N.A.	*
c. Particulate Sampler	N.A.	N.A.	N.A.	N.A.	*
d. Flow Rate Monitor	D(6)	N.A.	R	Q	*
e. Sampler Flow Rate Measuring Device	D(6)	N.A.	R	Q	*
5. FUEL BUILDING VENTILATION SYSTEM (RU-145 and RU-146)					
a. Nobel Gas Activity Monitor	D(5)	M(7)	R(3)	Q(2)	##
b. Iodine Sampler	N.A.	N.A.	N.A.	N.A.	##
c. Particulate Sample	N.A.	N.A.	N.A.	N.A.	##
d. Flow Rate Monitor	D(6)	N.A.	R	Q	##
e. Sampler Flow Rate Measuring Device	D(6)	N.A.	R	Q	##

Table 2-2 (Continued)

TABLE NOTATION

*	At all times.
**	During GASEOUS RADWASTE SYSTEM operation
***	Whenever the condenser air removal system is in operation, or whenever turbine glands are being supplied with steam from sources other than the auxiliary boiler(s).
#	During waste gas release.
##	In MODES 1, 2, 3, and 4 or when irradiated fuel is in the fuel storage pool.
###	Functional test should consist of, but not be limited to, a verification of system isolation capability by the insertion of a simulated alarm condition.

(1) The CHANNEL FUNCTIONAL TEST shall also demonstrate that automatic isolation of this pathway occurs if the instrument indicates measured levels above the alarm/trip setpoint.

(2) The CHANNEL FUNCTIONAL TEST shall also demonstrate that control room alarm annunciation occurs if any of the following conditions exists:

1. Instrument indicates measured levels above the alarm setpoint.
2. Circuit failure.
3. Instrument indicates a downscale failure.
4. Instrument controls not set in operate mode.

(3) The initial CHANNEL CALIBRATION shall be performed using one or more of the reference standards certified by the National Institute of Standards and Technology(NIST) or using standards that have been obtained from suppliers that participate in measurement assurance activities with NIST. These standards shall permit calibrating the system over its intended range of energy and measurement range. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration may be used in lieu of the reference standards associated with the initial calibration.

(4) NOT USED

(5) The channel check for channels in standby status shall consist of verification that the channel is on-line and reachable.

(6) Daily channel check not required for flow monitors in standby status.

(7) LED may be utilized as the check source in lieu of a source of increased activity.

Note: Action item numbering and instrument numbering are the same as in the Technical Specifications from which this section was taken to avoid potential confusion. Thus not all action item numbers will be found in this ODCM.

2.1.2 Implementation of the Requirements:

The general methodology for establishing low range gaseous effluent monitor setpoints is based upon a site release rate limit in µCi/sec derived from site specific meteorological dispersion conditions, radioisotopic distribution, and whole body and skin dose factors. The high alarm of the low range monitors will alarm/trip when the release rate from an individual vent will result in exceeding the limits in Section 3.1. 80% of Section 3.1 limits is considered to be the site release rate limit. The site release rate limit will be allocated among the licensed units' release points. The unit release rate limit will then be utilized for the determination of gaseous effluent monitor setpoints. A fraction of the unit release rate limit is then allotted to each release point and its monitor alert setpoint (µCi/cc) is derived using actual or fan design flow rates.

Administrative values are used to reduce each setpoint to account for the potential activity in other releases. These administrative values shall be reviewed based on actual release data.

For the purpose of implementation of Section 2.1, the alarm setpoint levels for low range effluent noble gas monitors are established to ensure that personnel are alerted when the noble gas releases are at a rate such that if the releases would continue for the year they would approach the total body dose rate of 500 mrem/yr and 3000 mrem/yr skin dose in Section 3.1. The equations in Section 3.1 of this manual provide the methodology for calculating the gaseous effluent dose rate.

The evaluation of doses due to releases of radioactive material can be simplified by the use of equivalent dose factors as defined in Section 2.1.2.1.

The equivalent dose factors will be evaluated periodically to assure that the best information on isotopic distribution is being used for the dose equivalent value.

2.1.2.1 Equivalent Dose Factor Determination

The equivalent whole body dose factor is calculated as follows:

$$K_{eq} = \sum_i [(K_i) (f_i)] \qquad (2\text{-}1)$$

Where:

K_{eq}	=	the equivalent whole body dose factor weighted by historical radionuclide distribution in releases in mrem/yr per $\mu Ci/m^3$.
K_i	=	the whole body dose factor due to gamma emissions for each identified noble gas radionuclide i, in mrem/yr per $\mu Ci/m^3$ from Table 3-3.
f_i	=	the fraction of noble gas radionuclide i in the total noble gas radionuclide mix.

The equivalent skin dose factor is calculated as follows:

$$(L + 1.1M)_{eq} = \sum_i [(L_i + 1.1M_i) (f_i)] \qquad (2\text{-}2)$$

Where:

$(L+1.1M)_{eq}$	=	the equivalent skin dose factor due to beta and gamma emissions from all noble gases released, weighted by the historical radionuclide distribution in releases in mrem/yr per $\mu Ci/m^3$.
L_i	=	the skin dose factor due to the beta emissions for each identified noble gas radionuclide i, in mrem/yr per $\mu Ci/m^3$ from Table 3-3.
M_i	=	the air dose factor due to gamma emissions for each identified noble gas radionuclide i, in mrad/yr per $\mu Ci/m^3$ from Table 3-3.
f_i	=	the fraction of noble gas radionuclide i in the total noble gas radionuclide mix.
1.1	=	unit conversion constant of 1.1 mrem/mrad converts air dose to skin dose.

2.1.2.2 Site Release Rate Limit (Q_{SITE})

The release rates corresponding to 80% of the whole body (Q_{WB}) and skin (Q_{SK}) dose rate limits are calculated using the equivalent dose factors defined in Section 2.1.2.1. The site release rate limit (Q_{SITE}) is the lower of Q_{WB} or Q_{SK}, thus assuring that the more restrictive dose rate limit will not be exceeded.

The Q_{SITE} is established as follows:

$$Q_{SITE,WB} = \frac{(D_{WB})\,(0.8)}{(K_{eq})\,(X/Q)_{SITE}} \tag{2-3}$$

Where:

$Q_{SITE,WB}$ = the site release rate, in µCi/sec, that would deliver a dose rate 80% of the whole body dose rate limit, D_{WB}.

D_{WB} = whole body dose rate limit of 500 mrem/yr.

K_{eq} = equivalent whole body dose factor, in mrem/yr per µCi/m^3 weighted by the historical radionuclide distribution.

$(X/Q)_{SITE}$ = 8.91E-06, the highest calculated annual average dispersion parameter, in sec/m^3, at the Site Boundary for any of the 3 units, from Table 3-2.

0.8 = administrative factor to compensate for any unexpected variability in the radionuclide mix and to ensure that Site Boundary dose rate limits will not be exceeded.

$$Q_{SITE,SK} = \frac{(D_{SK})\,(0.8)}{(L+1.1M)_{eq}\,(X/Q)_{SITE}} \tag{2-4}$$

Where:

$Q_{SITE,SK}$ = the site release rate limit, in µCi/sec, that would deliver a dose rate 80% of the skin dose rate limit, D_{SK}.

D_{SK} = skin dose rate limit of 3000 mrem/yr.

$(L+1.1M)_{eq}$ = equivalent skin dose factor, in mrem/yr per µCi/m^3, weighted by the radionuclide distribution.

$(X/Q)_{SITE}$ = 8.91E-06, the highest calculated annual average dispersion parameter, in sec/m^3, at the Site Boundary for any of the three units, from Table 3-2.

0.8 = administrative factor to compensate for any unexpected variability in the radionuclide mix and to ensure that Site Boundary dose rate limits will not be exceeded.

After determination of the Q_{SITE} whole body and skin dose rates (equations 2-3 and 2-4, respectively), the most conservative result will be used as Q_{SITE}, the site release rate limit.

2.1.2.3 Unit Release Rate Limits (Q_{UNIT})

Typically Q_{SITE} will be divided equally among operating units. If operational history dictates a larger fraction of the Q_{SITE} be assigned to a specific unit then a weighted average of each unit's contribution to the Q_{SITE} will be utilized to determine the Q_{UNIT}.

$$Q_{UNIT} = (f_{UNIT})(Q_{SITE}) \qquad (2\text{-}5)$$

Where:

Q_{UNIT} = unit release rate limit, in µCi/sec.

f_{UNIT} = the fraction ($\leq$ 1) of noble gas historically released from a specific operating unit to the total of all noble gas released from the site.

Q_{SITE} = the site release rate limit, in µCi/sec determined in Section 2.1.2.2.

2.1.2.4 Setpoint Determination

To comply with the requirements in Section 2.1, the alarm/trip setpoints can now be established using the unit release rate limit (Q_{UNIT}) to ensure that the noble gas releases do not exceed the dose rate limits.

To allow for multiple sources of releases from different or common release points, the effluent monitor setpoint includes an administrative factor which allocates a percentage of the unit release rate limit to each of the release sources. Monitor setpoints will also be adjusted in accordance with Nuclear Administrative and Technical Manual procedures to account for monitor-specific characteristics.

<u>Monitors RU-143 and RU-145</u>

The alarm/trip setpoint for Monitors RU-143 and RU-145 is calculated as follows:

$$\text{Monitor Setpoint} \leq \frac{(Q_{UNIT})\,(a)}{(472)\,(\text{Flow Rate})} \qquad (2\text{-}6)$$

Where:

Monitor

Setpoint = the setpoint for the effluent monitor, in µCi/cc, which provides a safe margin of assurance that the allowable dose rate limits will not be exceeded.

Q_{UNIT} = unit release rate limit, in µCi/sec, as determined in Section 2.1.2.3.

Flow Rate = the flow rate, in cfm, from flow rate monitors or the fan design flow rate for the release source under consideration.

472 = conversion factor, cubic centimeter/second per cubic feet/minute.

a = fraction of Q_{UNIT} allocated for a specific release point. The sum of these administrative values shall be less than or equal to one.

Monitor RU-12

The alarm/trip setpoint for Monitor RU-12, the Waste Gas Decay Tank Monitor, is calculated as follows:

$$\text{Monitor setpoint} \leq \frac{[(Q_{UNIT})(a)(0.9) - (H)(PF)(472)]}{(\text{Flow Rate})(472)} \qquad (2\text{-}7)$$

Where:

Monitor

Setpoint = the setpoint for the monitor, in µCi/cc at STP, which provides a safe margin of assurance that the allowable dose rate limits will not be exceeded.

Q_{UNIT} = unit release rate limit, in µCi/sec, as determined in Section 2.1.2.3.

Flow Rate = flow rate, in cfm at STP at which the tank will be released.

PF = the current process flow of the plant vent in CFM.

H = the current plant vent monitor concentration in µCi/cc.

a = fraction of Q_{UNIT} allocated for a specific release point. This administrative value should be equal to or less than the administrative value used for the Plant Vent.

0.9 = an administrative value to account for potential increases in activity from other contributors to the same release point.

472 = conversion factor, cubic centimeter/second per cubic feet/minute.

If there is no release associated with this monitor, the monitor setpoint should be established as close as practical to background to prevent spurious alarms, and yet assure an alarm should an inadvertent release occur.

2.1.2.5 Monitor Calibration

The Radiation Level Conversion Factor (RLF) for each monitor is entered into the Radiation Monitoring System Database and may change whenever the monitor is calibrated. Calibration is performed in accordance with Nuclear Administrative and Technical Manual procedures.

3.0 GASEOUS AND LIQUID EFFLUENT DOSE RATES

3.1 Requirements: Gaseous Effluents

The dose rate due to radioactive materials released in gaseous effluents from the site (see Figures 6-4 and 6-5) 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.

Applicability: At all times.

Action:

With the dose rate(s) exceeding the above limits, immediately decrease the release rate to within the above limits(s).

3.1.1 Surveillance Requirements:

a. The dose rate due to noble gases in gaseous effluents shall be determined to be within the above limits in accordance with the methods contained in Section 3.1.2.

b. The dose rate due to I-131, I-133, tritium and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents shall be determined to be within the above limits in accordance with the methods contained in Section 3.1.2 by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in Table 3-1.

3.1.2 Implementation of the Requirements:

Noble Gases

Noble gas activity monitor setpoints are established at release rates which permit corrective action to be taken before exceeding offsite dose rates corresponding to the 10 CFR 20 annual dose limits as described in Section 2.0. The requirements for sampling and analysis of continuous and batch effluent releases are given in Table 3-1. The methods for sampling and analysis of continuous and batch effluent releases are given in the Nuclear Administrative and Technical Manual procedures. The dose rate in unrestricted areas shall be determined using the following equations.

For whole body dose rate:

$$D_{WB} = \sum_i [(K_i) (X/Q)_{SITE} (Q_i)] \tag{3-1}$$

For skin dose rate:

$$D_{SK} = \sum_i [(L_i + 1.1M_i) (X/Q)_{SITE} (Q_i)] \tag{3-2}$$

Where:

K_i = the whole body dose factor due to gamma emissions for each identified noble gas radionuclide i, in mrem/yr per $\mu Ci/m^3$ from Table 3-3.

Q_i = the release rate of radionuclide i, in $\mu Ci/sec$.

$(X/Q)_{SITE}$ = 8.91E-06, the highest calculated annual average dispersion parameter, in sec/m^3, for any of the three units, from Table 3-2.

D_{WB} = the annual whole body dose rate (mrem/yr.).

L_i = the skin dose factor due to the beta emissions for each identified noble gas radionuclide i, in mrem/yr per $\mu Ci/m^3$ from Table 3-3.

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide i, in mrad/yr per $\mu Ci/m^3$ from Table 3-3.

D_{SK} = the annual skin dose rate (mrem/yr).

1.1 = unit conversion constant of 1.1 mrem/mrad converts air dose to skin dose.

[illegible]

I-131, I-133, tritium and radionuclides in particulate form with half-lives greater than 8 days

The methods for sampling and analysis of continuous and batch releases for I-131, I-133, tritium and radionuclides in particulate form with half-lives greater than 8 days, are given in the applicable Nuclear Administrative and Technical Manual procedures. Additional monthly and quarterly analyses shall be performed in accordance with Table 3-1. The total organ dose rate in unrestricted areas shall be determined by the following equation:

$$D_o = \sum_i [(P_i) (X/Q)_{SITE} (Q_i)] \qquad (3\text{-}3)$$

Where:

P_i = the dose factor, in mrem/yr per µCi/m^3, for radionuclide i, for the inhalation pathway, from Table 3-4.

$(X/Q)_{SITE}$ = 8.91E-06, the highest calculated annual average dispersion parameter, in sec/m^3, at the Site Boundary, for any of the three units,

Q_i = the release rate of radionuclide i, in µCi/sec

D_o = the total organ dose rate (mrem/yr).

TABLE 3-1

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

GASEOUS RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) (μCi/ml)[a]
A. Waste Gas Storage	P Each Tank Grab Sample	P Each Tank	Principal Gamma Emitters[g]	1.0E-04
B. Containment Purge	P Each Purge[b,c] Grap Sample	P Each Purge[b,c]	Principal Gamma Emitters[g]	1.0E-04
			H-3	1.0E-06
C. 1. DELETED 2. Plant Vent 3. Fuel Bldg. Exhaust	M[b,c] Grab Sample	M[b]	Principal Gamma Emitters[g]	1.0E-04
			H-3	1.0E-06
	Continuous[f]	4/M[d] Charcoal Sample	I-131	1.0E-12
			I-133	1.0E-10
	Continuous[f]	4/M[d] Particulate Sample	Principal Gamma Emitters[g] (I-131, Others)	1.0E-11
	Continuous[f]	M Composite Particulate Sample	Gross Alpha	1.0E-11
	Continuous[f]	Q Composite Particulate Sample	Sr-89, Sr-90	1.0E-11
D. All Radwaste Types as listed in A., B., and C., above.	Continuous[f]	Noble Gas Monitor	Noble Gases Gross Beta or Gamma	1.0E-06

Table 3-1 (Continued)

TABLE NOTATION

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

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

$$LLD = \frac{4.66\ s_b}{E * V * 2.22E6 * Y * \exp(-\lambda \Delta t)}$$

Where:

LLD is the a priori lower limit of detection as defined above (as µCi per unit mass or volume). Current literature defines the LLD as the detection capability for the instrumentation only and the MDC minimum detectable concentration, as the detection capability for a given instrument, procedure and type of sample.

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute),

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

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

2.22E6 is the number of transformations per minute per microcurie,

Y is the fractional radiochemical yield (when applicable),

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

Δt is the elapsed time between the midpoint of sample collection and time of counting (for plant effluents, not environmental samples).

The value of s_b used in the calculation of the LLD for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. In calculating the LLD for a radionuclide determined by gamma-ray spectrometry the background should include the typical contributions of other radionuclides normally present in the samples. Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

Table 3-1 (Continued)

TABLE NOTATION

b Analyses shall also be performed following SHUTDOWN, STARTUP, or a THERMAL POWER change exceeding 15% of the RATED THERMAL POWER within a 1-hour period if 1) analysis shows that the DOSE EQUIVALENT I-131 concentration in the primary coolant has increased more than a factor of 3; and 2) the noble gas activity monitor on the plant vent shows that effluent activity has increased by more than a factor of 3. If the associated noble gas vent monitor is inoperable, samples must be obtained as soon as possible. Analyses shall be performed within a four-hour period. This requirement does not apply to the Fuel Building Exhaust.

c Sampling and analyses shall also be performed at least once per 31 days when purging time exceeds 30 days continuous.

d Samples shall be changed at least 4 times a month and analyses shall be completed within 48 hours after changing (or after removal from sampler). When samples collected for 24 hours are analyzed, the corresponding LLDs may be increased by a factor of 10.

e Tritium grab samples shall be taken at least monthly from the ventilation exhaust from the spent fuel pool area, whenever spent fuel is in the spent fuel pool.

f The ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period covered by each dose or dose rate calculation made in accordance with Requirements 3.1, 4.1 and 4.2 of the ODCM.

g The principal gamma emitters for which the LLD specification applies include the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for gaseous emissions and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141 and Ce-144 for particulate emissions. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides shall also be identified and reported in the Annual Radioactive Effluent Release Report.

TABLE 3-2

DISPERSION AND DEPOSITION PARAMETERS FOR LONG TERM RELEASES AT THE SITE BOUNDARY

DIRECTION	UNIT 1 DISTANCE (METERS)	UNIT 1 X/Q (SEC/m^3)	UNIT 1 D/Q (m^{-2})	UNIT 2 DISTANCE (METERS)	UNIT 2 X/Q (SEC/m^3)	UNIT 2 D/Q (m^{-2})	UNIT 3 DISTANCE (METERS)	UNIT 3 X/Q (SEC/m^3)	UNIT 3 D/Q (m^{-2})
N	1037	4.93E-06	9.24E-09	1318	3.85E-06	6.17E-09	1661	3.54E-06	4.86E-09
NNE	1057	4.14E-06	1.19E-08	1342	3.18E-06	7.93E-09	1693	2.86E-06	6.23E-09
NE	2206	2.84E-06	6.84E-09	2545	2.42E-06	5.34E-09	2756	2.21E-06	4.65E-09
ENE	1967	2.51E-06	4.43E-09	2206	2.22E-06	3.64E-09	2337	2.08E-06	3.30E-09
E	1927	2.56E-06	3.24E-09	2163	2.27E-06	2.66E-09	2290	2.14E-06	2.41E-09
ESE	1967	2.61E-06	2.46E-09	2067	2.32E-06	2.11E-09	2023	2.37E-06	2.10E-09
SE	2049	3.56E-06	2.36E-09	2101	3.47E-06	2.26E-09	2256	3.24E-06	2.00E-09
SSE	2730	3.80E-06	1.58E-09	3026	3.43E-06	1.32E-09	2786	3.72E-06	1.52E-09
S	3006	5.07E-06	1.78E-09	2699	5.16E-06	1.97E-09	2346	5.90E-06	2.51E-09
SSW	2258	6.52E-06	3.20E-09	1836	7.90E-06	4.56E-09	1607	8.91E-06	5.73E-09
SW	1487	7.47E-06	5.65E-09	1208	7.72E-06	6.88E-09	1057	8.68E-06	8.61E-09
WSW	1251	4.52E-06	5.93E-09	1014	5.55E-06	8.44E-09	889	5.34E-06	8.83E-09
W	1225	4.73E-06	9.49E-09	993	5.86E-06	1.34E-08	871	6.72E-06	1.67E-08
WNW	1244	3.76E-06	6.76E-09	1010	4.67E-06	9.60E-09	885	5.37E-06	1.19E-08
NW	1254	3.43E-06	5.87E-09	1191	3.62E-06	6.40E-09	1045	4.17E-06	7.98E-09
NNW	1069	3.70E-06	7.26E-09	1342	2.85E-06	4.87E-09	1561	2.93E-06	4.58E-09

Reference: Distances are from the PVNGS ER-OL, Table 2.3-33. Dispersion and Deposition parameters are from a September, 1985, calculation by NUS Corporation based on 9 years of meteorological data; NUS Corporation letter NUS-ANPP-1386, dated October 4, 1985.

TABLE 3-3

DOSE FACTORS FOR NOBLE GASES AND DAUGHTERS

Radionuclide	Whole Body Dose Factor K_i mrem-m^3 / yr-µCi	Skin Dose Factor L_i mrem-m^3 / yr-µCi	Gamma Air Dose Factor M_i mrad-m^3 / yr-µCi	Beta Air Dose Factor N_i mrad-m^3 / yr-µCi
Kr-83m	7.56E-02	------------	1.93E+01	2.88E+02
Kr-85m	1.17E+03	1.46E+03	1.23E+03	1.97E+03
Kr-85	1.61E+01	1.34E+03	1.72E+01	1.95E+03
Kr-87	5.92E+03	9.73E+03	6.17E+03	1.03E+04
Kr-88	1.47E+04	2.37E+03	1.52E+04	2.93E+03
Kr-89	1.66E+04	1.01E+04	1.73E+04	1.06E+04
Kr-90	1.56E+04	7.29E+03	1.63E+04	7.83E+03
Xe-131m	9.15E+01	4.76E+02	1.56E+02	1.11E+03
Xe-133m	2.51E+02	9.94E+02	3.27E+02	1.48E+03
Xe-133	2.94E+02	3.06E+02	3.53E+02	1.05E+03
Xe-135m	3.12E+03	7.11E+02	3.36E+03	7.39E+02
Xe-135	1.81E+03	1.86E+03	1.92E+03	2.46E+03
Xe-137	1.42E+03	1.22E+04	1.51E+03	1.27E+04
Xe-138	8.83E+03	4.13E+03	9.21E+03	4.75E+03
Ar-41	8.84E+03	2.69E+03	9.30E+03	3.28E+03

Reference: Regulatory Guide 1.109, Table B-1.

TABLE 3-4

P_i VALUES FOR THE INHALATION PATHWAY

(mrem/yr/μCi/m^3)

NUCLIDE	Age Group	Organ	P_i
H-3	TEEN	LIVER	1.27E+03
CR-51	TEEN	LUNG	2.10E+04
MN-54	TEEN	LUNG	1.98E+06
FE-59	TEEN	LUNG	1.53E+06
CO-58	TEEN	LUNG	1.34E+06
CO-60	TEEN	LUNG	8.72E+06
ZN-65	TEEN	LUNG	1.24E+06
SR-89	TEEN	LUNG	2.42E+06
SR-90	TEEN	BONE	1.08E+08
ZR-95	TEEN	LUNG	2.69E+06
SB-124	TEEN	LUNG	3.85E+06
I-131	CHILD	THYROID	1.62E+07
I-133	CHILD	THYROID	3.85E+06
CS-134	TEEN	LIVER	1.13E+06
CS-137	CHILD	BONE	9.07E+05
BA-140	TEEN	LUNG	2.03E+06
CE-141	TEEN	LUNG	6.14E+05
CE-144	TEEN	LUNG	1.34E+07

3.2 Requirements:Secondary System Liquid Waste Discharges To Onsite Evaporation Ponds or Circulating Water System - Concentration

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 20.1001-20.2401, Appendix B, Table 2, Column 2, for all other isotopes

Applicability: At all times.

Action:

When any secondary system liquid waste discharge pathway concentration determined in accordance with the surveillance requirements given below exceeds the above Requirements, divert that discharge pathway to the liquid radwaste system without delay or terminate the discharge.

3.2.1 Surveillance Requirements:

a. Secondary system liquid wastes shall be sampled and analyzed according to the sampling and analysis program of Table 3-5.

3.2.2 Implementation of the Requirements:

This requirement is implemented by Nuclear Administrative and Technical Manual procedures.

TABLE 3-5

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

SECONDARY SYSTEM LIQUID RELEASE PATHWAY	SAMPLING & ANALYSIS FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)[a] (μCi/ml)
1. Chemical Waste Neutralizer Tank	P Each Batch		Principal Gamma Emitters[c]	5.0E-07
			I-131	1.0E-06
			H-3	1.0E-05
2. Steam Generator Blowdown Low TDS Sump	P Each Batch (1)		Principal Gamma Emitters[c]	5.0E-07
			I-131	1.0E-06
			H-3	1.0E-05
3. Condensate				
a. Condensate Polishing Low TDS Sump	P Each Batch (1)		Principal Gamma Emitters[c]	5.0E-07
			I-131	1.0E-06
			H-3	1.0E-05
b. Initial Backwash	P Each Batch (2)		Principal Gamma Emitters[c]	5.0E-07
			I-131	1.0E-06
			H-3	1.0E-05
c. Pre-service rinse effluent	P Each Batch (3)		Principal Gamma Emitters[c]	5.0E-07
			I-131	1.0E-06
			H-3	1.0E-05
d. Overboard condensate to circulating water system	P Each Batch (4)		Principal Gamma Emitters[c]	5.0E-07
			I-131	1.0E-06
			H-3	1.0E-05
4. Turbine Building Sump	D Grab Sample(1)		Principal Gamma Emitters[c]	5.0E-07
			I-131	1.0E-06
			H-3	1.0E-05
5. North & South Condenser Area Sumps	D Grab Sample(1)		Principal Gamma Emitters[c]	5.0E-07
			I-131	1.0E-06
			H-3	1.0E-05

1 Sampling and analysis are required only when concentration for chemical waste neutralizer tank or steam generator activity exceeds the requirement

2 Sampling and analysis is required if the Initial backwash is being directed to Circulating water via the Condensate Polishing Low TDS Sump.

3 If the pre-service rinse effluent is to be discharged to the Circulating water system, one of the following conditions must be met:

a. If the SG blowdown activity is greater than the Requirement, the activity of the condensate or CD influent, AND the effluent of the service vessel in question (while in "standby") shall be verified less than the Requirement.

b. If the SG blowdown activity is less than the Requirement, the effluent of the service vessel in question (while in "standby") shall be verified less than the Requirement.

4 Condensate activity shall be verified less than the Requirement

Table 3-5 (Continued)

TABLE NOTATION

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

For a particular measurement system which may include radiochemical separation:

$$LLD = \frac{4.66 s_b}{E * V * 2.22E6 * Y * \exp(-\lambda \Delta t)}$$

Where:

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

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate as counts per minute,

E is the counting efficiency as counts per disintegration,

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

2.22E6 is the number of disintegrations per minute per microcurie

Y is the fractional radiochemical yield when applicable,

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

Δt is the elapsed time between midpoint of sample collection and time of counting.

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

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

b A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed to assure representative sampling.

c The principal gamma emitters for which the LLD specification applies include the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, and Ce-141. Ce-144, shall also be measured, but with an LLD of 3.0E-06. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radioactive Effluent Release Report pursuant to Specification 6.9.1.8.

d A continuous release is the discharge of liquid wastes of a nondiscrete volume, e.g., from a volume of a system that has an input flow during the continuous release.

4.0 GASEOUS & LIQUID EFFLUENTS - DOSE

4.1 Requirements: Noble Gases

The air dose due to noble gases released in gaseous effluents, from each reactor unit to areas at and beyond the SITE BOUNDARY (see Figure 6-4 and 6-5) 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.

Applicability: At all times.

Action:

With the calculated air dose from radioactive noble gases in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

4.1.1 Surveillance Requirements:

a. Cumulative dose contributions for the current calendar quarter and current calendar year for noble gases shall be determined in accordance with the methodology contained in Section 4.1.2 at least once per 31 days.

4.1.2 Implementation of the Requirement: Noble Gas

The air dose in unrestricted areas beyond the site boundary due to noble gases released in gaseous effluents from each unit during any specified time period shall be determined by the following equations:

For gamma radiation:

$$D\gamma_u = (3.17E\text{-}08)\, \Sigma_i\, [(M_i)\, (X/Q)_{UNIT}(Q_i)] \qquad (4\text{-}1)$$

For beta radiation:

$$D\beta_u = (3.17E\text{-}08)\, \Sigma_i\, [(N_i)\, (X/Q)_{UNIT}(Q_i)] \qquad (4\text{-}2)$$

Where:

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide i, in mrad/yr per μCi/m^3 from Table 3-3.

N_i = the air dose factor due to beta emissions for each identified noble gas radionuclide i, in mrad/yr per μCi/m^3 from Table 3-3.

$(X/Q)_{UNIT}$ = the highest calculated annual average dispersion parameter, in sec/m^3, at the site boundary for the particular unit, from Table 3-2.

=7.47E-06 from Unit 1
=7.90E-06 from Unit 2
=8.91E-06 from Unit 3

$D\gamma_u$ = the total gamma air dose, for the particular unit, in mrad, due to noble gases released in gaseous effluents for a specified time period at the SITE BOUNDARY.

$D\beta_u$ = the total beta air dose, for the particular unit, in mrad, due to noble gases released in gaseous effluents for a specified time period at the SITE BOUNDARY.

Q_i = the integrated release, from the particular unit, in μCi, of each identified noble gas radionuclide i, in gaseous effluents for a specified time period.

3.17E-08 = the inverse of seconds in a year (yr/sec).

The cumulative gamma air dose and beta air dose for a quarterly or annual evaluation shall be based on the calculated dose contribution from each specified time period occurring during the reporting time period.

[illegible]

4.2 Requirement: Iodine-131, Iodine-133, Tritium, and All Radionuclides in Particulate Form With Half-Lives Greater Than 8 Days

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 (see Figures 6-4 and 6-5) 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.

Applicability: At all times.

Action:

With the calculated dose from the release of iodine-131, iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days, in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report that identifies the cause(s) for exceeding the limit and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

4.2.1 Surveillance Requirements:

a. Cumulative dose contributions for the current calendar quarter and current calendar year for iodine-131, iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days shall be determined in accordance with the methodology and parameters contained in Section 4.2.2 at least once per 31 days.

[illegible]

4.2.2 Implementation of the Requirement

The organ dose to an individual from I-131, I-133, tritium, and all radionuclides in particulate form, with half-lives greater than eight days, in gaseous effluents released to unrestricted areas from each reactor unit is calculated using the following expressions:

$$D_{ou} = (3.17E\text{-}08) \sum_i [\sum_k (R_{ik} W_k) (Qi)] \quad (4\text{-}3)$$

Where:

D_{ou} = the total accumulated organ dose from gaseous effluents for a particular unit, to a MEMBER OF THE PUBLIC, in mrem, at the SITE BOUNDARY or at the controlling location.

Q_i = the quantity of radionuclide i, in µCi, released in gaseous effluents from a particular unit.

R_{ik} = the dose factor for each identified radionuclide i, for pathway k (for the inhalation pathway in mrem/yr per µCi/m^3 and for the food and ground plane pathways in m^2 - mrem/yr per µCi/sec, except H-3, which has units of mrem/yr per µCi/m^3) at the controlling location. The R_{ik}'s for each age group are given in Tables 4-1 through 4-15.

3.17E-08 = the inverse of seconds per year (yr/sec).

W_k = the highest annual average dispersion or deposition parameter for the particular unit, used for estimating the dose at the site boundary or to a MEMBER OF THE PUBLIC at the controlling location for the particular unit.

= $(X/Q)_{UNIT}$, in sec/m^3 for the inhalation pathway and for all tritium calculations, for organ dose at the site boundary, from Table 3-2.

=7.47E-06 from Unit 1
=7.90E-06 from Unit 2
=8.91E-06 from Unit 3

= $(X/Q)_{UNIT}$, in sec/m^3 for the inhalation pathway and for all tritium calculations, for organ dose at the controlling location, from Table 4-16.

=2.92E-06 from Unit 1
=2.19E-06 from Unit 2
=2.31E-06 from Unit 3

= $(D/Q)_{UNIT}$, in m^{-2}, for the food and ground plane pathways, for organ dose at the site boundary, from Table 3-2.

=1.19E-08 from Unit 1
=1.34E-08 from Unit 2
=1.67E-08 from Unit 3

= $(D/Q)_{UNIT}$, in m^{-2}, for the food and ground plane pathways, for organ dose at the controlling location, from Table 4-16.

=3.25E-09 from Unit 1
=3.88E-10 from Unit 2
=4.21E-10 from Unit 3

Residences, vegetable gardens and milk animals located within 5 miles of the site will be identified during the annual land use census. The controlling pathway and location will be identified and will be used for all MEMBER OF THE PUBLIC dose evaluations.

The R_i values were calculated in accordance with the methodologies in NUREG-0133. The following site specific information was used to calculate R_i:

	Value
The length of the grazing season for milk animals (f_s). Ref. ER-OL, Section 2.1.3.4.3	0.75
The length of the grazing season for meat animals (f_s). Ref. ER-OL, Section 2.1.3.4.4	0.25
The fraction of daily feed derived from pasture while on pasture for milk animals (f_p). Ref. ER-OL, Section 2.1.3.4.3	0.35
The fraction of daily feed derived from pasture while on pasture for meat animals (f_p). Ref. ER-OL, Section 2.1.3.4.3	0.05
The fraction of year vegetables are grown, (f_l) approximation. Ref. ER-OL, Section 2.1.3.4, Table 2.1-8.	0.667
The annual absolute humidity (g/m^3), H, Ref. UFSAR, Table 2.3-16	6

4.3 Requirements: Gaseous Radwaste Treatment

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 (see Figures 6-4 and 6-5) 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 (see Figures 6-4 and 6-5) when averaged over 31 days would exceed 0.3 mrem to any organ of a MEMBER OF THE PUBLIC.

Applicability: At all times:

Action:

With radioactive gaseous waste being discharged without treatment and in excess of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report which includes the following information:

a. Identification of the inoperable equipment or subsystems and the reason for inoperability,

b. Action(s) taken to restore the inoperable equipment to OPERABLE status, and

c. Summary description of action(s) taken to prevent a recurrence.

4.3.1 Surveillance Requirements:

a. Doses due to gaseous releases from the site shall be projected at least once per 31 days, in accordance with the methodology and parameters in Section 4.3.2.

4.3.2 Implementation of the Requirement

Where possible, consideration for expected operational evolutions (i.e., outages, etc.) should be taken in the dose projections.

Dose Projection - Noble Gases

The air dose, in mrads for the current quarter is determined using the methodology described in Section 4.1.2. This information is used to determine an air dose projection for the next 31 days using the following equations:

For gamma radiation:

$$31 \text{ day } \gamma = (D\gamma \text{ qtr}/T\text{qtr})\ 31 + CD\gamma \qquad (4\text{-}4)$$

For beta radiation:

$$31 \text{ day } \beta = (D\beta \text{ qtr}/T\text{qtr})\ 31 + CD\beta \qquad (4\text{-}5)$$

Where:

$D\gamma$ qtr	=	the total gamma air dose due to noble gases released in gaseous effluents for the current quarter, in mrads, at the site boundary.
$D\beta$ qtr	=	the total beta air dose due to noble gases released in gaseous effluents for the current quarter, in mrads, at the site boundary.
Tqtr	=	the time period, in days, over which $D\gamma$ qtr and $D\beta$ qtr were integrated.
31	=	the number of days over which the dose projections are made.
31 day γ	=	the 31 day projected gamma air dose due to noble gases released in gaseous effluents, in mrads, at the site boundary.
31 day β	=	the 31 day projected beta air dose due to noble gases released in gaseous effluents, in mrads, at the site boundary.
$CD\gamma$	=	any current or projected gamma air dose, in mrads, due to noble gases released in gaseous effluents, which could have a significant impact on 31 day γ.
$CD\beta$	=	any current or projected beta air dose, in mrads, due to noble gases released in gaseous effluents, which could have a significant impact on 31 day β.

[illegible]

Dose Projection - I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than eight days

The organ dose, in mrem, for a particular unit, for the current quarter is determined using the methodology described in Section 4.2.2 of this manual. This information is used to determine an organ dose projection for the next 31 days using the following equation:

$$31day_o = (D_o\, qtr/Tqtr)31 + CD_o \qquad (4\text{-}6)$$

where:

$D_o\,qtr$ = the total organ dose from a particular unit due to I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than eight days, released in gaseous effluents for the current quarter, in mrem.

Tqtr = the time period, in days, over which $D_o qtr$ was integrated.

31 = the number of days over which the dose projections are made.

$31\ day_o$ = the 31 day projected organ dose, in mrem, from a particular unit.

CD_o = any current or projected organ dose for a particular unit, in mrem, which could have a significant impact on $31\ day_o$.

TABLE 4-1

Ri DOSE CONVERSION FACTORS FOR THE GROUND PLANE PATHWAY

NUCLIDE	T. BODY	SKIN
H-3	0.00E+00	0.00E+00
CR-51	4.66E+06	5.51E+06
MN-54	1.39E+09	1.63E+09
FE-59	2.73E+08	3.21E+08
CO-58	3.79E+08	4.44E+08
CO-60	2.15E+10	2.53E+10
ZN-65	7.47E+08	8.59E+08
SR-89	2.16E+04	2.51E+04
SR-90	0.00E+00	0.00E+00
ZR-95	2.45E+08	2.84E+08
SB-124	5.98E+08	6.90E+08
I-131	1.72E+07	2.09E+07
I-133	2.45E+06	2.98E+06
CS-134	6.86E+09	8.00E+09
CS-137	1.03E+10	1.20E+10
BA-140	2.05E+07	2.35E+07
CE-141	1.37E+07	1.54E+07
CE-144	6.95E+07	8.04E+07

TABLE 4-2

Ri DOSE CONVERSION FACTORS FOR THE VEGETATION PATHWAY - ADULT RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	2.87E+03	2.87E+03	2.87E+03	2.87E+03	2.87E+03	2.87E+03
CR-51	0.00E+00	0.00E+00	4.00E+04	2.39E+04	8.82E+03	5.31E+04	1.01E+07
MN-54	0.00E+00	2.97E+08	5.66E+07	0.00E+00	8.83E+07	0.00E+00	9.09E+08
FE-59	1.14E+08	2.68E+08	1.03E+08	0.00E+00	0.00E+00	7.49E+07	8.93E+08
CO-58	0.00E+00	2.84E+07	6.38E+07	0.00E+00	0.00E+00	0.00E+00	5.76E+08
CO-60	0.00E+00	1.59E+08	3.51E+08	0.00E+00	0.00E+00	0.00E+00	2.99E+09
ZN-65	3.00E+08	9.56E+08	4.32E+08	0.00E+00	6.39E+08	0.00E+00	6.02E+08
SR-89	9.08E+09	0.00E+00	2.61E+08	0.00E+00	0.00E+00	0.00E+00	1.46E+09
SR-90	5.76E+11	0.00E+00	1.41E+11	0.00E+00	0.00E+00	0.00E+00	1.67E+10
ZR-95	1.08E+06	3.47E+05	2.35E+05	0.00E+00	5.45E+05	0.00E+00	1.10E+09
SB-124	9.53E+07	1.80E+06	3.78E+07	2.31E+05	0.00E+00	7.42E+07	2.71E+09
I-131	5.49E+07	7.85E+07	4.50E+07	2.57E+10	1.35E+08	0.00E+00	2.07E+07
I-133	1.39E+06	2.42E+06	7.38E+05	3.56E+08	4.22E+06	0.00E+00	2.17E+06
CS-134	4.44E+09	1.06E+10	8.64E+09	0.00E+00	3.42E+09	1.13E+09	1.85E+08
CS-137	6.06E+09	8.29E+09	5.43E+09	0.00E+00	2.81E+09	9.36E+08	1.60E+08
BA-140	9.43E+07	1.19E+05	6.18E+06	0.00E+00	4.03E+04	6.78E+04	1.94E+08
CE-141	1.73E+05	1.17E+05	1.33E+04	0.00E+00	5.44E+04	0.00E+00	4.48E+08
CE-144	3.12E+07	1.30E+07	1.67E+06	0.00E+00	7.73E+06	0.00E+00	1.05E+10

TABLE 4-3

Ri DOSE CONVERSION FACTORS FOR THE VEGETATION

PATHWAY - TEEN RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	3.36E+03	3.36E+03	3.36E+03	3.36E+03	3.36E+03	3.36E+03
CR-51	0.00E+00	0.00E+00	5.60E+04	3.11E+04	1.23E+04	7.99E+04	9.41E+06
MN-54	0.00E+00	4.41E+08	8.74E+07	0.00E+00	1.31E+08	0.00E+00	9.04E+08
FE-59	1.69E+08	3.94E+08	1.52E+08	0.00E+00	0.00E+00	1.24E+08	9.31E+08
CO-58	0.00E+00	4.16E+07	9.59E+07	0.00E+00	0.00E+00	0.00E+00	5.74E+08
CO-60	0.00E+00	2.42E+08	5.45E+08	0.00E+00	0.00E+00	0.00E+00	3.15E+09
ZN-65	4.11E+08	1.43E+09	6.65E+08	0.00E+00	9.12E+08	0.00E+00	6.04E+08
SR-89	1.43E+10	0.00E+00	4.10E+08	0.00E+00	0.00E+00	0.00E+00	1.70E+09
SR-90	7.30E+11	0.00E+00	1.80E+11	0.00E+00	0.00E+00	0.00E+00	2.05E+10
ZR-95	1.64E+06	5.17E+05	3.56E+05	0.00E+00	7.60E+05	0.00E+00	1.19E+09
SB-124	1.47E+08	2.70E+06	5.73E+07	3.33E+05	0.00E+00	1.28E+08	2.96E+09
I-131	5.29E+07	7.41E+07	3.98E+07	2.16E+10	1.28E+08	0.00E+00	1.47E+07
I-133	1.29E+06	2.19E+06	6.68E+05	3.06E+08	3.84E+06	0.00E+00	1.66E+06
CS-134	6.90E+09	1.62E+10	7.53E+09	0.00E+00	5.16E+09	1.97E+09	2.02E+08
CS-137	9.86E+09	1.31E+10	4.57E+09	0.00E+00	4.46E+09	1.73E+09	1.87E+08
BA-140	1.07E+08	1.31E+05	6.88E+06	0.00E+00	4.44E+04	8.80E+04	1.65E+08
CE-141	2.61E+05	1.74E+05	2.00E+04	0.00E+00	8.19E+04	0.00E+00	4.98E+08
CE-144	5.11E+07	2.12E+07	2.75E+06	0.00E+00	1.26E+07	0.00E+00	1.29E+10

TABLE 4-4

Ri DOSE CONVERSION FACTORS FOR THE VEGETATION PATHWAY - CHILD RECEPTOR

NUCLIDES	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	5.23E+03	5.23E+03	5.23E+03	5.23E+03	5.23E+03	5.23E+03
CR-51	0.00E+00	0.00E+00	1.08E+05	6.02E+04	1.64E+04	1.10E+05	5.75E+06
MN-54	0.00E+00	6.49E+08	1.73E+08	0.00E+00	1.82E+08	0.00E+00	5.45E+08
FE-59	3.79E+08	6.13E+08	3.05E+08	0.00E+00	0.00E+00	1.78E+08	6.38E+08
CO-58	0.00E+00	6.21E+07	1.90E+08	0.00E+00	0.00E+00	0.00E+00	3.62E+08
CO-60	0.00E+00	3.70E+08	1.09E+09	0.00E+00	0.00E+00	0.00E+00	2.05E+09
ZN-65	7.93E+08	2.11E+09	1.31E+09	0.00E+00	1.33E+09	0.00E+00	3.71E+08
SR-89	3.44E+10	0.00E+00	9.83E+08	0.00E+00	0.00E+00	0.00E+00	1.33E+09
SR-90	1.22E+12	0.00E+00	3.09E+11	0.00E+00	0.00E+00	0.00E+00	1.64E+10
ZR-95	3.72E+06	8.17E+05	7.27E+05	0.00E+00	1.17E+06	0.00E+00	8.52E+08
SB-124	3.38E+08	4.39E+06	1.19E+08	7.47E+05	0.00E+00	1.88E+08	2.12E+09
I-131	9.95E+07	1.00E+08	5.68E+07	3.31E+10	1.64E+08	0.00E+00	8.90E+06
I-133	2.36E+06	2.91E+06	1.10E+06	5.41E+08	4.85E+06	0.00E+00	1.17E+06
CS-134	1.57E+10	2.57E+10	5.43E+09	0.00E+00	7.98E+09	2.86E+09	1.39E+08
CS-137	2.34E+10	2.24E+10	3.31E+09	0.00E+00	7.31E+09	2.63E+09	1.40E+08
BA-140	2.20E+08	1.93E+05	1.28E+07	0.00E+00	6.27E+04	1.15E+05	1.11E+08
CE-141	6.15E+05	3.07E+05	4.55E+04	0.00E+00	1.34E+05	0.00E+00	3.83E+08
CE-144	1.24E+08	3.89E+07	6.62E+06	0.00E+00	2.15E+07	0.00E+00	1.01E+10

TABLE 4-5

Ri DOSE CONVERSION FACTORS FOR THE GRASS-COW-MEAT PATHWAY - ADULT RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	4.33E+02	4.33E+02	4.33E+02	4.33E+02	4.33E+02	4.33E+02
CR-51	0.00E+00	0.00E+00	3.44E+02	2.06E+02	7.58E+01	4.57E+02	8.65E+04
MN-54	0.00E+00	2.71E+06	5.18E+05	0.00E+00	8.08E+05	0.00E+00	8.31E+06
FE-59	2.60E+07	6.11E+07	2.34E+07	0.00E+00	0.00E+00	1.71E+07	2.04E+08
CO-58	0.00E+00	2.84E+06	6.36E+06	0.00E+00	0.00E+00	0.00E+00	5.75E+07
CO-60	0.00E+00	2.61E+07	5.76E+07	0.00E+00	0.00E+00	0.00E+00	4.90E+08
ZN-65	9.97E+07	3.17E+08	1.43E+08	0.00E+00	2.12E+08	0.00E+00	2.00E+08
SR-89	3.41E+07	0.00E+00	9.79E+05	0.00E+00	0.00E+00	0.00E+00	5.47E+06
SR-90	4.43E+09	0.00E+00	1.09E+09	0.00E+00	0.00E+00	0.00E+00	1.28E+08
ZR-95	2.68E+05	8.58E+04	5.81E+04	0.00E+00	1.35E+05	0.00E+00	2.72E+08
SB-124	2.67E+06	5.05E+04	1.06E+06	6.48E+03	0.00E+00	2.08E+06	7.59E+07
I-131	1.36E+05	1.94E+05	1.11E+05	6.37E+07	3.33E+05	0.00E+00	5.13E+04
I-133	4.56E-03	7.94E-03	2.42E-03	1.17E+00	1.39E-02	0.00E+00	7.14E-03
CS-134	2.17E+08	5.17E+08	4.23E+08	0.00E+00	1.67E+08	5.56E+07	9.05E+06
CS-137	3.11E+08	4.25E+08	2.78E+08	0.00E+00	1.44E+08	4.79E+07	8.22E+06
BA-140	4.35E+05	5.46E+02	2.85E+04	0.00E+00	1.86E+02	3.13E+02	8.95E+05
CE-141	8.87E+02	6.00E+02	6.80E+01	0.00E+00	2.79E+02	0.00E+00	2.29E+06
CE-144	4.23E+05	1.77E+05	2.27E+04	0.00E+00	1.05E+05	0.00E+00	1.43E+08

TABLE 4-6

Ri DOSE CONVERSION FACTORS FOR THE GRASS-COW-MEAT

PATHWAY - TEEN RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	2.58E+02	2.58E+02	2.58E+02	2.58E+02	2.58E+02	2.58E+02
CR-51	0.00E+00	0.00E+00	2.75E+02	1.53E+02	6.03E+01	3.93E+02	4.62E+04
MN-54	0.00E+00	2.07E+06	4.11E+05	0.00E+00	6.18E+05	0.00E+00	4.25E+06
FE-59	2.08E+07	4.85E+07	1.87E+07	0.00E+00	0.00E+00	1.53E+07	1.15E+08
CO-58	0.00E+00	2.19E+06	5.04E+06	0.00E+00	0.00E+00	0.00E+00	3.02E+07
CO-60	0.00E+00	2.03E+07	4.56E+07	0.00E+00	0.00E+00	0.00E+00	2.64E+08
ZN-65	7.01E+07	2.43E+08	1.14E+08	0.00E+00	1.56E+08	0.00E+00	1.03E+08
SR-89	2.88E+07	0.00E+00	8.24E+05	0.00E+00	0.00E+00	0.00E+00	3.43E+06
SR-90	2.87E+09	0.00E+00	7.08E+08	0.00E+00	0.00E+00	0.00E+00	8.05E+07
ZR-95	2.14E+05	6.76E+04	4.65E+04	0.00E+00	9.93E+04	0.00E+00	1.56E+08
SB-124	2.18E+06	4.02E+04	8.52E+05	4.95E+03	0.00E+00	1.91E+06	4.40E+07
I-131	1.13E+05	1.58E+05	8.49E+04	4.61E+07	2.72E+05	0.00E+00	3.13E+04
I-133	3.82E-03	6.48E-03	1.98E-03	9.04E-01	1.14E-02	0.00E+00	4.90E-03
CS-134	1.73E+08	4.07E+08	1.89E+08	0.00E+00	1.29E+08	4.94E+07	5.06E+06
CS-137	2.58E+08	3.43E+08	1.20E+08	0.00E+00	1.17E+08	4.54E+07	4.88E+06
BA-140	3.59E+05	4.40E+02	2.31E+04	0.00E+00	1.49E+02	2.96E+02	5.54E+05
CE-141	7.45E+02	4.97E+02	5.71E+01	0.00E+00	2.34E+02	0.00E+00	1.42E+06
CE-144	3.56E+05	1.47E+05	1.91E+04	0.00E+00	8.80E+04	0.00E+00	8.96E+07

TABLE 4-7

Ri DOSE CONVERSION FACTORS FOR THE GRASS-COW-MEAT PATHWAY - CHILD RECEPTOR

NUCLIDES	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	3.12E+02	3.12E+02	3.12E+02	3.12E+02	3.12E+02	3.12E+02
CR-51	0.00E+00	0.00E+00	4.29E+02	2.38E+02	6.51E+01	4.35E+02	2.28E+04
MN-54	0.00E+00	2.37E+06	6.31E+05	0.00E+00	6.64E+05	0.00E+00	1.99E+06
FE-59	3.68E+07	5.96E+07	2.97E+07	0.00E+00	0.00E+00	1.73E+07	6.20E+07
CO-58	0.00E+00	2.55E+06	7.82E+06	0.00E+00	0.00E+00	0.00E+00	1.49E+07
CO-60	0.00E+00	2.40E+07	7.09E+07	0.00E+00	0.00E+00	0.00E+00	1.33E+08
ZN-65	1.05E+08	2.80E+08	1.74E+08	0.00E+00	1.77E+08	0.00E+00	4.92E+07
SR-89	5.45E+07	0.00E+00	1.56E+06	0.00E+00	0.00E+00	0.00E+00	2.11E+06
SR-90	3.70E+09	0.00E+00	9.39E+08	0.00E+00	0.00E+00	0.00E+00	4.99E+07
ZR-95	3.81E+05	8.36E+04	7.45E+04	0.00E+00	1.20E+05	0.00E+00	8.73E+07
SB-124	3.95E+06	5.12E+04	1.38E+06	8.72E+03	0.00E+00	2.19E+06	2.47E+07
I-131	2.09E+05	2.11E+05	1.20E+05	6.96E+07	3.46E+05	0.00E+00	1.87E+04
I-133	7.09E-03	8.77E-03	3.32E-03	1.63E+00	1.46E-02	0.00E+00	3.53E-03
CS-134	3.05E+08	5.00E+08	1.06E+08	0.00E+00	1.55E+08	5.56E+07	2.70E+06
CS-137	4.75E+08	4.55E+08	6.71E+07	0.00E+00	1.48E+08	5.33E+07	2.85E+06
BA-140	6.63E+05	5.81E+02	3.87E+04	0.00E+00	1.89E+02	3.46E+02	3.36E+05
CE-141	1.40E+03	6.99E+02	1.04E+02	0.00E+00	3.07E+02	0.00E+00	8.72E+05
CE-144	6.72E+05	2.11E+05	3.58E+04	0.00E+00	1.17E+05	0.00E+00	5.49E+07

TABLE 4-8

Ri DOSE CONVERSION FACTORS FOR THE GRASS-COW-MILK PATHWAY - ADULT RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	1.02E+03	1.02E+03	1.02E+03	1.02E+03	1.02E+03	1.02E+03
CR-51	0.00E+00	0.00E+00	8.28E+03	4.95E+03	1.82E+03	1.10E+04	2.08E+06
MN-54	0.00E+00	3.99E+06	7.61E+05	0.00E+00	1.19E+06	0.00E+00	1.22E+07
FE-59	9.69E+06	2.28E+07	8.73E+06	0.00E+00	0.00E+00	6.36E+06	7.59E+07
CO-58	0.00E+00	1.74E+06	3.90E+06	0.00E+00	0.00E+00	0.00E+00	3.53E+07
CO-60	0.00E+00	8.41E+06	1.85E+07	0.00E+00	0.00E+00	0.00E+00	1.58E+08
ZN-65	6.34E+08	2.02E+09	9.12E+08	0.00E+00	1.35E+09	0.00E+00	1.27E+09
SR-89	4.90E+08	0.00E+00	1.41E+07	0.00E+00	0.00E+00	0.00E+00	7.86E+07
SR-90	2.43E+10	0.00E+00	5.96E+09	0.00E+00	0.00E+00	0.00E+00	7.02E+08
ZR-95	3.39E+02	1.09E+02	7.37E+01	0.00E+00	1.71E+02	0.00E+00	3.45E+05
SB-124	9.11E+06	1.72E+05	3.61E+06	2.21E+04	0.00E+00	7.09E+06	2.59E+08
I-131	7.77E+07	1.11E+08	6.37E+07	3.64E+10	1.91E+08	0.00E+00	2.93E+07
I-133	1.02E+06	1.77E+06	5.39E+05	2.60E+08	3.08E+06	0.00E+00	1.59E+06
CS-134	2.83E+09	6.73E+09	5.50E+09	0.00E+00	2.18E+09	7.23E+08	1.18E+08
CS-137	3.83E+09	5.24E+09	3.43E+09	0.00E+00	1.78E+09	5.91E+08	1.01E+08
BA-140	7.11E+06	8.93E+03	4.66E+05	0.00E+00	3.04E+03	5.11E+03	1.46E+07
CE-141	8.73E+03	5.90E+03	6.70E+02	0.00E+00	2.74E+03	0.00E+00	2.26E+07
CE-144	1.01E+06	4.21E+05	5.41E+04	0.00E+00	2.50E+05	0.00E+00	3.41E+08

TABLE 4-9

Ri DOSE CONVERSION FACTORS FOR THE GRASS-COW-MILK PATHWAY - TEEN RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	1.33E+03	1.33E+03	1.33E+03	1.33E+03	1.33E+03	1.33E+03
CR-51	0.00E+00	0.00E+00	1.45E+04	8.03E+03	3.17E+03	2.06E+04	2.43E+06
MN-54	0.00E+00	6.64E+06	1.32E+06	0.00E+00	1.98E+06	0.00E+00	1.36E+07
FE-59	1.69E+07	3.95E+07	1.52E+07	0.00E+00	0.00E+00	1.24E+07	9.33E+07
CO-58	0.00E+00	2.93E+06	6.76E+06	0.00E+00	0.00E+00	0.00E+00	4.04E+07
CO-60	0.00E+00	1.42E+07	3.21E+07	0.00E+00	0.00E+00	0.00E+00	1.86E+08
ZN-65	9.74E+08	3.38E+09	1.58E+09	0.00E+00	2.17E+09	0.00E+00	1.43E+09
SR-89	9.03E+08	0.00E+00	2.59E+07	0.00E+00	0.00E+00	0.00E+00	1.08E+08
SR-90	3.43E+10	0.00E+00	8.48E+09	0.00E+00	0.00E+00	0.00E+00	9.64E+08
ZR-95	5.94E+02	1.87E+02	1.29E+02	0.00E+00	2.75E+02	0.00E+00	4.32E+05
SB-124	1.62E+07	2.99E+05	6.34E+06	3.69E+04	0.00E+00	1.42E+07	3.27E+08
I-131	1.41E+08	1.98E+08	1.06E+08	5.76E+10	3.40E+08	0.00E+00	3.91E+07
I-133	1.86E+06	3.15E+06	9.60E+05	4.39E+08	5.52E+06	0.00E+00	2.38E+06
CS-134	4.91E+09	1.16E+10	5.36E+09	0.00E+00	3.67E+09	1.40E+09	1.44E+08
CS-137	6.95E+09	9.24E+09	3.22E+09	0.00E+00	3.15E+09	1.22E+09	1.32E+08
BA-140	1.28E+07	1.57E+04	8.27E+05	0.00E+00	5.33E+03	1.06E+04	1.98E+07
CE-141	1.60E+04	1.07E+04	1.23E+03	0.00E+00	5.03E+03	0.00E+00	3.06E+07
CE-144	1.86E+06	7.68E+05	9.97E+04	0.00E+00	4.59E+05	0.00E+00	4.67E+08

TABLE 4-10

Ri DOSE CONVERSION FACTORS FOR THE GRASS-COW-MILK

PATHWAY - CHILD RECEPTOR

NUCLIDES	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	2.09E+03	2.09E+03	2.09E+03	2.09E+03	2.09E+03	2.09E+03
CR-51	0.00E+00	0.00E+00	2.95E+04	1.64E+04	4.47E+03	2.99E+04	1.56E+06
MN-54	0.00E+00	9.94E+06	2.65E+06	0.00E+00	2.79E+06	0.00E+00	8.34E+06
FE-59	3.92E+07	6.35E+07	3.16E+07	0.00E+00	0.00E+00	1.84E+07	6.61E+07
CO-58	0.00E+00	4.48E+06	1.37E+07	0.00E+00	0.00E+00	0.00E+00	2.61E+07
CO-60	0.00E+00	2.21E+07	6.52E+07	0.00E+00	0.00E+00	0.00E+00	1.23E+08
ZN-65	1.91E+09	5.09E+09	3.17E+09	0.00E+00	3.21E+09	0.00E+00	8.95E+08
SR-89	2.23E+09	0.00E+00	6.38E+07	0.00E+00	0.00E+00	0.00E+00	8.65E+07
SR-90	5.80E+10	0.00E+00	1.47E+10	0.00E+00	0.00E+00	0.00E+00	7.81E+08
ZR-95	1.38E+03	3.03E+02	2.70E+02	0.00E+00	4.34E+02	0.00E+00	3.16E+05
SB-124	3.84E+07	4.99E+05	1.35E+07	8.49E+04	0.00E+00	2.13E+07	2.41E+08
I-131	3.42E+08	3.44E+08	1.96E+08	1.14E+11	5.65E+08	0.00E+00	3.06E+07
I-133	4.51E+06	5.57E+06	2.11E+06	1.04E+09	9.29E+06	0.00E+00	2.25E+06
CS-134	1.13E+10	1.86E+10	3.92E+09	0.00E+00	5.76E+09	2.07E+09	1.00E+08
CS-137	1.67E+10	1.60E+10	2.36E+09	0.00E+00	5.22E+09	1.88E+09	1.00E+08
BA-140	3.10E+07	2.71E+04	1.81E+06	0.00E+00	8.83E+03	1.62E+04	1.57E+07
CE-141	3.94E+04	1.97E+04	2.92E+03	0.00E+00	8.62E+03	0.00E+00	2.45E+07
CE-144	4.57E+06	1.43E+06	2.44E+05	0.00E+00	7.94E+05	0.00E+00	3.74E+08

TABLE 4-11

Ri DOSE CONVERSION FACTORS FOR THE GRASS-COW-MILK PATHWAY - INFANT RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	3.18E+03	3.18E+03	3.18E+03	3.18E+03	3.18E+03	3.18E+03
CR-51	0.00E+00	0.00E+00	4.67E+04	3.05E+04	6.66E+03	5.93E+04	1.36E+06
MN-54	0.00E+00	1.85E+07	4.19E+06	0.00E+00	4.10E+06	0.00E+00	6.79E+06
FE-59	7.32E+07	1.28E+08	5.04E+07	0.00E+00	0.00E+00	3.78E+07	6.11E+07
CO-58	0.00E+00	8.96E+06	2.23E+07	0.00E+00	0.00E+00	0.00E+00	2.23E+07
CO-60	0.00E+00	4.52E+07	1.07E+08	0.00E+00	0.00E+00	0.00E+00	1.07E+08
ZN-65	2.57E+09	8.81E+09	4.06E+09	0.00E+00	4.27E+09	0.00E+00	7.44E+09
SR-89	4.25E+09	0.00E+00	1.22E+08	0.00E+00	0.00E+00	0.00E+00	8.74E+07
SR-90	6.31E+10	0.00E+00	1.61E+10	0.00E+00	0.00E+00	0.00E+00	7.88E+08
ZR-95	2.45E+03	5.97E+02	4.23E+02	0.00E+00	6.43E+02	0.00E+00	2.97E+05
SB-124	7.41E+07	1.09E+06	2.30E+07	1.97E+05	0.00E+00	4.64E+07	2.29E+08
I-131	7.14E+08	8.42E+08	3.70E+08	2.77E+11	9.83E+08	0.00E+00	3.00E+07
I-133	9.52E+06	1.39E+07	4.06E+06	2.52E+09	1.63E+07	0.00E+00	2.35E+06
CS-134	1.82E+10	3.40E+10	3.44E+09	0.00E+00	8.76E+09	3.59E+09	9.24E+07
CS-137	2.67E+10	3.13E+10	2.22E+09	0.00E+00	8.39E+09	3.40E+09	9.78E+07
BA-140	6.37E+07	6.37E+04	3.28E+06	0.00E+00	1.51E+04	3.91E+04	1.57E+07
CE-141	7.81E+04	4.77E+04	5.61E+03	0.00E+00	1.47E+04	0.00E+00	2.46E+07
CE-144	6.55E+06	2.68E+06	3.67E+05	0.00E+00	1.08E+06	0.00E+00	3.76E+08

TABLE 4-12

Ri DOSE CONVERSION FACTORS FOR THE INHALATION

PATHWAY - ADULT RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	1.26E+03	1.26E+03	1.26E+03	1.26E+03	1.26E+03	1.26E+03
CR-51	0.00E+00	0.00E+00	1.00E+02	5.95E+01	2.28E+01	1.44E+04	3.32E+03
MN-54	0.00E+00	3.96E+04	6.30E+03	0.00E+00	9.84E+03	1.40E+06	7.74E+04
FE-59	1.18E+04	2.78E+04	1.06E+04	0.00E+00	0.00E+00	1.02E+06	1.88E+05
CO-58	0.00E+00	1.58E+03	2.07E+03	0.00E+00	0.00E+00	9.28E+05	1.06E+05
CO-60	0.00E+00	1.15E+04	1.48E+04	0.00E+00	0.00E+00	5.97E+06	2.85E+05
ZN-65	3.24E+04	1.03E+05	4.66E+04	0.00E+00	6.90E+04	8.64E+05	5.34E+04
SR-89	3.04E+05	0.00E+00	8.72E+03	0.00E+00	0.00E+00	1.40E+06	3.50E+05
SR-90	9.92E+07	0.00E+00	6.10E+06	0.00E+00	0.00E+00	9.60E+06	7.22E+05
ZR-95	1.07E+05	3.44E+04	2.33E+04	0.00E+00	5.42E+04	1.77E+06	1.50E+05
SB-124	3.12E+04	5.89E+02	1.24E+04	7.55E+01	0.00E+00	2.48E+06	4.06E+05
I-131	2.52E+04	3.58E+04	2.05E+04	1.19E+07	6.13E+04	0.00E+00	6.28E+03
I-133	8.64E+03	1.48E+04	4.52E+03	2.15E+06	2.58E+04	0.00E+00	8.88E+03
CS-134	3.73E+05	8.48E+05	7.28E+05	0.00E+00	2.87E+05	9.76E+04	1.04E+04
CS-137	4.78E+05	6.21E+05	4.28E+05	0.00E+00	2.22E+05	7.52E+04	8.40E+03
BA-140	3.90E+04	4.90E+01	2.57E+03	0.00E+00	1.67E+01	1.27E+06	2.18E+05
CE-141	1.99E+04	1.35E+04	1.53E+03	0.00E+00	6.26E+03	3.62E+05	1.20E+05
CE-144	3.43E+06	1.43E+06	1.84E+05	0.00E+00	8.48E+05	7.78E+06	8.16E+05

TABLE 4-13

Ri DOSE CONVERSION FACTORS FOR THE INHALATION

PATHWAY - TEEN RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	1.27E+03	1.27E+03	1.27E+03	1.27E+03	1.27E+03	1.27E+03
CR-51	0.00E+00	0.00E+00	1.35E+02	7.50E+01	3.07E+01	2.10E+04	3.00E+03
MN-54	0.00E+00	5.11E+04	8.40E+03	0.00E+00	1.27E+04	1.98E+06	6.68E+04
FE-59	1.59E+04	3.70E+04	1.43E+04	0.00E+00	0.00E+00	1.53E+06	1.78E+05
CO-58	0.00E+00	2.07E+03	2.78E+03	0.00E+00	0.00E+00	1.34E+06	9.52E+04
CO-60	0.00E+00	1.51E+04	1.98E+04	0.00E+00	0.00E+00	8.72E+06	2.59E+05
ZN-65	3.86E+04	1.34E+05	6.24E+04	0.00E+00	8.64E+04	1.24E+06	4.66E+04
SR-89	4.34E+05	0.00E+00	1.25E+04	0.00E+00	0.00E+00	2.42E+06	3.71E+05
SR-90	1.08E+08	0.00E+00	6.68E+06	0.00E+00	0.00E+00	1.65E+07	7.65E+05
ZR-95	1.46E+05	4.58E+04	3.15E+04	0.00E+00	6.74E+04	2.69E+06	1.49E+05
SB-124	4.30E+04	7.94E+02	1.68E+04	9.76E+01	0.00E+00	3.85E+06	3.98E+05
I-131	3.54E+04	4.91E+04	2.64E+04	1.46E+07	8.40E+04	0.00E+00	6.49E+03
I-133	1.22E+04	2.05E+04	6.22E+03	2.92E+06	3.59E+04	0.00E+00	1.03E+04
CS-134	5.02E+05	1.13E+06	5.49E+05	0.00E+00	3.75E+05	1.46E+05	9.76E+03
CS-137	6.70E+05	8.48E+05	3.11E+05	0.00E+00	3.04E+05	1.21E+05	8.48E+03
BA-140	5.47E+04	6.70E+01	3.52E+03	0.00E+00	2.28E+01	2.03E+06	2.29E+05
CE-141	2.84E+04	1.90E+04	2.17E+03	0.00E+00	8.88E+03	6.14E+05	1.26E+05
CE-144	4.89E+06	2.02E+06	2.62E+05	0.00E+00	1.21E+06	1.34E+07	8.64E+05

TABLE 4-14

Ri DOSE CONVERSION FACTORS FOR THE INHALATION

PATHWAY - CHILD RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	1.12E+03	1.12E+03	1.12E+03	1.12E+03	1.12E+03	1.12E+03
CR-51	0.00E+00	0.00E+00	1.54E+02	8.55E+01	2.43E+01	1.70E+04	1.08E+03
MN-54	0.00E+00	4.29E+04	9.51E+03	0.00E+00	1.00E+04	1.58E+06	2.29E+04
FE-59	2.07E+04	3.34E+04	1.67E+04	0.00E+00	0.00E+00	1.27E+06	7.07E+04
CO-58	0.00E+00	1.77E+03	3.16E+03	0.00E+00	0.00E+00	1.11E+06	3.44E+04
CO-60	0.00E+00	1.31E+04	2.26E+04	0.00E+00	0.00E+00	7.07E+06	9.62E+04
ZN-65	4.26E+04	1.13E+05	7.03E+04	0.00E+00	7.14E+04	9.95E+05	1.63E+04
SR-89	5.99E+05	0.00E+00	1.72E+04	0.00E+00	0.00E+00	2.16E+06	1.67E+05
SR-90	1.01E+08	0.00E+00	6.44E+06	0.00E+00	0.00E+00	1.48E+07	3.43E+05
ZR-95	1.90E+05	4.18E+04	3.70E+04	0.00E+00	5.96E+04	2.23E+06	6.11E+04
SB-124	5.74E+04	7.40E+02	2.00E+04	1.26E+02	0.00E+00	3.24E+06	1.64E+05
I-131	4.81E+04	4.81E+04	2.73E+04	1.62E+07	7.88E+04	0.00E+00	2.84E+03
I-133	1.66E+04	2.03E+04	7.70E+03	3.85E+06	3.38E+04	0.00E+00	5.48E+03
CS-134	6.51E+05	1.01E+06	2.25E+05	0.00E+00	3.30E+05	1.21E+05	3.85E+03
CS-137	9.07E+05	8.25E+05	1.28E+05	0.00E+00	2.82E+05	1.04E+05	3.62E+03
BA-140	7.40E+04	6.48E+01	4.33E+03	0.00E+00	2.11E+01	1.74E+06	1.02E+05
CE-141	3.92E+04	1.95E+04	2.90E+03	0.00E+00	8.55E+03	5.44E+05	5.66E+04
CE-144	6.77E+06	2.12E+06	3.61E+05	0.00E+00	1.17E+06	1.20E+07	3.89E+05

TABLE 4-15

Ri DOSE CONVERSION FACTORS FOR THE INHALATION PATHWAY - INFANT RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	6.47E+02	6.47E+02	6.47E+02	6.47E+02	6.47E+02	6.47E+02
CR-51	0.00E+00	0.00E+00	8.95E+01	5.75E+01	1.32E+01	1.28E+04	3.57E+02
MN-54	0.00E+00	2.53E+04	4.98E+03	0.00E+00	4.98E+03	1.00E+06	7.06E+03
FE-59	1.36E+04	2.35E+04	9.48E+03	0.00E+00	0.00E+00	1.02E+06	2.48E+04
CO-58	0.00E+00	1.22E+03	1.82E+03	0.00E+00	0.00E+00	7.77E+05	1.11E+04
CO-60	0.00E+00	8.02E+03	1.18E+04	0.00E+00	0.00E+00	4.51E+06	3.19E+04
ZN-65	1.93E+04	6.26E+04	3.11E+04	0.00E+00	3.25E+04	6.47E+05	5.14E+04
SR-89	3.98E+05	0.00E+00	1.14E+04	0.00E+00	0.00E+00	2.03E+06	6.40E+04
SR-90	4.09E+07	0.00E+00	2.59E+06	0.00E+00	0.00E+00	1.12E+07	1.31E+05
ZR-95	1.15E+05	2.79E+04	2.03E+04	0.00E+00	3.11E+04	1.75E+06	2.17E+04
SB-124	3.79E+04	5.56E+02	1.20E+04	1.01E+02	0.00E+00	2.65E+06	5.91E+04
I-131	3.79E+04	4.44E+04	1.96E+04	1.48E+07	5.18E+04	0.00E+00	1.06E+03
I-133	1.32E+04	1.92E+04	5.60E+03	3.56E+06	2.24E+04	0.00E+00	2.16E+03
CS-134	3.96E+05	7.03E+05	7.45E+04	0.00E+00	1.90E+05	7.97E+04	1.33E+03
CS-137	5.49E+05	6.12E+05	4.55E+04	0.00E+00	1.72E+05	7.13E+04	1.33E+03
BA-140	5.60E+04	5.60E+01	2.90E+03	0.00E+00	1.34E+01	1.60E+06	3.84E+04
CE-141	2.77E+04	1.67E+04	1.99E+03	0.00E+00	5.25E+03	5.17E+05	2.16E+04
CE-144	3.19E+06	1.21E+06	1.76E+05	0.00E+00	5.38E+05	9.84E+06	1.48E+05

TABLE 4-16

PALO VERDE NUCLEAR GENERATING STATION DISPERSION

AND DEPOSITION PARAMETERS FOR LONG TERM RELEASES

AT THE NEAREST PATHWAY LOCATIONS CENTERED ON UNIT 1

DIRECTION	X/Q (Sec/m^3)	RESIDENCE(b) Dist. Miles	D/Q (m^{-2})	X/Q (Sec/m^3)	GARDEN(b) Dist. Miles	D/Q (m^{-2})	X/Q (Sec/m^3)	MILK(b) Dist. Miles	D/Q (m^{-2})	
N	2.92E-06	1.4	3.25E-09	2.92E-06	1.4	3.25E-09	7.03E-07	(a)	3.48E-10	
NNE	1.81E-06	1.8	2.88E-09	4.70E-07	(a)	4.04E-10	4.70E-07	(a)	4.04E-10	
NE	1.95E-06	1.9	3.85E-09	1.76E-06	2.1	3.29E-09	5.77E-07	(a)	6.51E-10	
ENE	1.03E-06	2.7	1.08E-09	1.03E-06	2.7	1.08E-09	3.86E-07	(a)	2.86E-10	
E	9.39E-07	2.8	6.68E-10	3.71E-07	(a)	1.87E-10	3.71E-07	(a)	1.87E-10	
ESE	6.37E-07	3.7	2.84E-10	4.12E-07	4.6	1.60E-10	4.12E-07	4.6	1.60E-10	goat
SE	8.83E-07	4.1	2.61E-10	8.83E-07	4.1	2.61E-10	5.84E-07	(a)	1.52E-10	
SSE	1.27E-06	4.7	2.61E-10	1.09E-06	(a)	2.15E-10	1.09E-06	(a)	2.15E-10	
S	2.58E-06	4.6	4.85E-10	2.09E-06	5.2	3.59E-10	2.13E-06	5.1	3.71E-10	cow
SSW	3.26E-06	3.5	8.26E-10	2.28E-06	(a)	4.53E-10	2.28E-06	(a)	4.53E-10	
SW	2.80E-06	2.9	9.10E-10	1.58E-06	(a)	3.56E-10	1.58E-06	(a)	3.56E-10	
WSW	1.95E-06	2.6	1.09E-09	8.55E-07	(a)	3.18E-10	8.55E-07	(a)	3.18E-10	
W	7.54E-07	(a)	4.44E-10	7.54E-07	(a)	4.44E-10	7.54E-07	(a)	4.44E-10	
WNW	6.03E-07	(a)	3.25E-10	6.03E-07	(a)	3.25E-10	6.03E-07	(a)	3.25E-10	
NW	8.24E-07	3.8	5.25E-10	7.55E-07	4.1	4.61E-10	6.02E-07	(a)	3.27E-10	
NNW	1.46E-06	2.0	1.47E-09	5.20E-07	(a)	3.04E-10	5.20E-07	(a)	3.04E-10	

(a) 5-mile value used since there is no pathway located within the sector up to five miles.

(b) Controlling locations are discussed in Appendix A.

References: 1984 Land Use Census (letter ANPM-21221-JRM/LEB). NUS Corporation letters NUS-ANPP-1385 and NUS-ANPP-1386.

TABLE 4-16 (Continued)

PALO VERDE NUCLEAR GENERATING STATION DISPERSION

AND DEPOSITION PARAMETERS FOR LONG TERM RELEASES

AT THE NEAREST PATHWAY LOCATIONS CENTERED ON UNIT 2

DIRECTION	X/Q (Sec/m^3)	RESIDENCE(b) Dist. Miles	D/Q (m^{-2})	X/Q (Sec/m^3)	GARDEN(b) Dist. Miles	D/Q (m^{-2})	X/Q (Sec/m^3)	MILK(b) Dist. Miles	D/Q (m^{-2})
N	2.73E-06	1.5	2.92E-09	2.39E-06	1.7	2.35E-09	7.03E-07	(a)	3.48E-10
NNE	2.20E-06	1.5	3.87E-09	2.20E-06	1.5	3.87E-09	4.70E-07	(a)	4.04E-10
NE	1.85E-06	2.0	3.55E-09	1.57E-06	2.3	2.78E-09	5.77E-07	(a)	6.51E-10
ENE	1.03E-06	2.7	1.08E-09	1.03E-06	2.7	1.08E-09	3.86E-07	(a)	2.86E-10
E	8.80E-07	3.0	6.06E-10	3.71E-07	(a)	1.87E-10	3.71E-07	(a)	1.87E-10
ESE	6.25E-07	3.7	2.76E-10	3.96E-07	4.7	1.51E-10	3.96E-07	4.7	1.51E-10 goat
SE	9.06E-07	4.0	2.72E-10	9.06E-07	4.0	2.72E-10	5.84E-07	(a)	1.52E-10
SSE	1.34E-06	4.5	2.81E-10	1.09E-06	(a)	2.15E-10	1.09E-06	(a)	2.15E-10
S	2.63E-06	4.5	5.01E-10	2.19E-06	5.0	3.88E-10	2.19E-06	5.0	3.88E-10 cow
SSW	3.48E-06	3.2	9.19E-10	2.28E-06	(a)	4.53E-10	2.28E-06	(a)	4.53E-10
SW	2.93E-06	2.7	9.75E-10	1.58E-06	(a)	3.56E-10	1.58E-06	(a)	3.56E-10
WSW	2.01E-06	2.5	1.16E-09	8.55E-07	(a)	3.18E-10	8.55E-07	(a)	3.18E-10
W	7.54E-07	(a)	4.44E-10	7.54E-07	(a)	4.44E-10	7.54E-07	(a)	4.44E-10
WNW	6.03E-07	(a)	3.25E-10	6.03E-07	(a)	3.25E-10	6.03E-07	(a)	3.25E-10
NW	7.84E-07	4.0	4.88E-10	7.84E-07	4.0	4.88E-10	6.02E-07	(a)	3.27E-10
NNW	1.46E-06	2.0	1.47E-09	5.20E-07	5.0	3.04E-10	5.20E-07	(a)	3.04E-10

(a) 5-mile value used since there is no pathway located within the sector up to five miles.

(b) Controlling locations are discussed in Appendix A.

References: 1984 Land Use Census (letter ANPM-21221-JRM/LEB). NUS Corporation letters NUS-ANPP-1385 and NUS-ANPP-1386.

TABLE 4-16 (Continued)

PALO VERDE NUCLEAR GENERATING STATION DISPERSION

AND DEPOSITION PARAMETERS FOR LONG TERM RELEASES

AT THE NEAREST PATHWAY LOCATIONS CENTERED ON UNIT 3

DIRECTION	X/Q (Sec/m^3)	RESIDENCE(b) Dist. Miles	D/Q (m^{-2})	X/Q (Sec/m^3)	GARDEN(b) Dist. Miles	D/Q (m^{-2})	X/Q (Sec/m^3)	MILK(b) Dist. Miles	D/Q (m^{-2})
N	2.58E-06	1.8	2.47E-09	2.42E-06	1.9	2.22E-09	7.03E-07	(a)	3.48E-10
NNE	1.85E-06	1.7	2.97E-09	1.85E-06	1.7	2.97E-09	4.70E-07	(a)	4.04E-10
NE	1.66E-06	2.2	3.00E-09	1.48E-06	2.4	2.54E-09	5.77E-07	(a)	6.51E-10
ENE	8.75E-07	2.9	8.86E-10	8.75E-07	2.9	8.86E-10	3.86E-07	(a)	2.86E-10
E	8.90E-07	3.0	6.17E-10	4.06E-07	4.6	2.15E-10	4.25E-07	4.5	2.31E-10 goat
ESE	6.37E-07	3.7	2.84E-10	5.80E-07	4.0	2.46E-10	3.73E-07	(a)	1.37E-10
SE	5.84E-07	(a)	1.52E-10	5.84E-07	(a)	1.52E-10	5.84E-07	(a)	1.52E-10
SSE	1.36E-06	4.4	2.88E-10	1.09E-06	(a)	2.15E-10	1.09E-06	(a)	2.15E-10
S	2.65E-06	4.2	5.25E-10	2.25E-06	4.9	4.06E-10	2.31E-06	4.8	4.21E-10 cow
SSW	3.64E-06	3.1	9.82E-10	2.28E-06	(a)	4.53E-10	2.28E-06	(a)	4.53E-10
SW	3.19E-06	2.5	1.11E-09	1.58E-06	(a)	3.56E-10	1.58E-06	(a)	3.56E-10
WSW	2.12E-06	2.4	1.26E-09	8.55E-07	(a)	3.18E-10	8.55E-07	(a)	3.18E-10
W	7.54E-07	(a)	4.44E-10	7.54E-07	(a)	4.44E-10	7.54E-10	(a)	4.44E-10
WNW	6.03E-07	(a)	3.25E-10	6.03E-07	(a)	3.25E-10	6.03E-07	(a)	3.25E-10
NW	6.83E-07	4.3	4.05E-10	6.82E-07	4.3	4.05E-10	6.02E-07	(a)	3.27E-10
NNW	1.34E-06	2.2	1.26E-09	5.16E-07	5.0	3.01E-10	5.20E-07	(a)	3.04E-10

(a) 5-mile value used since there is no pathway located within the sector up to five miles.

(b) Controlling locations are discussed in Appendix A.

References: 1984 Land Use Census (letter ANPM-21221-JRM/LEB). NUS Corporation letters NUS-ANPP-1385 and NUS-ANPP-1386.

4.4 Requirements: Liquid Effluents

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 (See Figure 6-4) 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.

Applicability: At all times.

Action:

With the calculated dose from the release of radioactive materials in liquid effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

4.4.1 Surveillance Requirements:

Cumulative dose contributions from liquid effluents for the current calendar quarter and the current calendar year shall be determined in accordance with the methodology and parameters in the ODCM at least once per 31 days.

4.4.2 Implementation of the Requirements:

This Requirement does not require implementation guidance. There are no offsite liquid effluent releases.

5.0 TOTAL DOSE AND DOSE TO PUBLIC ONSITE

5.1 Requirement: Total Dose

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.

Applicability: At all times.

Action:

With the calculated doses from the release of radioactive materials in liquid and gaseous effluents exceeding twice the limits of Section 4.4a, 4.4b, 4.1a, 4.1b, 4.2a or 4.2b calculations shall be made including direct radiation contributions from the reactor units (including outside storage tanks, etc.) to determine whether the above limits of Section 5.1 have been exceeded. If such is the case, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report that defines the corrective action to be taken to reduce subsequent releases to prevent recurrence of exceeding the above limits and includes the schedule for achieving conformance with the above limits. This Special Report, as defined in 10 CFR 20.2203(a)(4), shall include an analysis that estimates the radiation exposure (dose) to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, including all effluent pathways and direct radiation, for the calendar year that includes the release(s) covered by this report. It shall also describe levels of radiation and concentrations of radioactive material involved, and the cause of the exposure levels or concentrations. If the estimated dose(s) exceeds the above limits, and if the release condition resulting in violation of 40 CFR Part 190 has not already been corrected, the Special Report shall include a request for a variance in accordance with the provisions of 40 CFR Part 190. Submittal of the report within 30 days is considered a timely request, and a variance is granted until staff action on the request is complete.

5.1.1 Surveillance Requirements:

a. Cumulative dose contributions from the gaseous effluents shall be determined in accordance with the surveillance requirements of Section 4.4.1, 4.1.1 and 4.2.1 and in accordance with the methodology and parameters contained in Section 5.1.2.

b. Cumulative dose contributions from direct radiation from the reactor units and from radwaste storage tanks shall be determined in accordance with the methodology and parameters in Section 5.1.2. This requirement is applicable only under conditions set forth in Section 5.1, Action.

5.1.2 Implementation of the Requirement

Since all other uranium fuel cycle sources are greater than 20 miles away, only the PVNGS site need be considered.

The total dose to any MEMBER OF THE PUBLIC will be determined based on a sum of the doses from all three units' releases and doses from direct radiation from PVNGS.

This dose evaluation is performed annually and submitted with the Annual Radioactive Effluent Release Report to assure compliance with 40 CFR Part 190, Environmental Radiation Protection Standards for Nuclear Power Operation. NUREG-0543, Methods for Demonstrating LWR Compliance With the EPA Uranium Fuel Cycle Standard (40 CFR Part 190), February 1980, provides a discussion on compliance with 40 CFR Part 190 in relation to the Radiological Environmental Technical Specifications for sites of up to four nuclear power reactors. The NUREG concludes that as long as a nuclear plant site operates at a level below the 10 CFR Part 50, Appendix I reporting requirements, and there is no significant source of direct radiation from the site, no extra analysis is required to demonstrate compliance with 40 CFR Part 190. As a result, this dose evaluation will also be performed whenever calculated doses associated with effluent releases exceed twice the limits of Section 4.4a, 4.4b, 4.1a, 4.1b, 4.2a or 4.2b.

Dose Contribution from Liquid and Gaseous Effluents

The annual whole body dose accumulated by a MEMBER OF THE PUBLIC for the noble gases released in gaseous effluents is determined by using the following equation:

$$D_{WB} = (3.17E\text{-}08)\ \Sigma_i\ [(K_i)\ (X/Q)_{UNIT}\ (Q_i)] \qquad (5\text{-}1)$$

Where:

K_i = the whole body dose factor due to gamma emissions for each identified noble gas radionuclide i, in mrem/yr per μCi/m^3 from Table 3-3.

Q_i = the integrated release of radionuclide i, in μCi for the previous calendar year.

$(X/Q)_{UNIT}$ = the highest calculated annual average dispersion parameter, in sec/m^3, for a particular unit, at the controlling location, from Table 4-16, or concurrent meteorological data if available.

= 2.92E-06 from Unit 1
=2.19E-06 from Unit 2
=2.31E-06 from Unit 3

D_{WB} = the annual whole body dose in mrem to a MEMBER OF THE PUBLIC at the controlling location due to noble gases released in gaseous effluents.

3.17E-08 = the inverse of seconds in a year (yr/sec).

The annual dose to any organ accumulated by a MEMBER OF THE PUBLIC for iodine-131, iodine-133, tritium and all radionuclides in particulate form with half-lives greater than 8 days released in gaseous effluents is determined by using the following equation:

$$D_o = (3.17E\text{-}08)\,\Sigma_i\,[\Sigma_k(R_{ik}W_k)\,(Q_i)] \tag{5-2}$$

Where:

D_o = the total annual organ dose from gaseous effluents to a MEMBER OF THE PUBLIC, in mrem, at the controlling location.

Q_i = the integrated release of radionuclide i, in μCi, for the previous calendar year.

R_{ik} = the dose factor for each identified radionuclide i, for pathway k (for the inhalation pathway in mrem/yr per $\mu Ci/m^3$ and for the food and ground plane pathways in m^2-mrem/yr per μCi/sec) at the controlling location. The R_{ik}'s for each age group are given in Tables 4-1 through 4-15.

W_K = the highest annual average dispersion or deposition parameter for the particular unit, used for estimating the total annual organ dose to a MEMBER OF THE PUBLIC at the controlling location for the particular unit.

= $(X/Q)_{UNIT}$, in sec/m^3 for the inhalation pathway and for all tritium calculations, for organ dose at the controlling location, from Table 4-16 or concurrent meteorological data if available.

= 2.92E-06 from Unit 1
=2.19E-06 from Unit 2
=2.31E-06 from Unit 3

= $(D/Q)_{UNIT}$, in m^{-2}, for the food and ground plane pathways, for organ dose at the controlling location, from Table 4-16 or concurrent meteorological data if available.

= 3.25E-09 from Unit 1
=3.88E-10 from Unit 2
=4.21E-10 from Unit 3

3.17E-08 = the inverse of seconds in a year (yr/sec).

Dose Due to Direct Radiation

The component of dose to a MEMBER OF THE PUBLIC due to direct radiation will be evaluated by first determining the direct radiation dose at the site boundary in each sector, and then extrapolating the site boundary dose to the controlling location by the inverse square law of distance.

Dose from Radioactive Liquid and Gaseous Effluents to MEMBERS OF THE PUBLIC due to their activities within the SITE BOUNDARY.

These activities have been determined to be limited to the vicinity of the Visitor Center located inside the SITE BOUNDARY west of Unit 1. An assumption was made that no MEMBER OF THE PUBLIC would spend more than eight hours per year at this location. However this calculation has been historically performed assuming an occupancy factor of one, (implying continuous occupancy over the entire year).

A X/Q, determined for the Visitor Center, will be used for this assessment.

Equations 5-1 and 5-2 in Section 5.1.2 should be used for this assessment.

6.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

6.1 Requirements: REMP

The radiological environmental monitoring program shall be conducted as specified in Table 6-1.

Applicability: At all times.

Action:

a. With the radiological environmental monitoring program not being conducted as specified in Table 6-1, prepare and submit to the Commission, in the Annual Radiological Environmental Operating Report, as required by Section 7.2, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence.

b. With the level of radioactivity as the result of plant effluents in an environmental sampling medium at a specified location exceeding the reporting levels of Table 6-2 when averaged over any calendar quarter, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce radioactive effluents so that the potential annual dose* to A MEMBER OF THE PUBLIC is less than the calendar year limits of Section 4.4, 4.1 and 4.2. When more than one of the radionuclides in Table 6-2 are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{concentration (1)}}{\text{reporting level (1)}} + \frac{\text{concentration (2)}}{\text{reporting level (2)}} + \ldots \geq 1.0$$

When radionuclides other than those in Table 6-2 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose* to a MEMBER OF THE PUBLIC is equal to or greater than the calendar year limits of Section 4.4, 4.1 and 4.2. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such an event, the condition shall be reported and described in the Annual Radiological Environmental Operating Report.

c. With milk or fresh leafy vegetable samples unavailable from one or more of the sample locations required by Table 6-1, identify locations for obtaining replacement samples and add them to the Radiological Environmental Monitoring Program within 30 days. The specific locations from which samples were unavailable may then be deleted from the monitoring program. Pursuant to Section 7.1, Annual Radioactive Effluent Release Report, identify the cause of the unavailability of samples and identify the new location(s) for obtaining replacement samples in the next Annual Radioactive Effluent Release Report and also include in the report a revised figure(s) and table for the ODCM reflecting the new location(s).

* The methodology and parameters used to estimate the potential annual dose to a MEMBER OF THE PUBLIC shall be indicated in this report.

6.1.1 Surveillance Requirements:

a. The radiological environmental monitoring samples shall be collected pursuant to Table 6-1 from the specific locations given in Table 6-4 and Figures 6-1, 6-2, and 6-3, and shall be analyzed pursuant to the requirements of Table 6-1, and the detection capabilities required by Table 6-3.

6.1.2 Implementation of the Requirements: REMP

The results of the radiological environmental monitoring program are intended to supplement the results of the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected based on the effluent measurements and modeling of the environmental exposure pathways. Thus the specified environmental monitoring program provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides which lead to the highest potential radiation exposures to individuals resulting from station operation.

This requirement is implemented by Nuclear Administrative and Technical Manual procedures.

TABLE 6-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Representative Samples and Sample Locations[a]	Sampling and Collection Frequency[a]	Type and Frequency of Analysis[d]
<u>Airborne</u> Radioiodine and particulates	Samples from 5 locations: 3 samples at or near the SITE BOUNDARIES (#14A, 15, 21) in different sectors of the highest calculated annual average ground level D/Q.* 1 sample (#40) from areas of special interest, which is from the vicinity of a community having the highest calculated annual average D/Q. 1 sample (#6A) from a control location 15-30 km (10-20 mi) distant and in the least prevalent wind direction.[c]	Continuous sampling collected weekly, or more frequently if required by dust loading.	Gross beta weekly[c], I-131 weekly; gamma isotopic analysis of composite (by location) quarterly.
Direct radiation[b]	41 stations (#6-42, #44-46, #50) with two or more dosimeters for measuring dose rate continuously, placed as follows: an inner ring of stations at the site boundary and an outer ring in the 4-to-5 mi range from the site with a station in each sector of each ring (16 sectors x 2 rings = 32 stations). 7 additional stations are at local schools and/or population centers; 2 other stations are used as controls.	Quarterly	Gamma dose quarterly.

* D/Q refers to average annual relative ground deposition rate.

TABLE 6-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Representative Samples and Sample Locations[a]	Sampling and Collection Frequency[a]	Type and Frequency of Analysis[d]
<u>Waterborne</u>			
Surface	Water storage reservoir (#60) Evaporation pond #1 (#59) Evaporation pond #2 (#63)	Monthly composite of weekly grab sample.	Gamma isotopic analysis monthly; tritium quarterly.
Ground	2 onsite wells[f] (#57, #58)	Quarterly grab sample	Tritium and gamma isotopic analysis quarterly.
Drinking (well)	3 wells from surrounding residences (#46, #48, #49) that would be affected by its discharge.	Composite sample of weekly grab samples over 2-week period when I-131 analysis is performed, monthly composite of weekly grab samples otherwise	I-131 analysis on each composite when the dose calculated for the consumption of the water is greater than 1 mrem per year.[g] Composite for gross beta and gamma isotopic analyses monthly. Composite for tritium analysis quarterly.
<u>Ingestion</u> Milk	Samples from milking animals in 3 locations within 5 km distance having the highest dose potential. If there are none, 1 sample from milking animals in each of three areas (#50, #51, #53) between 5 and 8 km distant where doses are calculated to be greater than 1 mrem per year.[g]	Semimonthly for animals on pasture; otherwise, monthly.	Gamma isotopic and I-131 analysis semimonthly when animals are on pasture or monthly at other times.

TABLE 6-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Representative Samples and Sample Locations[a]	Sampling and Collection Frequency[a]	Type and Frequency of Analysis[d]
Food Products *	Samples (#47, #52) of 3 different kinds of broad leaf vegetation grown nearest each of two offsite locations of highest predicted annual average ground-level D/Q if milk sampling id not performed.	Monthly during growing season.	Gamma isotopic analysis..
	1 sample (#62) of each of the similar broad leaf vegetation grown 15=30 km distant in the least prevalent wind direction if milk sampling is not performed. Monthly during growing season.	Monthly during growing season.	Gamma isotopic analysis.

* When broad leaf vegetation samples are not available, reports from 4 existing supplemental airborne radioiodine sample locations will be substituted.

Table 6-1 (Continued)

TABLE NOTATION

a The number, media, frequency, and location of sampling may vary from site to site. It is recognized that, at times, it may not be possible or practical to obtain samples of the media of choice at the most desired location or time. In these instances suitable alternative media and locations may be chosen for the particular pathway in question. Actual locations (distance and direction) from the site shall be provided in Table 6-4 and Figures 6-1, 6-2, or 6-3 in the ODCM. Refer to Regulatory Guide 4.1, "Programs for Monitoring Radioactivity in the Environs of Nuclear Power Plants."

b Regulatory Guide 4.13 provides guidance for thermoluminescence dosimetry (TLD) systems used for environmental monitoring. One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. For the purposes of this table, a thermoluminescent dosimeter may be considered to be one phosphor, and two or more phosphors in a packet may be considered as two or more dosimeters. Film badges should not be used for measuring direct radiation.

c Particulate sample filters shall be analyzed for gross beta 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air or water is greater than 10 times the yearly mean of control samples for any medium, gamma isotopic analysis should be performed on the individual samples.

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

e The purpose of this sample is to obtain background information. If it is not practical to establish control locations in accordance with the wind direction criteria, other sites that provide valid background data may be substituted.

f Groundwater samples should be taken when this source is tapped for drinking or irrigation purposes in areas where the hydraulic gradient or recharge properties are suitable for contamination.

g The dose shall be calculated for the maximum organ and age group, using the methodology and parameters in the ODCM.

TABLE 6-2

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Analysis	Water (pCi/l)	Airborne Particulate or Gas (pCi/m^3)	Fresh Milk (pCi/l)	Food Products (pCi/kg, wet)
H-3	20,000 *			
Mn-54	1,000			
Fe-59	400			
Co-58	1,000			
Co-60	300			
Zn-65	300			
Zr-Nb-95	400			
I-131	2 **	0.9	3	100
Cs-134	30	10	60	1,000
Cs-137	50	20	70	2,000
Ba-La-140	200		300	

* For drinking water samples. This is a 40 CFR 141 value. If no drinking water pathway exists, a value of 30,000 pCi/l may be used.

** If no drinking water pathway exists, a reporting level of 20 pCi/l may be used.

TABLE 6-3

DETECTION CAPABILITIES FOR ENVIRONMENTAL ANALYSIS [a]

Lower Limit of Detection (LLD)[b]				
Analysis	Water (pCi/l)	Airborne Particulate or Gas (pCi/m^3)	Fresh Milk (pCi/l)	Food Products (pCi/kg, wet)
Gross Beta	4	0.01		
H-3	2000*			
Mn-54	15			
Fe-59	30			
Co-58, -60	15			
Zn-65	30			
Zr-95	30			
Nb-95	15			
I-131	1**	0.07	1	60
Cs-134	15	0.05	15	60
Cs-137	18	0.06	18	80
Ba-140	60		60	
La-140	15		15	

NOTE: This list does not mean that only these nuclides are to be detected and reported. Other peaks that are measurable and identifiable, together with the above nuclides, shall also be identified and reported.

* If no drinking water pathway exists, a value of 3000 pCi/l may be used.

** If no drinking water pathway exists, a value of 15 pCi/l may be used.

Table 6-3 (Continued)

TABLE NOTATION

a Guidance for detection capabilities for thermoluminescent dosimeters used for environmental measurements is given in Regulatory Guide 4.13.

b Table 6-3 indicates acceptable detection capabilities for radioactive materials in environmental samples. These detection capabilities are tabulated in terms of the lower limits of detection (LLDs). The LLD is defined, for purposes of this guide, as the smallest concentration of radioactive material in a sample that will yield a net count (above system background) that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

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

$$LLD = \frac{4.66 s_b}{E * V * 2.22 * Y * \exp(-\lambda \Delta t)}$$

Where:

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

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute),

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

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

2.22 is the number of disintegrations per minute per picocurie,

Y is the fractional radiochemical yield (when applicable),

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

Δt for environmental samples is the elapsed time between sample collection (or end of the sample collection period) and time of counting.

In calculating the LLD for a radionuclide determined by gamma-ray spectrometry the background should include the typical contributions of other radionuclides normally present in the samples (e.g., potassium-40 in milk samples). Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Operating Report.

6.2 Requirement: Land Use Census

A land use census shall be conducted and shall identify within a distance of 8 km (5 miles) the location in each of the 16 meteorological sectors of the nearest milk animal, the nearest residence and the nearest garden* of greater than 50 m^2 (500 ft^2) producing broad leaf vegetation.

Applicability: At all times.

Action:

a. With a land use census identifying a location(s) that yields a calculated dose or dose commitment greater than the values currently being calculated in Section 4.2.1, identify the new location(s) in the next Annual Radioactive Effluent Release Report, pursuant to Section 7.1.

b. With a land use census identifying a location(s) that yields a calculated dose or dose commitment (via the same exposure pathway) 20% greater than at a location from which samples are currently being obtained in accordance with Section 6.1, add the new location(s) to the radiological environmental monitoring program within 30 days. The sampling location(s), excluding the control station location, having the lowest calculated dose or dose commitment(s), via the same exposure pathway, may be deleted from this monitoring program after (October 31) of the year in which this land use census was conducted. Pursuant to Section 7.1, identify the new location(s) in the next Annual Radioactive Effluent Release Report and also include in the report a revised figure(s) and table for the ODCM reflecting the new location(s).

6.2.1 Surveillance Requirements:

a. The land use census shall be conducted during the growing season at least once per 12 months using that information that will provide the best results, such as by a door-to-door survey, aerial survey, or by consulting local agriculture authorities. The results of the land use census shall be included in the Annual Radiological Environmental Operating Report pursuant to Section 7.2.

6.2.2 Implementation of the Requirements:

The above Requirement is implemented by Nuclear Administrative and Technical Manual procedures.

* Broad Leaf vegetation sampling of at least three different kinds of vegetation may be performed at the SITE BOUNDARY in each of two different direction sectors with the highest predicted D/Qs in lieu of the garden census. Specifications for broad leaf vegetation sampling in Table 6-1 shall be followed, including analysis of control samples.

6.3 Requirements: Interlaboratory Comparison Program

Analyses shall be performed on radioactive materials supplied as part of an Interlaboratory Comparison Program that has been approved by the Commission that correspond to samples required by Table 6-1.

Applicability: At all times.

Action:

a. With analyses not being performed as required above, report the corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Operating Report pursuant to Section 7.2.

6.3.1 Surveillance Requirements:

a. A summary of the results obtained as part of the above required Interlaboratory Comparison Program and in accordance with the methodology and parameters in this manual shall be included in the Annual Radiological Environmental Operating Report pursuant to Section 7.2.

6.3.2 Implementation of the Requirements:

PVNGS laboratories or contract laboratories which perform analyses for the Radiological Environmental Monitoring Program (REMP) participate in the Environmental Protection Agency (EPA) Environmental Radioactivity Laboratory Intercomparison Studies (crosscheck) Program. The participation includes all of the determinations (sample medium-radionuclide combinations) that are offered by the EPA and that are also included in the monitoring program.

The sample handling preparation and analysis procedures approved for use on routine REMP samples, at the time the crosscheck samples are received from the EPA, are used to implement the program. The results of the crosscheck sample analyses are reviewed, at minimum on an annual basis, to ensure that the control limits established by the EPA are not exceeded.

If deviation from these specified limits is identified an investigation is made to determine the reason for the deviation and corrective actions are taken as necessary. The results of all analyses made under this program are included in the Annual Radiological Environmental Operating Report.

TABLE 6-4

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE COLLECTION LOCATIONS

SAMPLE SITE	SAMPLE TYPE	NOTE (d)	LOCATION DESIGNATION (a)	LOCATION DESCRIPTION (c)
1	TLD		E30	APS Western Division Office, Goodyear
1	Air		E30	Same as TLD (E of RR tracks)
2	TLD		ENE24	Scott-Libby School, Perryville and Thomas Rds.
3	TLD		E21	Liberty School, 19800 W. Hwy 85
4	TLD		E16	APS Buckeye Office, 615 N. 4th St., Buckeye
4	Air		E16	Same as TLD
5	TLD		ESE11	Palo Verde School, Palo Verde Rd. (291st Ave.) and Old US 80
6	TLD (b)	SP	SSE31	APS Gila Bend substation, frontage road W of town
6A	Air (b)	Control	SSE13	Old US 80, Gila Bend side of Gillespie Bridge
7	TLD (b)	SP	SE7	Old US 80 and Arlington School Rd.
7A	Air		SE8	Arlington School, 16351 S. Arlington School Rd.
8	TLD (b)	OR	SSE5	Southern Pacific Pipeline Rd., 1.4 miles SW of 355th Ave.
9	TLD (b)	OR	S5	Southern Pacific Pipeline Rd., 2.5 miles SW of 355th Ave.
10	TLD (b)	OR	SE5	SE corner of 355th Ave. and Elliot Rd.
11	TLD (b)	OR	ESE5	NW corner of 339th Ave. and Dobbins Rd.
12	TLD (b)	OR	E5	NE corner of 339th Ave. and Buckeye-Salome Rd.
13	TLD (b)	IR	N1	N site boundary
14	TLD (b)	IR	NNE2	NNE site boundary
14A	Air (b)		NNE2	SW corner of 371st Ave. and Buckeye-Salome Rd.
15	TLD (b)	IR	NE2	NE site boundary, WRF access road
15	Air (b)		NE2	Same as TLD
16	TLD (b)	IR	ENE2	ENE site boundary
17	TLD (b)	IR	E2	E site boundary
17A	Air		E4	351st Ave., 1 mile S of Buckeye-Salome Rd.
18	TLD (b)	IR	ESE2	ESE site boundary

TABLE 6-4

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE COLLECTION LOCATIONS

SAMPLE SITE	SAMPLE TYPE	NOTE (d)	LOCATION DESIGNATION (a)	LOCATION DESCRIPTION (c)
19	TLD (b)	IR	SE2	SE site boundary
20	TLD (b)	IR	SSE2	SSE site boundary
21	TLD (b)	IR	S3	S site boundary
21	Air (b)		S3	Same as TLD
22	TLD (b)	IR	SSW3	SSW site boundary
23	TLD (b)	OR	W5	2 miles N of Elliot Rd., 3 miles W of Wintersburg Rd.
24	TLD (b)	OR	SW4	Elliot Rd., 2 miles W of Wintersburg Rd.
25	TLD (b)	OR	WSW5	Elliot Rd., 3 miles W of Wintersburg Rd. at cattleguard
26	TLD (b)	OR	SSW5	Shepard farm, 13202 S. 383rd Ave., 0.5 miles W of house
27	TLD (b)	IR	SW1	SW site boundary
28	TLD (b)	IR	WSW1	WSW site boundary
29	TLD (b)	IR	W1	W site boundary
29	Air (b)		W1	Same as TLD
30	TLD (b)	IR	WNW1	WNW site boundary
31	TLD (b)	IR	NW1	NW site boundary
32	TLD (b)	IR	NNW1	NNW site boundary
33	TLD (b)	OR	NW4	Buckeye Rd., 0.5 miles W of 395th Ave.
34	TLD (b)	OR	NNW5	SE corner of 395th Ave. and Van Buren St.
35	TLD (b)	SP	NNW8	Fire Station, 40901 W. Osborn Rd., Tonopah
35	Air		NNW8	Same as TLD
36	TLD (b)	OR	N5	SW corner of Wintersburg Rd. and Van Buren St.
37	TLD (b)	OR	NNE5	SE corner of 363rd Ave. and Van Buren St.
38	TLD (b)	OR	NE5	SW corner of 355th Ave. and Buckeye Rd.
39	TLD (b)	OR	ENE5	343rd Ave., 0.5 miles S of Lower Buckeye Rd.
40	TLD (b)	SP	N3	Wintersburg, Transmission Rd. S of trailer park

TABLE 6-4

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE COLLECTION LOCATIONS

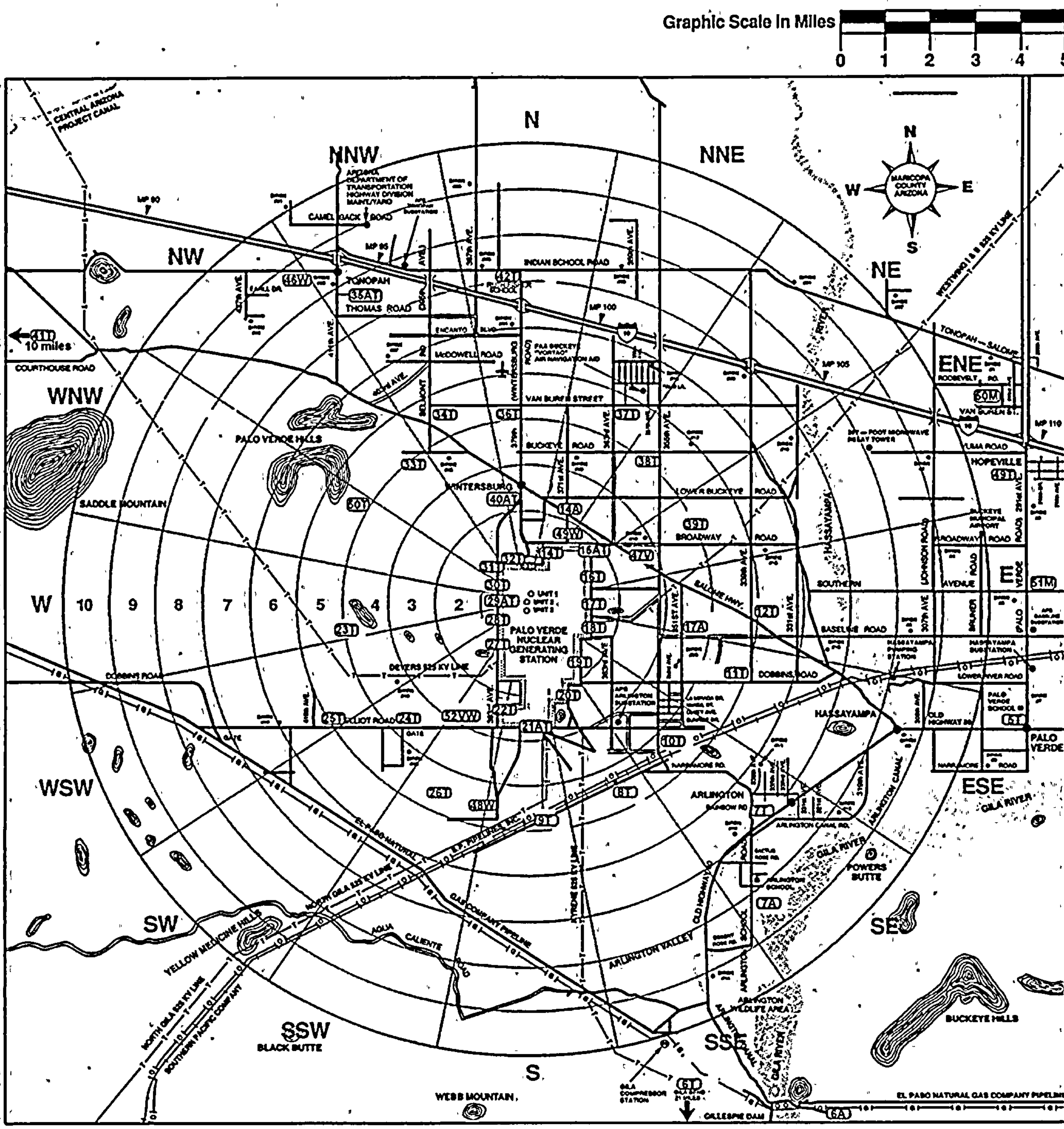
SAMPLE SITE	SAMPLE TYPE	NOTE (d)	LOCATION DESIGNATION (a)	LOCATION DESCRIPTION (c)
40	Air (b)		N3	Same as TLD
41	TLD (b)	SP	WNW	20 Harquahala Valley School, Van Buren St., 1 mile W of Steve Martori Dr.
42	TLD (b)	SP	N8	Ruth Fisher School, Indian School and Wintersburg Rds.
43	DELETED			
44	TLD (b)	Control	ENE35	APS El Mirage Office, 12313 W. Grand Ave.
45	TLD (b)	Transit Control	E16	APS Buckeye Office, 615 N. 4th St., REMP trailer (lead pig)
46	TLD (b)	SP	ENE30	Litchfield Park School, 13825 W. Indian School Rd.
46	Water (b)	WD	NW9	McArthur residence, 41701 W. Indian School Rd., Tonopah
47	TLD		E35	Littleton School, 115th Ave. and Hwy 85, Cashion
47	Vegetation (b)		ENE3	Adams' residence, NW corner of 355th Ave. and Buckeye-Salome Rd.
48	TLD		E24	Jackrabbit Trail, S of I-10, N of Filmore St.
48	Water (b)	WD	S5	Shepard farm, 13202 S. 383rd Ave.
49	TLD		ENE11	Palo Verde Rd., 0.25 miles S of I-10
49	Water (b)	WD	NNE2	Chowanez residence, 371st Ave., 0.5 miles S of Buckeye-Salome Rd.
50	TLD (b)	OR	WNW5	3.5 miles W of Wintersburg Rd., 2 miles S of Buckeye-Salome Rd.
50	Milk (b)		ENE12	Crosswinds Dairy, 295th Ave. and Van Buren St.
51	Milk (b)		E11	Butler Dairy, Palo Verde Rd and Southern Ave.
52	Vegetation (b), Water	WD	SW3	Gavette residence, 39326 W. Elliot Rd.
53	Milk (b)		E19	Kerr Dairy, Dean and Baseline Rds.
54	Milk		E17	Dickman Dairy, Broadway and Apache (Cemetery) Rds.
55	CHANGED TO SITE 52			

TABLE 6-4

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE COLLECTION LOCATIONS

SAMPLE SITE	SAMPLE TYPE	NOTE (d)	LOCATION DESIGNATION (a)	LOCATION DESCRIPTION (c)
56	Milk (b)	Control	E60	Pew Dairy, McQueen and Ryan Rds., Chandler
57	Ground Water (b)	WG	onsite	Well 27ddc
58	Ground Water (b)	WG	onsite	Well 34abb
59	Surface Water (b)	WS	onsite	Evaporation Pond #1
60	Surface Water (b)	WS	onsite	Reservoir
62	Vegetation (b)	Control	E35	Tolleson Produce Co., 91st Ave. and Van Buren St.
63	Surface Water (b)	WS	onsite	Evaporation Pond #2

NOTES:
(a) Distance and direction are relative to the Unit 2 containment, rounded to the nearest mile.
(b) These samples fulfill the requirements of the ODCM, Table 6-1.
(c) Refer to Figures 6-1, 6-2, and 6-3 for relative locations of sample sites.
(d) IR - inner ring
OR - outer ring
SP - school or population center
WS - waterborne surface
WG - waterborne ground
WD - waterborne drinking



KEY TO MAP

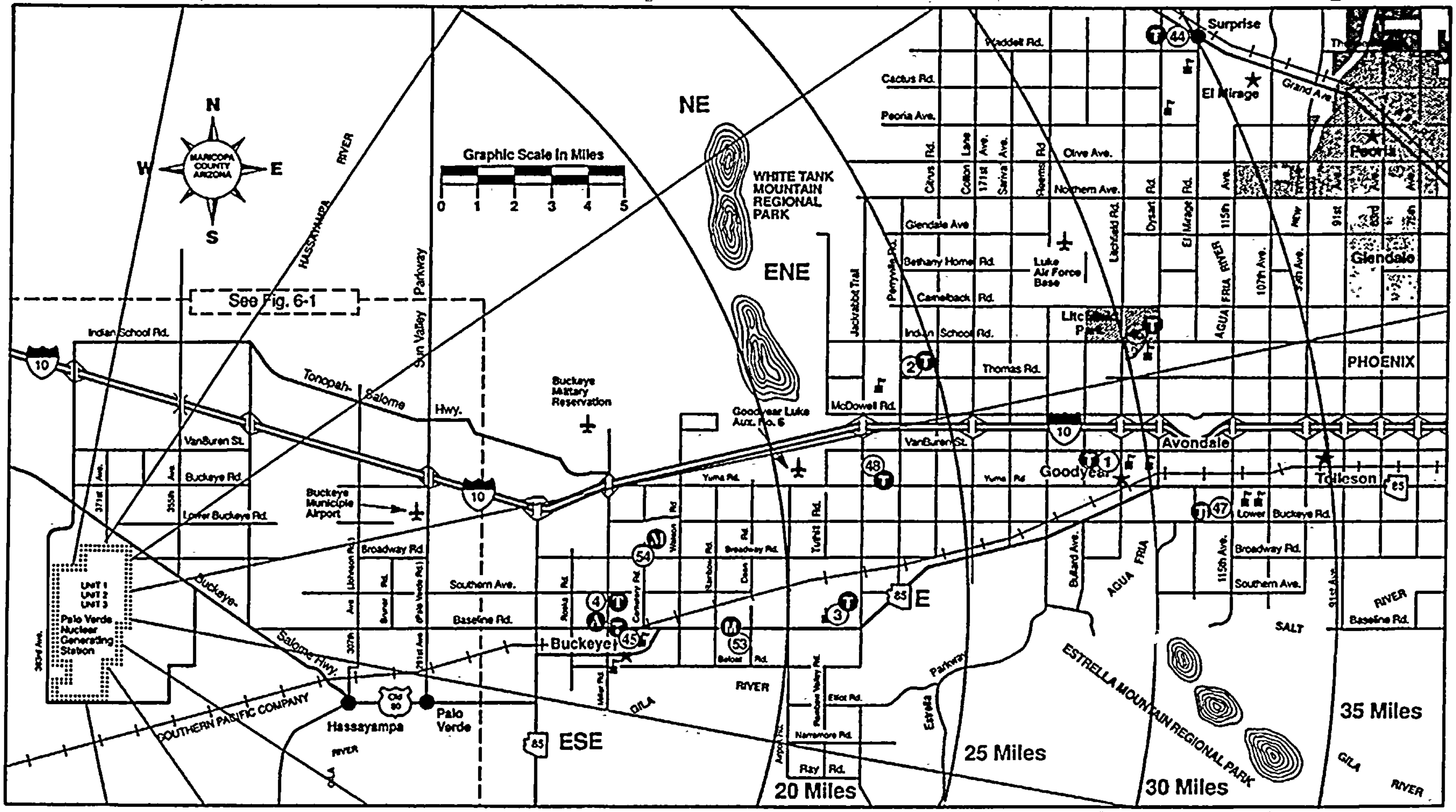
- Paved Road
- Unpaved Road
- 4WD Road
- Gas Pipeline
- Oil Pipeline
- Power Line
- Railroad
- Airstrip
- School
- Siren
- MP Milepost
- Palo Verde Nuclear Generating Station Boundary
- T Thermoluminescent Dosimeters (TLD)
- A Air Sample
- V Vegetation Sample
- W Water Sample
- M Milk Sample
- (1) Sample Sites

Palo Verde Nuclear Generating Station

Radiological Environmental Monitoring Program Sample Sites

0 – 10 Miles

Figure 6-1



KEY TO MAP

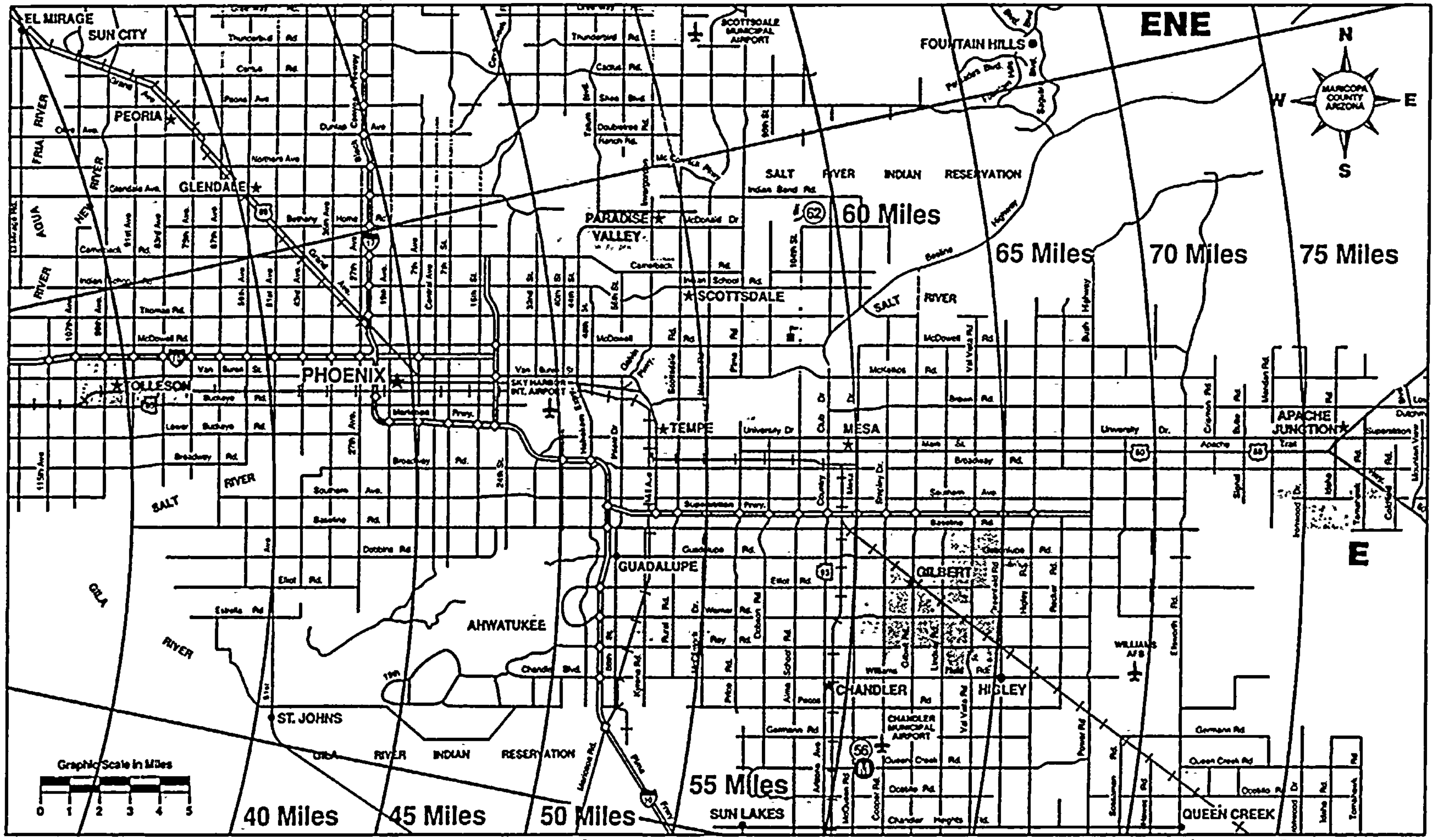
- Railroad
- Airstrip/Airport
- Schools Located Near Sample Sites
- Municipal Buildings
- Palo Verde Nuclear Generating Station Boundary
- Thermoluminescent Dosimeters (TLD)
- Air Sample
- Milk Sample
- Sample Sites

Palo Verde Nuclear Generating Station

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLE SITES

0–35 Miles

Fig. 6-2



KEY TO MAP

- Railroad
- Airstrip/Airport
- Schools Located Near Sample Sites
- Municipal Buildings
- Palo Verde Nuclear Generating Station Boundary
- Ⓜ Milk Sample
- ① Sample Sites
- Vegetation Sample

Palo Verde Nuclear Generating Station

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLE SITES

35-75 Miles

Fig. 6-3

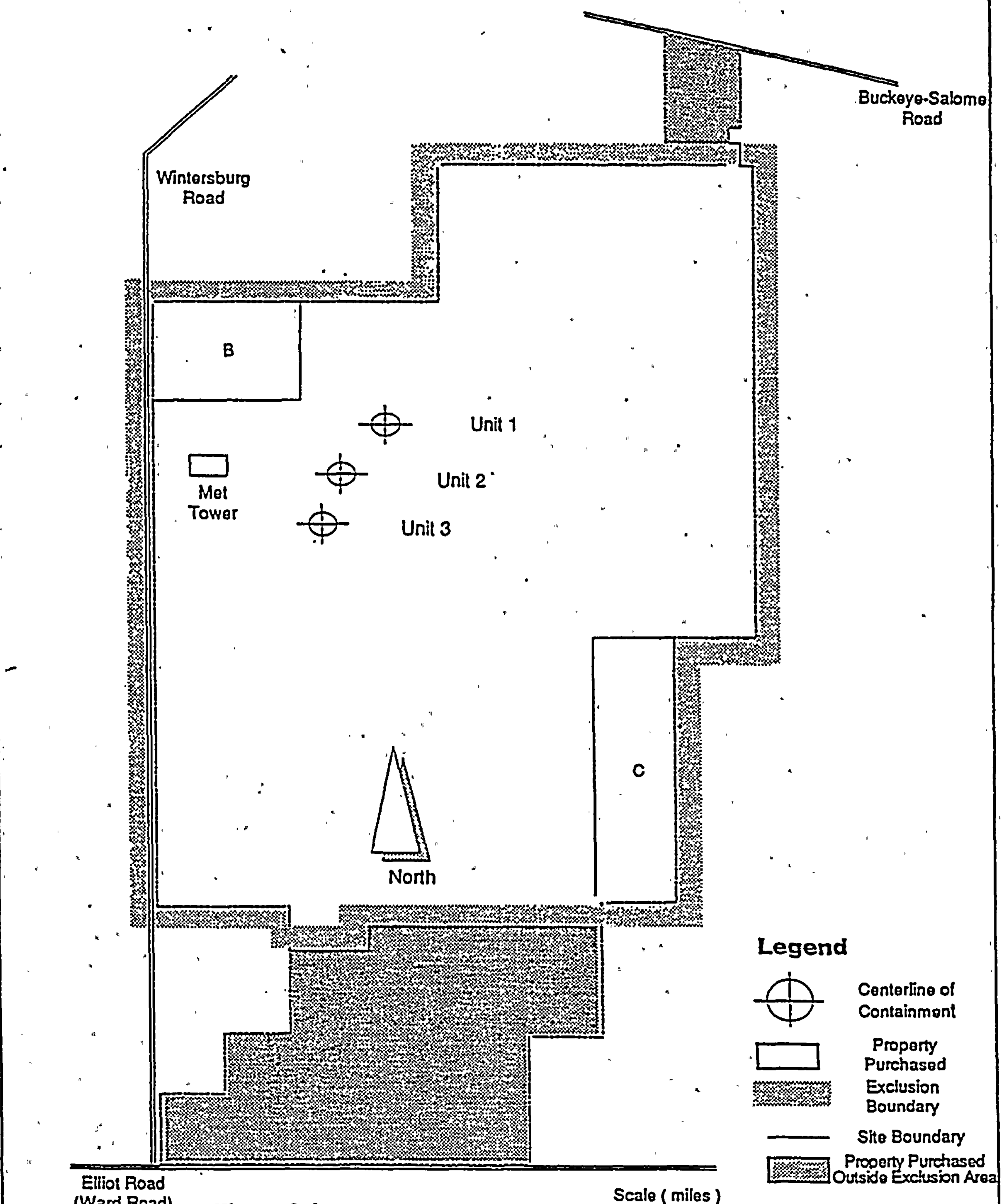
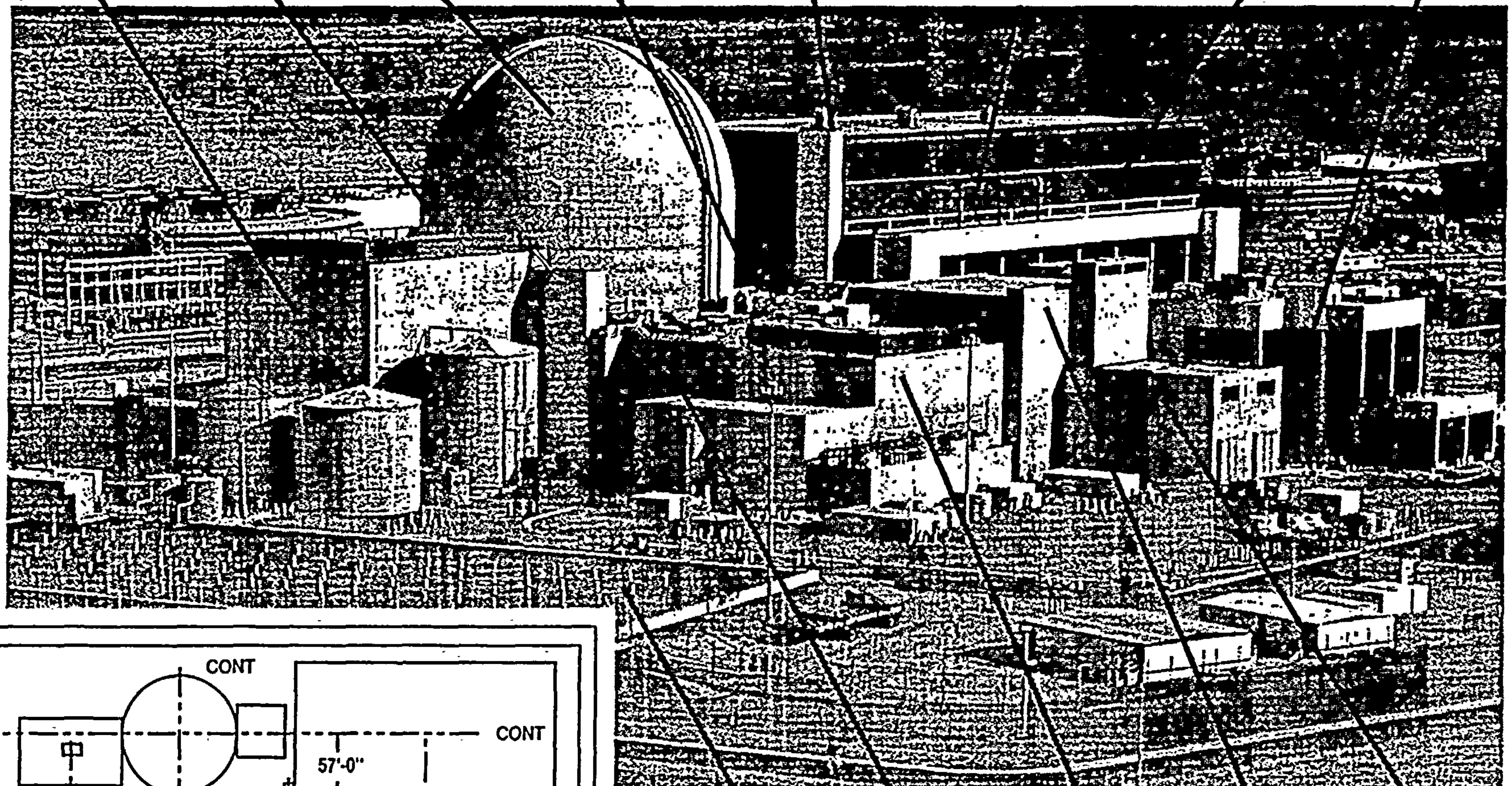
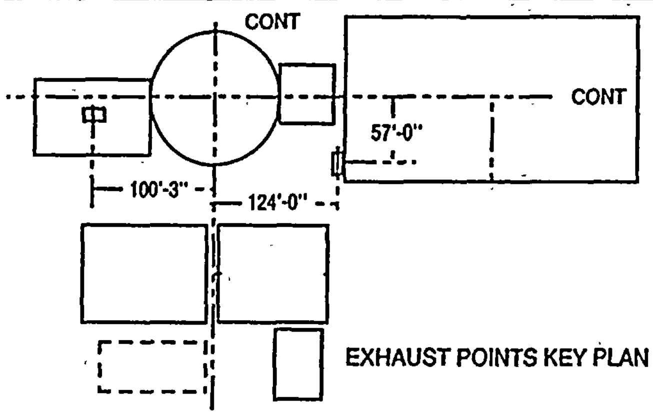


Figure 6-4
Site and Exclusion Boundaries





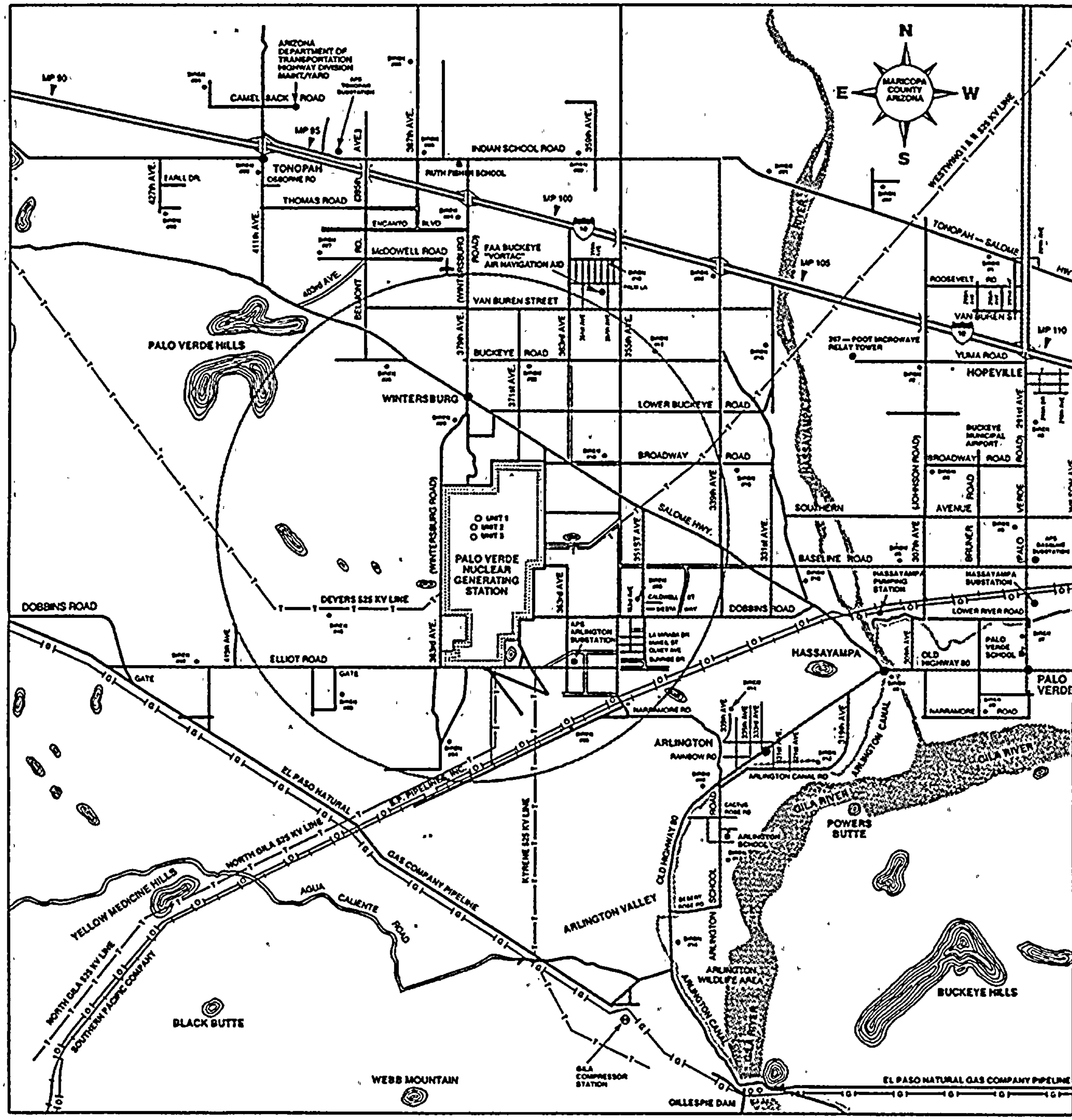
EXHAUST POINTS KEY PLAN

Elevation of Exhaust Point Above Grade	
Plant Vent/Condenser Vacuum	145'
Fuel Building	109'-9"

Palo Verde Nuclear Generating Station
GASEOUS EFFLUENT RELEASE POINTS

Fig. 6-5

Graphic Scale In Miles 0 1 2 3 4 5



KEY TO MAP

- Paved Road
- Unpaved Road
- 4WD Road
- Gas Pipeline
- Oil Pipeline
- Power Line
- Railroad
- Airstrip
- Palo Verde Nuclear Generating Station Boundary
- School
- Siren
- MP Milepost

Palo Verde Nuclear Generating Station
LOW POPULATION ZONE

0–5 Miles

Figure 6-6

7.0 RADIOLOGICAL REPORTS

7.1 Requirement: Annual Radioactive Effluent Release Report *

Routine Annual Radioactive Effluent Release Reports covering the operation of the unit during the previous calendar year shall be submitted before May 1 of each year.

The Annual Radioactive Effluent Release Reports shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit as outlined in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," Revision 1, June 1974, with data summarized on a quarterly basis following the format of Appendix B thereof.

The Annual Radioactive Effluent Release Report shall include an annual summary of hourly meteorological data collected over the previous year. This annual summary may be either in the form of an hour-by-hour listing on magnetic tape of wind speed, wind direction, atmospheric stability, and precipitation (if measured), or in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability**. This same report shall include an assessment of the radiation doses due to the radioactive liquid and gaseous effluents released from the unit or station during the previous calendar year. This same report shall also include an assessment of the radiation doses from radioactive liquid and gaseous effluents to MEMBERS OF THE PUBLIC due to their activities inside the SITE BOUNDARY (Figure 6-4) during the report period. All assumptions used in making these assessments, i.e., specific activity, exposure time and location, shall be included in these reports. The meteorological conditions concurrent with the time of release of radioactive materials in gaseous effluents, as determined by sampling frequency and measurement, shall be used for determining the gaseous pathway doses. The assessment of radiation doses shall be performed in accordance with the methodology and parameters in the ODCM.

The Annual Radioactive Effluent Release Report shall also include an assessment of radiation doses to the likely most exposed MEMBER OF THE PUBLIC from reactor releases and other nearby uranium fuel cycle sources, including doses from primary effluent pathways and direct radiation, for the previous calendar year to show conformance with 40 CFR Part 190, Environmental Radiation Protection Standards for Nuclear Power Operation. Acceptable methods for calculating the dose contributions are given Section 5.0 and Regulatory Guide 1.109 Rev. 1, October 1977.

* A single submittal may be made for a multiple unit station. The submittal should combine those sections that are common to all units at the station; however, for units with separate radwaste systems, the submittal shall specify the releases of radioactive material from each unit.

** In lieu of submission with the Annual Radioactive Effluent Release Report, the licensee has the option of retaining this summary of required meteorological data on site in a file that shall be provided to the NRC upon request.

The Annual Radioactive Effluent Release Reports shall include the following information for each class of solid waste (as defined by 10 CFR Part 61) shipped offsite during the report period:

a. Container volume,

b. Total curie quantity (specify whether determined by measurement or estimate),

c. Principal radionuclides (specify whether determined by measurement or estimate),

d. Source of waste and processing employed (e.g., dewatered spent resin, compacted dry waste, evaporator bottoms),

e. Type of container (e.g., LSA, Type A, Type B, Large Quantity), and

f. Solidification agent or absorbent (e.g., cement, urea formaldehyde).

The Annual Radioactive Effluent Release Reports shall include a list and description of unplanned releases from the site to UNRESTRICTED AREAS of radioactive materials in gaseous and liquid effluents made during the reporting period.

The Annual Radioactive Effluent Release Reports shall include any changes made during the reporting period to the PROCESS CONTROL PROGRAM and to the OFFSITE DOSE CALCULATION MANUAL, as well as a listing of new locations for dose calculations and/or environmental monitoring identified by the land use census pursuant to Section 6.2.

7.2 Requirement: Annual Radiological Environmental Operating Report *

Routine Annual Radiological Environmental Operating Reports covering the operation of the unit during the previous calendar year shall be submitted prior to May 1 of each year. The initial report shall be submitted prior to May 1 of the year following criticality.

The Annual Radiological Environmental Operating Reports shall include summaries, interpretations, and an analysis of trends of the results of the radiological environmental surveillance activities for the report period, including a comparison with preoperational studies, with operational controls as appropriate, and with previous environmental surveillance reports, and an assessment of the observed impacts of the plant operation on the environment. The reports shall also include the results of land use censuses required by Section 6.2.

The Annual Radiological Environmental Operating Reports shall include the results of analysis of all radiological environmental samples and of all environmental radiation measurements taken during the period pursuant to the locations specified in Table 6-4 and Figures 6-1, 6-2, and 6-3, as well as summarized and tabulated results of these analyses and measurements in the format of the table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979. In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report.

The reports shall also include the following: a summary description of the radiological environmental monitoring program; at least two legible maps** covering all sampling locations keyed to a table giving distances and directions from the centerline of one reactor; the results of licensee participation in the Interlaboratory Comparison Program, required by Section 6.3; discussion of all deviations from the sampling schedule of Table 6-1; and discussion of all analyses in which the LLD required by Table 6-3 was not achievable.

* A single submittal may be made for a multiple unit station.

** One map shall cover stations near the SITE BOUNDARY; a second shall include the more distant stations.

APPENDIX A
DETERMINATION OF CONTROLLING LOCATION

The controlling location is the location of the MEMBER OF THE PUBLIC who receives the highest doses.

The determination of a controlling location for implementation of 10CFR50 for radioiodines and particulates is known to be a function of:

(1) Isotopic release rates

(2) Meteorology

(3) Exposure pathway

(4) Receptor's age

The incorporation of these parameters into Equation 5-2 results in the respective equations at the controlling location. The isotopic release rates are based upon the source terms calculated using the PVNGS Environmental Report, Operating License Stage, Table 3.5-12, without carbon.

All of the locations and exposure pathways, identified in the 1984 Land Use Census, have been evaluated. These include cow milk ingestion, goat milk ingestion, vegetable ingestion, inhalation, and ground plane exposure. An infant is assumed to be present at all milk pathway locations. A child is assumed to be present at all vegetable garden locations. The ground plane exposure pathway is only considered to be present where an infant is not present. Naturally, inhalation is present everywhere an individual is present.

For the determination of the controlling locations, the highest X/Q and D/Q values, based on the 9 year meteorological data base, for the vegetable garden, cow milk, and goat milk pathways, are selected for each unit. The receptor organ doses have been calculated at each of these locations. Based upon these calculations, it is determined that the controlling receptor pathway is a function of unit location. For Unit 1, the controlling receptor is a garden-child pathway; for releases from Unit 2 and Unit 3 the controlling receptor is a cow milk-infant pathway. These determinations are based upon Table 4-16 which, in turn, is based upon the 1984 Land Use Census. Locations of the nearest residences, gardens and milk animals, as determined in the 1984 Land Use Census, are given in Table 4-16.

[illegible]

APPENDIX B
BASES FOR REQUIREMENTS

B-2.1 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The alarm/trip setpoints for these instruments shall be calculated and adjusted in accordance with the methodology and parameters in the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, 64 of Appendix A to 10 CFR PART 50.

There are two separate radioactive gaseous effluent monitoring systems: the low range effluent monitors for normal plant radioactive gaseous effluents and the high range effluent monitors for post-accident plant radioactive gaseous effluents. The low range monitors operate at all times until the concentration of radioactivity in the effluent becomes too high during post-accident conditions. The high range monitors only operate when the concentration of radioactivity in the effluent is above the setpoint in the low range monitors.

B-3.1 GASEOUS EFFLUENT - DOSE RATE

This requirement provides reasonable assurance that radioactive material discharged in gaseous effluents will not result in the exposure of a MEMBER OF THE PUBLIC in an UNRESTRICTED AREA, either at or beyond the SITE BOUNDARY, in excess of the design objectives of Appendix I to 10 CFR part 50. This requirement is provided to ensure that gaseous effluents from all units on the site will be appropriately controlled. It provides operational flexibility for releasing gaseous effluents to satisfy the Section II.A and II.C design objectives of Appendix I to 10 CFR part 50. For MEMBERS OF THE PUBLIC who may at times be within the SITE BOUNDARY, the occupancy of that MEMBER OF THE PUBLIC will usually be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the SITE BOUNDARY. Examples of calculations for such MEMBERS OF THE PUBLIC, with the appropriate occupancy factors, shall be given in the ODCM. The specified release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to a MEMBER OF THE PUBLIC at or beyond the SITE BOUNDARY to less than or equal to 500 mrems/year to the total body or to less than or equal to 3000 mrems/year to the skin. These release rate limits also restrict, at all times, the corresponding thyroid dose rate above background to a child via the inhalation pathway to less than or equal to 1500 mrems/year. This requirement does not affect the requirement to comply with the annual limitations of 10 CFR 20.1301(a).

This requirement applies to the release of radioactive materials in gaseous effluents from all reactor units at the site.

The required detection capabilities for radioactive materials in gaseous waste samples are tabulated in terms of the lower limits of detection (LLD). Detailed discussion of the LLD and other detection limits can be found in Currie, L. A., "Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements," NUREG/CR-4007 (September 1984), and in the HASL Procedures Manual, HASL-300 (revised annually).

B-3.2 SECONDARY SYSTEM LIQUID WASTE DISCHARGE TO ONSITE EVAPORATION PONDS - CONCENTRATION

This requirement is provided to ensure that at any time during the life of the nuclear station, the annual total body dose due to ground contamination of an UNRESTRICTED AREA, arising from transportation and deposition by wind of the accumulated activity discharged to the pond from the secondary system of the plant (if the pond gets dried up) on the UNRESTRICTED AREA, is within the guidelines of 10 CFR Part 20 for the above-mentioned postulated event.

Restricting the concentrations of the secondary liquid wastes discharged to the onsite evaporation ponds will restrict the quantity of radioactive material that can get accumulated in the ponds. This, in turn, provides assurance that in the event of an uncontrolled release of the pond's contents to an UNRESTRICTED AREA, the resulting total body annual exposure from ground contamination to a MEMBER OF THE PUBLIC at the nearest exclusion area boundary will be within 0.5 rem.

This requirement applies to the secondary system liquid waste discharges of radioactive materials from all reactor units to the onsite evaporation ponds. Since the chemical neutralizer tank concentrations will bound concentrations in other secondary waste discharges, surveillance requirements stipulate that sampling and analysis of other secondary waste discharges need be performed only if the sampling and analysis of the contents of the chemical neutralizer tank shows that the neutralizer tank concentration exceeds the specified LLD.

The required detection capabilities for radioactive materials in gaseous waste samples are tabulated in terms of the lower limits of detection (LLD). Detailed discussion of the LLD and other detection limits can be found in Currie, L. A., "Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements," NUREG/CR-4007 (September 1984), and in the HASL Procedures Manual, HASL-300 (revised annually).

B-4.1 GASEOUS EFFLUENT - DOSE, Noble Gases

This requirement is provided to implement Sections II.B, III.A and IV.A of Appendix I, 10 CFR Part 50. This requirement implements the guides set forth in Section II.B of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable." The surveillance requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The dose calculation methodology and parameters established in the ODCM for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors," Revision 1, July 1977. The ODCM equations provided for determining the air doses at and beyond the SITE BOUNDARY are based upon the historical average atmospheric conditions.

This requirement applies to the release of radioactive materials in gaseous effluents from each reactor unit at the site.

B-4.2 GASEOUS EFFLUENT - DOSE - Iodine-131, Iodine-133, Tritium, and All Radionuclides in Particulate Form With Half-Lives Greater Than 8 Days

This requirement is provided to implement the requirements of Sections II.C, III.A, IV.A of Appendix I, 10 CFR Part 50. This requirement is the guide set forth in Section II.C of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive materials in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable." The ODCM calculational methods specified in the surveillance requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The ODCM calculational methodology and parameters for calculating the doses due to the actual release rates of the subject materials are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases for Light-Water-Cooled Reactors," Revision 1, July 1977. These equations also provide for determining the actual doses based upon the historical average atmospheric conditions. The release rate specifications for iodine-131, iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days are dependent upon the existing radionuclide pathways to man, in the areas at and beyond the SITE BOUNDARY. The pathways that were examined in the development of these calculations were: (1) individual inhalation of airborne radionuclides, (2) deposition of radionuclides onto green leafy vegetation with subsequent consumption by man, (3) deposition onto grassy areas where milk animals and meat-producing animals graze with consumption of the milk and meat by man, and (4) deposition on the ground with subsequent exposure of man.

This requirement applies to the release of radioactive materials in gaseous effluents from each reactor unit at the site.

B-4.3 GASEOUS RADWASTE TREATMENT

The OPERABILITY of the GASEOUS RADWASTE SYSTEM and the VENTILATION EXHAUST TREATMENT SYSTEM ensures that the systems will be available for use whenever gaseous effluents require treatment prior to release to the environment. The requirement that the appropriate portions of these systems be used, when specified, provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as reasonably achievable." This requirement implements the requirements of 10 CFR 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50, and the design objectives given in Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the systems were specified as a suitable fraction of the dose design objectives set forth in Sections II.B and II.C of Appendix I, 10 CFR Part 50, for gaseous effluents.

This requirement applies to the release of radioactive materials in gaseous effluents from each reactor unit at the site.

The minimum analysis frequency of 4/M (i.e., at least 4 times per month at intervals no greater than 9 days and a minimum of 48 times a year) is used for certain radioactive gaseous waste sampling in Table 3-1. This will eliminate taking double samples when quarterly and weekly samples are required at the same time.

B-4.4 SECONDARY SYSTEM LIQUID WASTE DISCHARGE TO ONSITE EVAPORATION PONDS - DOSE

This requirement is provided to implement the requirements of Sections II.A, III.A and IV.A of Appendix I, 10 CFR Part 50. This requirement implements the guides set forth in Section II.A of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable." Also, for fresh water sites with drinking water supplies that can be potentially affected by plant operations, there is reasonable assurance that the operation of the facility will not result in radionuclide concentrations in the finished drinking water that are in excess of the requirements of 40 CFR Part 141. The dose calculation methodology and parameters in the ODCM implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The equations specified in the ODCM for calculating the doses due to the actual release rates of radioactive materials in liquid effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," April 1977.

This requirement applies to the release of liquid effluents from each reactor at the site. For units with shared radwaste treatment systems, the liquid effluents from the shared system are proportioned among the units sharing that system.

B-5.1 TOTAL DOSE AND DOSE TO PUBLIC ONSITE

This requirement is provided to meet the dose limitations of 40 CFR Part 190 that have been incorporated into 10 CFR 20.1301(d). The requirement specifies the preparation and submittal of a Special Report whenever the calculated doses due to releases of radioactivity and to radiation from uranium fuel cycle sources exceed 25 mrems to the whole body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrems. Even if a site was to contain up to four reactors, it is highly unlikely that the resultant dose to a MEMBER OF THE PUBLIC will exceed the dose limits of 40 CFR Part 190 if the individual reactors remain within twice the dose design objectives of Appendix I, and if direct radiation doses from the reactor units (including outside storage tanks, etc.) are kept small. The Special Report will describe a course of action that should result in the limitation of the annual dose to a MEMBER OF THE PUBLIC to within the 40 CFR Part 190 limits. For the purposes of the Special Report, it may be assumed that the dose commitment to the MEMBER OF THE PUBLIC from other uranium fuel cycle sources is negligible, with the exception that dose contributions from other nuclear fuel cycle facilities at the same site or within a radius of 8 km must be considered. If the dose to any MEMBER OF THE PUBLIC is estimated to exceed the requirements of 40 CFR Part 190, submittal of the Special Report within 30 days with a request for a variance (provided the release conditions resulting in violation of 40 CFR Part 190 have not already been corrected), in accordance with the provisions of 40 CFR Part 190.11 and 10 CFR Part 20.2203(a)(4), is considered to be a timely request and fulfills the requirements of 40 CFR Part 190 until NRC staff action is completed. The variance only relates to the limits of 40 CFR Part 190, and does not apply in any way to other requirements for dose limitation of 10 CFR Part 20, as addressed in Section 3.2 and 3.1 of the ODCM. An individual is not considered a MEMBER OF THE PUBLIC during any period in which he/she is engaged in carrying out any operation that is part of the nuclear fuel cycle. Demonstration of compliance with the limits of 40 CFR Part 190 or with the design objectives of Appendix I to 10 CFR Part 50 will be considered to demonstrate compliance with the 0.1 rem limit of 10 CF 20.1301.

B-6.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

The Radiological Environmental Monitoring Program required by this requirement provides representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of MEMBERS OF THE PUBLIC resulting from the station operation. This monitoring program implements Section IV.B.2 of Appendix I to 10 CFR Part 50 and thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways. Guidance for this monitoring program is provided by the Radiological Assessment Branch Technical Position on Environmental Monitoring. The initially specified monitoring program will be effective for at least the first 3 years of commercial operation. Following this period, program changes may be initiated based on operational experience.

The required detection capabilities for environmental sample analyses are tabulated in terms of the lower limits of detection (LLD). The LLDs required by Table 6-3 are considered optimum for routine environmental measurements in industrial laboratories. It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

Detailed discussion of the LLD and other detection limits can be found in Currie, L. A., "Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements," NUREG/CR-4007 (September 1984), and in the HASL Procedures Manual, HASL-300 (revised annually).

B-6.2 LAND USE CENSUS

This requirement is provided to ensure that changes in the use of areas at and beyond the SITE BOUNDARY are identified and that modifications to the radiological environmental monitoring program are made if required by the results of this census. The best information from the door-to-door survey, from aerial survey or from consulting with local agricultural authorities shall be used. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50. Restricting the census to gardens of greater than 50 m^2 provides assurance that significant exposure pathways via leafy vegetables will be identified and monitored since a garden of this size is the minimum required to produce the quantity (26 kg/year) of leafy vegetables assumed in Regulatory Guide 1.109 for consumption by a child. To determine this minimum garden size, the following assumptions were made: (1) 20% of the garden was used for growing broad leaf vegetation (i.e., similar to lettuce and cabbage), and (2) a vegetation yield of 2 kg/m^2.

B-6.3 INTERLABORATORY COMPARISON PROGRAM

The requirement for participation in an approved Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to 10 CFR Part 50.

APPENDIX C

DEFINITIONS

Note:

The following definitions are from the Palo Verde Nuclear Generating Station Technical Specifications. These selected definitions support those portions of the Technical Specifications which were transferred to the ODCM and have been incorporated into the Requirements sections of the ODCM.

Definitions:

The defined terms of this section appear in capitalized type and are applicable throughout the Requirements sections of this ODCM.

ACTION

ACTION shall be that part of a requirement which prescribes remedial measures required under designated conditions.

CHANNEL CALIBRATION

A CHANNEL CALIBRATION shall be the adjustment, as necessary, of the channel output such that it responds with the necessary range and accuracy to known values of the parameter which the channel monitors. The CHANNEL CALIBRATION shall encompass the entire channel including the sensor and alarm and/or trip functions, and shall include the CHANNEL FUNCTIONAL TEST. The CHANNEL CALIBRATION may be performed by any series of sequential, overlapping, or total channel steps such that the entire channel is calibrated.

CHANNEL CHECK

A CHANNEL CHECK shall be the qualitative assessment of channel behavior during operation by observation. This determination shall include, where possible, comparison of the channel indication and/or status with other indications and/or status derived from independent instrument channels measuring the same parameter.

CHANNEL FUNCTIONAL TEST

A CHANNEL FUNCTIONAL TEST shall be:

a. Analog channels - the injection of a simulated signal into the channel as close to the sensor as practicable to verify OPERABILITY including alarm and/or trip functions.

b. Bistable channels - the injection of a simulated signal into the sensor to verify OPERABILITY including alarm and/or trip functions.

c. Digital computer channels - the exercising of the digital computer hardware using diagnostic programs and the injection of simulated process data into the channel to verify OPERABILITY including alarm and/or trip functions.

d. Radiological effluent process monitoring channels - the CHANNEL FUNCTIONAL TEST may be performed by any series of sequential, overlapping, or total channel steps such that the entire channel is functionally tested.

The CHANNEL FUNCTIONAL TEST shall include adjustment, as necessary, of the alarm, interlock and/or trip setpoints such that the setpoints are within the required range and accuracy.

DEFINITIONS (Continued)

DOSE EQUIVALENT I-131

DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134 and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in Table III of TID-14844, Calculation of Distance Factors for Power and Test Reactor Sites.

FREQUENCY NOTATION

The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table C-1.

GASEOUS RADWASTE SYSTEM

A GASEOUS RADWASTE SYSTEM shall be any system designed and installed to reduce radioactive gaseous effluents by collecting primary coolant system offgases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.

MEMBER(S) OF THE PUBLIC

MEMBER(S) OF THE PUBLIC shall include all persons who are not occupationally associated with the plant. This category does not include employees of the licensee, its contractors, or vendors. Also excluded from this category are persons who enter the site to service equipment or to make deliveries. This category does include persons who use portions of the site for recreational, occupational, or other purposes not associated with the plant.

OFFSITE DOSE CALCULATION MANUAL

The OFFSITE DOSE CALCULATION MANUAL shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring Alarm/Trip Setpoints, and in the conduct of the Environmental Radiological Monitoring Program. The ODCM shall also contain:

(1) the Radioactive Effluent Controls and Radiological Environmental Monitoring Programs required by Technical Specification Section 6.8.4, and

(2) descriptions of the information that should be included in the Annual Radiological Environmental Operating and Annual Radioactive Effluent Release Reports required by Technical Specifications 6.9.1.7 and 6.9.1.8.

OPERABLE-OPERABILITY

A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s), and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related support function(s).

OPERATIONAL MODE-MODE

An OPERATIONAL MODE (i.e., MODE) shall correspond to any one inclusive combination of core reactivity condition, power level, and cold leg reactor coolant temperature specified in Table C-2.

PROCESS CONTROL PROGRAM

The PROCESS CONTROL PROGRAM shall 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.

PURGE-PURGING

PURGE or PURGING shall be the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration, or other operating condition, in such a manner that replacement air or gas is required to purify the confinement.

RATED THERMAL POWER

RATED THERMAL POWER shall be a total reactor core heat transfer rate to the reactor coolant of 3800 MWt.

SITE BOUNDARY

The SITE BOUNDARY shall be that line beyond which the land is neither owned, nor leased, nor otherwise controlled by the licensee.

SOLIDIFICATION

SOLIDIFICATION shall be the conversion of radioactive wastes from liquid systems to a homogeneous (uniformly distributed), monolithic, immobilized solid with definite volume and shape, bounded by a stable surface of distinct outline on all sides (free-standing).

SOURCE CHECK

A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a source of increased radioactivity.

THERMAL POWER

THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant.

UNRESTRICTED AREA

An UNRESTRICTED AREA shall be any area at or beyond the SITE BOUNDARY access to which is not controlled by the licensee for the purposes of protection of individuals from exposure to radiation and radioactive materials, or any area within the SITE BOUNDARY used for residential quarters or for industrial, commercial, institutional, and/or recreational purposes.

VENTILATION EXHAUST TREATMENT SYSTEM

A VENTILATION EXHAUST TREATMENT SYSTEM shall be any system designed and installed to reduce gaseous radioiodine or radioactive material in particulate form in effluents by passing ventilation or vent exhaust gases through charcoal adsorbers and/or HEPA filters for the purpose of removing iodines or particulates from the gaseous exhaust stream prior to the release to the environment. Such a system is not considered to have any effect on noble gas effluents. Engineered Safety Feature (ESF) atmospheric cleanup systems are not considered to be VENTILATION EXHAUST TREATMENT SYSTEM components.

VENTING

VENTING shall be the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration, or other operating condition, in such a manner that replacement air or gas is not provided or required during VENTING. Vent, used in system names, does not imply a VENTING process.

TABLE C-1

FREQUENCY NOTATION

NOTATION	FREQUENCY
S	At least once per 12 hours.
D	At least once per 24 hours.
W	At least once per 7 days.
4/M	At least 4 times per month at intervals no greatr than 9 days and a minimum of 48 times per year.
M	At least once per 31 days.
Q	At least once per 92 days.
SA	At least once per 184 days.
R	At least once per 18 months.
P	Completed prior to each release.
S/U	Prior to reactor startup.
N.A.	Not Applicable.

TABLE C-2

OPERATIONAL MODES

Operational Mode	Reactivity Condition, K_{eff}	% of Rated Thermal Power*	Cold Leg Temperature (T_{cold})
1. POWER OPERATION	≥ 0.99	$> 5\%$	$\geq 350°F$
2. STARTUP	≥ 0.99	$\leq 5\%$	$\geq 350°F$
3. HOT STANDBY	< 0.99	0	$\geq 350°F$
4. HOT SHUTDOWN	< 0.99	0	$350°F > T_{cold} < 210°F$
5. COLD SHUTDOWN	< 0.99	0	$\leq 210°F$
6. REFUELING**	≤ 0.95	0	$\leq 135°F$

* Excluding decay heat.

** Fuel in the reactor vessel with the vessel head closure bolts less than fully tensioned or with the head removed.

APPENDIX D
DISPOSITION OF NRC GENERIC LETTER 89-01 ITEMS FROM THE PVNGS TECHNICAL SPECIFICATIONS TO THE ODCM

NUREG 0472 Tech Spec #	PVNGS T.S. #	ODCM	Item	Disposition
Table 1.2	Table 1.1	Table C-1	FREQUENCY NOTATION	Table retained in Technical Specifications and duplicated in the ODCM.
N/A	Table 1.2	Table C-2	OPERATIONAL MODES	Table retained in Technical Specifications and duplicated in the ODCM.
1.17	1.18	Apx C	OFFSITE DOSE CALCULATION MANUAL	Definition incorporated in Technical Specifications and the ODCM definitions.
1.30	1.24	Apx C	PROCESS CONTROL PROGRAM	Definition incorporated in Technical Specifications and the ODCM definitions.
1.31	1.32	Apx C	SOLIDIFICATION	Definition deleted from Technical Specifications and relocated to the ODCM and PCP.
3/4.3.3.10	N/A	N/A	RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION	This item does not exist in the PVNGS Technical Specifications since there are no liquid effluents.
3/4.3.3.11	3/4.3.3.8	2.1	RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION	Relocated to the ODCM. Existing requirements for explosive gas monitoring instrument-action are retained in the Technical Specifications.
Table 3.3-13	Table 3.3-12	Table 2-1	RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION	Relocated to the ODCM.
Table 4.3-13	Table 4.3-8	Table 2-2	RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION	Relocated to the ODCM.
3/4.11.1.1	3/4.11.1.1	3.2	LIQUID EFFLUENTS: CONCENTRATION	Relocated to the ODCM.

APPENDIX D (Continued)
DISPOSITION OF NRC GENERIC LETTER 89-01 ITEMS FROM THE PVNGS TECHNICAL SPECIFICATIONS TO THE ODCM

NUREG 0472 Tech Spec #	PVNGS T.S. #	ODCM	Item	Disposition
Table 4.11-1	Table 4.11-1	Table 3-5	RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM	Relocated to the ODCM.
3/4.11.1.2	3/4.11.1.2	4.4	LIQUID EFFLUENTS: DOSE	Relocated to the ODCM.
3/4.11.1.3	N/A		LIQUID EFFLUENTS: LIQUID RADWASTE TREATMENT SYSTEM	This item does not exist in the PVNGS Technical Specifications since there are no liquid effluents.
3/4.11.1.4	3/4.11.1.3	N/A	LIQUID HOLDUP TANKS	Existing specification requirements are retained in the Technical Specifications.
3/4.11.2.1	3/4.11.2.1	3.1	GASEOUS EFFLUENTS: DOSE RATE	Relocated to the ODCM.
Table 4.11-2	Table 4.11-2	Table 3-1	RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM	Relocated to the ODCM.
3/4.11.2.2	3/4.11.2.2	4.1	GASEOUS EFFLUENTS: DOSE-NOBLE GASES	Relocated to the ODCM.
3/4.11.2.3	3/4.11.2.3	4.2	GASEOUS EFFLUENTS: DOSE- I-131, I-133,Tritium, and Radioactive Material in Particulate form.	Relocated to the ODCM.
3/4.11.2.4	3/4.11.2.4	4.3	GASEOUS EFFLUENTS: Gaseous Radwaste Treatment or Ventilation Exhaust Treatment System	Relocated to the ODCM.
3/4.11.2.5	3/4.11.2.5	N/A	EXPLOSIVE GAS MIXTURE	Retained in the Technical Specifications.
3/4.11.2.6	3/4.11.2.6	N/A	GAS STORAGE TANKS	Retained in the Technical Specifications.
3/4.11.3	3/4.11.3	N/A	SOLID RADIOACTIVE WASTES	Relocated to the PCP.

APPENDIX D (Continued)
DISPOSITION OF NRC GENERIC LETTER 89-01 ITEMS FROM THE PVNGS TECHNICAL SPECIFICATIONS TO THE ODCM

NUREG 0472 Tech Spec #	PVNGS T.S. #	ODCM	Item	Disposition
3/4.11.4	3/4.11.4	5.1	RADIOACTIVE EFFLUENTS: Total Dose	Relocated to the ODCM.
3/4.12.1	3/4.12.1	6.1	RADIOLOGICAL ENVIRONMENTAL MONITORING: Monitoring Program	Relocated to the ODCM.
Table 3.12-1	Table 3.12-1	Table 6-1	RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM	Relocated to the ODCM.
Table 3.12-2	Table 3.12-2	Table 6-2	REPORTING LEVELS FOR RADIO-ACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES	Relocated to the ODCM.
Table 4.12-1	Table 4.12-1	Table 6-3	DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS	Relocated to the ODCM.
3/4.12.2	3/4.12.2	6.2	RADIOACTIVE ENVIRONMENTAL MONITORING: Land Use Census	Relocated to the ODCM.
3/4.12.3	3/4.12.3	6.3	RADIOACTIVE ENVIRONMENTAL MONITORING: Interlaboratory Comparison Program	Relocated to the ODCM.
			DESIGN FEATURES:	
Figure 5.1-1	Figure 5.1-1	Figure 6-4	SITE AND EXCLUSION BOUNDARIES	Figure revised in Technical Specifications and duplicated in the ODCM.
Figure 5.1-2	Figure 5.1-2	Figure 6-6	LOW POPULATION ZONE	Figure revised in Technical Specifications and duplicated in the ODCM.
Figure 5.1-3	Figure 5.1-3	Figure 6-5	GASEOUS RELEASE POINTS	Figure revised in Technical Specifications and duplicated in the ODCM.

APPENDIX D (Continued)
DISPOSITION OF NRC GENERIC LETTER 89-01 ITEMS FROM THE PVNGS TECHNICAL SPECIFICATIONS TO THE ODCM

NUREG 0472 Tech Spec #	PVNGS T.S. #	ODCM	Item	Disposition
N/A	6.8.6.g	N/A	Radioactive Effluent Controls Program	New Section is added to Technical Specifications to address programmatic controls being relocated to the ODCM.
N/A	6.8.6.h	N/A	Radiological Environmental Monitoring	New Section is added to Technical Specifications Program to address programmatic controls being relocated to the ODCM.
6.9.1.3	6.9.1.7	7.2	REPORTING REQUIREMENTS: Annual Radiological EnvironmentalOperating Report	Relocated to the ODCM and simplified in Technical Specifications.
6.9.1.4	6.9.1.8	7.1	REPORTING REQUIREMENTS: Semiannual Radiological Effluent Release Report	Relocated to ODCM and simplified in Technical Specifications.
N/A	6.10.2.q	N/A	RECORD RETENTION	New section is added to Technical Specifications to address records of reviews performed for changes made to the ODCM and PCP.
6.13	6.13	N/A	PROCESS CONTROL PROGRAM	Technical Specification requirements simplified.
6.14	6.14	N/A	OFFSITE DOSE CALCULATION MANUAL	Technical Specification requirements simplified.
6.15	6.15	N/A	MAJOR CHANGES TO LIQUID, GASEOUS, AND SOLID RADWASTE TREATMENT SYSTEMS	No changes, retained in Technical Specifications.

APPENDIX D (Continued)
DISPOSITION OF NRC GENERIC LETTER 89-01 ITEMS
FROM THE PVNGS TECHNICAL SPECIFICATIONS TO THE ODCM

NUREG 0472 Tech Spec #	PVNGS T.S. #	ODCM	Item	Disposition
			BASES	The BASES for the above sections that were relocated from the Technical Specifications to the ODCM are also relocated to the ODCM, Appendix B. For convenience, the section references are included below.
3/4.3.3.10	3/4.3.3.8	2.1		
3/4.11.1.1	3/4.11.1.1	3.2		
3/4.11.1.2	3/4.11.1.2	4.4		
3/4.11.2.1	3/4.11.2.1	3.1		
3/4.11.2.2	3/4.11.2.2	4.1		
3/4.11.2.3	3/4.11.2.3	4.2		
3/4.11.2.4	3/4.11.2.4	4.3		
3/4.11.4	3/4.11.4	5.1		
3/4.12.1	3/4.12.1	6.1		
3/4.12.2	3/4.12.2	6.2		
3/4.12.3	3/4.12.3	6.3		

APPENDIX E

ODCM, Revision 10

OFFSITE DOSE CALCULATION MANUAL
PALO VERDE NUCLEAR GENERATING STATION
UNITS 1, 2 AND 3

REVISION 10

Originator		Date	10-6-95
Tech. Reviewer		Date	10-10-95
Director, Site Chemistry		Date	10/17/95
PRB		Date	11/8/95
Plant Manager	N/A	Date	

Effective Date 12-6-95

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1.0 INTRODUCTION

The Offsite Dose Calculation Manual (ODCM) implements the program elements which are required by the Administrative Controls section of the Technical Specifications, Section 6.8.4.g. Radioactive Effluent Controls Program, and Section 6.8.4.h. Radiological Environmental Monitoring Program at the Palo Verde Nuclear Generating Station (PVNGS) for Unit 1, Unit 2 and Unit 3. The ODCM is defined in Technical Specifications, Section 1.18 and in the Definitions in Appendix C of this manual. The ODCM contains the operational requirements, the surveillance requirements, and actions required if the operational requirements are not met for the Radioactive Effluent Controls Program and the Radiological Environmental Monitoring Program to assure compliance with 10 CFR 20.1302, 40 CFR Part 190, 10 CFR 50.36a, and Appendix I to 10 CFR Part 50. The Technical Specifications, Section 3/4.0, also apply to the ODCM. Substitute the word "Requirements" for "Limiting Condition for Operation." It should be noted that the hot and cold shutdown and operability requirements in Technical Specification 3.0.3 and 3.0.4 do not apply to any of the requirements contained in this ODCM. The ODCM also contains descriptions of the information that should be included in the Annual Radiological Environmental Operating Report and the Annual Radioactive Effluent Release Report required by Technical Specifications Section 6.9.1.7 and 6.9.1.8.

The ODCM provides the parameters and methodology to be used in calculating offsite doses resulting from radioactive effluents, in the calculation of gaseous effluent monitor Alarm/Trip Setpoints, and in the conduct of the Radiological Environmental Monitoring Program. Included are methods for determining air, whole body, and organ dose at the controlling location due to plant effluents to assure compliance with the regulatory requirements detailed in the ODCM. Methods are included for performing dose projections to assure compliance with the gaseous treatment system operability sections of the ODCM. The ODCM utilizes information from NRC Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," October 1977, and NRC NUREG 0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," October 1978. NUREG 0133 utilizes some of the key information in Regulatory Guide 1.109 to provide methods which were used in the preparation of the radiological effluent Technical Specifications and which have now been transferred to the ODCM in accordance with NRC Generic Letter 89-01, "Implementation of Programmatic Controls for Radiological Effluent Technical Specifications in the Administrative Controls Section of the Technical Specifications and the Relocation of Procedural Details of RETS to the Offsite Dose Calculation Manual or to the Process Control Program," January 31, 1989, and NUREG 1301, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Pressurized Water Reactors," Generic Letter 89-01, Supplement No. 1, April 1991. Further guidance for the implementation of the new 10 CFR part 20, effective January 1, 1994, was obtained from the Federal Register, Vol. 58, December 23, 1993. It is recognized that this is only draft guidance, however, it is the only guidance for referencing the new 10 CFR 20 in the ODCM.

1.1 Liquid Effluent Pathways

Dose calculation methodology for liquid effluents is not included in this manual due to the desert location of the plant, the hydrology of the area, and the fact that there are no liquid releases to areas at or beyond the SITE BOUNDARY during normal operation. All liquid discharges to the onsite evaporation ponds are controlled by Section 3.2. The impact of postulated accidental seepages on the groundwater system, and in particular on the existing wells located in the 5-mile zone around the site area has been calculated and analyzed in Section 2.4.13.3 of the PVNGS FSAR.

If plant operating conditions become such that the likelihood of a liquid effluent pathway is created, then dose calculation methodology for this pathway will be added to this manual.

1.2 Gaseous Effluent Pathways

All gaseous effluents are treated as ground level releases and are considered to be "long-term" as discussed in NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants." This includes the containment purge and Waste Gas Decay Tank releases as well as the normal ventilation system and condenser vacuum exhaust releases. All releases are either greater than 500 hours in duration or are made at random, not depending upon atmospheric conditions or time of day. The releases are lumped together and calculated as an entity. Historical annual average X/Q values are used throughout this manual for all gaseous effluent setpoint and dose calculations. Airborne releases are further subdivided into two subclasses:

1.2.1 Iodine-131, Iodine-133, Tritium and Radionuclides in Particulate Form with Half-lives Greater than Eight Days

In this model, a controlling location is identified for assessing the maximum exposure to a MEMBER OF THE PUBLIC for the various pathways and to critical organs. Infant exposure occurs through inhalation and any actual milk pathway. Child, teenager and adult exposure derives from inhalation, consumed vegetation pathways, and any actual milk and meat pathways. Dose to each of the seven organs listed in Regulatory Guide 1.109 (bone, liver, total body, thyroid, kidney, lung and GI-LLI) are computed from individual nuclide contributions in each sector. The largest of the organ doses in any sector is compared to 10 CFR 50, Appendix I design objectives. The release rates of these nuclides will be converted to instantaneous dose rates for comparison to the limits of 10 CFR 20.

1.2.2 Noble Gases

The air dose from both the beta and gamma radiation component of the noble gases will be assessed and compared to the 10 CFR 50, Appendix I design objectives. The noble gas release rate will be converted to instantaneous dose rates for comparison to the limits of 10 CFR 20.

Section 2.0 of this manual discusses the methodology to be used in determining effluent monitor alarm/trip setpoints to assure compliance with the 10 CFR Part 20 limits as implemented in Section 3.0. Section 4.0 discusses the methods to assure releases are As Low As Reasonably Achievable (ALARA) in accordance with Appendix I to 10 CFR Part 50. Methods are described in Section 5.0 for determining the annual cumulative dose to a MEMBER OF THE PUBLIC from gaseous effluents and direct radiation to assure compliance with 40 CFR Part 190.

The requirements for the Annual Radiological Effluent Release Report and the Radiological Environmental Monitoring Program, including the Annual Land Use Census and the Interlaboratory Comparison Program, and the Annual Environmental Report are described in Sections 6.0 and 7.0 of this manual.

1.3 Nuisance Pathways

This section addresses the potential release pathways which should not contribute more than 10% of the doses evaluated in this manual. Table 1-1 lists examples of potential release pathways. The ODCM methodology for calculation of doses will be applied to an applicable release pathway if a likely potential arises for contributing more than 10% of the doses evaluated in this manual.

TABLE 1-1

NUISANCE PATHWAYS

(EXAMPLES)

Evaporation Pond

Cooling Towers

Laundry/Decon Building Exhaust

Unmonitored Secondary System Steam Vents/Reliefs

Turbine Building Ventilation Exhaust

Unmonitored Tank Atmospheric Vents

Dry Active Waste Processing and Storage (DAWPS) Building

Respirator Cleaning Facility

Secondary Side Decontamination Equipment

Low Level Radioactive Material Storage Facility

1.4 Meteorology

Historical annual average atmospheric dispersion (X/Q) and deposition(D/Q) data, based on nine years of meteorological data, and given in Table 3-2 for each of the three nuclear generating units are used to demonstrate compliance with the ODCM Requirements. These Requirements include:

Section 2.0	Gaseous Effluent Monitor Setpoints;
Section 3.0	Gaseous and Liquid Effluent - Dose Rate
Section 4.0	Gaseous and Liquid Effluent - Dose
Section 5.0	Total Dose and Dose to Public Onsite

Sections 2.0 and 3.0 specify utilizing the highest X/Q or D/Q meteorological dispersion parameter at the Site Boundary for any of the three units as applicable. Using the highest dispersion parameter for any of the units provides a conservative assumption to assure compliance with the higher 10 CFR Part 20 limits.

Section 4.0 specifies utilizing the highest X/Q at the Site Boundary for the particular unit, from Table 3-2 for noble gases. The highest X/Q and D/Q are utilized for the particular unit's releases as applicable for gases other than noble gases (iodines, particulates, and tritium) for the controlling pathway's location (site boundary using Table 3-2 or other controlling locations using Table 4-16).

Section 5.0 specifies utilizing the highest X/Q for the particular unit's releases at the controlling location from Table 4-16 for noble gases. The highest X/Q and D/Q are utilized for the particular unit's releases as applicable for gases other than noble gases at the controlling pathway's location using Table 4-16.

Section 7.0 requires that the meteorological conditions concurrent with the time of release of radioactive materials in gaseous effluents, as determined by sampling frequency and measurement, shall be used for determining the gaseous pathway doses.

2.0 GASEOUS EFFLUENT MONITOR SETPOINTS

2.1 Requirements: Gaseous Monitors

The radioactive gaseous effluent monitoring instrumentation channels shown in Table 2-1 shall be OPERABLE with their alarm/trip setpoints set to ensure that the dose requirements in Section 3.0 are not exceeded. The alarm/trip setpoints of these channels shall be determined and adjusted in accordance with the methodology and parameters in Section 2.1.2.

Applicability: As shown in Table 2-1.

Action:

a. With the low range radioactive gaseous effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above Requirement, immediately suspend the release of radioactive gaseous effluents monitored by the affected channel, or declare the channel inoperable, or change the setpoint so it is acceptably conservative.

b. With less than the minimum number of radioactive gaseous effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 2-1. Restore the inoperable instrumentation to OPERABLE status within 30 days or, if unsuccessful, explain in the next Annual Radioactive Effluent Release Report why this inoperability was not corrected within the time specified.

2.1.1 Surveillance Requirements:

a. Each radioactive gaseous effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION, and CHANNEL FUNCTIONAL TEST operations at the frequencies shown in Table 2-2.

TABLE 2-1

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
1. GASEOUS RADWASTE SYSTEM			
a. Noble Gas Activity Monitor - Providing Alarm and Automatic Termination of Release #RU-12	1	#	35
b. Flow Rate Monitor	1	#	36
2. NOT USED			
3. DELETED			
4. PLANT VENT SYSTEM			
A. Low Range Monitors			
a. Noble Gas Activity Monitor #RU-143	1	*	37
b. Iodine Sampler	1	*	40
c. Particulate Sampler	1	*	40
d. Flow Rate Monitor	1	*	36
e. Sampler Flow Rate Measuring Device	1	*	36
B. High Range Monitors			
a. Noble Gas Activity Monitor #RU-144	1	*	42
b. Iodine Sampler	1	*	42
c. Particulate Sampler	1	*	42
d. Sampler Flow Rate Measuring Device	1	*	42

TABLE 2-1 (Continued)

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
5. FUEL BUILDING VENTILATION SYSTEM			
A. Low Range Monitors			
a. Nobel Gas Activity Monitor #RU-145	1	##	37, 41
b. Iodine Sampler	1	##	40
c. Particulate Sample	1	##	40
d. Flow Rate Monitor	1	##	36
e. Sampler Flow Rate Measuring Device	1	##	36
B. High Range Monitors			
a. Noble Gas Activity Monitor #RU-146	1	##	42
b. Iodine Sampler	1	##	42
c. Particulate Sample	1	##	42
d. Sampler Flow Rate Measuring Device	1	##	42

Table 2-1 (Continued)

TABLE NOTATION

- * At all times.
- ** During GASEOUS RADWASTE SYSTEM operation
- *** Whenever the condenser air removal system is in operation, or whenever turbine glands are being supplied with steam from sources other than the auxiliary boiler(s).
- # During waste gas release.
- ## In MODES 1, 2, 3, and 4 or when irradiated fuel is in the fuel storage pool.

ACTION 35 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, the contents of the tank(s) may be released to the environment provided that prior to initiating the release:

a. At least two independent samples of the tanks contents are analyzed, and

b. At least two technically qualified members of the facility staff independently verify the release rate calculations and discharge valve lineup;

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION 36 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided the flow rate is estimated at least once per 4 hours.

ACTION 37 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided the actions of (a) or (b) or (c) are performed:

a. Initiate the Preplanned Alternate Sampling Program to monitor the appropriate parameter(s).

b. Place moveable air monitors in-line.

c. Either take grab samples at least once per 12 hours, OR obtain gas channel monitor readings locally at least once per 12 hours if the channel is functional locally but inoperable due to loss of communication with the minicomputer. The surveillance requirements of Section 2.1.1 must be performed at the required frequencies for the channel to be functional locally.

ACTION 38 - NOT USED

ACTION 39 - NOT USED

ACTION 40 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via the effected pathway may continue provided samples are continuously collected with auxiliary sampling equipment as required in Table 3-1 within one hour after the channel has been declared inoperable.

ACTION 41 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirements, comply with the ACTIONS of Technical Specification 3.9.12 or operate the fuel building essential ventilation system while moving irradiated fuel.

Table 2-1 (Continued)

TABLE NOTATION

ACTION 42 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement restore the channel to OPERABLE status within 72 hours or:

a. Initiate the Preplanned Alternate Sampling Program to monitor the appropriate parameter(s) when it is needed.

b. Prepare and submit a Special Report to the Commission pursuant to Technical Specification 6.9.2 within 30 days following the event outlining the action(s) taken, the cause of the inoperability, and the plans and schedule for restoring the system to OPERABLE status.

NOTE: Action item numbering and instrument numbering are the same as in the Technical Specifications from which this section was taken to avoid potential confusion. Thus not all action item numbers will be found in this ODCM.

TABLE 2-2

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

INSTRUMENT	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST	MODE IN WHICH SURVEILLANCE IS REQUIRED
1. GASEOUS RADWASTE SYSTEM					
a. Noble Gas Activity Monitor - Providing Alarm and Automatic Termination of Release RU-12	P	P(7)	R(3)	Q(1),(2),P###	#
b. Flow Rate Monitor	P	N.A.	R	Q,P###	#
2. DELETED					
3. DELETED					
4. PLANT VENT SYSTEM (RU-143 and RU-144)					
a. Noble Gas Activity Monitor	D(5)	M(7)	R(3)	Q(2)	*
b. Iodine Sampler	N.A.	N.A.	N.A.	N.A.	*
c. Particulate Sampler	N.A.	N.A.	N.A.	N.A.	*
d. Flow Rate Monitor	D(6)	N.A.	R	Q	*
e. Sampler Flow Rate Measuring Device	D(6)	N.A.	R	Q	*
5. FUEL BUILDING VENTILATION SYSTEM (RU-145 and RU-146)					
a. Nobel Gas Activity Monitor	D(5)	M(7)	R(3)	Q(2)	##
b. Iodine Sampler	N.A.	N.A.	N.A.	N.A.	##
c. Particulate Sample	N.A.	N.A.	N.A.	N.A.	##
d. Flow Rate Monitor	D(6)	N.A.	R	Q	##
e. Sampler Flow Rate Measuring Device	D(6)	N.A.	R	Q	##

Table 2-2 (Continued)

TABLE NOTATION

*	At all times.
**	During GASEOUS RADWASTE SYSTEM operation
***	Whenever the condenser air removal system is in operation, or whenever turbine glands are being supplied with steam from sources other than the auxiliary boiler(s).
#	During waste gas release.
##	In MODES 1, 2, 3, and 4 or when irradiated fuel is in the fuel storage pool.
###	Functional test should consist of, but not be limited to, a verification of system isolation capability by the insertion of a simulated alarm condition.

(1) The CHANNEL FUNCTIONAL TEST shall also demonstrate that automatic isolation of this pathway occurs if the instrument indicates measured levels above the alarm/trip setpoint.

(2) The CHANNEL FUNCTIONAL TEST shall also demonstrate that control room alarm annunciation occurs if any of the following conditions exists:

1. Instrument indicates measured levels above the alarm setpoint.
2. Circuit failure.
3. Instrument indicates a downscale failure.
4. Instrument controls not set in operate mode.

(3) The initial CHANNEL CALIBRATION shall be performed using one or more of the reference standards certified by the National Institute of Standards and Technology(NIST) or using standards that have been obtained from suppliers that participate in measurement assurance activities with NIST. These standards shall permit calibrating the system over its intended range of energy and measurement range. For subsequent CHANNEL CALIBRATION, sources that have been related to the initial calibration may be used in lieu of the reference standards associated with the initial calibration.

(4) NOT USED

(5) The channel check for channels in standby status shall consist of verification that the channel is on-line and reachable.

(6) Daily channel check not required for flow monitors in standby status.

(7) LED may be utilized as the check source in lieu of a source of increased activity.

Note: Action item numbering and instrument numbering are the same as in the Technical Specifications from which this section was taken to avoid potential confusion. Thus not all action item numbers will be found in this ODCM.

2.1.2 Implementation of the Requirements:

The general methodology for establishing low range gaseous effluent monitor setpoints is based upon a site release rate limit in µCi/sec derived from site specific meteorological dispersion conditions, radioisotopic distribution, and whole body and skin dose factors. The high alarm of the low range monitors will alarm/trip when the release rate from an individual vent will result in exceeding the limits in Section 3.1. 80% of Section 3.1 limits is considered to be the site release rate limit. The site release rate limit will be allocated among the licensed units' release points. The unit release rate limit will then be utilized for the determination of gaseous effluent monitor setpoints. A fraction of the unit release rate limit is then allotted to each release point and its monitor alert setpoint (µCi/cc) is derived using actual or fan design flow rates.

Administrative values are used to reduce each setpoint to account for the potential activity in other releases. These administrative values shall be reviewed based on actual release data.

For the purpose of implementation of Section 2.1, the alarm setpoint levels for low range effluent noble gas monitors are established to ensure that personnel are alerted when the noble gas releases are at a rate such that if the releases would continue for the year they would approach the total body dose rate of 500 mrem/yr and 3000 mrem/yr skin dose in Section 3.1. The equations in Section 3.1 of this manual provide the methodology for calculating the gaseous effluent dose rate.

The evaluation of doses due to releases of radioactive material can be simplified by the use of equivalent dose factors as defined in Section 2.1.2.1.

The equivalent dose factors will be evaluated periodically to assure that the best information on isotopic distribution is being used for the dose equivalent value.

2.1.2.1 Equivalent Dose Factor Determination

The equivalent whole body dose factor is calculated as follows:

$$K_{eq} = \sum_i [(K_i)(f_i)] \tag{2-1}$$

Where:

K_{eq} = the equivalent whole body dose factor weighted by historical radionuclide distribution in releases in mrem/yr per $\mu Ci/m^3$.

K_i = the whole body dose factor due to gamma emissions for each identified noble gas radionuclide i, in mrem/yr per $\mu Ci/m^3$ from Table 3-3.

f_i = the fraction of noble gas radionuclide i in the total noble gas radionuclide mix.

The equivalent skin dose factor is calculated as follows:

$$(L + 1.1M)_{eq} = \sum_i [(L_i + 1.1M_i)(f_i)] \tag{2-2}$$

Where:

$(L+1.1M)_{eq}$ = the equivalent skin dose factor due to beta and gamma emissions from all noble gases released, weighted by the historical radionuclide distribution in releases in mrem/yr per $\mu Ci/m^3$.

L_i = the skin dose factor due to the beta emissions for each identified noble gas radionuclide i, in mrem/yr per $\mu Ci/m^3$ from Table 3-3.

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide i, in mrad/yr per $\mu Ci/m^3$ from Table 3-3.

f_i = the fraction of noble gas radionuclide i in the total noble gas radionuclide mix.

1.1 = unit conversion constant of 1.1 mrem/mrad converts air dose to skin dose.

2.1.2.2 Site Release Rate Limit (Q_{SITE})

The release rates corresponding to 80% of the whole body (Q_{WB}) and skin (Q_{SK}) dose rate limits are calculated using the equivalent dose factors defined in Section 2.1.2.1. The site release rate limit (Q_{SITE}) is the lower of Q_{WB} or Q_{SK}, thus assuring that the more restrictive dose rate limit will not be exceeded.

The Q_{SITE} is established as follows:

$$Q_{SITE,WB} = \frac{(D_{WB})\ (0.8)}{(K_{eq})\ (X/Q)_{SITE}} \tag{2-3}$$

Where:

$Q_{SITE,WB}$ = the site release rate, in µCi/sec, that would deliver a dose rate 80% of the whole body dose rate limit, D_{WB}.

D_{WB} = whole body dose rate limit of 500 mrem/yr.

K_{eq} = equivalent whole body dose factor, in mrem/yr per µCi/m^3 weighted by the historical radionuclide distribution.

$(X/Q)_{SITE}$ = 8.91E-06, the highest calculated annual average dispersion parameter, in sec/m^3, at the Site Boundary for any of the 3 units, from Table 3-2.

0.8 = administrative factor to compensate for any unexpected variability in the radionuclide mix and to ensure that Site Boundary dose rate limits will not be exceeded.

$$Q_{SITE,SK} = \frac{(D_{SK})\ (0.8)}{(L + 1.1M)_{eq}\ (X/Q)_{SITE}} \tag{2-4}$$

Where:

$Q_{SITE,SK}$ = the site release rate limit, in µCi/sec, that would deliver a dose rate 80% of the skin dose rate limit, D_{SK}.

D_{SK} = skin dose rate limit of 3000 mrem/yr.

$(L+1.1M)_{eq}$ = equivalent skin dose factor, in mrem/yr per µCi/m^3, weighted by the radionuclide distribution.

$(X/Q)_{SITE}$ = 8.91E-06, the highest calculated annual average dispersion parameter, in sec/m^3, at the Site Boundary for any of the three units, from Table 3-2.

0.8 = administrative factor to compensate for any unexpected variability in the radionuclide mix and to ensure that Site Boundary dose rate limits will not be exceeded.

After determination of the Q_{SITE} whole body and skin dose rates (equations 2-3 and 2-4, respectively), the most conservative result will be used as Q_{SITE}, the site release rate limit.

2.1.2.3 Unit Release Rate Limits (Q_{UNIT})

Typically Q_{SITE} will be divided equally among operating units. If operational history dictates a larger fraction of the Q_{SITE} be assigned to a specific unit then a weighted average of each unit's contribution to the Q_{SITE} will be utilized to determine the Q_{UNIT}.

$$Q_{UNIT} = (f_{UNIT})(Q_{SITE}) \qquad (2\text{-}5)$$

Where:

Q_{UNIT} = unit release rate limit, in µCi/sec.

f_{UNIT} = the fraction ($\leq$ 1) of noble gas historically released from a specific operating unit to the total of all noble gas released from the site.

Q_{SITE} = the site release rate limit, in µCi/sec determined in Section 2.1.2.2.

2.1.2.4 Setpoint Determination

To comply with the requirements in Section 2.1, the alarm/trip setpoints can now be established using the unit release rate limit (Q_{UNIT}) to ensure that the noble gas releases do not exceed the dose rate limits.

To allow for multiple sources of releases from different or common release points, the effluent monitor setpoint includes an administrative factor which allocates a percentage of the unit release rate limit to each of the release sources. Monitor setpoints will also be adjusted in accordance with Nuclear Administrative and Technical Manual procedures to account for monitor-specific characteristics.

<u>Monitors RU-143 and RU-145</u>

The alarm/trip setpoint for Monitors RU-143 and RU-145 is calculated as follows:

$$\text{Monitor Setpoint} \leq \frac{(Q_{UNIT})\,(a)}{(472)\,(\text{Flow Rate})} \qquad (2\text{-}6)$$

Where:

Monitor

Setpoint = the setpoint for the effluent monitor, in µCi/cc, which provides a safe margin of assurance that the allowable dose rate limits will not be exceeded.

Q_{UNIT} = unit release rate limit, in µCi/sec, as determined in Section 2.1.2.3.

Flow Rate = the flow rate, in cfm, from flow rate monitors or the fan design flow rate for the release source under consideration.

472 = conversion factor, cubic centimeter/second per cubic feet/minute.

a = fraction of Q_{UNIT} allocated for a specific release point. The sum of these administrative values shall be less than or equal to one.

Monitor RU-12

The alarm/trip setpoint for Monitor RU-12, the Waste Gas Decay Tank Monitor, is calculated as follows:

$$\text{Monitor setpoint} \leq \frac{[(Q_{UNIT})(a)(0.9) - (H)(PF)(472)]}{(\text{Flow Rate})(472)} \qquad (2\text{-}7)$$

Where:

Monitor

Setpoint	=	the setpoint for the monitor, in µCi/cc at STP, which provides a safe margin of assurance that the allowable dose rate limits will not be exceeded.
Q_{UNIT}	=	unit release rate limit, in µCi/sec, as determined in Section 2.1.2.3.
Flow Rate	=	flow rate, in cfm at STP at which the tank will be released.
PF	=	the current process flow of the plant vent in CFM.
H	=	the current plant vent monitor concentration in µCi/cc.
a	=	fraction of Q_{UNIT} allocated for a specific release point. This administrative value should be equal to or less than the administrative value used for the Plant Vent.
0.9	=	an administrative value to account for potential increases in activity from other contributors to the same release point.
472	=	conversion factor, cubic centimeter/second per cubic feet/minute.

If there is no release associated with this monitor, the monitor setpoint should be established as close as practical to background to prevent spurious alarms, and yet assure an alarm should an inadvertent release occur.

2.1.2.5 Monitor Calibration

The Radiation Level Conversion Factor (RLF) for each monitor is entered into the Radiation Monitoring System Database and may change whenever the monitor is calibrated. Calibration is performed in accordance with Nuclear Administrative and Technical Manual procedures.

3.0 GASEOUS AND LIQUID EFFLUENT DOSE RATES

3.1 Requirements: Gaseous Effluents

The dose rate due to radioactive materials released in gaseous effluents from the site (see Figures 6-4 and 6-5) 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.

Applicability: At all times.

Action:

With the dose rate(s) exceeding the above limits, immediately decrease the release rate to within the above limits(s).

3.1.1 Surveillance Requirements:

a. The dose rate due to noble gases in gaseous effluents shall be determined to be within the above limits in accordance with the methods contained in Section 3.1.2.

b. The dose rate due to I-131, I-133, tritium and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents shall be determined to be within the above limits in accordance with the methods contained in Section 3.1.2 by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in Table 3-1.

3.1.2 Implementation of the Requirements:

Noble Gases

Noble gas activity monitor setpoints are established at release rates which permit corrective action to be taken before exceeding offsite dose rates corresponding to the 10 CFR 20 annual dose limits as described in Section 2.0. The requirements for sampling and analysis of continuous and batch effluent releases are given in Table 3-1. The methods for sampling and analysis of continuous and batch effluent releases are given in the Nuclear Administrative and Technical Manual procedures. The dose rate in unrestricted areas shall be determined using the following equations.

For whole body dose rate:

$$D_{WB} = \sum_i [(K_i) (X/Q)_{SITE} (Q_i)] \quad (3\text{-}1)$$

For skin dose rate:

$$D_{SK} = \sum_i [(L_i + 1.1M_i) (X/Q)_{SITE} (Q_i)] \quad (3\text{-}2)$$

Where:

K_i	=	the whole body dose factor due to gamma emissions for each identified noble gas radionuclide i, in mrem/yr per μCi/m^3 from Table 3-3.
Q_i	=	the release rate of radionuclide i, in μCi/sec.
$(X/Q)_{SITE}$	=	8.91E-06, the highest calculated annual average dispersion parameter, in sec/m^3, for any of the three units, from Table 3-2.
D_{WB}	=	the annual whole body dose rate (mrem/yr.).
L_i	=	the skin dose factor due to the beta emissions for each identified noble gas radionuclide i, in mrem/yr per μCi/m^3 from Table 3-3.
M_i	=	the air dose factor due to gamma emissions for each identified noble gas radionuclide i, in mrad/yr per μCi/m^3 from Table 3-3.
D_{SK}	=	the annual skin dose rate (mrem/yr).
1.1	=	unit conversion constant of 1.1 mrem/mrad converts air dose to skin dose.

I-131, I-133, tritium and radionuclides in particulate form with half-lives greater than 8 days

The methods for sampling and analysis of continuous and batch releases for I-131, I-133, tritium and radionuclides in particulate form with half-lives greater than 8 days, are given in the applicable Nuclear Administrative and Technical Manual procedures. Additional monthly and quarterly analyses shall be performed in accordance with Table 3-1. The total organ dose rate in unrestricted areas shall be determined by the following equation:

$$D_o = \sum_i [(P_i) (X/Q)_{SITE} (Q_i)] \qquad (3\text{-}3)$$

Where:

P_i = the dose factor, in mrem/yr per $\mu Ci/m^3$, for radionuclide i, for the inhalation pathway, from Table 3-4.

$(X/Q)_{SITE}$ = 8.91E-06, the highest calculated annual average dispersion parameter, in sec/m^3, at the Site Boundary, for any of the three units,

Q_i = the release rate of radionuclide i, in $\mu Ci/sec$

D_o = the total organ dose rate (mrem/yr).

TABLE 3-1

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

GASEOUS RELEASE TYPE	SAMPLING FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD) (μCi/ml)[a]
A. Waste Gas Storage	P Each Tank Grab Sample	P Each Tank	Principal Gamma Emitters[g]	1.0E-04
B. Containment Purge	P Each Purge[b,c] Grap Sample	P Each Purge[b,c]	Principal Gamma Emitters[g]	1.0E-04
			H-3	1.0E-06
C. 1. DELETED 2. Plant Vent 3. Fuel Bldg. Exhaust	M[b,e] Grab Sample	M[b]	Principal Gamma Emitters[g]	1.0E-04
			H-3	1.0E-06
	Continuous[f]	4/M[d] Charcoal Sample	I-131	1.0E-12
			I-133	1.0E-10
	Continuous[f]	4/M[d] Particulate Sample	Principal Gamma Emitters[g] (I-131, Others)	1.0E-11
	Continuous[f]	M Composite Particulate Sample	Gross Alpha	1.0E-11
	Continuous[f]	Q Composite Particulate Sample	Sr-89, Sr-90	1.0E-11
D. All Radwaste Types as listed in A., B., and C., above.	Continuous[f]	Noble Gas Monitor	Noble Gases Gross Beta or Gamma	1.0E-06

Table 3-1 (Continued)

TABLE NOTATION

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

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

$$\text{LLD} = \frac{4.66\, s_b}{E * V * 2.22E6 * Y * \exp(-\lambda \Delta t)}$$

Where:

LLD is the a priori lower limit of detection as defined above (as µCi per unit mass or volume). Current literature defines the LLD as the detection capability for the instrumentation only and the MDC minimum detectable concentration, as the detection capability for a given instrument, procedure and type of sample.

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute),

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

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

2.22E6 is the number of transformations per minute per microcurie,

Y is the fractional radiochemical yield (when applicable),

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

Δt is the elapsed time between the midpoint of sample collection and time of counting (for plant effluents, not environmental samples).

The value of s_b used in the calculation of the LLD for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. In calculating the LLD for a radionuclide determined by gamma-ray spectrometry the background should include the typical contributions of other radionuclides normally present in the samples. Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

Table 3-1 (Continued)

TABLE NOTATION

b Analyses shall also be performed following SHUTDOWN, STARTUP, or a THERMAL POWER change exceeding 15% of the RATED THERMAL POWER within a 1-hour period if 1) analysis shows that the DOSE EQUIVALENT I-131 concentration in the primary coolant has increased more than a factor of 3; and 2) the noble gas activity monitor on the plant vent shows that effluent activity has increased by more than a factor of 3. If the associated noble gas vent monitor is inoperable, samples must be obtained as soon as possible. Analyses shall be performed within a four-hour period. This requirement does not apply to the Fuel Building Exhaust.

c Sampling and analyses shall also be performed at least once per 31 days when purging time exceeds 30 days continuous.

d Samples shall be changed at least 4 times a month and analyses shall be completed within 48 hours after changing (or after removal from sampler). When samples collected for 24 hours are analyzed, the corresponding LLDs may be increased by a factor of 10.

e Tritium grab samples shall be taken at least monthly from the ventilation exhaust from the spent fuel pool area, whenever spent fuel is in the spent fuel pool.

f The ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period covered by each dose or dose rate calculation made in accordance with Requirements 3.1, 4.1 and 4.2 of the ODCM.

g The principal gamma emitters for which the LLD specification applies include the following radionuclides: Kr-87, Kr-88, Xe-133, Xe-133m, Xe-135, and Xe-138 for gaseous emissions and Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141 and Ce-144 for particulate emissions. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides shall also be identified and reported in the Annual Radioactive Effluent Release Report.

TABLE 3-2

DISPERSION AND DEPOSITION PARAMETERS FOR LONG TERM RELEASES

AT THE SITE BOUNDARY

DIRECTION	UNIT 1 DISTANCE (METERS)	UNIT 1 X/Q (SEC/m^3)	UNIT 1 D/Q (m^{-2})	UNIT 2 DISTANCE (METERS)	UNIT 2 X/Q (SEC/m^3)	UNIT 2 D/Q (m^{-2})	UNIT 3 DISTANCE (METERS)	UNIT 3 X/Q (SEC/m^3)	UNIT 3 D/Q (m^{-2})
N	1037	4.93E-06	9.24E-09	1318	3.85E-06	6.17E-09	1661	3.54E-06	4.86E-09
NNE	1057	4.14E-06	1.19E-08	1342	3.18E-06	7.93E-09	1693	2.86E-06	6.23E-09
NE	2206	2.84E-06	6.84E-09	2545	2.42E-06	5.34E-09	2756	2.21E-06	4.65E-09
ENE	1967	2.51E-06	4.43E-09	2206	2.22E-06	3.64E-09	2337	2.08E-06	3.30E-09
E	1927	2.56E-06	3.24E-09	2163	2.27E-06	2.66E-09	2290	2.14E-06	2.41E-09
ESE	1967	2.61E-06	2.46E-09	2067	2.32E-06	2.11E-09	2023	2.37E-06	2.10E-09
SE	2049	3.56E-06	2.36E-09	2101	3.47E-06	2.26E-09	2256	3.24E-06	2.00E-09
SSE	2730	3.80E-06	1.58E-09	3026	3.43E-06	1.32E-09	2786	3.72E-06	1.52E-09
S	3006	5.07E-06	1.78E-09	2699	5.16E-06	1.97E-09	2346	5.90E-06	2.51E-09
SSW	2258	6.52E-06	3.20E-09	1836	7.90E-06	4.56E-09	1607	8.91E-06	5.73E-09
SW	1487	7.47E-06	5.65E-09	1208	7.72E-06	6.88E-09	1057	8.68E-06	8.61E-09
WSW	1251	4.52E-06	5.93E-09	1014	5.55E-06	8.44E-09	889	5.34E-06	8.83E-09
W	1225	4.73E-06	9.49E-09	993	5.86E-06	1.34E-08	871	6.72E-06	1.67E-08
WNW	1244	3.76E-06	6.76E-09	1010	4.67E-06	9.60E-09	885	5.37E-06	1.19E-08
NW	1254	3.43E-06	5.87E-09	1191	3.62E-06	6.40E-09	1045	4.17E-06	7.98E-09
NNW	1069	3.70E-06	7.26E-09	1342	2.85E-06	4.87E-09	1561	2.93E-06	4.58E-09

Reference: Distances are from the PVNGS ER-OL, Table 2.3-33. Dispersion and Deposition parameters are from a September, 1985, calculation by NUS Corporation based on 9 years of meteorological data; NUS Corporation letter NUS-ANPP-1386, dated October 4, 1985.

TABLE 3-3

DOSE FACTORS FOR NOBLE GASES AND DAUGHTERS

Radionuclide	Whole Body Dose Factor K_i $\frac{mrem\text{-}m^3}{yr\text{-}\mu Ci}$	Skin Dose Factor L_i $\frac{mrem\text{-}m^3}{yr\text{-}\mu Ci}$	Gamma Air Dose Factor M_i $\frac{mrad\text{-}m^3}{yr\text{-}\mu Ci}$	Beta Air Dose Factor N_i $\frac{mrad\text{-}m^3}{yr\text{-}\mu Ci}$
Kr-83m	7.56E-02	------------	1.93E+01	2.88E+02
Kr-85m	1.17E+03	1.46E+03	1.23E+03	1.97E+03
Kr-85	1.61E+01	1.34E+03	1.72E+01	1.95E+03
Kr-87	5.92E+03	9.73E+03	6.17E+03	1.03E+04
Kr-88	1.47E+04	2.37E+03	1.52E+04	2.93E+03
Kr-89	1.66E+04	1.01E+04	1.73E+04	1.06E+04
Kr-90	1.56E+04	7.29E+03	1.63E+04	7.83E+03
Xe-131m	9.15E+01	4.76E+02	1.56E+02	1.11E+03
Xe-133m	2.51E+02	9.94E+02	3.27E+02	1.48E+03
Xe-133	2.94E+02	3.06E+02	3.53E+02	1.05E+03
Xe-135m	3.12E+03	7.11E+02	3.36E+03	7.39E+02
Xe-135	1.81E+03	1.86E+03	1.92E+03	2.46E+03
Xe-137	1.42E+03	1.22E+04	1.51E+03	1.27E+04
Xe-138	8.83E+03	4.13E+03	9.21E+03	4.75E+03
Ar-41	8.84E+03	2.69E+03	9.30E+03	3.28E+03

Reference: Regulatory Guide 1.109, Table B-1.

TABLE 3-4

P_i VALUES FOR THE INHALATION PATHWAY

(mrem/yr/μCi/m^3)

NUCLIDE	Age Group	Organ	P_i
H-3	TEEN	LIVER	1.27E+03
CR-51	TEEN	LUNG	2.10E+04
MN-54	TEEN	LUNG	1.98E+06
FE-59	TEEN	LUNG	1.53E+06
CO-58	TEEN	LUNG	1.34E+06
CO-60	TEEN	LUNG	8.72E+06
ZN-65	TEEN	LUNG	1.24E+06
SR-89	TEEN	LUNG	2.42E+06
SR-90	TEEN	BONE	1.08E+08
ZR-95	TEEN	LUNG	2.69E+06
SB-124	TEEN	LUNG	3.85E+06
I-131	CHILD	THYROID	1.62E+07
I-133	CHILD	THYROID	3.85E+06
CS-134	TEEN	LIVER	1.13E+06
CS-137	CHILD	BONE	9.07E+05
BA-140	TEEN	LUNG	2.03E+06
CE-141	TEEN	LUNG	6.14E+05
CE-144	TEEN	LUNG	1.34E+07

3.2 Requirements:Secondary System Liquid Waste Discharges To Onsite Evaporation Ponds or Circulating Water System - Concentration

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 20.1001-20.2401, Appendix B, Table 2, Column 2, for all other isotopes

Applicability: At all times.

Action:

When any secondary system liquid waste discharge pathway concentration determined in accordance with the surveillance requirements given below exceeds the above Requirements, divert that discharge pathway to the liquid radwaste system without delay or terminate the discharge.

3.2.1 Surveillance Requirements:

a. Secondary system liquid wastes shall be sampled and analyzed according to the sampling and analysis program of Table 3-5.

3.2.2 Implementation of the Requirements:

This requirement is implemented by Nuclear Administrative and Technical Manual procedures.

TABLE 3-5

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

SECONDARY SYSTEM LIQUID RELEASE PATHWAY	SAMPLING & ANALYSIS FREQUENCY	MINIMUM ANALYSIS FREQUENCY	TYPE OF ACTIVITY ANALYSIS	LOWER LIMIT OF DETECTION (LLD)[a] (μCi/ml)
1. Chemical Waste Neutralizer Tank	P Each Batch		Principal Gamma Emitters[c]	5.0E-07
			I-131	1.0E-06
			H-3	1.0E-05
2. Steam Generator Blowdown Low TDS Sump	P Each Batch (1)		Principal Gamma Emitters[c]	5.0E-07
			I-131	1.0E-06
			H-3	1.0E-05
3. Condensate				
a. Condensate Polishing Low TDS Sump	P Each Batch (1)		Principal Gamma Emitters[c]	5.0E-07
			I-131	1.0E-06
			H-3	1.0E-05
b. Initial Backwash	P Each Batch (2)		Principal Gamma Emitters[c]	5.0E-07
			I-131	1.0E-06
			H-3	1.0E-05
c. Pre-service rinse effluent	P Each Batch (3)		Principal Gamma Emitters[c]	5.0E-07
			I-131	1.0E-06
			H-3	1.0E-05
d. Overboard condensate to circulating water system	P Each Batch (4)		Principal Gamma Emitters[c]	5.0E-07
			I-131	1.0E-06
			H-3	1.0E-05
4. Turbine Building Sump	D Grab Sample(1)		Principal Gamma Emitters[c]	5.0E-07
			I-131	1.0E-06
			H-3	1.0E-05
5. North & South Condenser Area Sumps	D Grab Sample(1)		Principal Gamma Emitters[c]	5.0E-07
			I-131	1.0E-06
			H-3	1.0E-05

1 Sampling and analysis are required only when concentration for chemical waste neutralizer tank or steam generator activity exceeds the requirement

2 Sampling and analysis is required if the Initial backwash is being directed to Circulating water via the Condensate Polishing Low TDS Sump.

3 If the pre-service rinse effluent is to be discharged to the Circulating water system, one of the following conditions must be met:

a. If the SG blowdown activity is greater than the Requirement, the activity of the condensate or CD influent, AND the effluent of the service vessel in question (while in "standby") shall be verified less than the Requirement.

b. If the SG blowdown activity is less than the Requirement, the effluent of the service vessel in question (while in "standby") shall be verified less than the Requirement.

4 Condensate activity shall be verified less than the Requirement

Table 3-5 (Continued)

TABLE NOTATION

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

For a particular measurement system which may include radiochemical separation:

$$LLD = \frac{4.66\ s_b}{E * V * 2.22E6 * Y * \exp(-\lambda \Delta t)}$$

Where:

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

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate as counts per minute,

E is the counting efficiency as counts per disintegration,

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

2.22E6 is the number of disintegrations per minute per microcurie

Y is the fractional radiochemical yield when applicable,

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

Δt is the elapsed time between midpoint of sample collection and time of counting.

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

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

b A batch release is the discharge of liquid wastes of a discrete volume. Prior to sampling for analyses, each batch shall be isolated, and then thoroughly mixed to assure representative sampling.

c The principal gamma emitters for which the LLD specification applies include the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, and Ce-141. Ce-144, shall also be measured, but with an LLD of 3.0E-06. This list does not mean that only these nuclides are to be considered. Other gamma peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radioactive Effluent Release Report pursuant to Specification 6.9.1.8.

d A continuous release is the discharge of liquid wastes of a nondiscrete volume, e.g., from a volume of a system that has an input flow during the continuous release.

4.0 GASEOUS & LIQUID EFFLUENTS - DOSE

4.1 Requirements: Noble Gases

The air dose due to noble gases released in gaseous effluents, from each reactor unit to areas at and beyond the SITE BOUNDARY (see Figure 6-4 and 6-5) 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.

Applicability: At all times.

Action:

With the calculated air dose from radioactive noble gases in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

4.1.1 Surveillance Requirements:

a. Cumulative dose contributions for the current calendar quarter and current calendar year for noble gases shall be determined in accordance with the methodology contained in Section 4.1.2 at least once per 31 days.

4.1.2 Implementation of the Requirement: Noble Gas

The air dose in unrestricted areas beyond the site boundary due to noble gases released in gaseous effluents from each unit during any specified time period shall be determined by the following equations:

For gamma radiation:

$$D\gamma_u = (3.17E\text{-}08) \Sigma_i [(M_i)(X/Q)_{UNIT}(Q_i)] \quad (4\text{-}1)$$

For beta radiation:

$$D\beta_u = (3.17E\text{-}08) \Sigma_i [(N_i)(X/Q)_{UNIT}(Q_i)] \quad (4\text{-}2)$$

Where:

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide i, in mrad/yr per $\mu Ci/m^3$ from Table 3-3.

N_i = the air dose factor due to beta emissions for each identified noble gas radionuclide i, in mrad/yr per $\mu Ci/m^3$ from Table 3-3.

$(X/Q)_{UNIT}$ = the highest calculated annual average dispersion parameter, in sec/m^3, at the site boundary for the particular unit, from Table 3-2.

=7.47E-06 from Unit 1
=7.90E-06 from Unit 2
=8.91E-06 from Unit 3

$D\gamma_u$ = the total gamma air dose, for the particular unit, in mrad, due to noble gases released in gaseous effluents for a specified time period at the SITE BOUNDARY.

$D\beta_u$ = the total beta air dose, for the particular unit, in mrad, due to noble gases released in gaseous effluents for a specified time period at the SITE BOUNDARY.

Q_i = the integrated release, from the particular unit, in μCi, of each identified noble gas radionuclide i, in gaseous effluents for a specified time period.

3.17E-08 = the inverse of seconds in a year (yr/sec).

The cumulative gamma air dose and beta air dose for a quarterly or annual evaluation shall be based on the calculated dose contribution from each specified time period occurring during the reporting time period.

4.2 **Requirement: Iodine-131, Iodine-133, Tritium, and All Radionuclides in Particulate Form With Half-Lives Greater Than 8 Days**

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 (see Figures 6-4 and 6-5) 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.

Applicability: At all times.

Action:

With the calculated dose from the release of iodine-131, iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days, in gaseous effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report that identifies the cause(s) for exceeding the limit and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

4.2.1 **Surveillance Requirements:**

a. Cumulative dose contributions for the current calendar quarter and current calendar year for iodine-131, iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days shall be determined in accordance with the methodology and parameters contained in Section 4.2.2 at least once per 31 days.

4.2.2 Implementation of the Requirement

The organ dose to an individual from I-131, I-133, tritium, and all radionuclides in particulate form, with half-lives greater than eight days, in gaseous effluents released to unrestricted areas from each reactor unit is calculated using the following expressions:

$$D_{ou} = (3.17E\text{-}08) \Sigma_i [\Sigma_k (R_{ik} W_k) (Qi)] \quad (4\text{-}3)$$

Where:

D_{ou} = the total accumulated organ dose from gaseous effluents for a particular unit, to a MEMBER OF THE PUBLIC, in mrem, at the SITE BOUNDARY or at the controlling location.

Q_i = the quantity of radionuclide i, in µCi, released in gaseous effluents from a particular unit.

R_{ik} = the dose factor for each identified radionuclide i, for pathway k (for the inhalation pathway in mrem/yr per µCi/m^3 and for the food and ground plane pathways in m^2 - mrem/yr per µCi/sec, except H-3, which has units of mrem/yr per µCi/m^3) at the controlling location. The R_{ik}'s for each age group are given in Tables 4-1 through 4-15.

3.17E-08 = the inverse of seconds per year (yr/sec).

W_k = the highest annual average dispersion or deposition parameter for the particular unit, used for estimating the dose at the site boundary or to a MEMBER OF THE PUBLIC at the controlling location for the particular unit.

= $(X/Q)_{UNIT}$, in sec/m^3 for the inhalation pathway and for all tritium calculations, for organ dose at the site boundary, from Table 3-2.

=7.47E-06 from Unit 1
=7.90E-06 from Unit 2
=8.91E-06 from Unit 3

= $(X/Q)_{UNIT}$, in sec/m^3 for the inhalation pathway and for all tritium calculations, for organ dose at the controlling location, from Table 4-16.

=2.92E-06 from Unit 1
=2.19E-06 from Unit 2
=2.31E-06 from Unit 3

= $(D/Q)_{UNIT}$, in m^{-2}, for the food and ground plane pathways, for organ dose at the site boundary, from Table 3-2.

=1.19E-08 from Unit 1
=1.34E-08 from Unit 2
=1.67E-08 from Unit 3

= $(D/Q)_{UNIT}$, in m^{-2}, for the food and ground plane pathways, for organ dose at the controlling location, from Table 4-16.

=3.25E-09 from Unit 1
=3.88E-10 from Unit 2
=4.21E-10 from Unit 3

Residences, vegetable gardens and milk animals located within 5 miles of the site will be identified during the annual land use census. The controlling pathway and location will be identified and will be used for all MEMBER OF THE PUBLIC dose evaluations.

The R_i values were calculated in accordance with the methodologies in NUREG-0133. The following site specific information was used to calculate R_i:

	Value
The length of the grazing season for milk animals (f_s). Ref. ER-OL, Section 2.1.3.4.3	0.75
The length of the grazing season for meat animals (f_s). Ref. ER-OL, Section 2.1.3.4.4	0.25
The fraction of daily feed derived from pasture while on pasture for milk animals (f_p). Ref. ER-OL, Section 2.1.3.4.3	0.35
The fraction of daily feed derived from pasture while on pasture for meat animals (f_p). Ref. ER-OL, Section 2.1.3.4.3	0.05
The fraction of year vegetables are grown, (f_l) approximation. Ref. ER-OL, Section 2.1.3.4, Table 2.1-8.	0.667
The annual absolute humidity (g/m^3), H, Ref. UFSAR, Table 2.3-16	6

4.3 Requirements: Gaseous Radwaste Treatment

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 (see Figures 6-4 and 6-5) 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 (see Figures 6-4 and 6-5) when averaged over 31 days would exceed 0.3 mrem to any organ of a MEMBER OF THE PUBLIC.

Applicability: At all times:

Action:

With radioactive gaseous waste being discharged without treatment and in excess of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report which includes the following information:

a. Identification of the inoperable equipment or subsystems and the reason for inoperability,

b. Action(s) taken to restore the inoperable equipment to OPERABLE status, and

c. Summary description of action(s) taken to prevent a recurrence.

4.3.1 Surveillance Requirements:

a. Doses due to gaseous releases from the site shall be projected at least once per 31 days, in accordance with the methodology and parameters in Section 4.3.2.

4.3.2 Implementation of the Requirement

Where possible, consideration for expected operational evolutions (i.e., outages, etc.) should be taken in the dose projections.

Dose Projection - Noble Gases

The air dose, in mrads for the current quarter is determined using the methodology described in Section 4.1.2. This information is used to determine an air dose projection for the next 31 days using the following equations:

For gamma radiation:

$$31 \text{ day } \gamma = (D\gamma\, qtr/Tqtr)\, 31 + CD\gamma \quad (4\text{-}4)$$

For beta radiation:

$$31 \text{ day } \beta = (D\beta\, qtr/Tqtr)\, 31 + CD\beta \quad (4\text{-}5)$$

Where:

$D\gamma$ qtr	=	the total gamma air dose due to noble gases released in gaseous effluents for the current quarter, in mrads, at the site boundary.
$D\beta$ qtr	=	the total beta air dose due to noble gases released in gaseous effluents for the current quarter, in mrads, at the site boundary.
Tqtr	=	the time period, in days, over which $D\gamma$ qtr and $D\beta$ qtr were integrated.
31	=	the number of days over which the dose projections are made.
31 day γ	=	the 31 day projected gamma air dose due to noble gases released in gaseous effluents, in mrads, at the site boundary.
31 day β	=	the 31 day projected beta air dose due to noble gases released in gaseous effluents, in mrads, at the site boundary.
$CD\gamma$	=	any current or projected gamma air dose, in mrads, due to noble gases released in gaseous effluents, which could have a significant impact on 31 day γ.
$CD\beta$	=	any current or projected beta air dose, in mrads, due to noble gases released in gaseous effluents, which could have a significant impact on 31 day β.

Dose Projection - I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than eight days

The organ dose, in mrem, for a particular unit, for the current quarter is determined using the methodology described in Section 4.2.2 of this manual. This information is used to determine an organ dose projection for the next 31 days using the following equation:

$$31day_o = (D_o qtr/Tqtr)31 + CD_o \tag{4-6}$$

where:

D_o qtr	=	the total organ dose from a particular unit due to I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than eight days, released in gaseous effluents for the current quarter, in mrem.
Tqtr	=	the time period, in days, over which $D_o$qtr was integrated.
31	=	the number of days over which the dose projections are made.
31 day_o	=	the 31 day projected organ dose, in mrem, from a particular unit.
CD_o	=	any current or projected organ dose for a particular unit, in mrem, which could have a significant impact on 31 day_o.

TABLE 4-1

Ri DOSE CONVERSION FACTORS FOR THE GROUND PLANE PATHWAY

NUCLIDE	T. BODY	SKIN
H-3	0.00E+00	0.00E+00
CR-51	4.66E+06	5.51E+06
MN-54	1.39E+09	1.63E+09
FE-59	2.73E+08	3.21E+08
CO-58	3.79E+08	4.44E+08
CO-60	2.15E+10	2.53E+10
ZN-65	7.47E+08	8.59E+08
SR-89	2.16E+04	2.51E+04
SR-90	0.00E+00	0.00E+00
ZR-95	2.45E+08	2.84E+08
SB-124	5.98E+08	6.90E+08
I-131	1.72E+07	2.09E+07
I-133	2.45E+06	2.98E+06
CS-134	6.86E+09	8.00E+09
CS-137	1.03E+10	1.20E+10
BA-140	2.05E+07	2.35E+07
CE-141	1.37E+07	1.54E+07
CE-144	6.95E+07	8.04E+07

TABLE 4-2

Ri DOSE CONVERSION FACTORS FOR THE VEGETATION

PATHWAY - ADULT RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	2.87E+03	2.87E+03	2.87E+03	2.87E+03	2.87E+03	2.87E+03
CR-51	0.00E+00	0.00E+00	4.00E+04	2.39E+04	8.82E+03	5.31E+04	1.01E+07
MN-54	0.00E+00	2.97E+08	5.66E+07	0.00E+00	8.83E+07	0.00E+00	9.09E+08
FE-59	1.14E+08	2.68E+08	1.03E+08	0.00E+00	0.00E+00	7.49E+07	8.93E+08
CO-58	0.00E+00	2.84E+07	6.38E+07	0.00E+00	0.00E+00	0.00E+00	5.76E+08
CO-60	0.00E+00	1.59E+08	3.51E+08	0.00E+00	0.00E+00	0.00E+00	2.99E+09
ZN-65	3.00E+08	9.56E+08	4.32E+08	0.00E+00	6.39E+08	0.00E+00	6.02E+08
SR-89	9.08E+09	0.00E+00	2.61E+08	0.00E+00	0.00E+00	0.00E+00	1.46E+09
SR-90	5.76E+11	0.00E+00	1.41E+11	0.00E+00	0.00E+00	0.00E+00	1.67E+10
ZR-95	1.08E+06	3.47E+05	2.35E+05	0.00E+00	5.45E+05	0.00E+00	1.10E+09
SB-124	9.53E+07	1.80E+06	3.78E+07	2.31E+05	0.00E+00	7.42E+07	2.71E+09
I-131	5.49E+07	7.85E+07	4.50E+07	2.57E+10	1.35E+08	0.00E+00	2.07E+07
I-133	1.39E+06	2.42E+06	7.38E+05	3.56E+08	4.22E+06	0.00E+00	2.17E+06
CS-134	4.44E+09	1.06E+10	8.64E+09	0.00E+00	3.42E+09	1.13E+09	1.85E+08
CS-137	6.06E+09	8.29E+09	5.43E+09	0.00E+00	2.81E+09	9.36E+08	1.60E+08
BA-140	9.43E+07	1.19E+05	6.18E+06	0.00E+00	4.03E+04	6.78E+04	1.94E+08
CE-141	1.73E+05	1.17E+05	1.33E+04	0.00E+00	5.44E+04	0.00E+00	4.48E+08
CE-144	3.12E+07	1.30E+07	1.67E+06	0.00E+00	7.73E+06	0.00E+00	1.05E+10

TABLE 4-3

Ri DOSE CONVERSION FACTORS FOR THE VEGETATION PATHWAY - TEEN RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	3.36E+03	3.36E+03	3.36E+03	3.36E+03	3.36E+03	3.36E+03
CR-51	0.00E+00	0.00E+00	5.60E+04	3.11E+04	1.23E+04	7.99E+04	9.41E+06
MN-54	0.00E+00	4.41E+08	8.74E+07	0.00E+00	1.31E+08	0.00E+00	9.04E+08
FE-59	1.69E+08	3.94E+08	1.52E+08	0.00E+00	0.00E+00	1.24E+08	9.31E+08
CO-58	0.00E+00	4.16E+07	9.59E+07	0.00E+00	0.00E+00	0.00E+00	5.74E+08
CO-60	0.00E+00	2.42E+08	5.45E+08	0.00E+00	0.00E+00	0.00E+00	3.15E+09
ZN-65	4.11E+08	1.43E+09	6.65E+08	0.00E+00	9.12E+08	0.00E+00	6.04E+08
SR-89	1.43E+10	0.00E+00	4.10E+08	0.00E+00	0.00E+00	0.00E+00	1.70E+09
SR-90	7.30E+11	0.00E+00	1.80E+11	0.00E+00	0.00E+00	0.00E+00	2.05E+10
ZR-95	1.64E+06	5.17E+05	3.56E+05	0.00E+00	7.60E+05	0.00E+00	1.19E+09
SB-124	1.47E+08	2.70E+06	5.73E+07	3.33E+05	0.00E+00	1.28E+08	2.96E+09
I-131	5.29E+07	7.41E+07	3.98E+07	2.16E+10	1.28E+08	0.00E+00	1.47E+07
I-133	1.29E+06	2.19E+06	6.68E+05	3.06E+08	3.84E+06	0.00E+00	1.66E+06
CS-134	6.90E+09	1.62E+10	7.53E+09	0.00E+00	5.16E+09	1.97E+09	2.02E+08
CS-137	9.86E+09	1.31E+10	4.57E+09	0.00E+00	4.46E+09	1.73E+09	1.87E+08
BA-140	1.07E+08	1.31E+05	6.88E+06	0.00E+00	4.44E+04	8.80E+04	1.65E+08
CE-141	2.61E+05	1.74E+05	2.00E+04	0.00E+00	8.19E+04	0.00E+00	4.98E+08
CE-144	5.11E+07	2.12E+07	2.75E+06	0.00E+00	1.26E+07	0.00E+00	1.29E+10

TABLE 4-4

Ri DOSE CONVERSION FACTORS FOR THE VEGETATION

PATHWAY - CHILD RECEPTOR

NUCLIDES	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	5.23E+03	5.23E+03	5.23E+03	5.23E+03	5.23E+03	5.23E+03
CR-51	0.00E+00	0.00E+00	1.08E+05	6.02E+04	1.64E+04	1.10E+05	5.75E+06
MN-54	0.00E+00	6.49E+08	1.73E+08	0.00E+00	1.82E+08	0.00E+00	5.45E+08
FE-59	3.79E+08	6.13E+08	3.05E+08	0.00E+00	0.00E+00	1.78E+08	6.38E+08
CO-58	0.00E+00	6.21E+07	1.90E+08	0.00E+00	0.00E+00	0.00E+00	3.62E+08
CO-60	0.00E+00	3.70E+08	1.09E+09	0.00E+00	0.00E+00	0.00E+00	2.05E+09
ZN-65	7.93E+08	2.11E+09	1.31E+09	0.00E+00	1.33E+09	0.00E+00	3.71E+08
SR-89	3.44E+10	0.00E+00	9.83E+08	0.00E+00	0.00E+00	0.00E+00	1.33E+09
SR-90	1.22E+12	0.00E+00	3.09E+11	0.00E+00	0.00E+00	0.00E+00	1.64E+10
ZR-95	3.72E+06	8.17E+05	7.27E+05	0.00E+00	1.17E+06	0.00E+00	8.52E+08
SB-124	3.38E+08	4.39E+06	1.19E+08	7.47E+05	0.00E+00	1.88E+08	2.12E+09
I-131	9.95E+07	1.00E+08	5.68E+07	3.31E+10	1.64E+08	0.00E+00	8.90E+06
I-133	2.36E+06	2.91E+06	1.10E+06	5.41E+08	4.85E+06	0.00E+00	1.17E+06
CS-134	1.57E+10	2.57E+10	5.43E+09	0.00E+00	7.98E+09	2.86E+09	1.39E+08
CS-137	2.34E+10	2.24E+10	3.31E+09	0.00E+00	7.31E+09	2.63E+09	1.40E+08
BA-140	2.20E+08	1.93E+05	1.28E+07	0.00E+00	6.27E+04	1.15E+05	1.11E+08
CE-141	6.15E+05	3.07E+05	4.55E+04	0.00E+00	1.34E+05	0.00E+00	3.83E+08
CE-144	1.24E+08	3.89E+07	6.62E+06	0.00E+00	2.15E+07	0.00E+00	1.01E+10

TABLE 4-5

Ri DOSE CONVERSION FACTORS FOR THE GRASS-COW-MEAT PATHWAY - ADULT RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	4.33E+02	4.33E+02	4.33E+02	4.33E+02	4.33E+02	4.33E+02
CR-51	0.00E+00	0.00E+00	3.44E+02	2.06E+02	7.58E+01	4.57E+02	8.65E+04
MN-54	0.00E+00	2.71E+06	5.18E+05	0.00E+00	8.08E+05	0.00E+00	8.31E+06
FE-59	2.60E+07	6.11E+07	2.34E+07	0.00E+00	0.00E+00	1.71E+07	2.04E+08
CO-58	0.00E+00	2.84E+06	6.36E+06	0.00E+00	0.00E+00	0.00E+00	5.75E+07
CO-60	0.00E+00	2.61E+07	5.76E+07	0.00E+00	0.00E+00	0.00E+00	4.90E+08
ZN-65	9.97E+07	3.17E+08	1.43E+08	0.00E+00	2.12E+08	0.00E+00	2.00E+08
SR-89	3.41E+07	0.00E+00	9.79E+05	0.00E+00	0.00E+00	0.00E+00	5.47E+06
SR-90	4.43E+09	0.00E+00	1.09E+09	0.00E+00	0.00E+00	0.00E+00	1.28E+08
ZR-95	2.68E+05	8.58E+04	5.81E+04	0.00E+00	1.35E+05	0.00E+00	2.72E+08
SB-124	2.67E+06	5.05E+04	1.06E+06	6.48E+03	0.00E+00	2.08E+06	7.59E+07
I-131	1.36E+05	1.94E+05	1.11E+05	6.37E+07	3.33E+05	0.00E+00	5.13E+04
I-133	4.56E-03	7.94E-03	2.42E-03	1.17E+00	1.39E-02	0.00E+00	7.14E-03
CS-134	2.17E+08	5.17E+08	4.23E+08	0.00E+00	1.67E+08	5.56E+07	9.05E+06
CS-137	3.11E+08	4.25E+08	2.78E+08	0.00E+00	1.44E+08	4.79E+07	8.22E+06
BA-140	4.35E+05	5.46E+02	2.85E+04	0.00E+00	1.86E+02	3.13E+02	8.95E+05
CE-141	8.87E+02	6.00E+02	6.80E+01	0.00E+00	2.79E+02	0.00E+00	2.29E+06
CE-144	4.23E+05	1.77E+05	2.27E+04	0.00E+00	1.05E+05	0.00E+00	1.43E+08

[illegible]

TABLE 4-6

Ri DOSE CONVERSION FACTORS FOR THE GRASS-COW-MEAT

PATHWAY - TEEN RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	2.58E+02	2.58E+02	2.58E+02	2.58E+02	2.58E+02	2.58E+02
CR-51	0.00E+00	0.00E+00	2.75E+02	1.53E+02	6.03E+01	3.93E+02	4.62E+04
MN-54	0.00E+00	2.07E+06	4.11E+05	0.00E+00	6.18E+05	0.00E+00	4.25E+06
FE-59	2.08E+07	4.85E+07	1.87E+07	0.00E+00	0.00E+00	1.53E+07	1.15E+08
CO-58	0.00E+00	2.19E+06	5.04E+06	0.00E+00	0.00E+00	0.00E+00	3.02E+07
CO-60	0.00E+00	2.03E+07	4.56E+07	0.00E+00	0.00E+00	0.00E+00	2.64E+08
ZN-65	7.01E+07	2.43E+08	1.14E+08	0.00E+00	1.56E+08	0.00E+00	1.03E+08
SR-89	2.88E+07	0.00E+00	8.24E+05	0.00E+00	0.00E+00	0.00E+00	3.43E+06
SR-90	2.87E+09	0.00E+00	7.08E+08	0.00E+00	0.00E+00	0.00E+00	8.05E+07
ZR-95	2.14E+05	6.76E+04	4.65E+04	0.00E+00	9.93E+04	0.00E+00	1.56E+08
SB-124	2.18E+06	4.02E+04	8.52E+05	4.95E+03	0.00E+00	1.91E+06	4.40E+07
I-131	1.13E+05	1.58E+05	8.49E+04	4.61E+07	2.72E+05	0.00E+00	3.13E+04
I-133	3.82E-03	6.48E-03	1.98E-03	9.04E-01	1.14E-02	0.00E+00	4.90E-03
CS-134	1.73E+08	4.07E+08	1.89E+08	0.00E+00	1.29E+08	4.94E+07	5.06E+06
CS-137	2.58E+08	3.43E+08	1.20E+08	0.00E+00	1.17E+08	4.54E+07	4.88E+06
BA-140	3.59E+05	4.40E+02	2.31E+04	0.00E+00	1.49E+02	2.96E+02	5.54E+05
CE-141	7.45E+02	4.97E+02	5.71E+01	0.00E+00	2.34E+02	0.00E+00	1.42E+06
CE-144	3.56E+05	1.47E+05	1.91E+04	0.00E+00	8.80E+04	0.00E+00	8.96E+07

TABLE 4-7

Ri DOSE CONVERSION FACTORS FOR THE GRASS-COW-MEAT PATHWAY - CHILD RECEPTOR

NUCLIDES	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	3.12E+02	3.12E+02	3.12E+02	3.12E+02	3.12E+02	3.12E+02
CR-51	0.00E+00	0.00E+00	4.29E+02	2.38E+02	6.51E+01	4.35E+02	2.28E+04
MN-54	0.00E+00	2.37E+06	6.31E+05	0.00E+00	6.64E+05	0.00E+00	1.99E+06
FE-59	3.68E+07	5.96E+07	2.97E+07	0.00E+00	0.00E+00	1.73E+07	6.20E+07
CO-58	0.00E+00	2.55E+06	7.82E+06	0.00E+00	0.00E+00	0.00E+00	1.49E+07
CO-60	0.00E+00	2.40E+07	7.09E+07	0.00E+00	0.00E+00	0.00E+00	1.33E+08
ZN-65	1.05E+08	2.80E+08	1.74E+08	0.00E+00	1.77E+08	0.00E+00	4.92E+07
SR-89	5.45E+07	0.00E+00	1.56E+06	0.00E+00	0.00E+00	0.00E+00	2.11E+06
SR-90	3.70E+09	0.00E+00	9.39E+08	0.00E+00	0.00E+00	0.00E+00	4.99E+07
ZR-95	3.81E+05	8.36E+04	7.45E+04	0.00E+00	1.20E+05	0.00E+00	8.73E+07
SB-124	3.95E+06	5.12E+04	1.38E+06	8.72E+03	0.00E+00	2.19E+06	2.47E+07
I-131	2.09E+05	2.11E+05	1.20E+05	6.96E+07	3.46E+05	0.00E+00	1.87E+04
I-133	7.09E-03	8.77E-03	3.32E-03	1.63E+00	1.46E-02	0.00E+00	3.53E-03
CS-134	3.05E+08	5.00E+08	1.06E+08	0.00E+00	1.55E+08	5.56E+07	2.70E+06
CS-137	4.75E+08	4.55E+08	6.71E+07	0.00E+00	1.48E+08	5.33E+07	2.85E+06
BA-140	6.63E+05	5.81E+02	3.87E+04	0.00E+00	1.89E+02	3.46E+02	3.36E+05
CE-141	1.40E+03	6.99E+02	1.04E+02	0.00E+00	3.07E+02	0.00E+00	8.72E+05
CE-144	6.72E+05	2.11E+05	3.58E+04	0.00E+00	1.17E+05	0.00E+00	5.49E+07

TABLE 4-8

Ri DOSE CONVERSION FACTORS FOR THE GRASS-COW-MILK

PATHWAY - ADULT RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	1.02E+03	1.02E+03	1.02E+03	1.02E+03	1.02E+03	1.02E+03
CR-51	0.00E+00	0.00E+00	8.28E+03	4.95E+03	1.82E+03	1.10E+04	2.08E+06
MN-54	0.00E+00	3.99E+06	7.61E+05	0.00E+00	1.19E+06	0.00E+00	1.22E+07
FE-59	9.69E+06	2.28E+07	8.73E+06	0.00E+00	0.00E+00	6.36E+06	7.59E+07
CO-58	0.00E+00	1.74E+06	3.90E+06	0.00E+00	0.00E+00	0.00E+00	3.53E+07
CO-60	0.00E+00	8.41E+06	1.85E+07	0.00E+00	0.00E+00	0.00E+00	1.58E+08
ZN-65	6.34E+08	2.02E+09	9.12E+08	0.00E+00	1.35E+09	0.00E+00	1.27E+09
SR-89	4.90E+08	0.00E+00	1.41E+07	0.00E+00	0.00E+00	0.00E+00	7.86E+07
SR-90	2.43E+10	0.00E+00	5.96E+09	0.00E+00	0.00E+00	0.00E+00	7.02E+08
ZR-95	3.39E+02	1.09E+02	7.37E+01	0.00E+00	1.71E+02	0.00E+00	3.45E+05
SB-124	9.11E+06	1.72E+05	3.61E+06	2.21E+04	0.00E+00	7.09E+06	2.59E+08
I-131	7.77E+07	1.11E+08	6.37E+07	3.64E+10	1.91E+08	0.00E+00	2.93E+07
I-133	1.02E+06	1.77E+06	5.39E+05	2.60E+08	3.08E+06	0.00E+00	1.59E+06
CS-134	2.83E+09	6.73E+09	5.50E+09	0.00E+00	2.18E+09	7.23E+08	1.18E+08
CS-137	3.83E+09	5.24E+09	3.43E+09	0.00E+00	1.78E+09	5.91E+08	1.01E+08
BA-140	7.11E+06	8.93E+03	4.66E+05	0.00E+00	3.04E+03	5.11E+03	1.46E+07
CE-141	8.73E+03	5.90E+03	6.70E+02	0.00E+00	2.74E+03	0.00E+00	2.26E+07
CE-144	1.01E+06	4.21E+05	5.41E+04	0.00E+00	2.50E+05	0.00E+00	3.41E+08

TABLE 4-9

Ri DOSE CONVERSION FACTORS FOR THE GRASS-COW-MILK

PATHWAY - TEEN RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	1.33E+03	1.33E+03	1.33E+03	1.33E+03	1.33E+03	1.33E+03
CR-51	0.00E+00	0.00E+00	1.45E+04	8.03E+03	3.17E+03	2.06E+04	2.43E+06
MN-54	0.00E+00	6.64E+06	1.32E+06	0.00E+00	1.98E+06	0.00E+00	1.36E+07
FE-59	1.69E+07	3.95E+07	1.52E+07	0.00E+00	0.00E+00	1.24E+07	9.33E+07
CO-58	0.00E+00	2.93E+06	6.76E+06	0.00E+00	0.00E+00	0.00E+00	4.04E+07
CO-60	0.00E+00	1.42E+07	3.21E+07	0.00E+00	0.00E+00	0.00E+00	1.86E+08
ZN-65	9.74E+08	3.38E+09	1.58E+09	0.00E+00	2.17E+09	0.00E+00	1.43E+09
SR-89	9.03E+08	0.00E+00	2.59E+07	0.00E+00	0.00E+00	0.00E+00	1.08E+08
SR-90	3.43E+10	0.00E+00	8.48E+09	0.00E+00	0.00E+00	0.00E+00	9.64E+08
ZR-95	5.94E+02	1.87E+02	1.29E+02	0.00E+00	2.75E+02	0.00E+00	4.32E+05
SB-124	1.62E+07	2.99E+05	6.34E+06	3.69E+04	0.00E+00	1.42E+07	3.27E+08
I-131	1.41E+08	1.98E+08	1.06E+08	5.76E+10	3.40E+08	0.00E+00	3.91E+07
I-133	1.86E+06	3.15E+06	9.60E+05	4.39E+08	5.52E+06	0.00E+00	2.38E+06
CS-134	4.91E+09	1.16E+10	5.36E+09	0.00E+00	3.67E+09	1.40E+09	1.44E+08
CS-137	6.95E+09	9.24E+09	3.22E+09	0.00E+00	3.15E+09	1.22E+09	1.32E+08
BA-140	1.28E+07	1.57E+04	8.27E+05	0.00E+00	5.33E+03	1.06E+04	1.98E+07
CE-141	1.60E+04	1.07E+04	1.23E+03	0.00E+00	5.03E+03	0.00E+00	3.06E+07
CE-144	1.86E+06	7.68E+05	9.97E+04	0.00E+00	4.59E+05	0.00E+00	4.67E+08

TABLE 4-10

Ri DOSE CONVERSION FACTORS FOR THE GRASS-COW-MILK

PATHWAY - CHILD RECEPTOR

NUCLIDES	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	2.09E+03	2.09E+03	2.09E+03	2.09E+03	2.09E+03	2.09E+03
CR-51	0.00E+00	0.00E+00	2.95E+04	1.64E+04	4.47E+03	2.99E+04	1.56E+06
MN-54	0.00E+00	9.94E+06	2.65E+06	0.00E+00	2.79E+06	0.00E+00	8.34E+06
FE-59	3.92E+07	6.35E+07	3.16E+07	0.00E+00	0.00E+00	1.84E+07	6.61E+07
CO-58	0.00E+00	4.48E+06	1.37E+07	0.00E+00	0.00E+00	0.00E+00	2.61E+07
CO-60	0.00E+00	2.21E+07	6.52E+07	0.00E+00	0.00E+00	0.00E+00	1.23E+08
ZN-65	1.91E+09	5.09E+09	3.17E+09	0.00E+00	3.21E+09	0.00E+00	8.95E+08
SR-89	2.23E+09	0.00E+00	6.38E+07	0.00E+00	0.00E+00	0.00E+00	8.65E+07
SR-90	5.80E+10	0.00E+00	1.47E+10	0.00E+00	0.00E+00	0.00E+00	7.81E+08
ZR-95	1.38E+03	3.03E+02	2.70E+02	0.00E+00	4.34E+02	0.00E+00	3.16E+05
SB-124	3.84E+07	4.99E+05	1.35E+07	8.49E+04	0.00E+00	2.13E+07	2.41E+08
I-131	3.42E+08	3.44E+08	1.96E+08	1.14E+11	5.65E+08	0.00E+00	3.06E+07
I-133	4.51E+06	5.57E+06	2.11E+06	1.04E+09	9.29E+06	0.00E+00	2.25E+06
CS-134	1.13E+10	1.86E+10	3.92E+09	0.00E+00	5.76E+09	2.07E+09	1.00E+08
CS-137	1.67E+10	1.60E+10	2.36E+09	0.00E+00	5.22E+09	1.88E+09	1.00E+08
BA-140	3.10E+07	2.71E+04	1.81E+06	0.00E+00	8.83E+03	1.62E+04	1.57E+07
CE-141	3.94E+04	1.97E+04	2.92E+03	0.00E+00	8.62E+03	0.00E+00	2.45E+07
CE-144	4.57E+06	1.43E+06	2.44E+05	0.00E+00	7.94E+05	0.00E+00	3.74E+08

TABLE 4-11

Ri DOSE CONVERSION FACTORS FOR THE GRASS-COW-MILK

PATHWAY - INFANT RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	3.18E+03	3.18E+03	3.18E+03	3.18E+03	3.18E+03	3.18E+03
CR-51	0.00E+00	0.00E+00	4.67E+04	3.05E+04	6.66E+03	5.93E+04	1.36E+06
MN-54	0.00E+00	1.85E+07	4.19E+06	0.00E+00	4.10E+06	0.00E+00	6.79E+06
FE-59	7.32E+07	1.28E+08	5.04E+07	0.00E+00	0.00E+00	3.78E+07	6.11E+07
CO-58	0.00E+00	8.96E+06	2.23E+07	0.00E+00	0.00E+00	0.00E+00	2.23E+07
CO-60	0.00E+00	4.52E+07	1.07E+08	0.00E+00	0.00E+00	0.00E+00	1.07E+08
ZN-65	2.57E+09	8.81E+09	4.06E+09	0.00E+00	4.27E+09	0.00E+00	7.44E+09
SR-89	4.25E+09	0.00E+00	1.22E+08	0.00E+00	0.00E+00	0.00E+00	8.74E+07
SR-90	6.31E+10	0.00E+00	1.61E+10	0.00E+00	0.00E+00	0.00E+00	7.88E+08
ZR-95	2.45E+03	5.97E+02	4.23E+02	0.00E+00	6.43E+02	0.00E+00	2.97E+05
SB-124	7.41E+07	1.09E+06	2.30E+07	1.97E+05	0.00E+00	4.64E+07	2.29E+08
I-131	7.14E+08	8.42E+08	3.70E+08	2.77E+11	9.83E+08	0.00E+00	3.00E+07
I-133	9.52E+06	1.39E+07	4.06E+06	2.52E+09	1.63E+07	0.00E+00	2.35E+06
CS-134	1.82E+10	3.40E+10	3.44E+09	0.00E+00	8.76E+09	3.59E+09	9.24E+07
CS-137	2.67E+10	3.13E+10	2.22E+09	0.00E+00	8.39E+09	3.40E+09	9.78E+07
BA-140	6.37E+07	6.37E+04	3.28E+06	0.00E+00	1.51E+04	3.91E+04	1.57E+07
CE-141	7.81E+04	4.77E+04	5.61E+03	0.00E+00	1.47E+04	0.00E+00	2.46E+07
CE-144	6.55E+06	2.68E+06	3.67E+05	0.00E+00	1.08E+06	0.00E+00	3.76E+08

TABLE 4-12

Ri DOSE CONVERSION FACTORS FOR THE INHALATION

PATHWAY - ADULT RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	1.26E+03	1.26E+03	1.26E+03	1.26E+03	1.26E+03	1.26E+03
CR-51	0.00E+00	0.00E+00	1.00E+02	5.95E+01	2.28E+01	1.44E+04	3.32E+03
MN-54	0.00E+00	3.96E+04	6.30E+03	0.00E+00	9.84E+03	1.40E+06	7.74E+04
FE-59	1.18E+04	2.78E+04	1.06E+04	0.00E+00	0.00E+00	1.02E+06	1.88E+05
CO-58	0.00E+00	1.58E+03	2.07E+03	0.00E+00	0.00E+00	9.28E+05	1.06E+05
CO-60	0.00E+00	1.15E+04	1.48E+04	0.00E+00	0.00E+00	5.97E+06	2.85E+05
ZN-65	3.24E+04	1.03E+05	4.66E+04	0.00E+00	6.90E+04	8.64E+05	5.34E+04
SR-89	3.04E+05	0.00E+00	8.72E+03	0.00E+00	0.00E+00	1.40E+06	3.50E+05
SR-90	9.92E+07	0.00E+00	6.10E+06	0.00E+00	0.00E+00	9.60E+06	7.22E+05
ZR-95	1.07E+05	3.44E+04	2.33E+04	0.00E+00	5.42E+04	1.77E+06	1.50E+05
SB-124	3.12E+04	5.89E+02	1.24E+04	7.55E+01	0.00E+00	2.48E+06	4.06E+05
I-131	2.52E+04	3.58E+04	2.05E+04	1.19E+07	6.13E+04	0.00E+00	6.28E+03
I-133	8.64E+03	1.48E+04	4.52E+03	2.15E+06	2.58E+04	0.00E+00	8.88E+03
CS-134	3.73E+05	8.48E+05	7.28E+05	0.00E+00	2.87E+05	9.76E+04	1.04E+04
CS-137	4.78E+05	6.21E+05	4.28E+05	0.00E+00	2.22E+05	7.52E+04	8.40E+03
BA-140	3.90E+04	4.90E+01	2.57E+03	0.00E+00	1.67E+01	1.27E+06	2.18E+05
CE-141	1.99E+04	1.35E+04	1.53E+03	0.00E+00	6.26E+03	3.62E+05	1.20E+05
CE-144	3.43E+06	1.43E+06	1.84E+05	0.00E+00	8.48E+05	7.78E+06	8.16E+05

TABLE 4-13

Ri DOSE CONVERSION FACTORS FOR THE INHALATION

PATHWAY - TEEN RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	1.27E+03	1.27E+03	1.27E+03	1.27E+03	1.27E+03	1.27E+03
CR-51	0.00E+00	0.00E+00	1.35E+02	7.50E+01	3.07E+01	2.10E+04	3.00E+03
MN-54	0.00E+00	5.11E+04	8.40E+03	0.00E+00	1.27E+04	1.98E+06	6.68E+04
FE-59	1.59E+04	3.70E+04	1.43E+04	0.00E+00	0.00E+00	1.53E+06	1.78E+05
CO-58	0.00E+00	2.07E+03	2.78E+03	0.00E+00	0.00E+00	1.34E+06	9.52E+04
CO-60	0.00E+00	1.51E+04	1.98E+04	0.00E+00	0.00E+00	8.72E+06	2.59E+05
ZN-65	3.86E+04	1.34E+05	6.24E+04	0.00E+00	8.64E+04	1.24E+06	4.66E+04
SR-89	4.34E+05	0.00E+00	1.25E+04	0.00E+00	0.00E+00	2.42E+06	3.71E+05
SR-90	1.08E+08	0.00E+00	6.68E+06	0.00E+00	0.00E+00	1.65E+07	7.65E+05
ZR-95	1.46E+05	4.58E+04	3.15E+04	0.00E+00	6.74E+04	2.69E+06	1.49E+05
SB-124	4.30E+04	7.94E+02	1.68E+04	9.76E+01	0.00E+00	3.85E+06	3.98E+05
I-131	3.54E+04	4.91E+04	2.64E+04	1.46E+07	8.40E+04	0.00E+00	6.49E+03
I-133	1.22E+04	2.05E+04	6.22E+03	2.92E+06	3.59E+04	0.00E+00	1.03E+04
CS-134	5.02E+05	1.13E+06	5.49E+05	0.00E+00	3.75E+05	1.46E+05	9.76E+03
CS-137	6.70E+05	8.48E+05	3.11E+05	0.00E+00	3.04E+05	1.21E+05	8.48E+03
BA-140	5.47E+04	6.70E+01	3.52E+03	0.00E+00	2.28E+01	2.03E+06	2.29E+05
CE-141	2.84E+04	1.90E+04	2.17E+03	0.00E+00	8.88E+03	6.14E+05	1.26E+05
CE-144	4.89E+06	2.02E+06	2.62E+05	0.00E+00	1.21E+06	1.34E+07	8.64E+05

TABLE 4-14

Ri DOSE CONVERSION FACTORS FOR THE INHALATION

PATHWAY - CHILD RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	1.12E+03	1.12E+03	1.12E+03	1.12E+03	1.12E+03	1.12E+03
CR-51	0.00E+00	0.00E+00	1.54E+02	8.55E+01	2.43E+01	1.70E+04	1.08E+03
MN-54	0.00E+00	4.29E+04	9.51E+03	0.00E+00	1.00E+04	1.58E+06	2.29E+04
FE-59	2.07E+04	3.34E+04	1.67E+04	0.00E+00	0.00E+00	1.27E+06	7.07E+04
CO-58	0.00E+00	1.77E+03	3.16E+03	0.00E+00	0.00E+00	1.11E+06	3.44E+04
CO-60	0.00E+00	1.31E+04	2.26E+04	0.00E+00	0.00E+00	7.07E+06	9.62E+04
ZN-65	4.26E+04	1.13E+05	7.03E+04	0.00E+00	7.14E+04	9.95E+05	1.63E+04
SR-89	5.99E+05	0.00E+00	1.72E+04	0.00E+00	0.00E+00	2.16E+06	1.67E+05
SR-90	1.01E+08	0.00E+00	6.44E+06	0.00E+00	0.00E+00	1.48E+07	3.43E+05
ZR-95	1.90E+05	4.18E+04	3.70E+04	0.00E+00	5.96E+04	2.23E+06	6.11E+04
SB-124	5.74E+04	7.40E+02	2.00E+04	1.26E+02	0.00E+00	3.24E+06	1.64E+05
I-131	4.81E+04	4.81E+04	2.73E+04	1.62E+07	7.88E+04	0.00E+00	2.84E+03
I-133	1.66E+04	2.03E+04	7.70E+03	3.85E+06	3.38E+04	0.00E+00	5.48E+03
CS-134	6.51E+05	1.01E+06	2.25E+05	0.00E+00	3.30E+05	1.21E+05	3.85E+03
CS-137	9.07E+05	8.25E+05	1.28E+05	0.00E+00	2.82E+05	1.04E+05	3.62E+03
BA-140	7.40E+04	6.48E+01	4.33E+03	0.00E+00	2.11E+01	1.74E+06	1.02E+05
CE-141	3.92E+04	1.95E+04	2.90E+03	0.00E+00	8.55E+03	5.44E+05	5.66E+04
CE-144	6.77E+06	2.12E+06	3.61E+05	0.00E+00	1.17E+06	1.20E+07	3.89E+05

TABLE 4-15

Ri DOSE CONVERSION FACTORS FOR THE INHALATION PATHWAY - INFANT RECEPTOR

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E+00	6.47E+02	6.47E+02	6.47E+02	6.47E+02	6.47E+02	6.47E+02
CR-51	0.00E+00	0.00E+00	8.95E+01	5.75E+01	1.32E+01	1.28E+04	3.57E+02
MN-54	0.00E+00	2.53E+04	4.98E+03	0.00E+00	4.98E+03	1.00E+06	7.06E+03
FE-59	1.36E+04	2.35E+04	9.48E+03	0.00E+00	0.00E+00	1.02E+06	2.48E+04
CO-58	0.00E+00	1.22E+03	1.82E+03	0.00E+00	0.00E+00	7.77E+05	1.11E+04
CO-60	0.00E+00	8.02E+03	1.18E+04	0.00E+00	0.00E+00	4.51E+06	3.19E+04
ZN-65	1.93E+04	6.26E+04	3.11E+04	0.00E+00	3.25E+04	6.47E+05	5.14E+04
SR-89	3.98E+05	0.00E+00	1.14E+04	0.00E+00	0.00E+00	2.03E+06	6.40E+04
SR-90	4.09E+07	0.00E+00	2.59E+06	0.00E+00	0.00E+00	1.12E+07	1.31E+05
ZR-95	1.15E+05	2.79E+04	2.03E+04	0.00E+00	3.11E+04	1.75E+06	2.17E+04
SB-124	3.79E+04	5.56E+02	1.20E+04	1.01E+02	0.00E+00	2.65E+06	5.91E+04
I-131	3.79E+04	4.44E+04	1.96E+04	1.48E+07	5.18E+04	0.00E+00	1.06E+03
I-133	1.32E+04	1.92E+04	5.60E+03	3.56E+06	2.24E+04	0.00E+00	2.16E+03
CS-134	3.96E+05	7.03E+05	7.45E+04	0.00E+00	1.90E+05	7.97E+04	1.33E+03
CS-137	5.49E+05	6.12E+05	4.55E+04	0.00E+00	1.72E+05	7.13E+04	1.33E+03
BA-140	5.60E+04	5.60E+01	2.90E+03	0.00E+00	1.34E+01	1.60E+06	3.84E+04
CE-141	2.77E+04	1.67E+04	1.99E+03	0.00E+00	5.25E+03	5.17E+05	2.16E+04
CE-144	3.19E+06	1.21E+06	1.76E+05	0.00E+00	5.38E+05	9.84E+06	1.48E+05

TABLE 4-16

PALO VERDE NUCLEAR GENERATING STATION DISPERSION

AND DEPOSITION PARAMETERS FOR LONG TERM RELEASES

AT THE NEAREST PATHWAY LOCATIONS CENTERED ON UNIT 1

DIRECTION	X/Q (Sec/m^3)	RESIDENCE(b) Dist. Miles	D/Q (m^{-2})	X/Q (Sec/m^3)	GARDEN(b) Dist. Miles	D/Q (m^{-2})	X/Q (Sec/m^3)	MILK(b) Dist. Miles	D/Q (m^{-2})
N	2.92E-06	1.4	3.25E-09	2.92E-06	1.4	3.25E-09	7.03E-07	(a)	3.48E-10
NNE	1.81E-06	1.8	2.88E-09	4.70E-07	(a)	4.04E-10	4.70E-07	(a)	4.04E-10
NE	1.95E-06	1.9	3.85E-09	1.76E-06	2.1	3.29E-09	5.77E-07	(a)	6.51E-10
ENE	1.03E-06	2.7	1.08E-09	1.03E-06	2.7	1.08E-09	3.86E-07	(a)	2.86E-10
E	9.39E-07	2.8	6.68E-10	3.71E-07	(a)	1.87E-10	3.71E-07	(a)	1.87E-10
ESE	6.37E-07	3.7	2.84E-10	4.12E-07	4.6	1.60E-10	4.12E-07	4.6	1.60E-10 goat
SE	8.83E-07	4.1	2.61E-10	8.83E-07	4.1	2.61E-10	5.84E-07	(a)	1.52E-10
SSE	1.27E-06	4.7	2.61E-10	1.09E-06	(a)	2.15E-10	1.09E-06	(a)	2.15E-10
S	2.58E-06	4.6	4.85E-10	2.09E-06	5.2	3.59E-10	2.13E-06	5.1	3.71E-10 cow
SSW	3.26E-06	3.5	8.26E-10	2.28E-06	(a)	4.53E-10	2.28E-06	(a)	4.53E-10
SW	2.80E-06	2.9	9.10E-10	1.58E-06	(a)	3.56E-10	1.58E-06	(a)	3.56E-10
WSW	1.95E-06	2.6	1.09E-09	8.55E-07	(a)	3.18E-10	8.55E-07	(a)	3.18E-10
W	7.54E-07	(a)	4.44E-10	7.54E-07	(a)	4.44E-10	7.54E-07	(a)	4.44E-10
WNW	6.03E-07	(a)	3.25E-10	6.03E-07	(a)	3.25E-10	6.03E-07	(a)	3.25E-10
NW	8.24E-07	3.8	5.25E-10	7.55E-07	4.1	4.61E-10	6.02E-07	(a)	3.27E-10
NNW	1.46E-06	2.0	1.47E-09	5.20E-07	(a)	3.04E-10	5.20E-07	(a)	3.04E-10

(a) 5-mile value used since there is no pathway located within the sector up to five miles.

(b) Controlling locations are discussed in Appendix A.

References: 1984 Land Use Census (letter ANPM-21221-JRM/LEB). NUS Corporation letters NUS-ANPP-1385 and NUS-ANPP-1386.

TABLE 4-16 (Continued)

PALO VERDE NUCLEAR GENERATING STATION DISPERSION

AND DEPOSITION PARAMETERS FOR LONG TERM RELEASES

AT THE NEAREST PATHWAY LOCATIONS CENTERED ON UNIT 2

DIRECTION	X/Q (Sec/m^3)	RESIDENCE(b) Dist. Miles	D/Q (m^{-2})	X/Q (Sec/m^3)	GARDEN(b) Dist. Miles	D/Q (m^{-2})	X/Q (Sec/m^3)	MILK(b) Dist. Miles	D/Q (m^{-2})
N	2.73E-06	1.5	2.92E-09	2.39E-06	1.7	2.35E-09	7.03E-07	(a)	3.48E-10
NNE	2.20E-06	1.5	3.87E-09	2.20E-06	1.5	3.87E-09	4.70E-07	(a)	4.04E-10
NE	1.85E-06	2.0	3.55E-09	1.57E-06	2.3	2.78E-09	5.77E-07	(a)	6.51E-10
ENE	1.03E-06	2.7	1.08E-09	1.03E-06	2.7	1.08E-09	3.86E-07	(a)	2.86E-10
E	8.80E-07	3.0	6.06E-10	3.71E-07	(a)	1.87E-10	3.71E-07	(a)	1.87E-10
ESE	6.25E-07	3.7	2.76E-10	3.96E-07	4.7	1.51E-10	3.96E-07	4.7	1.51E-10 goat
SE	9.06E-07	4.0	2.72E-10	9.06E-07	4.0	2.72E-10	5.84E-07	(a)	1.52E-10
SSE	1.34E-06	4.5	2.81E-10	1.09E-06	(a)	2.15E-10	1.09E-06	(a)	2.15E-10
S	2.63E-06	4.5	5.01E-10	2.19E-06	5.0	3.88E-10	2.19E-06	5.0	3.88E-10 cow
SSW	3.48E-06	3.2	9.19E-10	2.28E-06	(a)	4.53E-10	2.28E-06	(a)	4.53E-10
SW	2.93E-06	2.7	9.75E-10	1.58E-06	(a)	3.56E-10	1.58E-06	(a)	3.56E-10
WSW	2.01E-06	2.5	1.16E-09	8.55E-07	(a)	3.18E-10	8.55E-07	(a)	3.18E-10
W	7.54E-07	(a)	4.44E-10	7.54E-07	(a)	4.44E-10	7.54E-07	(a)	4.44E-10
WNW	6.03E-07	(a)	3.25E-10	6.03E-07	(a)	3.25E-10	6.03E-07	(a)	3.25E-10
NW	7.84E-07	4.0	4.88E-10	7.84E-07	4.0	4.88E-10	6.02E-07	(a)	3.27E-10
NNW	1.46E-06	2.0	1.47E-09	5.20E-07	5.0	3.04E-10	5.20E-07	(a)	3.04E-10

(a) 5-mile value used since there is no pathway located within the sector up to five miles.

(b) Controlling locations are discussed in Appendix A.

References: 1984 Land Use Census (letter ANPM-21221-JRM/LEB). NUS Corporation letters NUS-ANPP-1385 and NUS-ANPP-1386.

TABLE 4-16 (Continued)

PALO VERDE NUCLEAR GENERATING STATION DISPERSION

AND DEPOSITION PARAMETERS FOR LONG TERM RELEASES

AT THE NEAREST PATHWAY LOCATIONS CENTERED ON UNIT 3

DIRECTION	X/Q (Sec/m^3)	RESIDENCE(b) Dist. Miles	D/Q (m^{-2})	X/Q (Sec/m^3)	GARDEN(b) Dist. Miles	D/Q (m^{-2})	X/Q (Sec/m^3)	MILK(b) Dist. Miles	D/Q (m^{-2})
N	2.58E-06	1.8	2.47E-09	2.42E-06	1.9	2.22E-09	7.03E-07	(a)	3.48E-10
NNE	1.85E-06	1.7	2.97E-09	1.85E-06	1.7	2.97E-09	4.70E-07	(a)	4.04E-10
NE	1.66E-06	2.2	3.00E-09	1.48E-06	2.4	2.54E-09	5.77E-07	(a)	6.51E-10
ENE	8.75E-07	2.9	8.86E-10	8.75E-07	2.9	8.86E-10	3.86E-07	(a)	2.86E-10
E	8.90E-07	3.0	6.17E-10	4.06E-07	4.6	2.15E-10	4.25E-07	4.5	2.31E-10 goat
ESE	6.37E-07	3.7	2.84E-10	5.80E-07	4.0	2.46E-10	3.73E-07	(a)	1.37E-10
SE	5.84E-07	(a)	1.52E-10	5.84E-07	(a)	1.52E-10	5.84E-07	(a)	1.52E-10
SSE	1.36E-06	4.4	2.88E-10	1.09E-06	(a)	2.15E-10	1.09E-06	(a)	2.15E-10
S	2.65E-06	4.2	5.25E-10	2.25E-06	4.9	4.06E-10	2.31E-06	4.8	4.21E-10 cow
SSW	3.64E-06	3.1	9.82E-10	2.28E-06	(a)	4.53E-10	2.28E-06	(a)	4.53E-10
SW	3.19E-06	2.5	1.11E-09	1.58E-06	(a)	3.56E-10	1.58E-06	(a)	3.56E-10
WSW	2.12E-06	2.4	1.26E-09	8.55E-07	(a)	3.18E-10	8.55E-07	(a)	3.18E-10
W	7.54E-07	(a)	4.44E-10	7.54E-07	(a)	4.44E-10	7.54E-10	(a)	4.44E-10
WNW	6.03E-07	(a)	3.25E-10	6.03E-07	(a)	3.25E-10	6.03E-07	(a)	3.25E-10
NW	6.83E-07	4.3	4.05E-10	6.82E-07	4.3	4.05E-10	6.02E-07	(a)	3.27E-10
NNW	1.34E-06	2.2	1.26E-09	5.16E-07	5.0	3.01E-10	5.20E-07	(a)	3.04E-10

(a) 5-mile value used since there is no pathway located within the sector up to five miles.

(b) Controlling locations are discussed in Appendix A.

References: 1984 Land Use Census (letter ANPM-21221-JRM/LEB). NUS Corporation letters NUS-ANPP-1385 and NUS-ANPP-1386.

4.4 Requirements: Liquid Effluents

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 (See Figure 6-4) 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.

Applicability: At all times.

Action:

With the calculated dose from the release of radioactive materials in liquid effluents exceeding any of the above limits, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions that have been taken to reduce the releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with the above limits.

4.4.1 Surveillance Requirements:

Cumulative dose contributions from liquid effluents for the current calendar quarter and the current calendar year shall be determined in accordance with the methodology and parameters in the ODCM at least once per 31 days.

4.4.2 Implementation of the Requirements:

This Requirement does not require implementation guidance. There are no offsite liquid effluent releases.

5.0 TOTAL DOSE AND DOSE TO PUBLIC ONSITE

5.1 Requirement: Total Dose

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.

Applicability: At all times.

Action:

With the calculated doses from the release of radioactive materials in liquid and gaseous effluents exceeding twice the limits of Section 4.4a, 4.4b, 4.1a, 4.1b, 4.2a or 4.2b calculations shall be made including direct radiation contributions from the reactor units (including outside storage tanks, etc.) to determine whether the above limits of Section 5.1 have been exceeded. If such is the case, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report that defines the corrective action to be taken to reduce subsequent releases to prevent recurrence of exceeding the above limits and includes the schedule for achieving conformance with the above limits. This Special Report, as defined in 10 CFR 20.2203(a)(4), shall include an analysis that estimates the radiation exposure (dose) to a MEMBER OF THE PUBLIC from uranium fuel cycle sources, including all effluent pathways and direct radiation, for the calendar year that includes the release(s) covered by this report. It shall also describe levels of radiation and concentrations of radioactive material involved, and the cause of the exposure levels or concentrations. If the estimated dose(s) exceeds the above limits, and if the release condition resulting in violation of 40 CFR Part 190 has not already been corrected, the Special Report shall include a request for a variance in accordance with the provisions of 40 CFR Part 190. Submittal of the report within 30 days is considered a timely request, and a variance is granted until staff action on the request is complete.

5.1.1 Surveillance Requirements:

a. Cumulative dose contributions from the gaseous effluents shall be determined in accordance with the surveillance requirements of Section 4.4.1, 4.1.1 and 4.2.1 and in accordance with the methodology and parameters contained in Section 5.1.2.

b. Cumulative dose contributions from direct radiation from the reactor units and from radwaste storage tanks shall be determined in accordance with the methodology and parameters in Section 5.1.2. This requirement is applicable only under conditions set forth in Section 5.1, Action.

5.1.2 Implementation of the Requirement

Since all other uranium fuel cycle sources are greater than 20 miles away, only the PVNGS site need be considered.

The total dose to any MEMBER OF THE PUBLIC will be determined based on a sum of the doses from all three units' releases and doses from direct radiation from PVNGS.

This dose evaluation is performed annually and submitted with the Annual Radioactive Effluent Release Report to assure compliance with 40 CFR Part 190, Environmental Radiation Protection Standards for Nuclear Power Operation. NUREG-0543, Methods for Demonstrating LWR Compliance With the EPA Uranium Fuel Cycle Standard (40 CFR Part 190), February 1980, provides a discussion on compliance with 40 CFR Part 190 in relation to the Radiological Environmental Technical Specifications for sites of up to four nuclear power reactors. The NUREG concludes that as long as a nuclear plant site operates at a level below the 10 CFR Part 50, Appendix I reporting requirements, and there is no significant source of direct radiation from the site, no extra analysis is required to demonstrate compliance with 40 CFR Part 190. As a result, this dose evaluation will also be performed whenever calculated doses associated with effluent releases exceed twice the limits of Section 4.4a, 4.4b, 4.1a, 4.1b, 4.2a or 4.2b.

Dose Contribution from Liquid and Gaseous Effluents

The annual whole body dose accumulated by a MEMBER OF THE PUBLIC for the noble gases released in gaseous effluents is determined by using the following equation:

$$D_{WB} = (3.17E\text{-}08)\ \Sigma_i\ [(K_i)\ (X/Q)_{UNIT}\ (Q_i)] \qquad (5\text{-}1)$$

Where:

K_i = the whole body dose factor due to gamma emissions for each identified noble gas radionuclide i, in mrem/yr per $\mu Ci/m^3$ from Table 3-3.

Q_i = the integrated release of radionuclide i, in μCi for the previous calendar year.

$(X/Q)_{UNIT}$ = the highest calculated annual average dispersion parameter, in sec/m^3, for a particular unit, at the controlling location, from Table 4-16, or concurrent meteorological data if available.

=2.92E-06 from Unit 1
=2.19E-06 from Unit 2
=2.31E-06 from Unit 3

D_{WB} = the annual whole body dose in mrem to a MEMBER OF THE PUBLIC at the controlling location due to noble gases released in gaseous effluents.

3.17E-08 = the inverse of seconds in a year (yr/sec).

The annual dose to any organ accumulated by a MEMBER OF THE PUBLIC for iodine-131, iodine-133, tritium and all radionuclides in particulate form with half-lives greater than 8 days released in gaseous effluents is determined by using the following equation:

$$D_o = (3.17E\text{-}08)\ \Sigma_i\ [\Sigma_k(R_{ik}W_k)\ (Q_i)] \qquad (5\text{-}2)$$

Where:

D_o = the total annual organ dose from gaseous effluents to a MEMBER OF THE PUBLIC, in mrem, at the controlling location.

Q_i = the integrated release of radionuclide i, in µCi, for the previous calendar year.

R_{ik} = the dose factor for each identified radionuclide i, for pathway k (for the inhalation pathway in mrem/yr per µCi/m^3 and for the food and ground plane pathways in m^2-mrem/yr per µCi/sec) at the controlling location. The R_{ik}'s for each age group are given in Tables 4-1 through 4-15.

W_K = the highest annual average dispersion or deposition parameter for the particular unit, used for estimating the total annual organ dose to a MEMBER OF THE PUBLIC at the controlling location for the particular unit.

= $(X/Q)_{UNIT}$, in sec/m^3 for the inhalation pathway and for all tritium calculations, for organ dose at the controlling location, from Table 4-16 or concurrent meteorological data if available.

=2.92E-06 from Unit 1
=2.19E-06 from Unit 2
=2.31E-06 from Unit 3

= $(D/Q)_{UNIT}$, in m^{-2}, for the food and ground plane pathways, for organ dose at the controlling location, from Table 4-16 or concurrent meteorological data if available.

=3.25E-09 from Unit 1
=3.88E-10 from Unit 2
=4.21E-10 from Unit 3

3.17E-08 = the inverse of seconds in a year (yr/sec).

Dose Due to Direct Radiation

The component of dose to a MEMBER OF THE PUBLIC due to direct radiation will be evaluated by first determining the direct radiation dose at the site boundary in each sector, and then extrapolating the site boundary dose to the controlling location by the inverse square law of distance.

Dose from Radioactive Liquid and Gaseous Effluents to MEMBERS OF THE PUBLIC due to their activities within the SITE BOUNDARY.

These activities have been determined to be limited to the vicinity of the Visitor Center located inside the SITE BOUNDARY west of Unit 1. An assumption was made that no MEMBER OF THE PUBLIC would spend more than eight hours per year at this location. However this calculation has been historically performed assuming an occupancy factor of one, (implying continuous occupancy over the entire year).

A X/Q, determined for the Visitor Center, will be used for this assessment.

Equations 5-1 and 5-2 in Section 5.1.2 should be used for this assessment.

6.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

6.1 Requirements: REMP

The radiological environmental monitoring program shall be conducted as specified in Table 6-1.

Applicability: At all times.

Action:

a. With the radiological environmental monitoring program not being conducted as specified in Table 6-1, prepare and submit to the Commission, in the Annual Radiological Environmental Operating Report, as required by Section 7.2, a description of the reasons for not conducting the program as required and the plans for preventing a recurrence.

b. With the level of radioactivity as the result of plant effluents in an environmental sampling medium at a specified location exceeding the reporting levels of Table 6-2 when averaged over any calendar quarter, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report that identifies the cause(s) for exceeding the limit(s) and defines the corrective actions to be taken to reduce radioactive effluents so that the potential annual dose* to A MEMBER OF THE PUBLIC is less than the calendar year limits of Section 4.4, 4.1 and 4.2. When more than one of the radionuclides in Table 6-2 are detected in the sampling medium, this report shall be submitted if:

$$\frac{\text{concentration (1)}}{\text{reporting level (1)}} + \frac{\text{concentration (2)}}{\text{reporting level (2)}} + \ldots \geq 1.0$$

When radionuclides other than those in Table 6-2 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose* to a MEMBER OF THE PUBLIC is equal to or greater than the calendar year limits of Section 4.4, 4.1 and 4.2. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such an event, the condition shall be reported and described in the Annual Radiological Environmental Operating Report.

c. With milk or fresh leafy vegetable samples unavailable from one or more of the sample locations required by Table 6-1, identify locations for obtaining replacement samples and add them to the Radiological Environmental Monitoring Program within 30 days. The specific locations from which samples were unavailable may then be deleted from the monitoring program. Pursuant to Section 7.1, Annual Radioactive Effluent Release Report, identify the cause of the unavailability of samples and identify the new location(s) for obtaining replacement samples in the next Annual Radioactive Effluent Release Report and also include in the report a revised figure(s) and table for the ODCM reflecting the new location(s).

* The methodology and parameters used to estimate the potential annual dose to a MEMBER OF THE PUBLIC shall be indicated in this report.

6.1.1 Surveillance Requirements:

a. The radiological environmental monitoring samples shall be collected pursuant to Table 6-1 from the specific locations given in Table 6-4 and Figures 6-1 and 6-2 and shall be analyzed pursuant to the requirements of Table 6-1, and the detection capabilities required by Table 6-3.

6.1.2 Implementation of the Requirements: REMP

The results of the radiological environmental monitoring program are intended to supplement the results of the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected based on the effluent measurements and modeling of the environmental exposure pathways. Thus the specified environmental monitoring program provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides which lead to the highest potential radiation exposures to individuals resulting from station operation.

This requirement is implemented by Nuclear Administrative and Technical Manual procedures.

TABLE 6-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Representative Samples and Sample Locations[a]	Sampling and Collection Frequency[a]	Type and Frequency of Analysis[d]
<u>Airborne</u> Radioiodine and particulates	Samples from 5 locations: 3 samples at or near the SITE BOUNDARIES (#14A, 15, 21) in different sectors of the highest calculated annual average ground level D/Q.* 1 sample (#40) from areas of special interest, which is from the vicinity of a community having the highest calculated annual average D/Q. 1 sample (#6A) from a control location 15-30 km (10-20 mi) distant and in the least prevalent wind direction.[c]	Continuous sampling collected weekly, or more frequently if required by dust loading.	Gross beta weekly[c], I-131 weekly; gamma isotopic analysis of composite (by location) quarterly.
Direct radiation[b]	41 stations (#6-42, #44-46, #50) with two or more dosimeters for measuring dose rate continuously, placed as follows: an inner ring of stations at the site boundary and an outer ring in the 4-to-5 mi range from the site with a station in each sector of each ring (16 sectors x 2 rings = 32 stations). 7 additional stations are at local schools and/or population centers; 2 other stations are used as controls.	Quarterly	Gamma dose quarterly.

* D/Q refers to average annual relative ground deposition rate.

TABLE 6-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Representative Samples and Sample Locations[a]	Sampling and Collection Frequency[a]	Type and Frequency of Analysis[d]
Waterborne			
Surface	Water storage reservoir (#60) Evaporation pond #1 (#59) Evaporation pond #2 (#63)	Monthly composite of weekly grab sample.	Gamma isotopic analysis monthly; tritium quarterly.
Ground	2 onsite wells[f] (#57, #58)	Quarterly grab sample	Tritium and gamma isotopic analysis quarterly.
Drinking (well)	3 wells from surrounding residences (#46, #48, #49) that would be affected by its discharge.	Composite sample of weekly grab samples over 2-week period when I-131 analysis is performed, monthly composite of weekly grab samples otherwise	I-131 analysis on each composite when the dose calculated for the consumption of the water is greater than 1 mrem per year.[g] Composite for gross beta and gamma isotopic analyses monthly. Composite for tritium analysis quarterly.
Ingestion Milk	Samples from milking animals in 3 locations within 5 km distance having the highest dose potential. If there are none, 1 sample from milking animals in each of three areas between 5 and 8 km distant where doses are calculated to be greater than 1 mrem per year.[g] One sample from milking animals at a control location 15 to 30 km distant and in the least prevalent wind direction.	Semimonthly for animals on pasture; otherwise, monthly.	Gamma isotopic and I-131 analysis semimonthly when animals are on pasture or monthly at other times.

TABLE 6-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Representative Samples and Sample Locations[a]	Sampling and Collection Frequency[a]	Type and Frequency of Analysis[d]
Food Products *	Samples (#47, #52) of 3 different kinds of broad leaf vegetation grown nearest each of two offsite locations of highest predicted annual average ground-level D/Q if milk sampling is not performed.	Monthly during growing season.	Gamma isotopic analysis.
	1 sample (#62) of each of the similar broad leaf vegetation grown 15 to 30 km distant in the least prevalent wind direction if milk sampling is not performed. Monthly during growing season.	Monthly during growing season.	Gamma isotopic analysis.

* When broad leaf vegetation samples are not available, reports from 4 existing supplemental airborne radioiodine sample locations will be substituted.

Table 6-1 (Continued)

TABLE NOTATION

a The number, media, frequency, and location of sampling may vary from site to site. It is recognized that, at times, it may not be possible or practical to obtain samples of the media of choice at the most desired location or time. In these instances suitable alternative media and locations may be chosen for the particular pathway in question. Actual locations (distance and direction) from the site shall be provided in Table 6-4 and Figures 6-1 or 6-2 in the ODCM. Refer to Regulatory Guide 4.1, "Programs for Monitoring Radioactivity in the Environs of Nuclear Power Plants."

b Regulatory Guide 4.13 provides guidance for thermoluminescence dosimetry (TLD) systems used for environmental monitoring. One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. For the purposes of this table, a thermoluminescent dosimeter may be considered to be one phosphor, and two or more phosphors in a packet may be considered as two or more dosimeters. Film badges should not be used for measuring direct radiation.

c Particulate sample filters shall be analyzed for gross beta 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air or water is greater than 10 times the yearly mean of control samples for any medium, gamma isotopic analysis should be performed on the individual samples.

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

e The purpose of this sample is to obtain background information. If it is not practical to establish control locations in accordance with the wind direction criteria, other sites that provide valid background data may be substituted.

f Groundwater samples should be taken when this source is tapped for drinking or irrigation purposes in areas where the hydraulic gradient or recharge properties are suitable for contamination.

g The dose shall be calculated for the maximum organ and age group, using the methodology and parameters in the ODCM.

TABLE 6-2

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Analysis	Water (pCi/l)	Airborne Particulate or Gas (pCi/m^3)	Fresh Milk (pCi/l)	Food Products (pCi/kg, wet)
H-3	20,000 *			
Mn-54	1,000			
Fe-59	400			
Co-58	1,000			
Co-60	300			
Zn-65	300			
Zr-Nb-95	400			
I-131	2 **	0.9	3	100
Cs-134	30	10	60	1,000
Cs-137	50	20	70	2,000
Ba-La-140	200		300	

* For drinking water samples. This is a 40 CFR 141 value. If no drinking water pathway exists, a value of 30,000 pCi/l may be used.

** If no drinking water pathway exists, a reporting level of 20 pCi/l may be used.

TABLE 6-3

DETECTION CAPABILITIES FOR ENVIRONMENTAL ANALYSIS [a]

Lower Limit of Detection (LLD)[b]				
Analysis	Water (pCi/l)	Airborne Particulate or Gas (pCi/m^3)	Fresh Milk (pCi/l)	Food Products (pCi/kg, wet)
Gross Beta	4	0.01		
H-3	2000*			
Mn-54	15			
Fe-59	30			
Co-58, -60	15			
Zn-65	30			
Zr-95	30			
Nb-95	15			
I-131	1**	0.07	1	60
Cs-134	15	0.05	15	60
Cs-137	18	0.06	18	80
Ba-140	60		60	
La-140	15		15	

NOTE: This list does not mean that only these nuclides are to be detected and reported. Other peaks that are measurable and identifiable, together with the above nuclides, shall also be identified and reported.

* If no drinking water pathway exists, a value of 3000 pCi/l may be used.

** If no drinking water pathway exists, a value of 15 pCi/l may be used.

Table 6-3 (Continued)

TABLE NOTATION

a Guidance for detection capabilities for thermoluminescent dosimeters used for environmental measurements is given in Regulatory Guide 4.13.

b Table 6-3 indicates acceptable detection capabilities for radioactive materials in environmental samples. These detection capabilities are tabulated in terms of the lower limits of detection (LLDs). The LLD is defined, for purposes of this guide, as the smallest concentration of radioactive material in a sample that will yield a net count (above system background) that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal.

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

$$LLD = \frac{4.66 s_b}{E * V * 2.22 * Y * \exp(-\lambda \Delta t)}$$

Where:

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

s_b is the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (as counts per minute),

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

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

2.22 is the number of disintegrations per minute per picocurie,

Y is the fractional radiochemical yield (when applicable),

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

Δt for environmental samples is the elapsed time between sample collection (or end of the sample collection period) and time of counting.

In calculating the LLD for a radionuclide determined by gamma-ray spectrometry the background should include the typical contributions of other radionuclides normally present in the samples (e.g., potassium-40 in milk samples). Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Operating Report.

6.2 Requirement: Land Use Census

A land use census shall be conducted and shall identify within a distance of 8 km (5 miles) the location in each of the 16 meteorological sectors of the nearest milk animal, the nearest residence and the nearest garden* of greater than 50 m^2 (500 ft^2) producing broad leaf vegetation.

Applicability: At all times.

Action:

a. With a land use census identifying a location(s) that yields a calculated dose or dose commitment greater than the values currently being calculated in Section 4.2.1, identify the new location(s) in the next Annual Radioactive Effluent Release Report, pursuant to Section 7.1.

b. With a land use census identifying a location(s) that yields a calculated dose or dose commitment (via the same exposure pathway) 20% greater than at a location from which samples are currently being obtained in accordance with Section 6.1, add the new location(s) to the radiological environmental monitoring program within 30 days. The sampling location(s), excluding the control station location, having the lowest calculated dose or dose commitment(s), via the same exposure pathway, may be deleted from this monitoring program after (October 31) of the year in which this land use census was conducted. Pursuant to Section 7.1, identify the new location(s) in the next Annual Radioactive Effluent Release Report and also include in the report a revised figure(s) and table for the ODCM reflecting the new location(s).

6.2.1 Surveillance Requirements:

a. The land use census shall be conducted during the growing season at least once per 12 months using that information that will provide the best results, such as by a door-to-door survey, aerial survey, or by consulting local agriculture authorities. The results of the land use census shall be included in the Annual Radiological Environmental Operating Report pursuant to Section 7.2.

6.2.2 Implementation of the Requirements:

The above Requirement is implemented by Nuclear Administrative and Technical Manual procedures.

* Broad Leaf vegetation sampling of at least three different kinds of vegetation may be performed at the SITE BOUNDARY in each of two different direction sectors with the highest predicted D/Qs in lieu of the garden census. Specifications for broad leaf vegetation sampling in Table 6-1 shall be followed, including analysis of control samples.

6.3 Requirements: Interlaboratory Comparison Program

Analyses shall be performed on radioactive materials supplied as part of an Interlaboratory Comparison Program that correspond to samples required by Table 6-1, as applicable.

Applicability: At all times.

Action:

a. With analyses not being performed as required above, report the corrective actions taken to prevent a recurrence to the Commission in the Annual Radiological Environmental Operating Report pursuant to Section 7.2.

6.3.1 Surveillance Requirements:

a. A summary of the results obtained as part of the above required Interlaboratory Comparison Program and in accordance with the methodology and parameters in this manual shall be included in the Annual Radiological Environmental Operating Report pursuant to Section 7.2.

6.3.2 Implementation of the Requirements:

PVNGS laboratories or contract laboratories which perform analyses for the Radiological Environmental Monitoring Program (REMP) participate in an Interlaboratory Comparison Program. The participation includes all of the determinations (sample medium-radionuclide combinations) that are included in the monitoring program.

If deviation from specified limits is identified an investigation is made to determine the reason for the deviation and corrective actions are taken as necessary. The results of all analyses made under this program are included in the Annual Radiological Environmental Operating Report.

TABLE 6-4

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE COLLECTION LOCATIONS

SAMPLE SITE	SAMPLE TYPE	NOTE (d)	LOCATION DESIGNATION (a)	LOCATION DESCRIPTION (c)
1	TLD	SUP	E30	APS Western Division Office, Goodyear
1	Air	Deleted		
2	TLD	SUP	ENE24	Scott-Libby School, Perryville and Thomas Rds.
3	TLD	SUP	E21	Liberty School, 19800 W. Hwy 85
4	TLD	SUP	E16	APS Buckeye Office, 615 N. 4th St., Buckeye
4	Air	SUP	E16	Same as TLD
5	TLD	SUP	ESE11	Palo Verde School, Palo Verde Rd. (291st Ave.) and Old US 80
6	TLD (b)	SP	SSE31	APS Gila Bend substation, frontage road W of town
6A	Air (b)	Control	SSE13	Old US 80, Gila Bend side of Gillespie Bridge
7	TLD (b)	SP	SE7	Old US 80 and Arlington School Rd.
7A	Air	SUP	SE8	Arlington School, 16351 S. Arlington School Rd.
8	TLD (b)	OR	SSE4	Southern Pacific Pipeline Rd., 1.4 miles SW of 355th Ave.
9	TLD (b)	OR	S5	Southern Pacific Pipeline Rd., 2.5 miles SW of 355th Ave.
10	TLD (b)	OR	SE5	SE corner of 355th Ave. and Elliot Rd.
11	TLD (b)	OR	ESE5	NW corner of 339th Ave. and Dobbins Rd.
12	TLD (b)	OR	E5	NE corner of 339th Ave. and Buckeye-Salome Rd.
13	TLD (b)	IR	N1	N site boundary
14	TLD (b)	IR	NNE2	NNE site boundary
14A	Air (b)		NNE2	SW corner of 371st Ave. and Buckeye-Salome Rd.
15	TLD (b)	IR	NE2	NE site boundary, WRF access road
15	Air (b)		NE2	Same as TLD
16	TLD (b)	IR	ENE2	ENE site boundary
17	TLD (b)	IR	E2	E site boundary
17A	Air	SUP	E4	351st Ave., 1 mile S of Buckeye-Salome Rd.
18	TLD (b)	IR	ESE2	ESE site boundary

TABLE 6-4

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE COLLECTION LOCATIONS

SAMPLE SITE	SAMPLE TYPE	NOTE (d)	LOCATION DESIGNATION (a)	LOCATION DESCRIPTION (c)
19	TLD (b)	IR	SE2	SE site boundary
20	TLD (b)	IR	SSE2	SSE site boundary
21	TLD (b)	IR	S3	S site boundary
21	Air (b)		S3	Same as TLD
22	TLD (b)	IR	SSW3	SSW site boundary
23	TLD (b)	OR	W5	2 miles N of Elliot Rd., 3 miles W of Wintersburg Rd.
24	TLD (b)	OR	SW4	Elliot Rd., 2 miles W of Wintersburg Rd.
25	TLD (b)	OR	WSW5	Elliot Rd., 3 miles W of Wintersburg Rd. at cattleguard
26	TLD (b)	OR	SSW4	Sheppard farm, 13202 S. 383rd Ave., 0.5 miles W of house
27	TLD (b)	IR	SW1	SW site boundary
28	TLD (b)	IR	WSW1	WSW site boundary
29	TLD (b)	IR	W1	W site boundary
29	Air	SUP	W1	Same as TLD
30	TLD (b)	IR	WNW1	WNW site boundary
31	TLD (b)	IR	NW1	NW site boundary
32	TLD (b)	IR	NNW1	NNW site boundary
33	TLD (b)	OR	NW4	Buckeye Rd., 0.5 miles W of 395th Ave.
34	TLD (b)	OR	NNW5	SE corner of 395th Ave. and Van Buren St.
35	TLD (b)	SP	NNW8	Fire Station, 40901 W. Osborn Rd., Tonopah
35	Air	SUP	NNW8	Same as TLD
36	TLD (b)	OR	N5	SW corner of Wintersburg Rd. and Van Buren St.
37	TLD (b)	OR	NNE5	SE corner of 363rd Ave. and Van Buren St.
38	TLD (b)	OR	NE5	SW corner of 355th Ave. and Buckeye Rd.
39	TLD (b)	OR	ENE5	343rd Ave., 0.5 miles S of Lower Buckeye Rd.
40	TLD (b)	SP	N3	Wintersburg, Transmission Rd. S of trailer park

TABLE 6-4

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE COLLECTION LOCATIONS

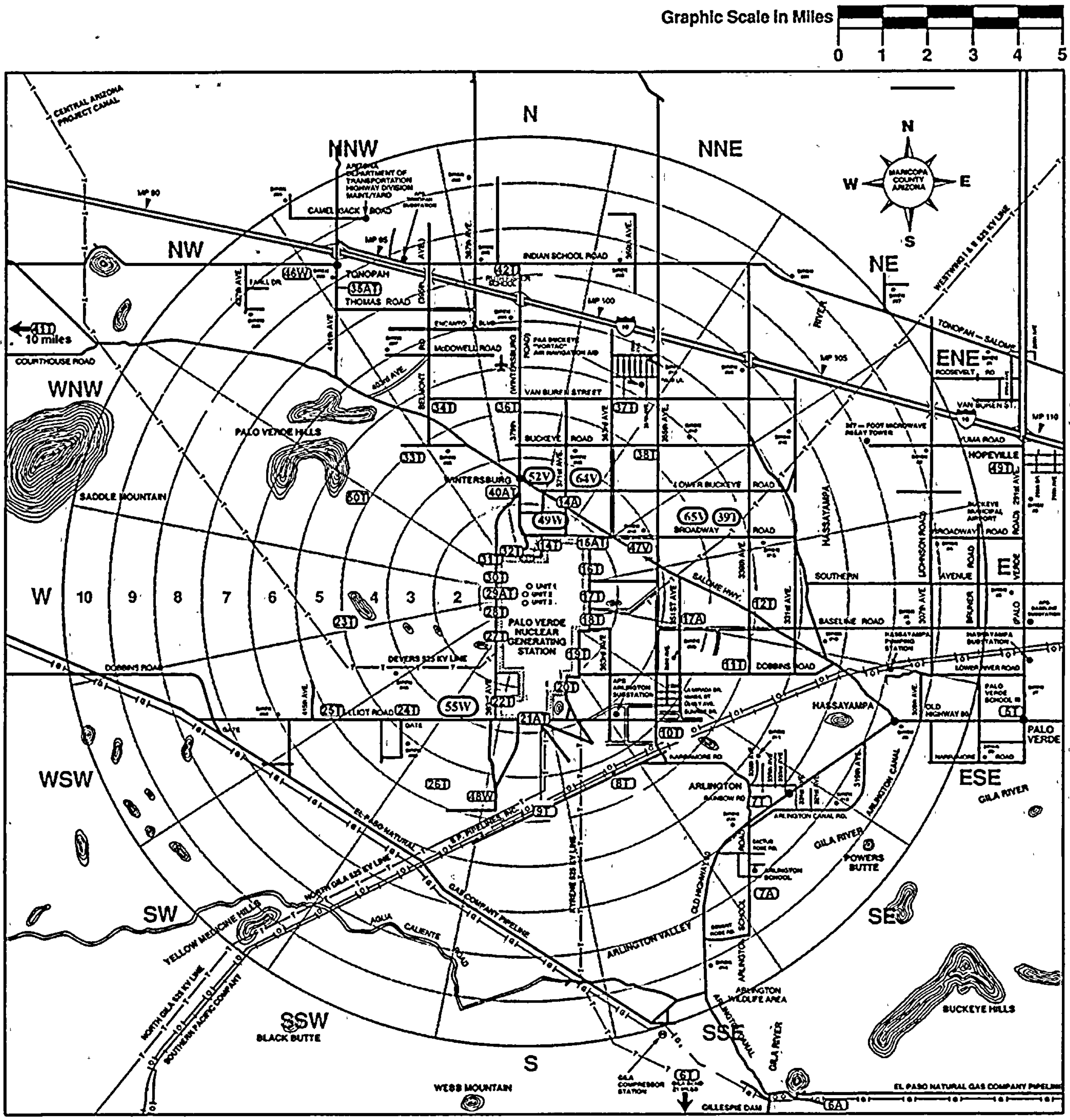
SAMPLE SITE	SAMPLE TYPE	NOTE (d)	LOCATION DESIGNATION (a)	LOCATION DESCRIPTION (c)
40	Air (b)		N3	Same as TLD
41	TLD (b)	SP	WNW20	Harquahala Valley School, Van Buren St., 1 mile W of Steve Martori Dr.
42	TLD (b)	SP	N8	Ruth Fisher School, Indian School and Wintersburg Rds.
43	DELETED			
44	TLD (b)	Control	ENE35	APS El Mirage Office, 12313 W. Grand Ave.
45	TLD (b)	Transit Control	E16	APS Buckeye Office, 615 N. 4th St., REMP trailer (lead pig)
46	TLD (b)	SP	ENE30	Litchfield Park School, 13825 W. Indian School Rd.
46	Water (b)	WD	NW9	McArthur residence, 41701 W. Indian School Rd., Tonopah
47	TLD	SUP	E35	Littleton School, 115th Ave. and Hwy 85, Cashion
47	Vegetation (b)		ENE3	Adams' residence, NW corner of 355th Ave. and Buckeye-Salome Rd.
48	TLD	SUP	E24	Jackrabbit Trail, S of I-10, N of Filmore St.
48	Water (b)	WD	SSW4	Sheppard farm, 13202 S. 383rd Ave.
49	TLD	SUP	ENE11	Palo Verde Rd., 0.25 miles S of I-10
49	Water (b)	WD	N2	Masengale residence, 371st Ave., 0.5 miles S of Buckeye-Salome Rd.
50	TLD (b)	OR	WNW5	3.5 miles W of Wintersburg Rd., 2 miles S of Buckeye-Salome Rd.
50	Milk			
51	Milk	Deleted		
52	Vegetation (b)		NNE3	Guajardo residence, 37300 W. Lower Buckeye Rd.
53	Milk			
54	Milk	Deleted		
55	Water	WD SUP	SW3	Gavette residence, 39326 W. Elliot Rd.

TABLE 6-4

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE COLLECTION LOCATIONS

SAMPLE SITE	SAMPLE TYPE	NOTE (d)	LOCATION DESIGNATION (a)	LOCATION DESCRIPTION (c)
56	Milk	Deleted		
57	Ground Water (b)	WG	onsite	Well 27ddc
58	Ground Water (b)	WG	onsite	Well 34abb
59	Surface Water (b)	WS	onsite	Evaporation Pond #1
60	Surface Water (b)	WS	onsite	Reservoir
62	Vegetation (b)	Control	E35	Tolleson Produce Co., 91st Ave. and Van Buren St.
63	Surface Water (b)	WS	onsite	Evaporation Pond #2
64	Vegetation	SUP	NNE3	Bigelow residence, 37000 W. Lower Buckeye Rd.
65	Vegetation	SUP	ENE4	Hommel residence, 35026 W. Broadway Rd.

NOTES:
(a) Distance and direction are relative to the Unit 2 containment, rounded to the nearest mile.
(b) These samples fulfill the requirements of the ODCM, Table 6-1.
(c) Refer to Figures 6-1 and 6-2 for relative locations of sample sites.
(d) IR - inner ring
OR - outer ring
SP - school or population center
WS - waterborne surface
WG - waterborne ground
WD - waterborne drinking
SUP -designated supplemental sampling location



KEY TO MAP

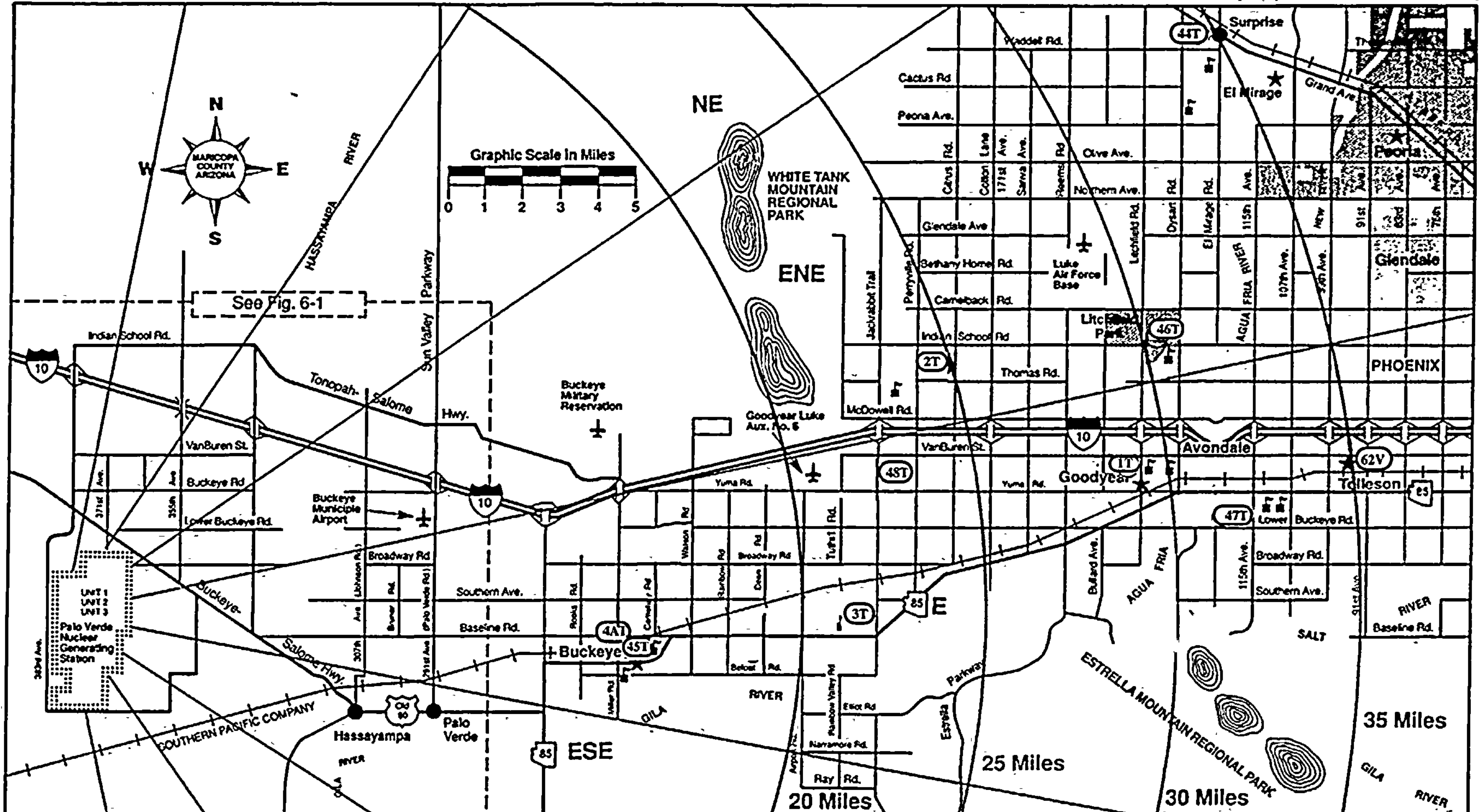
- Paved Road
- Unpaved Road
- 4WD Road
- Gas Pipeline
- Oil Pipeline
- Power Line
- Railroad
- Airstrip
- School
- Siren
- MP Milepost
- Palo Verde Nuclear Generating Station Boundary
- T Thermoluminescent Dosimeters (TLD)
- A Air Sample
- V Vegetation Sample
- W Water Sample
- (1) Sample Sites

Palo Verde Nuclear Generating Station

Radiological Environmental Monitoring Program Sample Sites

0 – 10 Miles

Figure 6-1



KEY TO MAP

- Railroad
- Airstrip/Airport
- Schools Located Near Sample Sites
- ★ Municipal Buildings
- Palo Verde Nuclear Generating Station Boundary
- T Thermoluminescent Dosimeters (TLD)
- A Air Sample
- (1) Sample Sites
- V Vegetation

Palo Verde Nuclear Generating Station

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SAMPLE SITES

0–35 Miles

Fig. 6-2

FIGURE 6-3 DELETED

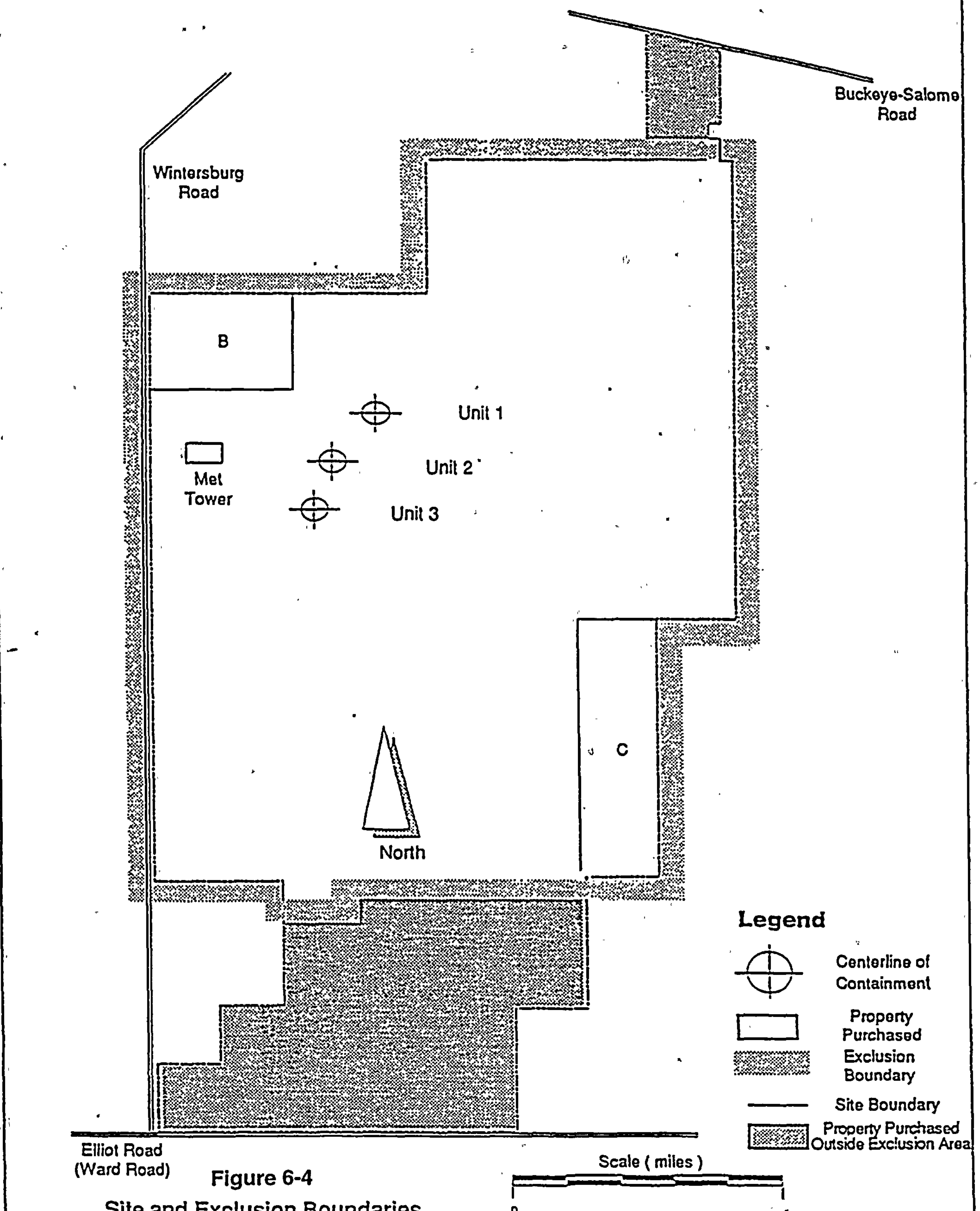
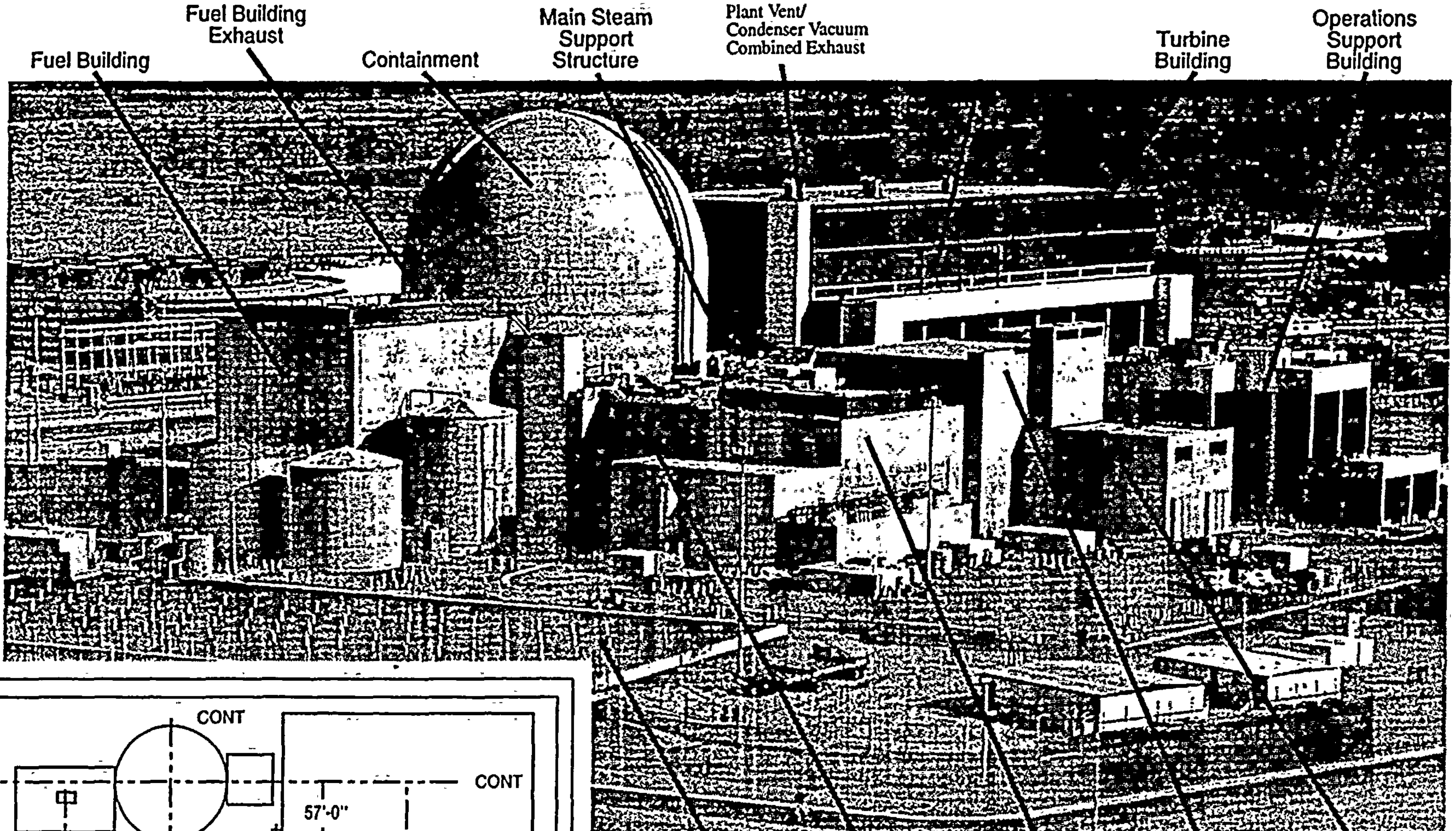
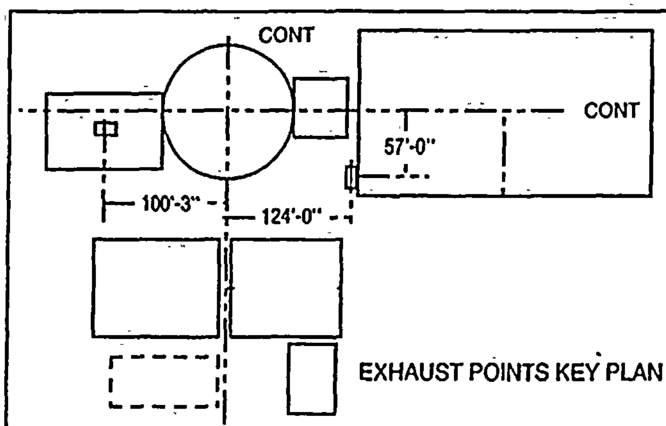


Figure 6-4
Site and Exclusion Boundaries





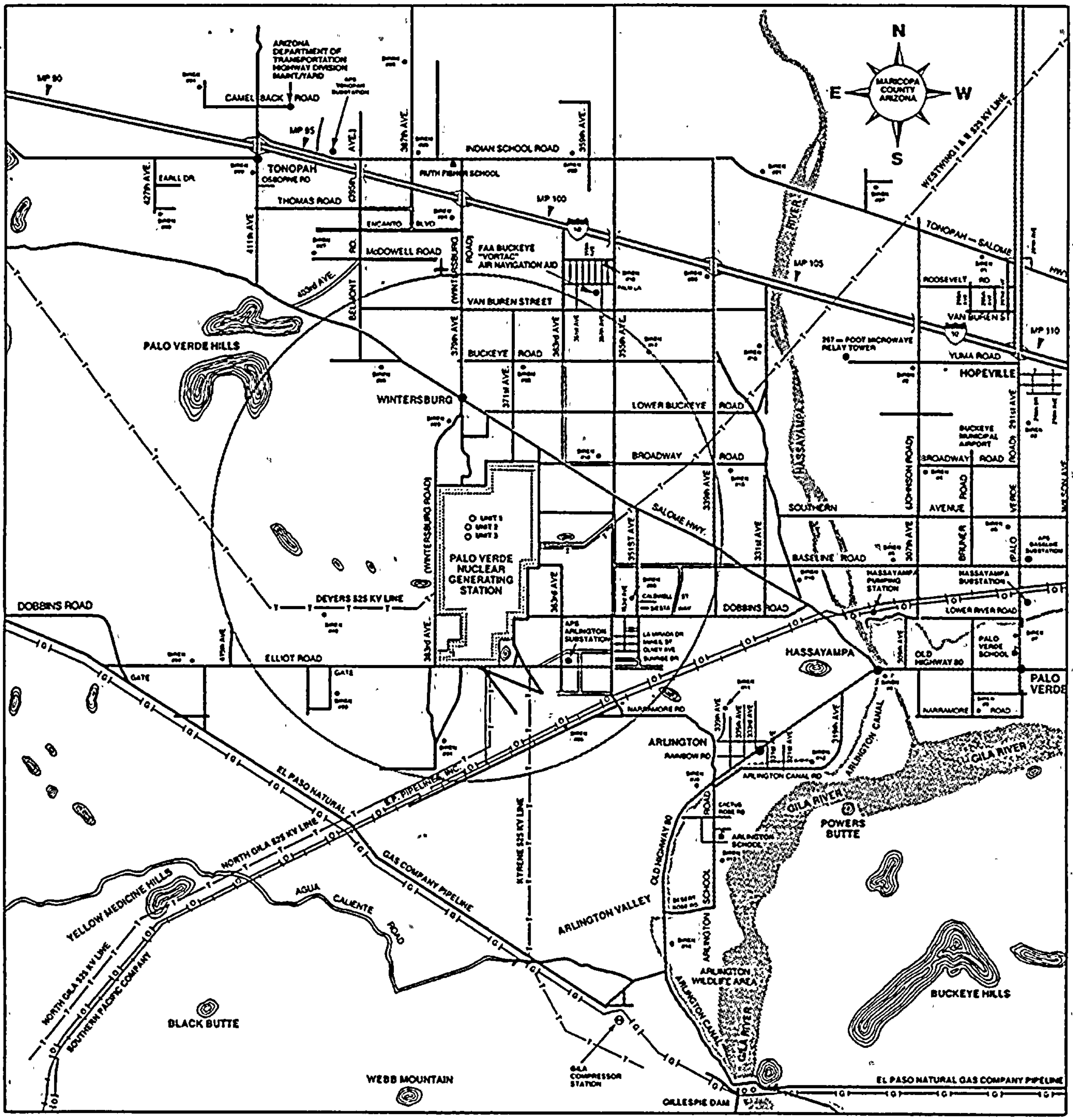
EXHAUST POINTS KEY PLAN

Elevation of Exhaust Point Above Grade	
Plant Vent/Condenser Vacuum	145'
Fuel Building	109'-9"

Palo Verde Nuclear Generating Station
GASEOUS EFFLUENT RELEASE POINTS

Fig. 6-5

Graphic Scale in Miles 0 1 2 3 4 5



KEY TO MAP

- Paved Road
- Unpaved Road
- 4WD Road
- Gas Pipeline
- Oil Pipeline
- Power Line
- Railroad
- Airstrip
- Palo Verde Nuclear Generating Station Boundary
- School
- Siren
- MP Milepost

Palo Verde Nuclear Generating Station
LOW POPULATION ZONE

0–5 Miles

Figure 6-6

7.0 RADIOLOGICAL REPORTS

7.1 Requirement: Annual Radioactive Effluent Release Report *

Routine Annual Radioactive Effluent Release Reports covering the operation of the unit during the previous calendar year shall be submitted before May 1 of each year.

The Annual Radioactive Effluent Release Reports shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit as outlined in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," Revision 1, June 1974, with data summarized on a quarterly basis following the format of Appendix B thereof.

The Annual Radioactive Effluent Release Report shall include an annual summary of hourly meteorological data collected over the previous year. This annual summary may be either in the form of an hour-by-hour listing on magnetic tape of wind speed, wind direction, atmospheric stability, and precipitation (if measured), or in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability**. This same report shall include an assessment of the radiation doses due to the radioactive liquid and gaseous effluents released from the unit or station during the previous calendar year. This same report shall also include an assessment of the radiation doses from radioactive liquid and gaseous effluents to MEMBERS OF THE PUBLIC due to their activities inside the SITE BOUNDARY (Figure 6-4) during the report period. All assumptions used in making these assessments, i.e., specific activity, exposure time and location, shall be included in these reports. The meteorological conditions concurrent with the time of release of radioactive materials in gaseous effluents, as determined by sampling frequency and measurement, shall be used for determining the gaseous pathway doses. The assessment of radiation doses shall be performed in accordance with the methodology and parameters in the ODCM.

The Annual Radioactive Effluent Release Report shall also include an assessment of radiation doses to the likely most exposed MEMBER OF THE PUBLIC from reactor releases and other nearby uranium fuel cycle sources, including doses from primary effluent pathways and direct radiation, for the previous calendar year to show conformance with 40 CFR Part 190, Environmental Radiation Protection Standards for Nuclear Power Operation. Acceptable methods for calculating the dose contributions are given Section 5.0 and Regulatory Guide 1.109 Rev. 1, October 1977.

* A single submittal may be made for a multiple unit station. The submittal should combine those sections that are common to all units at the station; however, for units with separate radwaste systems, the submittal shall specify the releases of radioactive material from each unit.

** In lieu of submission with the Annual Radioactive Effluent Release Report, the licensee has the option of retaining this summary of required meteorological data on site in a file that shall be provided to the NRC upon request.

The Annual Radioactive Effluent Release Reports shall include the following information for each class of solid waste (as defined by 10 CFR Part 61) shipped offsite during the report period:

a. Container volume,

b. Total curie quantity (specify whether determined by measurement or estimate),

c. Principal radionuclides (specify whether determined by measurement or estimate),

d. Source of waste and processing employed (e.g., dewatered spent resin, compacted dry waste, evaporator bottoms),

e. Type of container (e.g., LSA, Type A, Type B, Large Quantity), and

f. Solidification agent or absorbent (e.g., cement, urea formaldehyde).

The Annual Radioactive Effluent Release Reports shall include a list and description of unplanned releases from the site to UNRESTRICTED AREAS of radioactive materials in gaseous and liquid effluents made during the reporting period.

The Annual Radioactive Effluent Release Reports shall include any changes made during the reporting period to the PROCESS CONTROL PROGRAM and to the OFFSITE DOSE CALCULATION MANUAL, as well as a listing of new locations for dose calculations and/or environmental monitoring identified by the land use census pursuant to Section 6.2.

7.2 Requirement: Annual Radiological Environmental Operating Report *

Routine Annual Radiological Environmental Operating Reports covering the operation of the unit during the previous calendar year shall be submitted prior to May 1 of each year. The initial report shall be submitted prior to May 1 of the year following criticality.

The Annual Radiological Environmental Operating Reports shall include summaries, interpretations, and an analysis of trends of the results of the radiological environmental surveillance activities for the report period, including a comparison with preoperational studies, with operational controls as appropriate, and with previous environmental surveillance reports, and an assessment of the observed impacts of the plant operation on the environment. The reports shall also include the results of land use censuses required by Section 6.2.

The Annual Radiological Environmental Operating Reports shall include the results of analysis of all radiological environmental samples and of all environmental radiation measurements taken during the period pursuant to the locations specified in Table 6-4 and Figures 6-1 and 6-2 as well as summarized and tabulated results of these analyses and measurements in the format of the table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979. In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report.

The reports shall also include the following: a summary description of the radiological environmental monitoring program; at least two legible maps** covering all sampling locations keyed to a table giving distances and directions from the centerline of one reactor; the results of licensee participation in the Interlaboratory Comparison Program, required by Section 6.3; discussion of all deviations from the sampling schedule of Table 6-1; and discussion of all analyses in which the LLD required by Table 6-3 was not achievable.

* A single submittal may be made for a multiple unit station.

** One map shall cover stations near the SITE BOUNDARY; a second shall include the more distant stations.

APPENDIX A
DETERMINATION OF CONTROLLING LOCATION

The controlling location is the location of the MEMBER OF THE PUBLIC who receives the highest doses.

The determination of a controlling location for implementation of 10CFR50 for radioiodines and particulates is known to be a function of:

(1) Isotopic release rates

(2) Meteorology

(3) Exposure pathway

(4) Receptor's age

The incorporation of these parameters into Equation 5-2 results in the respective equations at the controlling location. The isotopic release rates are based upon the source terms calculated using the PVNGS Environmental Report, Operating License Stage, Table 3.5-12, without carbon.

All of the locations and exposure pathways, identified in the 1984 Land Use Census, have been evaluated. These include cow milk ingestion, goat milk ingestion, vegetable ingestion, inhalation, and ground plane exposure. An infant is assumed to be present at all milk pathway locations. A child is assumed to be present at all vegetable garden locations. The ground plane exposure pathway is only considered to be present where an infant is not present. Naturally, inhalation is present everywhere an individual is present.

For the determination of the controlling locations, the highest X/Q and D/Q values, based on the 9 year meteorological data base, for the vegetable garden, cow milk, and goat milk pathways, are selected for each unit. The receptor organ doses have been calculated at each of these locations. Based upon these calculations, it is determined that the controlling receptor pathway is a function of unit location. For Unit 1, the controlling receptor is a garden-child pathway; for releases from Unit 2 and Unit 3 the controlling receptor is a cow milk-infant pathway. These determinations are based upon Table 4-16 which, in turn, is based upon the 1984 Land Use Census. Locations of the nearest residences, gardens and milk animals, as determined in the 1984 Land Use Census, are given in Table 4-16.

APPENDIX B
BASES FOR REQUIREMENTS

B-2.1 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The alarm/trip setpoints for these instruments shall be calculated and adjusted in accordance with the methodology and parameters in the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63, 64 of Appendix A to 10 CFR PART 50.

There are two separate radioactive gaseous effluent monitoring systems: the low range effluent monitors for normal plant radioactive gaseous effluents and the high range effluent monitors for post-accident plant radioactive gaseous effluents. The low range monitors operate at all times until the concentration of radioactivity in the effluent becomes too high during post-accident conditions. The high range monitors only operate when the concentration of radioactivity in the effluent is above the setpoint in the low range monitors.

B-3.1 GASEOUS EFFLUENT - DOSE RATE

This requirement provides reasonable assurance that radioactive material discharged in gaseous effluents will not result in the exposure of a MEMBER OF THE PUBLIC in an UNRESTRICTED AREA, either at or beyond the SITE BOUNDARY, in excess of the design objectives of Appendix I to 10 CFR part 50. This requirement is provided to ensure that gaseous effluents from all units on the site will be appropriately controlled. It provides operational flexibility for releasing gaseous effluents to satisfy the Section II.A and II.C design objectives of Appendix I to 10 CFR part 50. For MEMBERS OF THE PUBLIC who may at times be within the SITE BOUNDARY, the occupancy of that MEMBER OF THE PUBLIC will usually be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the SITE BOUNDARY. Examples of calculations for such MEMBERS OF THE PUBLIC, with the appropriate occupancy factors, shall be given in the ODCM. The specified release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to a MEMBER OF THE PUBLIC at or beyond the SITE BOUNDARY to less than or equal to 500 mrems/year to the total body or to less than or equal to 3000 mrems/year to the skin. These release rate limits also restrict, at all times, the corresponding thyroid dose rate above background to a child via the inhalation pathway to less than or equal to 1500 mrems/year. This requirement does not affect the requirement to comply with the annual limitations of 10 CFR 20.1301(a).

This requirement applies to the release of radioactive materials in gaseous effluents from all reactor units at the site.

The required detection capabilities for radioactive materials in gaseous waste samples are tabulated in terms of the lower limits of detection (LLD). Detailed discussion of the LLD and other detection limits can be found in Currie, L. A., "Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements," NUREG/CR-4007 (September 1984), and in the HASL Procedures Manual, HASL-300 (revised annually).

B-3.2 SECONDARY SYSTEM LIQUID WASTE DISCHARGE TO ONSITE EVAPORATION PONDS - CONCENTRATION

This requirement is provided to ensure that at any time during the life of the nuclear station, the annual total body dose due to ground contamination of an UNRESTRICTED AREA, arising from transportation and deposition by wind of the accumulated activity discharged to the pond from the secondary system of the plant (if the pond gets dried up) on the UNRESTRICTED AREA, is within the guidelines of 10 CFR Part 20 for the above-mentioned postulated event.

Restricting the concentrations of the secondary liquid wastes discharged to the onsite evaporation ponds will restrict the quantity of radioactive material that can get accumulated in the ponds. This, in turn, provides assurance that in the event of an uncontrolled release of the pond's contents to an UNRESTRICTED AREA, the resulting total body annual exposure from ground contamination to a MEMBER OF THE PUBLIC at the nearest exclusion area boundary will be within 0.5 rem.

This requirement applies to the secondary system liquid waste discharges of radioactive materials from all reactor units to the onsite evaporation ponds. Since the chemical neutralizer tank concentrations will bound concentrations in other secondary waste discharges, surveillance requirements stipulate that sampling and analysis of other secondary waste discharges need be performed only if the sampling and analysis of the contents of the chemical neutralizer tank shows that the neutralizer tank concentration exceeds the specified LLD.

The required detection capabilities for radioactive materials in gaseous waste samples are tabulated in terms of the lower limits of detection (LLD). Detailed discussion of the LLD and other detection limits can be found in Currie, L. A., "Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements," NUREG/CR-4007 (September 1984), and in the HASL Procedures Manual, HASL-300 (revised annually).

B-4.1 GASEOUS EFFLUENT - DOSE, Noble Gases

This requirement is provided to implement Sections II.B, III.A and IV.A of Appendix I, 10 CFR Part 50. This requirement implements the guides set forth in Section II.B of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable." The surveillance requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The dose calculation methodology and parameters established in the ODCM for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors," Revision 1, July 1977. The ODCM equations provided for determining the air doses at and beyond the SITE BOUNDARY are based upon the historical average atmospheric conditions.

This requirement applies to the release of radioactive materials in gaseous effluents from each reactor unit at the site.

B-4.2 GASEOUS EFFLUENT - DOSE - Iodine-131, Iodine-133, Tritium, and All Radionuclides in Particulate Form With Half-Lives Greater Than 8 Days

This requirement is provided to implement the requirements of Sections II.C, III.A, IV.A of Appendix I, 10 CFR Part 50. This requirement is the guide set forth in Section II.C of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive materials in gaseous effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable." The ODCM calculational methods specified in the surveillance requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The ODCM calculational methodology and parameters for calculating the doses due to the actual release rates of the subject materials are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases for Light-Water-Cooled Reactors," Revision 1, July 1977. These equations also provide for determining the actual doses based upon the historical average atmospheric conditions. The release rate specifications for iodine-131, iodine-133, tritium, and radionuclides in particulate form with half-lives greater than 8 days are dependent upon the existing radionuclide pathways to man, in the areas at and beyond the SITE BOUNDARY. The pathways that were examined in the development of these calculations were: (1) individual inhalation of airborne radionuclides, (2) deposition of radionuclides onto green leafy vegetation with subsequent consumption by man, (3) deposition onto grassy areas where milk animals and meat-producing animals graze with consumption of the milk and meat by man, and (4) deposition on the ground with subsequent exposure of man.

This requirement applies to the release of radioactive materials in gaseous effluents from each reactor unit at the site.

B-4.3 GASEOUS RADWASTE TREATMENT

The OPERABILITY of the GASEOUS RADWASTE SYSTEM and the VENTILATION EXHAUST TREATMENT SYSTEM ensures that the systems will be available for use whenever gaseous effluents require treatment prior to release to the environment. The requirement that the appropriate portions of these systems be used, when specified, provides reasonable assurance that the releases of radioactive materials in gaseous effluents will be kept "as low as reasonably achievable." This requirement implements the requirements of 10 CFR 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50, and the design objectives given in Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the systems were specified as a suitable fraction of the dose design objectives set forth in Sections II.B and II.C of Appendix I, 10 CFR Part 50, for gaseous effluents.

This requirement applies to the release of radioactive materials in gaseous effluents from each reactor unit at the site.

The minimum analysis frequency of 4/M (i.e., at least 4 times per month at intervals no greater than 9 days and a minimum of 48 times a year) is used for certain radioactive gaseous waste sampling in Table 3-1. This will eliminate taking double samples when quarterly and weekly samples are required at the same time.

B-4.4 SECONDARY SYSTEM LIQUID WASTE DISCHARGE TO ONSITE EVAPORATION PONDS - DOSE

This requirement is provided to implement the requirements of Sections II.A, III.A and IV.A of Appendix I, 10 CFR Part 50. This requirement implements the guides set forth in Section II.A of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents to UNRESTRICTED AREAS will be kept "as low as is reasonably achievable." Also, for fresh water sites with drinking water supplies that can be potentially affected by plant operations, there is reasonable assurance that the operation of the facility will not result in radionuclide concentrations in the finished drinking water that are in excess of the requirements of 40 CFR Part 141. The dose calculation methodology and parameters in the ODCM implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of a MEMBER OF THE PUBLIC through appropriate pathways is unlikely to be substantially underestimated. The equations specified in the ODCM for calculating the doses due to the actual release rates of radioactive materials in liquid effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," April 1977.

This requirement applies to the release of liquid effluents from each reactor at the site. For units with shared radwaste treatment systems, the liquid effluents from the shared system are proportioned among the units sharing that system.

B-5.1 TOTAL DOSE AND DOSE TO PUBLIC ONSITE

This requirement is provided to meet the dose limitations of 40 CFR Part 190 that have been incorporated into 10 CFR 20.1301(d). The requirement specifies the preparation and submittal of a Special Report whenever the calculated doses due to releases of radioactivity and to radiation from uranium fuel cycle sources exceed 25 mrems to the whole body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrems. Even if a site was to contain up to four reactors, it is highly unlikely that the resultant dose to a MEMBER OF THE PUBLIC will exceed the dose limits of 40 CFR Part 190 if the individual reactors remain within twice the dose design objectives of Appendix I, and if direct radiation doses from the reactor units (including outside storage tanks, etc.) are kept small. The Special Report will describe a course of action that should result in the limitation of the annual dose to a MEMBER OF THE PUBLIC to within the 40 CFR Part 190 limits. For the purposes of the Special Report, it may be assumed that the dose commitment to the MEMBER OF THE PUBLIC from other uranium fuel cycle sources is negligible, with the exception that dose contributions from other nuclear fuel cycle facilities at the same site or within a radius of 8 km must be considered. If the dose to any MEMBER OF THE PUBLIC is estimated to exceed the requirements of 40 CFR Part 190, submittal of the Special Report within 30 days with a request for a variance (provided the release conditions resulting in violation of 40 CFR Part 190 have not already been corrected), in accordance with the provisions of 40 CFR Part 190.11 and 10 CFR Part 20.2203(a)(4), is considered to be a timely request and fulfills the requirements of 40 CFR Part 190 until NRC staff action is completed. The variance only relates to the limits of 40 CFR Part 190, and does not apply in any way to other requirements for dose limitation of 10 CFR Part 20, as addressed in Section 3.2 and 3.1 of the ODCM. An individual is not considered a MEMBER OF THE PUBLIC during any period in which he/she is engaged in carrying out any operation that is part of the nuclear fuel cycle. Demonstration of compliance with the limits of 40 CFR Part 190 or with the design objectives of Appendix I to 10 CFR Part 50 will be considered to demonstrate compliance with the 0.1 rem limit of 10 CF 20.1301.

B-6.1 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM (REMP)

The Radiological Environmental Monitoring Program required by this requirement provides representative measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposures of MEMBERS OF THE PUBLIC resulting from the station operation. This monitoring program implements Section IV.B.2 of Appendix I to 10 CFR Part 50 and thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and the modeling of the environmental exposure pathways. Guidance for this monitoring program is provided by the Radiological Assessment Branch Technical Position on Environmental Monitoring. The initially specified monitoring program will be effective for at least the first 3 years of commercial operation. Following this period, program changes may be initiated based on operational experience.

The required detection capabilities for environmental sample analyses are tabulated in terms of the lower limits of detection (LLD). The LLDs required by Table 6-3 are considered optimum for routine environmental measurements in industrial laboratories. It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement.

Detailed discussion of the LLD and other detection limits can be found in Currie, L. A., "Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements," NUREG/CR-4007 (September 1984), and in the HASL Procedures Manual, HASL-300 (revised annually).

B-6.2 LAND USE CENSUS

This requirement is provided to ensure that changes in the use of areas at and beyond the SITE BOUNDARY are identified and that modifications to the radiological environmental monitoring program are made if required by the results of this census. The best information from the door-to-door survey, from aerial survey or from consulting with local agricultural authorities shall be used. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50. Restricting the census to gardens of greater than 50 m^2 provides assurance that significant exposure pathways via leafy vegetables will be identified and monitored since a garden of this size is the minimum required to produce the quantity (26 kg/year) of leafy vegetables assumed in Regulatory Guide 1.109 for consumption by a child. To determine this minimum garden size, the following assumptions were made: (1) 20% of the garden was used for growing broad leaf vegetation (i.e., similar to lettuce and cabbage), and (2) a vegetation yield of 2 kg/m^2.

B-6.3 INTERLABORATORY COMPARISON PROGRAM

The requirement for participation in an Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to 10 CFR Part 50.

APPENDIX C

DEFINITIONS

Note:

The following definitions are from the Palo Verde Nuclear Generating Station Technical Specifications. These selected definitions support those portions of the Technical Specifications which were transferred to the ODCM and have been incorporated into the Requirements sections of the ODCM.

Definitions:

The defined terms of this section appear in capitalized type and are applicable throughout the Requirements sections of this ODCM.

<u>ACTION</u>

ACTION shall be that part of a requirement which prescribes remedial measures required under designated conditions.

<u>CHANNEL CALIBRATION</u>

A CHANNEL CALIBRATION shall be the adjustment, as necessary, of the channel output such that it responds with the necessary range and accuracy to known values of the parameter which the channel monitors. The CHANNEL CALIBRATION shall encompass the entire channel including the sensor and alarm and/or trip functions, and shall include the CHANNEL FUNCTIONAL TEST. The CHANNEL CALIBRATION may be performed by any series of sequential, overlapping, or total channel steps such that the entire channel is calibrated.

<u>CHANNEL CHECK</u>

A CHANNEL CHECK shall be the qualitative assessment of channel behavior during operation by observation. This determination shall include, where possible, comparison of the channel indication and/or status with other indications and/or status derived from independent instrument channels measuring the same parameter.

<u>CHANNEL FUNCTIONAL TEST</u>

A CHANNEL FUNCTIONAL TEST shall be:

a. Analog channels - the injection of a simulated signal into the channel as close to the sensor as practicable to verify OPERABILITY including alarm and/or trip functions.

b. Bistable channels - the injection of a simulated signal into the sensor to verify OPERABILITY including alarm and/or trip functions.

c. Digital computer channels - the exercising of the digital computer hardware using diagnostic programs and the injection of simulated process data into the channel to verify OPERABILITY including alarm and/or trip functions.

d. Radiological effluent process monitoring channels - the CHANNEL FUNCTIONAL TEST may be performed by any series of sequential, overlapping, or total channel steps such that the entire channel is functionally tested.

The CHANNEL FUNCTIONAL TEST shall include adjustment, as necessary, of the alarm, interlock and/or trip setpoints such that the setpoints are within the required range and accuracy.

DOSE EQUIVALENT I-131

DOSE EQUIVALENT I-131 shall be that concentration of I-131 (microcuries/gram) which alone would produce the same thyroid dose as the quantity and isotopic mixture of I-131, I-132, I-133, I-134 and I-135 actually present. The thyroid dose conversion factors used for this calculation shall be those listed in Table III of TID-14844, Calculation of Distance Factors for Power and Test Reactor Sites.

FREQUENCY NOTATION

The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table C-1.

GASEOUS RADWASTE SYSTEM

A GASEOUS RADWASTE SYSTEM shall be any system designed and installed to reduce radioactive gaseous effluents by collecting primary coolant system offgases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment.

MEMBER(S) OF THE PUBLIC

MEMBER(S) OF THE PUBLIC shall include all persons who are not occupationally associated with the plant. This category does not include employees of the licensee, its contractors, or vendors. Also excluded from this category are persons who enter the site to service equipment or to make deliveries. This category does include persons who use portions of the site for recreational, occupational, or other purposes not associated with the plant.

OFFSITE DOSE CALCULATION MANUAL

The OFFSITE DOSE CALCULATION MANUAL shall contain the methodology and parameters used in the calculation of offsite doses resulting from radioactive gaseous and liquid effluents, in the calculation of gaseous and liquid effluent monitoring Alarm/Trip Setpoints, and in the conduct of the Environmental Radiological Monitoring Program. The ODCM shall also contain:

(1) the Radioactive Effluent Controls and Radiological Environmental Monitoring Programs required by Technical Specification Section 6.8.4, and

(2) descriptions of the information that should be included in the Annual Radiological Environmental Operating and Annual Radioactive Effluent Release Reports required by Technical Specifications 6.9.1.7 and 6.9.1.8.

OPERABLE-OPERABILITY

A system, subsystem, train, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified function(s), and when all necessary attendant instrumentation, controls, electrical power, cooling or seal water, lubrication or other auxiliary equipment that are required for the system, subsystem, train, component, or device to perform its function(s) are also capable of performing their related support function(s).

APPENDIX C

DEFINITIONS (Continued)

OPERATIONAL MODE-MODE

An OPERATIONAL MODE (i.e., MODE) shall correspond to any one inclusive combination of core reactivity condition, power level, and cold leg reactor coolant temperature specified in Table C-2.

PROCESS CONTROL PROGRAM

The PROCESS CONTROL PROGRAM shall 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.

PURGE-PURGING

PURGE or PURGING shall be the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration, or other operating condition, in such a manner that replacement air or gas is required to purify the confinement.

RATED THERMAL POWER

RATED THERMAL POWER shall be a total reactor core heat transfer rate to the reactor coolant of 3800 MWt.

SITE BOUNDARY

The SITE BOUNDARY shall be that line beyond which the land is neither owned, nor leased, nor otherwise controlled by the licensee.

SOLIDIFICATION

SOLIDIFICATION shall be the conversion of radioactive wastes from liquid systems to a homogeneous (uniformly distributed), monolithic, immobilized solid with definite volume and shape, bounded by a stable surface of distinct outline on all sides (free-standing).

SOURCE CHECK

A SOURCE CHECK shall be the qualitative assessment of channel response when the channel sensor is exposed to a source of increased radioactivity.

THERMAL POWER

THERMAL POWER shall be the total reactor core heat transfer rate to the reactor coolant.

UNRESTRICTED AREA

An UNRESTRICTED AREA shall be any area at or beyond the SITE BOUNDARY access to which is not controlled by the licensee for the purposes of protection of individuals from exposure to radiation and radioactive materials, or any area within the SITE BOUNDARY used for residential quarters or for industrial, commercial, institutional, and/or recreational purposes.

VENTILATION EXHAUST TREATMENT SYSTEM

A VENTILATION EXHAUST TREATMENT SYSTEM shall be any system designed and installed to reduce gaseous radioiodine or radioactive material in particulate form in effluents by passing ventilation or vent exhaust gases through charcoal adsorbers and/or HEPA filters for the purpose of removing iodines or particulates from the gaseous exhaust stream prior to the release to the environment. Such a system is not considered to have any effect on noble gas effluents. Engineered Safety Feature (ESF) atmospheric cleanup systems are not considered to be VENTILATION EXHAUST TREATMENT SYSTEM components.

VENTING

VENTING shall be the controlled process of discharging air or gas from a confinement to maintain temperature, pressure, humidity, concentration, or other operating condition, in such a manner that replacement air or gas is not provided or required during VENTING. Vent, used in system names, does not imply a VENTING process.

TABLE C-1

FREQUENCY NOTATION

NOTATION	FREQUENCY
S	At least once per 12 hours.
D	At least once per 24 hours.
W	At least once per 7 days.
4/M	At least 4 times per month at intervals no greatr than 9 days and a minimum of 48 times per year.
M	At least once per 31 days.
Q	At least once per 92 days.
SA	At least once per 184 days.
R	At least once per 18 months.
P	Completed prior to each release.
S/U	Prior to reactor startup.
N.A.	Not Applicable.

TABLE C-2

OPERATIONAL MODES

Operational Mode	Reactivity Condition, K_{eff}	% of Rated Thermal Power*	Cold Leg Temperature (T_{cold})
1. POWER OPERATION	≥ 0.99	$> 5\%$	$\geq 350°F$
2. STARTUP	≥ 0.99	$\leq 5\%$	$\geq 350°F$
3. HOT STANDBY	< 0.99	0	$\geq 350°F$
4. HOT SHUTDOWN	< 0.99	0	$350°F > T_{cold} < 210°F$
5. COLD SHUTDOWN	< 0.99	0	$\leq 210°F$
6. REFUELING**	≤ 0.95	0	$\leq 135°F$

* Excluding decay heat.

** Fuel in the reactor vessel with the vessel head closure bolts less than fully tensioned or with the head removed.

APPENDIX D
DISPOSITION OF NRC GENERIC LETTER 89-01 ITEMS
FROM THE PVNGS TECHNICAL SPECIFICATIONS TO THE ODCM

NUREG 0472 Tech Spec #	PVNGS T.S. #	ODCM	Item	Disposition
Table 1.2	Table 1.1	Table C-1	FREQUENCY NOTATION	Table retained in Technical Specifications and duplicated in the ODCM.
N/A	Table 1.2	Table C-2	OPERATIONAL MODES	Table retained in Technical Specifications and duplicated in the ODCM.
1.17	1.18	Apx C	OFFSITE DOSE CALCULATION MANUAL	Definition incorporated in Technical Specifications and the ODCM definitions.
1.30	1.24	Apx C	PROCESS CONTROL PROGRAM	Definition incorporated in Technical Specifications and the ODCM definitions.
1.31	1.32	Apx C	SOLIDIFICATION	Definition deleted from Technical Specifications and relocated to the ODCM and PCP.
3/4.3.3.10	N/A	N/A	RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION	This item does not exist in the PVNGS Technical Specifications since there are no liquid effluents.
3/4.3.3.11	3/4.3.3.8	2.1	RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION	Relocated to the ODCM. Existing requirements for explosive gas monitoring instrument-action are retained in the Technical Specifications.
Table 3.3-13	Table 3.3-12	Table 2-1	RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION	Relocated to the ODCM.
Table 4.3-13	Table 4.3-8	Table 2-2	RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION	Relocated to the ODCM.
3/4.11.1.1	3/4.11.1.1	3.2	LIQUID EFFLUENTS: CONCENTRATION	Relocated to the ODCM.

APPENDIX D (Continued)
DISPOSITION OF NRC GENERIC LETTER 89-01 ITEMS
FROM THE PVNGS TECHNICAL SPECIFICATIONS TO THE ODCM

NUREG 0472 Tech Spec #	PVNGS T.S. #	ODCM	Item	Disposition
Table 4.11-1	Table 4.11-1	Table 3-5	RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM	Relocated to the ODCM.
3/4.11.1.2	3/4.11.1.2	4.4	LIQUID EFFLUENTS: DOSE	Relocated to the ODCM.
3/4.11.1.3	N/A		LIQUID EFFLUENTS: LIQUID RADWASTE TREATMENT SYSTEM	This item does not exist in the PVNGS Technical Specifications since there are no liquid effluents.
3/4.11.1.4	3/4.11.1.3	N/A	LIQUID HOLDUP TANKS	Existing specification requirements are retained in the Technical Specifications.
3/4.11.2.1	3/4.11.2.1	3.1	GASEOUS EFFLUENTS: DOSE RATE	Relocated to the ODCM.
Table 4.11-2	Table 4.11-2	Table 3-1	RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM	Relocated to the ODCM.
3/4.11.2.2	3/4.11.2.2	4.1	GASEOUS EFFLUENTS: DOSE-NOBLE GASES	Relocated to the ODCM.
3/4.11.2.3	3/4.11.2.3	4.2	GASEOUS EFFLUENTS: DOSE- I-131, I-133,Tritium, and Radioactive Material in Particulate form.	Relocated to the ODCM.
3/4.11.2.4	3/4.11.2.4	4.3	GASEOUS EFFLUENTS: Gaseous Radwaste Treatment or Ventilation Exhaust Treatment System	Relocated to the ODCM.
3/4.11.2.5	3/4.11.2.5	N/A	EXPLOSIVE GAS MIXTURE	Retained in the Technical Specifications.
3/4.11.2.6	3/4.11.2.6	N/A	GAS STORAGE TANKS	Retained in the Technical Specifications.
3/4.11.3	3/4.11.3	N/A	SOLID RADIOACTIVE WASTES	Relocated to the PCP.

APPENDIX D (Continued)
DISPOSITION OF NRC GENERIC LETTER 89-01 ITEMS
FROM THE PVNGS TECHNICAL SPECIFICATIONS TO THE ODCM

NUREG 0472 Tech Spec #	PVNGS T.S. #	ODCM	Item	Disposition
3/4.11.4	3/4.11.4	5.1	RADIOACTIVE EFFLUENTS: Total Dose	Relocated to the ODCM.
3/4.12.1	3/4.12.1	6.1	RADIOLOGICAL ENVIRONMENTAL MONITORING: Monitoring Program	Relocated to the ODCM.
Table 3.12-1	Table 3.12-1	Table 6-1	RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM	Relocated to the ODCM.
Table 3.12-2	Table 3.12-2	Table 6-2	REPORTING LEVELS FOR RADIO-ACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES	Relocated to the ODCM.
Table 4.12-1	Table 4.12-1	Table 6-3	DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS	Relocated to the ODCM.
3/4.12.2	3/4.12.2	6.2	RADIOACTIVE ENVIRONMENTAL MONITORING: Land Use Census	Relocated to the ODCM.
3/4.12.3	3/4.12.3	6.3	RADIOACTIVE ENVIRONMENTAL MONITORING: Interlaboratory Comparison Program	Relocated to the ODCM.
			DESIGN FEATURES:	
Figure 5.1-1	Figure 5.1-1	Figure 6-4	SITE AND EXCLUSION BOUNDARIES	Figure revised in Technical Specifications and duplicated in the ODCM.
Figure 5.1-2	Figure 5.1-2	Figure 6-6	LOW POPULATION ZONE	Figure revised in Technical Specifications and duplicated in the ODCM.
Figure 5.1-3	Figure 5.1-3	Figure 6-5	GASEOUS RELEASE POINTS	Figure revised in Technical Specifications and duplicated in the ODCM.

APPENDIX D (Continued)
DISPOSITION OF NRC GENERIC LETTER 89-01 ITEMS
FROM THE PVNGS TECHNICAL SPECIFICATIONS TO THE ODCM

NUREG 0472 Tech Spec #	PVNGS T.S. #	ODCM	Item	Disposition
N/A	6.8.6.g	N/A	Radioactive Effluent Controls Program	New Section is added to Technical Specifications to address programmatic controls being relocated to the ODCM.
N/A	6.8.6.h	N/A	Radiological Environmental Monitoring	New Section is added to Technical Specifications Program to address programmatic controls being relocated to the ODCM.
6.9.1.3	6.9.1.7	7.2	REPORTING REQUIREMENTS: Annual Radiological EnvironmentalOperating Report	Relocated to the ODCM and simplified in Technical Specifications.
6.9.1.4	6.9.1.8	7.1	REPORTING REQUIREMENTS: Semiannual Radiological Effluent Release Report	Relocated to ODCM and simplified in Technical Specifications.
N/A	6.10.2.q	N/A	RECORD RETENTION	New section is added to Technical Specifications to address records of reviews performed for changes made to the ODCM and PCP.
6.13	6.13	N/A	PROCESS CONTROL PROGRAM	Technical Specification requirements simplified.
6.14	6.14	N/A	OFFSITE DOSE CALCULATION MANUAL	Technical Specification requirements simplified.
6.15	6.15	N/A	MAJOR CHANGES TO LIQUID, GASEOUS, AND SOLID RADWASTE TREATMENT SYSTEMS	No changes, retained in Technical Specifications.

APPENDIX D (Continued)
DISPOSITION OF NRC GENERIC LETTER 89-01 ITEMS
FROM THE PVNGS TECHNICAL SPECIFICATIONS TO THE ODCM

NUREG 0472 Tech Spec #	PVNGS T.S. #	ODCM	Item	Disposition
			BASES	The BASES for the above sections that were relocated from the Technical Specifications to the ODCM are also relocated to the ODCM, Appendix B. For convenience, the section references are included below.
3/4.3.3.10	3/4.3.3.8	2.1		
3/4.11.1.1	3/4.11.1.1	3.2		
3/4.11.1.2	3/4.11.1.2	4.4		
3/4.11.2.1	3/4.11.2.1	3.1		
3/4.11.2.2	3/4.11.2.2	4.1		
3/4.11.2.3	3/4.11.2.3	4.2		
3/4.11.2.4	3/4.11.2.4	4.3		
3/4.11.4	3/4.11.4	5.1		
3/4.12.1	3/4.12.1	6.1		
3/4.12.2	3/4.12.2	6.2		
3/4.12.3	3/4.12.3	6.3		