

Docket # 50-206

Accession # 9705050224

Date 4/28/97 of Ltr
Regulatory Docket 75a

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SAN ONOFRE NUCLEAR GENERATING STATION

Annual Radioactive Effluent Release Report

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1996

January - December

PREFACE

San Onofre Nuclear Generating Station is located next to San Onofre State Beach, adjoining Camp Pendleton Marine Corps Base, in San Diego County, 64 miles south of Los Angeles, California. There are two operating pressurized water reactors with a total rated capacity of 2254 net megawatts electrical.

Unit 1, rated at 410 net megawatts electrical, was supplied by Westinghouse Electric Company and began commercial operation on January 1, 1968. The unit was permanently shutdown on November 30, 1992. It is owned by Southern California Edison (80%) and San Diego Gas and Electric (20%).

Unit 2 and Unit 3 were supplied by Combustion Engineering, Inc., with turbine generators supplied by G.E.C. Turbine Generators, Ltd., of England. The units began commercial operation on August 18, 1983, and April 1, 1984, respectively and are rated at 1127 net megawatts electrical each. The twin units are owned by Southern California Edison (75.05%), San Diego Gas and Electric (20%), City of Anaheim (3.16%), and the City of Riverside (1.79%).

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ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

January - December

SECTION A. INTRODUCTION

This Annual Radioactive Effluent Release Report summarizes the gaseous and liquid radioactive effluent releases and radwaste shipments made from the San Onofre Nuclear Generating Station, Unit 1. This report is prepared in the general format of USNRC Regulatory Guide 1.21 and includes:

1. Quarterly Summaries of Gaseous and Liquid Effluents for "Continuous" and "Batch" Modes of Release
2. Percent of Applicable Limits
3. Estimated Total Percent Error
4. Lower Limit of Detection Concentrations
5. Batch Release Summaries
6. Previous Radioactive Effluent Release Report Addendum
7. Radwaste Shipments
8. 10 CFR 50 Appendix I Requirements
9. Changes to Offsite Dose Calculation Manual

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SECTION B. GASEOUS EFFLUENTS

Table 1A, "Gaseous Effluents-Summation of All Releases," provides a detailed listing of gaseous effluents released quarterly in four categories: fission and activation gases, iodine-131, particulates with half-lives greater than eight days, and tritium. Listed for each of the four categories are:

- (1) the total curies released
- (2) the average release rate
- (3) the percent of applicable limit
- (4) the estimated total error

In addition, the particulate category lists the gross alpha radioactivity released for each quarter.

The methodology used to calculate the percent of Applicable Limit is presented in Section F of this report. The methodology used in Table 1A to calculate the estimated total error is presented in Section G of this report.

Table 1B, "Gaseous Effluents-Elevated Release," has not been included in this report since San Onofre Nuclear Generating Station Unit 1 does not conduct elevated releases.

Table 1C, "Gaseous Effluents-Ground Level Releases," provides the systematic listing by radionuclide for the quantity of radioactivity released in three categories: fission gases, iodines, and particulates. The total radioactivity for each radionuclide is listed for each quarterly period by "continuous" mode of release. Plant stack releases are considered to be "continuous" releases. As of 8/4/93, "batch" mode releases are no longer conducted because of the permanent shutdown of the reactor.

Table 1D, "Gaseous Effluents-Lower Limit of Detection," provides a listing of lower limit of detection concentrations for radionuclides not detected in Tables 1A and 1C for continuous mode releases only.

Table 1E, "Gaseous Effluents-Radiation Doses at the Site Boundary," provides a quarterly summary of doses at the site boundary for this report period.

Table 1F, "Gaseous Effluents-Batch Release Summary," has been deleted. "Batch" mode releases are no longer conducted as of 8/4/93, due to the permanent shutdown of the reactor.

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TABLE 1A

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	First Quarter	Second Quarter	Estimated Total Error, %
A. Fission and activation gases				
1. Total release	Ci	<LLD	<LLD	3.00E+1
2. Average release rate for period	μCi/sec	0.00E+0	0.00E+0	
3. Percent of applicable limit	% MPC	0.00E+0	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	0.00E+0	
B. Iodines				
1. Total iodine-131	Ci	<LLD	<LLD	1.90E+1
2. Average release rate for period	μCi/sec	0.00E+0	0.00E+0	
3. Percent of applicable limit	% MPC	0.00E+0	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	0.00E+0	
C. Particulates				
1. Particulates with half-lives >8 days	Ci	<LLD	<LLD	1.60E+1
2. Average release rate for period	μCi/sec	0.00E+0	0.00E+0	
3. Percent of applicable limit	% MPC	0.00E+0	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	0.00E+0	
5. Gross alpha activity	Ci	1.78E-8	3.74E-8	5.00E+1
D. Tritium				
1. Total release	Ci	3.18E-1	1.50E-1	2.50E+1
2. Average release rate for period	μCi/sec	4.04E-2	1.91E-2	
3. Percent of applicable limit	% MPC	2.63E-4	1.24E-4	
4. Percent Effluent Concentration Limit	% ECL	5.26E-4	2.48E-4	

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TABLE 1A (Continued)

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	Third Quarter	Fourth Quarter	Estimated Total Error, %
A. Fission and activation gases				
1. Total release	Ci	<LLD	<LLD	3.00E+1
2. Average release rate for period	μCi/sec	0.00E+0	0.00E+0	
3. Percent of applicable limit	% MPC	0.00E+0	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	0.00E+0	
B. Iodines				
1. Total iodine-131	Ci	<LLD	<LLD	1.90E+1
2. Average release rate for period	μCi/sec	0.00E+0	0.00E+0	
3. Percent of applicable limit	% MPC	0.00E+0	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	0.00E+0	
C. Particulates				
1. Particulates with half-lives >8 days	Ci	<LLD	<LLD	1.60E+1
2. Average release rate for period	μCi/sec	0.00E+0	0.00E+0	
3. Percent of applicable limit	% MPC	0.00E+0	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	0.00E+0	
5. Gross alpha activity	Ci	1.01E-7	<LLD	5.00E+1
D. Tritium				
1. Total release	Ci	1.12E+0	2.16E+0	2.50E+1
2. Average release rate for period	μCi/sec	1.41E-1	2.72E-1	
3. Percent of applicable limit	% MPC	9.16E-4	1.77E-3	
4. Percent Effluent Concentration Limit	% ECL	1.83E-3	3.53E-3	

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TABLE 1C

GASEOUS EFFLUENTS-GROUND LEVEL RELEASES
CONTINUOUS MODE

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1. Fission and activation gases					
krypton-85	Ci	<LLD	<LLD	<LLD	<LLD
krypton-85m	Ci	<LLD	<LLD	<LLD	<LLD
krypton-87	Ci	<LLD	<LLD	<LLD	<LLD
krypton-88	Ci	<LLD	<LLD	<LLD	<LLD
xenon-133	Ci	<LLD	<LLD	<LLD	<LLD
xenon-133m	Ci	<LLD	<LLD	<LLD	<LLD
xenon-135	Ci	<LLD	<LLD	<LLD	<LLD
xenon-135m	Ci	<LLD	<LLD	<LLD	<LLD
xenon-138	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	<LLD	<LLD	<LLD	<LLD
2. Iodines					
iodine-131	Ci	<LLD	<LLD	<LLD	<LLD
iodine-133	Ci	<LLD	<LLD	<LLD	<LLD
iodine-135	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	<LLD	<LLD	<LLD	<LLD
3. Particulates					
barium-140	Ci	<LLD	<LLD	<LLD	<LLD
cerium-141	Ci	<LLD	<LLD	<LLD	<LLD
cerium-144	Ci	<LLD	<LLD	<LLD	<LLD
cesium-134	Ci	<LLD	<LLD	<LLD	<LLD
cesium-137	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-58	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-60	Ci	<LLD	<LLD	<LLD	<LLD
iron-59	Ci	<LLD	<LLD	<LLD	<LLD
lanthanum-140	Ci	<LLD	<LLD	<LLD	<LLD
manganese-54	Ci	<LLD	<LLD	<LLD	<LLD
molybdenum-99	Ci	<LLD	<LLD	<LLD	<LLD
strontium-89	Ci	<LLD	<LLD	<LLD	<LLD
strontium-90	Ci	<LLD	<LLD	<LLD	<LLD
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD

LLD Lower Limit of Detection; see Table 1D.

NOTE: Due to the permanent shutdown of S.O.N.G.S. 1, "BATCH MODE" releases are no longer conducted.

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TABLE 1D

GASEOUS EFFLUENTS-LOWER LIMIT OF DETECTION
CONTINUOUS MODE

Radionuclides	LLD ($\mu\text{Ci/cc}$)
1. Fission and activation gases	
krypton-85	2.00E-5
krypton-85m	4.80E-8
krypton-87	2.50E-7
krypton-88	1.70E-7
xenon-133	1.20E-7
xenon-133m	3.90E-7
xenon-135	5.00E-8
xenon-135m	2.00E-6
xenon-138	3.30E-6
2. Iodines	
iodine-131	1.90E-13
iodine-133	1.20E-12
iodine-135	3.20E-11
3. Particulates	
barium-140	3.90E-13
cerium-141	4.90E-14
cerium-144	2.00E-13
cesium-134	1.20E-13
cesium-137	9.60E-14
cobalt-58	1.10E-13
cobalt-60	1.70E-13
iron-59	2.60E-13
lanthanum-140	6.30E-13
manganese-54	1.10E-13
molybdenum-99	5.20E-14
strontium-89	1.00E-14
strontium-90	1.00E-15
zinc-65	2.80E-13
4. gross alpha	1.00E-14

NOTE: Due to the permanent shutdown of S.O.N.G.S. 1, "BATCH MODE" releases are no longer conducted.

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TABLE 1E

GASEOUS EFFLUENTS-RADIATION DOSES AT THE SITE BOUNDARY

	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
A. Noble Gas					
1. Gamma Air Dose	mrads	0.00E+0	0.00E+0	0.00E+0	0.00E+0
2. Percent Applicable Limit	%	0.00E+0	0.00E+0	0.00E+0	0.00E+0
3. Beta Air Dose	mrads	0.00E+0	0.00E+0	0.00E+0	0.00E+0
4. Percent Applicable Limit	%	0.00E+0	0.00E+0	0.00E+0	0.00E+0
B. Tritium, Iodine, Particulates (at the nearest receptor)					
5. Organ Dose	mrem	1.35E-5	5.32E-6	3.97E-5	7.69E-5
6. Percent Applicable Limit	%	1.80E-4	7.09E-5	5.29E-4	1.03E-3

NOTE: Calculations performed in accordance with the ODCM utilizing the historical X/Q.

TABLE 1F

GASEOUS EFFLUENTS-BATCH RELEASE SUMMARY

NOTE: Due to the permanent shutdown of S.O.N.G.S. 1, "BATCH MODE" releases are no longer conducted.

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SECTION C. LIQUID EFFLUENTS

Table 2A, "Liquid Effluents-Summation of All Releases," provides a detailed summary of liquid effluents released quarterly in three categories: fission and activation products, tritium, and dissolved and entrained gases. Listed for each of the three categories are:

- (1) the total curies released
- (2) the average diluted concentration
- (3) the percent of applicable limit
- (4) the estimated total error

In addition, Table 2A lists:

- (1) the gross alpha radioactivity
- (2) the volume of waste released (prior to dilution)
- (3) the volume of dilution water

The methodology used to calculate the percent of applicable limit is presented in Section F of this report. The methodology used to calculate the estimated total error in Table 2A is presented in Section G of this report.

Table 2B, "Liquid Effluents," provides the systematic listing by radionuclide for the quantity of radioactivity released in each category. The total radioactivity of each radionuclide released is listed for each quarterly period by both "continuous" and "batch" modes of release.

Table 2C, "Liquid Effluents-Lower Limit of Detection," provides a listing of lower limit of detection concentrations for radionuclides not detected in Table 2B.

Table 2D, "Liquid Effluents-Radiation Doses at the Liquid Site Boundary," presents a quarterly summary of doses at the Liquid Site Boundary for this report period.

Table 2E, "Liquid Effluents-Batch Release Summary," provides summary information regarding batch releases conducted during this report period from San Onofre Nuclear Generating Station Unit 1.

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TABLE 2A

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	First Quarter	Second Quarter	Estimated Total Error, %
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	1.72E-3	1.00E-5	1.90E+1
2. Average diluted concentration during period	μCi/ml	1.05E-9	5.83E-12	
3. Percent of applicable limit	% MPC	5.75E-3	3.13E-5	
4. Percent Effluent Concentration Limit	% ECL	8.49E-2	5.87E-4	
B. Tritium				
1. Total release	Ci	1.45E-2	7.19E-5	1.90E+1
2. Average diluted concentration during period	μCi/ml	8.90E-9	4.18E-11	
3. Percent of applicable limit	% MPC	2.97E-4	1.39E-6	
4. Percent Effluent Concentration Limit	% ECL	8.90E-4	4.18E-6	
C. Dissolved and entrained gases				
1. Total release	Ci	<LLD	<LLD	1.90E+1
2. Average diluted concentration during period	μCi/ml	0.00E+0	0.00E+0	
3. Percent of applicable limit	% MPC	0.00E+0	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	0.00E+0	
D. Gross alpha radioactivity				
1. Total release	Ci	<LLD	<LLD	5.00E+1
E. Volume of waste released (batch & continuous, prior to dilution)	liters	5.43E+6	1.00E+5	5.00E+0
F. Volume of dilution water used during period	liters	1.63E+9	1.72E+9	5.00E+0

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TABLE 2A (Continued)

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	Third Quarter	Fourth Quarter	Estimated Total Error, %
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	4.31E-2	4.77E-4	1.90E+1
2. Average diluted concentration during period	μCi/ml	2.54E-8	3.18E-10	
3. Percent of applicable limit	% MPC	9.98E-2	1.62E-3	
4. Percent Effluent Concentration Limit	% ECL	1.24E+0	3.16E-2	
B. Tritium				
1. Total release	Ci	3.05E+0	1.32E-2	1.90E+1
2. Average diluted concentration during period	μCi/ml	1.79E-6	8.80E-9	
3. Percent of applicable limit	% MPC	5.98E-2	2.93E-4	
4. Percent Effluent Concentration Limit	% ECL	1.79E-1	8.80E-4	
C. Dissolved and entrained gases				
1. Total release	Ci	<LLD	<LLD	1.90E+1
2. Average diluted concentration during period	μCi/ml	0.00E+0	0.00E+0	
3. Percent of applicable limit	% MPC	0.00E+0	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	0.00E+0	
D. Gross alpha radioactivity				
1. Total release	Ci	<LLD	<LLD	5.00E+1
E. Volume of waste released (batch & continuous, prior to dilution)	liters	1.46E+6	5.44E+6	5.00E+0
F. Volume of dilution water used during period	liters	1.70E+9	1.50E+9	5.00E+0

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TABLE 2B

LIQUID EFFLUENTS
CONTINUOUS MODE

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1. Fission and activation products					
barium-140	Ci	<LLD	<LLD	<LLD	<LLD
cerium-141	Ci	<LLD	<LLD	<LLD	<LLD
cerium-144	Ci	<LLD	<LLD	<LLD	<LLD
cesium-134	Ci	3.02E-4	6.11E-7	1.48E-5	8.58E-6
cesium-137	Ci	9.41E-4	9.42E-6	1.06E-4	4.62E-4
chromium-51	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-58	Ci	1.15E-4	<LLD	<LLD	<LLD
cobalt-60	Ci	2.49E-4	<LLD	<LLD	6.30E-6
iodine-131	Ci	<LLD	<LLD	<LLD	<LLD
iron-55	Ci	<LLD	<LLD	<LLD	<LLD
iron-59	Ci	<LLD	<LLD	<LLD	<LLD
lanthanum-140	Ci	<LLD	<LLD	<LLD	<LLD
manganese-54	Ci	<LLD	<LLD	<LLD	<LLD
molybdenum-99	Ci	<LLD	<LLD	<LLD	<LLD
niobium-95	Ci	<LLD	<LLD	<LLD	<LLD
silver-110m	Ci	1.07E-4	<LLD	<LLD	<LLD
strontium-89	Ci	<LLD	<LLD	<LLD	<LLD
strontium-90	Ci	<LLD	<LLD	<LLD	<LLD
technetium-99m	Ci	<LLD	<LLD	<LLD	<LLD
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD
zirconium-95	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	1.72E-3	1.00E-5	1.21E-4	4.77E-4
2. Dissolved and entrained gases					
xenon-133	Ci	<LLD	<LLD	<LLD	<LLD
xenon-135	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	<LLD	<LLD	<LLD	<LLD

LLD Lower Limit of Detection; see Table 2C.

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TABLE 2B (Continued)

LIQUID EFFLUENTS
BATCH MODE

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1. Fission and activation products					
antimony-125	Ci	<LLD	<LLD	2.19E-4	<LLD
barium-140	Ci	<LLD	<LLD	<LLD	<LLD
cerium-141	Ci	<LLD	<LLD	<LLD	<LLD
cerium-144	Ci	<LLD	<LLD	<LLD	<LLD
cesium-134	Ci	<LLD	<LLD	1.59E-3	<LLD
cesium-137	Ci	<LLD	<LLD	8.15E-3	<LLD
chromium-51	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-58	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-60	Ci	<LLD	<LLD	3.31E-2	<LLD
iodine-131	Ci	<LLD	<LLD	<LLD	<LLD
iron-55	Ci	<LLD	<LLD	<LLD	<LLD
iron-59	Ci	<LLD	<LLD	<LLD	<LLD
lanthanum-140	Ci	<LLD	<LLD	<LLD	<LLD
manganese-54	Ci	<LLD	<LLD	<LLD	<LLD
molybdenum-99	Ci	<LLD	<LLD	<LLD	<LLD
niobium-95	Ci	<LLD	<LLD	<LLD	<LLD
strontium-89	Ci	<LLD	<LLD	<LLD	<LLD
strontium-90	Ci	<LLD	<LLD	<LLD	<LLD
technetium-99m	Ci	<LLD	<LLD	<LLD	<LLD
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD
zirconium-95	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	<LLD	<LLD	4.31E-2	<LLD
2. Dissolved and entrained gases					
xenon-133	Ci	<LLD	<LLD	<LLD	<LLD
xenon-135	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	<LLD	<LLD	<LLD	<LLD

LLD Lower Limit of Detection; see Table 2C.

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TABLE 2C

LIQUID EFFLUENTS-LOWER LIMIT OF DETECTION
CONTINUOUS MODE

Radionuclides	LLD ($\mu\text{Ci/cc}$)
1. Fission and activation products	
barium-140	4.10E-7
cerium-141	6.70E-8
cerium-144	2.70E-7
chromium-51	4.70E-7
cobalt-58	9.70E-8
cobalt-60	1.40E-7
iodine-131	8.10E-8
iron-55	1.00E-6
iron-59	2.30E-7
lanthanum-140	7.50E-7
manganese-54	9.60E-8
molybdenum-99	8.80E-8
niobium-95	9.70E-8
silver-110m	1.40E-7
strontium-89	5.00E-8
strontium-90	1.00E-8
technetium-99m	9.00E-8
zinc-65	2.40E-7
zirconium-95	1.70E-7
2. Dissolved and entrained gases	
xenon-133	3.00E-7
xenon-135	1.30E-7
3. gross alpha	1.00E-7

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TABLE 2C (Continued)

LIQUID EFFLUENTS-LOWER LIMIT OF DETECTION
BATCH MODE

Radionuclides	LLD ($\mu\text{Ci/cc}$)
1. Fission and activation products	
antimony-125	3.30E-7
barium-140	3.20E-7
cerium-141	6.10E-8
cerium-144	2.70E-7
cesium-134	1.10E-7
cesium-137	9.10E-8
chromium-51	4.20E-7
cobalt-58	9.30E-8
cobalt-60	1.40E-7
iodine-131	5.70E-8
iron-55	1.00E-6
iron-59	2.10E-7
lanthanum-140	1.70E-7
manganese-54	9.50E-8
molybdenum-99	3.40E-8
niobium-95	8.90E-8
strontium-89	5.00E-8
strontium-90	1.00E-8
technetium-99m	3.40E-8
zinc-65	2.40E-7
zirconium-95	1.60E-7
2. Dissolved and entrained gases	
xenon-133	3.00E-7
xenon-135	1.30E-7
3. gross alpha	1.00E-7

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TABLE 2D

LIQUID EFFLUENTS-RADIATION DOSES AT THE LIQUID SITE BOUNDARY

	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
A.					
1. Total body dose	mrem	1.61E-2	1.07E-4	1.52E-1	5.63E-3
2. Percent Applicable Limit	%	1.07E+0	7.11E-3	1.02E+1	3.75E-1
B.					
1. Limiting organ dose	mrem	9.49E-2	1.60E-4	7.66E-1	8.50E-3
2. Percent Applicable Limit	%	1.90E+0	3.20E-3	1.53E+1	1.70E-1
3. Limiting organ for period		GI-LLI	Liver	GI-LLI	Liver

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TABLE 2E

LIQUID EFFLUENTS-BATCH RELEASE SUMMARY

	12 month period
1. Number of batch releases:	1 release
2. Total time period for batch releases:	5137 minutes
3. Maximum time period for a batch release:	5137 minutes
4. Average time period for a batch release:	5137 minutes
5. Minimum time period for a batch release:	5137 minutes
6. Average saltwater flow during batch releases:	6200 gpm

SECTION D. PREVIOUS RADIOACTIVE EFFLUENT RELEASE REPORT ADDENDUM

None.

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SECTION E. RADWASTE SHIPMENTS

TABLE 3

SOLID WASTE AND IRRADIATED FUEL SHIPMENT

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not Irradiated Fuel)

1. Type of waste	Unit	12 month period	Estimated total error (%)
a. Spent resins, filter sludges, evaporator bottoms	m ³	N/A	N/A
	Ci	N/A	
b. Dry compressible waste, contaminated equipment	m ³	N/A	N/A
	Ci	N/A	
c. Irradiated components, control rods	m ³	N/A	N/A
	Ci	N/A	
d. Other	m ³	N/A	N/A
	Ci	N/A	

N/A No shipment made.

2. Estimate of major nuclide composition (by type of waste)		
a. not applicable	%	0.00E+0
b. not applicable	%	0.00E+0
c. not applicable	%	0.00E+0
d. not applicable	%	0.00E+0

3. Solid Waste Disposition

See COMMON section of this report

B. IRRADIATED FUEL SHIPMENTS (Disposition)

See COMMON section of this report

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SECTION F. APPLICABLE LIMITS

Gaseous Effluents - Applicable Limits

The percent of Applicable Limits, tabulated in Sections A.3, B.3, C.3, and D.3 of Table 1A, was calculated using the following equation:

$$\bullet \quad \% \text{ Applicable Limit} = \frac{(\text{Rel Rate}) (X/Q) (100)}{\text{MPC}_{\text{eff}}}$$

where: Rel Rate = total curies released in each category and each quarter, divided by the seconds in a quarter; the value in Sections A.2, B.2, C.2 and D.2 of Table 1A, $\mu\text{Ci/sec}$.

X/Q = $1.30\text{E-}5 \text{ sec/m}^3$; the annual average atmospheric dispersion defined in the Unit 1 ODCM, Rev. 11.

$$\circ \quad \text{MPC}_{\text{eff}} = \frac{1}{\sum_{i=1}^n \frac{F_i}{\text{MPC}_i}}$$

where: F_i = fractional abundance of the i^{th} radionuclide obtained by dividing the activity (curies) for each radionuclide, C_i , by the sum of all the isotopic activity, C_T .

n = total number of radionuclides identified

MPC_i = Maximum Permissible Concentration (MPC) of the i^{th} radionuclide from 10 CFR 20 (20.1-20.602), Appendix B, Table II, Column 1.

$$\bullet \quad \% \text{ ECL} = \frac{(\text{Rel Rate}) (X/Q) (100)}{\text{ECL}_{\text{eff}}}$$

where: Rel Rate = total curies released in each category and each quarter, divided by the seconds in a quarter; the value in Sections A.2, B.2, C.2 and D.2 of Table 1A, $\mu\text{Ci/sec}$.

X/Q = $1.30\text{E-}5 \text{ sec/m}^3$; the annual average atmospheric dispersion defined in the Unit 1 ODCM, Rev. 11.

$$\circ \quad \text{ECL}_{\text{eff}} = \frac{1}{\sum_{i=1}^n \frac{F_i}{\text{ECL}_i}}$$

where: F_i = fractional abundance of the i^{th} radionuclide obtained by dividing the activity (curies) for each radionuclide, C_i , by the sum of all the isotopic activity, C_T .

n = total number of radionuclides identified

ECL_i = Effluent Concentration Limit (ECL) of the i^{th} radionuclide from 10 CFR 20 (20.1001-20.2402), Appendix B, Table 2, Column 1.

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Liquid Effluents - Applicable Limits

The percent of Applicable Limits, tabulated in Sections A.3, B.3, and C.3 of Table 2A, were calculated using the following equations:

- $\% \text{ Applicable Limit} = \frac{(\text{Dil Conc}) (100)}{\text{MPC}_{\text{eff}}}$
 - where: Dil Conc = total curies released in each category and each quarter divided by the total volume released (sum of Sections E and F in Table 2A); the value in Sections A.2, B.2, and C.2 of Table 2A, $\mu\text{Ci/ml}$.
- $\text{MPC}_{\text{eff}} = \frac{1}{\sum_{i=1}^n \frac{F_i}{\text{MPC}_i}}$
 - where: F_i = fractional abundance of the i^{th} radionuclide obtained by dividing the activity (curies) for each radionuclide, C_i , by the sum of all the isotopic activity, C_T .
 - n = total number of radionuclides identified
 - MPC_i = Maximum Permissible Concentration (MPC) of the i^{th} radionuclide from 10 CFR 20 (20.1-20.602), Appendix B, Table II, Column 2.
- $\% \text{ ECL} = \frac{(\text{Dil Conc}) (100)}{\text{ECL}_{\text{eff}}}$
 - where: Dil Conc = total curies released in each category and each quarter divided by the total volume released (sum of Sections E and F in Table 2A); the value in Sections A.2, B.2, and C.2 of Table 2A, $\mu\text{Ci/ml}$.
- $\text{ECL}_{\text{eff}} = \frac{1}{\sum_{i=1}^n \frac{F_i}{\text{ECL}_i}}$
 - where: F_i = fractional abundance of the i^{th} radionuclide obtained by dividing the activity (curies) for each radionuclide, C_i , by the sum of all the isotopic activity, C_T .
 - n = total number of radionuclides identified
 - ECL_i = Effluent Concentration Limit (ECL) of the i^{th} radionuclide from 10 CFR 20 (20.1001-20.2402), Appendix B, Table 2, Column 2.

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SECTION G. ESTIMATION OF ERROR

Estimations of the error in reported values of gaseous and liquid effluents releases have been made.

Sources of error for gaseous effluents - batch releases are:

- (1) tank volumes
- (2) sampling
- (3) counting
- (4) calibration

Sources of error for gaseous effluents - continuous releases are:

- (1) fan flow rate
- (2) sampling
- (3) counting
- (4) calibration
- (5) differential pressure drop

Sources of error for liquid effluents - batch releases are:

- (1) tank volumes
- (2) sampling
- (3) counting
- (4) calibration

Sources of error for liquid effluents - continuous releases are:

- (1) dilution flow rate
- (2) sampling
- (3) counting
- (4) calibration

These sources of error are independent, and thus, the total error is calculated according to the following formula:

$$\text{Total Error} = \sqrt{\sigma_1^2 + \sigma_2^2 + \sigma_3^2 + \dots + \sigma_i^2}$$

where: σ_i = Error associated with each component.

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SECTION H. 10 CFR 50 APPENDIX I REQUIREMENTS

Table 1 in Section H presents the quarterly and annual maximum dose to an individual. Six different categories are presented:

- (1) Liquid Effluents - Whole Body
- (2) Liquid Effluents - Organ
- (3) Airborne Effluents - Tritium, Iodines and Particulates
- (4) Noble Gases - Gamma
- (5) Noble Gases - Beta
- (6) Direct Radiation

The doses for categories 1 and 2 were calculated using the methodology of the ODCM, this data is also presented in Table 2D. Categories 3, 4, and 5 were calculated utilizing RRRGS (Radioactive Release Report Generating System) software, Regulatory Guide 1.109 methodology, and concurrent meteorology. Table 1E of gaseous effluents previously presented, however, lists data similar to categories 3, 4 and 5 using methods described in the ODCM and the historical meteorology (X/Q). Category 6 presents direct dose data measured by TLD dosimeters. Each portion of each category is footnoted to briefly describe each maximum individual dose presented.

For individuals who may, at times, be within the site boundary, the occupancy of the individual will be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the site boundary. For members of the public who traverse the site boundary via highway I-5, the residency time shall be considered negligible and hence the dose "0".

Table 2 in Section H presents the percent of Applicable Limits for each dose presented in Table 1.

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S.O.N.G.S. 1

TABLE 1

	Dose * (millirems)				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
LIQUID EFFLUENTS	1)	2)	3)	4)	5)
Whole Body	1.61E-2	1.07E-4	1.52E-1	5.63E-3	1.74E-1
Organ	6)	7)	8)	9)	10)
	9.49E-2	1.60E-4	7.66E-1	8.50E-3	8.61E-1
AIRBORNE EFFLUENTS	11)	12)	13)	14)	15)
Tritium, Iodines, and Particulates	4.59E-4	1.45E-4	5.96E-4	1.37E-3	2.57E-3
NOBLE GASES **	16)	17)	18)	19)	20)
Gamma	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Beta	21)	22)	23)	24)	25)
	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
DIRECT RADIATION	26)	27)	28)	29)	30)
	2.80E-1	1.30E-1	1.45E-1	1.23E-1	6.78E-1

* The numbered footnotes below briefly explain how each maximum dose was calculated, including the organ and the predominant pathway(s).

** Noble gas doses due to airborne effluent are in units of mrad, reflecting the air dose.

1. This data was calculated using the methodology of the ODCM.
2. This data was calculated using the methodology of the ODCM.
3. This data was calculated using the methodology of the ODCM.
4. This data was calculated using the methodology of the ODCM.
5. This data was calculated using the methodology of the ODCM.

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6. This data was calculated using the methodology of the ODCM; the GI-LII received the maximum dose primarily by the saltwater fish pathway.
7. This data was calculated using the methodology of the ODCM; the liver received the maximum dose primarily by the saltwater fish pathway.
8. This data was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
9. This data was calculated using the methodology of the ODCM; the liver received the maximum dose primarily by the saltwater fish pathway.
10. This data was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
11. The maximum organ dose was to any organ for a child and was located in the NW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
12. The maximum organ dose was to any organ for a child and was located in the NW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
13. The maximum organ dose was to any organ for a child and was located in the NW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
14. The maximum organ dose was to any organ for a child and was located in the NW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
15. The maximum organ dose was to any organ for a child and was located in the NW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
16. There was no activity detected during the release period, therefore the reported air dose for gamma radiation was 0.00E+0 mrad.
17. There was no activity detected during the release period, therefore the reported air dose for gamma radiation was 0.00E+0 mrad.
18. There was no activity detected during the release period, therefore the reported air dose for gamma radiation was 0.00E+0 mrad.
19. There was no activity detected during the release period, therefore the reported air dose for gamma radiation was 0.00E+0 mrad.
20. There was no activity detected during the release period, therefore the reported air dose for gamma radiation was 0.00E+0 mrad.
21. There was no activity detected during the release period, therefore the reported air dose for beta radiation was 0.00E+0 mrad.
22. There was no activity detected during the release period, therefore the reported air dose for beta radiation was 0.00E+0 mrad.
23. There was no activity detected during the release period, therefore the reported air dose for beta radiation was 0.00E+0 mrad.
24. There was no activity detected during the release period, therefore the reported air dose for beta radiation was 0.00E+0 mrad.

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25. There was no activity detected during the release period, therefore the reported air dose for beta radiation was 0.00E+0 mrad.
26. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the WSW sector.
27. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the SW sector.
28. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the SW sector.
29. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the SE sector.
30. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary as a composite of the highest sector for each quarter.

TABLE 2

SOURCE	Percent Applicable Limit				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
LIQUID EFFLUENTS					
Whole Body	1.07E+0	7.11E-3	1.02E+1	3.75E-1	5.80E+0
Organ	1.90E+0	3.20E-3	1.53E+1	1.70E-1	8.61E+0
AIRBORNE EFFLUENTS					
Tritium, Iodines, and Particulates	6.12E-3	1.93E-3	7.95E-3	1.83E-2	1.71E-2
NOBLE GASES					
Gamma	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Beta	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

NOTE: Direct Radiation is not specifically addressed in the Applicable Limits.

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S.O.N.G.S. 1

SECTION I. CHANGES TO OFFSITE DOSE CALCULATION MANUAL

None.

SECTION J. CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS

- There were no changes to the Unit 1 Radioactive Waste Treatment Systems during the reporting period, January 1, 1995 to December 31, 1995.
- See the description of the Carbon Dioxide (CO₂) Decontamination Unit in Section J. of the S.O.N.G.S 2 and 3 section of this report.

SECTION K. MISCELLANEOUS

- Unplanned, Uncontrolled Release from Yard Drain Sump

The Unit 1 Yard Drain Sump overflowed to the PMF Catch Basin on eight occasions in 1996:

Start Date/Time	Stop Date/Time	Duration (minutes)	Estimated Curies Released	Estimated Whole Body Dose (mrem)	Estimated Liver Dose (mrem)
01/31/96 @ 1842	01/31/96 @ 1905	23	0.0E+0	0.0E+0	0.0E+0
02/21/96 @ 0710	02/21/96 @ 0755	45	0.0E+0	0.0E+0	0.0E+0
10/30/96 @ 0924	10/30/96 @ 0935	11	0.0E+0	0.0E+0	0.0E+0
10/30/96 @ 0947	10/30/96 @ 1010	23	6.4E-5	7.4E-4	1.1E-3
11/21/96 @ 1422	11/21/96 @ 1553	91	0.0E+0	0.0E+0	0.0E+0
11/21/96 @ 2040	11/21/96 @ 2059	19	0.0E+0	0.0E+0	0.0E+0
11/21/96 @ 2358	11/22/96 @ 0018	20	0.0E+0	0.0E+0	0.0E+0
11/22/96 @ 0040	11/22/96 @ 0131	51	0.0E+0	0.0E+0	0.0E+0

These events were due to heavy rainfall. It should be noted that curbs were placed to redirect runoff away from the Yard Drain Sump and the sump and pumps are routinely cleaned. These measures have been successful in reducing the duration and frequency of overflow. Based on conservative assumptions, there were no significant dose consequences as a result of these unplanned releases.

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S.O.N.G.S. 1

EFFLUENT RADIATION MONITORS OUT OF SERVICE GREATER THAN 30 DAYS

January 1, 1996 - December 31, 1996

S.O.N.G.S. 1			
Monitor	Inoperability Period	Inoperability Cause	Explanation
R-1218 Liquid Radwaste Discharge Line Monitor	08/15/96 - 10/07/96	Failed surveillance	Extensive corrective work required as result of failed surveillance. Also repaired leak in system.
R-1221 Plant Vent Stack Monitor	01/01/94 - 12/07/96	Anisokinetic sampling	Effluent monitor sample flow rate was not adjusted to provide isokinetic sampling with reduced plant vent stack flow rate.
R-1254 Plant Vent Stack Process Flow Monitor	08/12/88 - 01/31/97	Process flow indication	Process flow instrumentation is inadequate. Design change to remove flow measurement equipment was implemented. Radiation monitor remained functional.
Plant Vent Stack Monitor	01/01/94 - present	Anisokinetic sampling	Effluent monitor sample flow rate was not adjusted to provide isokinetic sampling with reduced plant vent stack flow rate.
	02/07/96 - present	Heat trace inoperable	Required electrical panel rework and parts replacement. Radiation monitor remains functional.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

S.O.N.G.S. 1

SECTION L. S O.N.G.S. 1 CONCLUSIONS

- Gaseous releases totaled $3.81\text{E}+0$ curies of which noble gases were $0.00\text{E}+0$ curies, iodines were $0.00\text{E}+0$ curies, particulates were $1.56\text{E}-7$ curies, and tritium was $3.81\text{E}+0$ curies.
- The radiation doses from gaseous releases are: (a) gamma air dose: $0.00\text{E}+0$ mrad at the site boundary, (b) beta air dose: $0.00\text{E}+0$ mrad at the site boundary, (c) organ dose: $2.57\text{E}-3$ mrem at the nearest receptor.
- Liquid releases totaled $3.12\text{E}+0$ curies of which particulates and iodines were $4.54\text{E}-2$ curies, tritium was $3.08\text{E}+0$ curies, and noble gases were $0.00\text{E}+0$ curies.
- The radiation doses from liquid releases are: (a) total body: $1.74\text{E}-1$ mrem, (b) limiting organ: $8.61\text{E}-1$ mrem.
- The radioactive releases and resulting doses generated from Unit 1 were below the Applicable Limits for both gaseous and liquid effluents.

S.O.N.G.S. 2 and 3



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ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

January - December

SECTION A. INTRODUCTION

This Annual Radioactive Effluent Release Report summarizes the gaseous and liquid radioactive effluent releases and radwaste shipments made from the San Onofre Nuclear Generating Station, Units 2 and 3. This report is prepared in the general format of USNRC Regulatory Guide 1.21 and includes:

1. Quarterly Summaries of Gaseous and Liquid Effluents for "Continuous" and "Batch" Modes of Release
2. Percent of Applicable Limits
3. Estimated Total Percent Error
4. Lower Limit of Detection Concentrations
5. Batch Release Summaries
6. Previous Radioactive Effluent Release Report Addendum
7. Radwaste Shipments
8. 10 CFR 50 Appendix I Requirements
9. Changes to Offsite Dose Calculation Manual

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

S.O.N.G.S. 2 and 3

SECTION B. GASEOUS EFFLUENTS

Table 1A, "Gaseous Effluents-Summation of All Releases," provides a detailed listing of gaseous effluents released quarterly in four categories: fission and activation gases, iodine-131, particulates with half-lives greater than eight days, and tritium. Listed for each of the four categories are:

- (1) the total curies released
- (2) the average release rate
- (3) the percent of applicable limit
- (4) the estimated total error

In addition, the particulate category lists the gross alpha radioactivity released for each quarter.

The methodology used to calculate the percent of Applicable Limit is presented in Section F of this report. The methodology used in Table 1A to calculate the estimated total error is presented in Section G of this report.

Table 1B, "Gaseous Effluents-Elevated Release," has not been included in this report since San Onofre Nuclear Generating Station Units 2 and 3 do not conduct elevated releases.

Table 1C, "Gaseous Effluents-Ground Level Releases," provides the systematic listing by radionuclide for the quantity of radioactivity released in three categories: fission gases, iodines, and particulates. The total radioactivity for each radionuclide is listed for each quarterly period by both "continuous" and "batch" modes of release.

Waste gas decay tank and monitor calibration releases are considered to be "batch" releases. Containment purges and plant stack releases are considered to be "continuous" releases.

Table 1D, "Gaseous Effluents-Lower Limit of Detection," provides a listing of lower limit of detection concentrations for radionuclides not detected in Tables 1A and 1C.

Table 1E, "Gaseous Effluents-Radiation Doses at the Site Boundary," provides a quarterly summary of doses at the site boundary for this report period.

Table 1F, "Gaseous Effluents-Batch Release Summary," provides summary information regarding batch releases conducted during this report period from San Onofre Nuclear Generating Station Units 2 and 3.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

S.O.N.G.S. 2 and 3

TABLE 1A

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	First Quarter	Second Quarter	Estimated Total Error, %
A. Fission and activation gases				
1. Total release	Ci	1.29E+2	6.54E+1	3.00E+1
2. Average release rate for period	μCi/sec	1.64E+1	8.32E+0	
3. Percent of applicable limit	% MPC	3.25E-2	1.87E-2	
4. Percent Effluent Concentration Limit	% ECL	4.03E-2	3.22E-2	
B. Iodines				
1. Total iodine-131	Ci	3.68E-5	1.26E-4	1.90E+1
2. Average release rate for period	μCi/sec	4.68E-6	1.60E-5	
3. Percent of applicable limit	% MPC	2.25E-5	7.69E-5	
4. Percent Effluent Concentration Limit	% ECL	1.12E-5	3.85E-5	
C. Particulates				
1. Particulates with half-lives >8 days	Ci	4.05E-6	1.65E-6	1.60E+1
2. Average release rate for period	μCi/sec	5.15E-7	2.10E-7	
3. Percent of applicable limit	% MPC	5.28E-7	3.37E-7	
4. Percent Effluent Concentration Limit	% ECL	1.65E-6	2.02E-6	
5. Gross alpha activity	Ci	<LLD	3.90E-9	5.00E+1
D. Tritium				
1. Total release	Ci	1.19E+1	5.03E+0	2.50E+1
2. Average release rate for period	μCi/sec	1.51E+0	6.40E-1	
3. Percent of applicable limit	% MPC	3.63E-3	1.54E-3	
4. Percent Effluent Concentration Limit	% ECL	7.26E-3	3.07E-3	

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

S.O.N.G.S. 2 and 3

TABLE 1A (Continued)

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	Third Quarter	Fourth Quarter	Estimated Total Error, %
A. Fission and activation gases				
1. Total release	Ci	8.89E+1	1.43E+2	3.00E+1
2. Average release rate for period	μCi/sec	1.12E+1	1.80E+1	
3. Percent of applicable limit	% MPC	2.20E-2	3.38E-2	
4. Percent Effluent Concentration Limit	% ECL	2.91E-2	3.99E-2	
B. Iodines				
1. Total iodine-131	Ci	1.10E-4	2.38E-3	1.90E+1
2. Average release rate for period	μCi/sec	1.38E-5	2.99E-4	
3. Percent of applicable limit	% MPC	6.64E-5	1.44E-3	
4. Percent Effluent Concentration Limit	% ECL	3.32E-5	7.19E-4	
C. Particulates				
1. Particulates with half-lives >8 days	Ci	4.51E-4	3.22E-4	1.60E+1
2. Average release rate for period	μCi/sec	5.67E-5	4.05E-5	
3. Percent of applicable limit	% MPC	2.44E-5	1.04E-5	
4. Percent Effluent Concentration Limit	% ECL	6.67E-5	2.32E-5	
5. Gross alpha activity	Ci	8.93E-7	1.11E-7	5.00E+1
D. Tritium				
1. Total release	Ci	2.51E+0	6.12E+0	2.50E+1
2. Average release rate for period	μCi/sec	3.16E-1	7.70E-1	
3. Percent of applicable limit	% MPC	7.58E-4	1.85E-3	
4. Percent Effluent Concentration Limit	% ECL	1.52E-3	3.70E-3	

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S.O.N.G.S. 2 and 3

TABLE 1C

GASEOUS EFFLUENTS-GROUND LEVEL RELEASES
CONTINUOUS MODE

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1. Fission and activation gases					
argon-41	Ci	3.68E+0	4.03E+0	3.09E+0	3.81E+0
krypton-85	Ci	<LLD	<LLD	<LLD	<LLD
krypton-85m	Ci	1.89E-1	<LLD	<LLD	1.92E-3
krypton-87	Ci	<LLD	<LLD	<LLD	<LLD
krypton-88	Ci	<LLD	4.27E-4	<LLD	2.00E-3
xenon-133	Ci	1.22E+2	6.13E+1	8.44E+1	1.38E+2
xenon-133m	Ci	<LLD	<LLD	<LLD	3.93E-3
xenon-135	Ci	3.18E+0	8.35E-2	1.96E-1	6.85E-2
xenon-135m	Ci	<LLD	<LLD	<LLD	9.30E-3
xenon-138	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	1.29E+2	6.54E+1	8.77E+1	1.42E+2
2. Iodines					
iodine-131	Ci	3.68E-5	1.26E-4	1.10E-4	2.38E-3
iodine-132	Ci	<LLD	1.20E-7	4.07E-5	3.03E-3
iodine-133	Ci	1.34E-4	2.52E-4	3.58E-4	1.57E-4
iodine-135	Ci	<LLD	8.67E-7	4.84E-5	1.40E-5
Total for period	Ci	1.71E-4	3.79E-4	5.57E-4	5.58E-3

LLD Lower Limit of Detection; see Table 1D.

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S.O.N.G.S. 2 and 3

TABLE 1C (Continued)

GASEOUS EFFLUENTS-GROUND LEVEL RELEASES
CONTINUOUS MODE

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
3. Particulates					
barium-140	Ci	<LLD	<LLD	6.35E-5	<LLD
bromine-82	Ci	3.05E-5	9.42E-5	6.18E-5	1.28E-4
cerium-141	Ci	<LLD	3.93E-10	<LLD	<LLD
cerium-144	Ci	<LLD	<LLD	8.47E-6	9.41E-10
cesium-134	Ci	<LLD	<LLD	2.51E-6	<LLD
cesium-137	Ci	3.43E-6	<LLD	7.27E-6	4.19E-8
cesium-138	Ci	2.14E-4	3.10E-4	6.87E-4	1.70E-4
chromium-51	Ci	<LLD	<LLD	3.70E-5	<LLD
cobalt-57	Ci	<LLD	<LLD	2.00E-7	<LLD
cobalt-58	Ci	<LLD	<LLD	2.58E-4	3.18E-4
cobalt-60	Ci	4.82E-7	1.65E-6	6.91E-6	3.28E-6
iron-59	Ci	<LLD	<LLD	3.53E-6	<LLD
lanthanum-140	Ci	<LLD	<LLD	3.09E-5	<LLD
manganese-54	Ci	1.15E-7	<LLD	3.15E-5	2.28E-8
molybdenum-99	Ci	<LLD	<LLD	1.24E-5	<LLD
niobium-95	Ci	<LLD	<LLD	4.54E-6	<LLD
rubidium-88	Ci	3.84E-4	9.25E-4	6.62E-4	3.96E-4
scandium-46	Ci	7.98E-6	<LLD	<LLD	<LLD
strontium-89	Ci	1.86E-8	3.64E-9	2.16E-5	2.48E-8
strontium-90	Ci	<LLD	<LLD	2.43E-7	<LLD
yttrium-92	Ci	1.87E-5	1.44E-5	1.42E-5	1.09E-5
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD

LLD Lower Limit of Detection; see Table 1D.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

S.O.N.G.S. 2 and 3

TABLE 1C (Continued)

GASEOUS EFFLUENTS-GROUND LEVEL RELEASES
BATCH MODE *

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1. Fission and activation gases					
krypton-85	Ci	<LLD	<LLD	1.17E+0	1.16E+0
krypton-85m	Ci	<LLD	<LLD	<LLD	<LLD
krypton-87	Ci	<LLD	<LLD	<LLD	<LLD
krypton-88	Ci	<LLD	<LLD	<LLD	<LLD
xenon-133	Ci	5.59E-3	<LLD	<LLD	<LLD
xenon-133m	Ci	<LLD	<LLD	<LLD	<LLD
xenon-135	Ci	<LLD	<LLD	<LLD	<LLD
xenon-135m	Ci	<LLD	<LLD	<LLD	<LLD
xenon-138	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	5.59E-3	<LLD	1.17E+0	1.16E+0

LLD Lower Limit of Detection; see Table 1D.

* Iodines and particulates are not analyzed prior to release via batch mode.

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TABLE 1D

GASEOUS EFFLUENTS-LOWER LIMIT OF DETECTION
CONTINUOUS MODE

Radionuclides	LLD ($\mu\text{Ci/cc}$)
1. Fission and activation gases	
krypton-85	2.00E-5
krypton-85m	4.80E-8
krypton-87	2.50E-7
krypton-88	1.70E-7
xenon-133m	3.90E-7
xenon-135m	2.00E-6
xenon-138	3.30E-6
2. Iodines	
iodine-132	2.00E-11
iodine-135	3.20E-11
3. Particulates	
barium-140	6.60E-13
cerium-141	1.20E-13
cerium-144	4.70E-13
cesium-134	2.50E-13
cesium-137	2.10E-13
chromium-51	1.10E-13
cobalt-57	5.90E-14
cobalt-58	2.20E-13
iron-59	5.40E-13
lanthanum-140	1.30E-12
manganese-54	2.20E-13
molybdenum-99	1.20E-13
niobium-95	2.20E-13
scandium-46	3.30E-13
strontium-90	1.00E-14
zinc-65	5.80E-13
4. gross alpha	1.00E-13

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

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TABLE 1D (Continued)

GASEOUS EFFLUENTS-LOWER LIMIT OF DETECTION
BATCH MODE

Radionuclides	LLD ($\mu\text{Ci/cc}$)
1. Fission and activation gases	
krypton-85	1.30E-3
krypton-85m	2.60E-6
krypton-87	1.30E-5
krypton-88	9.20E-6
xenon-133	6.80E-6
xenon-133m	2.30E-5
xenon-135	3.00E-6
xenon-135m	4.00E-5
xenon-138	5.70E-5

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S.O.N.G.S. 2 and 3

TABLE 1E

GASEOUS EFFLUENTS-RADIATION DOSES AT THE SITE BOUNDARY

	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
A. Noble Gas					
1. Gamma Air Dose	mrad	1.27E-2	9.01E-3	8.97E-3	1.29E-2
2. Percent Applicable Limit	%	1.27E-1	9.01E-2	8.97E-2	1.29E-1
3. Beta Air Dose	mrad	2.25E-2	1.18E-2	1.55E-2	2.43E-2
4. Percent Applicable Limit	%	1.13E-1	5.92E-2	7.73E-2	1.22E-1
B. Tritium, Iodine, Particulates (at the nearest receptor)					
5. Organ Dose	mrem	3.97E-4	2.29E-4	2.60E-4	1.15E-3
6. Percent Applicable Limit	%	2.64E-3	1.52E-3	1.73E-3	7.66E-3

NOTE: Calculations performed in accordance with the ODCM utilizing the historical X/Q.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

S.O.N.G.S. 2 and 3

TABLE 1F

GASEOUS EFFLUENTS-BATCH RELEASE SUMMARY

	12 month period
1. Number of batch releases:	7 releases
2. Total time period for batch releases:	2603 minutes
3. Maximum time period for a batch release:	467 minutes
4. Average time period for a batch release:	372 minutes
5. Minimum time period for a batch release:	244 minutes

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SECTION C. LIQUID EFFLUENTS

Table 2A, "Liquid Effluents-Summation of All Releases," provides a detailed summary of liquid effluents released quarterly in three categories: fission and activation products, tritium, and dissolved and entrained gases. Listed for each of the three categories are:

- (1) the total curies released
- (2) the average diluted concentration
- (3) the percent of applicable limit
- (4) the estimated total error

In addition, Table 2A lists:

- (1) the gross alpha radioactivity
- (2) the volume of waste released (prior to dilution)
- (3) the volume of dilution water

The methodology used to calculate the percent of applicable limit is presented in Section F of this report. The methodology used to calculate the estimated total error in Table 2A is presented in Section G of this report.

Table 2B, "Liquid Effluents," provides the systematic listing by radionuclide for the quantity of radioactivity released in each category. The total radioactivity of each radionuclide released is listed for each quarterly period by both "continuous" and "batch" modes of release.

Table 2C, "Liquid Effluents-Lower Limit of Detection," provides a listing of lower limit of detection concentrations for radionuclides not detected in Table 2B.

Table 2D, "Liquid Effluents-Radiation Doses at the Liquid Site Boundary," presents a quarterly summary of doses at the Liquid Site Boundary for this report period.

Table 2E, "Liquid Effluents-Batch Release Summary," provides summary information regarding batch releases conducted during this report period from San Onofre Nuclear Generating Station Units 2 and 3.

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TABLE 2A

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	First Quarter	Second Quarter	Estimated Total Error, %
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	2.62E-2	3.71E-3	1.90E+1
2. Average diluted concentration during period	μCi/ml	3.48E-11	4.96E-12	
3. Percent of applicable limit	% MPC	6.91E-5	1.67E-5	
4. Percent Effluent Concentration Limit	% ECL	5.27E-4	5.68E-5	
B. Tritium				
1. Total release	Ci	1.25E+2	4.23E+2	1.90E+1
2. Average diluted concentration during period	μCi/ml	1.66E-7	5.65E-7	
3. Percent of applicable limit	% MPC	5.53E-3	1.88E-2	
4. Percent Effluent Concentration Limit	% ECL	1.66E-2	5.65E-2	
C. Dissolved and entrained gases				
1. Total release	Ci	8.13E-5	5.61E-2	1.90E+1
2. Average diluted concentration during period	μCi/ml	1.08E-13	7.49E-11	
3. Percent of applicable limit	% MPC	5.40E-8	3.74E-5	
4. Percent Effluent Concentration Limit	% ECL	5.40E-8	3.74E-5	
D. Gross alpha radioactivity				
1. Total release	Ci	<LLD	<LLD	5.00E+1
E. Volume of waste released (batch & continuous, prior to dilution)	liters	1.58E+7	8.74E+7	5.00E+0
F. Volume of dilution water used during period	liters	7.53E+11	7.49E+11	5.00E+0

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

S.O.N.G.S. 2 and 3

TABLE 2A (Continued)

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

	Unit	Third Quarter	Fourth Quarter	Estimated Total Error, %
A. Fission and activation products				
1. Total release (not including tritium, gases, alpha)	Ci	2.67E-2	8.34E-2	1.90E+1
2. Average diluted concentration during period	μCi/ml	3.55E-11	1.35E-10	
3. Percent of applicable limit	% MPC	1.28E-4	6.48E-3	
4. Percent Effluent Concentration Limit	% ECL	4.91E-4	1.47E-3	
B. Tritium				
1. Total release	Ci	3.42E+2	5.59E+2	1.90E+1
2. Average diluted concentration during period	μCi/ml	4.54E-7	9.02E-7	
3. Percent of applicable limit	% MPC	1.51E-2	3.01E-2	
4. Percent Effluent Concentration Limit	% ECL	4.54E-2	9.02E-2	
C. Dissolved and entrained gases				
1. Total release	Ci	6.00E-3	5.27E-2	1.90E+1
2. Average diluted concentration during period	μCi/ml	7.97E-12	8.50E-11	
3. Percent of applicable limit	% MPC	3.98E-6	4.25E-5	
4. Percent Effluent Concentration Limit	% ECL	3.98E-6	4.25E-5	
D. Gross alpha radioactivity				
1. Total release	Ci	<LLD	<LLD	5.00E+1
E. Volume of waste released (batch & continuous, prior to dilution)	liters	3.47E+7	1.58E+7	5.00E+0
F. Volume of dilution water used during period	liters	7.53E+11	6.20E+11	5.00E+0

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TABLE 2B

LIQUID EFFLUENTS
CONTINUOUS MODE

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1. Fission and activation products					
barium-140	Ci	<LLD	<LLD	<LLD	<LLD
cerium-141	Ci	<LLD	<LLD	<LLD	<LLD
cerium-144	Ci	<LLD	<LLD	<LLD	<LLD
cesium-134	Ci	1.27E-5	<LLD	<LLD	<LLD
cesium-137	Ci	4.14E-5	<LLD	1.37E-4	1.21E-4
chromium-51	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-58	Ci	9.27E-6	<LLD	<LLD	<LLD
cobalt-60	Ci	<LLD	<LLD	<LLD	<LLD
iodine-131	Ci	<LLD	<LLD	<LLD	<LLD
iron-55	Ci	<LLD	<LLD	<LLD	<LLD
iron-59	Ci	<LLD	<LLD	<LLD	<LLD
lanthanum-140	Ci	<LLD	<LLD	<LLD	<LLD
manganese-54	Ci	<LLD	<LLD	<LLD	<LLD
molybdenum-99	Ci	<LLD	<LLD	<LLD	<LLD
niobium-95	Ci	<LLD	<LLD	<LLD	<LLD
strontium-89	Ci	<LLD	<LLD	<LLD	<LLD
strontium-90	Ci	<LLD	<LLD	<LLD	<LLD
technetium-99m	Ci	<LLD	<LLD	<LLD	<LLD
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD
zirconium-95	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	6.34E-5	<LLD	1.37E-4	1.21E-4
2. Dissolved and entrained gases					
xenon-133	Ci	<LLD	<LLD	<LLD	<LLD
xenon-135	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	<LLD	<LLD	<LLD	<LLD

LLD Lower Limit of Detection; see Table 2C.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

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TABLE 2B (Continued)

LIQUID EFFLUENTS
BATCH MODE

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1. Fission and activation products					
antimony-124	Ci	2.41E-5	<LLD	<LLD	8.25E-5
antimony-125	Ci	2.86E-3	1.21E-3	8.35E-3	3.99E-3
barium-140	Ci	<LLD	<LLD	<LLD	<LLD
cerium-141	Ci	<LLD	<LLD	<LLD	<LLD
cerium-144	Ci	<LLD	<LLD	<LLD	<LLD
cesium-134	Ci	3.55E-4	1.53E-5	9.47E-5	2.60E-4
cesium-136	Ci	<LLD	9.67E-6	<LLD	<LLD
cesium-137	Ci	4.01E-4	3.71E-5	1.25E-4	4.62E-4
chromium-51	Ci	2.31E-4	5.62E-5	8.43E-5	6.69E-3
cobalt-57	Ci	7.06E-5	5.13E-6	1.40E-5	1.00E-4
cobalt-58	Ci	4.48E-3	4.39E-4	6.74E-4	4.79E-2
cobalt-60	Ci	5.87E-3	6.18E-4	6.57E-3	1.41E-2
iodine-131	Ci	<LLD	1.06E-5	<LLD	<LLD
iodine-133	Ci	<LLD	3.10E-5	<LLD	<LLD
iron-55	Ci	4.37E-3	7.34E-4	5.94E-3	<LLD
iron-59	Ci	<LLD	<LLD	<LLD	5.39E-4
lanthanum-140	Ci	<LLD	<LLD	<LLD	2.03E-5
manganese-54	Ci	8.01E-4	5.02E-5	5.96E-4	1.31E-3
molybdenum-99	Ci	<LLD	<LLD	<LLD	<LLD
niobium-95	Ci	1.63E-3	2.97E-5	<LLD	1.45E-3
niobium-97	Ci	<LLD	<LLD	2.57E-5	<LLD
ruthenium-103	Ci	<LLD	<LLD	<LLD	4.02E-5
ruthenium-106	Ci	<LLD	<LLD	6.49E-4	<LLD
silver-110m	Ci	3.90E-3	4.44E-4	3.01E-3	3.80E-3
strontium-89	Ci	<LLD	<LLD	<LLD	1.20E-3
strontium-90	Ci	<LLD	<LLD	<LLD	<LLD
strontium-92	Ci	1.32E-4	<LLD	5.11E-5	4.60E-6
technetium-99m	Ci	<LLD	<LLD	<LLD	<LLD

LLD Lower Limit of Detection; see Table 2C.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

S.O.N.G.S. 2 and 3

TABLE 2B (Continued)

LIQUID EFFLUENTS
BATCH MODE

Radionuclides Released	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1. Fission and activation products (Continued)					
tin-113	Ci	1.19E-4	<LLD	2.06E-4	2.14E-4
tin-117m	Ci	<LLD	<LLD	<LLD	5.77E-5
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD
zirconium-95	Ci	7.78E-4	1.25E-5	4.90E-5	8.84E-4
zirconium-97	Ci	1.15E-4	1.28E-5	1.56E-4	1.53E-4
Total for period	Ci	2.61E-2	3.71E-3	2.66E-2	8.33E-2
2. Dissolved and entrained gases					
krypton-85	Ci	<LLD	1.09E-2	<LLD	3.60E-3
xenon-131m	Ci	<LLD	3.10E-3	<LLD	5.35E-3
xenon-133	Ci	8.13E-5	4.18E-2	5.98E-3	4.37E-2
xenon-133m	Ci	<LLD	1.17E-4	<LLD	<LLD
xenon-135	Ci	<LLD	1.33E-4	2.01E-5	9.15E-6
Total for period	Ci	8.13E-5	5.61E-2	6.00E-3	5.27E-2

LLD Lower Limit of Detection; see Table 2C.

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TABLE 2C

LIQUID EFFLUENTS-LOWER LIMIT OF DETECTION
CONTINUOUS MODE

Radionuclides	LLD ($\mu\text{Ci/cc}$)
1. Fission and activation products	
barium-140	4.10E-7
cerium-141	6.70E-8
cerium-144	2.70E-7
cesium-134	1.10E-7
cesium-137	9.10E-8
chromium-51	4.70E-7
cobalt-58	9.70E-8
cobalt-60	1.40E-7
iodine-131	8.10E-8
iron-55	1.00E-6
iron-59	2.30E-7
lanthanum-140	7.50E-7
manganese-54	9.60E-8
molybdenum-99	8.80E-8
niobium-95	9.70E-8
strontium-89	5.00E-8
strontium-90	1.00E-8
technetium-99m	9.00E-8
zinc-65	2.40E-7
zirconium-95	1.70E-7
2. Dissolved and entrained gases	
xenon-133	3.00E-7
xenon-135	1.30E-7
3. gross alpha	1.00E-7

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

S.O.N.G.S. 2 and 3

TABLE 2C (Continued)

LIQUID EFFLUENTS-LOWER LIMIT OF DETECTION
BATCH MODE

Radionuclides	LLD ($\mu\text{Ci/cc}$)
1. Fission and activation products	
antimony-124	1.80E-7
barium-140	3.20E-7
cerium-141	6.10E-8
cerium-144	2.70E-7
cesium-136	1.50E-7
iodine-131	5.70E-8
iodine-133	8.40E-8
iron-55	1.00E-6
iron-59	2.10E-7
lanthanum-140	1.70E-7
molybdenum-99	3.40E-8
niobium-95	8.90E-8
niobium-97	9.40E-8
ruthenium-103	6.90E-8
ruthenium-106	7.40E-7
strontium-89	5.00E-8
strontium-90	1.00E-8
strontium-92	5.00E-7
technetium-99m	3.40E-8
tin-113	7.50E-8
tin-117m	3.40E-8
zinc-65	2.40E-7
2. Dissolved and entrained gases	
krypton-85	4.30E-5
xenon-131m	4.50E-6
xenon-133m	9.90E-7
xenon-135	1.30E-7
3. gross alpha	1.00E-7

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S.O.N.G.S. 2 and 3

TABLE 2D

LIQUID EFFLUENTS-RADIATION DOSES AT THE LIQUID SITE BOUNDARY

	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
A.					
1. Total body dose	mrem	6.69E-4	7.71E-4	1.08E-3	1.95E-3
2. Percent Applicable Limit	%	2.23E-2	2.57E-2	3.60E-2	6.52E-2
B.					
1. Limiting organ dose	mrem	1.51E-2	2.40E-3	1.32E-2	2.22E-2
2. Percent Applicable Limit	%	1.51E-1	2.40E-2	1.32E-1	2.22E-1
3. Limiting organ for period		GI-LLI	GI-LLI	GI-LLI	GI-LLI

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

S.O.N.G.S. 2 and 3

TABLE 2E

LIQUID EFFLUENTS-BATCH RELEASE SUMMARY

	12 month period
1. Number of batch releases:	48 releases
2. Total time period for batch releases:	14531 minutes
3. Maximum time period for a batch release:	818 minutes
4. Average time period for a batch release:	303 minutes
5. Minimum time period for a batch release:	50 minutes
6. Average saltwater flow during batch releases:	739854 gpm

SECTION D. PREVIOUS RADIOACTIVE EFFLUENT RELEASE REPORT ADDENDUM

None.

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SECTION E. RADWASTE SHIPMENTS

TABLE 3

SOLID WASTE AND IRRADIATED FUEL SHIPMENT

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not Irradiated Fuel)

1. Type of waste	Unit	12 month period	Estimated total error (%)
a. Spent resins, filter sludges *	m ³	1.90E+1	3.00E+1
	Ci	1.13E+3	
b. Dry compressible waste, contaminated equipment	m ³	N/A	N/A
	Ci	N/A	
c. Irradiated components, control rods	m ³	N/A	N/A
	Ci	N/A	
d. Other	m ³	N/A	N/A
	Ci	N/A	

Note: Total curie content estimated.

* Material packaged into High Integrity Containers and shipped in a Type A Cask (C of C 9159), Type A Cask (C of C 9176), or Type B Cask (C of C 9028).

N/A No shipment made.

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A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not Irradiated Fuel)

2. Estimate of major nuclide composition (by type of waste)		
a.	americium-241	% 9.08E-5
	antimony-125	% 1.34E-1
	beryllium-7	% 2.97E+0
	carbon-14	% 3.10E-1
	cerium-144	% 4.41E-3
	cesium-134	% 1.23E+1
	cesium-137	% 1.73E+1
	cobalt-57	% 3.02E-1
	cobalt-58	% 3.84E+0
	cobalt-60	% 6.96E+0
	curium-242	% 5.24E-5
	curium-243/244	% 1.45E-4
	iodine-129	% 1.54E-3
	iodine-131	% 7.52E-3
	iron-55	% 2.12E+1
	iron-59	% 2.79E-2
	manganese-54	% 3.61E+0
	nickel-59	% 3.44E-1
	nickel-63	% 3.02E+1
	niobium-94	% 1.53E-2
	plutonium-238	% 2.57E-4
	plutonium-239/240	% 1.22E-4
	plutonium-241	% 1.29E-2
	silver-110m	% 2.72E-2
	strontium-89	% 3.75E-2
	strontium-90	% 6.20E-2
	technetium-99	% 1.34E-5
	tellurium-123m	% 1.06E-2
	tin-113	% 1.42E-1
	tritium	% 1.28E-2
	zinc-65	% 6.72E-2
b.	not applicable	% 0.00E+0
c.	not applicable	% 0.00E+0
d.	not applicable	% 0.00E+0

3. Solid Waste Disposition

See COMMON section of this report

B. IRRADIATED FUEL SHIPMENTS (Disposition)

See COMMON section of this report

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SECTION F. APPLICABLE LIMITS

Gaseous Effluents - Applicable Limits

The percent of Applicable Limits, tabulated in Sections A.3, B.3, C.3, and D.3 of Table 1A, was calculated using the following equation:

$$\bullet \quad \% \text{ Applicable Limit} = \frac{(\text{Rel Rate}) (X/Q) (100)}{MPC_{\text{eff}}}$$

where: Rel Rate = total curies released in each category and each quarter, divided by the seconds in a quarter; the value in Sections A.2, B.2, C.2 and D.2 of Table 1A, $\mu\text{Ci/sec}$.

X/Q = $4.80\text{E-}6 \text{ sec/m}^3$; the annual average atmospheric dispersion defined in the Units 2&3 ODCM, Rev. 29.

$$\circ \quad MPC_{\text{eff}} = \frac{1}{\sum_{i=1}^n \frac{F_i}{MPC_i}}$$

where: F_i = fractional abundance of the i^{th} radionuclide obtained by dividing the activity (curies) for each radionuclide, C_i , by the sum of all the isotopic activity, C_T .

n = total number of radionuclides identified

MPC_i = Maximum Permissible Concentration (MPC) of the i^{th} radionuclide from 10 CFR 20 (20.1-20.602), Appendix B, Table II, Column 1.

$$\bullet \quad \% \text{ ECL} = \frac{(\text{Rel Rate}) (X/Q) (100)}{ECL_{\text{eff}}}$$

where: Rel Rate = total curies released in each category and each quarter, divided by the seconds in a quarter; the value in Sections A.2, B.2, C.2 and D.2 of Table 1A, $\mu\text{Ci/sec}$.

X/Q = $4.80\text{E-}6 \text{ sec/m}^3$; the annual average atmospheric dispersion defined in the Units 2&3 ODCM, Rev. 29.

$$\circ \quad ECL_{\text{eff}} = \frac{1}{\sum_{i=1}^n \frac{F_i}{ECL_i}}$$

where: F_i = fractional abundance of the i^{th} radionuclide obtained by dividing the activity (curies) for each radionuclide, C_i , by the sum of all the isotopic activity, C_T .

n = total number of radionuclides identified

ECL_i = Effluent Concentration Limit (ECL) of the i^{th} radionuclide from 10 CFR 20 (20.1001-20.2402), Appendix B, Table 2, Column 1.

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Liquid Effluents - Applicable Limits

The percent of Applicable Limits, tabulated in Sections A.3, B.3, and C.3 of Table 2A, were calculated using the following equations:

$$\bullet \quad \% \text{ Applicable Limit} = \frac{(\text{Dil Conc}) (100)}{\text{MPC}_{\text{eff}}}$$

where: Dil Conc = total curies released in each category and each quarter divided by the total volume released (sum of Sections E and F in Table 2A); the value in Sections A.2, B.2, and C.2 of Table 2A, $\mu\text{Ci/ml}$.

$$\circ \quad \text{MPC}_{\text{eff}} = \frac{1}{\sum_{i=1}^n \frac{F_i}{\text{MPC}_i}}$$

where: F_i = fractional abundance of the i^{th} radionuclide obtained by dividing the activity (curies) for each radionuclide, C_i , by the sum of all the isotopic activity, C_T .

n = total number of radionuclides identified

MPC_i = Maximum Permissible Concentration (MPC) of the i^{th} radionuclide from 10 CFR 20 (20.1-20.602), Appendix B, Table II, Column 2.

$$\bullet \quad \% \text{ ECL} = \frac{(\text{Dil Conc}) (100)}{\text{ECL}_{\text{eff}}}$$

where: Dil Conc = total curies released in each category and each quarter divided by the total volume released (sum of Sections E and F in Table 2A); the value in Sections A.2, B.2, and C.2 of Table 2A, $\mu\text{Ci/ml}$.

$$\circ \quad \text{ECL}_{\text{eff}} = \frac{1}{\sum_{i=1}^n \frac{F_i}{\text{ECL}_i}}$$

where: F_i = fractional abundance of the i^{th} radionuclide obtained by dividing the activity (curies) for each radionuclide, C_i , by the sum of all the isotopic activity, C_T .

n = total number of radionuclides identified

ECL_i = Effluent Concentration Limit (ECL) of the i^{th} radionuclide from 10 CFR 20 (20.1001-20.2402), Appendix B, Table 2, Column 2.

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SECTION G. ESTIMATION OF ERROR

Estimations of the error in reported values of gaseous and liquid effluents releases have been made.

Sources of error for gaseous effluents - batch releases are:

- (1) tank volumes
- (2) sampling
- (3) counting
- (4) calibration

Sources of error for gaseous effluents - continuous releases are:

- (1) fan flow rate
- (2) sampling
- (3) counting
- (4) calibration
- (5) differential pressure drop

Sources of error for liquid effluents - batch releases are:

- (1) tank volumes
- (2) sampling
- (3) counting
- (4) calibration

Sources of error for liquid effluents - continuous releases are:

- (1) dilution flow rate
- (2) sampling
- (3) counting
- (4) calibration

These sources of error are independent, and thus, the total error is calculated according to the following formula:

$$\text{Total Error} = \sqrt{\sigma_1^2 + \sigma_2^2 + \sigma_3^2 + \dots + \sigma_i^2}$$

where: σ_i = Error associated with each component.

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SECTION H. 10 CFR 50 APPENDIX I REQUIREMENTS

Table 1 in Section H presents the quarterly and annual maximum dose to an individual. Six different categories are presented:

- (1) Liquid Effluents - Whole Body
- (2) Liquid Effluents - Organ
- (3) Airborne Effluents - Tritium, Iodines and Particulates
- (4) Noble Gases - Gamma
- (5) Noble Gases - Beta
- (6) Direct Radiation

The doses for categories 1 and 2 were calculated using the methodology of the ODCM, this data is also presented in Table 2D. Categories 3, 4, and 5 were calculated utilizing RRRGS (Radioactive Release Report Generating System) software, Regulatory Guide 1.109 methodology, and concurrent meteorology. Table 1E of gaseous effluents previously presented, however, lists data similar to categories 3, 4 and 5 using methods described in the ODCM and the historical meteorology (X/Q). Category 6 presents direct dose data measured by TLD dosimeters. Each portion of each category is footnoted to briefly describe each maximum individual dose presented.

For individuals who may, at times, be within the site boundary, the occupancy of the individual will be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the site boundary. For members of the public who traverse the site boundary via highway I-5, the residency time shall be considered negligible and hence the dose "0".

Table 2 in Section H presents the percent of Applicable Limits for each dose presented in Table 1.

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TABLE 1

	Dose * (millirems)				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
LIQUID EFFLUENTS	1)	2)	3)	4)	5)
Whole Body	6.69E-4	7.71E-4	1.08E-3	1.95E-3	4.47E-3
Organ	6)	7)	8)	9)	10)
	1.51E-2	2.40E-3	1.32E-2	2.22E-2	5.29E-2
AIRBORNE EFFLUENTS	11)	12)	13)	14)	15)
Tritium, Iodines, and Particulates	2.36E-3	1.78E-3	4.27E-4	2.83E-3	7.23E-3
NOBLE GASES **	16)	17)	18)	19)	20)
Gamma	5.92E-3	3.24E-3	2.73E-3	4.62E-3	1.47E-2
Beta	21)	22)	23)	24)	25)
	8.54E-3	4.78E-3	4.19E-3	9.38E-3	2.55E-2
DIRECT RADIATION	26)	27)	28)	29)	30)
	2.80E-1	1.30E-1	1.45E-1	1.23E-1	6.78E-1

* The numbered footnotes below briefly explain how each maximum dose was calculated, including the organ and the predominant pathway(s).

** Noble gas doses due to airborne effluent are in units of mrad, reflecting the air dose.

1. This data was calculated using the methodology of the ODCM.
2. This data was calculated using the methodology of the ODCM.
3. This data was calculated using the methodology of the ODCM.
4. This data was calculated using the methodology of the ODCM.
5. This data was calculated using the methodology of the ODCM.

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6. This data was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
7. This data was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
8. This data was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
9. This data was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
10. This data was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.
11. The maximum organ dose was to a child's thyroid and was located in the NNW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
12. The maximum organ dose was to a child's thyroid and was located in the NNW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
13. The maximum organ dose was to a child's thyroid and was located in the ESE sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
14. The maximum organ dose was to a child's thyroid and was located in the NNW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
15. The maximum organ dose was to a child's thyroid and was located in the NNW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
16. The maximum air dose for gamma radiation was located in the ENE sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
17. The maximum air dose for gamma radiation was located in the E sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
18. The maximum air dose for gamma radiation was located in the ENE sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
19. The maximum air dose for gamma radiation was located in the E sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
20. The maximum air dose for gamma radiation was located in the ENE sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
21. The maximum air dose for beta radiation was located in the ENE sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
22. The maximum air dose for beta radiation was located in the E sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
23. The maximum air dose for beta radiation was located in the E sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
24. The maximum air dose for beta radiation was located in the E sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.

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25. The maximum air dose for beta radiation was located in the E sector, at the exclusion area boundary, and calculated using the assumptions of the USNRC Regulatory Guide 1.109.
26. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the WSW sector.
27. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the SW sector.
28. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the SW sector.
29. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary in the SE sector.
30. Measurements were made using TLD dosimeters; values are presented as site wide dose and are prorated to 300 hours per year; highest dose was measured at the Site Boundary as a composite of the highest sector for each quarter.

TABLE 2

SOURCE	Percent Applicable Limit				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
LIQUID EFFLUENTS					
Whole Body	2.23E-2	2.57E-2	3.60E-2	6.52E-2	7.45E-2
Organ	1.51E-1	2.40E-2	1.32E-1	2.22E-1	2.65E-1
AIRBORNE EFFLUENTS					
Tritium, Iodines, and Particulates	2.36E-2	1.78E-2	4.27E-3	2.83E-2	3.62E-2
NOBLE GASES					
Gamma	2.96E-2	1.62E-2	1.37E-2	2.31E-2	3.68E-2
Beta	5.69E-2	3.19E-2	2.79E-2	6.25E-2	8.50E-2

NOTE: Direct Radiation is not specifically addressed in the Applicable Limits.

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SECTION I. CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL

On July 31, 1996, revision 29 to the Units 2/3 Offsite Dose Calculation Manual (ODCM) was adopted and published. In this revision, the changes were limited to only those concerned with the issuance of the Technical Specification Improvement Program (TSIP). Mainly, Technical Specification (TS) paragraph references are changed to coincide with the new document. In one case, the reference drawing was deleted and not transferred to the new document. The drawing, showing the site boundary for liquid effluents, is still valid and remains in the ODCM.

The site wide implementation of the TSIP has already received proper review and approval. The changes in this revision will not reduce the accuracy or reliability of dose calculations or setpoint determinations. Per NRC Generic Letter 89-01, no additional safety evaluations were required.

A copy of revision 29 is included as a separate document in the package that transmitted the ARERR to the NRC.

The following is a complete list of the changes:

All changes in this revision were to support the site wide implementation of the TSIP, PCN 299, effective August 5, 1996. All TS references in the ODCM were researched to find the corresponding paragraph reference number in the new TSIP document. The ODCM lists both reference numbers in this revision. The next revision of Unit 2/3 ODCM, which will occur after TSIP implementation, will note only the new references.

- 1-5 Added appropriate TSIP reference paragraph numbers.
- 1-6 Added appropriate TSIP reference paragraph numbers.
- 1-7 Deleted reference to Technical Specification figure 5.1-4 which no longer exists.
- 2-5 Added appropriate TSIP reference paragraph numbers.
- 2-6 Added appropriate TSIP reference paragraph numbers.
- 2-7 Added appropriate TSIP reference paragraph numbers.
- 5-1 Added appropriate TSIP reference paragraph numbers.
- 5-2 Rolled paragraph "d" from page 5-1 and added appropriate TSIP reference paragraph numbers.
- 5-11 Added appropriate TSIP reference paragraph numbers.
- 6-9 Added appropriate TSIP reference paragraph numbers.

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SECTION J. CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS

Implementation and operation of the South Yard Facility Carbon Dioxide (CO₂) Decontamination Unit.

DCP A-7022.00SC-ASC 1, South Yard Facility (SYF), has installed a permanent Carbon Dioxide (CO₂) Decontamination Unit for processing radioactive material. This represents a potentially radioactive airborne effluent release point to the atmosphere associated with the CO₂ Decontamination Unit. The system utilizes CO₂ dry ice pellet blasting within an enclosed booth. The CO₂ decontamination unit is located in the decontamination shop and has an independent intake and exhaust system. The exhaust of the booth is ducted through a HEPA filter which is then is monitored by an effluent monitor/sampler prior to discharge to the atmosphere.

Design Calculation N-0302-007, Revision 1, Airborne Source Term for SYF and Outdoor Activities, evaluated the impact of an unmonitored instantaneous airborne release for handling or working activities involving fission and activated corrosion products in the CO₂ Blast Decontamination Unit. It was concluded that up to a particulate surface contamination level of $5.28\text{E}+9$ dpm/100 cm² ($5.28\text{E}+8$ dpm/100 cm² removable based on smear efficiency) for REMS Box decontamination and a particulate surface contamination level of $1.38\text{E}+8$ dpm/100 cm² ($1.38\text{E}+7$ dpm/100 cm² removable based on smear efficiency) for RCS decontaminated components, the ECL limits in 10CFR20 will not be exceeded at the site boundary.

Station procedures S0123-XV-48, Rev. 1, South Yard Facility Effluent Controls, issued March 12, 1996 and S0123-VII-8.6.20, Rev. 0, NDC Carbon Dioxide Decontamination Unit, issued December 29, 1995, address the effluent controls required for the conservative compensatory operation of the CO₂ decontamination unit. The safety evaluation for using the CO₂ Decontamination Unit follows:

Evaluation of Using the CO₂ Decontamination Unit

NUREG 0472, "Standard Radiological Effluent Technical Specifications For Pressurized Water Reactors," on which SONGS models the Unit 2/3 Offsite Dose Calculation Manual (ODCM), requires for airborne release points from the SYF, the following effluent instrumentation:

- a. Noble Gas Activity Monitor.
- b. Iodine Sampler.
- c. Particulate Sampler.
- d. Process Flow Rate Instrumentation.
- e. Sample Flow Rate Monitor.

Given the design uses of the facility, the presence of noble gas is not a concern at the SYF. DCP A-7022.00SC explicitly specified that a noble gas activity monitor will not be installed. Activity released from the SYF, if any, will almost be entirely in particulate form. As such, a particulate monitor on each airborne release point will be installed. The remaining radioactive effluent instruments (b-e) are still applicable.

Final effluent instrumentation which will be installed for the SYF CO₂ Decontamination Unit release point are:

- a. Particulate Activity Monitor.
- b. Iodine Sampler.
- c. Particulate Sampler.
- d. Process Flow Rate Monitor Device.
- e. Associated Sample Flow Measuring Device.

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The SYF Carbon Dioxide Cleaning Unit has been constructed with these provisions:

1. CO2 Unit installed, maintaining a negative pressure relative to the decontamination shop portion of the SYF.
2. Sample flow rate ducting with isokinetic probe in place.

The unit is being operated using Station procedures that implement conservative operating limits and compensatory sampling measures until the effluent instrumentation installation is completed. Upon completion of instrumentation installation, the station will transition from the compensatory measures to the normal control provisions consistent with NUREG 0472 by revising the appropriate procedures as necessary.

Using realistic but conservative assumptions and assuming a HEPA filter with an efficiency of 99 percent, and no iodine removal via the charcoal filter to prevent the dispersion of airborne activity, Design Calculation N-0302-007, Rev. 1, concluded that decontamination of up to the following removable particulate contamination levels of $5.28\text{E}+8$ dpm/100 cm² for REMS Boxes and $1.38\text{E}+7$ dpm/100 cm² for RCS components, the ECL limits in 10CFR20 will not be exceeded at the site boundary. Recognizing the close proximity of the SYF to the site boundary, conservative administrative values have been established for material below $1.0\text{E}+6$ dpm/100 cm² removable particulate contamination level or 100 mR/hr fixed + loose contamination by direct measurement for the operation of the CO2 Decontamination Unit. Any work on material in excess of these limits shall be evaluated by Effluent Engineering on a case-by-case basis.

Memorandum from R. Morgan to P. Chang; Subject, "Iodine Contamination on Tools and Equipment", dated April 26, 1993, provided a correlation between particulate and iodine contamination levels based on RCS activity. For a $1.0\text{E}+6$ dpm/100 cm² particulate contamination level, even if the component to be handled or worked on is removed directly from the RCS at power without the benefit of decay or decontamination, the corresponding iodine contamination level will be less than $4.8\text{E}+5$ dpm/100 cm² unless RCS iodine activity exceeds 48% of the total RCS activity. As stated in the Memorandum, this is extremely unlikely as the typical RCS iodine activity is around 3%. In actual practice, typically all tools or equipment which have direct contact with the RCS will be decontaminated to a much lower level than $1.0\text{E}+6$ dpm/100 cm² removable particulate and $4.8\text{E}+5$ dpm/100 cm² removable iodine for site worker radiation protection purposes prior to any handling or working activities. In addition, the Memorandum cited several SONGS experiences to conclude that iodine does not present a significant airborne hazard. Also, a charcoal filter is installed on the outlet of the CO2 Blast Unit. It is considered non-effective due to insufficient contact time with the effluent stream, but will provide some amount of Iodine removal.

Based on the results of Design Calculation N-0302-007 and the previously referenced Memorandum from R. Morgan to P. Chang; Subject, "Iodine Contamination on Tools and Equipment", a removable surface contamination level at or below $1.0\text{E}+6$ dpm/100 cm² removable particulate does not pose any significant effluent impact on the health and safety to a member of the public. Furthermore, at this contamination level, the corresponding iodine contamination level also does not pose any significant effluent impact to a member of the public.

Memo from E. M. Goldin to P. K. Chang; Subject, "South Yard Facility Dispersion Factors for Potential Normal Gaseous Effluent Releases; Determination of Compliance with 10CFR50, Appendix I", dated December 11, 1994, provides a calculation for normal/operationally anticipated SYF activities for handling, working, and decontaminating radioactive material at the SYF. This calculation demonstrates that such activities have minimal dose impact (total annual dose of about $9.3\text{E}-7$ mrem) to the public.

S0123-XV-48, Rev. 1, provides the following major controls and measures for the use of the CO2 Cleaning Unit:

1. Conservative allowable contamination limits. Work process (such as filtration, negative pressure ambient) controls.
2. Contingent actions for abnormal conditions.
3. Conservative design process and sample flowrates for dose and concentration calculations consistent with the guidance of NUREG 0472.

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4. Appropriate compensatory sampling provisions consistent with the guidance of NUREG 0472.
5. Proper disposal of potentially radioactive liquids.
6. Controls for REMS containers/items and RCS contaminated equipment.

In addition to these controls in S0123-XV-48, Rev. 1, S0123-VII-8.6.20, NDC Carbon Dioxide Decontamination Unit, provides the following major controls and measures for the use of the C02 Cleaning Unit:

1. Proper configuration of the blast unit doors and covers prior to operation to ensure negative pressure in the C02 unit is maintained while in use.
2. Visual inspection of filters prior to operation of ventilation.

Operational experience in the use of the C02 Decontamination Unit during the year of 1996 has shown no detectable activity in the effluent release path samples. This experience supports that the conservative operational controls provide for acceptable use of the C02 Decontamination Unit. Based on conservative threshold contamination limits, work controls, compensatory action and sampling, and ongoing evaluation, S0123-XV-48, Rev. 1 provides adequate compensatory measures for work involving the C02 Decontamination Unit at the SYF prior to full design effluent instrumentation implementation. These controls and measures provide assurances that there will be minimal effluent impact on the health and safety to a member of the public.

50.59 SAFETY EVALUATION

1. **May the proposed activity increase the probability of occurrence of an accident evaluated previously in the safety analysis report?**

No. The SYF is located in Parking Lot 1, removed from the nuclear units and does not have any impact on the potential scenarios considered in Chapter 15 of the FSAR. Therefore, the decontamination activities associated with the C02 Unit at the SYF will not increase the occurrence of an accident previously evaluated in the safety analysis report.

2. **May the proposed activity increase the consequences of an accident evaluated previously in the safety analysis report?**

No. The SYF is located in Parking Lot 1, removed from the nuclear units and does not have any impact on the potential scenarios considered in Chapter 15 of the FSAR. Therefore, the decontamination activities associated with the C02 Unit at the SYF will not increase the consequence of an accident previously evaluated in the safety analysis report.

3. **May the proposed activity increase the probability of occurrence of a malfunction of equipment important to safety evaluated previously in the safety analysis report?**

No. The SYF is located in Parking Lot 1, removed from the nuclear units and does not interface with any equipment important to safety. Therefore, the decontamination activities associated with the C02 Unit at the SYF will not increase the probability of the occurrence of a malfunction of equipment important to safety previously evaluated in the safety analysis report.

4. **May the proposed activity increase the consequence of a malfunction of equipment important to safety evaluated previously in the safety analysis report?**

No. The SYF is located in Parking Lot 1, removed from the nuclear units and does not interface with any equipment important to safety. Therefore, the decontamination activities associated with the C02 Unit at the SYF will not increase the occurrence of an accident previously evaluated in the safety analysis report.

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S.O.N.G.S. 2 and 3

5. **May the proposed activity create the possibility of an accident of a different type than any evaluated previously in the safety analysis report?**

No. The SYF is located in Parking Lot 1, removed from the nuclear units and does not have any impact on the potential scenarios considered in Chapter 15 of the FSAR. Therefore, the decontamination activities associated with the C02 Unit at the SYF will not create the possibility of an accident of a different type than any evaluated previously in the safety analysis report.

6. **May the proposed activity create the possibility of a malfunction of equipment important to safety of a different type than any evaluated previously in the safety analysis report?**

No. The SYF is located in Parking Lot 1, removed from the nuclear units and does not interface with any equipment important to safety. Therefore, the decontamination activities associated with the C02 Unit at the SYF will not create the possibility of a malfunction of equipment important to safety of a different type than any evaluated previously in the safety analysis report.

7. **Does the proposed activity reduce the margin of safety as defined in the basis for any Technical Specification?**

No. There are no Technical Specifications related to the decontamination of radioactive material. Per NRC Generic Letter 89-01, the radioactive effluent technical specifications were transferred to the Units 2/3 Offsite Dose Calculation Manual. Radiological dose calculations have been performed and conclude that there will be no significant impact on the health and safety of a member of the public. Based on a combination of conservative threshold contamination limits, work controls, compensatory action and sampling, and ongoing evaluation, S0123-XV-48, Rev. 1 provides adequate compensatory measures for work involving decontamination of radioactive material at the SYF C02 Unit prior to full design effluent instrumentation implementation. These controls and measures provide additional assurances that there will be minimal effluent impact on the health and safety of a member of the public. Therefore, the decontamination activities associated with the C02 unit at the SYF will not reduce the margin of safety as defined in the basis for any Technical Specification or the Units 2/3 Offsite Dose Calculation Manual.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

S.O.N.G.S. 2 and 3

SECTION K. MISCELLANEOUS

• Uncontrolled Release from Unit 2 FFCPD Holdup Tank

Clean Sump Release Authorization #: 336

On 9/21/96, an inoperable liquid effluent monitor 2RT-7817 was used to conduct a Unit 2 Full Flow holdup tank release to the outfall. The monitor sample isolation valves were inadvertently left in the closed position during a cleaning and inspection evolution on 9/20/96. Holdup tank sample analysis indicated no detectable activity. The release is considered uncontrolled due to the isolated monitor. Action Request/Even Report 960900593 was written to document this event and to capture corrective actions.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

S.O.N.G.S. 2 and 3

EFFLUENT RADIATION MONITORS OUT OF SERVICE GREATER THAN 30 DAYS

January 1, 1996 - December 31, 1996

S.O.N.G.S. 2			
Monitor	Inoperability Period	Inoperability Cause	Explanation
2RT-6753 Steam Generator Blowdown Monitor	11/30/96 - Present	No sample flow	No Steam generator pressure or steam flow due to Unit being in a refueling outage.
2RT-6759 Steam Generator Blowdown Monitor	11/30/96 - Present	No sample flow	No Steam generator pressure or steam flow due to Unit being in a refueling outage.
2RT-7818 Condenser Air Ejector Monitor	08/24/96 - 02/04/97	Failed Detector	Repair of heat trace circuits caused by water intrusion and implemented design change to remove obsolete channel.
	12/01/96 - Present	No Steam Flow	No steam generator pressure or steam flow due to Unit being in a refueling outage.
2RT-7821 Turbine Plant Sump Monitor	07/09/96 - 09/02/96	Inaccurate sensing of sample flow	Cleaned flow transmitter and system piping of built up material that degraded the flow transmitter.
2RT-7865 Plant Vent Stack Process Flow Monitor	04/22/92 - 02/08/96	Process flow indication	Corrected during obsolete component design change. Radiation monitor functions were operable during this period. New design flow probes were installed and are working well since.
2RT-7870 Condenser Air Ejector Process Flow Monitor	08/24/96 - 02/04/97	Process flow indication	Required new parts to be installed. Radiation monitor functions were operable during this period.
S.O.N.G.S. 3			
3RT-7817 BPS/FFCPD Discharge Monitor	10/12/96 - 11/18/96	Process flow indication, plugged sample line	Process flow sensor failed and was replaced. Sample flow lines cleaned and flushed.
3RT-7821 Turbine Plant Sump Monitor	10/10/96 - 11/22/96	Process flow indication, plugged sample line	Process flow sensor failed and was replaced. Sample flow lines cleaned and flushed.
3RT-7865 Plant Vent Stack Process Flow Monitor	08/02/91 - 02/08/96	Process flow indication	Corrected during obsolete component design change. Radiation monitor functions were operable during this period. New design flow probes were installed and are working well since.
Plant Vent Stack Monitor	10/01/96 - 10/31/96	Detector failed	Repairs required new parts be installed.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

S.O.N.G.S. 2 and 3

SECTION L. S O.N.G.S. 2 and 3 CONCLUSIONS

- Gaseous releases totaled $4.51\text{E}+2$ curies of which noble gases were $4.26\text{E}+2$ curies, iodines were $6.69\text{E}-3$ curies, particulates were $5.18\text{E}-3$ curies, and tritium was $2.55\text{E}+1$ curies.
- The radiation doses from gaseous releases are: (a) gamma air dose: $1.47\text{E}-2$ mrad at the site boundary, (b) beta air dose: $2.55\text{E}-2$ mrad at the site boundary, (c) organ dose: $7.23\text{E}-3$ mrem at the nearest receptor.
- Liquid releases totaled $1.45\text{E}+3$ curies of which particulates and iodines were $1.40\text{E}-1$ curies, tritium was $1.45\text{E}+3$ curies, and noble gases were $1.15\text{E}-1$ curies.
- The radiation doses from liquid releases are: (a) total body: $4.47\text{E}-3$ mrem, (b) limiting organ: $5.29\text{E}-2$ mrem.
- The radioactive releases and resulting doses generated from Units 2 and 3 were below the Applicable Limits for both gaseous and liquid effluents.

COMMON

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

COMMON

TABLE 3 (Continued)

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

2. Estimate of major nuclide composition (by type of waste)		
a. not applicable	%	0.00E+0
b. americium-241	%	1.22E-3
antimony-124	%	3.61E-1
antimony-125	%	4.48E-1
carbon-14	%	1.73E+0
cerium-144	%	4.60E-1
cesium-134	%	3.99E+0
cesium-137	%	7.61E+0
chromium-51	%	7.43E+0
cobalt-57	%	4.06E-2
cobalt-58	%	2.99E+1
cobalt-60	%	6.85E+0
curium-242	%	1.02E-3
curium-243/44	%	3.16E-3
iodine-129	%	2.02E-3
iron-55	%	2.75E+1
iron-59	%	5.56E-1
manganese-54	%	1.05E+0
nickel-59	%	1.12E-1
nickel-63	%	1.11E+1
niobium-95	%	3.61E-1
plutonium-238	%	1.49E-3
plutonium-239/40	%	1.99E-3
plutonium-241	%	1.65E-1
silver-110m	%	2.10E-2
strontium-89	%	4.98E-3
strontium-90	%	4.94E-2
ruthenium-106	%	2.03E-2
technetium-99	%	7.24E-4
tin-113	%	2.47E-2
tritium	%	1.20E-1
uranium-233/34	%	3.93E-6
uranium-238	%	1.91E-6
zirconium-95	%	8.86E-2
c. not applicable	%	0.00E+0
d. not applicable	%	0.00E+0

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

COMMON

COMMON RADWASTE SHIPMENTS

TABLE 3

SOLID WASTE AND IRRADIATED FUEL SHIPMENT

A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (Not Irradiated Fuel)

1. Type of waste	Unit	12 month period	Estimated total error (%)
a. Spent resins, filter sludges, evaporator bottoms	m ³	N/A	N/A
	Ci	N/A	
b. Dry active waste (DAW), compactable and non-compactable (*)	m ³	3.83E+1	3.00E+1
	Ci	2.07E+0	
c. Irradiated components, control rods	m ³	N/A	N/A
	Ci	N/A	
d. Other (filters)	m ³	N/A	N/A
	Ci	N/A	

NOTE: Total curie content estimated.

* Material packaged in strong, tight containers of various sizes.

N/A No shipment made.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

COMMON

TABLE 3 (Continued)

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

3. Solid Waste Disposition (S.O.N.G.S. 1, 2, and 3)		
Number of Shipments	Mode of Transportation	Destination
3 *	Kindrick Trucking Company Truck/Type A Cask	Barnwell, SC
1 *	Kindrick Trucking Company Truck/Type B Cask	Barnwell, SC
2 *	Kindrick Trucking Company Truck/Trailer	Barnwell, SC
49 #	Hitman Transport Truck/Trailer	Barnwell, SC

* All waste packaged at SONGS is staged at one location. There are no independent shipments of dry active waste made for Unit 1 or Units 2&3, and are not reported separately.

SONGS maintains contracts with vendor (SEG) that provides volume reduction services. These shipments were made from their processing facility. The 49 shipments made from this facility included waste from other generators. Edison's waste volume was a small fraction of the total waste volume of these shipments.

B. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments	Mode of Transportation	Destination
None	No shipments were made	N/A

C. DEWATERING

Number of Containers	Solidification Agent
4	N/A

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

COMMON

TABLE 3 (Continued)

D. CHANGES TO THE PROCESS CONTROL PROGRAM AT SAN ONOFRE UNITS 1, 2 & 3

During the reporting period January 1, 1996 through December 31, 1996, two changes to the Units 1, 2 & 3 Process Control Program via procedure S0123-VII-8.5.1 were approved and implemented on May 10, 1996 and July 1, 1996. Please find the attached explanation of the changes and the justification for making the changes.

REFERENCES:

- 1) Unit 1 Technical Specifications, section D6.13.2.
- 2) Units 2 and 3 Technical Specifications, section 6.13.2.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

COMMON

TABLE 3 (Continued)

D. CHANGES TO THE PROCESS CONTROL PROGRAM AT SAN ONOFRE UNITS 1, 2 & 3 (Continued)

May 10, 1996

Memorandum to: Vice President/Site Manager
Operations Manager
Manager of Nuclear Regulatory Affairs
Supervisor, Nuclear Safety Group

SUBJECT: Notification of TCN to SO123-VII-8.5.1, Process Control Program for San Onofre Units 1, 2 and 3

In accordance with the Units 2 and 3 Technical Specifications 6.5.2.9, 6.5.2.10 and 6.13.2, and Unit 1 Permanently Defueled Technical Specifications D6.5.2.9, D6.5.2.10 and D6.13.2, a Revision to the Process Control Program, via procedure SO123-VII-8.5.1, has been approved for implementation. Please find attached a description of the approved change, and a discussion of the rationale for making the change.

If you require any additional information, please contact me.



P. J. Knapp

PJK9605.07

cc: Effluent Engineer
Station Manager
CDM Files

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

COMMON

TABLE 3 (Continued)

D. CHANGES TO THE PROCESS CONTROL PROGRAM AT SAN ONOFRE UNITS 1, 2 & 3 (Continued)

MEMORANDUM FOR FILE

May 10, 1996

SUBJECT: Notification of Change to the Process Control Program for San Onofre Units 1, 2, and 3.


Health Physics has initiated changes to the Process Control Program via procedure SO123-VII-8.5.1. The following provides an explanation of the revision and justification for the changes.

Description of Change: This procedure was modified to add Units 2 and 3 Licensee Controlled Specification Section 5.107.2 and Units 2 and 3 Topical Report Section 17.2.20.3.1, when implemented, to replace existing Technical Specification Sections 6.13 and 6.5.2.9 respectively. In addition to the above change, Chem Nuclear Inc. Barnwell Waste Disposal Facility, Barnwell, South Carolina was added as a waste disposal site to which San Onofre may ship radioactive waste.

Rationale for Change: SO123-VII-8.5.1, Process Control Program for San Onofre Units 1, 2, and 3 was modified in response to RCTS #9509041, action 003, procedure changes for PCN-299 (TSIP). Existing Technical Specification sections 6.13 and 6.5.2.9 have been removed from the revised Technical Specifications and placed in the Licensee Controlled Specifications Section 5.107.2 and Topical Report Section 17.2.20.3.1. The new Technical Specifications will become effective on July 15, 1996. Chem Nuclear Inc. Barnwell Waste Disposal Facility was also added as a waste disposal site because the facility has resumed accepting radioactive waste from other states.

Justification That the Change Does Not Reduce Conformance of the Solidified Waste to Existing Criteria: ~~The changes listed above~~ do not affect existing solidified waste criteria and therefore does not reduce conformance with the criteria.

APPROVED BY:


Health Physics Manager


Date

PJK9605.08

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

COMMON

TABLE 3 (Continued)

D. CHANGES TO THE PROCESS CONTROL PROGRAM AT SAN ONOFRE UNITS 1, 2 & 3 (Continued)

July 1, 1996

Memorandum to: R. W. Krieger
R. W. Waldo
W. C. Marsh
R. Lee

SUBJECT: Notification of TCN to SO123-VII-8.5.1, Process Control Program for San Onofre Units 1, 2 and 3

In accordance with the Units 2 and 3 Technical Specifications 6.5.2.9, 6.5.2.10 and 6.13.2, and Unit 1 Permanently Defueled Technical Specifications D6.5.2.9, D6.5.2.10 and D6.13.2, a Revision to the Process Control Program, via procedure SO123-VII-8.5.1, has been approved for implementation. Please find attached a description of the approved change, and a discussion of the rationale for making the change.

If you require any additional information, please contact me.


P. J. Knapp

SSewell:sjs
PJK9607.01
cc: P. K. Chang
CDM Files

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

COMMON

TABLE 3 (Continued)

D. CHANGES TO THE PROCESS CONTROL PROGRAM AT SAN ONOFRE UNITS 1, 2 & 3 (Continued)

MEMORANDUM FOR FILE

July 1, 1996

SUBJECT: Notification of Change to the Process Control Program for San Onofre Units 1, 2, and 3.

Health Physics has initiated changes to the Process Control Program via procedure SO123-VII-8.5.1. The following provides an explanation of the revision and justification for the changes.

Description of Change: This procedure was modified to add Units 2 and 3 Licensee Controlled Specification Section 5.0.103.2.2 and Units 2 and 3 Topical Report Section 17.2.20.3.1, when implemented, to replace existing Technical Specification Sections 6.13 and 6.5.2.9 respectively. In addition to the above change, Chem Nuclear Inc. Barnwell Waste Disposal Facility, Barnwell, South Carolina was added as a waste disposal site to which San Onofre may ship radioactive waste.

Rationale for Change: SO123-VII-8.5.1, Process Control Program for San Onofre Units 1, 2, and 3 was modified in response to RCTS #9509041, action 003, procedure changes for PCN-299 (TSIP). Existing Technical Specification sections 6.13 and 6.5.2.9 have been removed from the revised Technical Specifications and placed in the Licensee Controlled Specifications Section 5.0.103.2.2 and Topical Report Section 17.2.20.3.1. The new Technical Specifications will become effective on August 5, 1996. Chem Nuclear Inc. Barnwell Waste Disposal Facility was also added as a waste disposal site because the facility has resumed accepting radioactive waste from other states.

Justification That the Change Does Not Reduce Conformance of the Solidified Waste to Existing Criteria: The changes listed above do not affect existing solidified waste criteria and therefore does not reduce conformance with the criteria.

APPROVED BY:

Peter J Knapp
Health Physics Manager

7-2-96
Date

PJK9607.02
SSewell:sjs

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

COMMON

COMMON 40 CFR 190 REQUIREMENTS

Table 1 below presents the annual site-wide doses and percent of ODCM Specification limits to members of the public. These values are calculated utilizing doses resulting from all effluent pathways and direct radiation. The different categories presented are: (1) Total Body, (2) Limiting Organ, and (3) Thyroid.

Dose Category	Units	Year
1. Total Body		
a. Total Body Dose	mrem	1.48E+0
b. Percent ODCM Specification Limit	%	5.91E+0
2. Limiting Organ		
a. Organ Dose (GI-LLI)	mrem	9.16E-1
b. Percent ODCM Specification Limit	%	3.67E+0
3. Thyroid		
a. Thyroid Dose	mrem	5.24E-3
b. Percent ODCM Specification Limit	%	6.98E-3

In addition to the dose calculated in the table above, there is the potential for incremental exposure to the public through disposal of certain solid materials at a facility outside the sphere of influence of airborne and liquid pathways. For example, Southern California Edison collects marine debris on the screens of the circulating water system and gathers dirt and sweepings during housekeeping activities. From time to time, extremely low levels of radioactivity have been detected in these wastes, placing their disposal outside NRC jurisdiction as described in 10 CFR 61. The Department of Health Services for the State of California has evaluated the potential impact to the public attributable to disposing of these materials at a municipal facility and concluded that the maximum exposure to individuals living or working at the facility is an acceptably small fraction of the designated safe limits.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

COMMON

COMMON CONCLUSIONS

- Gaseous releases from S.O.N.G.S. 1, 2 and 3 totaled $4.55\text{E}+2$ curies of which noble gases were $4.26\text{E}+2$ curies, iodines were $6.69\text{E}-3$ curies, particulates were $5.18\text{E}-3$ curies, and tritium was $2.90\text{E}+1$ curies.
- Liquid releases from S.O.N.G.S. 1, 2 and 3 totaled $1.45\text{E}+3$ curies of which particulates and iodines were $1.85\text{E}-1$ curies, tritium was $1.45\text{E}+3$ curies, and noble gases were $1.15\text{E}-1$ curies.
- Radioactive releases and resulting doses generated from S.O.N.G.S. 1, 2 and 3 were below the Applicable Limits for both gaseous and liquid effluents.
- S.O.N.G.S. 1, 2 and 3 made 55 radwaste shipments to Barnwell, SC. Total volume was $5.73\text{E}+1$ cubic meters containing $1.13\text{E}+3$ curies of radioactivity.
- Meteorological conditions during the year were typical for S.O.N.G.S. Meteorological dispersion was good 34% of the time, fair 45% of the time and poor 21% of the time.
- The net result from the analysis of these effluent releases indicates that the operation of S.O.N.G.S. 1, 2 and 3 has met all the requirements of the applicable regulations and therefore has not resulted in any detrimental effects on the environment.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

COMMON

APPENDIX A

GASEOUS EFFLUENTS - APPLICABLE LIMITS

- A. Table 1A lists the total curies released and the release rate. The percent of applicable limit compares the released concentrations to the concentration limits of 10 CFR 20, Appendix B, Table II, Column 1.
- B. Table 1E lists the air doses as calculated using the historical X/Q. The air dose due to noble gases released in gaseous effluents from S.O.N.G.S. (per reactor) to areas at and beyond the site boundary shall be limited to the following values:
1. During any calendar quarter: ≤ 5 mrad for gamma radiation and
 ≤ 10 mrad for beta radiation.
 2. During any calendar year: ≤ 10 mrad for gamma radiation and
 ≤ 20 mrad for beta radiation.
- C. The dose to a Member of the Public from iodines, tritium, and all radionuclides in particulate form with half-lives greater than eight days in gaseous effluents released from S.O.N.G.S. (per reactor) to areas at and beyond the site boundary shall be limited to the following values:
1. During any calendar quarter: ≤ 7.5 mrem to any organ.
 2. During any calendar year: ≤ 15 mrem to any organ.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

COMMON

APPENDIX A (Continued)

LIQUID EFFLUENTS - APPLICABLE LIMITS

- A. Table 2A lists the total curies released, the diluted concentration, and percent of the applicable limit. The percent of applicable limit compares the diluted concentration of radioactive material released to the concentrations specified in 10 CFR 20, Appendix B, Table II, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration is limited to $2.00\text{E-}4 \mu\text{Ci/ml}$.
- B. Table 2D lists doses due to liquid releases. The dose commitment to a Member of the Public from radioactive materials in liquid effluents released from S.O.N.G.S. (per reactor) to unrestricted areas shall be limited to the following values:
1. During any calendar quarter: ≤ 1.5 mrem to the total body and
 ≤ 5 mrem to any organ.
 2. During any calendar year: ≤ 3 mrem to the total body and
 ≤ 10 mrem to any organ.

METEOROLOGY



METEOROLOGY

The meteorology of the San Onofre Nuclear Generating Station for each of the four quarters, 1996 is described in this section. Meteorological measurements have been made according to the guidance provided in USNRC Regulatory Guide 1.23, "Onsite Meteorological Programs." A summary report of the meteorological measurements taken during each calendar quarter are presented in Table 4A as joint frequency distribution (JFD) of wind direction and wind speed by atmospheric stability class.

Hourly meteorological data for batch releases have been recorded for the periods of actual release. This data is available, as well as the hourly data for the Annual Report, but has not been included in this report because of the bulk of data records.

Table 4A lists the joint frequency distribution for each quarter, 1996. Each page of Table 4A represents the data for the individual stability classes: A, B, C, D, E, F, and G. The last page of each section is the JFD for all the stability classes. The wind speeds have been measured at the 10-meter level, and the stability classes are defined by the temperature differential between the 10-meter and 40-meter levels.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

METEOROLOGY

TABLE 4A

January - March

SITE: SAN ONOFRE
 PERIOD OF RECORD 95123124-96033123
 WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL A

EXTREMELY UNSTABLE ($DT/DZ < -1.9$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	1	2	0	0	1	0	0	0	0	0	4
NNE	0	0	0	0	0	1	1	0	0	0	0	0	2
NE	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	1	0	1	2	1	0	0	0	0	0	5
ESE	0	0	0	1	0	2	1	1	0	0	0	0	5
SE	0	0	0	0	1	2	10	5	2	0	0	0	20
SSE	0	0	0	0	2	8	17	2	2	6	0	0	37
S	0	0	0	6	4	19	29	6	0	0	0	0	64
SSW	0	0	0	3	4	18	17	3	1	0	0	0	46
SW	0	0	2	4	9	30	13	0	0	0	0	0	58
WSW	0	0	0	5	12	42	14	2	0	0	0	0	75
W	0	1	0	3	7	49	61	6	0	0	0	0	127
WNW	0	0	0	0	6	8	28	15	6	0	0	0	63
NW	0	0	0	0	2	6	6	3	1	0	0	0	18
NNW	0	0	0	2	0	0	1	0	0	0	0	0	3
TOTALS	0	1	4	26	48	187	200	43	12	6	0	0	527

NUMBER OF VALID HOURS 527
 NUMBER OF INVALID HOURS 8

NUMBER OF CALMS 0
 TOTAL HOURS FOR THE PERIOD 2184

PASQUILL B

MODERATELY UNSTABLE ($-1.9 < DT/DZ \leq -1.7$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	1	0	1	1	0	0	0	0	0	0	3
NNE	0	0	0	0	1	0	0	0	0	0	0	0	1
NE	0	0	1	0	1	0	0	0	0	0	0	0	2
ENE	1	0	0	0	0	0	0	0	0	0	0	0	1
E	0	0	1	0	0	0	0	0	0	0	0	0	1
ESE	0	0	0	0	0	0	1	3	0	0	0	0	4
SE	0	0	0	1	1	2	2	0	0	0	0	0	6
SSE	0	0	0	0	2	3	7	0	0	1	0	0	13
S	0	0	0	0	0	1	5	0	0	1	0	0	7
SSW	0	0	0	0	0	0	1	0	0	0	0	0	1
SW	0	0	0	0	3	1	1	0	1	0	0	0	6
WSW	0	0	1	0	0	1	2	2	0	0	0	0	6
W	0	0	0	0	2	1	0	0	0	0	0	0	3
WNW	0	0	0	0	0	0	2	1	1	0	0	0	4
NW	0	0	0	1	0	0	3	2	2	0	0	0	8
NNW	0	1	0	1	1	1	1	0	0	0	0	0	5
TOTALS	1	1	4	3	12	11	25	8	4	2	0	0	71

NUMBER OF VALID HOURS 71
 NUMBER OF INVALID HOURS 8

NUMBER OF CALMS 0
 TOTAL HOURS FOR THE PERIOD 2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

METEOROLOGY

TABLE 4A
January - MarchSITE: SAN ONOFRE
PERIOD OF RECORD 95123124-96033123
WIND SPEED (M/S) AT 10 METER LEVELPASQUILL C
SLIGHTLY UNSTABLE ($-1.7 < DT/DZ \leq -1.5$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	0	0	1	1	0	0	0	0	0	0	2
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	1	0	0	1	0	0	0	0	0	2
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	1	1	0	0	0	0	0	0	2
SE	0	0	0	0	1	1	4	0	0	0	0	0	6
SSE	0	0	0	1	1	2	1	1	0	0	0	0	6
S	0	0	0	0	5	0	3	1	0	0	0	0	9
SSW	0	0	0	0	2	4	1	0	0	0	0	0	7
SW	0	0	0	0	3	5	2	1	0	0	0	0	11
WSW	0	0	0	0	2	2	2	0	0	0	0	0	6
W	1	0	0	2	2	1	0	0	1	0	0	0	7
WNW	0	0	0	0	1	3	2	1	3	0	0	0	10
NW	0	0	0	0	0	2	0	1	0	0	0	0	3
NNW	0	0	0	2	0	0	0	0	0	0	0	0	2
TOTALS	1	0	0	6	19	22	16	5	4	0	0	0	73

NUMBER OF VALID HOURS 73
NUMBER OF INVALID HOURS 8NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2184PASQUILL D
NEUTRAL ($-1.5 < DT/DZ \leq -0.5$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	2	4	6	10	5	1	0	0	0	0	28
NNE	0	2	4	6	18	18	3	2	0	0	0	0	53
NE	0	0	0	4	3	1	1	1	0	0	0	0	10
ENE	0	0	1	2	2	1	1	0	2	0	0	0	9
E	0	0	3	0	2	2	3	0	0	0	0	0	10
ESE	0	0	0	2	7	6	7	0	0	0	0	0	22
SE	0	1	0	5	3	20	31	22	2	0	0	0	84
SSE	0	0	3	2	9	17	20	15	4	0	0	0	70
S	0	1	1	5	6	8	14	1	5	1	0	0	42
SSW	0	1	3	3	3	8	8	5	0	0	0	0	31
SW	0	0	1	7	6	5	3	6	2	0	0	0	30
WSW	0	0	0	3	5	5	1	4	0	0	0	0	18
W	0	0	1	4	2	10	12	6	4	0	0	0	39
WNW	0	0	1	1	4	8	15	3	3	0	0	0	35
NW	0	2	1	6	1	7	16	13	2	0	0	0	48
NNW	0	0	2	3	2	6	8	3	0	0	0	0	24
TOTALS	0	7	23	57	79	132	148	82	24	1	0	0	553

NUMBER OF VALID HOURS 553
NUMBER OF INVALID HOURS 8NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

METEOROLOGY

TABLE 4A
January - MarchSITE: SAN ONOFRE
PERIOD OF RECORD 95123124-96033123
WIND SPEED (M/S) AT 10 METER LEVELPASQUILL E
SLIGHTLY STABLE ($-0.5 < DT/DZ \leq -1.5$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	0	4	4	13	8	0	0	0	0	0	29
NNE	0	1	2	24	29	36	36	0	0	0	0	0	128
NE	0	0	2	8	3	7	5	0	0	0	0	0	25
ENE	0	0	0	6	3	1	0	0	0	0	0	0	10
E	2	0	1	2	3	4	3	0	1	0	0	0	16
ESE	1	0	1	2	3	3	3	0	0	0	0	0	13
SE	0	0	0	2	0	7	5	3	0	0	0	0	17
SSE	0	0	1	3	3	4	5	1	0	0	0	0	17
S	0	0	0	1	0	3	1	1	0	0	0	0	6
SSW	0	0	0	1	0	0	0	0	0	0	0	0	1
SW	0	2	0	2	1	0	0	0	0	0	0	0	5
WSW	1	0	1	2	1	0	1	0	0	0	0	0	6
W	0	0	0	2	1	3	1	1	0	0	0	0	8
WNW	0	0	3	3	0	1	3	0	0	0	0	0	10
NW	0	0	0	1	0	5	8	0	0	0	0	0	14
NNW	0	0	2	2	5	4	9	0	0	0	0	0	22
TOTALS	4	3	13	65	56	91	88	6	1	0	0	0	327

NUMBER OF VALID HOURS 327
NUMBER OF INVALID HOURS 8NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2184PASQUILL F
MODERATELY STABLE ($1.5 \leq DT/DZ \leq -0.5$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	0	3	1	7	9	1	0	0	0	0	21
NNE	0	0	1	9	26	69	31	2	0	0	0	0	138
NE	0	1	3	10	9	8	1	0	0	0	0	0	32
ENE	0	1	0	3	4	1	1	0	0	0	0	0	10
E	0	0	1	3	3	0	0	0	0	0	0	0	7
ESE	0	0	0	2	1	2	0	0	0	0	0	0	5
SE	0	0	0	7	0	2	06	0	0	0	0	0	15
SSE	0	0	0	1	0	1	1	0	0	0	0	0	3
S	0	0	0	2	0	0	0	0	0	0	0	0	2
SSW	0	0	1	2	0	0	0	0	0	0	0	0	3
SW	0	1	1	2	0	0	0	0	0	0	0	0	4
WSW	0	1	0	1	0	0	0	0	0	0	0	0	2
W	0	0	1	2	1	2	1	0	0	0	0	0	7
WNW	0	0	0	0	0	2	0	1	0	0	0	0	3
NW	0	0	0	0	1	0	1	0	0	0	0	0	2
NNW	0	1	0	1	0	1	0	0	0	0	0	0	3
TOTALS	0	5	8	48	46	95	51	4	0	0	0	0	257

NUMBER OF VALID HOURS 257
NUMBER OF INVALID HOURS 8NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

METEOROLOGY

TABLE 4A
January - MarchSITE: SAN ONOFRE
PERIOD OF RECORD 95123124-96033123
WIND SPEED (M/S) AT 10 METER LEVELPASQUILL G
EXTREMELY STABLE (DT/DZ > 4.0 °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	0	1	1	5	11	2	0	0	0	0	20
NNE	0	0	1	8	9	99	139	16	1	0	0	0	273
NE	0	0	1	3	4	8	4	1	0	0	0	0	21
ENE	0	0	0	2	1	2	2	0	0	0	0	0	7
E	0	0	0	3	1	1	2	0	0	0	0	0	7
ESE	0	0	2	2	0	0	1	0	0	0	0	0	5
SE	0	0	0	3	1	1	5	0	0	0	0	0	10
SSE	0	0	0	0	1	0	2	0	0	0	0	0	3
S	0	0	0	1	0	0	0	0	0	0	0	0	1
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	0	0	0	0	1	0	0	0	0	0	0	0	1
WSW	0	0	0	1	0	0	0	0	0	0	0	0	1
W	0	0	0	1	2	3	0	0	0	0	0	0	6
WNW	0	0	0	1	0	1	2	0	0	0	0	0	4
NW	0	0	0	0	0	0	4	0	0	0	0	0	4
NNW	0	1	0	1	3	0	0	0	0	0	0	0	5
TOTALS	0	1	4	27	24	120	172	19	1	0	0	0	368

NUMBER OF VALID HOURS 368
NUMBER OF INVALID HOURS 8NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2184ALL STABILITY CLASSES, ALL DT/DZ
WIND SPEED (M/S) AT 10 METER LEVEL

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	4	14	14	37	34	3	0	0	0	0	106
NNE	0	3	8	47	83	223	210	19	1	0	0	0	594
NE	0	1	7	25	20	24	11	4	0	0	0	0	92
ENE	1	1	1	14	10	5	5	0	2	0	0	0	39
E	2	0	7	8	10	9	9	0	1	0	0	0	46
ESE	1	0	3	9	12	14	13	1	0	0	0	0	53
SE	0	1	0	18	7	35	63	33	4	0	0	0	161
SSE	0	0	4	7	18	35	53	19	6	7	0	0	149
S	0	1	1	15	15	31	52	9	5	2	0	0	131
SSW	0	1	4	9	9	30	27	8	1	0	0	0	89
SW	0	3	4	15	23	41	19	7	3	0	0	0	115
WSW	1	1	2	12	20	50	20	8	0	0	0	0	114
W	1	1	2	14	17	69	75	13	5	0	0	0	197
WNW	0	0	4	5	11	23	52	21	13	0	0	0	129
NW	0	2	1	8	4	20	38	19	5	0	0	0	97
NNW	0	3	4	12	11	12	19	3	0	0	0	0	64
TOTALS	6	18	56	232	284	658	700	167	46	9	0	0	2176

NUMBER OF VALID HOURS 2176
NUMBER OF INVALID HOURS 8NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

METEOROLOGY

TABLE 4A
April - JuneSITE: SAN ONOFRE
PERIOD OF RECORD 96033124-96063023
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL A

EXTREMELY UNSTABLE ($DT/DZ < -1.9$ °C/100 METERS)

WIND	.22-	.51-	.76-	1.1-	1.6-	2.1-	3.1-	5.1-	7.1-	10.1-	13.1-	>18	TOTAL
DIR	.50	.75	1.0	1.5	2.0	3.0	5.0	7.0	10.0	13.0	18.0		
N	0	0	0	0	0	0	0	0	0	0	0	0	0
NNE	0	1	0	0	0	0	0	0	0	0	0	0	1
NE	0	0	1	0	0	1	0	0	0	0	0	0	2
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	1	0	0	0	0	0	1
SSE	0	0	0	0	0	1	5	5	1	0	0	0	12
S	0	0	0	2	4	12	27	23	2	0	0	0	70
SSW	0	0	0	1	1	9	51	8	0	0	0	0	70
SW	0	0	1	3	6	52	86	7	0	0	0	0	155
WSW	0	0	0	2	8	50	106	2	0	0	0	0	168
W	0	0	0	0	3	52	130	6	0	0	0	0	191
WNW	0	0	0	0	2	6	34	16	2	0	0	0	60
NW	0	0	0	0	0	0	1	4	1	0	0	0	6
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	1	2	8	24	183	441	71	6	0	0	0	736

NUMBER OF VALID HOURS 736
NUMBER OF INVALID HOURS 5NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2184

PASQUILL B

MODERATELY UNSTABLE ($-1.9 < DT/DZ \leq -1.7$ °C/100)

WIND	.22-	.51-	.76-	1.1-	1.6-	2.1-	3.1-	5.1-	7.1-	10.1-	13.1-	>18	TOTAL
DIR	.50	.75	1.0	1.5	2.0	3.0	5.0	7.0	10.0	13.0	18.0		
N	0	0	0	0	0	0	0	0	0	0	0	0	0
NNE	0	0	0	0	1	0	0	0	0	0	0	0	1
NE	0	0	0	0	0	0	1	0	0	0	0	0	1
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	2	0	1	0	0	0	0	3
SSE	0	0	0	0	1	4	1	1	2	0	0	0	9
S	0	0	0	0	1	2	8	3	0	0	0	0	14
SSW	0	0	0	0	2	3	6	3	0	0	0	0	14
SW	0	0	0	1	2	6	4	0	0	0	0	0	13
WSW	0	0	0	1	3	4	1	0	0	0	0	0	9
W	0	0	0	0	2	5	0	0	0	0	0	0	7
WNW	0	0	0	0	0	2	5	0	0	0	0	0	7
NW	0	0	0	0	0	0	1	1	0	0	0	0	2
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	2	12	28	27	9	2	0	0	0	80

NUMBER OF VALID HOURS 80
NUMBER OF INVALID HOURS 5NUMBER OF CALMS 1
TOTAL HOURS FOR THE PERIOD 2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

METEOROLOGY

TABLE 4A
April - JuneSITE: SAN ONOFRE
PERIOD OF RECORD 96033124-96063023
WIND SPEED (M/S) AT 10 METER LEVELPASQUILL C
SLIGHTLY UNSTABLE ($-1.7 < DT/DZ \leq -1.5$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	0	0	0	0	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	1	0	0	0	0	0	1
SE	0	0	0	0	0	0	5	0	0	0	0	0	5
SSE	0	0	0	0	0	0	7	5	0	0	0	0	12
S	0	0	0	0	0	4	9	1	1	0	0	0	15
SSW	0	0	1	1	4	3	6	2	0	0	0	0	17
SW	0	0	0	2	0	5	5	0	0	0	0	0	12
WSW	0	0	0	0	2	3	2	0	0	0	0	0	7
W	0	0	0	1	0	2	0	0	0	0	0	0	3
WNW	0	0	0	0	2	6	4	0	0	0	0	0	12
NW	0	0	0	0	0	2	4	1	0	0	0	0	7
NNW	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTALS	0	0	1	4	8	26	43	9	1	0	0	0	92

NUMBER OF VALID HOURS 92
NUMBER OF INVALID HOURS 5NUMBER OF CALMS 1
TOTAL HOURS FOR THE PERIOD 2184PASQUILL D
NEUTRAL ($-1.5 < DT/DZ \leq -0.5$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	1	11	5	5	0	0	0	0	0	0	22
NNE	0	1	2	10	6	19	2	0	0	0	0	0	40
NE	0	0	0	3	5	8	1	0	0	0	0	0	17
ENE	0	0	0	1	1	3	0	0	0	0	0	0	5
E	0	0	0	2	6	10	9	1	0	0	0	0	28
ESE	0	0	0	3	2	16	6	1	0	0	0	0	28
SE	1	1	3	2	10	54	53	8	0	0	0	0	132
SSE	0	0	1	7	10	36	40	8	1	0	0	0	103
S	0	0	0	8	9	26	25	4	1	0	0	0	73
SSW	0	0	3	7	8	16	17	5	0	1	0	0	57
SW	0	1	4	2	7	18	11	0	1	0	0	0	44
WSW	2	0	2	7	9	4	6	0	0	0	0	0	30
W	0	1	1	6	7	3	3	0	0	0	0	0	21
WNW	0	0	0	6	7	7	8	2	0	0	0	0	30
NW	1	0	1	1	6	15	14	5	0	0	0	0	43
NNW	0	0	1	4	7	6	4	0	0	0	0	0	22
TOTALS	4	4	19	80	105	246	199	34	3	1	0	0	695

NUMBER OF VALID HOURS 695
NUMBER OF INVALID HOURS 5NUMBER OF CALMS 1
TOTAL HOURS FOR THE PERIOD 2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

METEOROLOGY

TABLE 4A
April - JuneSITE: SAN ONOFRE
PERIOD OF RECORD 96033124-96063023
WIND SPEED (M/S) AT 10 METER LEVELPASQUILL E
SLIGHTLY STABLE ($-0.5 < DT/DZ \leq -1.5$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	1	8	2	5	2	0	0	0	0	0	18
NNE	0	2	2	20	18	19	3	0	0	0	0	0	64
NE	0	2	2	11	3	3	1	0	0	0	0	0	22
ENE	0	4	0	2	2	3	0	0	0	0	0	0	11
E	0	0	1	3	5	11	2	0	0	0	0	0	22
ESE	0	0	0	0	4	1	0	0	0	0	0	0	5
SE	0	0	0	0	3	3	0	0	0	0	0	0	6
SSE	0	1	0	3	3	1	7	0	0	0	0	0	15
S	0	0	1	1	0	1	2	0	0	0	0	0	5
SSW	0	1	0	2	0	1	0	0	0	0	0	0	4
SW	0	1	0	2	1	0	0	0	0	0	0	0	4
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	2	4	4	1	0	0	0	0	0	11
WNW	0	1	0	0	1	2	1	0	0	0	0	0	5
NW	0	0	2	3	0	1	0	0	0	0	0	0	6
NNW	0	0	2	0	0	2	1	0	0	0	0	0	5
TOTALS	0	12	11	57	46	57	20	0	0	0	0	0	203

NUMBER OF VALID HOURS 203
NUMBER OF INVALID HOURS 5NUMBER OF CALMS 1
TOTAL HOURS FOR THE PERIOD 2184PASQUILL F
MODERATELY STABLE ($1.5 \leq DT/DZ \leq -0.5$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	0	1	3	6	1	0	0	0	0	0	11
NNE	1	0	2	11	32	40	6	0	0	0	0	0	92
NE	0	1	3	15	5	3	0	0	0	0	0	0	27
ENE	0	0	0	5	1	1	0	0	0	0	0	0	7
E	0	0	1	2	2	0	0	0	0	0	0	0	5
ESE	0	0	0	0	2	0	0	0	0	0	0	0	2
SE	0	0	0	0	1	1	2	0	0	0	0	0	4
SSE	0	0	0	0	1	2	1	0	0	0	0	0	4
S	0	0	0	4	0	0	0	0	0	0	0	0	4
SSW	0	0	0	1	1	0	0	0	0	0	0	0	2
SW	0	0	1	0	0	0	0	0	0	0	0	0	1
WSW	0	1	0	1	1	0	0	0	0	0	0	0	3
W	0	0	0	1	0	3	0	0	0	0	0	0	4
WNW	0	1	0	1	0	1	0	0	0	0	0	0	3
NW	0	0	1	0	0	1	1	0	0	0	0	0	3
NNW	0	0	0	0	0	2	0	0	0	0	0	0	2
TOTALS	1	3	8	42	49	60	11	0	0	0	0	0	174

NUMBER OF VALID HOURS 174
NUMBER OF INVALID HOURS 5NUMBER OF CALMS 1
TOTAL HOURS FOR THE PERIOD 2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

METEOROLOGY

TABLE 4A
April - JuneSITE: SAN ONOFRE
PERIOD OF RECORD 96033124-96063023
WIND SPEED (M/S) AT 10 METER LEVELPASQUILL G
EXTREMELY STABLE (DT/DZ > 4.0 °C/100 METERS)

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	1	0	1	1	4	0	0	0	0	0	7
NNE	0	0	0	6	14	83	39	4	0	0	0	0	146
NE	0	0	0	4	5	5	1	0	0	0	0	0	15
ENE	0	0	0	1	2	0	0	0	0	0	0	0	3
E	0	0	0	1	1	0	0	0	0	0	0	0	2
ESE	0	0	0	0	0	1	0	0	0	0	0	0	1
SE	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	1	0	1	0	0	0	0	0	0	2
S	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	0	0	2	2	0	0	0	0	0	0	0	0	4
SW	0	0	0	0	1	1	0	0	0	0	0	0	2
WSW	0	0	1	1	1	0	0	0	0	0	0	0	3
W	0	0	0	1	0	2	0	0	0	0	0	0	3
WNW	0	0	0	0	1	3	4	0	0	0	0	0	8
NW	0	0	0	0	0	0	2	0	0	0	0	0	2
NNW	0	0	1	0	0	0	0	0	0	0	0	0	1
TOTALS	0	0	5	17	26	97	50	4	0	0	0	0	199

NUMBER OF VALID HOURS 199
NUMBER OF INVALID HOURS 5NUMBER OF CALMS 1
TOTAL HOURS FOR THE PERIOD 2184ALL STABILITY CLASSES, ALL DT/DZ
WIND SPEED (M/S) AT 10 METER LEVEL

WIND DIR	.22-.50	.51-.75	.76-1.0	1.1-1.5	1.6-2.0	2.1-3.0	3.1-5.0	5.1-7.0	7.1-10.0	10.1-13.0	13.1-18.0	>18	TOTAL
N	0	0	3	20	11	17	7	0	0	0	0	0	58
NNE	1	4	6	47	71	161	50	4	0	0	0	0	344
NE	0	3	6	33	18	20	4	0	0	0	0	0	84
ENE	0	4	0	9	6	7	0	0	0	0	0	0	26
E	0	0	2	8	14	21	11	1	0	0	0	0	57
ESE	0	0	0	3	8	18	7	1	0	0	0	0	37
SE	1	1	3	2	14	60	68	9	0	0	0	0	158
SSE	0	1	1	11	15	45	56	19	4	0	0	0	152
S	0	0	1	15	14	45	69	31	4	0	0	0	179
SSW	0	1	6	14	16	32	80	18	0	1	0	0	168
SW	0	2	6	11	17	82	106	7	0	0	0	0	231
WSW	2	1	3	12	24	61	115	2	1	0	0	0	221
W	0	1	1	10	16	71	134	6	0	0	0	0	239
WNW	0	2	0	7	13	27	56	18	2	0	0	0	125
NW	1	0	4	4	6	19	23	11	1	0	0	0	69
NNW	0	0	4	4	7	11	5	0	0	0	0	0	31
TOTALS	5	20	46	210	270	697	791	127	12	1	0	0	2179

NUMBER OF VALID HOURS 2179
NUMBER OF INVALID HOURS 5NUMBER OF CALMS 1
TOTAL HOURS FOR THE PERIOD 2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

METEOROLOGY

TABLE 4A
July - SeptemberSITE: SAN ONOFRE
PERIOD OF RECORD 96063024-96093023
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL A

EXTREMELY UNSTABLE ($DT/DZ < -1.9$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	0	0	0	0	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	1	0	0	0	0	0	0	0	0	0	1
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	1	0	0	0	0	0	1	0	0	0	0	0	2
SSE	0	0	0	1	2	2	1	1	0	0	0	0	7
S	0	0	0	2	2	21	32	9	0	0	0	0	66
SSW	0	0	0	0	2	19	20	3	0	0	0	0	44
SW	0	0	0	4	9	33	36	0	0	0	0	0	82
WSW	0	0	0	2	19	87	57	3	0	0	0	0	168
W	0	0	0	2	9	80	173	4	0	0	0	0	268
WNW	0	0	0	0	1	21	71	7	0	0	0	0	100
NW	0	0	0	0	0	0	2	3	0	0	0	0	5
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	1	0	1	11	44	263	393	30	0	0	0	0	743

NUMBER OF VALID HOURS 743
NUMBER OF INVALID HOURS 8NUMBER OF CALMS 1
TOTAL HOURS FOR THE PERIOD 2208

PASQUILL B

MODERATELY UNSTABLE ($-1.9 < DT/DZ \leq -1.7$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	0	0	0	0	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	1	1	3	0	0	0	0	0	5
S	0	0	1	1	0	4	2	0	0	0	0	0	8
SSW	0	0	0	0	0	3	7	1	0	0	0	0	11
SW	0	0	0	0	1	5	3	1	0	0	0	0	10
WSW	0	0	0	2	0	3	1	0	0	0	0	0	6
W	0	0	1	0	5	4	0	0	0	0	0	0	10
WNW	0	0	1	0	1	5	3	1	0	0	0	0	11
NW	0	0	0	0	0	0	1	0	0	0	0	0	1
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	3	3	8	25	20	3	0	0	0	0	62

NUMBER OF VALID HOURS 62
NUMBER OF INVALID HOURS 8NUMBER OF CALMS 1
TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

METEOROLOGY

TABLE 4A
July - SeptemberSITE: SAN ONOFRE
PERIOD OF RECORD 96063024-96093023
WIND SPEED (M/S) AT 10 METER LEVELPASQUILL C
SLIGHTLY UNSTABLE ($-1.7 < DT/DZ \leq -1.5$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	0	0	0	0	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	1	0	0	0	0	0	1
SSE	0	0	0	0	1	4	4	3	0	0	0	0	12
S	0	0	0	0	3	1	6	0	0	0	0	0	10
SSW	0	0	0	1	3	4	4	2	0	0	0	0	14
SW	0	0	0	1	3	5	5	0	0	0	0	0	14
WSW	0	0	0	2	2	6	1	0	0	0	0	0	11
W	0	0	0	2	5	6	2	0	0	0	0	0	15
WNW	0	0	0	1	3	3	4	0	0	0	0	0	11
NW	0	0	0	0	3	1	2	0	0	0	0	0	6
NNW	0	0	0	0	0	0	1	0	0	0	0	0	1
TOTALS	0	0	0	7	23	30	30	5	0	0	0	0	95

NUMBER OF VALID HOURS 95
NUMBER OF INVALID HOURS 8NUMBER OF CALMS 1
TOTAL HOURS FOR THE PERIOD 2208PASQUILL D
NEUTRAL ($-1.5 < DT/DZ \leq -0.5$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	1	0	0	21	16	5	2	0	0	0	0	0	45
NNE	0	2	2	15	13	9	2	0	0	0	0	0	43
NE	0	0	1	6	4	5	0	0	0	0	0	0	16
ENE	1	0	0	3	4	1	0	0	0	0	0	0	9
E	1	0	0	3	3	6	4	0	0	0	0	0	17
ESE	1	0	0	2	3	4	3	0	0	0	0	0	13
SE	1	0	2	5	10	49	46	2	0	0	0	0	115
SSE	0	0	1	15	13	31	52	10	0	0	0	0	122
S	0	1	6	14	21	15	27	2	0	0	0	0	86
SSW	1	1	5	11	13	20	23	2	0	0	0	0	76
SW	1	3	4	11	18	9	11	0	0	0	0	0	57
WSW	0	3	3	10	16	14	1	0	0	0	0	0	47
W	2	2	7	22	12	18	3	0	0	0	0	0	66
WNW	0	1	5	19	28	20	8	0	0	0	0	0	81
NW	0	1	5	14	9	17	9	0	0	0	0	0	55
NNW	1	1	2	9	8	11	2	0	0	0	0	0	34
TOTALS	10	15	43	180	191	234	193	16	0	0	0	0	882

NUMBER OF VALID HOURS 882
NUMBER OF INVALID HOURS 8NUMBER OF CALMS 1
TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

METEOROLOGY

TABLE 4A

July - September

SITE: SAN ONOFRE
 PERIOD OF RECORD 96063024-96093023
 WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL E

SLIGHTLY STABLE ($-0.5 < DT/DZ \leq -1.5$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	1	2	1	14	12	6	1	1	0	0	0	0	38
NNE	0	2	3	29	16	17	2	0	0	0	0	0	69
NE	1	2	1	10	2	1	0	0	0	0	0	0	17
ENE	0	2	1	4	1	0	0	0	0	0	0	0	8
E	0	0	1	1	2	0	0	0	0	0	0	0	4
ESE	0	0	0	2	0	0	0	0	0	0	0	0	2
SE	0	1	1	1	1	6	6	1	0	0	0	0	17
SSE	0	0	1	3	7	2	3	1	0	0	0	0	17
S	0	3	2	3	1	2	0	0	0	0	0	0	11
SSW	0	1	1	1	0	1	0	0	0	0	0	0	4
SW	1	0	0	1	0	0	0	0	0	0	0	0	2
WSW	0	0	1	0	1	1	0	0	0	0	0	0	3
W	0	0	0	2	1	2	1	0	0	0	0	0	6
WNW	1	0	0	3	1	1	0	0	0	0	0	0	6
NW	0	1	1	3	0	0	0	0	0	0	0	0	5
NNW	2	1	0	2	1	3	0	0	0	0	0	0	9
TOTALS	6	15	14	79	46	42	13	3	0	0	0	0	218

NUMBER OF VALID HOURS 218
 NUMBER OF INVALID HOURS 8

NUMBER OF CALMS 1
 TOTAL HOURS FOR THE PERIOD 2208

PASQUILL F

MODERATELY STABLE ($1.5 \leq DT/DZ \leq -0.5$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	0	3	1	2	3	0	0	0	0	0	9
NNE	0	0	1	11	29	30	7	0	0	0	0	0	78
NE	0	1	4	4	2	0	0	0	0	0	0	0	11
ENE	0	1	1	2	1	0	0	0	0	0	0	0	5
E	0	0	0	3	1	0	0	0	0	0	0	0	4
ESE	0	0	1	0	0	0	0	0	0	0	0	0	1
SE	0	0	0	0	0	2	0	0	0	0	0	0	2
SSE	0	0	0	0	1	1	0	0	0	0	0	0	2
S	0	0	1	0	0	0	0	0	0	0	0	0	1
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	0	0	0	1	0	0	0	0	0	0	0	0	1
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	1	0	0	0	0	0	0	0	0	1
WNW	0	0	0	0	0	2	0	0	0	0	0	0	2
NW	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	2	8	25	35	37	10	0	0	0	0	0	117

NUMBER OF VALID HOURS 117
 NUMBER OF INVALID HOURS 8

NUMBER OF CALMS 1
 TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

METEOROLOGY

TABLE 4A
July - SeptemberSITE: SAN ONOFRE
PERIOD OF RECORD 96063024-96093023
WIND SPEED (M/S) AT 10 METER LEVELPASQUILL G
EXTREMELY STABLE (DT/DZ > 4.0 °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	1	0	0	1	2	0	0	0	0	0	0	4
NNE	0	0	1	0	8	47	17	0	0	0	0	0	73
NE	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	1	0	0	0	0	0	0	0	1
SE	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	1	0	0	0	0	0	0	1
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	0	0	0	1	0	0	0	0	0	0	0	0	1
W	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	0	0	0	0	0	1	2	0	0	0	0	0	3
NW	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	1	1	1	10	51	19	0	0	0	0	0	83

NUMBER OF VALID HOURS 83
NUMBER OF INVALID HOURS 8NUMBER OF CALMS 1
TOTAL HOURS FOR THE PERIOD 2208ALL STABILITY CLASSES, ALL DT/DZ
WIND SPEED (M/S) AT 10 METER LEVEL

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	2	3	1	38	30	15	6	1	0	0	0	0	96
NNE	0	4	7	55	66	103	28	0	0	0	0	0	263
NE	1	3	6	20	8	6	0	0	0	0	0	0	44
ENE	1	3	3	9	6	1	0	0	0	0	0	0	23
E	1	0	1	7	6	6	4	0	0	0	0	0	25
ESE	1	0	1	4	4	4	3	0	0	0	0	0	17
SE	2	1	3	6	11	57	54	3	0	0	0	0	137
SSE	0	0	2	19	25	41	63	15	0	0	0	0	165
S	0	4	10	20	27	44	67	11	0	0	0	0	183
SSW	1	2	6	13	18	47	54	8	0	0	0	0	149
SW	2	3	4	18	31	52	55	1	0	0	0	0	166
WSW	0	3	4	17	38	111	60	3	0	0	0	0	236
W	2	2	8	29	32	110	179	4	0	0	0	0	366
WNW	1	1	6	23	34	53	88	8	0	0	0	0	214
NW	0	2	6	17	12	18	14	3	0	0	0	0	72
NNW	3	2	2	11	9	14	3	0	0	0	0	0	44
TOTALS	17	33	70	306	357	682	678	57	0	0	0	0	2200

NUMBER OF VALID HOURS 2200
NUMBER OF INVALID HOURS 8NUMBER OF CALMS 1
TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

METEOROLOGY

TABLE 4A
October - DecemberSITE: SAN ONOFRE
PERIOD OF RECORD 96093024-96123123
WIND SPEED (M/S) AT 10 METER LEVELPASQUILL A
EXTREMELY UNSTABLE ($DT/DZ < -1.9$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	0	0	0	0	0	1	0	0	0	0	1
NNE	0	0	0	0	0	1	0	4	0	0	0	0	5
NE	0	0	0	0	1	0	1	1	1	0	0	0	4
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	2	0	1	0	0	0	0	3
SSE	0	0	0	0	0	1	7	3	0	0	0	0	11
S	0	0	0	3	4	10	13	0	3	0	0	0	33
SSW	0	0	0	0	3	9	3	0	0	0	0	0	15
SW	0	0	1	1	7	13	6	3	0	0	0	0	31
WSW	0	0	0	3	11	26	24	1	0	0	0	0	65
W	0	0	0	0	6	73	51	3	0	0	0	0	133
WNW	0	0	0	1	4	17	29	7	2	0	0	0	60
NW	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	1	8	36	152	134	24	6	0	0	0	361

NUMBER OF VALID HOURS 361
NUMBER OF INVALID HOURS 9NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2208PASQUILL B
MODERATELY UNSTABLE ($-1.9 < DT/DZ \leq -1.7$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	0	0	0	0	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0	1	0	0	0	0	1
NE	0	0	0	0	0	0	0	1	0	0	0	0	1
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	1	1	0	0	0	0	2
SSE	0	0	0	1	0	1	3	0	2	0	0	0	7
S	0	0	0	0	1	3	0	1	0	0	0	0	5
SSW	0	0	0	1	0	1	1	0	0	0	0	0	3
SW	0	0	0	0	1	0	2	1	0	0	0	0	4
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	0	2	5	0	0	0	0	0	0	7
WNW	0	0	0	0	0	2	2	1	0	0	0	0	5
NW	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	2	4	12	9	6	2	0	0	0	35

NUMBER OF VALID HOURS 35
NUMBER OF INVALID HOURS 9NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

METEOROLOGY

TABLE 4A
October - DecemberSITE: SAN ONOFRE
PERIOD OF RECORD 96093024-96123123
WIND SPEED (M/S) AT 10 METER LEVELPASQUILL C
SLIGHTLY UNSTABLE ($-1.7 < DT/DZ \leq -1.5$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	0	0	0	1	0	0	0	0	0	0	1
NNE	0	0	0	0	0	0	0	0	0	0	0	0	0
NE	0	0	0	0	1	0	2	3	1	0	0	0	7
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	1	3	1	0	0	0	0	5
SSE	0	0	0	1	0	2	7	0	1	0	0	0	11
S	0	0	1	0	1	1	0	0	0	0	0	0	3
SSW	0	0	0	0	0	2	3	0	0	0	0	0	5
SW	0	0	0	0	0	1	4	0	0	0	0	0	5
WSW	0	0	0	0	2	2	0	1	0	0	0	0	5
W	0	0	0	1	2	0	0	0	0	0	0	0	3
WNW	0	0	0	0	0	1	0	0	0	0	0	0	1
NW	0	0	0	0	0	1	2	1	0	0	0	0	4
NNW	0	0	0	0	0	0	0	1	0	0	0	0	1
TOTALS	0	0	1	2	6	12	21	7	2	0	0	0	51

NUMBER OF VALID HOURS 51
NUMBER OF INVALID HOURS 9NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2208PASQUILL D
NEUTRAL ($-1.5 < DT/DZ \leq -0.5$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	1	0	3	5	6	11	4	3	0	0	0	0	33
NNE	0	0	5	7	8	14	5	0	0	0	0	0	39
NE	0	1	1	4	4	5	5	8	3	0	0	0	31
ENE	0	2	2	2	2	1	2	2	1	0	0	0	14
E	0	0	2	4	3	3	1	0	0	0	0	0	13
ESE	0	0	0	0	1	8	7	1	1	0	0	0	18
SE	0	0	1	0	3	23	67	45	15	0	0	0	154
SSE	0	2	2	6	6	20	27	8	8	1	1	0	81
S	0	2	1	7	8	11	17	9	5	1	0	0	61
SSW	0	1	0	9	9	5	7	1	1	0	0	0	33
SW	1	1	2	10	6	3	4	3	0	2	0	0	32
WSW	0	1	4	7	5	5	7	5	0	0	0	0	34
W	0	0	3	7	6	9	4	0	1	0	0	0	30
WNW	0	1	0	10	3	10	15	1	5	1	0	0	46
NW	0	0	1	3	8	17	26	1	0	0	0	0	56
NNW	1	0	2	9	10	11	8	1	0	0	0	0	42
TOTALS	3	11	29	90	88	156	206	88	40	5	1	0	717

NUMBER OF VALID HOURS 717
NUMBER OF INVALID HOURS 9NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

METEOROLOGY

TABLE 4A
October - DecemberSITE: SAN ONOFRE
PERIOD OF RECORD 96093024-96123123
WIND SPEED (M/S) AT 10 METER LEVELPASQUILL E
SLIGHTLY STABLE ($-0.5 < DT/DZ \leq -1.5$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	0	6	7	15	9	2	0	0	0	0	39
NNE	0	1	6	14	18	31	22	8	1	0	0	0	101
NE	0	3	0	7	1	5	11	9	9	4	0	0	49
ENE	1	1	3	4	2	2	1	3	0	0	0	0	17
E	0	2	2	1	1	1	1	0	0	0	0	0	8
ESE	0	1	0	0	2	3	0	0	0	0	0	0	6
SE	1	0	0	4	2	4	10	3	2	0	0	0	26
SSE	0	1	2	3	3	8	6	5	0	0	0	0	28
S	0	0	0	0	1	0	0	0	3	1	0	0	5
SSW	0	1	1	1	0	0	2	3	1	2	1	0	12
SW	0	0	2	2	1	1	0	3	1	0	0	0	10
WSW	0	0	1	1	5	0	0	1	0	0	0	0	8
W	0	2	1	2	2	4	1	1	0	0	0	0	13
WNW	1	1	0	0	1	4	2	0	0	0	0	0	9
NW	0	1	1	0	5	7	2	0	0	0	0	0	16
NNW	0	2	0	3	4	7	2	0	0	0	0	0	18
TOTALS	3	16	19	48	55	92	69	38	17	7	1	0	365

NUMBER OF VALID HOURS 365
NUMBER OF INVALID HOURS 9NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2208PASQUILL F
MODERATELY STABLE ($1.5 \leq DT/DZ \leq -0.5$ °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	2	4	3	5	3	0	0	0	0	0	17
NNE	1	0	2	17	32	57	33	3	0	0	0	0	145
NE	0	1	5	9	10	10	7	2	0	0	0	0	44
ENE	0	0	0	6	0	0	0	0	0	0	0	0	6
E	0	1	1	3	1	1	1	0	0	0	0	0	8
ESE	0	0	2	1	1	1	0	0	0	0	0	0	5
SE	0	1	1	1	0	1	0	0	0	0	0	0	4
SSE	0	0	0	0	2	0	0	0	0	0	0	0	2
S	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	0	0	0	1	0	0	0	0	0	0	0	0	1
SW	0	1	0	0	0	0	0	0	0	0	0	0	1
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	1	3	4	1	0	0	0	0	0	9
WNW	2	0	0	0	0	3	0	0	0	0	0	0	5
NW	0	0	0	1	0	0	0	0	0	0	0	0	1
NNW	0	0	0	1	2	1	0	0	0	0	0	0	4
TOTALS	3	4	13	45	54	83	45	5	0	0	0	0	252

NUMBER OF VALID HOURS 252
NUMBER OF INVALID HOURS 9NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1996)

METEOROLOGY

TABLE 4A
October - DecemberSITE: SAN ONOFRE
PERIOD OF RECORD 96093024-96123123
WIND SPEED (M/S) AT 10 METER LEVELPASQUILL G
EXTREMELY STABLE (DT/DZ > 4.0 °C/100 METERS)

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	0	0	0	3	2	2	10	3	0	0	0	0	20
NNE	0	0	1	5	16	117	157	15	0	0	0	0	311
NE	0	0	0	5	15	16	10	0	0	0	0	0	46
ENE	0	0	2	3	2	1	0	0	0	0	0	0	8
E	0	0	1	2	0	0	0	0	0	0	0	0	3
ESE	0	0	0	1	0	0	0	0	0	0	0	0	1
SE	0	0	0	1	0	2	1	0	0	0	0	0	4
SSE	0	0	2	1	0	2	1	0	0	0	0	0	6
S	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	0	0	0	2	0	0	0	0	0	0	0	0	2
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	0	2	3	1	0	0	0	0	0	6
WNW	0	0	0	1	0	2	2	0	0	0	0	0	5
NW	0	0	1	0	0	0	1	0	0	0	0	0	2
NNW	1	0	0	1	0	2	0	0	0	0	0	0	4
TOTALS	1	0	7	25	37	147	183	18	0	0	0	0	418

NUMBER OF VALID HOURS 418
NUMBER OF INVALID HOURS 9NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2208ALL STABILITY CLASSES, ALL DT/DZ
WIND SPEED (M/S) AT 10 METER LEVEL

WIND DIR	.22- .50	.51- .75	.76- 1.0	1.1- 1.5	1.6- 2.0	2.1- 3.0	3.1- 5.0	5.1- 7.0	7.1- 10.0	10.1- 13.0	13.1- 18.0	>18	TOTAL
N	1	0	5	18	18	34	26	9	0	0	0	0	111
NNE	1	1	14	43	74	220	217	31	1	0	0	0	602
NE	0	5	6	25	32	36	36	24	14	4	0	0	182
ENE	1	3	7	15	6	4	3	5	1	0	0	0	45
E	0	3	6	10	5	5	3	0	0	0	0	0	32
ESE	0	1	2	2	4	12	7	1	1	0	0	0	30
SE	1	1	2	6	5	33	82	51	17	0	0	0	198
SSE	0	3	6	12	11	34	51	16	11	1	1	0	146
S	0	2	2	10	15	25	30	10	11	2	0	0	107
SSW	0	2	1	12	12	17	16	4	2	2	1	0	69
SW	1	2	5	15	15	18	16	10	1	2	0	0	85
WSW	0	1	5	11	23	33	31	8	0	0	0	0	112
W	0	2	4	11	23	98	58	4	1	0	0	0	201
WNW	3	2	0	12	8	39	50	9	7	1	0	0	131
NW	0	1	3	4	13	25	31	2	0	0	0	0	79
NNW	2	2	2	14	16	21	10	2	0	0	0	0	69
TOTALS	10	31	70	220	280	654	667	186	67	12	2	0	2199

NUMBER OF VALID HOURS 2199
NUMBER OF INVALID HOURS 9NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2208

