



SAN ONOFRE NUCLEAR GENERATING STATION

Annual Radioactive Effluent Release Report

1997

January - December

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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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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. Only 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	<LLD	2.17E-8	5.00E+1
D. Tritium				
1. Total release	Ci	2.92E-1	<LLD	2.50E+1
2. Average release rate for period	μCi/sec	3.76E-2	0.00E+0	
3. Percent of applicable limit	% MPC	2.44E-4	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	4.88E-4	0.00E+0	

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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	<LLD	4.69E-8	5.00E+1
D. Tritium				
1. Total release	Ci	1.73E-1	<LLD	2.50E+1
2. Average release rate for period	μCi/sec	2.18E-2	0.00E+0	
3. Percent of applicable limit	% MPC	1.41E-4	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	2.83E-4	0.00E+0	

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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	4.60E-13
cerium-141	5.80E-14
cerium-144	2.40E-13
cesium-134	1.40E-13
cesium-137	1.10E-13
cobalt-58	1.30E-13
cobalt-60	2.00E-13
iron-59	3.10E-13
lanthanum-140	7.60E-13
manganese-54	1.30E-13
molybdenum-99	6.10E-14
strontium-89	1.00E-14
strontium-90	1.00E-15
zinc-65	3.30E-13
4. gross alpha	1.00E-14

E: 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	mrad	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	mrad	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	1.04E-5	0.00E+0	6.46E-6	0.00E+0
6. Percent Applicable Limit	%	1.39E-4	0.00E+0	8.61E-5	0.00E+0

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 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	4.43E-5	2.44E-5	1.90E+1
2. Average diluted concentration during period	μCi/ml	2.79E-11	1.59E-11	
3. Percent of applicable limit	% MPC	1.35E-4	7.26E-5	
4. Percent Effluent Concentration Limit	% ECL	2.69E-3	1.41E-3	
B. Tritium				
1. Total release	Ci	<LLD	6.97E-5	1.90E+1
2. Average diluted concentration during period	μCi/ml	0.00E+0	4.56E-11	
3. Percent of applicable limit	% MPC	0.00E+0	1.52E-6	
4. Percent Effluent Concentration Limit	% ECL	0.00E+0	4.56E-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	7.24E+5	1.48E+5	5.00E+0
F. Volume of dilution water used during period	liters	1.59E+9	1.53E+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	4.62E-5	1.06E-4	1.90E+1
2. Average diluted concentration during period	μCi/ml	2.73E-11	6.67E-11	
3. Percent of applicable limit	% MPC	1.32E-4	2.25E-4	
4. Percent Effluent Concentration Limit	% ECL	2.62E-3	4.01E-3	
B. Tritium				
1. Total release	Ci	2.62E-4	<LLD	1.90E+1
2. Average diluted concentration during period	μCi/ml	1.55E-10	0.00E+0	
3. Percent of applicable limit	% MPC	5.17E-6	0.00E+0	
4. Percent Effluent Concentration Limit	% ECL	1.55E-5	0.00E+0	
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	7.47E+5	6.86E+5	5.00E+0
F. Volume of dilution water used during period	liters	1.69E+9	1.59E+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	<LLD	7.53E-8	<LLD	<LLD
cesium-137	Ci	4.27E-5	2.14E-5	4.41E-5	6.15E-5
chromium-51	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-58	Ci	1.63E-6	2.96E-6	2.11E-6	4.47E-5
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	4.43E-5	2.44E-5	4.62E-5	1.06E-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					
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
chromium-51	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-58	Ci	<LLD	<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	<LLD	<LLD	<LLD	<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
cesium-134	1.10E-7
chromium-51	4.70E-7
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

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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	
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	4.53E-4	2.51E-4	4.80E-4	7.43E-4
2. Percent Applicable Limit	%	3.02E-2	1.67E-2	3.20E-2	4.95E-2
B.					
1. Limiting organ dose	mrem	6.90E-4	3.77E-4	7.29E-4	1.05E-3
2. Percent Applicable Limit	%	1.38E-2	7.54E-3	1.46E-2	2.09E-2
3. Limiting organ for period		Liver	Liver	Liver	Liver

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TABLE 2E

LIQUID EFFLUENTS-BATCH RELEASE SUMMARY

	12 month period
1. Number of batch releases:	0 release
2. Total time period for batch releases:	0 minutes
3. Maximum time period for a batch release:	0 minutes
4. Average time period for a batch release:	0 minutes
5. Minimum time period for a batch release:	0 minutes
Average saltwater flow during batch releases:	0 gpm

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SECTION D. PREVIOUS RADIOACTIVE EFFLUENT RELEASE REPORT ADDENDUM (1996)

The contents of the Unit 1 liquid radwaste center holdup tank was released to the outfall on August 6, 1996. Contrary to the Unit 1 ODCM requirement that a monthly composite of batch releases be analyzed for alpha, strontium-89, strontium-90, and iron-55, a sample of this release was not sent out for offsite analysis. However, a sample of the tank was analyzed on-site for gamma emitters and tritium. This incident was documented in action request 980100477. Using the ratio of each beta emitter to total gamma activity for the previous liquid radwaste holdup tank release in November, isotopic concentrations were derived for Fe-55, Sr-89, and Sr-90; no alpha was detected in the November 1995 tank. These values were then used to calculate the total curies of these isotopes and any resultant dose to the public from the August 1996 release.

TABLE 2A: There was no change in the total number of curies for the third quarter Unit 1 liquid releases ($4.31\text{E-}2$ curies).

TABLE 2B (1996)
LIQUID EFFLUENTS
BATCH MODE

Radionuclides Released	Unit	Third Quarter
1. Fission and activation products		
iron-55	Ci	$3.95\text{E-}5$
strontium-89	Ci	$4.17\text{E-}7$
strontium-90	Ci	$3.07\text{E-}7$

TABLE 2D (1996)
LIQUID EFFLUENTS-RADIATION DOSES AT LIQUID SITE BOUNDARY

	Unit	Third Quarter
A.		
1. Total Body Dose	mrem	$1.95\text{E-}1$
2. Percent Applicable Limit	%	$1.30\text{E+}1$
B.		
1. Limiting Organ Dose	mrem	$8.69\text{E-}1$
2. Percent Applicable Limit	%	$1.74\text{E+}1$
3. Limiting Organ for period		GI-LLI

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SECTION H. 10 CFR50 APPENDIX I REQUIREMENTS (1996)

TABLE 1 (1996)

SOURCE	DOSE (millirems)	
	Third Quarter	Year
LIQUID EFFLUENTS		
Whole Body	¹⁾ 1.95E-1	¹⁾ 2.17E-1
Organ(GI-LLI)	²⁾ 8.69E-1	²⁾ 9.64E-1

1. This data was calculated using the methodology of the ODCM.
2. This data was calculated using the methodology of the ODCM; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.

TABLE 2 (1996)

SOURCE	Percent Applicable Limit	
	Third Quarter	Year
LIQUID EFFLUENTS		
Whole Body	1.30E+1	7.23E+0
Organ (GI-LLI)	1.74E+1	9.64E+0

SECTION L. S.O.N.G.S 1 CONCLUSIONS (1996)

- Liquid Curie totals did not change.
- The radiation doses from liquid release are: (a) Total Body: 2.17E-1 mrem, (b) Limiting Organ (GI-LLI): 9.64E-1 mrem.
- The 1996 total curies did not change. The individual curie contribution of Fe-55, Sr-89 and Sr-90 are noted on Table 2B changes. Previously they were <LLD. However, the third quarter and annual whole body and organ doses were changed, along with the percent applicable limits, as noted above.

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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. 12.

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

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 Units 1 ODCM, Rev. 12.

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

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:

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

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

SOURCE	Dose * (millirems)				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
LIQUID EFFLUENTS	1)	2)	3)	4)	5)
Whole Body	4.53E-4	2.51E-4	4.80E-4	7.43E-4	1.93E-3
Organ	6)	7)	8)	9)	10)
	6.90E-4	3.77E-4	7.29E-4	1.05E-3	2.84E-3
AIRBORNE EFFLUENTS	11)	12)	13)	14)	15)
Tritium, Iodines, and Particulates	2.97E-4	0.00E+0	1.36E-4	0.00E+0	4.33E-4
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)
	1.25E-1	9.67E-2	1.46E-1	1.67E-1	5.34E-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 liver 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 liver 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 liver 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. There was no activity detected during the release period, therefore the reported organ dose was 0.00E+0 mrem.
13. The maximum organ dose was to a child's thyroid and was located in the NW sector. This was calculated using the assumptions of USNRC Regulatory Guide 1.109.
14. There was no activity detected during the release period, therefore the reported organ dose was 0.00E+0 mrem.
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.

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24. There was no activity detected during the release period, therefore the reported air dose for beta radiation was 0.00E+0 mrad.
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 SSE 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 NE 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 NE 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 W 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 sectors for each quarter.

TABLE 2

SOURCE	Percent Applicable Limit				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
LIQUID EFFLUENTS					
Whole Body	3.02E-2	1.67E-2	3.20E-2	4.95E-2	6.42E-2
Organ	1.38E-2	7.54E-3	1.46E-2	2.09E-2	2.84E-2
AIRBORNE EFFLUENTS					
Tritium, Iodines, and Particulates	3.96E-3	0.00E+0	1.81E-3	0.00E+0	2.89E-3
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

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

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SECTION I. CHANGES TO OFFSITE DOSE CALCULATION MANUAL

On January 29, 1997, revision 12 to the Unit 1 Offsite Dose Calculation Manual (ODCM) was adopted and published. In this revision the land use census changes were incorporated and the Plant Vent Stack flow rate device associated with wide range gas monitor, R1254, which had been inoperable for several years was removed from Tables 4-3 and 4-4. An approved safety evaluation was generated for this change.

No safety evaluations were performed for implementing changes from the 1996 Land Use Census (LUC). These changes reflect results from routine updates and as such do not constitute a modification in methodology for determining activity released from the site and subsequent dose to a member of the public. The 1996 LUC was completed early enough to be included in this revision of the ODCM. The 1995 LUC data was not able to be included into revision 11. However, any changes due to the 1995 LUC were incorporated. The LUC for 1996 corrected several distances and X/Q and D/Q values. Due to the addition and deletion of locations from Table 2-12, several pages in section 2 were renumbered.

Per NRC Generic Letter 89-01, no safety review was required or performed for the correction of typographical errors.

The following is a complete list of changes:

- * Land Use Census changes per E. M. Goldin to P. K. Chang memos; "1995 Dose Parameters from SONGS Unit 1 and Units 2/3", dated March 26, 1996, and "1996 Dose Parameters for SONGS Unit 1", dated December 27, 1996.
- ° Drinking water changes per E. M. Goldin to P. K. Chang memo, "Revision of Tables for Environmental Sample Analyses", dated June 7, 1996.
- * Deletion of Plant Vent Stack Process Flow Instrument FT-1254 Safety Evaluation, 12/13/96
- ii Corrected total page count on Section 2, modified by deletion and addition of locations in Table 2-8
- vii Changed page numbering
- 1-23 Updated various calibration constants in table 1-2.
- 2-28 * Various locations and values were changed on the Controlling Location Factor table to reflect 1995 and 1996 LUC results.
- 2-29 * Combined Surf Beach location with sector P Surf Beach/Life Guard. Removed data from page number 2-29.
- 2-30 * Increased occupancy for adult from 667 to 2000 hr/yr, changed distance.
- 2-31 * Changed "51 Area" Beach Check-In from sector Q to sector P due to revised location.
- 2-32 * Changed X/Q and D/Q values for Cotton Point estates with Garden in sector P. The R_1 values remain unchanged.
- 2-33 * Changed X/Q value for Surf Beach/Guard Shack sector Q. The R_1 values remain unchanged.
- 2-34 * Added State Park Office Trailer to sector Q.
- 2-35 * Changed name from "51 Area" Beach Trailers to Rec Bldg Staff sector Q. Changed distance X/Q, D/Q, and adult R_1 values.

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- 2-36 * Changed X/Q value for "51 Area" Beach Campground sector Q. The R_i values remain unchanged.
- 2-37 * Changed X/Q and D/Q values for San Onofre Mobile Homes sector Q. The R_i values remain unchanged.
- 2-38 * Changed San Clemente Ranch (No Residents) distance and the X/Q and D/Q values. The R_i values remain unchanged.
- 2-39 * Changed San Clemente Ranch Adm. Offices, sector Q distance, deleted garden fraction use, and increased occupancy to 0.3995.
- 2-40 * Changed San Clemente Resident values for food and ground pathway to reflect the removal of gardens from this location. The name of this location was changed to reflect the absence of a garden. Changed distance, and the X/Q, D/Q and selected R_i values.
- 2-41 * Changed San Onofre Mobile Homes Sector R distance and the X/Q and D/Q values. The R_i values remain unchanged.
- 2-42 * Deleted Sheep Meat/Shephard location from sector R.
- 2-43 * Deleted Deer Consumer/Hunter from sector R.
- 2-44 * Changed San Clemente Ranch (No Residents) distance and the X/Q and D/Q values. The R_i values remain unchanged.
- 2-45 * Increased San Clemente Ranch Packing with Resident occupancy to 0.3995, deleted local garden fraction. Changed the X/Q, D/Q and adult R_i values.
- 2-46 * Deleted Sheep Meat/Shephard location from sector A.
- 2-47 * Changed Deer Consumer/Hunter sector A distance and the X/Q and D/Q values. The R_i values remain unchanged.
- 2-48 * Changed X/Q and D/Q values for Camp San Mateo sector A. The R_i values remain unchanged.
- 2-49 * Deleted Sheep Meat/Shephard location from sector B.
- 2-50 * Changed Deer Consumer/Hunter sector B distance and the X/Q and D/Q values. The R_i values remain unchanged.
- 2-52 * Changed Camp San Onofre Fire Stn sector C distance and the X/Q and D/Q values. The R_i values remain unchanged.
- 2-53 * Changed X/Q and D/Q values for Camp San Onofre sector C. The R_i values remain unchanged.
- 2-54 * Deleted Sheep Meat/Shephard location from sector C.
- 2-55 * Changed Deer Consumer/Hunter sector C distance and the X/Q and D/Q values. The R_i values remain unchanged.
- 2-57 * Deleted Sheep Meat/Shephard location from sector D.
- 2-58 * Changed Deer Consumer/Hunter sector D distance and the X/Q and D/Q values. The R_i values remain unchanged.
- 2-59 * Changed Camp San Onofre sector D distance and the X/Q and D/Q values. The R_i values remain unchanged.
- 2-60 * Changed Sheep Meat/Shephard sector E distance from and the X/Q and D/Q values. The R_i values remain unchanged.
- 2-61 * Changed Deer Consumer/Hunter sector E distance and the X/Q and D/Q values. The R_i values remain unchanged.
- 2-62 * Changed Camp Horno X/Q and D/Q values. The R_i values remain unchanged.

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- 2-63 * Changed Sheep Meat/Shephard sector F distance and the X/Q and D/Q values. The R_i values remain unchanged.
- 2-64 * Changed Deer Consumer/Hunter sector F distance and the X/Q and D/Q values. The R_i values remain unchanged.
- 2-65 * Changed X/Q and D/Q values for San Onofre State Park/Guard Shack. The R_i values remain unchanged.
- 2-66 * Changed X/Q and D/Q values for Border-Highway Patrol Weigh Station in sector F. The R_i values remain unchanged.
- 2-67 * Changed San Onofre State Park Beach Campground adult occupancy from 2000 hrs/yr to 8760 hrs/yr, changed distance, X/Q, D/Q and adult R_i values.
- 2-69 * Deleted Sheep Meat/Shephard location from sector G.
- 3-2 Updated 10CFR reference.
- 4-8 * Deleted line 1e Stack Fan Flow Indication, add note 5 concerning heat tracing.
- 4-11 * Changed line 1e to reflect new Plant Vent Stack flow configuration, added note 3.
- 5-7 ^o Revised Table 5-2 for Environmental sample analysis to add notes for reporting levels when no drinking water pathway exists.
- 5-9 ^o Revised Table 5-3 for Environmental sample analysis to revise LLD for Zr-95, Ba-140. Changed reference on I-131. Moved all notes to page 5-11.
- 5-11^o Deleted reference (3), added note d and changed note b to discuss drinking water requirements, all on table 5-3.
- 5-21 Correct typo on Huntington Beach Generating Station from NE to NW.
- 5-22 * Revised table 5-4, section for local crops to change location of garden in Oceanside. Added location '4 under drinking water and deleted locations '1 and '2.

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, 1997 to December 31, 1997.

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SECTION K. MISCELLANEOUS

ODCM Section 5.2.1, Action B.1 Special 30-Day Report

On December 5, 1997, a Special 30-Day Report (Docket No. 50-206) concerning the Radiological Environmental Monitoring Program, San Onofre Nuclear Generating Station, Unit 1 was provided by E. S. Medling (SCE) to the NRC. The report identified a location that yielded a calculated dose greater than the values calculated using the existing ODCM (Rev. 12). The newly identified location, where outage support workers for Unit 2 and 3 temporarily resided in campers, was parking lot 4A in Sector Q at 0.5 miles from the Unit 1 release point.

Unplanned, Uncontrolled Release from Yard Drain Sump (YDS)

The Unit 1 Yard Drain Sump overflowed to the PMF Catch Basin on three occasions in 1997:

Start Date/Time	Stop Date/Time	Duration (minutes)	Activity ($\mu\text{Ci}/\text{ml}$)	Estimated Release (curies)	Estimated Whole Body Dose (mrem)	Estimated Liver Dose (mrem)
01/15/97 @ 1705	01/15/97 @ 1733	28	<LLD	0.0E+0	0.0E+0	0.0E+0
11/13/97 @ 1457	11/13/97 @ 1513	16	<LLD	0.0E+0	0.0E+0	0.0E+0
11/26/97 @ 1019	11/26/97 @ 1032	13	<LLD	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 direct runoff away from the YDS 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 dose consequences as a result of these releases.

Unmonitored Release from Yard Drain Sump

On 9/12/97, a Yard Drain Sump was released with the radmonitor, R-2101, non-functional and no prior analysis of a grab sample. A routine grab sample of the sump contents was collected at 0440 for compositing, but since no release was anticipated, it was not analyzed. Operations released the contents of the sump several hours later. Another grab sample was collected at 1230 and both samples were analyzed subsequent to the release. Both sample analysis results were less than minimum detectable activity and therefore, the release had no dose impact. This incident is documented in AR 970900692.

Unplanned, Uncontrolled Release Due to Unit 1 Fire Header Rupture

On 10/09/97, approximately 125,700 gallons of water were released due to a Fire Header rupture. Of that, approximately 97,500 gallons overflowed into the intake structure and were released in an unplanned and uncontrolled manner. Since the Yard Drain Sump (YDS) pumps were in the manual "off" position, approximately 28,200 gallons were captured in the YDS and the adjacent West Road Area. This volume was sampled and released in accordance with site procedures. Total activity released was estimated at $3.82\text{E}-5$ curies. The dose consequences were well below site release limits and were estimated to be $4.13\text{E}-4$ mrem to the total body and $6.31\text{E}-4$ mrem to the limiting organ (liver). This incident is documented in AR 971000530.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

S.O.N.G.S. 1

EFFLUENT RADIATION MONITORS OUT OF SERVICE GREATER THAN 30 DAYS

January 1, 1997 - December 31, 1997

S.O.N.G.S. 1			
Monitor	Inoperability Period	Inoperability Cause	Explanation
R-1218 Liquid Radwaste Discharge Line Monitor	02/20/97 - 06/09/97	Instrument air outage, unable to perform surveillance	Discharge valves could not be operated during monitor surveillance due to instrument air outage. No releases were performed through the pathway in 1997.
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 - 06/25/97	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 remained functional.
	09/16/97 - 11/20/97	18 month calibration	Delay awaiting parts to install connector.
R-2100 Yard Drain Sump Monitor	08/15/97 - 10/10/97	Common power supply with R-2101.	Support investigation on R-2101.
R-2101 Reheater Pit Sump Monitor	07/18/97 - 10/10/97	Monitor exhibited high spikes and erratic indications with no flow.	Extensive troubleshooting and awaiting parts to complete repair.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

S.O.N.G.S. 1

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

- Gaseous releases totaled $4.65\text{E-}1$ curies of which noble gases were $0.00\text{E+}0$ curies, iodines were $0.00\text{E+}0$ curies, particulates were $6.86\text{E-}8$ curies, and tritium was $4.65\text{E-}1$ 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: $4.33\text{E-}4$ mrem at the nearest receptor.
- Liquid releases totaled $5.53\text{E-}4$ curies of which particulates and iodines were $2.21\text{E-}4$ curies, tritium was $3.32\text{E-}4$ curies, and noble gases were $0.00\text{E+}0$ curies.
- The radiation doses from liquid releases are: (a) total body: $1.93\text{E-}3$ mrem, (b) limiting organ: $2.84\text{E-}3$ 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 (1997)

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 (1997)

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 of 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 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 (1997)

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	4.97E+1	5.47E+1	3.00E+1
2. Average release rate for period	μCi/sec	6.39E+0	6.96E+0	
3. Percent of applicable limit	% MPC	1.31E-2	1.61E-2	
4. Percent Effluent Concentration Limit	% ECL	1.92E-2	2.88E-2	
B. Iodines				
1. Total iodine-131	Ci	2.64E-4	6.29E-3	1.90E+1
2. Average release rate for period	μCi/sec	3.40E-5	8.00E-4	
3. Percent of applicable limit	% MPC	1.63E-4	3.84E-3	
4. Percent Effluent Concentration Limit	% ECL	8.15E-5	1.92E-3	
C. Particulates				
1. Particulates with half-lives >8 days	Ci	1.80E-4	2.88E-4	1.60E+1
2. Average release rate for period	μCi/sec	2.32E-5	3.66E-5	
3. Percent of applicable limit	% MPC	6.62E-6	3.71E-5	
4. Percent Effluent Concentration Limit	% ECL	1.47E-5	2.07E-4	
5. Gross alpha activity	Ci	7.91E-7	4.37E-7	5.00E+1
D. Tritium ⁽¹⁾				
1. Total release	Ci	5.32E+1	7.83E+0	2.50E+1
2. Average release rate for period	μCi/sec	6.84E+0	9.96E-1	
3. Percent of applicable limit	% MPC	1.64E-2	2.39E-3	
4. Percent Effluent Concentration Limit	% ECL	3.28E-2	4.78E-3	

(1) A containment airborne tritium sample on 01/06/97 was obtained at 31 hrs, vice 24 hrs as required, after the previous sample. Sample results before and after the required sample were similar. This incident is documented in AR 970100404.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

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	7.42E+1	4.63E+1	3.00E+1
2. Average release rate for period	μCi/sec	9.33E+0	5.83E+0	
3. Percent of applicable limit	% MPC	1.75E-2	1.13E-2	
4. Percent Effluent Concentration Limit	% ECL	2.04E-2	1.47E-2	
B. Iodines ⁽²⁾				
1. Total iodine-131	Ci	1.58E-3	5.26E-5	1.90E+1
2. Average release rate for period	μCi/sec	1.99E-4	6.62E-6	
3. Percent of applicable limit	% MPC	9.53E-4	3.18E-5	
4. Percent Effluent Concentration Limit	% ECL	4.76E-4	1.59E-5	
C. Particulates ⁽²⁾				
1. Particulates with half-lives >8 days	Ci	2.04E-5	7.72E-7	1.60E+1
2. Average release rate for period	μCi/sec	2.56E-6	9.71E-8	
3. Percent of applicable limit	% MPC	7.43E-7	1.57E-7	
4. Percent Effluent Concentration Limit	% ECL	1.97E-6	9.32E-7	
5. Gross alpha activity	Ci	<LLD	7.53E-7	5.00E+1
D. Tritium				
1. Total release	Ci	4.25E+0	6.93E-1	2.50E+1
2. Average release rate for period	μCi/sec	5.35E-1	8.72E-2	
3. Percent of applicable limit	% MPC	1.28E-3	2.09E-4	
4. Percent Effluent Concentration Limit	% ECL	2.57E-3	4.18E-4	

(2) Unit 3 condenser air ejector particulate and iodine samples from 11/03/97 @ 1500-1538 were not collected. There was no measurable activity released from this pathway in the fourth quarter of 1997. This incident is documented in AR 971100161.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

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	2.15E+0	3.66E+0	1.94E+0	1.54E+0
krypton-85	Ci	<LLD	<LLD	<LLD	<LLD
krypton-85m	Ci	<LLD	3.15E-3	<LLD	<LLD
krypton-87	Ci	<LLD	<LLD	<LLD	<LLD
krypton-88	Ci	<LLD	<LLD	<LLD	<LLD
xenon-133	Ci	4.63E+1	5.07E+1	7.20E+1	4.45E+1
xenon-133m	Ci	3.77E-3	4.53E-2	<LLD	<LLD
xenon-135	Ci	1.05E-1	2.80E-1	<LLD	<LLD
xenon-135m	Ci	<LLD	<LLD	<LLD	<LLD
xenon-138	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	4.85E+1	5.47E+1	7.40E+1	4.60E+1
2. Iodines					
iodine-131	Ci	2.64E-4	6.29E-3	1.58E-3	5.26E-5
iodine-132	Ci	5.39E-7	1.50E-2	2.34E-5	5.52E-7
iodine-133	Ci	1.79E-4	3.82E-4	1.27E-4	1.07E-4
iodine-135	Ci	7.36E-6	4.87E-6	<LLD	<LLD
Total for period	Ci	4.51E-4	2.17E-2	1.73E-3	1.60E-4

LLD Lower Limit of Detection; see Table 1D.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

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					
antimony-122	Ci	6.27E-7	<LLD	<LLD	<LLD
barium-140	Ci	<LLD	<LLD	<LLD	<LLD
bromine-82	Ci	4.55E-5	6.30E-5	1.93E-5	4.66E-5
cerium-141	Ci	<LLD	<LLD	<LLD	<LLD
cerium-144	Ci	<LLD	<LLD	<LLD	<LLD
cesium-134	Ci	2.99E-6	<LLD	<LLD	<LLD
cesium-137	Ci	4.60E-6	8.80E-6	2.97E-8	<LLD
chromium-51	Ci	5.03E-7	1.79E-5	<LLD	<LLD
cobalt-57	Ci	6.46E-8	<LLD	<LLD	<LLD
cobalt-58	Ci	1.69E-4	9.73E-5	1.97E-5	<LLD
cobalt-60	Ci	1.42E-6	1.62E-4	6.43E-7	7.72E-7
iron-59	Ci	<LLD	<LLD	<LLD	<LLD
lanthanum-140	Ci	<LLD	<LLD	<LLD	<LLD
manganese-54	Ci	6.00E-7	1.25E-6	<LLD	<LLD
molybdenum-99	Ci	<LLD	<LLD	<LLD	<LLD
niobium-95	Ci	5.09E-7	5.47E-7	<LLD	<LLD
rubidium-88	Ci	1.40E-4	<LLD	1.76E-5	<LLD
strontium-89	Ci	<LLD	<LLD	<LLD	<LLD
strontium-90	Ci	<LLD	<LLD	<LLD	<LLD
tin-113	Ci	<LLD	1.89E-8	<LLD	<LLD
yttrium-92	Ci	3.09E-5	6.30E-6	3.52E-5	1.65E-5
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD
zirconium-95	Ci	4.05E-7	2.05E-7	<LLD	<LLD

LLD Lower Limit of Detection; see Table 1D.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

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	1.15E+0	<LLD	1.87E-1	2.68E-1
krypton-85m	Ci	<LLD	<LLD	<LLD	<LLD
krypton-87	Ci	<LLD	<LLD	<LLD	<LLD
krypton-88	Ci	<LLD	<LLD	<LLD	<LLD
xenon-133	Ci	1.21E-2	4.06E-3	2.68E-3	5.28E-3
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	1.17E+0	4.06E-3	1.90E-1	2.73E-1

LLD Lower Limit of Detection; see Table 1D.

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

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

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

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-135	5.00E-8
xenon-135m	2.00E-6
xenon-138	3.30E-6
2. Iodines	
iodine-135	2.00E-11
3. Particulates	
antimony-122	1.60E-13
barium-140	2.90E-13
cerium-141	3.60E-14
cerium-144	1.50E-13
cesium-134	8.70E-14
cesium-137	7.10E-14
chromium-51	3.10E-13
cobalt-57	1.80E-14
cobalt-58	7.80E-14
iron-59	1.90E-13
lanthanum-140	4.70E-13
manganese-54	7.80E-14
molybdenum-99	3.80E-14
niobium-95	7.70E-14
rubidium-88	4.30E-08
strontium-89	1.00E-13
strontium-90	1.00E-14
tin-113	5.40E-14
zinc-65	2.10E-13
zirconium-95	1.30E-13
4. gross alpha	1.00E-13

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

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

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-133m	2.30E-5
xenon-135	3.00E-6
xenon-135m	4.00E-5
xenon-138	5.70E-5

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

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	5.58E-3	7.96E-3	6.61E-3	4.56E-3
2. Percent Applicable Limit	%	5.58E-2	7.96E-2	6.61E-2	4.56E-2
3. Beta Air Dose	mrad	8.85E-3	1.00E-2	1.26E-2	7.95E-3
4. Percent Applicable Limit	%	4.43E-2	5.02E-2	6.28E-2	3.98E-2
B. Tritium, Iodine, Particulates (at the nearest receptor)					
5. Organ Dose	mrem	1.80E-3	3.16E-3	8.30E-4	5.37E-5
6. Percent Applicable Limit	%	1.20E-2	2.11E-2	5.54E-3	3.58E-4

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

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

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

TABLE 1F

GASEOUS EFFLUENTS-BATCH RELEASE SUMMARY

	12 month period
1. Number of batch releases:	9 releases
2. Total time period for batch releases:	3622 minutes
3. Maximum time period for a batch release:	560 minutes
4. Average time period for a batch release:	402 minutes
5. Minimum time period for a batch release:	275 minutes

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

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

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.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

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

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	1.61E-1	5.45E-2	1.90E+1
2. Average diluted concentration during period	μCi/ml	2.60E-10	1.05E-10	
3. Percent of applicable limit	% MPC	2.74E-4	1.34E-4	
4. Percent Effluent Concentration Limit	% ECL	1.58E-3	7.90E-4	
B. Tritium				
1. Total release	Ci	1.18E+2	5.85E+1	1.90E+1
2. Average diluted concentration during period	μCi/ml	1.90E-7	1.13E-7	
3. Percent of applicable limit	% MPC	6.34E-3	3.76E-3	
4. Percent Effluent Concentration Limit	% ECL	1.90E-2	1.13E-2	
C. Dissolved and entrained gases				
1. Total release	Ci	7.89E-2	2.12E-2	1.90E+1
2. Average diluted concentration during period	μCi/ml	1.27E-10	4.09E-11	
3. Percent of applicable limit	% MPC	6.36E-5	2.04E-5	
4. Percent Effluent Concentration Limit	% ECL	6.36E-5	2.04E-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	3.12E+4	3.44E+7	5.00E+0
F. Volume of dilution water used during period	liters	6.20E+11	5.18E+11	5.00E+0

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

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⁾				
1. Total release (not including tritium, gases, alpha)	Ci	9.25E-2	1.08E-2	1.90E+1
2. Average diluted concentration during period	μCi/ml	1.33E-10	1.42E-11	
3. Percent of applicable limit	% MPC	2.70E-4	1.87E-5	
4. Percent Effluent Concentration Limit	% ECL	7.85E-4	7.73E-5	
B. Tritium				
1. Total release	Ci	1.15E+2	1.61E+1	1.90E+1
2. Average diluted concentration during period	μCi/ml	1.65E-7	2.12E-8	
3. Percent of applicable limit	% MPC	5.50E-3	7.06E-4	
4. Percent Effluent Concentration Limit	% ECL	1.65E-2	2.12E-3	
C. Dissolved and entrained gases				
1. Total release	Ci	2.50E-1	1.04E-4	1.90E+1
2. Average diluted concentration during period	μCi/ml	3.58E-10	1.37E-13	
3. Percent of applicable limit	% MPC	1.79E-4	6.84E-8	
4. Percent Effluent Concentration Limit	% ECL	1.79E-4	6.84E-8	
D. Gross alpha radioactivity				
1. Total release	Ci	<LLD	<LLD	5.00E+1
E. Volume of waste released (batch & continuous, prior to dilution)	liters	4.07E+6	1.03E+7	5.00E+0
F. Volume of dilution water used during period	liters	6.97E+11	7.60E+11	5.00E+0

Six clean sump release samples were not included in the February 1997 monthly composite. The sample analysis yielded a conservative Fe-55 result due to a higher ratio of samples which contained activity. This incident is documented in AR 970901038.

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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					
antimony-125	Ci	2.22E-3	<LLD	<LLD	<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	2.15E-4	<LLD	<LLD	<LLD
cesium-137	Ci	2.06E-4	<LLD	<LLD	<LLD
chromium-51	Ci	<LLD	<LLD	<LLD	<LLD
cobalt-57	Ci	5.29E-5	<LLD	<LLD	<LLD
cobalt-58	Ci	3.02E-2	3.64E-4	<LLD	<LLD
cobalt-60	Ci	1.50E-3	7.00E-4	<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	6.64E-4	<LLD	<LLD	<LLD
molybdenum-99	Ci	<LLD	<LLD	<LLD	<LLD
niobium-95	Ci	2.60E-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
tin-113	Ci	1.06E-4	<LLD	<LLD	<LLD
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD
zirconium-95	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	3.54E-2	1.06E-3	<LLD	<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 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	4.98E-4	3.63E-4	1.08E-3	2.38E-4
antimony-125	Ci	2.53E-3	6.38E-3	1.96E-2	7.79E-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	3.12E-4	9.56E-5	<LLD	<LLD
cesium-137	Ci	5.51E-4	3.01E-4	1.33E-4	<LLD
chromium-51	Ci	4.28E-3	3.89E-3	7.01E-3	8.72E-5
cobalt-57	Ci	2.13E-4	7.02E-5	6.26E-5	<LLD
cobalt-58	Ci	6.44E-2	2.58E-2	1.14E-2	1.80E-4
cobalt-60	Ci	6.52E-3	4.08E-3	6.26E-3	2.41E-4
iodine-131	Ci	1.24E-5	<LLD	2.79E-4	<LLD
iron-55 ⁽¹⁾	Ci	3.86E-2	4.07E-3	3.23E-2	9.84E-4
iron-59	Ci	6.88E-4	2.03E-4	8.48E-4	<LLD
lanthanum-140	Ci	<LLD	<LLD	1.11E-5	<LLD
manganese-54	Ci	1.25E-3	1.07E-3	1.36E-3	2.11E-5
molybdenum-99	Ci	<LLD	<LLD	<LLD	<LLD
niobium-95	Ci	3.47E-3	3.94E-3	4.35E-3	1.59E-5
niobium-97	Ci	<LLD	1.92E-5	<LLD	<LLD
ruthenium-103	Ci	<LLD	8.31E-6	<LLD	<LLD
silver-110m	Ci	3.91E-4	1.12E-3	4.64E-3	1.11E-3
strontium-89	Ci	<LLD	<LLD	<LLD	<LLD
strontium-90	Ci	<LLD	<LLD	<LLD	<LLD
strontium-92	Ci	<LLD	1.60E-5	<LLD	4.37E-5
technetium-99m	Ci	<LLD	<LLD	<LLD	<LLD

LLD Lower Limit of Detection; see Table 2C.

- (1) Six clean sump release samples were not included in the February 1997 monthly composite. The sample analysis yielded a conservative Fe-55 result due to a higher ratio of samples which contained activity. This incident is documented in AR 970901038.

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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 (Continued)					
tin-113	Ci	8.65E-5	6.93E-5	5.03E-4	<LLD
tin-117m	Ci	1.16E-5	1.78E-5	9.09E-5	<LLD
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD
zirconium-95	Ci	1.89E-3	1.84E-3	2.37E-3	3.02E-5
zirconium-97	Ci	<LLD	<LLD	1.88E-4	5.23E-5
Total for period	Ci	1.26E-1	5.34E-2	9.25E-2	1.08E-2
2. Dissolved and entrained gases					
krypton-85	Ci	8.28E-3	<LLD	<LLD	<LLD
xenon-131m	Ci	3.88E-3	<LLD	1.48E-2	<LLD
xenon-133	Ci	6.67E-2	2.10E-2	2.35E-1	1.04E-4
xenon-133m	Ci	<LLD	1.83E-4	<LLD	<LLD
xenon-135	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	7.89E-2	2.12E-2	2.50E-1	1.04E-4

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	
antimony-125	1.80E-7
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-57	3.50E-8
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
tin-113	7.70E-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	
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
cobalt-57	3.50E-8
iodine-131	5.70E-8
iron-59	2.10E-7
lanthanum-140	1.70E-7
molybdenum-99	3.40E-8
niobium-97	9.40E-8
ruthenium-103	6.90E-8
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
zirconium-97	1.10E-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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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	4.52E-3	7.58E-4	2.45E-3	8.78E-5
2. Percent Applicable Limit	%	1.51E-1	2.53E-2	8.16E-2	2.93E-3
B.					
1. Limiting organ dose	mrem	2.09E-2	8.60E-3	2.69E-2	3.86E-3
2. Percent Applicable Limit	%	2.09E-1	8.60E-2	2.69E-1	3.86E-2
3. Limiting organ for period		GI-LLI	GI-LLI	GI-LLI	GI-LLI

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TABLE 2E

LIQUID EFFLUENTS-BATCH RELEASE SUMMARY

	12 month period
1. Number of batch releases:	139 releases
2. Total time period for batch releases:	25956 minutes
3. Maximum time period for a batch release:	800 minutes
4. Average time period for a batch release:	187 minutes
5. Minimum time period for a batch release:	89 minutes
6. Average saltwater flow during batch releases:	716043 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 active waste (DAW), compactable (*) and non-compactable (#)	m ³	7.18E+2	3.00E+1
	Ci	2.35E+1	
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 9176) or a Type B Cask (C of C 9028).

Material packaged in strong, tight containers of various sizes.

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.	not applicable	0.00E+0
b.	americium-241	4.13E-4
	antimony-124	3.29E-1
	antimony-125	2.26E-1
	carbon-14	3.65E-1
	cerium-144	1.84E-1
	cesium-134	9.26E-1
	cesium-137	2.16E+0
	chromium-51	4.13E+1
	cobalt-57	8.30E-4
	cobalt-58	2.13E+1
	cobalt-60	6.88E+0
	curium-242	4.34E-4
	curium-243/244	1.25E-3
	iodine-129	3.73E-6
	iron-55	1.69E+1
	iron-59	9.76E-1
	manganese-54	2.90E-1
	nickel-59	6.74E-3
	nickel-63	6.23E+0
	niobium-94	2.02E-4
	niobium-95	1.72E+0
	plutonium-238	7.73E-4
	plutonium-239/240	6.69E-4
	plutonium-241	5.62E-2
	ruthenium-106	6.10E-5
	silver-110m	5.56E-5
	strontium-89	1.90E-4
	strontium-90	1.56E-2
	technetium-99	4.09E-4
	tin-113	1.35E-3
	tritium	5.42E-2
	uranium-235	1.04E-8
	uranium-238	5.12E-9
	zinc-65	1.03E-4
	zirconium-95	5.06E-3
c.	not applicable	0.00E+0
d.	not applicable	0.00E+0

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

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 = $4.80\text{E-}6 \text{ sec/m}^3$; the annual average atmospheric dispersion defined in the Units 2&3 ODCM, Rev. 30.

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

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 = $4.80\text{E-}6 \text{ sec/m}^3$; the annual average atmospheric dispersion defined in the Units 2&3 ODCM, Rev. 30.

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

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

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

SOURCE	Dose * (millirems)				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
LIQUID EFFLUENTS	1)	2)	3)	4)	5)
Whole Body	4.52E-3	7.58E-4	2.45E-3	8.78E-5	7.82E-3
Organ	6)	7)	8)	9)	10)
	2.09E-2	8.60E-3	2.69E-2	3.86E-3	6.03E-2
AIRBORNE EFFLUENTS	11)	12)	13)	14)	15)
Tritium, Iodines, and Particulates	2.34E-2	9.77E-3	2.25E-3	1.84E-4	2.42E-2
NOBLE GASES **	16)	17)	18)	19)	20)
Gamma	2.63E-3	2.35E-3	2.16E-3	4.28E-3	1.11E-2
Beta	21)	22)	23)	24)	25)
	4.02E-3	2.40E-3	4.26E-3	6.29E-3	1.58E-2
DIRECT RADIATION	26)	27)	28)	29)	30)
	1.25E-1	9.67E-2	1.46E-1	1.67E-1	5.34E-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 NW 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 ESE 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 NW 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 E 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 E 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 E 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 ENE 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 SSE 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 NE 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 ESE 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 W 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 sectors for each quarter.

TABLE 2

SOURCE	Percent Applicable Limit				
	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Year
LIQUID EFFLUENTS Whole Body	1.51E-1	2.53E-2	8.16E-2	2.93E-3	1.30E-1
Organ	2.09E-1	8.60E-2	2.69E-1	3.86E-2	3.01E-1
AIRBORNE EFFLUENTS Tritium, Iodines, and Particulates	1.56E-1	6.51E-2	1.50E-2	1.23E-3	8.07E-2
NOBLE GASES Gamma	2.63E-2	2.35E-2	2.16E-2	4.28E-2	5.55E-2
Beta	2.01E-2	1.20E-2	2.13E-2	3.15E-2	3.95E-2

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

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SECTION 1. CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL

On May 28, 1997, revision 30 to the Units 2/3 Offsite Dose Calculation Manual (ODCM) was adopted and published. Incorporated into this revision are: 1) changes made due to the 1995 and 1996 Land Use Census, 2) changed various calibration constants for liquid and deleted two gas monitors, 3) modified section 4 regarding the periodicity of a required maintenance item and requirements for downscale failure, and 4) changes to section 5 based on the Annual Radiological Environmental Monitoring Report.

No safety evaluations were performed for implementing changes from the 1995 and 1996 Land Use Census (LUC). These changes reflect results from routine updates and as such do not constitute a modification in methodology for determining activity released from the site and subsequent dose to a member of the public. The 1995 LUC data was not able to be included into revision 29. However, any changes due to the 1995 LUC have been incorporated. The LUC for 1996 corrected several distances and X/Q and D/Q values.

Two radiation monitors were removed from service as part of DCP 6926; 2(3)RT-7818B. Over the year, calibration checks of the radiation monitors resulted in slight changes to the calibration constants. The new values are listed.

Section 4 was changed to reflect the periodicity requirements for performing system isolation closure surveillance. The system isolation closure requirement periodicity has been changed from quarterly to once per refueling period. Also, the requirement for demonstrating downscale failure was deleted due to monitor design and administrative controls. An approved safety evaluation covering both items was generated and approved.

Section 5, Table 5-2 "Reporting Levels for Radioactivity Concentrations in Environmental Samples" and Table 5-3 "Detection Capabilities for Environmental Sample Analysis" were changed slightly to make them more closely reflect NUREG 1301. These changes included reducing the LLD for Ba-140 and Zr-95. The new values are per NUREG 1301 and have received Environmental Protection's concurrence. Guidance from Health Physics and Environmental group is provided in their June 7, 1996 memo "Revision of Tables for Environmental Sample Analyses" to P.K. Chang.

Section 1.4 has been re-formatted and edited. One blank page is being deleted. Within each subsection, some paragraphs have been moved or rearranged to better facilitate dispensation of information. Pages with only these type changes, while containing change bars, do not force a new page revision.

Per NRC Generic Letter 89-01, no safety review was required or performed for the correction of typographical errors.

The following is a complete list of the changes:

In addition to the normal change bar notations found on the individual pages, ie: R=revised, D=deleted, and A=added, a new notation is used this revision to designate format changes, either a moved paragraph, re-formatted paragraph or page numbering. F=formatted

Indicates typographical, sequential and page numbering, and format changes. These administrative changes do not warrant a revision change.

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- ^b The 1995 Land Use Census (LUC) revealed three main changes: the presence of outage residents, the garden at a San Clemente residence was eliminated, and the occupancy factor at the San Onofre beach campground was increased. The 1996 LUC removed the Outage Residence from the ODCM. More precise land mapping completed during the 1996 LUC resulted in a significant number of changes to the database used in determining dose parameters and controlling locations. To reflect this, tables were updated showing new distances to land uses and the resultant changes to D/Q and X/Q parameters, as well as some deletions, primarily sheep grazing and deer hunting. In the several locations with slightly revised distances, the R_i values did not change. However, these changes were significant enough to also result in changes to the Controlling Location Factors. Also, changes to Tables 5-2 and 5-3 were made to conform more closely with NUREG 1301 in clarifying the lack of drinking water flow path on site for effluents and specifying isotopic LLDs.
- ^c Section 1.4 was reformatted. Within subsections, paragraphs were moved to better organize the information. This is considered to be administrative changes.
- ^d Section 4 maintenance actions were changed, requiring path isolation closure to be tested once per refueling cycle and removing the requirement for demonstrating downscale failure..
- I Corrected the title of section 1.4 and changed page numbers of section 1 and 2 due to reformatting.
- ii Some page numbers were changed due to reformatting. This is an administrative change.
- iii Revised page numbers in section 4 due to addition of one page. Also, parts of page ii have flowed onto this page.
- iv Revised page numbers in section 4 due to addition of one page.
- v Revised page numbers of the tables due to reformatting sections 1 and 2. This is an administrative change.
- 1-5 Deleted outdated Technical Specification references.
- 1-6 Deleted outdated Technical Specification references.
- 1-8 ^c Reformatted Section 1 from this page onward. One blank page was removed and sections were thru reformatted changing the total number of pages.
- 1-26
- 1-8 ^c Added note describing relationship between F and R and moved three paragraphs from page 1-9 here.
- 1-9 ^c Revised section on administrative factors and added an explanation of their use. Also removed phrase suggesting CCW heat exchanger releases through the SWC system. This is not a credited release point. Also one paragraph was moved here from page 1-8.
- 1-10 ^c corrected a typographical error and moved one paragraph off this page onto page 1-9. These are administrative changes.
- 1-11 ^c Converted the previous step 3 into steps 3 and 4 since two distinct actions were described. Reformatted definition under equation 1-4.
- 1-12 ^c Corrected typographical error on name of admin factor for RW and reformatted the listing of pump flow rates.
- 1-13 ^c Revised the note (which had been on page 1-14) making it more generic and removing specific component numbers, as Operations uses the instruments in their procedures. Also moved the paragraph discussing admin factors to a different page. Also reformatted two definitions.
- 1-14 ^c Moved the note to page 1-13 and deleted the first paragraph on administrative factors which is explained in fuller detail now elsewhere in section 1. This page is intentionally left blank.

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- 1-15 ° Moved note to this page and revised it making it more generic and removing specific component numbers, as Operations uses the instruments in their procedures. Also deleted paragraph discussing admin factors which was moved to a different page and added some definitions under equation 1-8.
- 1-16 ° Added "weekly" in definition of C_t as tritium composites are typically analyzed weekly for continuous release. Moved definitions to this page from page 1-17.
- 1-17 ° Added definitions under equation 1-10. Moved step 3 here from page 1-18 and created step 4 out the previous step 3. Definitions for equation 1-9 were moved to page 1-16.
- 1-18 ° Moved step 3 to page 1-17. This page left intentionally blank.
- 1-19 ° Moved and revised the note (from page 1-20) making it more generic and removing specific component numbers, as Operations uses the instruments in their procedures. Also moved paragraph discussing admin to a different page. Added definitions under equations 1-11 and 1-12.
- 1-20 ° Moved note to page 1-19. This page then left intentionally blank.
- 1-21 ° Expanded definitions under equations 1-13 thru 1-16.
- 1-22 ° Revised the note making it more generic and removing specific component numbers, as Operations uses the instruments in their procedures. Also moved paragraph discussing admin factors to a different page. Some definitions from equations 1-13 through 1-16 were expanded and put on this page.
- 1-23 ° Revised the note making it more generic and removing specific component numbers, as Operations uses the instruments in their procedures. Also added and expanded definitions under equations 1-17 and 1-18.
- 24 ° The paragraph describing administrative factors and the note were both moved from this page and placed elsewhere in this section. This is an administrative change and did not warrant a page revision.
- ° The old page 1-25 was blank and has been removed from the ODCM.
- 1-25 Changed calibration constants for various monitors.
- 2-4 Corrected a typographical error by adding Cs-137 to footnote g.
- 2-5 Deleted outdated Technical Specification references.
- 2-6 Deleted outdated Technical Specification references.
- 2-7 Deleted outdated Technical Specification references.
- 2-19 ° Corrected typographical error in equation 2-7a.
- 2-20 ° Corrected typographical error on definition of A_{max} .
- 2-22 ° Corrected typographical error in definition of A_{max} under equation 2-8.
- 2-24 Deleted 2 and 3 RT-7818B from the table as these two channels have been removed from the air ejector system.
- 2-26 Modified definition of X/Q (under equations 2-11 and 2-12) to include the addition of the South Yard Facility monitors.
- 2-27 Modified definitions of W_k (under equation 2-13) to include the addition of the South Yard Facility monitors.
- 2-28 Modified definition of X/Q (under equations 2-14 and 2-15) to include the addition of the South Yard Facility monitors.
- 0 Modified definitions of $\sum_k R_k W_k$ and R_k (under equation 2-18) to include the addition of the South Yard Facility monitors.

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- 2-31 Modified definitions of X/Q and D/Q under " W_k " (under equation 2-18) to account for the addition of the South Yard Facility monitors.
- 2-32 Modified definition of R_{ik0} (under equation 2-19) to include the addition of the South Yard Facility monitors.
- 2-35^b Three locations and CLF values for all locations were changed as a result of the 1995 and 1996 Land Use Census.
- 2-36^b Sector P: Surf Beach/Life Guard occupancy factor was increased from 667 hrs to 2000 hrs. X/Q, D/Q, and distance were changed. Also, all R_i values except infant were changed.
- 2-37^b Sector P: Cotton Point Estates with Garden X/Q and D/Q values were changed per LUC.
- 2-38^b Changed "51 Area Beach check-in" from sector Q to sector P due to more accurate mapping during the 1996 LUC. Changed X/Q and D/Q. R_i values and distance remained the same.
- 2-39^b Sector Q: Name changed from "51 Area Beach Trailers" to "Rec Building Staff". Distance, X/Q, D/Q, and R_i values were changed.
- 2-40^b Sector Q: San Onofre Mobile Homes: Changed the distance, X/Q and D/Q. R_i values remained the same.
- 2-41^b Sector Q: State Park Office Trailer: Changed X/Q and D/Q. R_i values remained the same.
- 2-42^b Sector Q: Surf Beach/Guard Shack: Changed X/Q and D/Q and child and teen inhalation values.
- 2-43^b Sector Q: 51 Area Beach/Campground: Changed X/Q and D/Q and distance. R_i values remained the same.
- 2-44^b Sector Q: This page was left blank as there are no longer any sheep grazing at this location.
- 2-45^b Sector Q: The garden at location "San Clemente Resident" has been eliminated. As a result, R_i values were changed. Distance, X/Q, and D/Q were also changed.
- 2-46^b Sector Q: San Clemente Ranch (No Residents): Changed X/Q and D/Q. R_i values remained the same.
- 2-47^b Sector Q: San Clemente Ranch Adm Offices: Changed the distance and Adult food and ground pathway per the LUC. The garden fraction was deleted in the LUC.
- 2-48^b Sector R: San Onofre Mobile Homes: Changed distance, X/Q and D/Q. R_i values remained the same.
- 2-49^b Sector R: San Clemente Ranch (No Residents): Changed X/Q and D/Q. R_i values remained the same.
- 2-50^b Sector R: San Clemente Ranch Packing: Changed D/Q. R_i values were changed due to the occupancy factor being increased. The name was changed to reflect no residents at this location.
- 2-51^b Sector R: This page was left blank as there are no longer any sheep grazing at this location.
- 2-52^b Sector R: This page was left blank as there is no longer deer hunting at this location.
- 2-53^b Sector A: Camp San Mateo: Changed X/Q per the LUC.
- 2-54^b Sector A: This page was left blank as there are no longer any sheep grazing at this location.
- 2-55^b Sector A: Deer Consumer/Hunter: Changed X/Q, D/Q and distance per the LUC. R_i values remained unchanged.
- 2-56^b Sector B: This page was left blank as there is no longer any sheep grazing at this location.

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- 2-57^b Sector B: Deer Consumer/Hunter: Changed X/Q, D/Q and distance per the LUC. R_1 values remained unchanged
- 2-58^b Sector B: Sanitary Landfill: Changed X/Q and D/Q per the LUC. R_1 values remained unchanged
- 2-59^b Sector C: Camp San Onofre: Changed X/Q and D/Q per the LUC. R_1 values remained unchanged
- 2-60^b Sector C: Camp San Onofre Fire Station: Changed X/Q, D/Q and distance per the LUC. R_1 values remained unchanged
- 2-61^b Sector C: Sewage Facility: Changed X/Q per the LUC.
- 2-62^b Sector C: This page was left blank as there is no longer any sheep grazing at this location
- 2-63^b Sector C: Deer Consumer/Hunter: Changed X/Q and D/Q per the LUC. R_1 values remained unchanged
- 2-64^b Sector D: Camp San Onofre: Changed X/Q, D/Q and distance per the LUC. R_1 values remained unchanged
- 2-65^b Sector D: This page was left blank as there is no longer any sheep grazing at this location
- 2-66^b Sector D: Deer Consumer/Hunter: Changed X/Q, D/Q and distance per the LUC. R_1 values remained unchanged
- 2-67^b Sector E: Camp Horno: Changed X/Q, D/Q and distance per the LUC. R_1 values remained unchanged
- 2-68^b Sector E: Sheep (Meat)/Shepherd: Changed X/Q, D/Q and distance per the LUC. R_1 values remained unchanged
- 2-69^b Sector E: Deer Consumer/Hunter: Changed X/Q, D/Q and distance per the LUC. R_1 values remained unchanged
- 2-70^b Sector F: San Onofre State Park/Guard Shack: Changed X/Q and D/Q per the LUC. R_1 values remained unchanged
- 2-71^b Sector F: Border Patrol Checkpoint: Changed X/Q and D/Q per the LUC. R_1 values remained unchanged
- 2-72^b Sector F: Sheep (Meat)/Shepherd: Changed X/Q, D/Q and distance per the LUC. R_1 values remained unchanged
- 2-73^b Sector F: Deer Consumer/Hunter: Changed X/Q, D/Q and distance per the LUC. R_1 values remained unchanged
- 2-74^b Sector G: San Onofre State Beach Campground: The occupancy factor for the adult was increased from 2000 hrs/yr to 8760 hrs/yr. As a result, R_1 values were changed. Distance, X/Q and D/Q were changed.
- 2-75^b Sector G: Highway Patrol Weigh Station: Changed X/Q and D/Q per the LUC. R_1 values remained unchanged
- 2-76^b Sector G: This page was left blank as there is no longer any sheep grazing at this location
- 2-77^b Sector G: This page was left blank as there is no longer any deer hunting in this area.
- 4-5^d Revised Channel Functional Test (CFT) on path isolation verification and downscale failure. Relocated footnote into appropriate table note.
- 4-14^d Revised CFT testing on path isolation verification and downscale failure. Relocated footnote into appropriate table note.
- 4-15^d New page added to handle the carryover from page 4-14 due to additions to that page. Corrected typographical error and moved the footnote to previous page. These are both administrative changes.

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

- 4-16^d thru 4-19 Page numbers increased by one to account for the added page 4-15.
- 5-1 Deleted outdated Technical Specification references
- 5-2 Deleted outdated Technical Specification references.
- 5-7^b Table 5-2 was revised to account for there not being a drinking water pathway at the site. The footnotes were made to reflect NUREG-1301. Corrected the name of Zr-95 and Ba-140.
- 5-8^b Iodine footnote was changed from "b" to "d". Ba-140 and Zr-95 LLDs were changed to reflect NUREG 1301. Also the footnotes were moved to page 5-10.
- 5-9 The last paragraph on footnote on LLD were moved to this page from page 5-10. Also deleted reference (3) as it is no longer applicable.
- 5-10^b Moved revised footnotes "b" and "d" to this page from page 5-8. The notes were changed to reflect NUREG-1301. Added footnote "d". Moved the top paragraph to page 5-9 as well as the footnotes for LLD.
- 5-11 Deleted outdated Technical Specification references.
- 5-19^b Revised the location of the Oceanside "Control", local crop #2, as the exact location will vary depending on where the sample is obtained. A footnote is also added to explain this. Deleted drinking water locations 1 (Tri-Cities Municipal Water District Reservoir) and 2 (San Clemente golf Course Well). Added drinking water location 4. The two remaining drinking water locations are the Control location and the closest location.
- 5-20^b Modified distance of non-migratory marine animals at the Units 2 and 3 outfall from 1.7 miles to 1.5 miles.
- 6-9 Deleted outdated Technical Specification references.

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SECTION J. CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS

There were no changes to the Units 2&3 Radioactive Waste Treatment Systmes during the reporting period, January 1, 1997 to December 31, 1997.

SECTION K. MISCELLANEOUS

- Spill of Steam Generator Chemical Cleaning (SGCC) Solution

On 4/25/97, a volume less than 1200 gallons of SGCC rinse water was spilled in the Main Steam Isolation Valve (MSIV) area. Some of this water was discharged into the Unit 3 plant yard drains which gravity drains to Unit 3 intake. Because Unit 3 was in an outage, the Unit 3 intake was drained; therefore the spill water was pumped to Unit 2 and released. Total activity released was estimated at $8.12\text{E-}7$ curies. The dose consequences were below site release limits and were estimated to be $8.00\text{E-}7$ mrem to the total body and $6.84\text{E-}6$ mrem to the limiting organ (GI-LLI). This incident is documented in Action Request (AR) 970401640.

- Improper Use of a Clean Sump Release Authorization (CSRA# C-97-70)

On 6/17/97, a Unit 2 FFCPD HUT was released using a CSRA instead of a release permit when Co-58 activity was erroneously overlooked. (CSRA's are used to document releases where no activity is detected.) The default setpoint in the radmonitor during the release was more conservative than the allowed monitor setpoint and the radmonitor was in service at the time of the release. Total activity released was $2.54\text{E-}5$ curies which was documented in release permit, (7L-127). The dose consequences were well below site release limits and were $2.04\text{E-}7$ mrem to the total body and $1.84\text{E-}6$ mrem to the limiting organ (GI-LLI). This incident is documented in AR 970601181.

- Missed Duplicate Sample Due to Monitor Inoperability (CSRA# C-97-0091-3 and C-97-0093-3)

On 7/21/97 and 7/27/97, CSRA's were generated on Unit 3 FFCPD HUT. The radmonitor was inoperable, and per procedure, two tank samples were required. The first occurrence was shortly after the procedure was revised requiring the sample. In the second event, Chemistry logs had the monitor incorrectly listed as being in service and therefore no second sample was obtained. Both clean sump releases were less than minimum detectable activity and therefore, there was no dose impact. These incidents were documented in AR 970701026 (C-97-0091-3) and AR 970701465 (C-97-0093-3).

- Inoperability of Containment Purge Monitor Isolation Valves Due to Inadequate Surveillance

Procedures were modified to remove the requirement for physical testing of the containment purge isolation valve closure functions of monitors 2(3)RT-7828 and 2(3)RT-7865. Instead, the surveillance verified that the valve closure logic received a closure signal by checking relay contacts instead of actual valve closure. This error resulted in the technical inoperability of the monitors' isolation functions since January 1989. Both units' mini purge valves and the Unit 3 main purge valves were surveilled soon after this was discovered and procedures were changed. Due to the site specification requiring the main purge valves to be sealed closed during plant operation, the Unit 2 main purge valves were surveilled at the first opportunity during the mid cycle outage in early 1998. The monitoring functions of the radiation monitors were not affected. This incident is documented in to AR 970101498 and Licensee Event Report (LER) 2-97-007.

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

EFFLUENT RADIATION MONITORS OUT OF SERVICE GREATER THAN 30 DAYS

January 1, 1997 - December 31, 1997

S.O.N.G.S. 2			
Monitor	Inoperability Period	Inoperability Cause	Explanation
2RT-6753 Steam Generator Blowdown Monitor	11/30/96 - 04/07/97	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 - 03/17/97	No sample flow	No steam generator pressure or steam flow due to Unit being in a refueling outage.
2RT-7817 BPS/FFCPD Discharge Monitor	12/28/96 - 02/07/97	Repeated monitor failure	Engineering evaluation required to replace existing flow switch.
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 - 04/07/97	No Steam Flow	No steam generator pressure with steam flow due to Unit being in a refueling outage.
2RT-7828 Containment Purge Monitor	12/01/96 - 01/04/97	Sample Line sensing switching inoperable	Solenoid valves will not switch to Main Purge nozzles. Problem was corrected with a software change.
	01/23/89 - 01/30/97	Improper channel functional test	Mini purge valves were not properly surveilled due to procedure error. LER-2-97-007
	01/23/89 - 01/26/98	Improper channel functional test	Main purge valves were not properly surveilled due to procedure error, unable to perform surveillance until 1998 mid-cycle outage. LER-2-97-007
2RT-7865 Containment Purge (Plant Vent Stack) Monitor	02/28/89 - 01/30/97	Improper channel functional test	Mini purge valves were not properly surveilled due to procedure error. LER-2-97-007
	02/28/89 - 01/26/98	Improper channel functional test	Main purge valves were not properly surveilled due to procedure error, unable to perform surveillance until 1998 mid-cycle outage. LER-2-97-007
2RT-7870 Condenser Air Ejector Process Flow Monitor	08/24/96 - 02/04/97	Failed process flow reading	Required new parts for flow instruments to be installed. Radiation monitor functions were operable during this period.
	02/15/97 - 03/22/97	Failed process flow reading	Required new parts for flow instruments to be installed. Radiation monitor functions were operable during this period.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

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

EFFLUENT RADIATION MONITORS OUT OF SERVICE GREATER THAN 30 DAYS

January 1, 1997 - December 31, 1997

S.O.N.G.S. 3

Monitor	Inoperability Period	Inoperability Cause	Explanation
3RT-6753 Steam Generator Blowdown Monitor	04/12/97 - 06/16/97	No sample flow	No steam generator pressure or steam flow due to Unit being in a refueling outage.
3RT-6759 Steam Generator Blowdown Monitor	04/12/97 - 06/16/97	No sample flow	No steam generator pressure or steam flow due to Unit being in a refueling outage.
3RT-7818 Condenser Air Ejector Monitor	04/04/97 - 06/02/97	Scheduled maintenance	Routine blower maintenance and channel functional test. (Performed during plant outage when monitor operability is not required)
	09/29/97 - 11/07/97	Scheduled maintenance	Channel calibration, rebuilt detector
3RT-7828 Containment Purge Monitor	01/23/89 - 01/28/97	Improper channel functional test	Mini purge valves were not properly surveilled due to procedure error. LER-2-97-007
	01/23/89 - 04/13/97	Improper channel functional test	Main purge valves were not properly surveilled due to procedure error. LER-2-97-007
3RT-7865 Containment Purge (Plant Vent Stack) Monitor	02/28/89 - 01/28/97	Improper channel functional test	Mini purge valves were not properly surveilled due to procedure error. LER-2-97-007
	02/28/89 - 06/05/97	Improper channel functional test	Main purge valves were not properly surveilled due to procedure error. LER-2-97-007
3RT-7870 Condenser Air Ejector Monitor	04/14/97 - 06/09/97	Scheduled Maintenance	Perform 18 month calibration. (Performed during plant outage when monitor operability is not required)

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

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

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

- Gaseous releases totaled $2.92\text{E}+2$ curies of which noble gases were $2.25\text{E}+2$ curies, iodines were $8.19\text{E}-3$ curies, particulates were $4.89\text{E}-4$ curies, and tritium was $6.72\text{E}+1$ curies.
- The radiation doses from gaseous releases are: (a) gamma air dose: $1.11\text{E}-2$ mrad at the site boundary, (b) beta air dose: $1.58\text{E}-2$ mrad at the site boundary, (c) organ dose: $2.42\text{E}-2$ mrem at the nearest receptor.
- Liquid releases totaled $3.08\text{E}+2$ curies of which particulates and iodines were $3.18\text{E}-1$ curies, tritium was $3.08\text{E}+2$ curies, and noble gases were $3.50\text{E}-1$ curies.
- The radiation doses from liquid releases are: (a) total body: $7.82\text{E}-3$ mrem, (b) limiting organ: $6.03\text{E}-2$ 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 (1997)

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 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 (filters)(*)	m ³	9.20E-1	3.00E+1
	Ci	1.44E+1	

NOTE: Total curie content estimated.

- Material packaged into High Integrity Containers and shipped in a Type A Cask ® of C 9176) or a Type B Cask ® of C 9028).

N/A No shipment made.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

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.	not applicable	0.00E+0
c.	not applicable	0.00E+0
d.	americium-241	3.52E-3
	carbon-14	7.38E+0
	cesium-137	7.66E+0
	cobalt-60	1.50E+1
	curium-242	2.15E-1
	curium-243/244	9.68E-3
	iron-55	4.80E+1
	nickel-59	8.98E-3
	nickel-63	2.01E+1
	niobium-94	6.38E-2
	plutonium-238	2.25E-3
	plutonium-239/240	1.96E-3
	plutonium-241	1.79E-1
	strontium-90	2.98E-2
	tritium	1.39E+0

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

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
1 *	Kindrick Trucking Company Truck/Type A Cask	Barnwell, SC
4 *	Kindrick Trucking Company Truck/Trailer	Barnwell, SC
29 *	Kindrick Trucking Company Truck/Trailer	Envirocare, UT
16 #	Hitman Trucking Company 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 16 shipments made from this facility included waste from other generators. SONGS' 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

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COMMON

TABLE 3 (Continued)

C. DEWATERING

Number of Containers	Solidification Agent
None	N/A

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

None.

REFERENCES:

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

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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	5.63E-1
b. Percent ODCM Specification Limit	%	2.25E+0
2. Limiting Organ		
a. Organ Dose (GI-LLI)	mrem	5.53E-2
b. Percent ODCM Specification Limit	%	2.21E-1
3. Thyroid		
a. Thyroid Dose	mrem	6.56E-3
b. Percent ODCM Specification Limit	%	8.75E-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.

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COMMON CONCLUSIONS

- Gaseous releases from S.O.N.G.S. 1, 2 and 3 totaled $2.92\text{E}+2$ curies of which noble gases were $2.25\text{E}+2$ curies, iodines were $8.19\text{E}-3$ curies, particulates were $4.89\text{E}-4$ curies, and tritium was $6.77\text{E}+1$ curies.
- Liquid releases from S.O.N.G.S. 1, 2 and 3 totaled $3.08\text{E}+2$ curies of which particulates and iodines were $3.18\text{E}-1$ curies, tritium was $3.08\text{E}+2$ curies, and noble gases were $3.50\text{E}-1$ 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 21 radwaste shipments to Barnwell, SC and 29 shipments to Envirocare, UT. Total volume was $7.18\text{E}+2$ cubic meters containing $3.79\text{E}+1$ curies of radioactivity.
- Meteorological conditions during the year were typical for S.O.N.G.S. Meteorological dispersion was good 31% of the time, fair 42% of the time and poor 27% 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.

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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.

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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, 1997 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, 1997. 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.

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METEOROLOGY

January - March
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 96123124-97033123
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	1	0	0	0	0	0	0	1
NNE	1	0	0	0	0	0	0	0	0	0	0	0	1
NE	0	0	0	0	0	0	2	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	1	0	0	0	1	0	0	0	0	0	0	2
SE	0	0	0	0	0	0	2	1	0	0	0	0	3
SSE	0	0	0	1	1	3	3	1	0	0	0	0	9
S	0	0	0	1	4	21	16	4	0	0	0	0	46
SSW	0	0	1	1	4	15	3	0	1	0	0	0	25
SW	0	0	0	2	6	21	15	1	0	0	0	0	45
WSW	0	0	0	4	12	36	29	1	0	0	0	0	82
W	0	0	0	0	6	44	60	2	2	0	0	0	114
WNW	0	0	0	0	0	10	29	5	2	0	0	0	46
NW	0	0	0	0	0	0	0	2	0	0	0	0	2
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	1	1	1	9	33	152	159	17	5	0	0	0	378

NUMBER OF VALID HOURS 378
NUMBER OF INVALID HOURS 7NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD 21PASQUILL 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	1	0	0	0	0	0	0	1
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	1	0	0	0	0	1
SSE	0	0	0	0	0	2	6	1	1	0	0	0	10
S	0	0	0	1	0	3	6	0	1	0	0	0	11
SSW	0	0	0	0	0	2	3	1	0	0	0	0	6
SW	0	0	0	1	2	4	2	0	0	0	0	0	9
WSW	0	0	0	2	2	0	0	0	2	0	0	0	6
W	0	0	1	0	2	6	0	0	0	0	0	0	9
WNW	0	0	0	0	1	1	3	1	0	0	0	0	6
NW	0	0	0	0	0	0	2	1	0	0	0	0	3
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	1	4	7	19	22	5	4	0	0	0	62

NUMBER OF VALID HOURS 62
NUMBER OF INVALID HOURS 7NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD 21

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METEOROLOGY

January - March
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 96123124-97033123
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL 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	3	0	0	0	0	0	3
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	1	0	0	0	0	0	1
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	1	2	0	0	0	0	0	3
SSE	0	0	0	0	0	4	1	0	2	0	0	0	7
S	0	0	0	1	3	2	2	1	0	0	0	0	9
SSW	0	0	0	0	2	0	3	0	0	0	0	0	5
SW	0	0	0	0	0	2	4	0	1	0	0	0	7
WSW	0	0	0	0	1	0	2	0	0	0	0	0	3
W	0	0	0	2	0	2	1	0	0	0	0	0	5
WNW	0	0	0	0	0	3	4	0	0	0	0	0	7
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	0	3	6	14	24	1	3	0	0	0	51

NUMBER OF VALID HOURS 51
NUMBER OF INVALID HOURS 7NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2160

PASQUILL 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	6	3	3	2	1	1	1	1	0	19
NNE	0	0	1	4	2	4	3	0	1	2	1	0	18
NE	0	0	1	2	2	0	1	2	0	0	0	0	8
ENE	0	0	0	0	1	2	0	0	0	0	0	0	3
E	0	0	0	0	2	2	4	0	0	0	0	0	8
ESE	0	0	2	3	0	6	10	1	0	0	0	0	22
SE	0	0	0	2	8	21	45	19	2	0	0	0	97
SSE	0	3	3	2	10	28	29	11	7	1	0	0	94
S	1	0	2	5	5	5	18	3	2	2	1	0	44
SSW	0	0	2	5	7	12	10	4	1	0	0	0	41
SW	0	0	0	6	4	14	8	2	4	0	0	0	38
WSW	0	0	2	4	5	8	7	3	2	0	0	0	31
W	0	0	1	5	5	6	5	1	6	1	0	0	30
WNW	1	0	1	2	3	7	7	3	1	0	0	0	25
NW	0	0	2	1	3	14	15	0	0	0	0	0	35
NNW	0	1	1	3	1	6	5	2	1	0	0	0	20
TOTALS	2	4	19	50	61	138	169	52	28	7	3	0	533

NUMBER OF VALID HOURS 533
NUMBER OF INVALID HOURS 7NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2160

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METEOROLOGY

January - March
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 96123124-97033123
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	0	1	1	2	3	11	2	1	0	0	0	0	21
NNE	0	0	1	11	20	29	8	0	3	2	0	0	74
NE	0	0	3	9	4	3	2	1	0	0	0	0	22
ENE	0	0	1	2	2	3	1	2	1	0	0	0	12
E	1	2	1	7	3	5	3	0	0	0	0	0	22
ESE	0	0	1	6	2	6	3	0	0	0	0	0	18
SE	0	0	1	3	3	9	6	1	0	0	0	0	23
SSE	0	1	0	3	4	5	6	2	0	0	0	0	21
S	0	0	1	6	3	1	2	1	0	0	0	0	14
SSW	0	0	1	7	1	0	0	1	0	0	0	0	10
SW	0	1	1	3	0	1	0	0	0	0	0	0	6
WSW	1	2	0	4	0	2	0	0	1	0	0	0	10
W	0	0	0	2	3	5	1	0	1	0	0	0	12
WNW	1	0	0	0	2	6	2	0	0	0	0	0	11
NW	0	0	0	2	3	2	4	0	0	0	0	0	11
NNW	0	1	2	0	2	4	2	1	0	0	0	0	12
TOTALS	3	8	14	67	55	92	42	10	6	2	0	0	299

NUMBER OF VALID HOURS 299
NUMBER OF INVALID HOURS 7NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD 299

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	1	0	0	4	2	4	0	0	0	0	0	11
NNE	0	0	0	21	46	71	14	0	0	0	0	0	152
NE	0	0	3	11	15	10	2	0	0	0	0	0	41
ENE	0	1	1	7	4	4	2	0	0	0	0	0	19
E	0	0	0	5	5	3	1	0	0	0	0	0	14
ESE	0	1	1	2	4	1	1	0	0	0	0	0	10
SE	0	1	0	1	2	2	1	0	0	0	0	0	7
SSE	0	0	0	0	0	4	0	0	0	0	0	0	4
S	0	0	1	1	0	1	1	0	0	0	0	0	4
SSW	0	0	1	0	0	0	0	0	0	0	0	0	1
SW	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	0	0	0	2	0	0	0	0	0	0	0	0	2
W	0	0	0	0	2	2	1	0	0	0	0	0	5
WNW	0	0	0	2	1	2	3	0	0	0	0	0	8
NW	0	0	0	3	3	2	4	0	0	0	0	0	12
NNW	0	0	0	0	2	4	4	0	0	0	0	0	10
TOTALS	0	4	7	55	88	108	38	0	0	0	0	0	300

NUMBER OF VALID HOURS 300
NUMBER OF INVALID HOURS 7NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD 300

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METEOROLOGY

January - March
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 96123124-97033123
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	1	2	9	14	1	0	0	0	0	28
NNE	0	0	2	5	29	154	159	21	1	0	0	0	371
NE	0	0	0	9	16	19	15	0	0	0	0	0	59
ENE	0	0	2	3	6	4	1	0	0	0	0	0	16
E	1	0	2	1	3	2	0	0	0	0	0	0	9
ESE	0	0	2	2	0	0	0	0	0	0	0	0	4
SE	0	0	0	1	2	2	0	0	0	0	0	0	5
SSE	0	0	1	0	3	0	0	0	0	0	0	0	4
S	0	1	3	2	0	1	0	0	0	0	0	0	7
SSW	0	0	0	1	0	0	0	0	0	0	0	0	1
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	1	0	1	1	5	0	0	0	0	0	0	8
WNW	0	0	1	1	1	3	8	1	0	0	0	0	15
NW	0	0	0	0	0	0	1	0	0	0	0	0	1
NNW	0	0	0	0	0	0	1	0	0	0	0	0	1
TOTALS	1	2	14	28	63	199	199	23	1	0	0	0	530

NUMBER OF VALID HOURS 530
NUMBER OF INVALID HOURS 7NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2160ALL 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	2	3	9	12	26	22	3	1	1	1	0	80
NNE	1	0	4	41	97	259	187	21	5	4	1	0	620
NE	0	0	7	31	37	32	22	3	0	0	0	0	132
ENE	0	1	4	12	13	13	4	2	1	0	0	0	50
E	2	2	3	13	13	12	9	0	0	0	0	0	54
ESE	0	2	6	13	6	14	14	1	0	0	0	0	56
SE	0	1	1	7	15	35	56	22	2	0	0	0	139
SSE	0	4	4	6	18	46	45	15	10	1	0	0	149
S	1	1	7	17	15	34	45	9	3	2	1	0	135
SSW	0	0	5	14	14	29	19	6	2	0	0	0	89
SW	0	1	1	12	12	42	29	3	5	0	0	0	105
WSW	1	2	2	17	20	46	38	4	5	0	0	0	135
W	0	1	2	10	19	70	68	3	9	1	0	0	183
WNW	2	0	2	5	8	32	56	10	3	0	0	0	118
NW	0	0	2	6	9	18	27	3	0	0	0	0	65
NNW	0	2	3	3	5	14	12	3	1	0	0	0	43
TOTALS	7	19	56	216	313	722	653	108	47	9	3	0	2153

NUMBER OF VALID HOURS 2153
NUMBER OF INVALID HOURS 7NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2160

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

METEOROLOGY

April - June
TABLE 4A

SITE: SAN ONOFRE
PERIOD OF RECORD 97033124-97063023
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	1	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	1	0	0	0	0	0	1
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	2	1	0	0	0	0	3
SSE	0	0	0	0	1	1	4	9	0	0	0	0	15
S	0	0	0	1	4	11	52	26	0	2	0	0	96
SSW	0	0	0	0	1	17	53	5	0	0	0	0	76
SW	0	0	0	1	8	45	91	5	0	0	0	0	150
WSW	0	0	0	1	8	51	111	7	0	0	0	0	178
W	0	0	0	1	3	46	113	11	1	0	0	0	175
WNW	0	0	0	0	0	7	17	9	4	0	0	0	37
NW	0	0	0	0	0	0	0	1	2	0	0	0	3
NNW	0	0	0	1	0	0	0	0	0	0	0	0	1
TOTALS	0	0	0	5	25	178	446	74	7	2	0	0	737

NUMBER OF VALID HOURS 737
NUMBER OF INVALID HOURS 4

NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD 21

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

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	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	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	3	3	5	0	0	0	0	11
S	0	0	1	0	1	4	3	2	1	0	0	0	12
SSW	0	0	0	0	0	4	20	1	1	0	0	0	26
SW	0	0	0	1	1	7	4	0	0	0	0	0	13
WSW	0	0	0	1	3	3	0	0	0	0	0	0	7
W	0	0	0	0	1	0	0	0	0	0	0	0	1
WNW	0	0	0	1	1	3	1	0	0	0	0	0	6
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	1	3	7	24	33	9	2	0	0	0	79

NUMBER OF VALID HOURS 79
NUMBER OF INVALID HOURS 4

NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD 21

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

METEOROLOGY

April - June
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 97033124-97063023
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL C

SLIGHTLY UNSTABLE ($-1.7 < \Delta T/\Delta Z \leq -1.5$ °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	2	0	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	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	1	0	0	0	0	0	0	1
SE	0	0	0	0	0	0	3	2	0	0	0	0	5
SSE	0	0	0	0	0	4	3	2	3	0	0	0	12
S	0	0	0	0	0	5	6	2	1	0	0	0	14
SSW	0	0	0	0	3	2	13	3	0	0	0	0	21
SW	0	0	0	1	1	5	5	0	0	0	0	0	12
WSW	0	0	0	1	3	0	1	0	0	0	0	0	5
W	0	0	0	0	1	0	2	0	0	0	0	0	3
WNW	0	0	0	0	1	1	3	0	0	0	0	0	5
NW	0	0	0	0	0	0	1	3	0	0	0	0	4
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	2	9	20	37	12	4	0	0	0	84

NUMBER OF VALID HOURS 84
NUMBER OF INVALID HOURS 4NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2184

PASQUILL D

NEUTRAL ($-1.5 < \Delta T/\Delta Z \leq -0.5$ °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	10	4	2	1	0	0	0	0	0	18
NNE	0	2	5	10	14	18	2	0	0	0	0	0	51
NE	0	0	1	5	3	5	1	1	0	0	0	0	16
ENE	0	0	1	2	3	3	1	0	1	0	0	0	11
E	0	2	1	3	5	16	7	0	0	0	0	0	34
ESE	0	1	0	3	6	22	20	2	0	0	0	0	54
SE	0	0	1	3	10	41	98	16	0	0	0	0	169
SSE	0	1	1	6	19	37	47	20	8	0	0	0	139
S	0	1	7	2	11	32	50	6	2	0	0	0	111
SSW	0	0	4	5	14	32	28	8	3	0	0	0	94
SW	0	0	2	6	9	16	10	5	0	0	0	0	48
WSW	1	1	3	7	11	6	6	1	1	0	0	0	37
W	0	1	2	8	9	8	2	1	0	0	0	0	31
WNW	0	0	1	6	5	10	5	2	1	0	0	0	30
NW	0	0	1	7	3	11	13	2	0	0	0	0	37
NNW	0	0	2	4	1	2	1	1	0	0	0	0	11
TOTALS	1	9	33	87	127	261	292	65	16	0	0	0	891

NUMBER OF VALID HOURS 891
NUMBER OF INVALID HOURS 4NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

METEOROLOGY

April - June
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 97033124-97063023
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	1	1	4	6	2	1	0	0	0	0	0	16
NNE	0	0	1	6	14	19	1	0	0	0	0	0	41
NE	0	0	0	3	2	1	2	0	0	0	0	0	8
ENE	0	1	5	2	1	4	0	0	0	0	0	0	13
E	1	0	3	5	3	6	0	0	0	0	0	0	18
ESE	0	0	0	3	7	2	0	0	0	0	0	0	12
SE	0	0	0	2	0	4	2	1	0	0	0	0	9
SSE	0	0	0	0	1	1	0	0	0	0	0	0	2
S	0	0	1	1	0	0	0	0	0	0	0	0	2
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	0	0	1	0	0	0	0	0	0	1
W	0	0	0	0	1	1	0	0	0	0	0	0	2
WNW	0	0	0	0	0	0	3	0	0	0	0	0	3
NW	0	0	0	0	0	0	1	0	0	0	0	0	1
NNW	0	0	2	1	1	1	0	0	0	0	0	0	5
TOTALS	2	2	13	27	36	42	10	1	0	0	0	0	133

NUMBER OF VALID HOURS 133
NUMBER OF INVALID HOURS 4NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD 218

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	5	2	1	0	0	0	0	0	0	8
NNE	0	0	3	10	27	36	6	0	0	0	0	0	82
NE	0	1	2	8	7	1	0	0	0	0	0	0	19
ENE	0	0	0	4	3	0	0	0	0	0	0	0	7
E	0	0	0	0	1	0	0	0	0	0	0	0	1
ESE	0	0	2	1	1	0	0	0	0	0	0	0	4
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	1	0	0	0	0	0	0	0	0	0	1
SSW	1	0	0	0	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	0	0	0	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	1	0	0	0	0	0	1
NW	0	0	0	0	1	0	0	0	0	0	0	0	1
NNW	0	0	0	1	0	0	0	0	0	0	0	0	1
TOTALS	1	2	8	29	42	38	7	0	0	0	0	0	127

NUMBER OF VALID HOURS 127
NUMBER OF INVALID HOURS 4NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD 218

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

METEOROLOGY

April - June
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 97033124-97063023
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL 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	2	0	1	0	0	0	0	0	0	3
NNE	0	1	0	1	9	55	41	0	0	0	0	0	107
NE	0	0	0	2	7	3	0	0	0	0	0	0	12
ENE	0	0	0	1	1	0	0	0	0	0	0	0	2
E	0	1	1	0	0	0	0	0	0	0	0	0	2
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	0	0	0	0	0	0	0	0	0
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	0	0	0	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	0	0	0	0	1	0	1	0	0	0	0	0	2
NNW	0	0	0	0	1	0	0	0	0	0	0	0	1
TOTALS	0	2	1	6	19	59	42	0	0	0	0	0	129

NUMBER OF VALID HOURS
NUMBER OF INVALID HOURS129
4NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD0
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	1	1	2	21	12	6	2	0	0	0	0	0	45
NNE	0	3	9	27	64	130	51	0	0	0	0	0	284
NE	0	1	3	18	19	10	5	1	0	0	0	0	57
ENE	0	1	6	9	8	7	1	0	1	0	0	0	33
E	1	3	5	8	9	22	8	0	0	0	0	0	56
ESE	0	1	2	7	14	25	20	2	0	0	0	0	71
SE	0	0	1	5	10	45	105	20	0	0	0	0	186
SSE	0	1	1	6	21	46	57	36	11	0	0	0	179
S	0	1	10	4	16	52	111	36	4	2	0	0	236
SSW	1	0	4	5	18	55	114	17	4	0	0	0	218
SW	0	1	2	9	19	73	110	10	0	0	0	0	224
WSW	1	1	3	10	25	61	118	8	1	0	0	0	228
W	0	1	2	9	15	55	117	12	1	0	0	0	212
WNW	0	0	1	7	7	21	30	11	5	0	0	0	82
NW	0	0	1	7	5	11	17	7	2	0	0	0	50
NNW	0	0	4	7	3	3	1	1	0	0	0	0	19
TOTALS	4	15	56	159	265	622	867	161	29	2	0	0	2180

NUMBER OF VALID HOURS
NUMBER OF INVALID HOURS2180
4NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD0
2184

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

METEOROLOGY

July - September
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 97063024-97093023
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	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	1	1	0	0	0	0	0	0	2
SE	0	0	0	0	0	4	0	0	0	0	0	0	4
SSE	0	0	0	0	1	4	8	2	0	0	0	0	15
S	0	0	0	1	6	5	16	10	0	0	0	0	38
SSW	0	0	1	3	3	11	26	1	0	0	0	0	45
SW	0	0	0	3	6	32	44	0	0	0	0	0	85
WSW	0	0	0	4	14	71	76	1	0	0	0	0	166
W	0	0	0	1	7	104	179	1	0	0	0	0	292
WNW	0	0	0	0	0	7	60	11	1	0	0	0	79
NW	1	0	0	1	0	0	0	1	1	0	0	0	4
NNW	0	0	0	0	1	0	0	0	0	0	0	0	1
TOTALS	1	0	1	13	39	235	413	27	2	0	0	0	731

NUMBER OF VALID HOURS 731
NUMBER OF INVALID HOURS 1NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD 2200PASQUILL 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	1	0	0	0	0	1
SSE	0	0	0	0	0	0	2	2	0	0	0	0	4
S	0	0	0	0	1	0	5	0	0	0	0	0	6
SSW	0	0	0	0	0	1	2	1	0	0	0	0	4
SW	0	0	0	1	1	3	2	0	0	0	0	0	7
WSW	0	0	0	2	2	5	0	0	0	0	0	0	9
W	0	0	0	0	3	5	0	0	0	0	0	0	8
WNW	0	0	0	0	1	3	3	1	0	0	0	0	8
NW	2	0	0	0	0	0	3	0	0	0	0	0	5
NNW	0	0	0	0	1	0	0	0	0	0	0	0	1
TOTALS	2	0	0	3	9	17	17	5	0	0	0	0	53

NUMBER OF VALID HOURS 53
NUMBER OF INVALID HOURS 1NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD 2000

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

METEOROLOGY

July - September
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 97063024-97093023
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL 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	0	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	1	1	1	0	0	0	0	0	0	3
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	4	1	0	0	0	0	7
S	0	0	0	0	0	1	4	0	0	0	0	0	5
SSW	0	0	0	1	1	6	3	0	0	0	0	0	11
SW	0	0	0	1	1	7	6	0	0	0	0	0	15
WSW	0	0	0	1	4	3	0	0	0	0	0	0	8
W	0	0	0	3	5	4	1	0	0	0	0	0	13
WNW	0	0	0	0	0	3	7	2	0	0	0	0	12
NW	1	0	0	0	0	1	2	1	0	0	0	0	5
NNW	0	0	0	0	1	0	0	0	0	0	0	0	1
TOTALS	1	0	0	7	15	27	27	4	0	0	0	0	81

NUMBER OF VALID HOURS 81
NUMBER OF INVALID HOURS 1NUMBER OF CALMS 0
TOTAL HOURS FOR THE PERIOD 2208

PASQUILL 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	0	16	10	8	4	0	0	0	0	0	38
NNE	1	2	3	10	8	18	5	0	0	0	0	0	47
NE	1	1	0	3	5	4	0	0	0	0	0	0	14
ENE	0	0	0	0	1	3	0	0	0	0	0	0	4
E	0	0	1	4	3	5	1	0	0	0	0	0	14
ESE	0	1	1	1	3	7	8	0	0	0	0	0	21
SE	1	0	3	4	10	36	34	2	0	0	0	0	90
SSE	0	0	3	12	14	22	27	10	1	0	0	0	89
S	1	3	1	8	8	17	26	6	0	0	0	0	70
SSW	0	0	2	7	7	13	17	0	0	0	0	0	46
SW	1	1	2	8	7	5	2	0	0	0	0	0	26
WSW	2	3	4	13	6	6	2	0	0	0	0	0	36
W	1	1	3	16	18	9	4	0	0	0	0	0	52
WNW	1	2	4	4	18	33	15	3	0	0	0	0	80
NW	1	1	4	14	16	23	13	1	0	0	0	0	73
NNW	0	1	2	9	10	9	2	0	0	0	0	0	33
TOTALS	10	16	33	129	144	218	160	22	1	0	0	0	733

NUMBER OF VALID HOURS 733
NUMBER OF INVALID HOURS 1NUMBER OF CALMS 1
TOTAL HOURS FOR THE PERIOD 2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

METEOROLOGY

July - September
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 97063024-97093023
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	0	1	6	9	5	4	2	0	0	0	0	0	27
NNE	1	1	6	36	19	18	8	0	0	0	0	0	89
NE	1	2	4	7	1	1	0	0	0	0	0	0	16
ENE	1	3	1	8	2	0	0	1	0	0	0	0	16
E	1	0	5	4	0	3	0	0	0	0	0	0	13
ESE	1	1	3	4	0	2	1	0	0	0	0	0	12
SE	0	1	0	2	3	7	8	2	0	0	0	0	23
SSE	0	0	1	5	5	9	4	1	0	0	0	0	25
S	2	0	2	3	0	1	1	0	0	0	0	0	9
SSW	2	1	0	6	0	1	0	0	0	0	0	0	10
SW	1	0	1	5	0	0	0	0	0	0	0	0	7
WSW	0	0	1	2	1	0	0	0	0	0	0	0	4
W	0	1	1	1	1	4	0	0	0	0	0	0	8
WNW	0	0	5	2	2	1	6	0	0	0	0	0	16
NW	0	1	0	0	2	3	1	0	0	0	0	0	7
NNW	0	1	1	2	1	2	0	0	0	0	0	0	7
TOTALS	10	13	37	96	42	56	31	4	0	0	0	0	289

NUMBER OF VALID HOURS 289
NUMBER OF INVALID HOURS 1NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD 289

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	1	1	3	4	3	0	0	0	0	0	12
NNE	0	2	0	15	30	44	6	1	0	0	0	0	98
NE	0	2	3	12	1	0	0	0	0	0	0	0	18
ENE	0	0	1	4	0	0	0	0	0	0	0	0	5
E	0	0	2	1	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	1	3	0	0	0	0	0	5
SSE	0	0	0	2	0	1	0	0	0	0	0	0	3
S	0	0	1	0	1	0	0	0	0	0	0	0	2
SSW	0	0	0	1	0	0	0	0	0	0	0	0	1
SW	1	0	0	0	0	0	0	0	0	0	0	0	1
WSW	0	0	0	0	0	0	1	0	0	0	0	0	1
W	0	0	0	0	0	2	0	0	0	0	0	0	2
WNW	0	0	0	0	0	3	2	0	0	0	0	0	5
NW	0	0	1	0	0	1	0	0	0	0	0	0	2
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	1	4	9	38	35	56	15	1	0	0	0	0	159

NUMBER OF VALID HOURS 159
NUMBER OF INVALID HOURS 1NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD 159

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

METEOROLOGY

July - September
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 97063024-97093023
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL 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	2	0	0	0	0	1	5	0	0	0	0	0	8
NNE	0	0	0	3	7	64	42	0	0	0	0	0	116
NE	0	0	2	1	3	2	1	0	0	0	0	0	9
ENE	0	0	0	1	0	1	1	0	0	0	0	0	3
E	0	0	0	0	0	1	1	0	0	0	0	0	2
ESE	1	1	0	1	0	0	0	0	0	0	0	0	3
SE	0	0	0	1	0	0	0	0	0	0	0	0	1
SSE	0	0	0	0	1	0	0	0	0	0	0	0	1
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	0	0	0	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	0	0	2	0	0	0	0	0	0	2
WNW	1	0	0	0	0	3	2	0	0	0	0	0	6
NW	3	0	0	0	1	2	0	0	0	0	0	0	6
NNW	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTALS	7	1	2	7	12	77	52	0	0	0	0	0	158

NUMBER OF VALID HOURS
NUMBER OF INVALID HOURS158
1NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD0
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	1	7	26	19	17	14	0	0	0	0	0	86
NNE	2	5	9	64	64	144	61	1	0	0	0	0	350
NE	2	5	9	24	11	8	1	0	0	0	0	0	60
ENE	1	3	2	13	3	4	1	1	0	0	0	0	28
E	1	0	8	9	3	9	2	0	0	0	0	0	32
ESE	2	3	4	7	4	10	9	0	0	0	0	0	39
SE	1	1	3	8	13	44	49	5	0	0	0	0	124
SSE	0	0	4	19	22	37	45	16	1	0	0	0	144
S	3	3	4	12	16	24	52	16	0	0	0	0	130
SSW	2	1	3	18	11	32	48	2	0	0	0	0	117
SW	3	1	3	18	15	47	54	0	0	0	0	0	141
WSW	2	3	5	22	27	85	79	1	0	0	0	0	224
W	1	2	4	21	34	130	184	1	0	0	0	0	377
WNW	2	2	9	6	21	53	95	17	1	0	0	0	206
NW	8	2	5	15	19	30	19	3	1	0	0	0	102
NNW	0	2	3	11	14	12	2	0	0	0	0	0	44
TOTALS	32	34	82	293	296	686	715	63	3	0	0	0	2204

NUMBER OF VALID HOURS
NUMBER OF INVALID HOURS2204
1NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD3
2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

METEOROLOGY

October - December
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 97093024-97123123
WIND SPEED (M/S) AT 10 METER LEVELPASQUILL 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	1	0	0	0	0	2
NE	0	0	0	0	0	1	1	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	4	0	0	0	0	0	4
SSE	0	0	0	1	3	2	1	0	0	0	0	0	7
S	0	0	0	1	4	12	12	2	0	0	0	0	31
SSW	0	0	0	2	5	7	15	1	0	0	0	0	30
SW	0	0	0	1	5	20	17	0	0	0	0	0	43
WSW	0	0	0	4	13	36	28	3	0	0	0	0	84
W	0	0	0	0	5	62	65	5	2	0	0	0	139
WNW	0	0	0	0	1	10	27	11	8	0	0	0	57
NW	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTALS	0	1	0	9	36	151	170	23	10	0	0	0	400

NUMBER OF VALID HOURS 400
NUMBER OF INVALID HOURS 11NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD 22PASQUILL B
MODERATELY UNSTABLE ($-1.9 < DT/DZ \leq -1.7$ °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	1	0	0	0	0	0	1
NNE	0	0	0	0	0	0	0	3	0	0	0	0	3
NE	0	0	0	0	0	0	1	2	0	0	0	0	3
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	1	0	0	3	1	0	0	0	0	5
S	0	0	0	0	0	1	1	0	0	0	0	0	2
SSW	0	0	0	1	0	3	4	1	0	0	0	0	9
SW	0	0	0	0	0	2	4	1	0	0	0	0	7
WSW	0	0	0	0	0	3	2	0	0	0	0	0	5
W	0	0	0	1	0	2	1	0	0	0	0	0	4
WNW	0	0	0	0	1	3	2	2	0	0	0	0	8
NW	0	0	0	0	0	0	0	0	1	0	0	0	1
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	3	1	14	20	10	1	0	0	0	49

NUMBER OF VALID HOURS 49
NUMBER OF INVALID HOURS 11NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD 2

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

METEOROLOGY

October - December
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 97093024-97123123
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL 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	3	2	0	0	0	0	5
NE	0	0	0	0	0	0	1	1	1	0	0	0	3
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	1	0	1	0	0	2
SSE	0	0	0	0	0	1	2	0	0	0	0	0	3
S	0	0	0	0	0	0	2	0	0	0	0	0	2
SSW	0	0	0	1	0	1	1	1	0	0	0	0	4
SW	0	0	0	1	0	2	4	1	1	1	0	0	10
WSW	0	0	0	0	0	1	0	0	0	0	0	0	1
W	0	0	0	0	3	5	1	0	0	1	0	0	10
WNW	0	0	0	0	1	0	0	0	0	0	0	0	1
NW	0	0	0	0	0	0	2	0	0	0	0	0	2
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	2	4	11	16	6	2	3	0	0	44

NUMBER OF VALID HOURS
NUMBER OF INVALID HOURS44
11NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD1
2208

PASQUILL 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	0	2	3	0	4	3	0	2	0	0	14
NNE	0	0	2	5	1	7	7	4	5	0	0	0	31
NE	0	2	1	1	1	1	5	1	1	0	0	0	13
ENE	0	0	1	1	3	0	2	0	0	0	0	0	7
E	0	0	0	0	1	3	3	0	0	0	0	0	7
ESE	0	0	0	1	0	5	6	6	2	0	0	0	20
SE	1	0	0	0	4	15	27	17	5	2	1	0	72
SSE	0	0	2	5	6	14	15	6	4	1	0	0	53
S	1	0	0	5	3	9	11	2	2	5	0	0	38
SSW	0	2	0	2	4	10	20	4	1	0	0	0	43
SW	0	0	0	2	0	7	6	3	1	0	0	0	19
WSW	0	0	1	3	3	6	2	6	3	1	0	0	25
W	0	1	0	4	7	5	2	5	9	0	0	0	33
WNW	0	1	1	3	7	6	5	5	10	0	0	0	38
NW	1	0	0	4	5	6	23	4	0	0	0	0	43
NNW	0	0	0	6	4	5	5	0	0	0	0	0	20
TOTALS	3	6	8	44	52	99	143	66	43	11	1	0	476

NUMBER OF VALID HOURS
NUMBER OF INVALID HOURS476
11NUMBER OF CALMS
TOTAL HOURS FOR THE PERIOD1
2208

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

METEOROLOGY

October - December

TABLE 4A

SITE: SAN ONOFRE
 PERIOD OF RECORD 97093024-97123123
 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	2	1	1	9	9	14	12	5	2	0	0	0	55
NNE	0	0	1	13	9	21	20	4	1	0	0	0	69
NE	0	0	2	4	2	4	5	5	0	0	0	0	22
ENE	0	0	2	2	1	3	4	5	1	1	0	0	19
E	0	1	0	3	0	4	5	0	0	0	0	0	13
ESE	0	1	2	3	2	5	3	1	0	0	0	0	17
SE	0	0	0	0	1	5	5	6	0	0	0	0	17
SSE	0	0	0	1	1	0	3	2	1	0	0	0	8
S	0	1	0	1	1	0	0	0	1	0	0	0	4
SSW	0	0	0	1	0	0	1	0	0	0	0	0	2
SW	0	1	0	1	0	0	0	0	0	0	0	0	2
WSW	0	0	0	0	0	2	0	0	4	0	0	0	6
W	1	1	0	0	1	6	0	3	7	0	0	0	19
WNW	2	0	0	1	0	5	1	2	0	0	0	0	11
NW	1	0	0	1	3	4	3	1	1	0	0	0	14
NNW	0	0	0	3	9	4	7	1	0	0	0	0	24
TOTALS	6	6	8	43	39	77	69	35	18	1	0	0	302

NUMBER OF VALID HOURS 302
 NUMBER OF INVALID HOURS 11

NUMBER OF CALMS
 TOTAL HOURS FOR THE PERIOD 22

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	1	1	5	4	7	8	0	0	0	0	0	26
NNE	0	0	1	9	24	58	40	2	0	0	0	0	134
NE	0	2	2	6	6	8	5	4	1	0	0	0	34
ENE	0	0	1	0	0	3	0	0	0	0	0	0	4
E	0	0	1	3	2	0	0	0	0	0	0	0	6
ESE	1	0	0	2	1	1	0	0	0	0	0	0	5
SE	0	0	0	0	1	0	0	0	0	0	0	0	1
SSE	0	0	0	2	2	1	0	0	0	0	0	0	5
S	0	0	1	2	1	0	0	0	0	0	0	0	4
SSW	0	0	0	1	0	0	0	0	0	0	0	0	1
SW	0	0	0	1	0	0	0	0	0	0	0	0	1
WSW	0	0	0	0	1	0	0	0	0	0	0	0	1
W	0	0	0	0	1	0	0	0	0	0	0	0	1
WNW	0	0	0	0	1	5	3	0	0	0	0	0	9
NW	0	0	0	0	1	1	0	0	0	0	0	0	2
NNW	0	1	0	1	0	3	3	1	0	0	0	0	9
TOTALS	1	4	7	32	45	87	59	7	1	0	0	0	243

NUMBER OF VALID HOURS 243
 NUMBER OF INVALID HOURS 11

NUMBER OF CALMS
 TOTAL HOURS FOR THE PERIOD 2

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT (1997)

METEOROLOGY

October - December
TABLE 4ASITE: SAN ONOFRE
PERIOD OF RECORD 97093024-97123123
WIND SPEED (M/S) AT 10 METER LEVEL

PASQUILL 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	2	2	10	19	5	0	0	0	0	39
NNE	0	0	1	3	20	172	324	24	1	0	0	0	545
NE	0	0	2	6	7	14	15	0	0	0	0	0	44
ENE	0	1	1	2	2	3	1	0	0	0	0	0	10
E	0	0	1	1	1	0	0	0	0	0	0	0	3
ESE	0	0	1	3	1	0	0	0	0	0	0	0	5
SE	0	0	1	0	2	0	2	0	0	0	0	0	5
SSE	0	1	0	0	3	0	0	0	0	0	0	0	4
S	0	0	0	3	0	0	0	0	0	0	0	0	3
SSW	0	0	0	0	0	0	0	0	0	0	0	0	0
SW	1	0	0	0	2	0	0	0	0	0	0	0	3
WSW	0	0	3	0	0	0	0	0	0	0	0	0	3
W	0	0	0	0	0	5	0	1	0	0	0	0	6
WNW	0	0	0	0	3	4	1	0	0	0	0	0	8
NW	0	0	0	0	0	1	0	0	0	0	0	0	1
NNW	0	0	0	0	0	3	1	0	0	0	0	0	4
TOTALS	1	2	11	20	43	212	363	30	1	0	0	0	683

NUMBER OF VALID HOURS 683
NUMBER OF INVALID HOURS 11NUMBER 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	2	3	18	18	32	44	13	2	2	0	0	136
NNE	0	1	5	30	54	258	394	40	7	0	0	0	789
NE	0	4	7	17	16	28	33	13	3	0	0	0	121
ENE	0	1	5	5	6	9	7	5	1	1	0	0	40
E	0	1	2	7	4	7	8	0	0	0	0	0	29
ESE	1	1	3	9	4	11	9	7	2	0	0	0	47
SE	1	0	1	0	8	20	39	24	5	3	1	0	102
SSE	0	1	2	10	15	18	24	9	5	1	0	0	85
S	1	1	1	12	9	22	26	4	3	5	0	0	84
SSW	0	2	0	8	9	21	41	7	1	0	0	0	89
SW	1	1	0	6	7	31	31	5	2	1	0	0	85
WSW	0	0	4	7	17	48	32	9	7	1	0	0	125
W	1	2	0	5	17	85	69	14	18	1	0	0	212
WNW	2	1	1	4	14	33	39	20	18	0	0	0	132
NW	2	0	0	5	9	12	28	5	2	0	0	0	63
NNW	0	1	0	10	13	16	16	2	0	0	0	0	58
TOTALS	11	19	34	153	220	651	840	177	76	15	1	0	2197

NUMBER OF VALID HOURS 2197
NUMBER OF INVALID HOURS 11NUMBER OF CALMS 1
TOTAL HOURS FOR THE PERIOD 2208