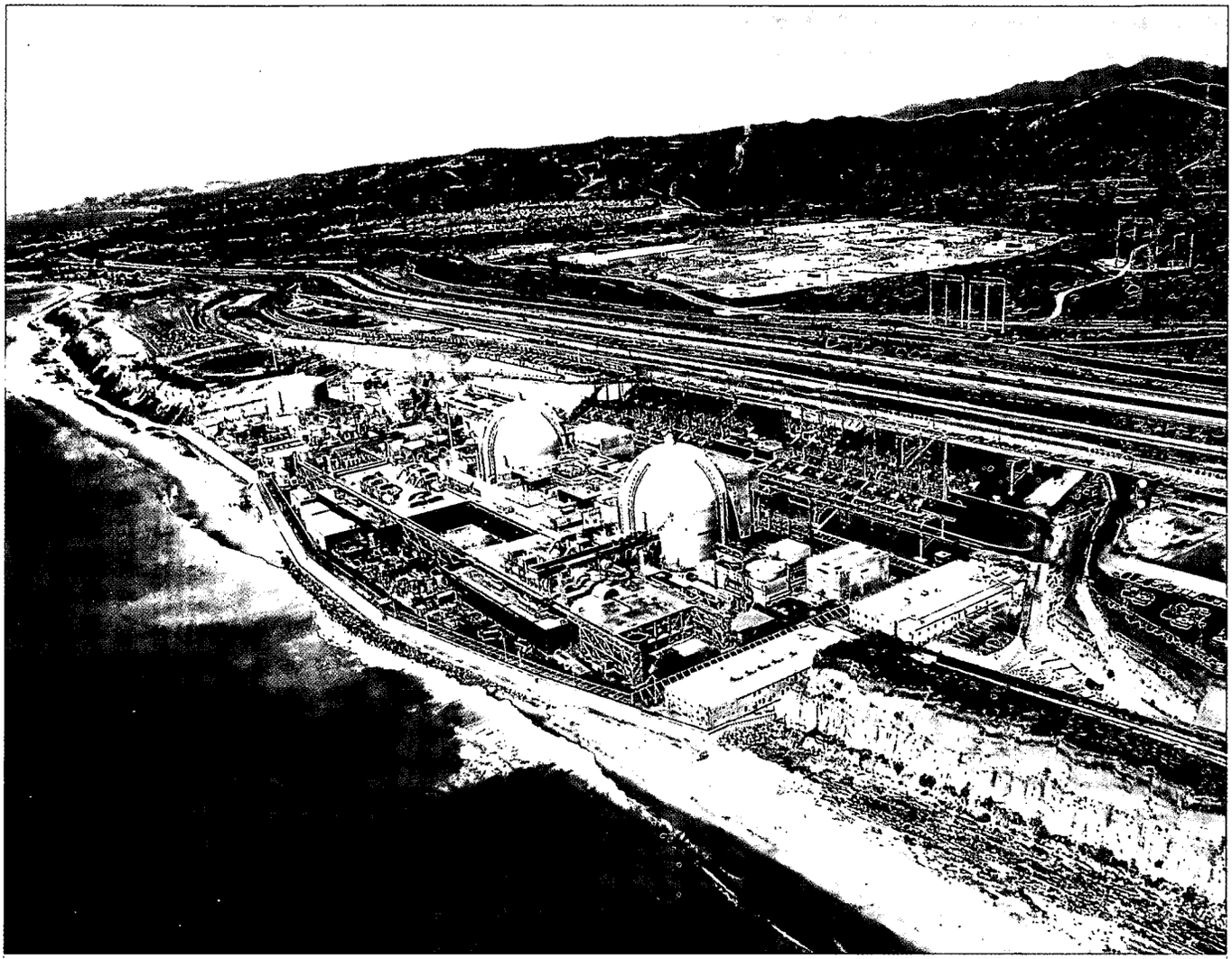

SAN ONOFRE

NUCLEAR GENERATING STATION

SEMIANNUAL EFFLUENT REPORT

JANUARY - JUNE 1991

Southern California Edison Company

SAN ONOFRE NUCLEAR GENERATING STATION
P.O. BOX 128
SAN CLEMENTE, CALIFORNIA 92672

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 three pressurized water reactors with a total rated capacity of 2664 net megawats electrical.

Unit 1 was supplied by Westinghouse Electric Company and began commercial operation on January 1, 1968. It is currently rated at 410 net megawatts electrical. 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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SEMIANNUAL EFFLUENT REPORT

January - June (1991)

SECTION A. INTRODUCTION

This Semiannual 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 Technical Specification Limits
3. Percent of Applicable Limits
4. Estimated Total Percent Error
5. Lower Limit of Detection Concentrations
6. Batch Release Summaries
7. Previous Semiannual Report Addenda
8. Radwaste Shipments
9. 10 CFR 50 Appendix I Requirements
10. Changes to Offsite Dose Calculation Manual

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 Technical Specification Limit (TSL)
(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 Technical Specification 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 both "continuous" and "batch" modes of release.

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

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

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

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

TABLE 1A

S.O.N.G.S. 1

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

		Unit	First Quarter	Second Quarter	Estimated Total Error, %
A.	Fission and activation gases				
1.	Total release	Ci	6.35E+0	9.96E+2	3.00E+1
2.	Average release rate for period	µCi/sec	8.17E-1	1.27E+2	
3.	Percent of technical specification limit	%	6.12E-3	5.84E-1	
B.	Iodines				
1.	Total iodine-131	Ci	4.33E-7	9.15E-4	1.90E+1
2.	Average release rate for period	µCi/sec	5.57E-8	1.16E-4	
3.	Percent of technical specification limit	%	7.24E-7	1.51E-3	
C.	Particulates				
1.	Particulates with half-lives > 8 days	Ci	4.15E-4	3.74E-6	1.60E+1
2.	Average release rate for period	µCi/sec	5.34E-5	4.76E-7	
3.	Percent of technical specification limit	%	1.51E-4	1.22E-6	
4.	Gross alpha radioactivity	Ci	<LLD #	*	5.00E+1
D.	Tritium				
1.	Total release	Ci	4.38E+0	4.53E+0	2.50E+1
2.	Average release rate for period	µCi/sec	5.63E-1	5.76E-1	
3.	Percent of technical specification limit	%	3.66E-3	3.75E-3	

Particulate and iodine samples for the plant vent stack from 2/19 to 2/21/91 were inadvertently discarded. Results have been ratioed to account for the missing interval. See LER 1-91-006.

* Second quarter analyses not available at report time; values will be included in the following Semiannual Report.

TABLE 1C

S.O.N.G.S. 1

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

Nuclides Released	Unit	Continous Mode First Quarter	Continous Mode Second Quarter	Batch Mode First Quarter	Batch Mode Second Quarter
1. Fission gases					
argon-41	Ci	<LLD	<LLD	<LLD	5.30E-3
krypton-85	Ci	<LLD	<LLD	2.80E-1	3.34E+0
krypton-85m	Ci	1.54E-1	5.10E-1	7.91E-5	5.20E-1
krypton-87	Ci	<LLD	<LLD	<LLD	5.19E-3
krypton-88	Ci	<LLD	<LLD	<LLD	2.95E-1
xenon-131m	Ci	<LLD	<LLD	<LLD	4.97E-1
xenon-133	Ci	3.51E+0	5.81E+2	2.40E-1	3.74E+2
xenon-133m	Ci	<LLD	2.05E+0	5.74E-3	5.31E+0
xenon-135	Ci	2.16E+0	1.67E+1	2.09E-3	1.18E+1
xenon-135m	Ci	<LLD	<LLD	<LLD	<LLD
xenon-138	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	5.83E+0	6.01E+2	5.28E-1	3.96E+2
2. Iodines					
iodine-131	Ci	4.33E-7	9.15E-4	NA	NA
iodine-132	Ci	<LLD	1.52E-3	NA	NA
iodine-133	Ci	2.11E-6	5.28E-4	NA	NA
iodine-135	Ci	<LLD	3.03E-4	NA	NA
Total for period	Ci	2.54E-6	3.26E-3	NA	NA
3. Particulates					
barium-139	Ci	2.48E-3	<LLD	NA	NA
barium-140	Ci	<LLD	<LLD	NA	NA
bromine-82	Ci	<LLD	2.17E-5	NA	NA
cerium-141	Ci	<LLD	7.83E-8	NA	NA
cesium-134	Ci	2.70E-8	1.46E-8	NA	NA
cesium-137	Ci	1.47E-4	3.65E-6	NA	NA
cesium-138	Ci	3.77E-4	2.26E-3	NA	NA
cobalt-57	Ci	3.09E-5	<LLD	NA	NA
cobalt-60	Ci	1.72E-4	<LLD	NA	NA
lanthanum-140	Ci	<LLD	<LLD	NA	NA
rubidium-88	Ci	1.47E-1	<LLD	NA	NA
strontium-89	Ci	<LLD #	*	NA	NA
strontium-90	Ci	<LLD #	*	NA	NA
tin-113	Ci	6.54E-5	<LLD	NA	NA

LLD Lower Limit of Detection; See Table 1D.
NA Iodines and particulates not analyzed prior to release via batch mode.
Particulate and iodine samples for the plant vent stack from 2/19 to 2/21/91 were inadvertently discarded. Results have been ratioed to account for the missing interval. See LER 1-91-006.
* Second quarter analyses not available at report time; values will be included in the following Semiannual Report.

TABLE 1D

S.O.N.G.S. 1

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
GASEOUS EFFLUENTS-LOWER LIMIT OF DETECTION

	RADIONUCLIDES	CONTINUOUS MODE LLD (μCi/cc)	BATCH MODE LLD (μCi/cc)
1.	Fission and activation gases		
	argon-41	1.20E-7	3.40E-6
	krypton-85	1.00E-5	*
	krypton-87	1.20E-7	8.20E-6
	krypton-88	2.20E-7	1.30E-5
	xenon-131m	2.10E-6	1.20E-4
	xenon-133m	3.80E-7	*
	xenon-135m	4.60E-7	2.40E-5
	xenon-138	1.70E-6	7.10E-5
2.	Iodines		
	iodine-132	7.90E-12	NA
	iodine-135	8.80E-12	NA
3.	Particulates		
	barium-139	3.10E-11	NA
	barium-140	9.00E-14	NA
	bromine-82	3.30E-13	NA
	cerium-141	4.70E-14	NA
	cobalt-57	2.20E-14	NA
	cobalt-60	3.80E-14	NA
	lanthanum-140	1.60E-13	NA
	rubidium-88	1.50E-8	NA
	strontium-89	1.00E-14	NA
	strontium-90	1.00E-15	NA
	tin-113	4.00E-14	NA
	gross alpha	1.00E-14	NA

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

* Nuclide detected in Table 1C.

TABLE 1E

S.O.N.G.S. 1

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
GASEOUS EFFLUENTS-RADIATION DOSES AT THE SITE BOUNDARY

		Unit	First Quarter	Second Quarter*
A.	Noble Gas			
	1. Gamma air dose	mrad	2.34E-3	1.65E-1
	2. Percent Technical Specification Limit	%	4.68E-2	3.30E+0
	3. Beta air dose	mrad	4.18E-3	4.51E-1
	4. Percent Technical Specification Limit	%	4.18E-2	4.51E+0
B.	Tritium, Iodine, Particulate (at the nearest receptor)			
	1. Organ dose	mrem	8.86E-4	6.37E-4
	2. Percent Technical Specification Limit	%	1.18E-2	8.49E-3

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

* Second quarter doses incomplete due to Sr-89 and Sr-90 analyses not available at report time; values will be reported in the following Semiannual Report.

TABLE 1F

S.O.N.G.S. 1

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
GASEOUS EFFLUENT-BATCH RELEASE SUMMARY

		6-MONTH PERIOD	
1.	Number of batch releases:	35	releases
2.	Total time period for batch releases:	13976	minutes
3.	Maximum time period for a batch release:	949	minutes
4.	Average time period for a batch release:	399	minutes
5.	Minimum time period for a batch release:	133	minutes

SECTION C. LIQUID EFFLUENTS

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

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

In addition, Table 2A lists:

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

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

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

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

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

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

TABLE 2A

S.O.N.G.S. 1

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

		Unit	First Quarter	Second Quarter	Estimated Total Error, %
A.	Fission and activation products				
1.	Total release (not including tritium, gases, alpha)	Ci	2.10E-1	1.33E-1	1.90E+1
2.	Average diluted concentration during period	µCi/ml	3.58E-9	1.14E-9	
3.	Percent of applicable limit	%	2.08E-2	5.38E-2	
B.	Tritium				
1.	Total release	Ci	8.79E+1	1.94E+2	1.90E+1
2.	Average diluted concentration during period	µCi/ml	1.50E-6	1.66E-6	
3.	Percent of applicable limit	%	4.99E-2	5.53E-2	
C.	Dissolved and entrained gases				
1.	Total release	Ci	8.62E-3	3.21E-1	1.90E+1
2.	Average diluted concentration during period	µCi/ml	1.47E-10	2.74E-9	
3.	Percent of applicable limit	%	7.35E-5	1.37E-3	
D.	Gross alpha radioactivity				
1.	Total release	Ci	1.14E-5 #	*	5.00E+1
E.	Volume of waste released (prior to dilution)	liters	1.85E+6	7.09E+5	5.00E+0
F.	Volume of dilution water used during period	liters	5.87E+10	1.17E+11	5.00E+0

\# Weekly composite samples for continuous pathways from 3/18 to 3/25/91 were inadvertently discarded. Results have been ratioed to account for the missing period. See LER 1-91-005.

* Second quarter analyses not available at report time; values will be included in the following Semiannual Report.

TABLE 2B

S.O.N.G.S. 1

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
LIQUID EFFLUENTS

Nuclides Released	Unit	Continuous Mode First Quarter	Continuous Mode Second Quarter	Batch Mode First Quarter	Batch Mode Second Quarter
1. Fission and activation products					
antimony-124	Ci	<LLD	<LLD	7.17E-5	2.14E-4
antimony-125	Ci	<LLD	<LLD	1.21E-4	3.43E-4
barium-140	Ci	<LLD	<LLD	<LLD	<LLD
cerium-141	Ci	<LLD	<LLD	<LLD	<LLD
cerium-144	Ci	<LLD	<LLD	1.37E-3	3.35E-4
cesium-134	Ci	4.70E-2	3.76E-2	4.28E-3	2.46E-4
cesium-136	Ci	<LLD	2.10E-6	<LLD	<LLD
cesium-137	Ci	8.30E-2	6.66E-2	6.92E-3	6.50E-4
chromium-51	Ci	<LLD	<LLD	2.42E-4	6.87E-4
cobalt-57	Ci	1.51E-4	2.60E-5	7.20E-5	7.00E-6
cobalt-58	Ci	1.31E-2	2.67E-4	7.35E-3	1.52E-3
cobalt-60	Ci	1.25E-2	5.80E-4	2.03E-2	5.62E-3
iodine-131	Ci	<LLD	1.65E-2	<LLD	2.35E-5
iodine-132	Ci	<LLD	2.98E-5	<LLD	<LLD
iron-55	Ci	<LLD #	*	6.57E-3	*
iron-59	Ci	<LLD	<LLD	4.40E-6	<LLD
lanthanum-140	Ci	<LLD	<LLD	<LLD	<LLD
manganese-54	Ci	4.08E-4	1.41E-5	9.99E-4	4.73E-4
molybdenum-99	Ci	<LLD	<LLD	<LLD	<LLD
niobium-95	Ci	<LLD	<LLD	4.51E-4	5.63E-5
niobium-95m	Ci	1.14E-5	<LLD	<LLD	<LLD
niobium-97	Ci	<LLD	<LLD	1.56E-5	1.12E-4
ruthenium-103	Ci	<LLD	<LLD	1.52E-4	1.97E-5
ruthenium-106	Ci	<LLD	<LLD	4.10E-3	1.43E-3
silver-110m	Ci	<LLD	<LLD	1.42E-4	1.49E-4
strontium-89	Ci	<LLD #	*	<LLD	*
strontium-90	Ci	3.79E-4 #	*	3.62E-5	*
strontium-92	Ci	<LLD	<LLD	1.73E-5	<LLD
technetium-99m	Ci	<LLD	<LLD	<LLD	<LLD
zinc-65	Ci	<LLD	<LLD	1.13E-4	<LLD
zirconium-95	Ci	<LLD	<LLD	2.30E-4	<LLD
Total for period	Ci	1.56E-1	1.22E-1	5.36E-2	1.19E-2

\# Weekly composite samples for continuous pathways from 3/18 to 3/25/91 were inadvertently discarded. Results have been ratioed to account for the missing period. See LER 1-91-005.

* Second quarter analyses not available at report time; values will be included in the following Semiannual Report.

TABLE 2B Continued

S.O.N.G.S. 1

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
LIQUID EFFLUENTS

Nuclides Released	Unit	Continuous Mode First Quarter	Continuous Mode Second Quarter	Batch Mode First Quarter	Batch Mode Second Quarter
2. Dissolved and entrained gases					
xenon-131m	Ci	<LLD	<LLD	<LLD	4.96E-3
xenon-133	Ci	3.39E-4	2.08E-2	1.91E-3	2.95E-1
xenon-133m	Ci	<LLD	<LLD	8.47E-5	<LLD
xenon-135	Ci	6.23E-3	<LLD	5.83E-5	<LLD

LLD Lower Limit of Detection; see Table 2C.

TABLE 2C

S.O.N.G.S. 1

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
LIQUID EFFLUENTS-LOWER LIMIT OF DETECTION

RADIONUCLIDES	CONTINUOUS MODE LLD (µCi/cc)	BATCH MODE LLD (µCi/cc)
1. Fission and activation products		
antimony-124	1.40E-7	*
antimony-125	1.90E-7	*
barium-140	2.10E-7	3.00E-7
cerium-141	9.70E-8	1.10E-7
cerium-144	4.00E-7	*
cesium-136	7.70E-8	9.30E-8
chromium-51	5.50E-7	*
iodine-131	7.00E-8	8.90E-8
iodine-132	4.90E-8	9.00E-8
iron-55	1.00E-6	*
iron-59	8.00E-8	1.40E-7
lanthanum-140	1.40E-7	5.10E-8
molybdenum-99	8.00E-8	7.60E-8
niobium-95	3.30E-8	*
niobium-95m	2.60E-7	2.90E-7
niobium-97	5.20E-7	*
ruthenium-103	6.70E-8	*
ruthenium-106	3.80E-7	*
silver-110m	6.90E-8	*
strontium-89	5.00E-8	5.00E-8
strontium-92	5.40E-6	1.10E-7
technetium-99m	8.10E-8	7.70E-8
zinc-65	1.20E-7	1.50E-7
zirconium-95	6.30E-8	1.40E-7
2. Dissolved and entrained gases		
xenon-131m	2.10E-6	4.00E-6
xenon-133m	4.30E-7	9.50E-7
xenon-135	5.40E-8	1.10E-7

* Nuclide detected in Table 2B.

TABLE 2D

S.O.N.G.S. 1

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
LIQUID EFFLUENTS-RADIATION DOSES AT THE LIQUID SITE BOUNDARY

		Unit	First Quarter	Second Quarter*
A.				
1.	Total body dose	mrem	5.32E-2	4.73E-2
2.	Percent Technical Specification Limit	%	3.55E+0	3.16E+0
B.				
1.	Limiting organ dose	mrem	7.51E-2	6.81E-2
2.	Percent Technical Specification Limit	%	1.50E+0	1.36E+0

NOTE: The limiting organ for the first quarter is the Liver and for the second quarter is the Thyroid.

* Second quarter doses incomplete due to Sr-89, Sr-90, and Fe-55 analyses not available at report time; values will be reported in the following Semiannual Report.

TABLE 2E

S.O.N.G.S. 1

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
LIQUID EFFLUENT-BATCH RELEASE SUMMARY

		6-MONTH PERIOD	
1.	Number of batch releases:	16	releases
2.	Total time period for batch releases:	17530	minutes
3.	Maximum time period for a batch release:	1945	minutes
4.	Average time period for a batch release:	1096	minutes
5.	Minimum time period for a batch release:	52	minutes
6.	Average saltwater flow during batch releases:	168750	gpm

SECTION D. PREVIOUS SEMIANNUAL REPORT ADDENDA

S.O.N.G.S. 1

1. The fourth quarter July - December 1990 Semiannual Report values for composite gross alpha, Sr-89, Sr-90, and Fe-55 (Tables 1A and 1C, Gaseous Effluents, Tables 2A and 2B, Liquid Effluents) were not available at report time. The values are as follows:

GASEOUS EFFLUENTS (4th Quarter 1990)

Nuclides Released	Unit	Continuous Mode	Batch Mode
strontium-89	Ci	<LLD	*
strontium-90	Ci	<LLD	*
Gross alpha	Ci	<LLD	*

Sr-89 LLD = 1.00E-14 µCi/cc
Sr-90 LLD = 1.00E-15 µCi/cc
Gross alpha LLD = 1.00E-14 µCi/cc

* All "batch" gaseous releases made from S.O.N.G.S. 1 are vented through the Plant Vent Stack, therefore, gross alpha, Sr-89, and Sr-90 are analyzed by "continuous" mode only.

LIQUID EFFLUENTS (4th Quarter 1990)

Nuclides Released	Unit	Continuous Mode	Batch Mode
iron-55	Ci	<LLD	5.70E-4
strontium-89	Ci	<LLD	9.40E-5
strontium-90	Ci	<LLD	1.96E-5
tritium	Ci	**	1.80E-5
Gross alpha	Ci	<LLD	<LLD

Fe-55 LLD = 1.00E-6 µCi/ml
Sr-89 LLD = 5.00E-8 µCi/ml
Sr-90 LLD = 1.00E-8 µCi/ml
Gross alpha LLD = 1.00E-7 µCi/ml

** Only composites from sewage sludge are analyzed for tritium. All other liquid pathways are analyzed for tritium onsite with the resultant curies enumerated in Table 2B.

2. GASEOUS EFFLUENT-RADIATION DOSES AT THE SITE BOUNDARY

For the fourth quarter of 1990 Semiannual Report, Sr-89, and Sr-90.

	Unit	Fourth Quarter
A. Tritium, Iodine, Particulate (at the nearest receptor)		
1. Organ dose	mrem	0.00E+0
2. Percent Applicable Limit	%	0.00E+0

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

3. LIQUID EFFLUENT-RADIATION DOSES AT THE SITE BOUNDARY

For the fourth quarter of 1990 Semiannual Report, Fe-55, Sr-89, and Sr-90.

	Unit	Fourth Quarter
A.		
1. Total body dose	mrem	3.27E-4
2. Percent Applicable Limit	%	2.18E-2
B.		
1. Limiting organ dose	mrem	1.97E-3
2. Percent Applicable Limit	%	3.94E-2

NOTE: The limiting organ is the bone.

SECTION E. RADWASTE SHIPMENTS

S.O.N.G.S. 1

TABLE 3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

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

1. Type of waste	Unit	6-month Period	Est. Total Error, %
a. Spent resins, filter sludges, evaporator bottoms, etc.	m^3	NA	
	Ci	NA	NA
b. Dry compressible waste, contaminated equip. etc.	m^3	6.74E+1 **	
	Ci	3.33E+0	3.00E+1
c. Irradiated components, control rods, etc.	m^3	NA	
	Ci	NA	NA
d. Other (filters)	m^3	2.50E+0 *	
	Ci	1.32E+0	3.00E+1

NOTE: Total curie content estimated.

* Shipped in Type A Cask (C of C 9176)

** Material packaged in 55-gallon DOT 7A drums (7.5 cu. ft. each), or strong, tight containers (steel boxes, 98 cu. ft. each).

SECTION E. RADWASTE SHIPMENTS (Continued)

S.O.N.G.S. 1

TABLE 3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
SOLID WASTE AND IRRADIATED FUEL SHIPMENT

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

2. Estimate of major nuclide composition (by type of waste)

a.	Not applicable	%	0.00E+0

b.	carbon-14	%	5.96E-4
	cesium-134	%	1.08E+1
	cesium-137	%	2.07E+1
	cobalt-58	%	2.10E-1
	cobalt-60	%	1.51E+0
	europium-152	%	9.90E-6
	iodine-129	%	2.81E-4
	iron-55	%	6.78E+0
	nickel-63	%	2.38E+0
	strontium-90	%	2.85E-5
	technetium-99	%	1.36E-3
	tritium	%	5.77E+1

c.	Not applicable	%	0.00E+0

S.O.N.G.S. 1

TABLE 3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
SOLID WASTE AND IRRADIATED FUEL SHIPMENT

d.	carbon-14	%	1.17E-3
	cerium-144	%	1.38E-1
	cesium-134	%	5.24E-1
	cesium-137	%	9.99E-1
	cobalt-60	%	4.20E+0
	curium-242	%	2.92E-2
	curium-243/244	%	1.55E-2
	europium-154	%	2.40E-2
	iodine-129	%	2.81E-6
	iron-55	%	6.08E+0
	manganese-54	%	5.42E-2
	nickel-63	%	2.47E+0
	technetium-99	%	2.01E-5
	tritium	%	8.55E+1

3. Solid Waste Disposition

See COMMON section of this report

B. IRRADIATED FUEL SHIPMENTS (Disposition)

See COMMON section of this report

SECTION F. TECHNICAL SPECIFICATION LIMITS AND APPLICABLE LIMITS

Gaseous Effluents - Technical Specification Limits

The percent of Technical Specification Limit, tabulated in Table 1A, was calculated using the following equation:

$$\% \text{ TSL} = \frac{(\text{Rel Rate})\ (X/Q)\ (100)}{MPC_{eff}}$$

where: Rel Rate = total curies released in each category and each quarter, divided by the seconds in a quarter; the value in Parts A.2, B.2, C.2 and D.2 of Table 1A, μCi/sec.

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

The MPC_{eff} is defined as:

$$\frac{1}{\sum_{i=1}^{n} \frac{F_i}{MPC_i}}$$

where: F_i = fractional abundance of the ith 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 = MPC of the ith radionuclide

The % TSL is placed in Parts A.3, B.3, C.3 and D.3 of Table 1A.

Liquid Effluents - Applicable Limits

The percent of applicable limit, tabulated in Table 2A, was calculated using the following equation:

$$\% \text{ Applicable Limit} = \frac{(\text{Dil Conc})\ (100)}{MPC_{eff}}$$

where: Dil Conc = total curies released in each category and each quarter divided by the total volume released (sum of Parts E and F in Table 2A); the value in Parts A.2, B.2 and C.2 of Table 2A, µCi/ml.

The MPC_{eff} is defined as:

$$\frac{1}{\sum_{i=1}^{n} \frac{F_i}{MPC_i}}$$

where: F_i = fractional abundance of the ith 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 = MPC of the ith radionuclide

The % Applicable Limit is placed in Parts A.3, B.3 and C.3 of Table 2A.

SECTION G. ESTIMATION OF ERROR

S.O.N.G.S. 1

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:

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

where: σ_i = Error associated with each component.

SECTION H. 10 CFR 50 APPENDIX I REQUIREMENTS

S.O.N.G.S. 1

Table 1 in Section H presents the first and second quarter 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, and are presented in Table 2D for the first and second quarters. 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.

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

SECTION H. 10 CFR 50 APPENDIX I REQUIREMENTS (Continued)

S.O.N.G.S. 1

TABLE 1

	Dose* (millirems)	
SOURCE	1st Quarter	2nd Quarter
LIQUID EFFLUENTS Whole Body	1) 5.32E-2	2) 4.73E-2
Organ	3) 7.51E-2	4) 6.81E-2
AIRBORNE EFFLUENTS Tritium, Iodines, and Particulates	5) 3.58E-3	6) 6.14E-3
NOBLE GASES** Gamma	7) 5.78E-4	8) 9.07E-2
Beta	9) 1.24E-3	10) 2.49E-1
DIRECT RADIATION	11) 1.31E-1	12) 1.20E-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 effluents are in units of mrad, reflecting the air dose.

SECTION H. 10 CFR 50 APPENDIX I REQUIREMENTS (Continued)

S.O.N.G.S. 1

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; the liver received the maximum dose primarily by the saltwater fish pathway.

4. This data was calculated using the methodology of the ODCM; the thyroid received the maximum dose primarily by the saltwater fish pathway.

5. The maximum organ dose was to a child's liver and was located in the NW sector. This was calculated using the activity reported in the January - June 1991 Semiannual Report with the assumptions of USNRC Regulatory Guide 1.109.

6. The maximum organ dose was to a child's thyroid and was located in the NW sector. This was calculated using the activity reported in the January - June 1991 Semiannual Report with the assumptions of USNRC Regulatory Guide 1.109.

7. A maximum air dose of 1.03E-2 mrad for gamma radiation was located in the SSW sector, a seaward direction. The reported maximum air dose for gamma radiation was located in the NW sector, a landward sector, at the exclusion area boundary and calculated with the assumptions of the USNRC Regulatory Guide 1.109.

8. A maximum air dose of 4.55E-1 mrad for gamma radiation was located in the SSW sector, a seaward direction. The reported maximum air dose for gamma radiation was located in the NW sector, a landward sector, at the exclusion area boundary and calculated with the assumptions of the USNRC Regulatory Guide 1.109.

9. A maximum air dose of 1.85E-2 mrad for beta radiation was located in the SSW sector, a seaward direction. The reported maximum air dose for beta radiation was located in the N sector, a landward sector, at the exclusion area boundary and calculated with the assumptions of the USNRC Regulatory Guide 1.109.

10. A maximum air dose of 1.23E+0 mrad for beta radiation was located in the SSW sector, a seaward direction. The reported maximum air dose for beta radiation was located in the NW sector, a landward sector, at the exclusion area boundary and calculated with the assumptions of the USNRC Regulatory Guide 1.109.

11. 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 E sector.

12. 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 E sector.

SECTION H. 10 CFR 50 APPENDIX I REQUIREMENTS (Continued)

S.O.N.G.S. 1

TABLE 2

	% Technical Specification Limit	
SOURCE	1st Quarter	2nd Quarter
LIQUID EFFLUENTS		
Whole Body	3.55E+0	3.16E+0
Organ	1.50E+0	1.36E+0
AIRBORNE EFFLUENTS		
Tritium, Iodines, and Particulates	4.77E-2	8.19E-2
NOBLE GASES		
Gamma	1.16E-2	1.81E+0
Beta	1.24E-2	2.49E+0

NOTE: Direct Radiation is not specifically addressed in the Technical Specifications.

SECTION I. CHANGES TO OFFSITE DOSE CALCULATION MANUAL

S.O.N.G.S 1

On February 28, 1991 Revision 6 to the Unit 1 Offsite Dose Calculation Manual (ODCM) was adopted and published. This revision encompassed a variety of changes to the document: update of airborne dose tables based on the 1990 Land Use Census, suggestions by the NRC (TAC Nos. 74359 and 74360), response to QA (CAR 1235), and update of tables used in liquid and gaseous dose calculations. Additionally, there were numerous editorial changes which corrected typographical errors and misspellings. None of the changes result in any modifications to either the plant configuration or operation. As such, there was no impact on the accuracy or reliability of methods for determining effluent dose or setpoint values and no safety reviews were required. Documentation of the fact that this change was reviewed and found acceptable by the Station Manager was indicated by his signature on a letter dated February 28, 1991.

The responses to Corrective Action Request (CAR) 1235 provide clarification of current methods of calculating offsite doses. They are administrative and did not result in any changes to the effluent program.

In June 1990, EG&G performed an audit of Revision 19 of the Units 2/3 ODCM. Those suggestions that were applicable to Unit 1 were incorporated into this revision for consistency and are referred to by the Units 2/3 TAC numbers 74359 and 74360. In one instance, the program was revised to conservatively select the most critical organ for gaseous dose determination. An evaluation by Corporate Health Physics and Environmental has shown that no significant changes to the offsite dose calculations resulted.

A complete copy of Revision 6 is being submitted to the NRC per Technical Specification 6.14.2.1 concurrent with this report. The following is a complete listing of the changes in this revision:

[a] Indicates typographical, sequential sectional and page numbering, and format changes only

i GENERAL-updated page numbers for pp. i - vi[a]; added 2.4.1.1, Annual Total Organ Dose[a]; added 2.4.1.2, Annual Total Whole Body Dose[a]; added 2.4.1.3, Annual Total Thyroid Dose[a]

iv Changed respective page numbers[a]

v Removed Table 2-16, Parameters Used to Calculate R_i, from list of Tables since table is no longer in the ODCM[a]

1-14 Revised RT-1218, -2100, and -2101 Liquid Effluent Radiation Monitor Calibration Constants

1-15 Added reference to liquid pathways in response to TAC 74359 and 74360

1-17 Revised dose commitment factors on Table 1-2 to reflect best available values; added Sn-117m

1-18 Revised dose commitment factors on Table 1-2 to reflect best available value

SECTION I. CHANGES TO OFFSITE DOSE CALCULATION MANUAL (Continued)

S.O.N.G.S 1

2-5 Typographical errors in formulae corrected[a]

2-7 Combined previous pages 2-7 and 2-8 in one page (2-7)[a]

2-8 Revised RT-1219 calibration constants

2-10 Amended Q_i definition per TAC 74359 and 74360

2-11 Amended Q_i definition and added reference to gaseous pathways per TAC 74359 and 74360; expanded definition of W_k to include D/Q

2-13 Added note on use of computer code per CAR 1235

2-15 Typographical errors in formulae corrected[a]

2-16 Amended last sentence of R_{ik} definition to reference PARTS V & V in response to TAC 74359 and 74360

2-17 Added note on use of computer code per CAR 1235; combined with previous pg 2-19[a]

2-19 Added Ru-103 to table

2-20 Added Ru-103, I-132 and I-134 to table; revised controlling location factors to reflect current land use census data

2-21 thru 2-62 Added Ru-103, I-132 and I-134 to tables; revised dose parameters to reflect current land use census data

2-23 Added Pt. Loran Military Housing pathway to dose parameter tables

2-26 Added Enlisted Beach Trailers pathway to dose parameter tables

5-2 Added "former" to SDG&E Offices[a], "U.S." to Coast Guard[a]; corrected punctuation[a]

5-6 Deleted San Clemente Resident with Garden from Local Crops

5-7 Corrected distances and directions to reflect current land use census data

5-10 thru 5-12 Updated maps

SECTION J. CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS

S.O.N.G.S 1

- There were no changes to the Unit 1 Radioactive Waste Treatment Systems during the reporting period, January 1, 1991 to June 30, 1991.

SECTION K. MISCELLANEOUS

S.O.N.G.S 1

- Unmonitored Release from the Oily Waste Separator

On 4/23/91, approximately 60 gallons of diesel fuel oil spilled from a delivery truck in the hold-down area for Units 2/3 which drains to the yard drain sump at Unit 1. To ensure NPDES limits for oil were not exceeded, the yard drain sump pumps were secured.

As part of the clean up of the yard drain sump, the contents were pumped to the oily waste separator using temporary sump pumps and hoses. The oily waste separator is downstream of the reheater pit sump radiation monitor, R-2100, resulting in an unmonitored release during the subsequent discharge of water.

Approximately four 1000-gallon batches were transferred to the oily waste separator before the unmonitored release was identified as such and terminated. Based on grab samples of the yard drain sump taken for the weekly composite, total particulate and iodine activity was 1.6E-6 uCi/ml, tritium 1.3E-3 uCi/ml. The maximum allowed particulate and iodine concentration for the reheater pit sump was 1.9E-5 uCi/ml. Given this information, the limits of 10CFR20 Appendix B, Table II were not exceeded due to transfer and discharge of the yard drain sump via the oily waste separator. Dose consequences from this activity were 5.6E-6 mrem whole body, and 7.8E-6 mrem liver.

- Unplanned and Unmonitored Release of the Yard Drains Sump

On March 18, heavy rainfall resulted in flooding the yard drain sump and oily waste separator at Unit 1. The overflow was directed into the PMF yard catch basin, resulting in an unplanned, unmonitored release into the intake structure that lasted approximately three hours.

Based on the physical dimensions of the sluiceway and a grab sample of the yard drain sump taken earlier that day, a total of 8E-3 Ci, 57% of which is tritium, could have been released. Particulate and iodine activity in the sample was 4E-6 uCi/ml compared to an allowed ODCM maximum concentration of 9.1E-5 uCi/ml, indicating that the limits of 10CFR20 Appendix B, Table II were not exceeded. Dose consequences from this unplanned, unmonitored release were 6.0E-4 mrem whole body and 1.4E-3 mrem GI-LLI.

o Safety relief valve RV-882 leakage into Unit 1 Doghouse

On 4/3/91 NCR 91040023 was initiated to document leakage from the bonnet cap of safety relief valve, S1-CRS-RV-882, in the Unit 1 Doghouse. This leakage resulted in RCS airborne activity being vented to the Doghouse in an uncontrolled manner. The Doghouse is an unventilated room with a locked gate to the exterior.

Daily sampling for noble gas, tritium, particulate and iodines was initiated in and around the Doghouse to assess the extent of airborne contamination. Liquid leakage was collected in the Doghouse sump for routing to the liquid radwaste processing system prior to discharge. On 4/9/91 a flexible ventilation hose was installed to route the gaseous activity to the plant vent stack, a monitored pathway. Airborne activity in the Doghouse dropped off significantly when the hose was repositioned directly over valve RV-882 on 4/15/91. Unit 1 was shut down on 4/21/91 due to high primary to secondary leakage, during which time valve RV-882 was repaired.

Based on the highest daily activity, a maximum assumed air exchange rate of 1 ft^3/sec through the Doghouse door, and a conservative X/Q of 1.58E-4, approximately 7.9E-2 Ci of noble gas and 3.3E-2 Ci of tritium could have been discharged. Dose consequences at the site boundary were calculated to be <8E-4 mrem for gamma and <7E-4 mrem beta.

SECTION K. MISCELLANEOUS (Continued)

January 1, 1991 - June 30, 1991

EFFLUENT RADIATION MONITORS OUT OF SERVICE FOR GREATER THAN 30 DAYS

S.O.N.G.S. 1

Monitor	Inoperability Period	Inoperability Cause	Explanation
R-1214 Plant Vent Stack, Noble Gas Monitor	06/13/86 to present	Removed from service	Maintained out-of-service pending Technical Specification change.
R-1216 Steam Generator Blowdown Monitor	07/02/90 to 03/25/91 04/18/91 to present	No sample flow Install/replace flow gauges	No steam generator pressure/steam flow due to unit outage. System modification to ensure sample flow meets detector design requirements.
R-1217 Component Cooling Water Monitor	11/27/90 to present	Removed from service	Installed seismic upgrade. System evaluation in progress.
R-1219/R-1220 Plant Vent Stack Monitor	12/05/90 to 01/16/91	92 day surveillance	R-1219 failed surveillance required isotopic calibration.
R-1219/R-1220 R-1221 Plant Vent Stack Monitor	04/18/91 to 05/18/91	18 month surveillance	Extensive calibration and system component upgrades performed.
R-1254 Plant Vent Stack, Process Flow Monitor	08/12/88 - present	Process flow indication	Process flow instrumentation is inadequate. Design change to correct flow measurement being tested. Radiation monitor functions operable.
Particulate and Iodine Sampler	03/04/91 - 04/13/91	Heat trace unit inoperable	System controller failed, required complete rebuild.

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

- Gaseous effluent releases, excluding tritium, totaled 1.00E+3 curies with 96% of the total being Xe-133.

- The radiation doses from gaseous releases are: (a) gamma air dose: 1.67E-1 mrad at the site boundary, (b) beta air dose: 4.55E-1 mrad at the site boundary, (c) organ dose: 1.52E-3 mrem at the nearest receptor.

- Liquid releases totaled 2.83E+2 curies of which tritium was 2.82E+2 Ci, noble gases were 3.30E-1 Ci, and particulates and iodines were 3.44E-1 Ci.

- The radiation doses from liquid releases are: (a) total body: 1.01E-1 mrem, (b) limiting organ: 1.31E-1 mrem.

- The radioactive releases and resulting doses generated from Unit 1 were below the Technical Specification Limits for both gaseous and liquid effluents.

TABLE OF CONTENTS

SEMIANNUAL EFFLUENT REPORT

January - June (1991)

SECTION A. INTRODUCTION

This Semiannual 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 Semiannual Report Addenda
7. Radwaste Shipments
8. 10 CFR 50 Appendix I Requirements

SECTION B. GASEOUS EFFLUENTS

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

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

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

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

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

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

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

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

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

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

TABLE 1A

S.O.N.G.S. 2-3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

		Unit	First Quarter	Second Quarter	Estimated Total Error, %
A.	Fission and activation gases				
1.	Total release	Ci	2.01E+2	3.25E+2	2.50E+1
2.	Average release rate for period	µCi/sec	2.59E+1	4.14E+1	
3.	Percent of applicable limit	%	4.33E-2	7.32E-2	
B.	Iodines				
1.	Total iodine-131	Ci	2.85E-3	3.72E-3	1.90E+1
2.	Average release rate for period	µCi/sec	3.67E-4	4.73E-4	
3.	Percent of applicable limit	%	1.76E-3	2.27E-3	
C.	Particulates				
1.	Particulates with half-lives > 8 days	Ci	7.63E-5	9.99E-5	1.60E+1
2.	Average release rate for period	µCi/sec	9.82E-6	1.27E-5	
3.	Percent of applicable limit	%	5.80E-6	5.92E-6	
4.	Gross alpha radioactivity	Ci	2.09E-6	*	5.00E+1
D.	Tritium				
1.	Total release	Ci	5.84E+0	1.26E+0	2.50E+1
2.	Average release rate for period	µCi/sec	7.51E-1	1.60E-1	
3.	Percent of applicable limit	%	1.80E-3	3.85E-4	

* Second quarter analyses not available at report time; values will be included in the following Semiannual Report.

TABLE 1C

S.O.N.G.S. 2-3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

Nuclides Released	Unit	Continuous Mode First Quarter	Continuous Mode Second Quarter	Batch Mode First Quarter	Batch Mode Second Quarter
1. Fission gases					
argon-41	Ci	1.40E+0	1.50E+0	<LLD	<LLD
krypton-85	Ci	<LLD	<LLD	5.19E-1	2.24E+0
krypton-85m	Ci	<LLD	7.12E-3	<LLD	<LLD
krypton-87	Ci	<LLD	6.38E-3	<LLD	<LLD
krypton-88	Ci	<LLD	<LLD	<LLD	<LLD
xenon-131m	Ci	3.30E-1	1.26E-1	1.36E-2	4.83E-1
xenon-133	Ci	1.99E+2	3.09E+2	1.78E-2	2.51E+0
xenon-133m	Ci	4.41E-2	4.83E-2	<LLD	<LLD
xenon-135	Ci	1.17E-1	8.02E+0	1.83E-4	2.81E-3
xenon-135m	Ci	<LLD	9.43E-1	<LLD	<LLD
xenon-138	Ci	<LLD	<LLD	<LLD	<LLD
Total for period	Ci	2.01E+2	3.20E+2	5.51E-1	5.23E+0
2. Iodines					
iodine-131	Ci	2.85E-3	3.72E-3	NA	NA
iodine-132	Ci	2.26E-4	1.63E-4	NA	NA
iodine-133	Ci	1.96E-3	1.91E-3	NA	NA
iodine-134	Ci	1.04E-4	<LLD	NA	NA
iodine-135	Ci	4.92E-4	2.63E-4	NA	NA
Total for period	Ci	5.63E-3	6.06E-3	NA	NA
3. Particulates					
barium-139	Ci	3.21E-4	<LLD	NA	NA
barium-140	Ci	1.38E-6	2.77E-6	NA	NA
bromine-82	Ci	4.71E-5	3.20E-5	NA	NA
cerium-143	Ci	<LLD	2.75E-6	NA	NA
cerium-144	Ci	1.64E-6	<LLD	NA	NA
cesium-134	Ci	3.74E-7	4.43E-6	NA	NA
cesium-136	Ci	4.26E-7	1.82E-6	NA	NA
cesium-137	Ci	2.07E-5	2.01E-5	NA	NA
cesium-138	Ci	1.87E-3	1.73E-4	NA	NA
chromium-51	Ci	9.85E-6	<LLD	NA	NA
cobalt-57	Ci	<LLD	6.20E-11	NA	NA
cobalt-58	Ci	3.21E-5	6.74E-5	NA	NA
cobalt-60	Ci	6.74E-6	2.35E-6	NA	NA

LLD Lower Limit of Detection; See Table 1D.
NA Iodines and particulates are not analyzed prior to release via batch mode.

TABLE 1C (Continued)

S.O.N.G.S. 2-3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
GASEOUS EFFLUENTS-GROUND LEVEL RELEASES

Nuclides Released	Unit	Continuous Mode First Quarter	Continuous Mode Second Quarter	Batch Mode First Quarter	Batch Mode Second Quarter
3. Particulates (Continued)					
lanthanum-140	Ci	3.11E-7	5.90E-7	NA	NA
manganese-54	Ci	1.41E-6	1.04E-6	NA	NA
molybdenum-99	Ci	1.78E-6	1.27E-6	NA	NA
rubidium-88	Ci	1.19E-6	9.94E-4	NA	NA
sodium-24	Ci	1.87E-5	1.28E-6	NA	NA
strontium-89	Ci	3.72E-7	*	NA	NA
strontium-90	Ci	<LLD	*	NA	NA
strontium-91	Ci	7.60E-6	1.40E-6	NA	NA
strontium-92	Ci	1.35E-5	<LLD	NA	NA
technetium-99m	Ci	1.83E-6	1.30E-6	NA	NA
tellurium-132	Ci	4.17E-11	<LLD	NA	NA
tin-113	Ci	1.35E-6	<LLD	NA	NA
tungsten-187	Ci	4.01E-6	<LLD	NA	NA

LLD Lower Limit of Detection; See Table 1D.

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

* Second quarter analyses not available at report time; values will be included in the following Semiannual Report.

TABLE 1D

S.O.N.G.S. 2-3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
GASEOUS EFFLUENTS-LOWER LIMIT OF DETECTION

	RADIONUCLIDES	CONTINUOUS MODE LLD (µCi/cc)	BATCH MODE LLD (µCi/cc)
1.	Fission and activation gases		
	argon-41	*	6.60E-6
	krypton-85	2.10E-5	*
	krypton-85m	2.40E-7	1.70E-6
	krypton-87	3.70E-7	5.90E-6
	krypton-88	4.50E-7	5.10E-6
	xenon-133m	*	1.40E-5
	xenon-135m	1.20E-6	1.90E-5
	xenon-138	2.30E-6	3.90E-5
2.	Iodines		
	iodine-134	8.40E-11	NA
3.	Particulates		
	barium-139	1.30E-10	NA
	cerium-143	9.00E-13	NA
	cerium-144	8.00E-13	NA
	chromium-51	1.80E-12	NA
	cobalt-57	9.40E-14	NA
	strontium-90	1.00E-14	NA
	strontium-92	1.60E-11	NA
	tellurium-132	2.30E-13	NA
	tin-113	2.00E-13	NA
	tungsten-187	2.10E-12	NA

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

* Nuclides were detected in Table 1C.

TABLE 1E

S.O.N.G.S. 2-3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
GASEOUS EFFLUENTS-RADIATION DOSES AT THE SITE BOUNDARY

		Unit	First Quarter	Second Quarter*
A.	Noble Gas			
	1. Gamma air dose	mrad	1.27E-2	2.17E-2
	2. Percent Applicable Limit	%	1.27E-1	2.17E-1
	3. Beta air dose	mrad	3.28E-2	5.44E-2
	4. Percent Applicable Limit	%	1.64E-1	2.72E-1
B.	Tritium, Iodine, Particulate (at the nearest receptor)			
	1. Organ dose	mrem	1.55E-3	1.66E-3
	2. Percent Applicable Limit	%	1.03E-2	1.11E-2

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

* Second quarter doses incomplete due to Sr-89 and Sr-90 analyses not available at report time; values will be reported in the following Semiannual Report.

TABLE 1F

S.O.N.G.S. 2-3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
GASEOUS EFFLUENTS-BATCH RELEASE SUMMARY

		6-MONTH PERIOD	
1.	Number of batch releases:	11	releases
2.	Total time period for batch releases:	3928	minutes
3.	Maximum time period for a batch release:	705	minutes
4.	Average time period for a batch release:	357	minutes
5.	Minimum time period for a batch release:	110	minutes

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.

TABLE 2A

S.O.N.G.S. 2-3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
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	1.14E-2	2.73E-2	1.90E+1
	2. Average diluted concentration during period	µCi/ml	1.62E-11	4.03E-11	
	3. Percent of applicable limit	%	1.14E-4	2.31E-4	
B.	Tritium				
	1. Total release	Ci	3.06E+2	4.37E+2	1.90E+1
	2. Average diluted concentration during period	µCi/ml	4.36E-7	6.45E-7	
	3. Percent of applicable limit	%	1.45E-2	2.15E-2	
C.	Dissolved and entrained gases				
	1. Total release	Ci	1.71E-2	8.44E-2	1.90E+1
	2. Average diluted concentration during period	µCi/ml	2.44E-11	1.24E-10	
	3. Percent of applicable limit	%	1.22E-5	6.20E-5	
D.	Gross alpha radioactivity				
	1. Total release	Ci	<LLD	*	5.00E+1
E.	Volume of waste released (prior to dilution)	liters	2.14E+6	2.33E+6	5.00E+0
F.	Volume of dilution water used during period	liters	7.02E+11	6.78E+11	5.00E+0

* Second quarter analyses not available at report time; values will be included in the following Semiannual Report.

TABLE 2B

S.O.N.G.S. 2-3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
LIQUID EFFLUENTS

Nuclides Released	Unit	Continuous Mode First Quarter	Continuous Mode Second Quarter	Batch Mode First Quarter	Batch Mode Second Quarter
1. Fission and activation products					
antimony-124	Ci	<LLD	<LLD	4.96E-5	1.20E-5
antimony-125	Ci	<LLD	<LLD	3.13E-3	9.36E-4
barium 140	Ci	<LLD	<LLD	<LLD	<LLD
cerium-141	Ci	<LLD	<LLD	<LLD	2.05E-5
cerium-144	Ci	<LLD	<LLD	1.06E-4	1.76E-4
cesium-134	Ci	<LLD	<LLD	8.91E-4	6.07E-4
cesium-136	Ci	<LLD	<LLD	4.80E-6	<LLD
cesium-137	Ci	3.16E-5	5.87E-4	1.99E-3	1.30E-3
chromium-51	Ci	<LLD	<LLD	1.01E-4	3.57E-3
cobalt-57	Ci	<LLD	<LLD	4.33E-5	3.87E-5
cobalt-58	Ci	<LLD	<LLD	2.73E-3	1.18E-2
cobalt-60	Ci	<LLD	<LLD	1.76E-3	3.34E-3
iodine-131	Ci	<LLD	<LLD	1.37E-4	3.18E-4
iodine-133	Ci	<LLD	<LLD	6.05E-6	<LLD
iron-55	Ci	<LLD	*	<LLD	*
iron-59	Ci	<LLD	<LLD	<LLD	3.40E-4
lanthanum-140	Ci	<LLD	<LLD	<LLD	3.66E-5
manganese-54	Ci	<LLD	<LLD	2.79E-4	4.00E-4
molybdenum-99	Ci	<LLD	<LLD	2.51E-6	5.08E-6
niobium-95	Ci	<LLD	<LLD	4.68E-5	1.77E-3
niobium-97	Ci	<LLD	<LLD	1.48E-5	<LLD
ruthenium-103	Ci	<LLD	<LLD	<LLD	2.28E-4
ruthenium-106	Ci	<LLD	<LLD	<LLD	8.77E-5
silver-110m	Ci	<LLD	<LLD	2.43E-5	1.62E-4
strontium-89	Ci	<LLD	*	<LLD	*
strontium-90	Ci	<LLD	*	<LLD	*
technetium-99m	Ci	<LLD	<LLD	2.56E-6	5.18E-6
tellurium-132	Ci	<LLD	<LLD	<LLD	8.36E-6
tin-113	Ci	<LLD	<LLD	<LLD	4.48E-4
tin-117m	Ci	<LLD	<LLD	<LLD	4.28E-5
zinc-65	Ci	<LLD	<LLD	<LLD	<LLD
zirconium-95	Ci	<LLD	<LLD	4.33E-6	1.09E-3
Total for period	Ci	3.16E-5	5.87E-4	1.13E-2	2.68E-2

LLD Lower Limit of Detection; see Table 2C.

* Second quarter analyses not available at report time; values will be included in the following Semiannual Report.

TABLE 2B (Continued)

S.O.N.G.S. 2-3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
LIQUID EFFLUENTS (Continued)

Nuclides Released	Unit	Continuous Mode First Quarter	Continuous Mode Second Quarter	Batch Mode First Quarter	Batch Mode Second Quarter
(2) Dissolved and entrained gases					
krypton-85	Ci	<LLD	<LLD	7.39E-3	<LLD
xenon-131m	Ci	<LLD	<LLD	<LLD	7.52E-3
xenon-133	Ci	<LLD	<LLD	9.68E-3	7.68E-2
xenon-133m	Ci	<LLD	<LLD	<LLD	8.43E-5
xenon-135	Ci	<LLD	<LLD	1.56E-5	3.50E-5

LLD Lower Limit of Detection; see Table 2C.

TABLE 2C

S.O.N.G.S. 2-3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
LIQUID EFFLUENTS-LOWER LIMIT OF DETECTION

RADIONUCLIDES	CONTINUOUS MODE LLD (µCi/cc)	BATCH MODE LLD (µCi/cc)
1. Fission and activation products		
antimony-124	3.10E-7	*
antimony-125	1.80E-7	*
barium-140	3.00E-7	2.00E-7
cerium-141	8.90E-8	6.80E-8
cerium-144	3.90E-7	*
cesium-134	8.00E-8	*
cesium-136	1.40E-7	3.80E-8
chromium-51	6.60E-7	*
cobalt-57	5.30E-8	*
cobalt-58	1.10E-7	*
cobalt-60	1.10E-7	*
iodine-131	8.00E-8	*
iodine-133	5.80E-7	6.70E-8
iron-55	1.00E-6	1.00E-6
iron-59	1.80E-7	8.90E-8
lanthanum-140	4.90E-7	4.60E-8
manganese-54	7.20E-8	*
molybdenum-99	1.10E-7	*
niobium-95	7.10E-8	*
niobium-97	8.50E-7	6.10E-8
ruthenium-103	5.60E-8	6.20E-8
ruthenium-106	7.10E-7	5.10E-7
silver-110m	1.10E-7	*
strontium-89	5.00E-8	5.00E-8
strontium-90	1.00E-8	1.00E-8
technetium-99m	1.10E-7	*
tellurium-132	1.10E-7	3.80E-8
tin-113	6.40E-8	6.80E-8
tin-117m	5.50E-8	3.80E-8
zinc-65	1.90E-7	6.90E-8
zirconium-95	1.40E-7	*
gross alpha	1.00E-7	1.00E-7
2. Dissolved and entrained gases		
krypton-85	4.70E-5	2.00E-5
xenon-131m	4.00E-6	1.80E-6
xenon-133	3.80E-7	*
xenon-133m	9.30E-7	5.50E-7
xenon-135	2.30E-8	*

* Nuclide detected in Table 2B.

TABLE 2D

S.O.N.G.S. 2-3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
LIQUID EFFLUENTS-RADIATION DOSES AT THE LIQUID SITE BOUNDARY

		Unit	First Quarter	Second Quarter*
A.				
1.	Total body dose	mrem	7.53E-4	1.23E-3
2.	Percent Applicable Limit	%	2.51E-2	4.10E-2
B.				
1.	Limiting organ dose	mrem	1.26E-3	5.11E-3
2.	Percent Applicable Limit	%	1.26E-2	5.11E-2

NOTE: The limiting organ for the first and second quarters is the GI-LLI.

* Second quarter doses incomplete due to Sr-89, Sr-90, and Fe-55 analyses not available at report time; values will be reported in the following Semiannual Report.

TABLE 2E

S.O.N.G.S. 2-3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
LIQUID EFFLUENTS-BATCH RELEASE SUMMARY

		6-MONTH PERIOD	
1.	Number of batch releases:	93	releases
2.	Total time period for batch releases:	18857	minutes
3.	Maximum time period for a batch release:	949	minutes
4.	Average time period for a batch release:	203	minutes
5.	Minimum time period for a batch release:	6	minutes
6.	Average saltwater flow during batch releases:	696237	gpm

SECTION D. PREVIOUS SEMIANNUAL REPORT ADDENDA

S.O.N.G.S. 2-3

1. The fourth quarter July-December 1990 Semiannual Report values for composite gross alpha, Sr-89, Sr-90, and Fe-55 (Tables 1A and 1C, Gaseous Effluents, Tables 2A and 2B, Liquid Effluents) were not available at report time. The values are as follows:

GASEOUS EFFLUENTS (4th Quarter 1990)

Nuclides Released	Unit	Continuous Mode	Batch Mode
strontium-89	Ci	<LLD	*
strontium-90	Ci	<LLD	*
Gross alpha	Ci	1.19E-6	*

Sr-89 LLD = 1.00E-13 µCi/cc
Sr-90 LLD = 1.00E-14 µCi/cc

* All "batch" gaseous releases made from S.O.N.G.S. 2-3 are vented through the Plant Stack, therefore, gross alpha, Sr-89, and Sr-90 are analyzed by "continuous" mode only.

LIQUID EFFLUENTS (4th Quarter 1990)

Nuclides Released	Unit	Continuous Mode	Batch Mode
iron-55	Ci	<LLD	1.31E-3
strontium-89	Ci	<LLD	<LLD
strontium-90	Ci	<LLD	<LLD
Gross alpha	Ci	<LLD	<LLD

Fe-55 LLD = 1.0E-6 µCi/ml
Sr-89 LLD = 5.0E-8 µCi/ml
Sr-90 LLD = 1.0E-8 µCi/ml
Gross alpha LLD = 1.0E-7 µCi/ml

2. GASEOUS EFFLUENT-RADIATION DOSES AT THE SITE BOUNDARY

For the fourth quarter of 1990 Semiannual Report, Sr-89, and Sr-90.

	Unit	Fourth Quarter
A. Tritium, Iodine, Particulate (at the nearest receptor)		
1. Organ dose	mrem	0.00E+0
2. Percent Applicable Limit	%	0.00E+0

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

3. LIQUID EFFLUENT-RADIATION DOSES AT THE SITE BOUNDARY

For the fourth quarter of 1990 Semiannual Report, Fe-55, Sr-89, and Sr-90.

	Unit	Fourth Quarter
A.		
1. Total body dose	mrem	2.07E-2
2. Percent Applicable Limit	%	6.90E-1
B.		
1. Limiting organ dose	mrem	1.28E-1
2. Percent Applicable Limit	%	1.20E+0

NOTE: The limiting organ is the bone.

SECTION E. RADWASTE SHIPMENTS

S.O.N.G.S. 2-3

TABLE 3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

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

1. Type of waste	Unit	6-month Period	Est. Total Error, %
a. Spent resins, filter sludges, evaporator bottoms, etc.	m^3	1.61E+1 *	
	Ci	3.76E+2	3.00E+1
b. Dry compressible waste, contaminated equip. etc.	m^3	5.69E+1 **	
	Ci	2.42E+0	3.00E+1
c. Irradiated components, control rods, etc.	m^3	NA	
	Ci	NA	NA
d. Other (filters)	m^3	NA	
	Ci	NA	NA

NOTE: Total curie content estimated.

* Shipped in Type A cask (C of C 9176)

** Material packaged in 55-gallon DOT 7A drums (7.5 cu. ft. each), or strong, tight containers (steel boxes, 98 cu. ft. each).

S.O.N.G.S. 2-3

TABLE 3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
SOLID WASTE AND IRRADIATED FUEL SHIPMENT

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

2. Estimate of major nuclide composition (by type of waste)

a.

antimony-124	%	1.01E-2
antimony-125	%	2.26E-1
carbon-14	%	8.44E-6
cesium-134	%	2.24E+1
cesium-137	%	4.33E+1
cobalt-57	%	1.34E-1
cobalt-58	%	1.96E+0
cobalt-60	%	5.30E+0
iodine-129	%	1.98E-4
iron-55	%	9.99E+0
manganese-54	%	1.69E+0
nickel-63	%	1.47E+1
niobium-95	%	1.20E-3
plutonium-241	%	1.64E-2
silver-110m	%	2.73E-2
strontium-90	%	1.28E-1
technetium-99	%	2.17E-4
tritium	%	3.38E-2

b.

antimony-125	%	9.92E-2
barium-133	%	3.75E-5
carbon-14	%	4.42E-3
cesium-134	%	2.80E+0
cesium-137	%	1.07E+1
cobalt-58	%	5.31E-1
cobalt-60	%	2.37E+0
iodine-129	%	1.14E-3
iron-55	%	7.46E+0
manganese-54	%	2.53E-1
nickel-63	%	1.57E+0
ruthenium-106	%	2.03E-3
strontium-90	%	1.86E-6
technetium-99	%	1.87E-3
tritium	%	7.42E+1

S.O.N.G.S. 2-3

TABLE 3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
SOLID WASTE AND IRRADIATED FUEL SHIPMENT

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

2. Estimate of major nuclide composition (by type of waste)

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

SECTION F. APPLICABLE LIMITS

Gaseous Effluents - Applicable Limits

The percent of applicable limit, tabulated in Table 1A, was calculated using the following equation:

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

where: Rel Rate = total curies released in each category and each quarter, divided by the seconds in a quarter; the value in Parts A.2, B.2, C.2 and D.2 of Table 1A, µCi/sec.

X/Q = 4.80E-6 sec/m^3; the annual average atmospheric dispersion defined in the ODCM, Rev. 17.

The MPC_{eff} is defined as:

$$\frac{1}{\sum_{i=1}^{n} \frac{F_i}{MPC_i}}$$

where: F_i = fractional abundance of the ith 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 = MPC of the ith radionuclide

The % Applicable Limit is placed in Parts A.3, B.3, C.3 and D.3 of Table 1A.

Liquid Effluents - Applicable Limits

The percent of applicable limit, tabulated in Table 2A, was calculated using the following equation:

$$\% \text{ Applicable Limit} = \frac{(\text{Dil Conc})\ (100)}{MPC_{eff}}$$

where: Dil Conc = total curies released in each category and each quarter divided by the total volume released (sum of Parts E and F in Table 2A); the value in Parts A.2, B.2 and C.2 of Table 2A, µCi/ml.

The MPC_{eff} is defined as:

$$\frac{1}{\sum_{i=1}^{n} \frac{F_i}{MPC_i}}$$

where: F_i = fractional abundance of the ith 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 = MPC of the ith radionuclide

The % Applicable Limit is placed in Parts A.3, B.3 and C.3 of Table 2A.

SECTION G. ESTIMATION OF ERROR

S.O.N.G.S. 2-3

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:

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

where: σ_i = Error associated with each component.

SECTION H. 10 CFR 50 APPENDIX I REQUIREMENTS

S.O.N.G.S. 2-3

Table 1 in Section H presents the first and second quarter 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, and are presented in Table 2D for the first and second quarters. 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.

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

S.O.N.G.S. 2-3

TABLE 1

	Dose* (millirems)	
SOURCE	1st Quarter	2nd Quarter
LIQUID EFFLUENTS Whole Body	1) 7.53E-4	2) 1.23E-3
Organ	3) 1.26E-3	4) 5.11E-3
AIRBORNE EFFLUENTS Tritium, Iodines, and Particulates	5) 4.65E-3	6) 3.79E-3
NOBLE GASES** Gamma	7) 8.03E-3	8) 8.48E-3
Beta	9) 1.94E-2	10) 1.95E-2
DIRECT RADIATION	11) 1.31E-1	12) 1.20E-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 effluents are in units of mrad, reflecting the air dose.

S.O.N.G.S. 2-3

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; the GI-LLI received the maximum dose primarily by the saltwater fish pathway.

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

5. The maximum organ dose was to a child's thyroid and was located in the NNW sector. This was calculated using the activity reported in the January - June 1991 Semiannual Report with the assumptions of USNRC Regulatory Guide 1.109.

6. The maximum organ dose was to a child's thyroid and was located in the ESE sector. This was calculated using the activity reported in the January - June 1991 Semiannual Report with the assumptions of USNRC Regulatory Guide 1.109.

7. The maximum air dose for gamma radiation was located in the E sector, at the exclusion area boundary and calculated with the assumptions of the USNRC Regulatory Guide 1.109.

8. The maximum air dose for gamma radiation was located in the E sector, at the exclusion area boundary, and calculated with the assumptions of the USNRC Regulatory Guide 1.109.

9. The maximum air dose for beta radiation was located in the E sector, at the exclusion area boundary and calculated with the assumptions of the USNRC Regulatory Guide 1.109.

10. The maximum air dose for beta radiation was located in the E sector, at the exclusion area boundary, and calculated with the assumptions of the USNRC Regulatory Guide 1.109.

11. 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 E sector.

12. 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 E sector.

S.O.N.G.S. 2-3

TABLE 2

	% Applicable Limit	
SOURCE	1st Quarter	2nd Quarter
LIQUID EFFLUENTS Whole Body	2.51E-2	4.10E-2
Organ	1.26E-2	5.11E-2
AIRBORNE EFFLUENTS Tritium, Iodines, and Particulates	3.10E-2	2.53E-2
NOBLE GASES Gamma	8.03E-2	8.48E-2
Beta	9.70E-2	9.75E-2

NOTE: Direct Radiation is not specifically addressed in the ODCM Specifications.

SECTION I. CHANGES TO OFFSITE DOSE CALCULATION MANUAL

S.O.N.G.S. 2-3

On February 28, 1991, Revision 23 to the Offsite Dose Calculation Manual (ODCM) for Units 2/3 was adopted and published. This revision encompassed a variety of changes to the document: update of airborne dose tables based on the 1990 Land Use Census, final responses to the NRC re TAC Nos. 74359 and 74360, addition of reporting requirements for missed ODCM actions or surveillances, and update of tables used in liquid and gaseous dose calculations. Additionally, there were two editorial changes for typographical errors. None of the changes resulted in any modifications to either the plant configuration or operation. As such, there was no impact on the accuracy or reliability of methods for determining effluent dose or setpoint values and no safety reviews were required. Documentation of the fact that this change was reviewed and found acceptable by the Station Manager was indicated by his signature on a letter dated February 28, 1991.

The majority of suggestions incorporated into this revision of the ODCM from TAC 74359 and 74360 do not affect the program at San Onofre but rather serve to correct documentation deficiencies. In one instance, the program has been revised to conservatively select the most critical organ for gaseous dose determination. An evaluation by Corporate Health Physics and Environmental has shown that no significant changes to the offsite dose calculations resulted.

A complete copy of Revision 23 is being submitted to the NRC per Technical Specification 6.14.2.3 concurrent with this report. The following is a complete listing of the changes in this revision:

[a] Indicates typographical, sequential sectional and page numbering, and format changes only - no safety review required.

i	GENERAL-updated page numbers for pp. ii, iv, and v[a]
1-27	Added reference for liquid pathways per TAC 74359 and 74360
1-28	Revised dose commitment factors on Table 1-4 to reflect best available data; added Sn-117m
1-29	Revised dose commitment factors on Table 1-4 to reflect best available data
2-32	Typographical errors in formulae corrected[a]; reference to PARTS V & V per TAC 74359 and 74360
2-36	Added Ru-103 to table
2-37	Added Ru-103, I-132 and I-134 to table; revised controlling location factors to reflect current land use census data
2-38 thru 2-80	Added Ru-103, I-132 and I-134 to tables; revised dose parameters to reflect current land use census data

2-39 Added Pt. Loran Military Housing pathway to dose parameter tables

2-41 Added Enlisted Beach Trailers pathway to dose parameter tables

4-1 Added reporting requirement for missed Action or Surveillance

4-6 Added reporting requirement for missed Action or Surveillance

5-15 Added "former" to SDG&E Offices[a], "U.S." to Coast Guard[a]

5-19 Deleted San Clemente Resident with Garden from Local Crops

5-20 Corrected distances and directions to reflect current land use census data

5-23 thru 5-25 Updated maps

6-2 Added definition for INVESTIGATIVE REPORT and renumbered following definitions

6-3 Renumbered definitions

o Potential Unplanned, Unmonitored Release from an Oil Polishing Rig

Normal operation of the plant produces waste oil contaminated with low levels of activity. Since none of the waste receiving sites accept mixed waste, a method was proposed to remove low levels of activity from used oil. Between November 1989 and January 1991, a truck-mounted unit was brought to San Onofre and operated at the old Batch plant in Parking Lot 1 near the Multipurpose Handling Facility (MPHF). Based on criteria in place at that time, no safety evaluation of the rig as a radwaste processing system was performed and no evaluation for potential effluent releases considered. Health Physics controls were established and any work performed in the area was done under the Radiation Exposure Permit program.

Review of the design and operation of the unit in October 1990 identified a potential for airborne releases from the unsealed hatch at the top of the tank. Air samples taken for worker protection purposes in the general vicinity did not show any detectable levels of either particulate or iodine activity.

Initially, waste water from the process was reintroduced to plant systems for disposal downstream of the installed radiation monitors. An evaluation was conducted to verify that 10 CFR 20, Appendix B, Table II limits had not been exceeded. Calculations using the highest specific activity of a given batch showed that the maximum additional activity contribution was 5E-7 uCi/ml compared to a maximum allowed concentration of 1.7E-4 uCi/ml.

Additional evaluations using worse case estimates of concentrations, flow rate, and historical meterology, showed that potential airborne releases during operation of the oil polishing unit would not have exceeded 1% of an MPC at the site boundary.

Processed oil was sold to various reclamation vendors once no gamma-emitters were detected in a grab sample from the batch. In response to NRC concerns, samples were analyzed offsite for tritium, iron-55, and strontium-89/90. Results were all below the minimum detectable levels specified in 10CFR61.

All evaluations showed that there were no significant dose consequences to a member of the public from the operation of the oil processing rig between November 1989 and January 1991. Additionally, the disposal of waste water from the process via plant systems did not result in the limits of 10 CFR 20, Appendix B, Table II being exceeded.

o Unplanned and Unmonitored Release via the Storm Drains

Parking Lot 1 has been used by the Station as a storage area for plant tools and equipment contaminated with low-level radioactive materials since 1984. In 1989 an additional laydown area in Parking Lot 1 was established for items from the Station Restricted Area (outside Red Badge Zones) which have not been surveyed and verified to be free of low levels of radioactive contamination. The potential exists for weathering of surfaces to occur and contaminated particles to be washed off and discharged via the unmonitored storm drain system. Based on criteria in place at that time, no safety evaluation was performed and no evaluation for potential effluent releases considered. Health Physics controls were established and any work performed in the area is done under the Radiation Exposure Permit program. No contaminated section has ever been established in the area.

During heavy rains in March, sampling of the retention basin was initiated to assess the potential for unmonitored releases. Over time, a layer of residual silt has accumulated in the basin. Less than 35% of the silt and 4% of the water samples showed traces of Cs-137. In the absence of other isotopes being identified, the low levels of cesium can be attributed to fallout from other non-plant related activities.

Evidence to date suggests that storage of materials with low levels of contamination in Parking Lot 1 has not resulted in an unplanned, unmonitored release of activity via the storm drain system. There has therefore been no impact on the health and safety of the public.

SECTION J. MISCELLANEOUS (Continued)

EFFLUENT RADIATION MONITORS OUT OF SERVICE FOR GREATER THAN 30 DAYS

January 1, 1991 - June 30, 1991

S.O.N.G.S. 2

Monitor	Inoperability Period	Inoperability Cause	Explanation
2RT-7818 A/B Condenser Air Ejector Monitor(*)	01/25/88 to present	Detector design deficiency	Design flaw in 2RT-7818 Channel B causes entire monitor to be inoperable. Testing program in progress to evaluate system performance.
2RT-7870 Condenser Air Ejector Process Flow Monitor	02/18/89 to present	Process flow indication	Inconsistent flow indication. Design change to replace existing circuitry in progress. Radiation monitor functions operable.
2RT-7828 Containment Purge Process Flow Monitor	05/03/91 to present	Process flow indication	Inconsistent stack flow indication. System testing in progress.

* 2RT-7818 is one of two monitors on the condenser air ejector exhaust. It is an analog design with an operable range of 1E-7 to 1E+2 uCi/cc compared to 2RT-7870, a digital system installed in 1983, with a range of detection from 1E-7 to 1E+5 uCi/cc. 2RT-7818B is inoperable due to attenuation design problems which do not affect the operability of the low range channel. During testing to evaluate 2RT-7818 performance, 2RT-7870 performs the functions required by Technical and ODCM Specifications.

EFFLUENT RADIATION MONITORS OUT OF SERVICE FOR GREATER THAN 30 DAYS (Continued)

January 1, 1991 - June 30, 1991

S.O.N.G.S. 3

Monitor	Inoperability Period	Inoperability Cause	Explanation
3RT-7818 A/B Condenser Air Ejector Monitor*	01/25/88 to present	Detector design deficiency	Design flaw in 3RT-7818 Channel B causes entire monitor to be inoperable. Testing program in progress to evaluate system performance.
3RT-7870 Condenser Air Ejector Process Flow Monitor	03/03/89 to present	Process flow indication	Inconsistent flow indication. Design change to replace existing circuitry in progress. Radiation monitor functions operable.
3RT-7828 Containment Purge Process Flow Monitor	03/02/91 to 04/08/91	Process flow indication	Inconsistent stack flow indication. Flow probes required re-calibration.

* 3RT-7818 is one of two monitors on the condenser air ejector exhaust. It is an analog design with an operable range of 1E-7 to 1E+2 uCi/cc compared to 3RT-7870, a digital system installed in 1983, with a range of detection from 1E-7 to 1E+5 uCi/cc. 3RT-7818B is inoperable due to attenuation design problems which do not affect the operability of the low range channel. During testing to evaluate 3RT-7818 performance, 3RT-7870 performs the functions required by Technical and ODCM Specifications.

SECTION K. S.O.N.G.S. 2-3 CONCLUSIONS

- Gaseous effluent releases, excluding tritium, totaled 5.26E+2 curies with 97% of the total being Xe-133.

- The radiation doses from gaseous releases are: (a) gamma air dose: 3.44E-2 mrad at the site boundary, (b) beta air dose: 8.72E-2 mrad at the site boundary, (c) organ dose: 3.21E-3 mrem at the nearest receptor.

- Liquid releases totaled 7.43E+2 curies of which tritium was 7.43E+2 Ci, noble gases were 1.02E-1 Ci, and particulates and iodines were 3.87E-2 Ci.

- The radiation doses from liquid releases are: (a) total body: 1.98E-3 mrem, (b) limiting organ: 6.37E-3 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 RADWASTE SHIPMENTS

TABLE 3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
SOLID WASTE AND IRRADIATED FUEL SHIPMENT

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

1. Type of waste	Unit	6-month Period	Est. Total Error, %
a. Spent resins, filter sludges, evaporate bottoms, etc.	m^3	NA	
	Ci	NA	NA
b. Dry compressible waste, contaminated equipment, etc.	m^3	NA	
	Ci	NA	NA
c. Irradiated components, control rods, etc.	m^3	NA	
	Ci	NA	NA
d. Other (filters, sludge, sand/rubble, wet trash	m^3	NA	
	Ci	NA	NA

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

TABLE 3

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT (1991)
SOLID WASTE AND IRRADIATED FUEL SHIPMENT

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

2. Solid Waste Disposition (S.O.N.G.S. 1, 2, and 3)

Number of Shipments	Mode of Transportation	Destination
6 *	Tri-State Motor Transit Truck/Trailer	Beatty, NV
5 *	Tri-State Motor Transit Truck/Cask	Beatty, NV
1 **	Hittman Transport Truck/Trailer	Barnwell, SC

* All waste packaged at SONGS is staged at one location. There are no independent shipments of Dry Active Waste (DAW) made for Unit 1 or Units 2/3 and are not reported separately.

** SONGS maintains contracts with vendors that provide volume reduction services. These shipments were made from their processing facilities.

B. IRRADIATED FUEL SHIPMENTS (Disposition)

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

C. DEWATERING

Number of Containers	Solidification Agent
4	N/A

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

1. There were no revisions to the Process Control Program procedure, SO123-VII-8.5.1 during the reporting period, January 1, 1991 to June 30, 1991.

REFERENCES:

1. Unit 1 Technical Specifications, Section 3.19
2. Unit 2 & 3 Technical Specifications, Section 6.13.2

COMMON CONCLUSIONS

- Radioactive releases from S.O.N.G.S. 1, 2 and 3 totaled 1.47E+3 curies for gaseous effluents, 96% of which was Xe-133. Curies discharged for liquid effluents were: tritium, 1.02E+3 curies; noble gases, 4.31E-1 curies; particulates and iodines, 3.82E-1 curies.

- Radioactive releases and resulting doses generated from S.O.N.G.S. 1, 2 and 3 were below the Technical Specification and ODCM specification limits for both gaseous and liquid effluents.

- S.O.N.G.S. 1, 2 and 3 made eleven radwaste shipments to Beatty, Nevada and one radwaste shipment to Barnwell, South Carolina. Total volume was 1.43E+2 cubic meters containing 3.83E+2 curies of radioactivity.

- Meteorological conditions during the year were typical for S.O.N.G.S. Meteorological dispersion was good 38% of the time, fair 38% of the time and poor 24% 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 Technical Specifications and other applicable regulatory requirements and therefore has not produced any detrimental effect on the environment.

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.

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 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 2.00E-4 μCi/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

The meteorology of the San Onofre Nuclear Generating Station for the first and second quarter, 1991 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 Semiannual Report, but has not been included in this report because of the bulk of data records.

Table 4A lists the joint frequency distribution for the first and second quarter, 1991. 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- and 40-meter levels.

Table 4A

07/19/91 12:16 SITE: SAN ONOFRE

PERIOD OF RECORD 90123124-91033124
EXTREMELY UNSTABLE (DT/DZ LESS THAN -1.9 DEG.C/100 M)
PASQUILL A
WIND SPEED (M/S) AT 10 M 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	TOT.
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	1	1	4	2	1	0	0	0	9
SSE	0	0	0	1	0	4	9	2	0	1	1	0	18
S	0	0	0	2	7	7	13	0	2	1	1	0	33
SSW	0	0	0	5	2	15	11	1	1	3	0	0	38
SW	0	0	0	4	8	24	13	2	1	1	0	0	53
WSW	0	0	0	2	13	21	25	5	3	1	0	0	70
W	0	0	0	0	9	57	81	15	5	2	0	0	170
WNW	0	0	0	0	2	11	29	10	8	0	0	0	60
NW	0	0	0	0	0	0	1	0	1	0	0	0	2
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	14	42	140	186	37	22	9	2	0	453

NUMBER OF CALMS 0
NUMBER OF INVALID HOURS 4
NUMBER OF VALID HOURS 453
TOTAL HOURS FOR THE PERIOD 2161

Table 4A

07/19/91 12:17 SITE: SAN ONOFRE

PERIOD OF RECORD 90123124-91033124
MODERATELY UNSTABLE (-1.9 < DT/DZ <= -1.7 DEG.C/100 M)
PASQUILL B
WIND SPEED (M/S) AT 10 M 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	TOT.
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
[illegible]E	0	0	0	0	0	0	0	0	0	0	0	0	0
[illegible]	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	2	0	0	0	0	0	2
SSW	0	0	0	0	0	0	2	0	0	0	0	0	2
SW	0	0	0	0	0	0	0	0	0	0	0	0	0
WSW	0	0	0	0	0	0	1	0	0	0	0	0	1
W	0	0	0	0	1	2	0	0	0	0	0	0	3
WNW	0	0	0	0	0	0	1	0	0	0	0	0	1
NW	0	0	0	0	1	0	1	0	0	0	0	0	2
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	0	2	2	7	0	0	0	0	0	11

NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	4
NUMBER OF VALID HOURS	11
TOTAL HOURS FOR THE PERIOD	2161

07/19/91 12:17 SITE: SAN ONOFRE

PERIOD OF RECORD 90123124-91033124
SLIGHTLY UNSTABLE (-1.7 < DT/TZ <= -1.5 DEG.C/100 M)
PASQUILL C
WIND SPEED (M/S) AT 10 M 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	TOT.
N	0	0	0	1	0	2	1	0	0	0	0	0	6
NNE	0	0	0	0	0	1	0	0	1	0	0	0	2
NE	0	0	0	0	1	0	0	0	1	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	1	0	0	0	0	0	0	0	1
SE	0	0	0	0	0	2	7	2	3	0	1	0	15
SSE	0	0	0	0	1	1	11	5	1	0	0	0	19
S	0	0	0	1	1	1	3	0	2	1	1	0	10
SSW	0	0	0	1	0	4	1	0	1	0	0	0	7
SW	0	0	0	1	3	0	1	2	0	1	0	0	8
WSW	0	0	0	2	2	2	3	1	2	0	0	0	12
W	0	0	1	1	0	7	3	0	2	1	0	0	15
WNW	0	0	0	1	3	11	10	2	1	0	0	0	28
NW	0	0	0	0	0	1	4	3	0	0	0	0	8
NNW	0	0	0	0	1	1	1	0	0	0	0	0	3
TOTALS	0	0	1	8	13	33	45	15	14	3	2	0	136

NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	4
NUMBER OF VALID HOURS	136
TOTAL HOURS FOR THE PERIOD	2161

Table 4A

07/19/91 12:17 SITE: SAN ONOFRE

PERIOD OF RECORD 90123124-91033124
NEUTRAL(-1.5 < DT/DZ <= -0.5 DEG.C/100 M)
PASQUILL D
WIND SPEED (M/S) AT 10 M 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	TOT.
N	0	0	2	5	4	4	3	1	0	0	0	0	19
NNE	0	0	3	8	3	6	6	5	4	0	0	0	35
NE	0	0	1	1	2	0	1	0	0	0	0	0	5
ENE	0	0	0	1	2	1	1	0	0	0	0	0	5
[illegible]	0	0	0	0	0	2	0	0	0	0	0	0	2
[illegible]E	0	0	0	0	1	5	8	0	1	0	0	0	15
SE	0	1	0	3	4	26	35	6	6	1	0	0	82
SSE	0	0	0	1	4	10	13	5	6	1	0	0	40
S	0	0	1	0	5	7	6	5	6	4	4	1	39
SSW	0	1	1	1	2	3	4	3	2	1	1	0	19
SW	1	1	2	4	0	3	2	0	5	3	0	0	21
WSW	0	0	2	0	1	3	0	1	3	2	0	0	12
W	1	1	2	3	0	7	5	5	11	4	0	0	39
WNW	0	0	0	1	1	16	4	9	13	0	0	0	44
NW	0	0	4	3	3	13	19	8	0	0	0	0	50
NNW	0	1	1	4	3	7	2	0	0	0	0	0	18
TOTALS	2	5	19	35	35	113	109	48	57	16	5	1	445

NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	4
NUMBER OF VALID HOURS	445
TOTAL HOURS FOR THE PERIOD	2161

Table 4A

07/19/91 12:17 SITE: SAN ONOFRE

PERIOD OF RECORD 90123124-91033124
SLIGHTLY STABLE (-0.5 < DT/DZ <= -1.5 DEG.C/100 M)
PASQUILL E
WIND SPEED (M/S) AT 10 M 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	TOT.
N	0	0	1	12	15	18	7	0	0	0	0	0	53
NNE	0	1	2	14	31	38	9	2	1	0	0	0	98
NE	0	1	6	7	1	1	5	2	1	0	0	0	24
ENE	0	0	1	1	1	2	1	0	0	0	0	0	[illegible]
E	1	1	2	3	4	6	1	0	0	0	0	0	[illegible]
ESE	0	0	1	4	3	4	0	0	0	0	0	0	[illegible]
SE	0	1	2	2	2	9	9	2	0	2	0	0	29
SSE	0	1	1	0	0	4	3	3	1	0	0	0	13
S	0	0	0	2	0	0	1	0	2	0	1	0	6
SSW	0	0	0	3	1	0	0	1	0	0	0	0	5
SW	0	0	0	2	0	0	0	0	0	1	0	0	3
WSW	0	0	1	1	2	0	0	0	0	0	0	0	4
W	0	0	0	3	4	8	3	0	0	0	0	0	18
WNW	0	0	1	1	2	6	11	0	0	0	0	0	21
NW	0	0	3	3	6	4	14	1	0	0	0	0	31
NNW	0	1	0	2	5	5	6	1	0	0	0	0	20
TOTALS	1	6	21	60	77	105	70	12	5	3	1	0	361

NUMBER OF CALMS 0
NUMBER OF INVALID HOURS 4
NUMBER OF VALID HOURS 361
TOTAL HOURS FOR THE PERIOD 2161

Table 4A

07/19/91 12:17 SITE: SAN ONOFRE

PERIOD OF RECORD 90123124-91033124
MODERATELY STABLE (1.5 <= DT/DZ <= -0.5 DEG.C/100 M)
PASQUILL F
WIND SPEED (M/S) AT 10 M 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	TOT.
N	0	0	1	2	6	10	7	0	0	0	0	0	27
NNE	0	1	2	24	35	71	22	1	0	0	0	0	156
NE	0	0	2	6	5	3	0	1	0	0	0	0	17
ENE	0	2	2	0	4	2	0	0	0	0	0	0	10
E	0	1	2	5	3	2	0	0	0	0	0	0	13
ESE	0	0	3	2	1	5	1	0	0	0	0	0	12
SE	0	1	0	0	1	1	4	0	0	0	0	0	7
SSE	0	0	0	0	3	2	4	0	0	0	0	0	9
S	0	0	0	2	2	0	0	0	0	0	0	0	4
SSW	0	0	0	0	0	3	0	0	0	0	0	0	3
SW	0	2	0	1	1	1	0	0	0	0	0	0	5
WSW	0	0	1	0	0	0	0	0	0	0	0	0	1
W	0	0	0	1	2	2	0	0	0	0	0	0	5
WNW	0	0	0	1	1	0	2	0	0	0	0	0	4
NW	0	0	0	1	1	2	1	0	0	0	0	0	5
NNW	0	0	1	1	2	2	1	0	0	0	0	0	7
TOTALS	0	7	14	46	67	106	42	2	0	0	0	0	285

NUMBER OF CALMS 0
NUMBER OF INVALID HOURS 4
NUMBER OF VALID HOURS 285
TOTAL HOURS FOR THE PERIOD 2161

Table 4A

07/19/91 12:17 SITE: SAN ONOFRE

PERIOD OF RECORD 90123124-91033124
EXTREMELY STABLE(DT/DZ EXCEEDS 4.0 DEG.C/100 M)
PASQUILL G
WIND SPEED (M/S) AT 10 M 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	TOT.
N	0	0	0	1	5	7	15	3	0	0	0	0	42
NNE	0	0	1	6	22	201	126	3	0	0	0	0	359
NE	0	0	1	10	5	8	1	1	0	0	0	0	26
ENE	0	0	0	3	1	2	1	0	0	0	0	0	7
E	0	0	0	2	2	0	0	0	0	0	0	0	4
ESE	0	0	1	1	1	0	0	0	0	0	0	0	3
SE	0	0	1	0	4	0	0	0	0	0	0	0	5
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	1	1	1	0	0	0	0	0	0	0	3
W	0	0	0	0	2	0	0	0	0	0	0	0	2
WNW	0	0	0	0	0	5	2	1	0	0	0	0	8
NW	0	0	0	0	1	0	0	0	0	0	0	0	1
NNW	0	0	0	0	1	2	2	0	0	0	0	0	5
TOTALS	0	0	5	24	46	225	147	8	0	0	0	0	466

NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	4
NUMBER OF VALID HOURS	466
TOTAL HOURS FOR THE PERIOD	2161

SONGS Semiannual Effluent Report

January - June 1991

Table 4A

07/19/91 12:17 SITE: SAN ONOFRE

PERIOD OF RECORD 90123124-91033124
ALL STABILITY, ALL DT/DZ
WIND SPEED (M/S) AT 10 M 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	TOT.
N	0	0	4	21	30	41	33	4	0	0	0	0	147
NNE	0	2	8	52	91	317	163	11	6	0	0	0	650
NE	0	1	10	24	14	12	7	4	2	0	0	0	74
ENE	0	2	3	5	8	7	3	0	0	0	0	0	28
E	1	2	4	10	9	10	1	0	0	0	0	0	37
ESE	0	0	5	7	7	14	9	0	1	0	0	0	43
[illegible]	0	3	3	5	12	39	59	12	10	3	1	0	147
[illegible]	0	1	1	2	9	21	40	15	8	2	1	0	100
S	0	0	1	7	15	15	25	5	12	6	7	1	94
SSW	0	1	1	10	5	25	18	5	4	4	1	0	74
SW	1	3	2	12	12	28	16	4	6	6	0	0	90
WSW	0	0	5	6	19	26	29	7	8	3	0	0	103
W	1	1	3	8	18	83	92	20	18	7	0	0	252
WNW	0	0	1	4	9	49	59	22	22	0	0	0	166
NW	0	0	7	7	12	20	40	12	1	0	0	0	99
NNW	0	2	2	7	12	17	12	1	0	0	0	0	53
TOTALS	3	18	60	187	282	724	606	122	98	31	10	1	2157

NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	4
NUMBER OF VALID HOURS	2157
TOTAL HOURS FOR THE PERIOD	2161

Table 4A

07/19/91 12:19 SITE: SAN ONOFRE

PERIOD OF RECORD 91040101-91063023
EXTREMELY UNSTABLE (DT/DZ LESS THAN -1.9 DEG.C/100 M)
PASQUILL A
WIND SPEED (M/S) AT 10 M 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	TOT.
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	1	0	0	0	0	1
ENE	0	0	0	0	0	0	1	1	0	0	0	0	2
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	3	2	0	0	0	0	5
SSE	0	0	0	0	0	2	13	5	2	0	0	0	22
S	0	0	0	1	4	10	38	13	0	0	0	0	66
SSW	0	0	0	2	8	28	65	7	0	0	0	0	110
SW	0	0	0	3	13	65	86	4	0	0	0	0	171
WSW	0	0	0	3	8	64	105	7	0	0	0	0	187
W	0	0	0	2	4	61	106	13	0	0	0	0	186
WNW	0	0	0	0	0	6	40	29	8	0	0	0	83
NW	0	0	0	0	0	0	5	2	0	0	0	0	7
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	11	37	236	462	84	10	0	0	0	840

NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	2
NUMBER OF VALID HOURS	840
TOTAL HOURS FOR THE PERIOD	2183

Table 4A

07/19/91 12:19 SITE: SAN ONOFRE

PERIOD OF RECORD 91040101-91063023
MODERATELY UNSTABLE (-1.9 < DT/DZ <= -1.7 DEG.C/100 M)
PASQUILL B
WIND SPEED (M/S) AT 10 M 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	TOT.
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
[illegible]	0	0	0	0	0	0	0	0	0	0	0	0	0
[illegible]	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	2	0	0	0	2
WNW	0	0	0	0	0	0	0	1	0	0	0	0	1
NW	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	0	0	0	0	0	1	2	0	0	0	3

NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	2
NUMBER OF VALID HOURS	3
TOTAL HOURS FOR THE PERIOD	2183

Table 4A

07/19/91 12:19 SITE: SAN ONOFRE

PERIOD OF RECORD 91040101-91063023
SLIGHTLY UNSTABLE (-1.7 < DT/TZ <= -1.5 DEG.C/100 M)
PASQUILL C
WIND SPEED (M/S) AT 10 M 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	TOT.
N	0	0	0	0	1	0	0	0	0	0	0	0	1
NNE	0	0	0	1	1	0	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	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	2	7	4	0	0	0	0	[illegible]
SSE	0	0	0	0	1	7	14	7	0	0	0	0	[illegible]
S	0	0	0	0	3	5	16	3	0	0	0	0	27
SSW	0	0	0	1	4	6	12	1	0	0	0	0	24
SW	0	0	0	0	4	2	5	0	0	0	0	0	11
WSW	0	0	2	5	2	5	0	0	0	0	0	0	14
W	0	0	1	5	7	9	2	1	1	0	0	0	26
WNW	0	0	0	1	2	9	18	1	1	0	0	0	32
NW	0	0	0	0	0	7	10	0	0	0	0	0	17
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTALS	0	0	3	13	25	52	84	17	2	0	0	0	196

NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	2
NUMBER OF VALID HOURS	196
TOTAL HOURS FOR THE PERIOD	2183

Table 4A

07/19/91 12:19 SITE: SAN ONOFRE

PERIOD OF RECORD 91040101-91063023
NEUTRAL(-1.5 < DT/DZ <= -0.5 DEG.C/100 M)
PASQUILL D
WIND SPEED (M/S) AT 10 M 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	TOT.
N	0	1	0	15	5	9	0	0	0	0	0	0	30
NNE	0	1	4	11	13	11	1	0	0	0	0	0	41
NE	0	0	3	4	4	1	0	0	0	0	0	0	12
ENE	0	0	0	2	0	1	0	0	1	0	0	0	4
[illegible]	0	0	0	0	0	10	4	2	0	0	0	0	16
[illegible]	0	1	0	1	0	7	17	1	0	0	0	0	27
[illegible]	0	0	0	3	2	25	70	2	0	0	0	0	102
SSE	0	0	0	5	5	29	40	15	0	0	0	0	94
S	0	0	1	9	14	44	33	4	0	0	0	0	105
SSW	0	1	2	10	9	20	11	1	0	0	0	0	54
SW	0	0	5	8	11	10	6	0	0	0	0	0	40
WSW	0	2	1	11	10	8	3	3	0	0	0	0	38
W	0	0	4	8	6	11	9	1	0	0	0	0	39
WNW	0	0	4	8	2	8	15	3	0	0	0	0	40
NW	0	0	5	5	5	7	8	0	0	0	0	0	30
NNW	0	0	1	5	6	13	2	0	0	0	0	0	27
TOTALS	0	6	30	105	92	214	219	32	1	0	0	0	699

NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	2
NUMBER OF VALID HOURS	699
TOTAL HOURS FOR THE PERIOD	2183

Table 4A

07/19/91 12:19 SITE: SAN ONOFRE

PERIOD OF RECORD 91040101-91063023
SLIGHTLY STABLE (-0.5 < DT/DZ <= -1.5 DEG.C/100 M)
PASQUILL E
WIND SPEED (M/S) AT 10 M 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	TOT.
N	0	0	1	5	6	7	1	0	0	0	0	0	20
NNE	0	0	4	17	25	14	2	0	0	0	0	0	62
NE	0	0	3	3	3	0	0	0	0	0	0	0	9
ENE	0	0	0	2	2	1	0	1	0	0	0	0	6
E	0	1	0	3	0	1	0	0	0	0	0	0	5
ESE	0	0	2	1	1	6	0	0	0	0	0	0	1
SE	0	0	0	2	1	5	0	0	0	0	0	0	8
SSE	0	0	1	1	2	3	1	0	0	0	0	0	8
S	0	0	0	1	0	1	0	0	0	0	0	0	2
SSW	0	0	0	1	3	1	0	0	0	0	0	0	5
SW	0	0	1	2	0	0	0	0	0	0	0	0	3
WSW	0	1	1	0	0	0	0	0	0	0	0	0	2
W	0	0	0	0	1	1	0	0	0	0	0	0	2
WNW	0	0	0	0	0	2	2	0	0	0	0	0	4
NW	0	0	0	1	0	2	1	1	0	0	0	0	5
NNW	0	1	2	0	0	1	1	0	0	0	0	0	5
TOTALS	0	3	15	39	44	45	8	2	0	0	0	0	156

NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	2
NUMBER OF VALID HOURS	156
TOTAL HOURS FOR THE PERIOD	2183

SONGS Semiannual Effluent Report

January - June 1991

Table 4A

07/19/91 12:19 SITE: SAN ONOFRE

PERIOD OF RECORD 91040101-91063023
MODERATELY STABLE (1.5 <= DT/DZ <= -0.5 DEG.C/100 M)
PASQUILL F
WIND SPEED (M/S) AT 10 M 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	TOT.
N	0	0	0	1	1	5	1	0	0	0	0	0	8
NNE	0	0	2	22	29	33	2	0	0	0	0	0	88
NE	0	1	2	3	1	1	0	0	0	0	0	0	8
ENE	0	0	0	2	0	1	0	0	0	0	0	0	3
E	0	2	3	1	0	0	0	0	0	0	0	0	6
[illegible]E	0	0	0	1	0	0	0	0	0	0	0	0	1
[illegible]	0	0	0	1	0	2	0	0	0	0	0	0	3
SSE	0	0	0	0	2	0	0	0	0	0	0	0	2
S	0	0	0	0	0	0	0	0	0	0	0	0	0
SSW	0	0	0	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	1	0	0	0	0	0	0	0	1
W	0	0	0	0	1	2	0	0	0	0	0	0	3
WNW	0	0	0	0	0	1	2	0	0	0	0	0	3
NW	0	0	0	2	0	0	1	0	0	0	0	0	3
NNW	0	0	0	0	0	1	0	0	0	0	0	0	1
TOTALS	0	3	7	33	35	46	6	0	0	0	0	0	130

NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	2
NUMBER OF VALID HOURS	130
TOTAL HOURS FOR THE PERIOD	2183

Table 4A

07/19/91 12:19 SITE: SAN ONOFRE

PERIOD OF RECORD 91040101-91063023
EXTREMELY STABLE(DT/DZ EXCEEDS 4.0 DEG.C/100 M)
PASQUILL G
WIND SPEED (M/S) AT 10 M 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	TOT.
N	0	0	0	0	2	1	5	2	0	0	0	0	10
NNE	0	0	0	7	20	73	27	1	0	0	0	0	128
NE	0	0	0	4	1	0	0	0	0	0	0	0	5
ENE	0	1	0	1	1	0	0	0	0	0	0	0	3
E	0	0	0	0	1	0	0	0	0	0	0	0	1
ESE	0	0	0	0	0	0	0	0	0	0	0	0	
SE	0	0	0	1	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	1	0	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	0	0	0	0	0	0	0	0	0	0
W	0	0	0	1	0	2	0	0	0	0	0	0	3
WNW	0	0	0	0	0	0	1	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	1	1	0	0	0	0	0	2
TOTALS	0	2	0	14	25	77	36	3	0	0	0	0	157

NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	2
NUMBER OF VALID HOURS	157
TOTAL HOURS FOR THE PERIOD	2183

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Table 4A

07/19/91 12:19 SITE: SAN ONOFRE

PERIOD OF RECORD 91040101-91063023
ALL STABILITY, ALL DT/DZ
WIND SPEED (M/S) AT 10 M 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	TOT.
N	0	1	1	21	15	22	7	2	0	0	0	0	69
NNE	0	1	10	58	88	131	32	1	0	0	0	0	321
NE	0	1	8	14	9	2	0	1	0	0	0	0	35
ENE	0	1	0	7	3	3	1	2	1	0	0	0	18
E	0	3	3	4	1	11	4	2	0	0	0	0	28
ESE	0	1	2	3	1	13	17	1	0	0	0	0	38
[illegible]	0	0	0	7	3	34	80	8	0	0	0	0	132
[illegible]E	0	0	1	6	10	41	68	27	2	0	0	0	155
S	0	0	1	11	21	60	87	20	0	0	0	0	200
SSW	0	2	2	14	24	55	88	9	0	0	0	0	194
SW	0	0	6	13	28	77	97	4	0	0	0	0	225
WSW	0	3	4	19	21	77	108	10	0	0	0	0	242
W	0	0	5	16	19	86	117	15	3	0	0	0	261
WNW	0	0	4	9	4	26	78	34	9	0	0	0	164
NW	0	0	5	8	5	16	27	3	0	0	0	0	64
NNW	0	1	3	5	6	16	4	0	0	0	0	0	35
TOTALS	0	14	55	215	258	670	815	139	15	0	0	0	2181

NUMBER OF CALMS	0
NUMBER OF INVALID HOURS	2
NUMBER OF VALID HOURS	2181
TOTAL HOURS FOR THE PERIOD	2183

OFFSITE DOSE CALCULATION MANUAL

NUCLEAR GENERATION SITE

UNIT 1

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INTRODUCTION

The OFFSITE DOSE CALCULATION MANUAL (ODCM) is a supporting document of the RADIOLOGICAL EFFLUENT TECHNICAL SPECIFICATIONS (NUREG 0472). The ODCM describes the methodology and parameters to be used in the calculation of offsite doses due to radioactive liquid and gaseous effluents. It is calculates the liquid an gaseous effluent monitoring instrumentation alarm/trip setpoints. The ODCM contains a list of the sample locations for the radiological environmental monitoring program.

The ODCM will be maintained at the Site for use as a document of acceptable methodologies and calculations to be used in implementing the Technical Specifications. Changes in the calculational methods or parameters will be incorporated into the ODCM in order to assure that the ODCM represents the present methodology.

1.0 LIQUID EFFLUENTS

1.1 Liquid Effluent Monitor Setpoints (3.15.1)

Liquid Radwaste Effluent Line Monitors provide alarm and automatic termination of release prior to exceeding the concentration limits specified in 10CFR20, Appendix B, Table II, Column 2 at the release point to the unrestricted area. To meet Specification 4.5.1.B and for the purpose of implementation of Specification 3.15.1, the alarm/trip setpoints for liquid effluent monitors and flow measurement devices are set to assure that the following equation is satisfied:

$$\frac{C_m R}{F+R} \leq MPC_{eff} \qquad (1\text{-}1)$$

where:

MPC_{eff} = the effective effluent maximum concentration permissible limit (μCi/ml) at the release point to the unrestricted area for the radionuclide mixture being released,

$$= \frac{1}{\sum_{i=1}^{N} \left(\frac{F_i}{MPC_i} \right)} \qquad (1\text{-}2)$$

1.1 Liquid Effluent Monitor Setpoints (3.15.1) (Continued)

F_i = fractional concentration of the i^{th} radionuclide as obtained by sample analysis.

N = Number of radionuclides identified in sample analysis.

MPC_i = MPC of the i^{th} radionuclide (10CFR20, App B, Table II, Column 2).

C_m = the setpoint, in μCi/ml, representative of a radionuclide concentration for the radiation monitor measuring the radioactivity in the waste effluent line prior to dilution and subsequent release.

R = the permissible waste effluent flow rate at the radiation monitor location, in volume per unit time in the same units as for F.

F = the dilution water flow in volume per unit time. The dilution water flow is 150,000 gpm per circ pump (2 total) and 3,500 gpm per saltwater pump (3 total).

Administrative values are used to reduce each setpoint to account for the potential activity in other releases. These administrative values shall be periodically reviewed based on actual release data (including, for example, any saltwater discharge of the component cooling water heat exchanger) and revised in accordance with the Unit 1 Technical Specifications.

1.1.1 Batch Release Setpoint Determination

The waste flow (R) and monitor setpoint (C_m) are set to meet the condition of equation (1-1) for the effective MPC (MPC_{eff}) limit. The method by which this is accomplished is as follows:

STEP 1: The isotopic concentration for each batch tank to be released is obtained from the sum of the measured concentrations in the tank as determined by analysis.

$$C = \sum_i C_{\gamma i} + C_\alpha + C_s + C_t + C_{Fe} \qquad (1\text{-}3)$$

Where:

C = The total concentration in each tank. (μCi/ml)

$\sum_i C_{\gamma i}$ = The sum of the measured concentrations for each radionuclide, i, in the gamma spectrum. (μCi/ml)

C_{Fe} = The Fe-55 concentration as determined in the previous quarterly composite sample. (μCi/ml)

C_α = The gross alpha concentration determined in the previous monthly composite sample. (μCi/ml)

1.1.1 Batch Release Setpoint Determination (Continued)

C_s = The Sr-89 and Sr-90 concentrations as determined in the previous quarterly composite sample. (μCi/ml)

C_t = The H-3 concentration as determined in the previous monthly composite sample. (μCi/ml)

STEP 2: The effective MPC (MPC_{eff}) for each batch tank, sump, or blowdown line is determined using:

$$MPC_{eff} = \frac{1}{\sum_i \frac{(C_{\gamma i}/C)}{(MPC_{\gamma i})} + \frac{(C_s/C)}{(MPC_s)} + \frac{(C_t/C)}{(MPC_t)} + \frac{(C_\alpha/C)}{(MPC_\alpha)} + \frac{(C_{Fe}/C)}{(MPC_{Fe})}} \quad (1\text{-}4)$$

$MPC_{\gamma i}$, MPC_s, MPC_t, MPC_{Fe}, MPC_α = the limiting concentrations of the appropriate radionuclide from 10CFR20, Appendix B, Table II, Column 2.

NOTE: For dissolved or entrained noble gases, the concentration shall be limited to 2.0E-4 μCi/ml total activity.

1.1.1 Batch Release Setpoint Determination (Continued)

STEP 3: The radioactivity monitor setpoint C_m (μCi/ml), may now be specified based on the values of C, $\sum_i C_{\gamma i}$, F, MPC_{eff} and R to provide compliance with the limits of 10CFR20, Appendix B, Table II, Column 2. The monitor setpoint in CPM is obtained by applying the appropriate calibration constant given in Table 1-1 to the calculated monitor concentration limit C_m (μCi/ml).

1.1.1.1 LIQUID RADWASTE EFFLUENT LINE (RT-1218)

The value for C_m, the concentration limit at the detector, is determined by using:

$$C_m \leq \frac{(RW)\ (F)\ (C_{eff})}{\frac{R_1 C_1}{MPC_{eff1}} + \frac{R_2 C_2}{MPC_{eff2}} + \ldots + \frac{R_n C_n}{MPC_{effn}}} \qquad (1\text{-}5)$$

Where:

n = Number of tanks to be released.

C_{eff} = Effective gamma isotopic concentration at the monitor for the tank combination to be released (equal to $\sum_i C_{\gamma i}$ for single tank releases).

$$= \frac{R_1\ (\Sigma C_{\gamma i})_1 + R_2\ (\Sigma C_{\gamma i})_2 + \ldots + R_n\ (\Sigma C_{\gamma i})_n}{R_1 + R_2 + \ldots + R_n} \qquad (1\text{-}6)$$

$(\Sigma_i C_{\gamma i})_1$, $(\Sigma_i C_{\gamma i})_2$, etc. = The total gamma isotopic concentration of first tank, second tank, etc. (μCi/ml).

R_1, R_2, etc. = The effluent flow rate from first tank, second tank, etc. Values of R for each tank are as follows:

Radwaste holdup tanks R = 50 gpm/pump (x no. of pumps to be run)

Radwaste monitor tanks R = 50 gpm/pump (x no. of pumps to be run)

Primary plant makeup tank R = 100 gpm/pump (x no. of pumps to be run)

NOTE: Since the values of R are much smaller than F, the term (F + R) in equation (1-1) may be replaced by F.

MPC_{eff1}, MPC_{eff2}, etc. = Values of MPC_{eff} from equation (1-4) for first tank, second tank, etc.

C_1, C_2, etc. = Values of C, the total concentration, from equation (1-3) for the first tank, second tank, etc. in (μCi/ml).

RW, SG_{1216}, S_{2100}, and S_{2101} are administrative values used for simultaneous releases from the Radwaste Effluent discharge and Steam Generators, the Turbine Bld. Sump, and the Yard Drain Sump. The fractions RW and SG_{1216}, S_{2100}, and S_{2101} will be assigned such that $RW + SG_{1216} + S_{2100} + S_{2101} \leq 1.0$. The 1.0 is an administrative value used to account for the potential activity for all release pathways. This assures that the total concentration from all release points to the plant discharge will not result in a release of concentrations exceeding the limits of 10CFR20, Appendix B, Table II, Column 2 from the site.

NOTE: If $C_m \leq C_{eff}$, then no release is possible. To increase C_m, increase dilution flow F (by running more pumps in the applicable discharge structure), and/or decrease the effluent flow rates R_1, R_2, etc. (by throttling the combined flow as measured on CV110) and recalculate C_m using the new F, R and equation (1-5). If there is no release associated with this monitor, the monitor setpoint should be established as close to background as practical to prevent spurious alarms and yet assure an alarm should an inadvertent release occur.

1.1.1.2 STEAM GENERATOR BLOWDOWN EFFLUENT LINE (RT-1216)

The value for C_m, the concentration limit at the detector, is determined by using:

$$C_m \leq \frac{(SG_{1216})\ F\ \Sigma_i C_{\gamma i}}{RC/MPC_{eff}} \qquad (1\text{-}7)$$

Where:

C, $\Sigma_i C_{\gamma i}$, MPC_{eff} = The values of C, $\Sigma_i C_{\gamma i}$ and MPC_{eff} in STEPS 1) and 2) above for the Steam Generator blowdown.

R = blowdown flow rate (maximum 400 gpm)

RW, SG_{1216}, S_{2100}, and S_{2101} are administrative values used for simultaneous releases from the Radwaste Effluent discharge and Steam Generators, the Turbine Bld. Sump, and the Yard Drain Sump. The fractions RW and SG_{1216}, S_{2100}, and S_{2101} will be assigned such that $RW + SG_{1216} + S_{2100} + S_{2101} \leq 1.0$.

NOTE: If $C_m < \Sigma C_{\gamma i}$, then no release is possible. To increase C_m, increase dilution flow F (by running more pumps), and/or decrease the effluent flow rate R, and recalculate C_m using the new F, R and equation (1-7).

1.1.1.2 STEAM GENERATOR BLOWDOWN EFFLUENT LINE (RT-1216) (Continued)

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

1.1.2 **Continuous Release Setpoint Determination**

STEP 1: The isotopic concentration for the continuous releases are obtained for each release stream (steam generator blowdown, reheater pit sump or yard sump) from the sum of the respective measured concentrations as determined by analysis:

$$C = \sum_i C_{\gamma i} + C_\alpha + C_t + C_s + C_{Fe} \qquad (1\text{-}8)$$

Where:

C = Total concentration (μCi/ml)

$\sum_i C_{\gamma i}$ = the total gamma activity (μCi/ml) associated with each radionuclide, i, in the weekly composite analysis for the release stream.

C_α = The total measured gross alpha concentration (μCi/ml) determined from the previous monthly composite analysis for the release stream.

1.1.2 Continuous Release Setpoint Determination (Continued)

C_{Fe} = The total Fe-55 concentration as determined in the previous quarterly composite sample for the release stream. (μCi/ml)

C_t = the total measured H-3 concentration (μCi/ml) determined from the previous monthly composite analysis for the release stream.

C_s = the total measured concentration (μCi/ml) of Sr-89 and Sr-90 as determined from the previous quarterly composite analysis for the release stream.

STEP 2: The effective MPC (MPC_{eff}) for each release stream (steam generator blowdown, reheater pit sump or yard drain sump) is determined using:

$$MPC_{eff} = \frac{1}{\sum_i \frac{(C_{\gamma i}/C)}{(MPC_{\gamma i})} + \frac{(C_s/C)}{(MPC_s)} + \frac{(C_\alpha/C)}{(MPC_\alpha)} + \frac{(C_{Fe}/C)}{(MPC_{Fe})} + \frac{(C_t/C)}{(MPC_t)}} \quad (1\text{-}9)$$

STEP 3: The setpoint (μCi/ml), for each continuous release radioactivity monitor may now be specified based on the respective values of C, $\sum_i C_{\gamma i}$, F, MPC_{eff}, and R to provide compliance with the limits of 10CFR20, Appendix B, Table II, Column 2. The monitor setpoint, in CPM, is obtained by applying the appropriate calibration constant in Table 1-1 to the calculated monitor limit (μCi/ml).

1.1.2.1 STEAM GENERATOR BLOWDOWN EFFLUENT LINE (RT-1216)

The value of C_{1216}, the concentration limit at the detector, is determined by using:

$$C_{1216} \leq \frac{(SG_{1216})\ F\ \Sigma C_{\gamma i}}{RC/MPC_{eff}} \qquad (1\text{-}10)$$

Where:

C_{1216} = limiting concentration at monitor RT-1216 (μCi/ml).

C, $\Sigma C_{\gamma i}$, MPC_{eff} = values of C, $\Sigma C_{\gamma i}$ and MPC_{eff} (as defined in STEPS 1 and 2 above)

R = blowdown flow rate (maximum 400 gpm)

RW, SG_{1216}, S_{2100}, and S_{2101} are administrative values used for simultaneous releases from the Radwaste Effluent discharge and Steam Generators, the Turbine Bld. Sump, and the Yard Drain Sump The fractions RW and SG_{1216}, S_{2100}, and S_{2101} will be assigned such that $RW + SG_{1216} + S_{2100} + S_{2101} \leq 1.0$.

NOTE: $C_m \leq \Sigma C_{\gamma i}$ then no release is possible. To increase C_m, increase the dilution flow F (by running and/or decrease the effluent flow rate R, and recalculate C_m using the new values of F, R and equation (1-10).

1.1.2.2 TURBINE BUILDING SUMP EFFLUENT LINE (REHEATER PIT SUMP) (RT-2100)

The value of C_{2100}, the concentration limit at the detector (μCi/ml), is determined by using:

$$C_{2100} \leq \frac{(S_{2100})\ F\ \Sigma_i C_{\gamma i}}{RC/MPC_{eff}} \qquad (1\text{-}11)$$

Where:

C_{2100} = limiting concentration at monitor RT-2100 (μCi/ml).

C, $\Sigma_i C_{\gamma i}$, MPC_{eff} = values of C, $\Sigma_i C_{\gamma i}$ and MPC_{eff} (as defined in STEPS 1 and 2 above)

R = 350 gpm/pump (x no. sump pumps to be run)

1.1.2.3 YARD SUMP EFFLUENT LINE (RT-2101)

The value of C_{2101}, the concentration limit at the (μCi/ml) detector, is determined by using:

$$C_{2101} \leq \frac{(S_{2101})\ F\ \Sigma_i C_{\gamma i}}{RC/MPC_{eff}} \qquad (1\text{-}12)$$

Where:

C_{2101} = limiting concentration at monitor RT-2101 (μCi/ml).

C, $\Sigma_i C_{\gamma i}$, MPC_{eff} = values of C, $\Sigma_i C_{\gamma i}$ and MPC_{eff} (as defined in STEPS 1 and 2 above)

R = 1000 gpm/pump (x no. sump pumps to be run)

1.1.2.3 YARD SUMP EFFLUENT LINE (RT-2101) (Continued)

RW, SG_{1216}, S_{2100}, and S_{2101} are administrative values used for simultaneous releases from the Radwaste Effluent discharge and Steam Generators, the Turbine Bld. Sump, and the Yard Drain Sump. The fractions RW and SG_{1216}, S_{2100}, and S_{2101} will be assigned such that $RW + SG_{1216} + S_{2100} + S_{2101} \leq 1.0$. The 1.0 is an administrative value used to account for the potential activity for all release pathways. This assures that the total concentration from all release points to the plant discharge will not result in a release of concentrations exceeding the limits of 10CFR20, Appendix B, Table II, Column 2 from the site.

NOTE: If either C_{2100} or $C_{2101} \leq \sum_i C_{\gamma i}$, then no release is possible from that sump. To increase C_{2100} or C_{2101}, increase the dilution flow F (by running more pumps) and recalculate C_{2100} or C_{2101} using the new value of F and equation (1-11) and/or (1-12).

Table 1-1[a]

Liquid Effluent Radiation Monitor
Calibration Constants
(μCi/cc/cpm)

MONITOR	Co-60	Ba-133	Cs-137
RT-1216	2.73E-8	3.02E-8	4.84E-8
RT-1218	5.24E-9	6.37E-9	9.51E-9
RT-2100	1.50E-9	2.16E-9	2.82E-9
RT-2101	1.49E-9	2.17E-9	2.98E-9

R

(a) This table provides typical (±20%) calibration constants for the liquid effluent radiation monitors.

1.2 Dose Calculation for Liquid Effluents (3.15.2)

The liquid releases considered in the following dose calculations are described in Section 1.1. The dose commitment to an individual from radioactive materials in liquid effluents released to unrestricted areas are calculated for the purpose of implementing Specification 3.15.2 using the following expression.

$$D_\tau = \sum_i^n [A_{i\tau} \sum_j^m (\Delta t_j \, C_{ij} \, F_j)] \qquad (1\text{-}13)$$

Where:

$A_{i\tau}$ = the site related adult ingestion dose commitment factor to the total body or an organ, τ, for each identified principal gamma and beta emitter, i, from Table 1-2 in mrem/hr per μCi/ml.

n = the number of principal gamma and beta emitters, i.

C_{ij} = the average concentration of radionuclide, i, in the undiluted liquid effluent during time period, Δt_j in (μCi/ml).

m = the number of time periods, j.

1.2 Dose Calculation for Liquid Effluents (Continued)

D_τ = the dose commitment to the total body or an organ, τ, from the liquid effluent for the time period, $\sum_j^m \Delta t_j$, in mrem

F_j = the average dilution factor for C_{ij} during the time period, Δt_j. This factor is the ratio of the maximum undiluted liquid waste flow during time period, Δt_j, to the average flow from the site discharge structure to unrestricted receiving waters, or

$$= \frac{\text{maximum liquid radioactive waste flow}}{\text{discharge structure exit flow}}$$

Δt_j = the length of the j^{th} time period over which C_{ij} and F_j are averaged for all liquid releases, in hours.

TABLE 1-2

DOSE COMMITMENT FACTORS*, $A_{i\tau}$
(mrem/hr per μCi/ml)

Radio-Nuclide	Bone	Liver	Total Body	Thyroid	Kidney	Lung	GI-LLI
H-3		2.82E-1	2.82E-1	2.82E-1	2.82E-1	2.82E-1	2.82E-1
Na-24	4.57E-1	4.57E-1	4.57E-1	4.57E-1	4.57E-1	4.57E-1	4.57E-1
Cr-51			5.58E+0	3.34E+0	1.23E+0	7.04E+0	1.40E+3
Mn-54		7.06E+3	1.35E+3		2.10E+3		2.16E+4
Mn-56		1.78E+2	3.15E+1		2.26E+2		5.67E+3
Fe-55	5.11E+4	3.53E+4	8.23E+3			1.97E+4	2.03E+4
Fe-59	8.06E+4	1.90E+5	7.27E+4			5.30E+4	6.32E+5
Co-57		1.42E+2	2.36E+2				3.59E+3
Co-58		6.03E+2	1.35E+3				1.22E+4
Co-60		1.73E+3	3.82E+3				3.25E+4
Cu-64		2.14E+2	1.01E+2		5.40E+2		1.83E+4
Zn-65	1.61E+5	5.13E+5	2.32E+5		3.43E+5		3.23E+5
Br-84			9.39E-2				7.37E-7
Rb-88		1.79E+0	9.49E-1				2.47E-11
Sr-89	4.99E+3		1.43E+2				8.00E+2
Sr-90	1.23E+5		3.01E+4				3.55E+3
Sr-91	9.18E+1		3.71E+0				4.37E+2
Sr-92	3.48E+1		1.51E+0				6.90E+2
Y-90	6.06E+0		1.63E-1				6.42E+4
Y-91m	5.73E-2		2.22E-3				1.68E-1
Y-92	5.32E-1		1.56E-2				9.32E+3
Zr-95	1.59E+1	5.11E+0	3.46E+0		8.02E+0		1.62E+4
Zr-97	8.81E-1	1.78E-1	8.13E-2		2.68E-1		5.51E+4
Nb-95	1.84E+0	1.03E+0	5.51E-1		1.01E+0		6.22E+3
Nb-95m	1.84E+0	1.03E+0	5.51E-1		1.01E+0		6.22E+3
Nb-97	1.55E-2	3.91E-3	1.43E-3		4.56E-3		1.44E+1
Mo-99		1.28E+2	2.43E+1		2.89E+2		2.96E+2
Tc-99M	1.30E-2	3.66E-2	4.66E-1		5.56E-1	1.79E-2	2.17E+1
Ru-103	1.07E+2		4.60E+1		4.07E+2		1.25E+4
Ru-106	1.59E+3		2.01E+2		3.06E+3		1.03E+5
Ag-110m	1.42E+3	1.32E+3	7.82E+2		2.59E+3		5.37E+5
Sn-113							2.26E+5
Sn-117m							2.26E+5
Sb-124	2.76E+2	5.22E+0	1.09E+2	6.70E-1		2.15E+2	7.84E+3
Sb-125	1.77E+2	1.97E+8	4.20E+1	1.79E-1		1.36E+2	1.94E+3
Te-129m	9.31E+2	3.47E+2	1.47E+2	3.20E+2	3.89E+3		4.67E+3
Te-132	2.04E+2	1.32E+2	1.24E+2	1.46E+2	1.27E+3		6.24E+3
I -131	2.18E+2	3.12E+2	1.79E+2	1.02E+5	5.35E+2		8.23E+1
I- 132	1.06E+1	2.85E+1	9.96E+0	9.96E+2	4.54E+1		5.35E+0
I -133	7.45E+1	1.30E+2	3.95E+1	1.90E+4	2.26E+2		1.16E+2
I -134	5.56E+0	1.51E+1	5.40E+0	2.62E+2	2.40E+1		1.32E-2
I -135	2.32E+1	6.08E+1	2.24E+1	4.01E+3	9.75E+1		6.87E+1

Where no value is given, no data are available
*Source: Reg. Guide 1.109, Table E-11, Table A-1
USNRC NUREG-0172, Table 4
Methodology: USNRC NUREG-0133, Section 4.3.1

R
IA
A

TABLE 1-2

DOSE COMMITMENT FACTORS*, $A_{i\tau}$
(mrem/hr per μCi/ml)

Radio-Nuclide	Total Body	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI
Cs 134	6.84E+3	1.63E+4	1.33E+4		5.27E+3	1.75E+3	2.85E+2
Cs 136	7.16E+2	2.83E+3	2.04E+3		1.57E+3	2.16E+2	3.21E+2
Cs 137	8.77E+3	1.20E+4	7.85E+3		4.07E+3	1.35E+3	2.32E+2
Cs 138	6.07E+0	1.20E+1	5.94E+0		8.81E+0	8.70E+1	5.12E+5
Ba 139	7.85E+0	5.59E-3	2.30E-1		5.23E-3	3.17E+3	1.39E+1
Ba 140	1.64E+3	2.06E+0	1.08E+2		7.02E+1	1.18E+0	3.38E+3
Cs 134	6.84E+3	1.63E+4	1.33E+4		5.27E+3	1.75E+3	2.85E+2
La-140	1.57E+0	7.94E-1	2.10E-1				5.83E+4
Ce-141	3.43E+0	2.32E+0	2.63E-1		1.08E+0		8.86E+3
Ce-143	6.04E-1	4.46E+2	4.94E-2		1.97E-1		1.67E+4
Ce-144	1.79E+2	7.47E+1	9.59E+0		4.43E+1		6.04E+4
Nd-147	3.96E+0	4.58E+0	2.74E-1		2.68E+0		2.20E+4
W -187	9.16E+0	7.66E+0	2.68E+0				2.51E+3
Np-239	3.53E-2	3.47E-3	1.91E-3		1.08E-2		7.11E+2

R

Where no value is given, no data are available
*Source: Reg. Guide 1.109, Table E-11, Table A-1
USNRC NUREG-0172, Table 4
Methodology: USNRC NUREG-0133, Section 4.3.1

A

1.3 Representative Sampling

Prior to sampling of a batch release, each batch shall be thoroughly mixed to assure representative sampling. The methodology for mixing and sampling is described in SO123-III-5.2.1 Unit 1 Radioactive Liquid Radwaste Sampling and Analysis.

2.0 GASEOUS EFFLUENTS

2.1 Gaseous Effluent Monitor Setpoints (3.16.1)

2.1.1 PLANT VENT STACK

a. RT-1214, Gross Activity Monitor
RT-1219, Noble Gas Monitor
RT-1212, Noble Gas Monitor

For the purpose of implementation of Specification 3.16.1, the alarm setpoint level for noble gas monitors is based on the gaseous effluent flow rate and meteorological dispersion factor.

The concentration at the detector is determined by using the smaller of the values from equations (2-1) and (2-2) below:

Total Body

$$C_{det} = \frac{(2120\ \frac{cfm}{m^3/sec})\ (\ 500\ mrem/yr)\ (10^{-6}\ m^3/cc)}{(\text{Flow rate, cfm})\ (X/Q,\ sec/m^3)\ \sum_i\ (K_i,\ \frac{mrem/yr}{\mu Ci/m^3})\ (\ \frac{C_{i-}}{C_{tot}}\ )} \qquad (2\text{-}1)$$

Skin

$$C_{det} = \frac{(2120\ \frac{cfm}{m^3/sec})\ (3000\ mrem/yr)\ (10^{-6}\ m^3/cc)}{(\text{Flow rate, cfm})\ (X/Q,\ sec/m^3)\ \sum_i\ (L_i + 1.1M_i\ \frac{mrem/yr}{\mu Ci/m^3})\ (\ \frac{C_{i-}}{C_{tot}}\ )} \qquad (2\text{-}2)$$

where:

C_{det} = the instantaneous concentration at the detector, μCi/cc

K_i = the total body dose conversion factor for the i^{th} gamma emitting noble gas, mrem/yr per μCi/m^3, from Table 2-2

L_i = Skin Dose Conversion Factor for the i^{th} noble gas, mrem/yr per μCi/m^3, from Table 2-2

M_i = Air Dose Conversion Factor for the i^{th} noble gas, mrem/yr per μCi/m^3, from Table 2-2

1.1 = Conversion factor to convert gamma air dose to skin dose.

3000 mrem/yr = skin dose rate limit, as specified by Technical Specification 3.16.1

500 mrem/yr = total body dose rate limit, as specified by Technical Specification 3.16.1

C_i = Concentration of the i^{th} noble gas, as determined by sample analysis, μCi/cc

C_{tot} = total concentration of noble gases, as determined by sample analysis, μCi/cc

Flow Rate = the plant vent flow rate, cfm
= 20,000 cfm/fan (x no. of fans to be run)

2120 = conversion constant, cfm to m^3/sec

X/Q = historical annual average dispersion factor,
= 1.3E-5 sec/m^3

The smaller of the values of C_{det} from equations (2-1) or (2-2) is to be used in the determination of the maximum permissible monitor alarm setpoint (cpm), as follows:

The maximum permissible alarm setpoint (cpm) is determined using the calibration constant for the applicable Plant Stack Airborne Monitor given in Table 2-1. The maximum permissible alarm setpoint is the value corresponding to the concentration, C_{det} (the smaller value from equation (2-1) or (2-2)). The calibration constant used is based on Kr-85 or on Xe-133, whichever yields a lower detection efficiency.

The alarm setpoint will be maintained at a value not greater than the maximum permissible alarm setpoint.

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

b. RT-1254, Wide Range Gas Monitor

The maximum release rate (μCi/sec) is determined by converting the concentration at the detector, C_{det}, to an equivalent release rate in μCi/sec, as follows:

$$A_{max} = (C_{det}, \mu Ci/cc)\ (\text{flow rate, cc/sec}) \quad (2\text{-}3)$$

where:

A_{max} = the maximum permissible release rate

C_{det} = the smaller of the values of C_{det} obtained from equations (2-1) and (2-2).

Flow Rate = Vent stack flow rate in cc/sec
= 9.44×10^6 cc/sec x (number of fans)

The release rate setpoint will not be set greater than the maximum release rate determined above, when this monitor is being used to meet the requirements of Technical Specification 3.16.1.

2.1.2 CONTAINMENT PURGE - RT-1212

For the purpose of implementation of Specification 3.16.1, the alarm setpoint level for noble gas monitors is based on the gaseous effluent flow rate from containment and the meteorological dispersion factor.

The limiting concentration at the detector is determined by using the smaller of the values of C_{det} from equations (2-4) and (2-5).

Total Body

$$C_{det} = \frac{(2120\ \frac{cfm}{m^3/sec})\ (\ 500\ mrem/yr)\ (10^{-6}\ m^3/cc)}{(Flow\ rate,\ cfm)\ (X/Q,\ sec/m^3)\ \sum_i\ (K_i,\ \frac{mrem/yr}{\mu Ci/m^3})\ (\ \frac{C_i}{C_{tot}}\ )} \qquad (2\text{-}1)$$

Skin

$$C_{det} = \frac{(2120\ \frac{cfm}{m^3/sec})\ (3000\ mrem/yr)\ (10^{-6}\ m^3/cc)}{(Flow\ rate,\ cfm)\ (X/Q,\ sec/m^3)\ \sum_i\ (L_i + 1.1M_i\ \frac{mrem/yr}{\mu Ci/m^3})\ (\frac{C_i}{C_{tot}})} \qquad (2\text{-}2)$$

where:

C_{det} = the instantaneous concentration at the detector (RT-1212) in μCi/cc.

Flow Rate = the containment purge flow rate in cfm
= 20,000 cfm

Other parameters are as specified in 2.1.1 above.

2.1.2 CONTAINMENT PURGE - RT-1212 (Continued)

The smaller value of C_{det} from equations (2-4) and (2-5) is to be used in determining the maximum permissible monitor alarm setpoint in cpm.

The maximum permissible alarm setting in cpm is determined by using the calibration constant for the Containment Airborne Monitor given in Table 2-1. The maximum permissible alarm setpoint is the cpm value corresponding to the concentration, C_{det}. The calibration constant is based on Kr-85 or Xe-133 whichever yields a lower detection efficiency.

The alarm setpoint will not be set greater than the maximum permissible alarm setting determined above.

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

2.1.3 WASTE GAS HEADER - RT-1219

For the purpose of Specification 3.16.1, the alarm setpoint level for noble gas monitors is based on the gaseous effluent flow rate and meteorological dispersion factor. Since the waste gas header discharges to the plant vent stack, RT-1219 is used to monitor waste gas header releases.

When plant vent stack monitor RT-1219 is being used to monitor waste gas header releases, the setpoint determined by the smaller of the values from equations (2-1) and (2-2) will provide automatic termination of release from the waste gas header. Determine the maximum permissible waste gas header effluent flow rate corresponding to the vent stack monitor setpoint, C_{det}, in accordance with the following:

$$f \leq \frac{(C_{det})\ (F)}{\sum_i C_{\gamma i}} \qquad (2\text{-}6)$$

R

where:

f = waste gas header effluent flow rate (cfm)

F = plant vent stack flow rate (cfm) used in equations (2-1) and (2-2)

C_{det} = limiting concentration (μCi/cc) at detector RT-1219 as determined from the smaller of the values from equations (2-1) and (2-2) in Section 2.1.1.

$\Sigma_i C_{\gamma i}$ = total gamma activity (μCi/cc) of the waste gas holdup tank to be released, as determined from the pre-release sample analysis.

Table 2-1[a]

Gaseous Effluent Radiation Monitor
Calibration Constants
(μCi/cc/cpm)

MONITOR	Kr-85	Xe-133
RT-1212	2.17E-8	1.48E-7
RT-1219[b]	1.62E-8	4.90E-8

R

[a] This table provides typical (±20%) calibration constants for the gaseous effluent radiation monitors.

[b] Calibration constants for Monitor RT-1219 include a 5.17% dilution factor (air in-leakage).

2.2 Gaseous Effluent Dose Rate (3.16.1)

The methodology used for the purpose of implementation of Technical Specification 3.16.1 for the dose rate above background to an individual in an unrestricted area is calculated by using the following expressions:

2.2.1 FOR NOBLE GASES:

$$\dot{D}_{TB} = \sum_i \left[K_i \, \overline{(X/Q)} \, \dot{Q}_i \right] \tag{2-7}$$

$$\dot{D}_S = \sum_i \left[(L_i + 1.1M_i) \, \overline{(X/Q)} \, \dot{Q}_i \right] \tag{2-8}$$

where:

$\dot{D}_{TB}$ = total body dose rate in unrestricted areas due to radioactive materials released in gaseous effluents, in mrem/yr.

$\dot{D}_S$ = skin dose rate in unrestricted areas due to radioactive materials released in gaseous effluents, in mrem/yr.

K_i = the total body dose factor due to gamma emissions for each identified noble gas radionuclide, i, in mrem/yr per μCi/m^3 from Table 2-2.

2.2.1 FOR NOBLE GASES: (Continued)

L_i = skin dose factor due to the beta emissions for each identified noble gas radionuclide, i, in mrem/yr per $\mu Ci/m^3$ from Table 2-2

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide, i, in mrad/yr per $\mu Ci/m^3$ from Table 2-2. (Unit conversion constant of 1.1 mrem/mrad converts air dose to skin dose.)

$\dot{Q}_i$ = the measured or calculated release rate of radionuclide, i, for either continuous or batch gaseous effluents in $\mu Ci/sec$ R

$(\overline{X/Q})$ = 1.3E-5 sec/m^3. The highest calculated annual average relative concentration for any area at or beyond the unrestricted area boundary.

2.2.2 FOR I-131, I-133, RADIOACTIVE MATERIALS IN PARTICULATE FORM WITH HALF LIVES GREATER THAN EIGHT DAYS AND H-3:

$$\dot{D}_o = \sum_i \left[\sum_k (P_{ik} \bar{W}_k) \dot{Q}_i \right] \qquad (2\text{-}9)$$

where:

$\dot{D}_o$ = organ dose rate in unrestricted areas due to radioactive materials released in gaseous effluents, in mrem/yr

2.2.2 FOR I-131, I-133, RADIOACTIVE MATERIALS IN PARTICULATE FORM WITH HALF LIVES GREATER THAN EIGHT DAYS AND H-3: (Continued)

$\dot{Q}_i$ = the measured or calculated release rate of radionuclide, i, for either continuous or batch gaseous effluents, in μCi/sec

P_{ik} = the dose parameter for radionuclide, i, for pathway, k, from Table 2-3 for the inhalation pathway in mrem/yr per μCi/m^3. The dose factors are based on the critical individual organ and the child age group.

$\overline{W}_k$ = the highest calculated annual average dispersion parameter for estimating the dose to an individual at or beyond the unrestricted area boundary for pathway k. R

= $(\overline{X/Q})$, 1.3E-5 sec/m^3 for the inhalation pathway. The location is the unrestricted area in the NW sector.

= $(\overline{D/Q})$, 7.2E-8 sec/m^3 for the food and ground pathways. The location is the unrestricted area in the NW sector. A

2.3 Gaseous Effluent Dose Calculation

2.3.1 DOSE FROM NOBLE GASES IN GASEOUS EFFLUENT (3.16.2)

The gaseous releases considered in the following dose calculations are described in Section 2.1. The air dose in unrestricted areas due to noble gases released in gaseous effluents is calculated using the following expressions: A

2.3.1.1 For historical meteorology:

$$D_\gamma = 3.17 \times 10^{-8} \sum_i [M_i \overline{(X/Q)} Q_i] \quad (2\text{-}10)$$

$$D_\beta = 3.17 \times 10^{-8} \sum_i [N_i \overline{(X/Q)} Q_i] \quad (2\text{-}11)$$

where:

D_γ = the total gamma air dose from gaseous effluents, in mrad

D_β = the total beta air dose from gaseous effluents, in mrad

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide, i, in mrad/yr per μCi/m^3 from Table 2-2

N_i = the air dose due to beta emissions for each identified noble gas radionuclide, i, in mrad/yr per μCi/m^3 from Table 2-2

$\overline{(X/Q)}$ = 1.3E-5 sec/m^3. The maximum annual average atmospheric dispersion factor for any sector and distance at or beyond the unrestricted area boundary.

Q_i = the amount of noble gas radionuclide, i, released in gaseous effluents in μCi.

3.17×10^{-8} = inverse seconds/year

2.3.1.2 For meteorology concurrent with release:

NOTE: Consistent with the methodology provided in Regulatory Guide 1.109 and the following equations, RRRGS (Radioactive Release Report Generating System) software is used to perform the actual calculations. A

$$D_{\gamma\theta} = 1.14 \times 10^{-4} \sum_i [M_i \sum_j (\Delta t_j \, (X/Q)_{j\theta} \, \dot{Q}_{ij})] \quad (2\text{-}12)$$

$$D_{\beta\theta} = 1.14 \times 10^{-4} \sum_i [N_i \sum_j (\Delta t_j \, (X/Q)_{j\theta} \, \dot{Q}_{ij})] \quad (2\text{-}13)$$

where:

$D_{\gamma\theta}$ = the total gamma air dose from gaseous effluents in sector θ, in mrad

$D_{\beta\theta}$ = the total beta air dose from gaseous effluents in sector θ, in mrad

M_i = the air dose factor due to gamma emissions for each identified noble gas radionuclide, i, in mrad/yr per μCi/m^3 from Table 2-2.

N_i = the air dose factor due to beta emissions for each identified noble gas radionuclide, i, in mrad/yr per μCi/m^3 from Table 2-2.

Δt_j = the length of the j^{th} time period over which $(X/Q)_{j\theta}$ and $\dot{Q}_{ij}$ are averaged for gaseous releases in hours

2.3.1.2 For meteorology concurrent with release: (Continued)

$(X/Q)_{j\theta}$ = the atmospheric dispersion factor for time period Δt_j at exclusion boundary location in sector θ determined by concurrent meteorology, in sec/m³

$\dot{Q}_{ij}$ = the average release rate of radionuclide, i, in gaseous effluents during time period, Δt_j, in μCi/sec

1.14×10^{-4} = inverse hours/year

2.3.2 DOSE FROM I-131, I-133, RADIOACTIVE MATERIAL IN PARTICULATE FORM AND H-3

The dose to an individual from I-131, I-133, radioactive materials in particulate form with half lives greater than eight days and H-3 in gaseous effluents released to unrestricted areas is calculated using the following expressions:

2.3.2.1 For historical meteorology:

$$D_o = 3.17 \times 10^{-8} \sum_i \left[\sum_k (R_{ik} W_k)\, Q_i \right] \qquad (2\text{-}14)$$

where:

D_o = the total projected dose from gaseous effluents to an individual, in mrem

Q_i = the amount of radioiodines, radioactive materials in particulate form and radionuclides other than noble gases with half lives greater than eight days, i, released in gaseous effluents in μCi

$\sum_k R_{ik} W_k$ = the sum of all pathways k for radionuclide, i, of the R_i, W product in mrem/yr per μCi/sec. The $\sum_k R_{ik} W_k$ value for each radionuclide, i, is given in Table 2-4. The given is the maximum $\sum_k R_{ik} W_k$ for all locations and is based on the most restrictive age groups.

2.3.2.1 For historical meteorology: (Continued)

R_{ik} = the dose factor for each identified radionuclide, i, for pathway k (for the inhalation pathway in mrem/yr per $\mu Ci/m^3$ and for the food and ground plane pathways in m^2 - mrem/yr per $\mu Ci/sec$) at the controlling location. The R_{ik}'s for each age group are given in Tables 2-5 thru 2-15. Data in these tables are derived using the NRC code, PARTS. (See "Submittal of 1990 ODCM Dose Parameters for SONGS 1, 2 and 3" from E. S. Medling to P. H. Penseyres, dated 1/29/91). R

W_k = the annual average dispersion parameter for estimating the dose to an individual at the controlling location for pathway k.

= $\overline{(X/Q)}$ for the inhalation pathway in sec/m^3. The $\overline{(X/Q)}$ for each controlling location is given in Tables 2-5 thru 2-15.

= $\overline{(D/Q)}$ for the food and ground plane pathways in m^{-2}. The $\overline{(D/Q)}$ for each controlling location are given in Tables 2-5 thru 2-15.

2.3.2.2 For meteorology concurrent with releases:

NOTE: Consistent with the methodology provided in Regulatory Guide 1.109 and the following equations, RRRGS (Radioactive Release Report Generating System) software is used to perform the actual calculations. A

$$D_\theta = 1.14 \times 10^{-4} \sum_i^l \sum_j^m \sum_k^n [(\Delta t_j)(R_{ik\theta})(W_{jk\theta})(\dot{Q}_{ij})] \quad (2\text{-}15)$$

where:

D_θ = the total annual dose from gaseous effluents to an individual in sector θ in mrem.

Δt_j = the length of the j^{th} period over which $W_{jk\theta}$ and $\dot{Q}_{ij}$ are averaged for gaseous releases in hours

$\dot{Q}_{ij}$ = the average release rate of radionuclide, i, in gaseous effluents during time period Δt_j in μCi/sec

$R_{ik\theta}$ = the dose factor for each identified radionuclide i, for pathway k for sector θ (for the inhalation pathway in mrem/yr per μCi/m^3 and for the food and ground plane pathways in m^2 mrem/yr per μCi/sec) at the controlling location.

The dose factor is based on the maximum dose to the most restrictive age group. A listing of R_{ik} for the controlling locations in each landward sector for each group is given in Tables 2-5 thru 2-15. The θ is determined by the concurrent meteorology.

$W_{jk\theta}$ = the dispersion parameters for the time period Δt_j for each pathway k for calculating the dose to an individual at the controlling location in sector θ using concurrent meteorological conditions.

= (X/Q) for the inhalation pathway in sec/m^3

= (D/Q) for the food and ground plane pathways in m^{-2}

TABLE 2-2

DOSE FACTORS FOR NOBLE GASES AND DAUGHTERS**

Radio-Nuclide	Total Body Dose Factor K_i (mrem/yr per $\mu Ci/m^3$)	Skin Dose Factor L_i (mrem/yr per $\mu Ci/m^3$)	Gamma Air Dose Factor M_i (mrad/yr per $\mu Ci/m^3$)	Beta Air Dose Factor N_i (mrad/yr per $\mu Ci/m^3$)
Kr-85m	1.17E+3*	1.46E+3	1.23E+3	1.97E+3
Kr-85	1.61E+1	1.34E+3	1.72E+1	1.95E+3
Kr-87	5.92E+3	9.73E+3	6.17E+3	1.03E+4
Kr-88	1.47E+4	2.37E+3	1.52E+4	2.93E+3
Xe-131m	9.15E+1	4.76E+2	1.56E+2	1.11E+3
Xe-133m	2.51E+2	9.94E+2	3.27E+2	1.48E+3
Xe-133	2.94E+2	3.06E+2	3.53E+2	1.05E+3
Xe-135m	3.12E+3	7.11E+2	3.36E+3	7.39E+2
Xe-135	1.81E+3	1.86E+3	1.92E+3	2.46E+3
Xe-138	8.83E+3	4.13E+3	9.21E+3	4.75E+3
Ar-41	8.84E+3	2.69E+3	9.30E+3	3.28E+3

*1.17E+3 = 1.17×10^3
**Source: USNRC Reg. Guide 1.109, Table B-1

TABLE 2-3

DOSE PARAMETER P_{ik}*

CHILD AGE GROUP
CRITICAL ORGAN

Radionuclide	Inhalation Pathway (mrem/yr per $\mu Ci/m^3$)	Radionuclide	Inhalation Pathway (mrem/yr per $\mu Ci/m^3$)
H - 3	1.1E+3	I -131	1.6E+7
Cr-51	1.7E+4	I -132	1.9E+5
Mn-54	1.6E+6	I -133	3.8E+6
Co-57	5.1E+5	I -134	5.1E+4
Co-58	1.1E+6	I -135	7.9E+5
Co-60	7.1E+6	Cs-134	1.0E+6
Sr-89	2.2E+6	Cs-136	1.7E+5
Sr-90	1.0E+8	Cs-137	9.1E+5
Zr-95	2.2E+6	Ba-140	1.7E+6
Nb-95	6.1E+5	Ce-141	5.4E+5
Ru-103	6.6E+5	Ce-144	1.2E+7
Te-129m	1.8E+6		

1A

*Source: USNRC NUREG-0133, Section 5.2.1.1

TABLE 2-4

CONTROLLING LOCATION FACTORS

Radionuclide	$\sum_k R_{ik} W_k$ mrem/yr per μCi/sec	
H -3	1.12E-3	
Cr-51	3.73E-2	
Mn-54	7.46E+0	
Co-57	1.90E+0	
Co-58	2.68E+0	
Co-60	9.77E+1	
Sr-89	5.58E+1	
Sr-90	2.34E+3	
Zr-95	3.35E+0	
Nb-95	4.92E+0	
Ru-103	7.80E+0	1A
Te-129m	4.14E+0	
Cs-134	4.32E+1	
Cs-136	7.78E-1	R
Cs-137	4.18E+1	
Ba-140	1.81E+0	
Ce-141	7.38E-1	
Ce-144	2.16E+1	
I -131	1.38E+1	
I -132	1.68E-1	1A
I -133	3.28E+0	
I -134	4.57E-2	1A
I -135	6.90E-1	
UN-ID	4.50E+0	

Footnote: These values to be used in manual calculations are the maximum $\sum_k R_{ik} W_k$ for all locations based on the most restrictive age group.

TABLE 2-5

DOSE PARAMETER R_i FOR SECTOR N

Pathway = Surf Beach
X/Q = 6.8E-6 sec/m3

Distance = 0.2 miles
D/Q = 2.2E-8 m^{-2}

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	1.2E+1	-0-	5.1E+1	-0-	1.6E+1	-0-
Cr-51	-0-	-0-	1.8E+2	2.2E+4	8.4E+2	1.1E+5	1.8E+2	1.9E+4
Mn-54	-0-	-0-	1.6E+4	6.6E+6	8.0E+4	3.2E+7	1.7E+4	5.7E+6
Co-57	-0-	-0-	5.3E+3	1.6E+6	2.4E+4	7.9E+6	4.5E+3	1.4E+6
Co-58	-0-	-0-	1.2E+4	1.8E+6	5.4E+4	8.7E+6	1.1E+4	1.6E+6
Co-60	-0-	-0-	7.3E+4	1.0E+8	3.5E+5	4.9E+8	7.3E+4	8.8E+7
Sr-89	-0-	-0-	2.2E+4	1.0E+2	9.7E+4	4.9E+2	1.7E+4	8.9E+1
Sr-90	-0-	-0-	1.1E+6	-0-	4.4E+6	-0-	1.2E+6	-0-
Zr-95	-0-	-0-	2.3E+4	1.2E+6	1.1E+5	5.8E+6	2.2E+4	1.0E+6
Nb-95	-0-	-0-	6.4E+3	6.6E+5	3.0E+4	3.1E+6	6.2E+3	5.6E+5
Ru-103	-0-	-0-	6.9E+3	5.2E+5	3.2E+4	2.5E+6	6.2E+3	4.5E+5
Te-129m	-0-	-0-	1.8E+4	9.4E+4	8.0E+4	4.5E+5	1.4E+4	8.1E+4
Cs-134	-0-	-0-	1.1E+4	3.3E+7	4.5E+4	1.6E+8	1.0E+4	2.8E+7
Cs-136	-0-	-0-	1.8E+3	7.2E+5	7.8E+3	3.4E+6	1.8E+3	6.2E+5
Cs-137	-0-	-0-	9.4E+3	4.9E+7	3.4E+4	2.4E+8	7.6E+3	4.2E+7
Ba-140	-0-	-0-	1.8E+4	9.9E+4	8.2E+4	4.7E+5	1.6E+4	8.4E+4
Ce-141	-0-	-0-	5.7E+3	6.6E+4	2.5E+4	3.1E+5	4.4E+3	5.6E+4
Ce-144	-0-	-0-	1.2E+5	3.3E+5	5.4E+5	1.6E+6	9.6E+4	2.9E+5
I -131	-0-	-0-	1.7E+5	8.3E+4	5.9E+5	3.9E+5	1.5E+5	7.1E+4
I -132	-0-	-0-	2.0E+3	5.9E+3	6.1E+3	2.8E+4	1.4E+3	5.1E+3
I -133	-0-	-0-	4.0E+4	1.2E+4	1.2E+5	5.6E+4	2.6E+4	1.0E+4
I -134	-0-	-0-	5.3E+2	2.2E+3	1.6E+3	1.0E+4	3.7E+2	1.8E+3
I -135	-0-	-0-	8.2E+3	1.2E+4	2.5E+4	5.8E+4	5.5E+3	1.0E+4
UN-ID	-0-	-0-	1.0E+4	3.6E+6	5.0E+4	1.7E+7	1.1E+4	3.1E+6

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-6

DOSE PARAMETER R_i FOR SECTOR P

Pathway = Surf Beach — Distance = 0.2 miles
X/Q = 6.4E-6 sec/m³ — D/Q = 2.7E-8 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult		
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	
H -3	-0-	-0-	1.2E+1	-0-	5.1E+1	-0-	8.7E+1	-0-	
Cr-51	-0-	-0-	1.8E+2	2.2E+4	8.4E+2	1.1E+5	9.9E+2	3.2E+5	
Mn-54	-0-	-0-	1.6E+4	6.6E+6	8.0E+4	3.2E+7	9.6E+4	9.5E+7	
Co-57	-0-	-0-	5.3E+3	1.6E+6	2.4E+4	7.9E+6	2.5E+4	2.3E+7	
Co-58	-0-	-0-	1.2E+4	1.8E+6	5.4E+4	8.7E+6	6.4E+4	2.6E+7	
Co-60	-0-	-0-	7.3E+4	1.0E+8	3.5E+5	4.9E+8	4.1E+5	1.5E+9	
Sr-89	-0-	-0-	2.2E+4	1.0E+2	9.7E+4	4.9E+2	9.6E+4	1.5E+3	
Sr-90	-0-	-0-	1.1E+6	-0-	4.4E+6	-0-	6.8E+6	-0-	
Zr-95	-0-	-0-	2.3E+4	1.2E+6	1.1E+5	5.8E+6	1.2E+5	1.7E+7	
Nb-95	-0-	-0-	6.4E+3	6.6E+5	3.0E+4	3.1E+6	3.5E+4	9.4E+6	
Ru-103	-0-	-0-	6.9E+3	5.2E+5	3.2E+4	2.5E+6	3.5E+4	7.4E+6	1A
Te-129m	-0-	-0-	1.8E+4	9.4E+4	8.0E+4	4.5E+5	7.9E+4	1.3E+6	
Cs-134	-0-	-0-	1.1E+4	3.3E+7	4.5E+4	1.6E+8	5.8E+4	4.7E+8	
Cs-136	-0-	-0-	1.8E+3	7.2E+5	7.8E+3	3.4E+6	1.0E+4	1.0E+7	R
Cs-137	-0-	-0-	9.4E+3	4.9E+7	3.4E+4	2.4E+8	4.3E+4	7.1E+8	
Ba-140	-0-	-0-	1.8E+4	9.9E+4	8.2E+4	4.7E+5	8.7E+4	1.4E+6	
Ce-141	-0-	-0-	5.7E+3	6.6E+4	2.5E+4	3.1E+5	2.5E+4	9.4E+5	
Ce-144	-0-	-0-	1.2E+5	3.3E+5	5.4E+5	1.6E+6	5.3E+5	4.8E+6	
I -131	-0-	-0-	1.7E+5	8.3E+4	5.9E+5	3.9E+5	8.2E+5	1.2E+6	
I -132	-0-	-0-	2.0E+3	5.9E+3	6.1E+3	2.8E+4	7.8E+3	8.5E+4	1A
I -133	-0-	-0-	4.0E+4	1.2E+4	1.2E+5	5.6E+4	1.5E+5	1.7E+5	
I -134	-0-	-0-	5.3E+2	2.2E+3	1.6E+3	1.0E+4	2.0E+3	3.1E+4	1A
I -135	-0-	-0-	8.2E+3	1.2E+4	2.5E+4	5.8E+4	3.1E+4	1.7E+5	
UN-ID	-0-	-0-	1.0E+4	3.6E+6	5.0E+4	1.7E+7	5.9E+4	5.1E+7	

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-6

DOSE PARAMETER R_i FOR SECTOR P

Pathway = Pt. Loran Military Hsng — Distance = 2.5 miles
X/Q = 1.5E-7 sec/m³ — D/Q = 4.5E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	6.5E+2	-0-	1.1E+3	-0-	1.3E+3	-0-	1.3E+3	-0-
Cr-51	1.3E+4	4.7E+6	1.7E+4	4.7E+6	2.1E+4	4.7E+6	1.4E+4	4.7E+6
Mn-54	1.0E+6	1.4E+9	1.6E+6	1.4E+9	2.0E+6	1.4E+9	1.4E+6	1.4E+9
Co-57	3.8E+5	3.4E+8	5.1E+5	3.4E+8	5.9E+5	3.4E+8	3.7E+5	3.4E+8
Co-58	7.8E+5	3.8E+8	1.1E+6	3.8E+8	1.3E+6	3.8E+8	9.3E+5	3.8E+8
Co-60	4.5E+6	2.2E+10	7.1E+6	2.2E+10	8.7E+6	2.2E+10	6.0E+6	2.2E+10
Sr-89	2.0E+6	2.2E+4	2.2E+6	2.2E+4	2.4E+6	2.2E+4	1.4E+6	2.2E+4
Sr-90	4.1E+7	-0-	1.0E+8	-0-	1.1E+8	-0-	9.9E+7	-0-
Zr-95	1.8E+6	2.5E+8	2.2E+6	2.5E+8	2.7E+6	2.5E+8	1.8E+6	2.5E+8
Nb-95	4.8E+5	1.4E+8	6.1E+5	1.4E+8	7.5E+5	1.4E+8	5.0E+5	1.4E+8
Ru-103	5.5E+5	1.1E+8	6.6E+5	1.1E+8	7.8E+5	1.1E+8	5.0E+5	1.1E+8
Te-129m	1.7E+6	2.0E+7	1.8E+6	2.0E+7	2.0E+6	2.0E+7	1.2E+6	2.0E+7
Cs-134	7.0E+5	6.8E+9	1.0E+6	6.8E+9	1.1E+6	6.8E+9	8.5E+5	6.8E+9
Cs-136	1.3E+5	1.5E+8	1.7E+5	1.5E+8	1.9E+5	1.5E+8	1.5E+5	1.5E+8
Cs-137	6.1E+5	1.0E+10	9.1E+5	1.0E+10	8.5E+5	1.0E+10	6.2E+5	1.0E+10
Ba-140	1.6E+6	2.1E+7	1.7E+6	2.1E+7	2.0E+6	2.1E+7	1.3E+6	2.1E+7
Ce-141	5.2E+5	1.4E+7	5.4E+5	1.4E+7	6.1E+5	1.4E+7	3.6E+5	1.4E+7
Ce-144	9.8E+6	7.0E+7	1.2E+7	7.0E+7	1.3E+7	7.0E+7	7.8E+6	7.0E+7
I -131	1.5E+7	1.7E+7	1.6E+7	1.7E+7	1.5E+7	1.7E+7	1.2E+7	1.7E+7
I -132	1.7E+5	1.2E+6	1.9E+5	1.2E+6	1.5E+5	1.2E+6	1.1E+5	1.2E+6
I -133	3.6E+6	2.4E+6	3.8E+6	2.4E+6	2.9E+6	2.4E+6	2.2E+6	2.4E+6
I -134	4.5E+4	4.5E+5	5.1E+4	4.5E+5	4.0E+4	4.5E+5	3.0E+4	4.5E+5
I -135	7.0E+5	2.5E+6	7.9E+5	2.5E+6	6.2E+5	2.5E+6	4.5E+5	2.5E+6
UN-ID	6.5E+5	7.5E+8	1.0E+6	7.5E+8	1.2E+6	7.5E+8	8.6E+5	7.5E+8

A

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-6

DOSE PARAMETER R_i FOR SECTOR P

Pathway = Former Nixon Estate (no garden) Distance = 2.6 miles
X/Q = 1.4E-7 sec/m³ D/Q = 4.2E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	6.5E+2	-0-	1.1E+3	-0-	1.3E+3	-0-	1.3E+3	-0-
Cr-51	1.3E+4	4.7E+6	1.7E+4	4.7E+6	2.1E+4	4.7E+6	1.4E+4	4.7E+6
Mn-54	1.0E+6	1.4E+9	1.6E+6	1.4E+9	2.0E+6	1.4E+9	1.4E+6	1.4E+9
Co-57	3.8E+5	3.4E+8	5.1E+5	3.4E+8	5.9E+5	3.4E+8	3.7E+5	3.4E+8
Co-58	7.8E+5	3.8E+8	1.1E+6	3.8E+8	1.3E+6	3.8E+8	9.3E+5	3.8E+8
Co-60	4.5E+6	2.2E+10	7.1E+6	2.2E+10	8.7E+6	2.2E+10	6.0E+6	2.2E+10
Sr-89	2.0E+6	2.2E+4	2.2E+6	2.2E+4	2.4E+6	2.2E+4	1.4E+6	2.2E+4
Sr-90	4.1E+7	-0-	1.0E+8	-0-	1.1E+8	-0-	9.9E+7	-0-
Zr-95	1.8E+6	2.5E+8	2.2E+6	2.5E+8	2.7E+6	2.5E+8	1.8E+6	2.5E+8
Nb-95	4.8E+5	1.4E+8	6.1E+5	1.4E+8	7.5E+5	1.4E+8	5.0E+5	1.4E+8
Ru-103	5.5E+5	1.1E+8	6.6E+5	1.1E+8	7.8E+5	1.1E+8	5.0E+5	1.1E+8
Te-129m	1.7E+6	2.0E+7	1.8E+6	2.0E+7	2.0E+6	2.0E+7	1.2E+6	2.0E+7
Cs-134	7.0E+5	6.8E+9	1.0E+6	6.8E+9	1.1E+6	6.8E+9	8.5E+5	6.8E+9
Cs-136	1.3E+5	1.5E+8	1.7E+5	1.5E+8	1.9E+5	1.5E+8	1.5E+5	1.5E+8
Cs-137	6.1E+5	1.0E+10	9.1E+5	1.0E+10	8.5E+5	1.0E+10	6.2E+5	1.0E+10
Ba-140	1.6E+6	2.1E+7	1.7E+6	2.1E+7	2.0E+6	2.1E+7	1.3E+6	2.1E+7
Ce-141	5.2E+5	1.4E+7	5.4E+5	1.4E+7	6.1E+5	1.4E+7	3.6E+5	1.4E+7
Ce-144	9.8E+6	7.0E+7	1.2E+7	7.0E+7	1.3E+7	7.0E+7	7.8E+6	7.0E+7
I -131	1.5E+7	1.7E+7	1.6E+7	1.7E+7	1.5E+7	1.7E+7	1.2E+7	1.7E+7
I -132	1.7E+5	1.2E+6	1.9E+5	1.2E+6	1.5E+5	1.2E+6	1.1E+5	1.2E+6
I -133	3.6E+6	2.4E+6	3.8E+6	2.4E+6	2.9E+6	2.4E+6	2.2E+6	2.4E+6
I -134	4.5E+4	4.5E+5	5.1E+4	4.5E+5	4.0E+4	4.5E+5	3.0E+4	4.5E+5
I -135	7.0E+5	2.5E+6	7.9E+5	2.5E+6	6.2E+5	2.5E+6	4.5E+5	2.5E+6
UN-ID	6.5E+5	7.5E+8	1.0E+6	7.5E+8	1.2E+6	7.5E+8	8.6E+5	7.5E+8

1A R 1A 1A

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-7

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = Surf Beach Guard Shack
X/Q = 3.3E-6 sec/m³

Distance = 0.5 miles
D/Q = 1.7E-8 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult		
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	
H -3	-0-	-0-	-0-	-0-	-0-	-0-	7.2E+1	-0-	
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	8.2E+2	2.7E+5	
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	8.0E+4	7.9E+7	
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	2.1E+4	2.0E+7	
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	5.3E+4	2.2E+7	
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	3.4E+5	1.2E+9	
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	8.0E+4	1.2E+3	
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	5.7E+6	-0-	
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.0E+5	1.4E+7	
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	2.9E+4	7.8E+6	
Ru-103	-0-	-0-	-0-	-0-	-0-	-0-	2.9E+4	6.2E+6	1A
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	6.6E+4	1.1E+6	
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	4.8E+4	3.9E+8	R
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	8.4E+3	8.6E+6	
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	3.5E+4	5.9E+8	
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	7.3E+4	1.2E+6	
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	2.1E+4	7.8E+5	
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	4.4E+5	4.0E+6	
I -131	-0-	-0-	-0-	-0-	-0-	-0-	6.8E+5	9.8E+5	
I -132	-0-	-0-	-0-	-0-	-0-	-0-	6.5E+3	7.1E+4	1A
I -133	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+5	1.4E+5	
I -134	-0-	-0-	-0-	-0-	-0-	-0-	1.7E+3	2.6E+4	1A
I -135	-0-	-0-	-0-	-0-	-0-	-0-	2.6E+4	1.4E+5	
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	4.9E+4	4.3E+7	

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-7

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = Enlisted Bch Trailers — Distance = 0.9 miles
X/Q = 1.3E-6 sec/m³ — D/Q = 6.6E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	6.3E+2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	7.2E+3	2.3E+6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	7.0E+5	6.9E+8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	1.8E+5	1.7E+8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	4.6E+5	1.9E+8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	3.0E+6	1.1E+10
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	7.0E+5	1.1E+4
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	5.0E+7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	8.8E+5	1.3E+8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	2.5E+5	6.8E+7
Ru-103	-0-	-0-	-0-	-0-	-0-	-0-	2.5E+5	5.4E+7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	5.8E+5	9.8E+6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	4.2E+5	3.4E+9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	7.3E+4	7.5E+7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	3.1E+5	5.1E+9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	6.4E+5	1.0E+7
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	1.8E+5	6.8E+6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	3.9E+6	3.5E+7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	6.0E+6	8.6E+6
I -132	-0-	-0-	-0-	-0-	-0-	-0-	5.7E+4	6.2E+5
I -133	-0-	-0-	-0-	-0-	-0-	-0-	1.1E+6	1.2E+6
I -134	-0-	-0-	-0-	-0-	-0-	-0-	1.5E+4	2.2E+5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	2.2E+5	1.3E+6
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	4.3E+5	3.7E+8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-7

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = Enlisted Beach
X/Q = 1.1E-6 sec/m³

Distance = 1.0 miles
D/Q = 5.5E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult		
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	
H -3	-0-	-0-	1.2E+1	-0-	5.1E+1	-0-	1.6E+1	-0-	
Cr-51	-0-	-0-	1.8E+2	2.2E+4	8.4E+2	1.1E+5	1.8E+2	1.9E+4	
Mn-54	-0-	-0-	1.6E+4	6.6E+6	8.0E+4	3.2E+7	1.7E+4	5.7E+6	
Co-57	-0-	-0-	5.3E+3	1.6E+6	2.4E+4	7.9E+6	4.5E+3	1.4E+6	
Co-58	-0-	-0-	1.2E+4	1.8E+6	5.4E+4	8.7E+6	1.1E+4	1.6E+6	
Co-60	-0-	-0-	7.3E+4	1.0E+8	3.5E+5	4.9E+8	7.3E+4	8.8E+7	
Sr-89	-0-	-0-	2.2E+4	1.0E+2	9.7E+4	4.9E+2	1.7E+4	8.9E+1	R
Sr-90	-0-	-0-	1.1E+6	-0-	4.4E+6	-0-	1.2E+6	-0-	
Zr-95	-0-	-0-	2.3E+4	1.2E+6	1.1E+5	5.8E+6	2.2E+4	1.0E+6	
Nb-95	-0-	-0-	6.4E+3	6.6E+5	3.0E+4	3.1E+6	6.2E+3	5.6E+5	
Ru-103	-0-	-0-	6.9E+3	5.2E+5	3.2E+4	2.5E+6	6.2E+3	4.5E+5	IA
Te-129m	-0-	-0-	1.8E+4	9.4E+4	8.0E+4	4.5E+5	1.4E+4	8.1E+4	
Cs-134	-0-	-0-	1.1E+4	3.3E+7	4.5E+4	1.6E+8	1.0E+4	2.8E+7	
Cs-136	-0-	-0-	1.8E+3	7.2E+5	7.8E+3	3.4E+6	1.8E+3	6.2E+5	
Cs-137	-0-	-0-	9.4E+3	4.9E+7	3.4E+4	2.4E+8	7.6E+3	4.2E+7	
Ba-140	-0-	-0-	1.8E+4	9.9E+4	8.2E+4	4.7E+5	1.6E+4	8.4E+4	
Ce-141	-0-	-0-	5.7E+3	6.6E+4	2.5E+4	3.1E+5	4.4E+3	5.6E+4	
Ce-144	-0-	-0-	1.2E+5	3.3E+5	5.4E+5	1.6E+6	9.6E+4	2.9E+5	
I -131	-0-	-0-	1.7E+5	8.3E+4	5.9E+5	3.9E+5	1.5E+5	7.1E+4	
I -132	-0-	-0-	2.0E+3	5.9E+3	6.1E+3	2.8E+4	1.4E+3	5.1E+3	IA
I -133	-0-	-0-	4.0E+4	1.2E+4	1.2E+5	5.6E+4	2.6E+4	1.0E+4	
I -134	-0-	-0-	5.3E+2	2.2E+3	1.6E+3	1.0E+4	3.7E+2	1.8E+3	IA
I -135	-0-	-0-	8.2E+3	1.2E+4	2.5E+4	5.8E+4	5.5E+3	1.0E+4	
UN-ID	-0-	-0-	1.0E+4	3.6E+6	5.0E+4	1.7E+7	1.1E+4	3.1E+6	

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-7

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = Enlisted Beach Check-In — Distance = 1.2 miles
X/Q = 8.6E-6 sec/m³ — D/Q = 4.1E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	2.9E+2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	3.3E+3	1.1E+6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	3.2E+5	3.2E+8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	8.4E+4	7.8E+7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	2.1E+5	8.7E+7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+6	4.9E+9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	3.2E+5	4.9E+3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.3E+7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	4.0E+5	5.7E+7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+5	3.1E+7
Ru-103	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+5	2.5E+7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	2.6E+5	4.5E+6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	1.9E+5	1.6E+9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	3.3E+4	3.4E+7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+5	2.3E+9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	2.9E+5	4.7E+6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	8.3E+4	3.1E+6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	1.8E+6	1.6E+7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	2.7E+6	3.9E+6
I -132	-0-	-0-	-0-	-0-	-0-	-0-	2.6E+4	2.8E+5
I -133	-0-	-0-	-0-	-0-	-0-	-0-	4.9E+5	5.6E+5
I -134	-0-	-0-	-0-	-0-	-0-	-0-	6.8E+3	1.0E+5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.0E+5	5.8E+5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.0E+5	1.7E+8

R

A

A

A

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-7

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = San Onofre Mobile Homes — Distance = 1.2 miles
X/Q = 8.6E-7 sec/m³ — D/Q = 4.1E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	6.5E+2	-0-	1.1E+3	-0-	1.3E+3	-0-	1.3E+3	-0-
Cr-51	1.3E+4	4.7E+6	1.7E+4	4.7E+6	2.1E+4	4.7E+6	1.4E+4	4.7E+6
Mn-54	1.0E+6	1.4E+9	1.6E+6	1.4E+9	2.0E+6	1.4E+9	1.4E+6	1.4E+9
Co-57	3.8E+5	3.4E+8	5.1E+5	3.4E+8	5.9E+5	3.4E+8	3.7E+5	3.4E+8
Co-58	7.8E+5	3.8E+8	1.1E+6	3.8E+8	1.3E+6	3.8E+8	9.3E+5	3.8E+8
Co-60	4.5E+6	2.2E+10	7.1E+6	2.2E+10	8.7E+6	2.2E+10	6.0E+6	2.2E+10
Sr-89	2.0E+6	2.2E+4	2.2E+6	2.2E+4	2.4E+6	2.2E+4	1.4E+6	2.2E+4
Sr-90	4.1E+7	-0-	1.0E+8	-0-	1.1E+8	-0-	9.9E+7	-0-
Zr-95	1.8E+6	2.5E+8	2.2E+6	2.5E+8	2.7E+6	2.5E+8	1.8E+6	2.5E+8
Nb-95	4.8E+5	1.4E+8	6.1E+5	1.4E+8	7.5E+5	1.4E+8	5.0E+5	1.4E+8
Ru-103	5.5E+5	1.1E+8	6.6E+5	1.1E+8	7.8E+5	1.1E+8	5.0E+5	1.1E+8
Te-129m	1.7E+6	2.0E+7	1.8E+6	2.0E+7	2.0E+6	2.0E+7	1.2E+6	2.0E+7
Cs-134	7.0E+5	6.8E+9	1.0E+6	6.8E+9	1.1E+6	6.8E+9	8.5E+5	6.8E+9
Cs-136	1.3E+5	1.5E+8	1.7E+5	1.5E+8	1.9E+5	1.5E+8	1.5E+5	1.5E+8
Cs-137	6.1E+5	1.0E+10	9.1E+5	1.0E+10	8.5E+5	1.0E+10	6.2E+5	1.0E+10
Ba-140	1.6E+6	2.1E+7	1.7E+6	2.1E+7	2.0E+6	2.1E+7	1.3E+6	2.1E+7
Ce-141	5.2E+5	1.4E+7	5.4E+5	1.4E+7	6.1E+5	1.4E+7	3.6E+5	1.4E+7
Ce-144	9.8E+6	7.0E+7	1.2E+7	7.0E+7	1.3E+7	7.0E+7	7.8E+6	7.0E+7
I -131	1.5E+7	1.7E+7	1.6E+7	1.7E+7	1.5E+7	1.7E+7	1.2E+7	1.7E+7
I -132	1.7E+5	1.2E+6	1.9E+5	1.2E+6	1.5E+5	1.2E+6	1.1E+5	1.2E+6
I -133	3.6E+6	2.4E+6	3.8E+6	2.4E+6	2.9E+6	2.4E+6	2.2E+6	2.4E+6
I -134	4.5E+4	4.5E+5	5.1E+4	4.5E+5	4.0E+4	4.5E+5	3.0E+4	4.5E+5
I -135	7.0E+5	2.5E+6	7.9E+5	2.5E+6	6.2E+5	2.5E+6	4.5E+5	2.5E+6
UN-ID	6.5E+5	7.5E+8	1.0E+6	7.5E+8	1.2E+6	7.5E+8	8.6E+5	7.5E+8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-7

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = San Clemente Ranch (No Residents) Distance = 1.9 miles
X/Q = 4.4E-7 sec/m³ D/Q = 1.8E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult		
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	
H -3	-0-	-0-	-0-	3.8E+3	-0-	2.4E+3	-0-	1.9E+3	R
Cr-51	-0-	-0-	-0-	4.8E+6	-0-	7.4E+6	-0-	6.7E+6	
Mn-54	-0-	-0-	-0-	6.1E+8	-0-	8.3E+8	-0-	8.0E+8	
Co-57	-0-	-0-	-0-	2.2E+8	-0-	2.9E+8	-0-	2.4E+8	
Co-58	-0-	-0-	-0-	3.3E+8	-0-	5.1E+8	-0-	4.7E+8	
Co-60	-0-	-0-	-0-	2.0E+9	-0-	3.0E+9	-0-	2.7E+9	
Sr-89	-0-	-0-	-0-	3.1E+10	-0-	1.2E+10	-0-	7.2E+9	
Sr-90	-0-	-0-	-0-	1.3E+12	-0-	7.7E+11	-0-	5.8E+11	
Zr-95	-0-	-0-	-0-	7.8E+8	-0-	1.1E+9	-0-	9.1E+8	
Nb-95	-0-	-0-	-0-	2.4E+8	-0-	3.5E+8	-0-	3.1E+8	
Ru-103	-0-	-0-	-0-	3.3E+8	-0-	4.5E+8	-0-	3.8E+8	A
Te-129m	-0-	-0-	-0-	2.3E+9	-0-	1.4E+9	-0-	9.5E+8	
Cs-134	-0-	-0-	-0-	2.4E+10	-0-	1.5E+10	-0-	9.2E+9	
Cs-136	-0-	-0-	-0-	9.0E+7	-0-	5.7E+7	-0-	3.6E+7	
Cs-137	-0-	-0-	-0-	2.2E+10	-0-	1.3E+10	-0-	7.8E+9	
Ba-140	-0-	-0-	-0-	1.1E+8	-0-	6.8E+7	-0-	5.3E+7	
Ce-141	-0-	-0-	-0-	3.3E+8	-0-	4.1E+8	-0-	3.2E+8	
Ce-144	-0-	-0-	-0-	9.2E+9	-0-	1.2E+10	-0-	9.0E+9	
I -131	-0-	-0-	-0-	4.1E+9	-0-	2.1E+9	-0-	1.4E+9	
I -132	-0-	-0-	-0-	6.0E-36	-0-	2.6E-36	-0-	1.7E-36	A
I -133	-0-	-0-	-0-	4.0E-11	-0-	1.7E-11	-0-	1.1E-11	
I -134	-0-	-0-	-0-	6.1E-37	-0-	2.7E-37	-0-	1.7E-37	A
I -135	-0-	-0-	-0-	7.0E-35	-0-	3.1E-35	-0-	1.9E-35	
UN-ID	-0-	-0-	-0-	2.5E+9	-0-	1.7E+9	-0-	1.1E+9	

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-7

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = S. C. Ranch Adm. Offices — Distance = 2.3 miles
X/Q = 3.3E-7 sec/m³ — D/Q = 1.3E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult		
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	
H -3	-0-	-0-	-0-	-0-	-0-	-0-	4.3E+2	1.9E+3	R
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	4.9E+3	8.3E+6	
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	4.8E+5	1.3E+9	
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	1.3E+5	3.6E+8	
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	3.2E+5	6.0E+8	
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	2.0E+6	1.0E+10	
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	4.8E+5	7.2E+9	
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	3.4E+7	5.8E+11	
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	6.1E+5	9.9E+8	
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	1.7E+5	3.6E+8	
Ru-103	-0-	-0-	-0-	-0-	-0-	-0-	1.7E+5	4.2E+8	A
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	4.0E+5	9.6E+8	
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	2.9E+5	1.2E+10	
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	5.0E+4	8.7E+7	
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	2.1E+5	1.1E+10	
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	4.4E+5	6.0E+7	
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+5	3.2E+8	
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	2.7E+6	9.0E+9	
I -131	-0-	-0-	-0-	-0-	-0-	-0-	4.1E+6	1.4E+9	
I -132	-0-	-0-	-0-	-0-	-0-	-0-	3.9E+4	4.2E+5	A
I -133	-0-	-0-	-0-	-0-	-0-	-0-	7.4E+5	8.4E+5	
I -134	-0-	-0-	-0-	-0-	-0-	-0-	1.0E+4	1.5E+5	A
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.5E+5	8.6E+5	
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	3.0E+5	1.3E+9	

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-7

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = SC Res. with Garden — Distance = 3.9 miles
X/Q = 1.4E-7 sec/m³ — D/Q = 4.9E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	6.5E+2	-0-	1.1E+3	3.8E+3	1.3E+3	2.4E+3	1.3E+3	1.9E+3
Cr-51	1.3E+4	4.7E+6	1.7E+4	9.4E+6	2.1E+4	1.2E+7	1.4E+4	1.1E+7
Mn-54	1.0E+6	1.4E+9	1.6E+6	2.0E+9	2.0E+6	2.2E+9	1.4E+6	2.2E+9
Co-57	3.8E+5	3.4E+8	5.1E+5	5.6E+8	5.9E+5	6.3E+8	3.7E+5	5.8E+8
Co-58	7.8E+5	3.8E+8	1.1E+6	7.1E+8	1.3E+6	8.9E+8	9.3E+5	8.5E+8
Co-60	4.5E+6	2.2E+10	7.1E+6	2.3E+10	8.7E+6	2.4E+10	6.0E+6	2.4E+10
Sr-89	2.0E+6	2.2E+4	2.2E+6	3.1E+10	2.4E+6	1.2E+10	1.4E+6	7.2E+9
Sr-90	4.1E+7	-0-	1.0E+8	1.3E+12	1.1E+8	7.7E+11	9.9E+7	5.8E+11
Zr-95	1.8E+6	2.5E+8	2.2E+6	1.0E+9	2.7E+6	1.3E+9	1.8E+6	1.2E+9
Nb-95	4.8E+5	1.4E+8	6.1E+5	3.8E+8	7.5E+5	4.9E+8	5.0E+5	4.5E+8
Ru-103	5.5E+5	1.1E+8	6.6E+5	4.4E+8	7.8E+5	5.6E+8	5.0E+5	4.9E+8
Te-129m	1.7E+6	2.0E+7	1.8E+6	2.4E+9	2.0E+6	1.4E+9	1.2E+6	9.7E+8
Cs-134	7.0E+5	6.8E+9	1.0E+6	3.1E+10	1.1E+6	2.2E+10	8.5E+5	1.6E+10
Cs-136	1.3E+5	1.5E+8	1.7E+5	2.4E+8	1.9E+5	2.1E+8	1.5E+5	1.9E+8
Cs-137	6.1E+5	1.0E+10	9.1E+5	3.4E+10	8.5E+5	2.3E+10	6.2E+5	1.8E+10
Ba-140	1.6E+6	2.1E+7	1.7E+6	1.3E+8	2.0E+6	8.8E+7	1.3E+6	7.4E+7
Ce-141	5.2E+5	1.4E+7	5.4E+5	3.4E+8	6.1E+5	4.2E+8	3.6E+5	3.3E+8
Ce-144	9.8E+6	7.0E+7	1.2E+7	9.3E+9	1.3E+7	1.2E+10	7.8E+6	9.0E+9
I -131	1.5E+7	1.7E+7	1.6E+7	4.1E+9	1.5E+7	2.1E+9	1.2E+7	1.4E+9
I -132	1.7E+5	1.2E+6	1.9E+5	1.2E+6	1.5E+5	1.2E+6	1.1E+5	1.2E+6
I -133	3.6E+6	2.4E+6	3.8E+6	2.4E+6	2.9E+6	2.4E+6	2.2E+6	2.4E+6
I -134	4.5E+4	4.5E+5	5.1E+4	4.5E+5	4.0E+4	4.5E+5	3.0E+4	4.5E+5
I -135	7.0E+5	2.5E+6	7.9E+5	2.5E+6	6.2E+5	2.5E+6	4.5E+5	2.5E+6
UN-ID	6.5E+5	7.5E+8	1.0E+6	3.3E+9	1.2E+6	2.4E+9	8.6E+5	1.8E+9

1A R 1A 1A

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

3075cc.man

TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR R

Pathway = San Onofre Mobile Homes — Distance = 1.1 miles
X/Q = 6.6E-7 sec/m³ — D/Q = 3.8E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	6.5E+2	-0-	1.1E+3	-0-	1.3E+3	-0-	1.3E+3	-0-
Cr-51	1.3E+4	4.7E+6	1.7E+4	4.7E+6	2.1E+4	4.7E+6	1.4E+4	4.7E+6
Mn-54	1.0E+6	1.4E+9	1.6E+6	1.4E+9	2.0E+6	1.4E+9	1.4E+6	1.4E+9
Co-57	3.8E+5	3.4E+8	5.1E+5	3.4E+8	5.9E+5	3.4E+8	3.7E+5	3.4E+8
Co-58	7.8E+5	3.8E+8	1.1E+6	3.8E+8	1.3E+6	3.8E+8	9.3E+5	3.8E+8
Co-60	4.5E+6	2.2E+10	7.1E+6	2.2E+10	8.7E+6	2.2E+10	6.0E+6	2.2E+10
Sr-89	2.0E+6	2.2E+4	2.2E+6	2.2E+4	2.4E+6	2.2E+4	1.4E+6	2.2E+4
Sr-90	4.1E+7	-0-	1.0E+8	-0-	1.1E+8	-0-	9.9E+7	-0-
Zr-95	1.8E+6	2.5E+8	2.2E+6	2.5E+8	2.7E+6	2.5E+8	1.8E+6	2.5E+8
Nb-95	4.8E+8	1.4E+8	6.1E+5	1.4E+8	7.5E+5	1.4E+8	5.0E+5	1.4E+8
Ru-103	5.5E+5	1.1E+8	6.6E+5	1.1E+8	7.8E+5	1.1E+8	5.0E+5	1.1E+8
Te-129m	1.7E+6	2.0E+7	1.8E+6	2.0E+7	2.0E+6	2.0E+7	1.2E+6	2.0E+7
Cs-134	7.0E+5	6.8E+9	1.0E+6	6.8E+9	1.1E+6	6.8E+9	8.5E+5	6.8E+9
Cs-136	1.3E+5	1.5E+8	1.7E+5	1.5E+8	1.9E+5	1.5E+8	1.5E+5	1.5E+8
Cs-137	6.1E+5	1.0E+10	9.1E+5	1.0E+10	8.5E+5	1.0E+10	6.2E+5	1.0E+10
Ba-140	1.6E+6	2.1E+7	1.7E+6	2.1E+7	2.0E+6	2.1E+7	1.3E+6	2.1E+7
Ce-141	5.2E+5	1.4E+7	5.4E+5	1.4E+7	6.1E+5	1.4E+7	3.6E+5	1.4E+7
Ce-144	9.8E+6	7.0E+7	1.2E+7	7.0E+7	1.3E+7	7.0E+7	7.8E+6	7.0E+7
I -131	1.5E+7	1.7E+7	1.6E+7	1.7E+7	1.5E+7	1.7E+7	1.2E+7	1.7E+7
I -132	1.7E+5	1.2E+6	1.9E+5	1.2E+6	1.5E+5	1.2E+6	1.1E+5	1.2E+6
I -133	3.6E+6	2.4E+6	3.8E+6	2.4E+6	2.9E+6	2.4E+6	2.2E+6	2.4E+6
I -134	4.5E+4	4.5E+5	5.1E+4	4.5E+5	4.0E+4	4.5E+5	3.0E+4	4.5E+5
I -135	7.0E+5	2.5E+6	7.9E+5	2.5E+6	6.2E+5	2.5E+6	4.5E+5	2.5E+6
UN-ID	6.5E+5	7.5E+8	1.0E+6	7.5E+8	1.2E+6	7.5E+8	8.6E+5	7.5E+8

IA R IA IA

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR R

Pathway = Sheep (Meat) — Distance = 0.9 miles
X/Q = 8.9E-7 sec/m³ — D/Q = 5.4E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	1.5E+0	-0-	1.2E+0	7.0E+0	2.1E+0
Cr-51	-0-	-0-	-0-	5.1E+1	-0-	1.0E+2	7.9E+1	2.6E+4
Mn-54	-0-	-0-	-0-	7.8E+2	-0-	1.4E+3	7.7E+3	7.6E+6
Co-57	-0-	-0-	-0-	4.7E+3	-0-	8.1E+3	2.0E+3	1.9E+6
Co-58	-0-	-0-	-0-	9.7E+3	-0-	2.0E+4	5.1E+3	2.1E+6
Co-60	-0-	-0-	-0-	3.7E+4	-0-	7.3E+4	3.3E+4	1.2E+8
Sr-89	-0-	-0-	-0-	5.0E+4	-0-	2.6E+4	7.7E+3	3.1E+4
Sr-90	-0-	-0-	-0-	1.0E+6	-0-	8.1E+5	5.5E+5	1.3E+6
Zr-95	-0-	-0-	-0-	6.3E+4	-0-	1.1E+5	9.7E+3	1.6E+6
Nb-95	-0-	-0-	-0-	2.4E+5	-0-	4.5E+5	2.8E+3	1.6E+6
Ru-103	-0-	-0-	-0-	4.2E+5	-0-	7.6E+5	2.8E+3	1.9E+6
Te-129m	-0-	-0-	-0-	6.0E+5	-0-	4.5E+5	6.4E+3	7.6E+5
Cs-134	-0-	-0-	-0-	1.4E+5	-0-	1.2E+5	4.7E+3	3.8E+7
Cs-136	-0-	-0-	-0-	5.1E+3	-0-	4.3E+3	8.1E+2	8.3E+5
Cs-137	-0-	-0-	-0-	1.3E+5	-0-	9.5E+4	3.4E+3	5.7E+7
Ba-140	-0-	-0-	-0-	5.1E+3	-0-	4.3E+3	7.0E+3	1.2E+5
Ce-141	-0-	-0-	-0-	1.5E+3	-0-	2.4E+3	2.0E+3	7.9E+4
Ce-144	-0-	-0-	-0-	1.8E+4	-0-	3.0E+4	4.3E+4	4.3E+5
I -131	-0-	-0-	-0-	6.6E+5	-0-	4.4E+5	6.6E+4	7.0E+5
I -132	-0-	-0-	-0-	-0-	-0-	-0-	6.3E+2	6.8E+3
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E+4	1.3E+4
I -134	-0-	-0-	-0-	-0-	-0-	-0-	1.6E+2	2.5E+3
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E+3	1.4E+4
UN-ID	-0-	-0-	-0-	1.1E+5	-0-	9.5E+4	4.8E+3	4.2E+6

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR R

Pathway = Deer Consumer
X/Q = 1.9E-7 sec/m³

Distance = 2.4 miles
D/Q = 1.6E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	2.8E+1	-0-	2.3E+1	3.5E+1	3.9E+1
Cr-51	-0-	-0-	-0-	5.0E+4	-0-	1.0E+5	3.9E+2	3.2E+5
Mn-54	-0-	-0-	-0-	7.7E+5	-0-	1.4E+6	3.8E+4	4.1E+7
Co-57	-0-	-0-	-0-	4.6E+6	-0-	8.0E+6	1.0E+4	2.3E+7
Co-58	-0-	-0-	-0-	9.6E+6	-0-	1.9E+7	2.5E+4	4.7E+7
Co-60	-0-	-0-	-0-	3.6E+7	-0-	7.2E+7	1.6E+5	7.2E+8
Sr-89	-0-	-0-	-0-	4.9E+7	-0-	2.6E+7	3.8E+4	3.1E+7
Sr-90	-0-	-0-	-0-	1.0E+9	-0-	8.0E+8	2.7E+6	1.2E+9
Zr-95	-0-	-0-	-0-	6.2E+7	-0-	1.1E+8	4.8E+4	2.0E+8
Nb-95	-0-	-0-	-0-	2.3E+8	-0-	4.5E+8	1.4E+4	8.2E+8
Ru-103	-0-	-0-	-0-	4.2E+9	-0-	7.5E+8	1.4E+4	1.3E+9
Te-129m	-0-	-0-	-0-	5.9E+8	-0-	4.5E+8	3.2E+4	6.4E+8
Cs-134	-0-	-0-	-0-	1.4E+8	-0-	1.2E+8	2.3E+4	3.4E+8
Cs-136	-0-	-0-	-0-	5.1E+6	-0-	4.2E+6	4.0E+3	9.5E+6
Cs-137	-0-	-0-	-0-	1.3E+8	-0-	9.3E+7	1.7E+4	4.0E+8
Ba-140	-0-	-0-	-0-	5.0E+6	-0-	4.2E+6	3.5E+4	7.4E+6
Ce-141	-0-	-0-	-0-	1.5E+6	-0-	2.4E+6	9.9E+3	4.2E+6
Ce-144	-0-	-0-	-0-	1.8E+7	-0-	2.9E+7	2.1E+5	4.9E+7
I -131	-0-	-0-	-0-	6.5E+8	-0-	4.3E+8	3.3E+5	5.9E+8
I -132	-0-	-0-	-0-	-0-	-0-	-0-	3.1E+3	3.4E+4
I -133	-0-	-0-	-0-	1.6E+1	-0-	8.6E+0	5.9E+4	6.7E+4
I -134	-0-	-0-	-0-	-0-	-0-	-0-	8.2E+2	1.2E+4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E+4	6.9E+4
UN-ID	-0-	-0-	-0-	1.1E+8	-0-	9.4E+7	2.4E+4	1.4E+8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR R

Pathway = San Clemente Ranch (No Residents) Distance = 2.0 miles
X/Q = 2.5E-7 sec/m³ D/Q = 1.3E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult		
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	
H -3	-0-	-0-	-0-	3.8E+3	-0-	2.4E+3	-0-	1.9E+3	R
Cr-51	-0-	-0-	-0-	4.8E+6	-0-	7.4E+6	-0-	6.7E+6	
Mn-54	-0-	-0-	-0-	6.1E+8	-0-	8.3E+8	-0-	8.0E+8	
Co-57	-0-	-0-	-0-	2.2E+8	-0-	2.9E+8	-0-	2.4E+8	
Co-58	-0-	-0-	-0-	3.3E+8	-0-	5.1E+8	-0-	4.7E+8	
Co-60	-0-	-0-	-0-	2.0E+9	-0-	3.0E+9	-0-	2.7E+9	
Sr-89	-0-	-0-	-0-	3.1E+10	-0-	1.2E+10	-0-	7.2E+9	
Sr-90	-0-	-0-	-0-	1.3E+12	-0-	7.7E+11	-0-	5.8E+11	
Zr-95	-0-	-0-	-0-	7.8E+8	-0-	1.1E+9	-0-	9.1E+8	
Nb-95	-0-	-0-	-0-	2.4E+8	-0-	3.5E+8	-0-	3.1E+8	
Ru-103	-0-	-0-	-0-	3.3E+8	-0-	4.5E+8	-0-	3.8E+8	A
Te-129m	-0-	-0-	-0-	2.3E+9	-0-	1.4E+9	-0-	9.5E+8	
Cs-134	-0-	-0-	-0-	2.4E+10	-0-	1.5E+10	-0-	9.2E+9	
Cs-136	-0-	-0-	-0-	9.0E+7	-0-	5.7E+7	-0-	3.6E+7	
Cs-137	-0-	-0-	-0-	2.3E+10	-0-	1.3E+10	-0-	7.8E+9	
Ba-140	-0-	-0-	-0-	1.1E+8	-0-	6.8E+7	-0-	5.3E+7	
Ce-141	-0-	-0-	-0-	3.3E+8	-0-	4.1E+8	-0-	3.2E+8	
Ce-144	-0-	-0-	-0-	9.2E+9	-0-	1.2E+10	-0-	9.0E+9	
I -131	-0-	-0-	-0-	4.1E+9	-0-	2.1E+9	-0-	1.4E+9	
I -132	-0-	-0-	-0-	6.0E-36	-0-	2.6E-36	-0-	1.7E-36	A
I -133	-0-	-0-	-0-	4.0E-11	-0-	1.7E-11	-0-	1.1E-11	
I -134	-0-	-0-	-0-	6.1E-37	-0-	2.7E-37	-0-	1.7E-37	A
I -135	-0-	-0-	-0-	7.0E-35	-0-	3.1E-35	-0-	1.9E-35	
UN-ID	-0-	-0-	-0-	2.5E+9	-0-	1.7E+9	-0-	1.1E+9	

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR R

Pathway = S.C. Ranch Pac. W. Res. Distance = 2.4 miles
X/Q = 1.9E-7 sec/m³ D/Q = 9.5E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult		
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	
H -3	-0-	-0-	-0-	-0-	-0-	-0-	7.4E+2	1.9E+3	
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	8.4E+3	9.5E+6	
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	8.2E+5	1.6E+9	
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	2.2E+5	4.4E+8	
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	5.4E+5	6.9E+8	
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	3.5E+6	1.5E+10	L
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	8.2E+5	7.2E+9	
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	5.8E+7	5.8E+11	
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.0E+6	1.1E+9	
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	2.9E+5	3.9E+8	
Ru-103	-0-	-0-	-0-	-0-	-0-	-0-	2.9E+5	4.4E+8	A
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	6.8E+5	9.6E+8	
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	4.9E+5	1.3E+10	
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	8.5E+4	1.2E+8	
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	3.6E+5	1.4E+10	
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	7.4E+5	6.5E+7	
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	2.1E+5	3.3E+8	
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	4.5E+6	9.0E+9	
I -131	-0-	-0-	-0-	-0-	-0-	-0-	7.0E+6	1.4E+9	
I -132	-0-	-0-	-0-	-0-	-0-	-0-	6.7E+4	7.2E+5	A
I -133	-0-	-0-	-0-	-0-	-0-	-0-	1.3E+6	1.4E+6	
I -134	-0-	-0-	-0-	-0-	-0-	-0-	1.7E+4	2.6E+5	A
I -135	-0-	-0-	-0-	-0-	-0-	-0-	2.6E+5	1.5E+6	
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	5.0E+5	1.5E+9	

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-9

DOSE PARAMETER R_i FOR SECTOR A

Pathway = Sheep (Meat) — Distance = 0.7 miles
X/Q = 9.5E-7 sec/m³ — D/Q = 7.4E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	1.5E+0	-0-	1.2E+0	7.0E+0	2.1E+0
Cr-51	-0-	-0-	-0-	5.1E+1	-0-	1.0E+2	7.9E+1	2.6E+4
Mn-54	-0-	-0-	-0-	7.8E+2	-0-	1.4E+3	7.7E+3	7.6E+6
Co-57	-0-	-0-	-0-	4.7E+3	-0-	8.1E+3	2.0E+3	1.9E+6
Co-58	-0-	-0-	-0-	9.7E+3	-0-	2.0E+4	5.1E+3	2.1E+6
Co-60	-0-	-0-	-0-	3.7E+4	-0-	7.3E+4	3.3E+4	1.2E+8
Sr-89	-0-	-0-	-0-	5.0E+4	-0-	2.6E+4	7.7E+3	3.1E+4
Sr-90	-0-	-0-	-0-	1.0E+6	-0-	8.1E+5	5.5E+5	1.3E+6
Zr-95	-0-	-0-	-0-	6.3E+4	-0-	1.1E+5	9.7E+3	1.6E+6
Nb-95	-0-	-0-	-0-	2.4E+5	-0-	4.5E+5	2.8E+3	1.6E+6
Ru-103	-0-	-0-	-0-	4.2E+5	-0-	7.6E+5	2.8E+3	1.9E+6
Te-129m	-0-	-0-	-0-	6.0E+5	-0-	4.5E+5	6.4E+3	7.6E+5
Cs-134	-0-	-0-	-0-	1.4E+5	-0-	1.2E+5	4.7E+3	3.8E+7
Cs-136	-0-	-0-	-0-	5.1E+3	-0-	4.3E+3	8.1E+2	8.3E+5
Cs-137	-0-	-0-	-0-	1.3E+5	-0-	9.5E+4	3.4E+3	5.7E+7
Ba-140	-0-	-0-	-0-	5.1E+3	-0-	4.3E+3	7.0E+3	1.2E+5
Ce-141	-0-	-0-	-0-	1.5E+3	-0-	2.4E+3	2.0E+3	7.9E+4
Ce-144	-0-	-0-	-0-	1.8E+4	-0-	3.0E+4	4.3E+4	4.3E+5
I -131	-0-	-0-	-0-	6.6E+5	-0-	4.4E+5	6.6E+4	7.0E+5
I -132	-0-	-0-	-0-	-0-	-0-	-0-	6.3E+2	6.8E+3
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E+4	1.3E+4
I -134	-0-	-0-	-0-	-0-	-0-	-0-	1.6E+2	2.5E+3
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E+3	1.4E+4
UN-ID	-0-	-0-	-0-	1.1E+5	-0-	9.5E+4	4.8E+3	4.2E+6

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-9

DOSE PARAMETER R_i FOR SECTOR A

Pathway = Deer Consumer
X/Q = 2.8E-7 sec/m³

Distance = 1.6 miles
D/Q = 1.0E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	2.8E+1	-0-	2.3E+1	3.5E+1	3.9E+1
Cr-51	-0-	-0-	-0-	5.0E+4	-0-	1.0E+5	3.9E+2	3.2E+5
Mn-54	-0-	-0-	-0-	7.7E+5	-0-	1.4E+6	3.8E+4	4.1E+7
Co-57	-0-	-0-	-0-	4.6E+6	-0-	8.0E+6	1.0E+4	2.3E+7
Co-58	-0-	-0-	-0-	9.6E+6	-0-	1.9E+7	2.5E+4	4.7E+7
Co-60	-0-	-0-	-0-	3.6E+7	-0-	7.2E+7	1.6E+5	7.2E+8
Sr-89	-0-	-0-	-0-	4.9E+7	-0-	2.6E+7	3.8E+4	3.1E+7
Sr-90	-0-	-0-	-0-	1.0E+9	-0-	8.0E+8	2.7E+6	1.2E+9
Zr-95	-0-	-0-	-0-	6.2E+7	-0-	1.1E+8	4.8E+4	2.0E+8
Nb-95	-0-	-0-	-0-	2.3E+8	-0-	4.5E+8	1.4E+4	8.2E+8
Ru-103	-0-	-0-	-0-	4.2E+8	-0-	7.5E+8	1.4E+4	1.3E+9
Te-129m	-0-	-0-	-0-	5.9E+8	-0-	4.5E+8	3.2E+4	6.4E+8
Cs-134	-0-	-0-	-0-	1.4E+8	-0-	1.2E+8	2.3E+4	3.4E+8
Cs-136	-0-	-0-	-0-	5.1E+6	-0-	4.2E+6	4.0E+3	9.5E+6
Cs-137	-0-	-0-	-0-	1.3E+8	-0-	9.3E+7	1.7E+4	4.0E+8
Ba-140	-0-	-0-	-0-	5.0E+6	-0-	4.2E+6	3.5E+4	7.4E+6
Ce-141	-0-	-0-	-0-	1.5E+6	-0-	2.4E+6	9.9E+3	4.2E+6
Ce-144	-0-	-0-	-0-	1.8E+7	-0-	2.9E+7	2.1E+5	4.9E+7
I -131	-0-	-0-	-0-	6.5E+8	-0-	4.3E+8	3.3E+5	5.9E+8
I -132	-0-	-0-	-0-	-0-	-0-	-0-	3.1E+3	3.4E+4
I -133	-0-	-0-	-0-	1.6E+1	-0-	8.6E+0	5.9E+4	6.7E+4
I -134	-0-	-0-	-0-	-0-	-0-	-0-	8.2E+2	1.2E+4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E+4	6.9E+4
UN-ID	-0-	-0-	-0-	1.1E+8	-0-	9.4E+7	2.4E+4	1.4E+8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-9

DOSE PARAMETER R_i FOR SECTOR A

Pathway = Camp San Mateo
X/Q = 7.6E-8 sec/m³

Distance = 3.5 miles
∴ D/Q = 4.3E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	1.3E+3	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+4	4.7E+6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+6	1.4E+9
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	3.7E+5	3.4E+8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	9.3E+5	3.8E+8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	6.0E+6	2.2E+10
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+6	2.2E+4
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	9.9E+7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.8E+6	2.5E+8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	5.0E+5	1.4E+8
Ru-103	-0-	-0-	-0-	-0-	-0-	-0-	5.0E+5	1.1E+8
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+6	2.0E+7
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	8.5E+5	6.8E+9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	1.5E+5	1.5E+8
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	6.2E+5	1.0E+10
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	1.3E+6	2.1E+7
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	3.6E+5	1.4E+7
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	7.8E+6	7.0E+7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+7	1.7E+7
I -132	-0-	-0-	-0-	-0-	-0-	-0-	1.1E+5	1.2E+6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	2.2E+6	2.4E+6
I -134	-0-	-0-	-0-	-0-	-0-	-0-	3.0E+4	4.5E+5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	4.5E+5	2.5E+6
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	8.6E+5	7.5E+8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-10

DOSE PARAMETER R_i FOR SECTOR B

Pathway = Sheep (Meat) — Distance = 0.7 miles
X/Q = 7.9E-7 sec/m³ — D/Q = 7.8E-09 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult		
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	
H -3	-0-	-0-	-0-	1.5E+0	-0-	1.2E+0	7.0E+0	2.1E+0	R
Cr-51	-0-	-0-	-0-	5.1E+1	-0-	1.0E+2	7.9E+1	2.6E+4	
Mn-54	-0-	-0-	-0-	7.8E+2	-0-	1.4E+3	7.7E+3	7.6E+6	
Co-57	-0-	-0-	-0-	4.7E+3	-0-	8.1E+3	2.0E+3	1.9E+6	
Co-58	-0-	-0-	-0-	9.7E+3	-0-	2.0E+4	5.1E+3	2.1E+6	
Co-60	-0-	-0-	-0-	3.7E+4	-0-	7.3E+4	3.3E+4	1.2E+8	
Sr-89	-0-	-0-	-0-	5.0E+4	-0-	2.6E+4	7.7E+3	3.1E+4	
Sr-90	-0-	-0-	-0-	1.0E+6	-0-	8.1E+5	5.5E+5	1.3E+6	
Zr-95	-0-	-0-	-0-	6.3E+4	-0-	1.1E+5	9.7E+3	1.6E+6	
Nb-95	-0-	-0-	-0-	2.4E+5	-0-	4.5E+5	2.8E+3	1.6E+6	
Ru-103	-0-	-0-	-0-	4.2E+5	-0-	7.6E+5	2.8E+3	1.9E+6	IA
Te-129m	-0-	-0-	-0-	6.0E+5	-0-	4.5E+5	6.4E+3	7.6E+5	
Cs-134	-0-	-0-	-0-	1.4E+5	-0-	1.2E+5	4.7E+3	3.8E+7	
Cs-136	-0-	-0-	-0-	5.1E+3	-0-	4.3E+3	8.1E+2	8.3E+5	
Cs-137	-0-	-0-	-0-	1.3E+5	-0-	9.5E+4	3.4E+3	5.7E+7	
Ba-140	-0-	-0-	-0-	5.1E+3	-0-	4.3E+3	7.0E+3	1.2E+5	
Ce-141	-0-	-0-	-0-	1.5E+3	-0-	2.4E+3	2.0E+3	7.9E+4	
Ce-144	-0-	-0-	-0-	1.8E+4	-0-	3.0E+4	4.3E+4	4.3E+5	
I -131	-0-	-0-	-0-	6.6E+5	-0-	4.4E+5	6.6E+4	7.0E+5	
I -132	-0-	-0-	-0-	-0-	-0-	-0-	6.3E+2	6.8E+3	IA
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E+4	1.3E+4	
I -134	-0-	-0-	-0-	-0-	-0-	-0-	1.6E+2	2.5E+3	IA
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E+3	1.4E+4	
UN-ID	-0-	-0-	-0-	1.1E+5	-0-	9.5E+4	4.8E+3	4.2E+6	

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-10

DOSE PARAMETER R_i FOR SECTOR B

Pathway = Deer Consumer
X/Q = 2.2E-7 sec/m³

Distance = 1.6 miles
D/Q = 2.1E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	2.8E+1	-0-	2.3E+1	3.5E+1	3.9E+1
Cr-51	-0-	-0-	-0-	5.0E+4	-0-	1.0E+5	3.9E+2	3.2E+5
Mn-54	-0-	-0-	-0-	7.7E+5	-0-	1.4E+6	3.8E+4	4.1E+7
Co-57	-0-	-0-	-0-	4.6E+6	-0-	8.0E+6	1.0E+4	2.3E+7
Co-58	-0-	-0-	-0-	9.6E+6	-0-	1.9E+7	2.5E+4	4.7E+7
Co-60	-0-	-0-	-0-	3.6E+7	-0-	7.2E+7	1.6E+5	7.2E+8
Sr-89	-0-	-0-	-0-	4.9E+7	-0-	2.6E+7	3.8E+4	3.1E+7
Sr-90	-0-	-0-	-0-	1.0E+9	-0-	8.0E+8	2.7E+6	1.2E+9
Zr-95	-0-	-0-	-0-	6.2E+7	-0-	1.1E+8	4.8E+4	2.0E+8
Nb-95	-0-	-0-	-0-	2.3E+8	-0-	4.5E+8	1.4E+4	8.2E+8
Ru-103	-0-	-0-	-0-	4.2E+8	-0-	7.5E+8	1.4E+4	1.3E+9
Te-129m	-0-	-0-	-0-	5.9E+8	-0-	4.5E+8	3.2E+4	6.4E+8
Cs-134	-0-	-0-	-0-	1.4E+8	-0-	1.2E+8	2.3E+4	3.4E+8
Cs-136	-0-	-0-	-0-	5.1E+6	-0-	4.2E+6	4.0E+3	9.5E+6
Cs-137	-0-	-0-	-0-	1.2E+8	-0-	9.3E+7	1.7E+4	4.0E+8
Ba-140	-0-	-0-	-0-	5.0E+6	-0-	4.2E+6	3.5E+4	7.4E+6
Ce-141	-0-	-0-	-0-	1.5E+6	-0-	2.4E+6	9.9E+3	4.2E+6
Ce-144	-0-	-0-	-0-	1.8E+7	-0-	2.9E+7	2.1E+5	4.9E+7
I -131	-0-	-0-	-0-	6.5E+8	-0-	4.3E+8	3.3E+5	5.9E+8
I -132	-0-	-0-	-0-	-0-	-0-	-0-	3.1E+3	3.4E+4
I -133	-0-	-0-	-0-	1.6E+1	-0-	8.6E+0	5.9E+4	6.7E+4
I -134	-0-	-0-	-0-	-0-	-0-	-0-	8.2E+2	1.2E+4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E+4	6.9E+4
UN-ID	-0-	-0-	-0-	1.1E+8	-0-	9.4E+7	2.4E+4	1.4E+8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-10

DOSE PARAMETER R_i FOR SECTOR B

Pathway = Sanitary Landfill — Distance = 2.1 miles
X/Q = 1.4E-7 sec/m³ — D/Q = 1.2E-09 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult		
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	
H -3	-0-	-0-	-0-	-0-	-0-	-0-	2.9E+2	-0-	
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	3.3E+3	1.1E+6	
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	3.2E+5	3.2E+8	
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	8.4E+4	7.8E+7	
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	2.1E+5	8.7E+7	
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+6	4.9E+9	
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	3.2E+5	4.9E+3	
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.3E+7	-0-	
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	4.0E+5	5.7E+7	
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+5	3.1E+7	
Ru-103	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+5	2.5E+7	1A
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	2.6E+5	4.5E+6	
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	1.9E+5	1.6E+9	R
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	3.3E+4	3.4E+7	
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+5	2.3E+9	
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	2.9E+5	4.7E+6	
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	8.3E+4	3.1E+6	
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	1.8E+6	1.6E+7	
I -131	-0-	-0-	-0-	-0-	-0-	-0-	2.7E+6	3.9E+6	
I -132	-0-	-0-	-0-	-0-	-0-	-0-	2.6E+4	2.8E+5	1A
I -133	-0-	-0-	-0-	-0-	-0-	-0-	4.9E+5	5.6E+5	
I -134	-0-	-0-	-0-	-0-	-0-	-0-	6.8E+3	1.0E+5	1A
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.0E+5	5.8E+5	
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.0E+5	1.7E+8	

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-11

DOSE PARAMETER R_i FOR SECTOR C

Pathway = Camp San Onofre Fr. Stn — Distance = 2.4 miles
X/Q = 1.1E-7 sec/m³ — D/Q = 1.0E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	5.2E+2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	5.9E+3	1.9E+6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	5.8E+5	5.7E+8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	1.5E+5	1.4E+8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	3.8E+5	1.6E+8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	2.5E+6	8.8E+9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	5.8E+5	8.9E+3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	4.1E+7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	7.3E+5	1.0E+8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	2.1E+5	5.6E+7
Ru-103	-0-	-0-	-0-	-0-	-0-	-0-	2.1E+5	4.5E+7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	4.8E+5	8.1E+6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	3.5E+5	2.8E+9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	6.0E+4	6.2E+7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	2.6E+5	4.2E+9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	5.2E+5	8.4E+6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	1.5E+5	5.6E+6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	3.2E+6	2.9E+7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	4.9E+6	7.1E+6
I -132	-0-	-0-	-0-	-0-	-0-	-0-	4.7E+4	5.1E+5
I -133	-0-	-0-	-0-	-0-	-0-	-0-	8.8E+5	1.0E+6
I -134	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+4	1.8E+5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.8E+5	1.0E+6
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	3.6E+5	3.1E+8

1A R 1A 1A

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-11

DOSE PARAMETER R_i FOR SECTOR C

Pathway = Camp San Onofre — Distance = 2.7 miles
X/Q = 9.1E-8 sec/m³ — D/Q = 8.1E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	1.3E+3	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+4	4.7E+6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+6	1.4E+9
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	3.7E+5	3.4E+8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	9.3E+5	3.8E+8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	6.0E+6	2.2E+10
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+6	2.2E+4
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	9.9E+7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.8E+6	2.5E+8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	5.0E+5	1.4E+8
Ru-103	-0-	-0-	-0-	-0-	-0-	-0-	5.0E+5	1.1E+8
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+6	2.0E+7
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	8.5E+5	6.8E+9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	1.5E+5	1.5E+8
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	6.2E+5	1.0E+10
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	1.3E+6	2.1E+7
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	3.6E+5	1.4E+7
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	7.8E+6	7.0E+7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+7	1.7E+7
I -132	-0-	-0-	-0-	-0-	-0-	-0-	1.1E+5	1.2E+6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	2.2E+6	2.4E+6
I -134	-0-	-0-	-0-	-0-	-0-	-0-	3.0E+4	4.5E+5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	4.5E+5	2.5E+6
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	8.6E+5	7.5E+8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-11

DOSE PARAMETER R_i FOR SECTOR C

Pathway = Sheep (Meat) — Distance = 0.3 miles
X/Q = 3.2E-6 sec/m³ — D/Q = 3.3E-8 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	1.5E+0	-0-	1.2E+0	7.0E+0	2.1E+0
Cr-51	-0-	-0-	-0-	5.1E+1	-0-	1.0E+2	7.9E+1	2.6E+4
Mn-54	-0-	-0-	-0-	7.8E+2	-0-	1.4E+3	7.7E+3	7.6E+6
Co-57	-0-	-0-	-0-	4.7E+3	-0-	8.1E+3	2.0E+3	1.9E+6
Co-58	-0-	-0-	-0-	9.7E+3	-0-	2.0E+4	5.1E+3	2.1E+6
Co-60	-0-	-0-	-0-	3.7E+4	-0-	7.3E+4	3.3E+4	1.2E+8
Sr-89	-0-	-0-	-0-	5.0E+4	-0-	2.6E+4	7.7E+3	3.1E+4
Sr-90	-0-	-0-	-0-	1.0E+6	-0-	8.1E+5	5.5E+5	1.3E+6
Zr-95	-0-	-0-	-0-	6.3E+4	-0-	1.1E+5	9.7E+3	1.6E+6
Nb-95	-0-	-0-	-0-	2.4E+5	-0-	4.5E+5	2.8E+3	1.6E+6
Ru-103	-0-	-0-	-0-	4.2E+5	-0-	7.6E+5	2.8E+3	1.9E+6
Te-129m	-0-	-0-	-0-	6.0E+5	-0-	4.5E+5	6.4E+3	7.6E+5
Cs-134	-0-	-0-	-0-	1.4E+5	-0-	1.2E+5	4.7E+3	3.8E+7
Cs-136	-0-	-0-	-0-	5.1E+3	-0-	4.3E+3	8.1E+2	8.3E+5
Cs-137	-0-	-0-	-0-	1.3E+5	-0-	9.5E+4	3.4E+3	5.7E+7
Ba-140	-0-	-0-	-0-	5.1E+3	-0-	4.3E+3	7.0E+3	1.2E+5
Ce-141	-0-	-0-	-0-	1.5E+3	-0-	2.4E+3	2.0E+3	7.9E+4
Ce-144	-0-	-0-	-0-	1.8E+4	-0-	3.0E+4	4.3E+4	4.3E+5
I -131	-0-	-0-	-0-	6.6E+5	-0-	4.4E+5	6.6E+4	7.0E+5
I -132	-0-	-0-	-0-	-0-	-0-	-0-	6.3E+2	6.8E+3
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E+4	1.3E+4
I -134	-0-	-0-	-0-	-0-	-0-	-0-	1.6E+2	2.5E+3
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E+3	1.4E+4
UN-ID	-0-	-0-	-0-	1.1E+5	-0-	9.5E+4	4.8E+3	4.2E+6

1A R 1A 1A

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-11

DOSE PARAMETER R_i FOR SECTOR C

Pathway = Deer Consumer
X/Q = 2.8E-7 sec/m³

Distance = 1.3 miles
D/Q = 2.9E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	2.8E+1	-0-	2.3E+1	3.5E+1	3.9E+1
Cr-51	-0-	-0-	-0-	5.0E+4	-0-	1.0E+5	3.9E+2	3.2E+5
Mn-54	-0-	-0-	-0-	7.7E+5	-0-	1.4E+6	3.8E+4	4.1E+7
Co-57	-0-	-0-	-0-	4.6E+6	-0-	8.0E+6	1.0E+4	2.3E+7
Co-58	-0-	-0-	-0-	9.6E+6	-0-	1.9E+7	2.5E+4	4.7E+7
Co-60	-0-	-0-	-0-	3.6E+7	-0-	7.2E+7	1.6E+5	7.2E+8
Sr-89	-0-	-0-	-0-	4.9E+7	-0-	2.6E+7	3.8E+4	3.1E+7
Sr-90	-0-	-0-	-0-	1.0E+9	-0-	8.0E+8	2.7E+6	1.2E+9
Zr-95	-0-	-0-	-0-	6.2E+7	-0-	1.1E+8	4.8E+4	2.0E+8
Nb-95	-0-	-0-	-0-	2.3E+8	-0-	4.5E+8	1.4E+4	8.2E+8
Ru-103	-0-	-0-	-0-	4.2E+8	-0-	7.5E+8	1.4E+4	1.3E+9
Te-129m	-0-	-0-	-0-	5.9E+8	-0-	4.5E+8	3.2E+4	6.4E+8
Cs-134	-0-	-0-	-0-	1.4E+8	-0-	1.2E+8	2.3E+4	3.4E+8
Cs-136	-0-	-0-	-0-	5.1E+6	-0-	4.2E+6	4.0E+3	9.5E+6
Cs-137	-0-	-0-	-0-	1.3E+8	-0-	9.3E+7	1.7E+4	4.0E+8
Ba-140	-0-	-0-	-0-	5.0E+6	-0-	4.2E+6	3.5E+4	7.4E+6
Ce-141	-0-	-0-	-0-	1.5E+6	-0-	2.4E+6	9.9E+3	4.2E+6
Ce-144	-0-	-0-	-0-	1.8E+7	-0-	2.9E+7	2.1E+5	4.9E+7
I -131	-0-	-0-	-0-	6.5E+8	-0-	4.3E+8	3.3E+5	5.9E+8
I -132	-0-	-0-	-0-	-0-	-0-	-0-	3.1E+3	3.4E+4
I -133	-0-	-0-	-0-	1.6E+1	-0-	8.6E+0	5.9E+4	6.7E+4
I -134	-0-	-0-	-0-	-0-	-0-	-0-	8.2E+2	1.2E+4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E+4	6.9E+4
UN-ID	-0-	-0-	-0-	1.1E+8	-0-	9.4E+7	2.4E+4	1.4E+8

1A R 1A 1A

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-11

DOSE PARAMETER R_i FOR SECTOR C

Pathway = Sewage Treat. Facility — Distance = 2.3 miles
X/Q = 1.2E-7 sec/m³ — D/Q = 1.1E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	2.9E+2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	3.3E+3	1.1E+6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	3.2E+5	3.2E+8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	8.4E+4	7.8E+7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	2.1E+5	8.7E+7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+6	4.9E+9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	3.2E+5	4.9E+3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.3E+7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	4.0E+5	5.7E+7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+5	3.1E+7
Ru-103	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+5	2.5E+7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	2.6E+5	4.5E+6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	1.9E+5	1.6E+9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	3.3E+4	3.4E+7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+5	2.3E+9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	2.9E+5	4.7E+6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	8.3E+4	3.1E+6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	1.8E+6	1.6E+7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	2.7E+6	3.9E+6
I -132	-0-	-0-	-0-	-0-	-0-	-0-	2.6E+4	2.8E+5
I -133	-0-	-0-	-0-	-0-	-0-	-0-	4.9E+5	5.6E+5
I -134	-0-	-0-	-0-	-0-	-0-	-0-	6.8E+3	1.0E+5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.0E+5	5.8E+5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.0E+5	1.7E+8

1A R 1A 1A

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-12

DOSE PARAMETER R_i FOR SECTOR D

Pathway = Sheep (Meat) — Distance = 0.3 miles
X/Q = 3.0E-6 sec/m³ — D/Q = 3.4E-8 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	1.5E+0	-0-	1.2E+0	7.0E+0	2.1E+0
Cr-51	-0-	-0-	-0-	5.1E+1	-0-	1.0E+2	7.9E+1	2.6E+4
Mn-54	-0-	-0-	-0-	7.8E+2	-0-	1.4E+3	7.7E+3	7.6E+6
Co-57	-0-	-0-	-0-	4.7E+3	-0-	8.1E+3	2.0E+3	1.9E+6
Co-58	-0-	-0-	-0-	9.7E+3	-0-	2.0E+4	5.1E+3	2.1E+6
Co-60	-0-	-0-	-0-	3.7E+4	-0-	7.3E+4	3.3E+4	1.2E+8
Sr-89	-0-	-0-	-0-	5.0E+4	-0-	2.6E+4	7.7E+3	3.1E+4
Sr-90	-0-	-0-	-0-	1.0E+6	-0-	8.1E+5	5.5E+5	1.3E+6
Zr-95	-0-	-0-	-0-	6.3E+4	-0-	1.1E+5	9.7E+3	1.6E+6
Nb-95	-0-	-0-	-0-	2.4E+5	-0-	4.5E+5	2.8E+3	1.6E+6
Ru-103	-0-	-0-	-0-	4.2E+5	-0-	7.6E+5	2.8E+3	1.9E+6
Te-129m	-0-	-0-	-0-	6.0E+5	-0-	4.5E+5	6.4E+3	7.6E+5
Cs-134	-0-	-0-	-0-	1.4E+5	-0-	1.2E+5	4.7E+3	3.8E+7
Cs-136	-0-	-0-	-0-	5.1E+3	-0-	4.3E+3	8.1E+2	8.3E+5
Cs-137	-0-	-0-	-0-	1.3E+5	-0-	9.5E+4	3.4E+3	5.7E+7
Ba-140	-0-	-0-	-0-	5.1E+3	-0-	4.3E+3	7.0E+3	1.2E+5
Ce-141	-0-	-0-	-0-	1.5E+3	-0-	2.4E+3	2.0E+3	7.9E+4
Ce-144	-0-	-0-	-0-	1.8E+4	-0-	3.0E+4	4.3E+4	4.3E+5
I -131	-0-	-0-	-0-	6.6E+5	-0-	4.4E+5	6.6E+4	7.0E+5
I -132	-0-	-0-	-0-	-0-	-0-	-0-	6.3E+2	6.8E+3
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E+4	1.3E+4
I -134	-0-	-0-	-0-	-0-	-0-	-0-	1.6E+2	2.5E+3
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E+3	1.4E+4
UN-ID	-0-	-0-	-0-	1.1E+5	-0-	9.5E+4	4.8E+3	4.2E+6

1A R 1A 1A

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-12

DOSE PARAMETER R_i FOR SECTOR D

Pathway = Deer Consumer
X/Q = 2.6E-7 sec/m³

Distance = 1.4 miles
D/Q = 6.0E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	2.8E+1	-0-	2.3E+1	3.5E+1	3.9E+1
Cr-51	-0-	-0-	-0-	5.0E+4	-0-	1.0E+5	3.9E+2	3.2E+5
Mn-54	-0-	-0-	-0-	7.7E+5	-0-	1.4E+6	3.8E+4	4.1E+7
Co-57	-0-	-0-	-0-	4.6E+6	-0-	8.0E+6	1.0E+4	2.3E+7
Co-58	-0-	-0-	-0-	9.6E+6	-0-	1.9E+7	2.5E+4	4.7E+7
Co-60	-0-	-0-	-0-	3.6E+7	-0-	7.2E+7	1.6E+5	7.2E+8
Sr-89	-0-	-0-	-0-	4.9E+7	-0-	2.6E+7	3.8E+4	3.1E+7
Sr-90	-0-	-0-	-0-	1.0E+9	-0-	8.0E+8	2.7E+6	1.2E+9
Zr-95	-0-	-0-	-0-	6.2E+7	-0-	1.1E+8	4.8E+4	2.0E+8
Nb-95	-0-	-0-	-0-	2.3E+8	-0-	4.5E+8	1.4E+4	8.2E+8
Ru-103	-0-	-0-	-0-	4.2E+8	-0-	7.5E+8	1.4E+4	1.3E+9
Te-129m	-0-	-0-	-0-	5.9E+8	-0-	4.5E+8	3.2E+4	6.4E+8
Cs-134	-0-	-0-	-0-	1.4E+8	-0-	1.2E+8	2.3E+4	3.4E+8
Cs-136	-0-	-0-	-0-	5.1E+6	-0-	4.2E+6	4.0E+3	9.5E+6
Cs-137	-0-	-0-	-0-	1.3E+8	-0-	9.3E+7	1.7E+4	4.0E+8
Ba-140	-0-	-0-	-0-	5.0E+6	-0-	4.2E+6	3.5E+4	7.4E+6
Ce-141	-0-	-0-	-0-	1.5E+6	-0-	2.4E+6	9.9E+3	4.2E+6
Ce-144	-0-	-0-	-0-	1.8E+7	-0-	2.9E+7	2.1E+5	4.9E+7
I -131	-0-	-0-	-0-	6.5E+8	-0-	4.3E+8	3.3E+5	5.9E+8
I -132	-0-	-0-	-0-	-0-	-0-	-0-	3.1E+3	3.4E+4
I -133	-0-	-0-	-0-	1.6E+1	-0-	8.6E+0	5.9E+4	6.7E+4
I -134	-0-	-0-	-0-	-0-	-0-	-0-	8.2E+2	1.2E+4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E+4	6.9E+4
UN-ID	-0-	-0-	-0-	1.1E+8	-0-	9.4E+7	2.4E+4	1.4E+8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-12

DOSE PARAMETER R_i FOR SECTOR D

Pathway = Camp San Onofre — Distance = 2.9 miles
X/Q = 7.1E-8 sec/m³ — D/Q = 7.3E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	1.3E+3	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+4	4.7E+6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+6	1.4E+9
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	3.7E+5	3.4E+8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	9.3E+5	3.8E+8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	6.0E+6	2.2E+10
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+6	2.2E+4
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	9.9E+7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.8E+6	2.5E+8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	5.0E+5	1.4E+8
Ru-103	-0-	-0-	-0-	-0-	-0-	-0-	5.0E+5	1.1E+8
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+6	2.0E+7
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	8.5E+5	6.8E+9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	1.5E+5	1.5E+8
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	6.2E+5	1.0E+10
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	1.3E+6	2.1E+7
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	3.6E+5	1.4E+7
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	7.8E+6	7.0E+7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+7	1.7E+7
I -132	-0-	-0-	-0-	-0-	-0-	-0-	1.1E+5	1.2E+6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	2.2E+6	2.4E+6
I -134	-0-	-0-	-0-	-0-	-0-	-0-	3.0E+4	4.5E+5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	4.5E+5	2.5E+6
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	8.6E+5	7.5E+8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-13

DOSE PARAMETER R_i FOR SECTOR E

Pathway = Sheep (Meat) — Distance = 0.4 miles
X/Q = 2.9E-6 sec/m³ — D/Q = 3.8E-8 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	1.5E+0	-0-	1.2E+0	7.0E+0	2.1E+0
Cr-51	-0-	-0-	-0-	5.1E+1	-0-	1.0E+2	7.9E+1	2.6E+4
Mn-54	-0-	-0-	-0-	7.8E+2	-0-	1.4E+3	7.7E+3	7.6E+6
Co-57	-0-	-0-	-0-	4.7E+3	-0-	8.1E+3	2.0E+3	1.9E+6
Co-58	-0-	-0-	-0-	9.7E+3	-0-	2.0E+4	5.1E+3	2.1E+6
Co-60	-0-	-0-	-0-	3.7E+4	-0-	7.3E+4	3.3E+4	1.2E+8
Sr-89	-0-	-0-	-0-	5.0E+4	-0-	2.6E+4	7.7E+5	3.1E+4
Sr-90	-0-	-0-	-0-	1.0E+6	-0-	8.1E+5	5.5E+5	1.3E+6
Zr-95	-0-	-0-	-0-	6.3E+4	-0-	1.1E+5	9.7E+3	1.6E+6
Nb-95	-0-	-0-	-0-	2.4E+5	-0-	4.5E+5	2.8E+3	1.6E+6
Ru-103	-0-	-0-	-0-	4.2E+5	-0-	7.6E+5	2.8E+3	1.9E+6
Te-129m	-0-	-0-	-0-	6.0E+5	-0-	4.5E+5	6.4E+3	7.6E+3
Cs-134	-0-	-0-	-0-	1.4E+5	-0-	1.2E+5	4.7E+3	3.8E+7
Cs-136	-0-	-0-	-0-	5.1E+3	-0-	4.3E+3	8.1E+2	8.3E+5
Cs-137	-0-	-0-	-0-	1.3E+5	-0-	9.5E+4	3.4E+3	5.7E+7
Ba-140	-0-	-0-	-0-	5.1E+3	-0-	4.3E+3	7.0E+3	1.2E+5
Ce-141	-0-	-0-	-0-	1.5E+3	-0-	2.4E+3	2.0E+3	7.9E+4
Ce-144	-0-	-0-	-0-	1.8E+4	-0-	3.0E+4	4.3E+4	4.3E+5
I -131	-0-	-0-	-0-	6.6E+5	-0-	4.4E+5	6.6E+4	7.0E+5
I -132	-0-	-0-	-0-	-0-	-0-	-0-	6.3E+2	6.8E+3
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E+4	1.3E+4
I -134	-0-	-0-	-0-	-0-	-0-	-0-	1.6E+2	2.5E+3
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E+3	1.4E+4
UN-ID	-0-	-0-	-0-	1.1E+5	-0-	9.5E+4	4.8E+3	4.2E+6

1A R 1A 1A

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-13

DOSE PARAMETER R_i FOR SECTOR E

Pathway = Deer Consumer
X/Q = 3.0E-7 sec/m³

Distance = 1.4 miles
D/Q = 4.7E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	2.8E+1	-0-	2.3E+1	3.5E+1	3.9E+1
Cr-51	-0-	-0-	-0-	5.0E+4	-0-	1.0E+5	3.9E+2	3.2E+5
Mn-54	-0-	-0-	-0-	7.7E+5	-0-	1.4E+6	3.8E+4	4.1E+7
Co-57	-0-	-0-	-0-	4.6E+6	-0-	8.0E+6	1.0E+4	2.3E+7
Co-58	-0-	-0-	-0-	9.6E+6	-0-	1.9E+7	2.5E+4	4.7E+7
Co-60	-0-	-0-	-0-	3.6E+7	-0-	7.2E+7	1.6E+5	7.2E+8
Sr-89	-0-	-0-	-0-	4.9E+7	-0-	2.6E+7	3.8E+4	3.1E+7
Sr-90	-0-	-0-	-0-	1.0E+9	-0-	8.0E+8	2.7E+6	1.2E+9
Zr-95	-0-	-0-	-0-	6.2E+7	-0-	1.1E+8	4.8E+4	2.0E+8
Nb-95	-0-	-0-	-0-	2.3E+8	-0-	4.5E+8	1.4E+4	8.2E+8
Ru-103	-0-	-0-	-0-	4.2E+8	-0-	7.5E+8	1.4E+4	1.3E+9
Te-129m	-0-	-0-	-0-	5.9E+8	-0-	4.5E+8	3.2E+4	6.4E+8
Cs-134	-0-	-0-	-0-	1.4E+8	-0-	1.2E+8	2.3E+4	3.4E+8
Cs-136	-0-	-0-	-0-	5.1E+6	-0-	4.2E+6	4.0E+3	9.5E+6
Cs-137	-0-	-0-	-0-	1.3E+8	-0-	9.3E+7	1.7E+4	4.0E+8
Ba-140	-0-	-0-	-0-	5.0E+6	-0-	4.2E+6	3.5E+4	7.4E+6
Ce-141	-0-	-0-	-0-	1.5E+6	-0-	2.4E+6	9.9E+3	4.2E+6
Ce-144	-0-	-0-	-0-	1.8E+7	-0-	2.9E+7	2.1E+5	4.9E+7
I -131	-0-	-0-	-0-	6.5E+8	-0-	4.3E+8	3.3E+5	5.9E+8
I -132	-0-	-0-	-0-	-0-	-0-	-0-	3.1E+3	3.4E+4
I -133	-0-	-0-	-0-	1.6E+1	-0-	8.6E+0	5.9E+4	6.7E+4
I -134	-0-	-0-	-0-	-0-	-0-	-0-	8.2E+2	1.2E+4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E+4	6.9E+4
UN-ID	-0-	-0-	-0-	1.1E+8	-0-	9.4E+7	2.4E+4	1.4E+8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-13

DOSE PARAMETER R_i FOR SECTOR E

Pathway = Camp Horno
X/Q = 6.2E-8 sec/m³

Distance = 4.2 miles
D/Q = 5.8E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	1.3E+3	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+4	4.7E+6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+6	1.4E+9
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	3.7E+5	3.4E+8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	9.3E+5	3.8E+8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	6.0E+6	2.2E+10
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+6	2.2E+4
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	9.9E+7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.8E+5	2.5E+8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	5.0E+5	1.4E+8
Ru-103	-0-	-0-	-0-	-0-	-0-	-0-	5.0E+5	1.1E+8
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+6	2.0E+7
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	8.5E+5	6.8E+9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	1.5E+5	1.5E+8
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	6.2E+5	1.0E+10
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	1.3E+6	2.1E+7
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	3.6E+5	1.4E+7
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	7.8E+6	7.0E+7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+7	1.7E+7
I -132	-0-	-0-	-0-	-0-	-0-	-0-	1.1E+5	1.2E+6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	2.2E+6	2.4E+6
I -134	-0-	-0-	-0-	-0-	-0-	-0-	3.0E+4	4.5E+5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	4.5E+5	2.5E+6
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	8.6E+5	7.5E+8

IA R IA IA

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-14

DOSE PARAMETER R_i FOR SECTOR F

Pathway = Sheep (Meat) — Distance = 0.7 miles
X/Q = 1.0E-6 sec/m³ — D/Q = 8.8E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	1.5E+0	-0-	1.2E+0	7.0E+0	2.1E+0
Cr-51	-0-	-0-	-0-	5.1E+1	-0-	1.0E+2	7.9E+1	2.6E+4
Mn-54	-0-	-0-	-0-	7.8E+2	-0-	1.4E+3	7.7E+3	7.6E+6
Co-57	-0-	-0-	-0-	4.7E+3	-0-	8.1E+3	2.0E+3	1.9E+6
Co-58	-0-	-0-	-0-	9.7E+3	-0-	2.0E+4	5.1E+3	2.1E+6
Co-60	-0-	-0-	-0-	3.7E+4	-0-	7.3E+4	3.3E+4	1.2E+8
Sr-89	-0-	-0-	-0-	5.0E+4	-0-	2.6E+4	7.7E+3	3.1E+4
Sr-90	-0-	-0-	-0-	1.0E+6	-0-	8.1E+5	5.5E+5	1.3E+6
Zr-95	-0-	-0-	-0-	6.3E+4	-0-	1.1E+5	9.7E+3	1.6E+6
Nb-95	-0-	-0-	-0-	2.4E+5	-0-	4.5E+5	2.8E+3	1.6E+6
Ru-103	-0-	-0-	-0-	4.2E+5	-0-	7.6E+5	2.8E+3	1.9E+6
Te-129m	-0-	-0-	-0-	6.0E+5	-0-	4.5E+5	6.4E+3	7.6E+5
Cs-134	-0-	-0-	-0-	1.4E+5	-0-	1.2E+5	4.7E+3	3.8E+7
Cs-136	-0-	-0-	-0-	5.1E+3	-0-	4.3E+3	8.1E+2	8.3E+5
Cs-137	-0-	-0-	-0-	1.3E+5	-0-	9.5E+4	3.4E+3	5.7E+7
Ba-140	-0-	-0-	-0-	5.1E+3	-0-	4.3E+3	7.0E+3	1.2E+5
Ce-141	-0-	-0-	-0-	1.5E+3	-0-	2.4E+3	2.0E+3	7.9E+4
Ce-144	-0-	-0-	-0-	1.8E+4	-0-	3.0E+4	4.3E+4	4.3E+5
I -131	-0-	-0-	-0-	6.6E+5	-0-	4.4E+5	6.6E+4	7.0E+5
I -132	-0-	-0-	-0-	-0-	-0-	-0-	6.3E+2	6.8E+3
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E+4	1.3E+4
I -134	-0-	-0-	-0-	-0-	-0-	-0-	1.6E+2	2.5E+3
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E+3	1.4E+4
UN-ID	-0-	-0-	-0-	1.1E+5	-0-	9.5E+4	4.8E+3	4.2E+6

1A R 1A 1A

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-14

DOSE PARAMETER R_i FOR SECTOR F

Pathway = Deer Consumer
X/Q = 7.8E-7 sec/m³

Distance = 0.9 miles
D/Q = 2.0E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	2.8E+1	-0-	2.3E+1	3.5E+1	3.9E+1
Cr-51	-0-	-0-	-0-	5.0E+4	-0-	1.0E+5	3.9E+2	3.2E+5
Mn-54	-0-	-0-	-0-	7.7E+5	-0-	1.4E+6	3.8E+4	4.1E+7
Co-57	-0-	-0-	-0-	4.6E+6	-0-	8.0E+6	1.0E+4	2.3E+7
Co-58	-0-	-0-	-0-	9.6E+6	-0-	1.9E+7	2.5E+4	4.7E+7
Co-60	-0-	-0-	-0-	3.6E+7	-0-	7.2E+7	1.6E+5	7.2E+8
Sr-89	-0-	-0-	-0-	4.9E+7	-0-	2.6E+7	3.8E+4	3.1E+7
Sr-90	-0-	-0-	-0-	1.0E+9	-0-	8.0E+8	2.7E+6	1.2E+9
Zr-95	-0-	-0-	-0-	6.2E+7	-0-	1.1E+8	4.8E+4	2.0E+8
Nb-95	-0-	-0-	-0-	2.3E+8	-0-	4.5E+8	1.4E+4	8.2E+8
Ru-103	-0-	-0-	-0-	4.2E+8	-0-	7.5E+8	1.4E+4	1.3E+9
Te-129m	-0-	-0-	-0-	5.9E+8	-0-	4.5E+8	3.2E+4	6.4E+8
Cs-134	-0-	-0-	-0-	1.4E+8	-0-	1.2E+8	2.3E+4	3.4E+8
Cs-136	-0-	-0-	-0-	5.1E+6	-0-	4.2E+6	4.0E+3	9.5E+6
Cs-137	-0-	-0-	-0-	1.3E+8	-0-	9.3E+7	1.7E+4	4.0E+8
Ba-140	-0-	-0-	-0-	5.0E+6	-0-	4.2E+6	3.5E+4	7.4E+6
Ce-141	-0-	-0-	-0-	1.5E+6	-0-	2.4E+6	9.9E+3	4.2E+6
Ce-144	-0-	-0-	-0-	1.8E+7	-0-	2.9E+7	2.1E+5	4.9E+7
I -131	-0-	-0-	-0-	6.5E+8	-0-	4.3E+8	3.3E+5	5.9E+8
I -132	-0-	-0-	-0-	-0-	-0-	-0-	3.1E+3	3.4E+4
I -133	-0-	-0-	-0-	1.6E+1	-0-	8.6E+0	5.9E+4	6.7E+4
I -134	-0-	-0-	-0-	-0-	-0-	-0-	8.2E+2	1.2E+4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E+4	6.9E+4
UN-ID	-0-	-0-	-0-	1.1E+8	-0-	9.4E+7	2.4E+4	1.4E+8

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-14

DOSE PARAMETER R_i FOR SECTOR F

Pathway = San Onofre State Park Guard Shack — Distance = 1.0 miles
X/Q = 6.2E-7 sec/m³ — D/Q = 5.0E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	7.2E+1	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	8.2E+2	2.7E+5
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	8.0E+4	7.9E+7
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	2.1E+4	2.0E+7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	5.3E+4	2.2E+7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	3.4E+5	1.2E+9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	8.0E+4	1.2E+3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	5.7E+6	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.0E+5	1.4E+7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	2.9E+4	7.8E+6
Ru-103	-0-	-0-	-0-	-0-	-0-	-0-	2.9E+4	6.2E+6
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	6.6E+4	1.1E+6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	4.8E+4	3.9E+8
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	8.4E+3	8.6E+6
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	3.5E+4	5.9E+8
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	7.3E+4	1.2E+6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	2.1E+4	7.8E+5
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	4.4E+5	4.0E+6
I -131	-0-	-0-	-0-	-0-	-0-	-0-	6.8E+5	9.8E+5
I -132	-0-	-0-	-0-	-0-	-0-	-0-	6.5E+3	7.1E+4
I -133	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+5	1.4E+5
I -134	-0-	-0-	-0-	-0-	-0-	-0-	1.7E+3	2.6E+4
I -135	-0-	-0-	-0-	-0-	-0-	-0-	2.6E+4	1.4E+5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	4.9E+4	4.3E+7

1A R 1A 1A

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-14

DOSE PARAMETER R_i FOR SECTOR F

Pathway = Beach Concession — Distance = 1.1 miles
X/Q = 5.3E-7 sec/m³ — D/Q = 4.3E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult		
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	
H -3	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+2	-0-	
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	1.3E+3	4.4E+5	
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	1.3E+5	1.3E+8	
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	3.5E+4	3.2E+7	
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	8.7E+4	3.6E+7	
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	5.6E+5	2.0E+9	
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	1.3E+5	2.0E+3	
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	9.3E+6	-0-	
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.7E+5	2.4E+7	
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	4.7E+4	1.3E+7	
Ru-103	-0-	-0-	-0-	-0-	-0-	-0-	4.7E+4	1.0E+7	1A
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	1.1E+5	1.8E+6	
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	7.9E+4	6.4E+8	
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+4	1.4E+7	R
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	5.8E+4	9.6E+8	
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+5	1.9E+6	
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	3.4E+4	1.3E+6	
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	7.3E+5	6.5E+6	
I -131	-0-	-0-	-0-	-0-	-0-	-0-	1.1E+6	1.6E+6	
I -132	-0-	-0-	-0-	-0-	-0-	-0-	1.1E+4	1.2E+5	1A
I -133	-0-	-0-	-0-	-0-	-0-	-0-	2.0E+5	2.3E+5	
I -134	-0-	-0-	-0-	-0-	-0-	-0-	2.8E+3	4.2E+4	1A
I -135	-0-	-0-	-0-	-0-	-0-	-0-	4.2E+4	2.4E+5	
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	8.1E+4	7.0E+7	

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-14

DOSE PARAMETER R_i FOR SECTOR F

Pathway = Border-Highway Patrol Weight Station — Distance = 2.0 miles
X/Q = 2.2E-7 sec/m³ — D/Q = 1.6E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult		
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	
H -3	-0-	-0-	-0-	-0-	-0-	-0-	3.6E+2	-0-	
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	4.1E+3	1.3E+6	
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	4.0E+5	3.9E+8	
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	1.1E+5	9.8E+7	
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	2.6E+5	1.1E+8	
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	1.7E+6	6.1E+9	
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	4.0E+5	6.2E+3	
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.8E+7	-0-	
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	5.0E+5	7.2E+7	
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+5	3.9E+7	
Ru-103	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+5	3.1E+7	1A
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	3.3E+5	5.6E+6	R
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	2.4E+5	1.9E+9	
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	4.2E+4	4.3E+7	
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.8E+5	2.9E+9	
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	3.6E+5	5.9E+6	
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	1.0E+5	3.9E+6	
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	2.2E+6	2.0E+7	
I -131	-0-	-0-	-0-	-0-	-0-	-0-	3.4E+6	4.9E+6	
I -132	-0-	-0-	-0-	-0-	-0-	-0-	3.3E+4	3.5E+5	1A
I -133	-0-	-0-	-0-	-0-	-0-	-0-	6.1E+5	7.0E+5	
I -134	-0-	-0-	-0-	-0-	-0-	-0-	8.5E+3	1.3E+5	1A
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.3E+5	7.2E+5	
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.5E+5	2.1E+8	

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-15

DOSE PARAMETER R_i FOR SECTOR G

Pathway = San Onofre State Park Beach Campground Distance = 1.0 miles
X/Q = 6.2E-7 sec/m³ D/Q = 2.9E-9 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	8.0E+1	-0-	1.4E+2	-0-	1.6E+2	-0-	1.6E+2	-0-
Cr-51	1.6E+3	5.7E+5	2.1E+3	5.7E+5	2.6E+3	5.7E+5	1.8E+3	5.7E+5
Mn-54	1.2E+5	1.7E+8	1.9E+5	1.7E+8	2.4E+5	1.7E+8	1.7E+5	1.7E+8
Co-57	4.7E+4	4.2E+7	6.3E+4	4.2E+7	7.2E+4	4.2E+7	4.6E+4	4.2E+7
Co-58	9.6E+4	4.7E+7	1.4E+5	4.7E+7	1.7E+5	4.7E+7	1.1E+5	4.7E+7
Co-60	5.6E+5	2.7E+9	8.7E+5	2.7E+9	1.1E+6	2.7E+9	7.4E+5	2.7E+9
Sr-89	2.5E+5	2.7E+3	2.7E+5	2.7E+3	3.0E+5	2.7E+3	1.7E+5	2.7E+3
Sr-90	5.0E+6	-0-	1.2E+7	-0-	1.3E+7	-0-	1.2E+7	-0-
Zr-95	2.2E+5	3.1E+7	2.8E+5	3.1E+7	3.3E+5	3.1E+7	2.2E+5	3.1E+7
Nb-95	5.9E+4	1.7E+7	7.6E+4	1.7E+7	9.3E+4	1.7E+7	6.2E+4	1.7E+7
Ru-103	6.8E+4	1.3E+7	8.2E+4	1.3E+7	9.7E+4	1.3E+7	6.2E+4	1.3E+7
Te-129m	2.1E+5	2.4E+6	2.2E+5	2.4E+6	2.4E+5	2.4E+6	1.4E+5	2.4E+6
Cs-134	8.7E+4	8.4E+8	1.3E+5	8.4E+8	1.4E+5	8.4E+8	1.0E+5	8.4E+8
Cs-136	1.7E+4	1.9E+7	2.1E+4	1.9E+7	2.4E+4	1.9E+7	1.8E+4	1.9E+7
Cs-137	7.5E+4	1.3E+9	1.1E+5	1.3E+9	1.0E+5	1.3E+9	7.7E+4	1.3E+9
Ba-140	2.0E+5	2.5E+6	2.1E+5	2.5E+6	2.5E+5	2.5E+6	1.6E+5	2.5E+6
Ce-141	6.4E+4	1.7E+6	6.7E+4	1.7E+6	7.6E+4	1.7E+6	4.5E+4	1.7E+6
Ce-144	1.2E+6	8.6E+6	1.5E+6	8.6E+6	1.6E+6	8.6E+6	9.6E+5	8.6E+6
I -131	1.8E+6	2.1E+6	2.0E+6	2.1E+6	1.8E+6	2.1E+6	1.5E+6	2.1E+6
I -132	2.1E+4	1.5E+5	2.4E+4	1.5E+5	1.9E+4	1.5E+5	1.4E+4	1.5E+5
I -133	4.4E+5	3.0E+5	4.7E+5	3.0E+5	3.6E+5	3.0E+5	2.7E+5	3.0E+5
I -134	5.5E+3	5.5E+4	6.3E+3	5.5E+4	4.9E+3	5.5E+4	3.7E+3	5.5E+4
I -135	8.6E+4	3.1E+5	9.8E+4	3.1E+5	7.7E+4	3.1E+5	5.5E+4	3.1E+5
UN-ID	8.0E+4	9.2E+7	1.2E+5	9.2E+7	1.5E+5	9.2E+7	1.1E+5	9.2E+7

1A R 1A 1A

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-15

DOSE PARAMETER R_i FOR SECTOR G

Pathway = Hwy Patrol Weigh Station — Distance = 2.2 miles
X/Q = 1.8E-7 sec/m³ — D/Q = 7.1E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	2.9E+2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	3.3E+3	1.1E+6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	3.2E+5	3.2E+8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	8.4E+4	7.8E+7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	2.1E+5	8.7E+7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+6	4.9E+9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	3.2E+5	4.9E+3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.3E+7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	4.0E+5	5.7E+7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+5	3.1E+7
Ru-103	-0-	-0-	-0-	-0-	-0-	-0-	1.2E+5	2.5E+7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	2.6E+5	4.5E+6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	1.9E+5	1.6E+9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	3.3E+4	3.4E+7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.4E+5	2.3E+9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	2.9E+5	4.7E+6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	8.3E+4	3.1E+6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	1.8E+6	1.6E+7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	2.7E+6	3.9E+6
I -132	-0-	-0-	-0-	-0-	-0-	-0-	2.6E+4	2.8E+5
I -133	-0-	-0-	-0-	-0-	-0-	-0-	4.9E+5	5.6E+5
I -134	-0-	-0-	-0-	-0-	-0-	-0-	6.8E+3	1.0E+5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.0E+5	5.8E+5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.0E+5	1.7E+8

1A R 1A 1A

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

TABLE 2-15

DOSE PARAMETER R_i FOR SECTOR G

Pathway = Sheep (Meat) Distance = 3.1 miles
X/Q = 1.0E-7 sec/m³ D/Q = 3.8E-10 m⁻²

Radio-Nuclide	Infant		Child		Teen		Adult		
	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	Inhalation Pathway	Food & Ground Pathway	
H -3	-0-	-0-	-0-	1.5E+0	-0-	1.2E+0	7.0E+0	2.1E+0	
Cr-51	-0-	-0-	-0-	5.1E+1	-0-	1.0E+2	7.9E+1	2.6E+4	
Mn-54	-0-	-0-	-0-	7.8E+2	-0-	1.4E+3	7.7E+3	7.6E+6	
Co-57	-0-	-0-	-0-	4.7E+3	-0-	8.1E+3	2.0E+3	1.9E+6	
Co-58	-0-	-0-	-0-	9.7E+3	-0-	2.0E+4	5.1E+3	2.1E+6	
Co-60	-0-	-0-	-0-	3.7E+4	-0-	7.3E+4	3.3E+4	1.2E+8	
Sr-89	-0-	-0-	-0-	5.0E+4	-0-	2.6E+4	7.7E+3	3.1E+4	
Sr-90	-0-	-0-	-0-	1.0E+6	-0-	8.1E+5	5.5E+5	1.3E+6	
Zr-95	-0-	-0-	-0-	6.3E+4	-0-	1.1E+5	9.7E+3	1.6E+6	
Nb-95	-0-	-0-	-0-	2.4E+5	-0-	4.5E+5	2.8E+3	1.6E+6	
Ru-103	-0-	-0-	-0-	4.2E+5	-0-	7.6E+5	2.8E+3	1.9E+6	1A
Te-129m	-0-	-0-	-0-	6.0E+5	-0-	4.5E+5	6.4E+3	7.6E+5	
Cs-134	-0-	-0-	-0-	1.4E+5	-0-	1.2E+5	4.7E+3	3.8E+7	
Cs-136	-0-	-0-	-0-	5.1E+3	-0-	4.3E+3	8.1E+2	8.3E+5	R
Cs-137	-0-	-0-	-0-	1.3E+5	-0-	9.5E+4	3.4E+3	5.7E+7	
Ba-140	-0-	-0-	-0-	5.1E+3	-0-	4.3E+3	7.0E+3	1.2E+5	
Ce-141	-0-	-0-	-0-	1.5E+3	-0-	2.4E+3	2.0E+3	7.9E+4	
Ce-144	-0-	-0-	-0-	1.8E+4	-0-	3.0E+4	4.3E+4	4.3E+5	
I -131	-0-	-0-	-0-	6.6E+5	-0-	4.4E+5	6.6E+4	7.0E+5	
I -132	-0-	-0-	-0-	-0-	-0-	-0-	6.3E+2	6.8E+3	1A
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E+4	1.3E+4	
I -134	-0-	-0-	-0-	-0-	-0-	-0-	1.6E+2	2.5E+3	1A
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E+3	1.4E+4	
UN-ID	-0-	-0-	-0-	1.1E+5	-0-	9.5E+4	4.8E+3	4.2E+6	

Inhalation Pathway, units = $\frac{\text{mrem/yr}}{\mu\text{Ci/m}^3}$

Food & Ground Pathway, units = $\frac{(\text{m}^2)(\text{mrem/yr})}{\mu\text{Ci/sec}}$

2.4 TOTAL DOSE CALCULATIONS

2.4.1 Total Dose to Most Likely Member of the Public

The total annual dose or total dose commitment to any member of the public, due to releases of radioactivity and to radiation, from uranium fuel cycle sources within 5 miles of the Site is calculated using the following expressions. This methodology is used to meet the dose limitations of 40 CFR 190 per twelve consecutive months. The transportation of radioactive material is excluded from the dose calculations.

The Annual Total Dose is determined monthly for maximum organ (gas & liquid), whole body (gas & liquid) and thyroid (gas & liquid) to verify that the Site total (Units 1, 2 and 3) is less than or equal to 25 mrem, 25 mrem and 75 mrem respectively.

.1 Annual Total Organ Dose D_{TOT} (organ)

$$\overset{*}{D}_{TOT}(\text{organ}) = \sum_{l=1}^{12} \sum_{j=1}^{2/3} \left[D_{jl}(OG) + D_{jl}(OL) + D_{jl}^{H^3}(OG) \right] \qquad (2\text{-}20)$$

j = Units 1, 2 and 3
l = months 1 - 12**

*NOTE: $D_{jl}^{H^3}(OG) = 0$ for bone

**All to be summed over the most recent 12 months.

where:

$$D_{jl}(OG) = K \sum_{i=1}^{n} C_i \Sigma R_{ik} W_k \; ; \qquad (2\text{-}21)$$

i = each isotope in specific organ category

$K = 3.1688E\text{-}2 \frac{\text{year-}\mu\text{Ci}}{\text{sec-Ci}}$

n = Number of isotopes in the specified organ category

C_i = Total particulate gas curies released for the month

$R_{ik} W_k$ = Controlling location factors from ODCM Tables 2-4, Units 1 and 2/3

$D_{jl}(OL)$ = Liquid organ dose for the specified organ in mrem for the month. [Reference ODCM Unit 1 (1-13), Units 2/3 (1-19)]

$D_{jl}^{H^3}(OG)$ = Gas organ dose from tritium in mrem for the month.

(Note: H^3 bone contribution = 0)

2.4.1.2 Annual Total Whole Body Dose ($D_{TOT}(WB)$)

$$D_{TOT}(WB) = \sum_{l=1}^{12} \sum_{j=1}^{2/3} \left[D_{jl}(WBL) + D^{Hs}_{jl}(OG) + 0.9\, D_{jl}(\gamma) \right] + D(Direct); \quad (2\text{-}22)$$

j = Units 1, 2 and 3
l = months 1 - 12*

*To be summed over the most recent 12 months.

where:

$D_{jl}(WBL)$ = Liquid whole body organ dose in mrem for the whole month. [Reference Unit 1 ODCM (1-13), ODCM Units 2/3 (1-19)]

$D^{Hs}_{jl}(OG)$ = Gas organ dose from tritium in mrem for the month. (from (2-21))

$D_{jl}(\gamma)$ = Gamma air dose in mrad for the month. 0.9 converts mrad to mrem. [Reference Unit 1 ODCM (2-10), ODCM Units 2/3 (2-14)]

$$D(Direct) = \sum_{j=1}^{4} \left[\max[D(beach)_i] - \frac{\sum_{i=1}^{n} D(bkgd)_i}{n} \right] .0342 \quad (2\text{-}23)$$

i = for all TLDs per quarter
j = for Quarters 1-4

2.4.1.2 Annual Total Whole Body Dose $D_{TOT}(WB)$ (Continued)

*Direct Radiation

The direct radiation levels are evaluated most recently using cadmium covered TLDs. The TLDs are placed at 59 locations around the site. The average dose from TLDs 5 to 50 miles from the site is used as background. These sites are subject to change.

The background is subtracted from the highest reading beach TLD (numbers 55 through 58). This value is the direct dose but must be prorated by the occupancy factor. R

Example: Beach time of 300 hrs/yr, or 8 hrs/yr for landward occupancy. A

.3 Annual Total Thyroid Dose $D_{TOT}(THYROID)$

$$D_{TOT}(THYROID) = \sum_{l=1}^{12} \sum_{j=1}^{2/3} \left[(D_{jl}(OG) + D_{jl}(OL) \right] \quad (2\text{-}24)$$

j = Units 1, 2 and 3
l = months 1 - 12*

*To be summed over the most recent 12 months.

where:

$D_{jl}(OG)$ = Thyroid organ dose from gaseous iodine for the month in mrem. (from 2-21)

$D_{jl}(OL)$ = Liquid thyroid organ dose for the month in mrem. [Reference Unit 1 ODCM (1-13), ODCM Units 2/3 (1-19)]

3.0 PROJECTED DOSES

3.1 Liquid Dose Projection (4.5.3)

The methodology used for projecting a liquid dose for Specification 4.5.3 is as follows:

1. Determine the monthly total body and organ doses resulting from releases during the previous twelve months.
2. Projected Dose = Previous 12 months' dose divided by 12 for the total body and each organ.

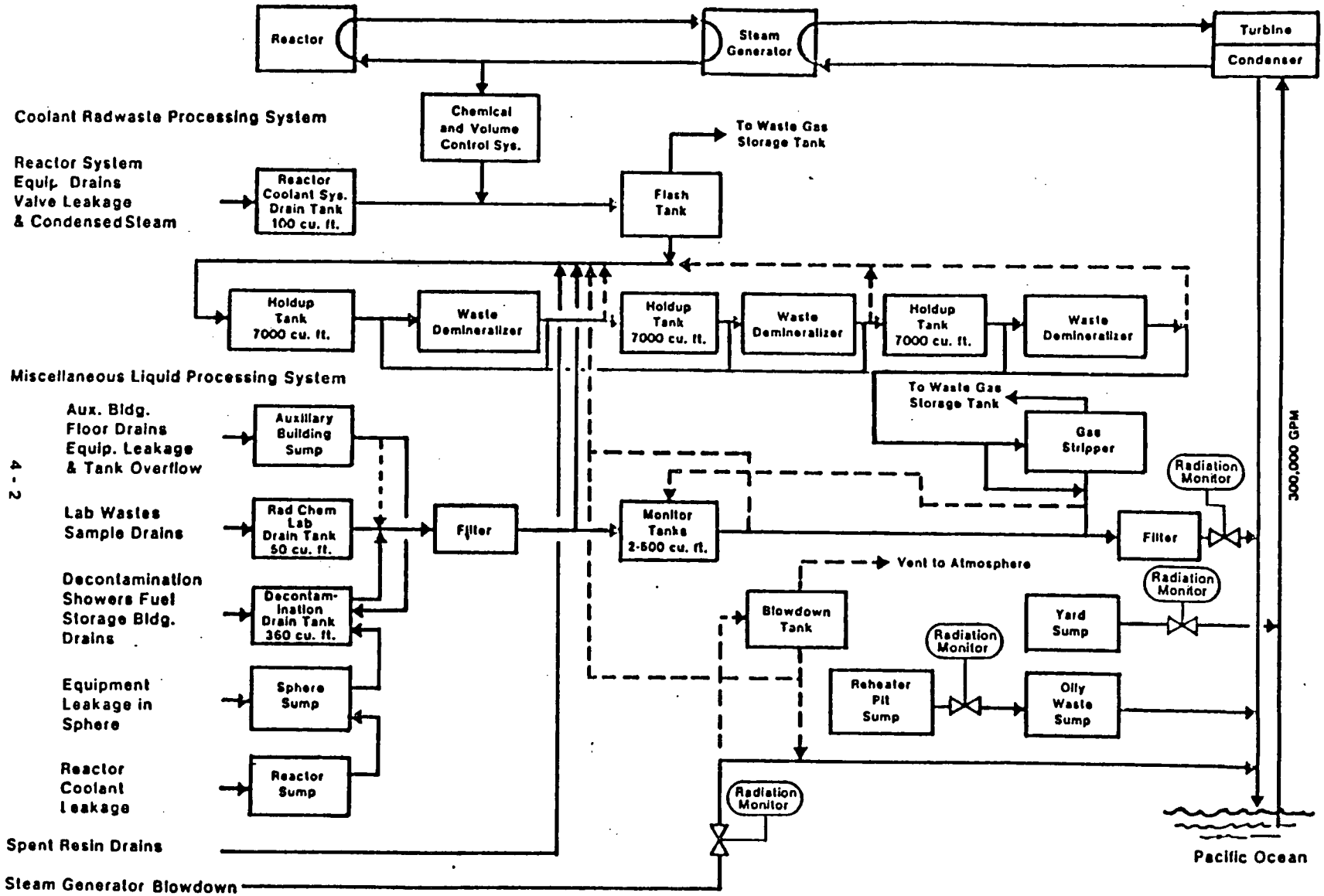
3.2 Gaseous Dose Projection (4.16.4)

The methodology used for projecting a gaseous dose for Specification 4.16.4 is as follows:

1. Determine the monthly gamma, beta and organ dose resulting from releases during the previous twelve months.
2. Projected Dose = Previous 12 months' dose divided by 12 for the gamma, beta and organ doses.

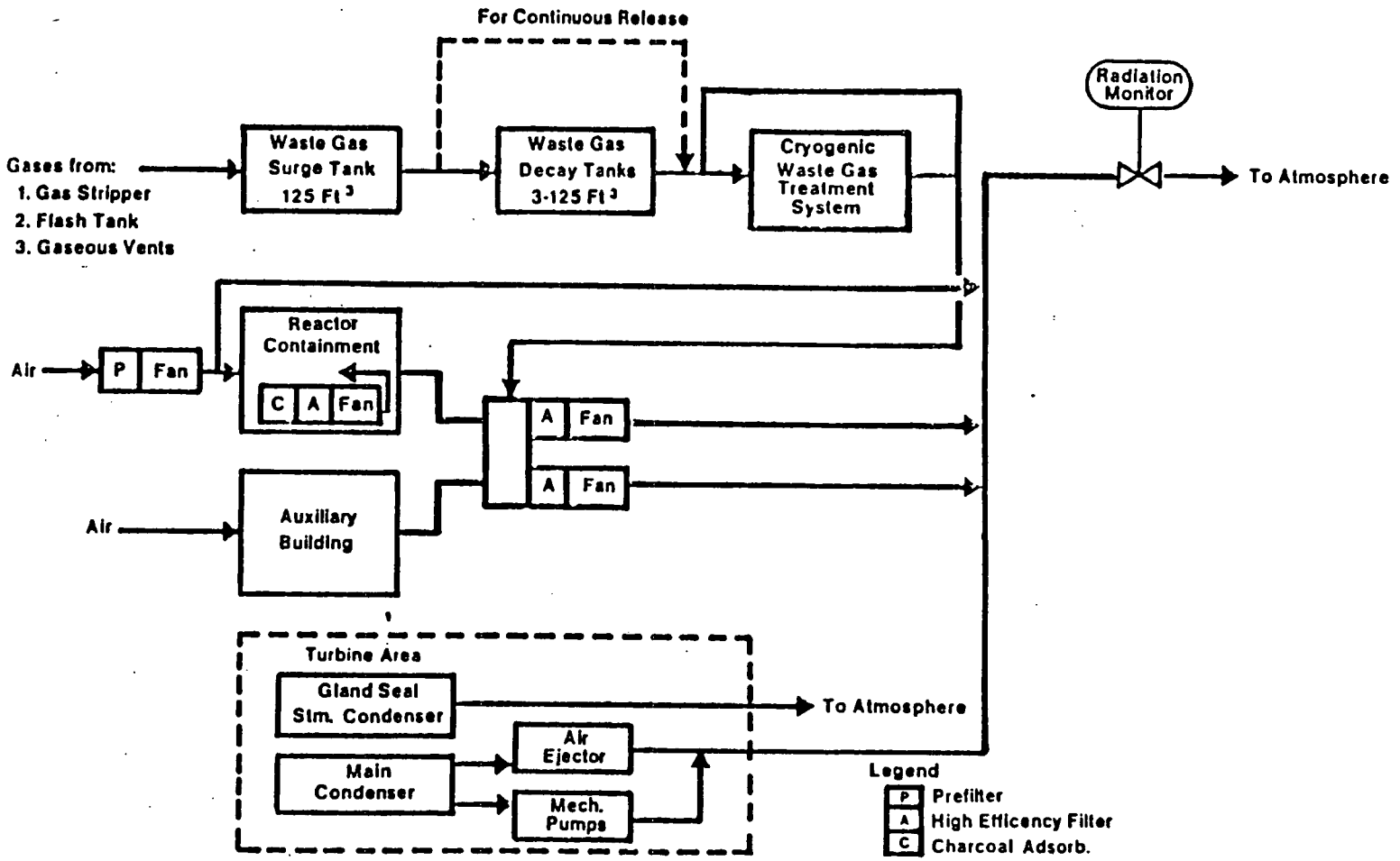
4.0 OPERABILITY OF EQUIPMENT

The flow diagrams defining the treatment paths and the components of the radioactive liquid, gaseous and and solid waste management systems are shown in Figures 4-1 thru 4-3.



Liquid Waste-Discharge System

Figure 4-1



Containment, Auxiliary Building and Turbine Area Ventilation System

Radioactive Gaseous-Waste System

Figure 4 - 2

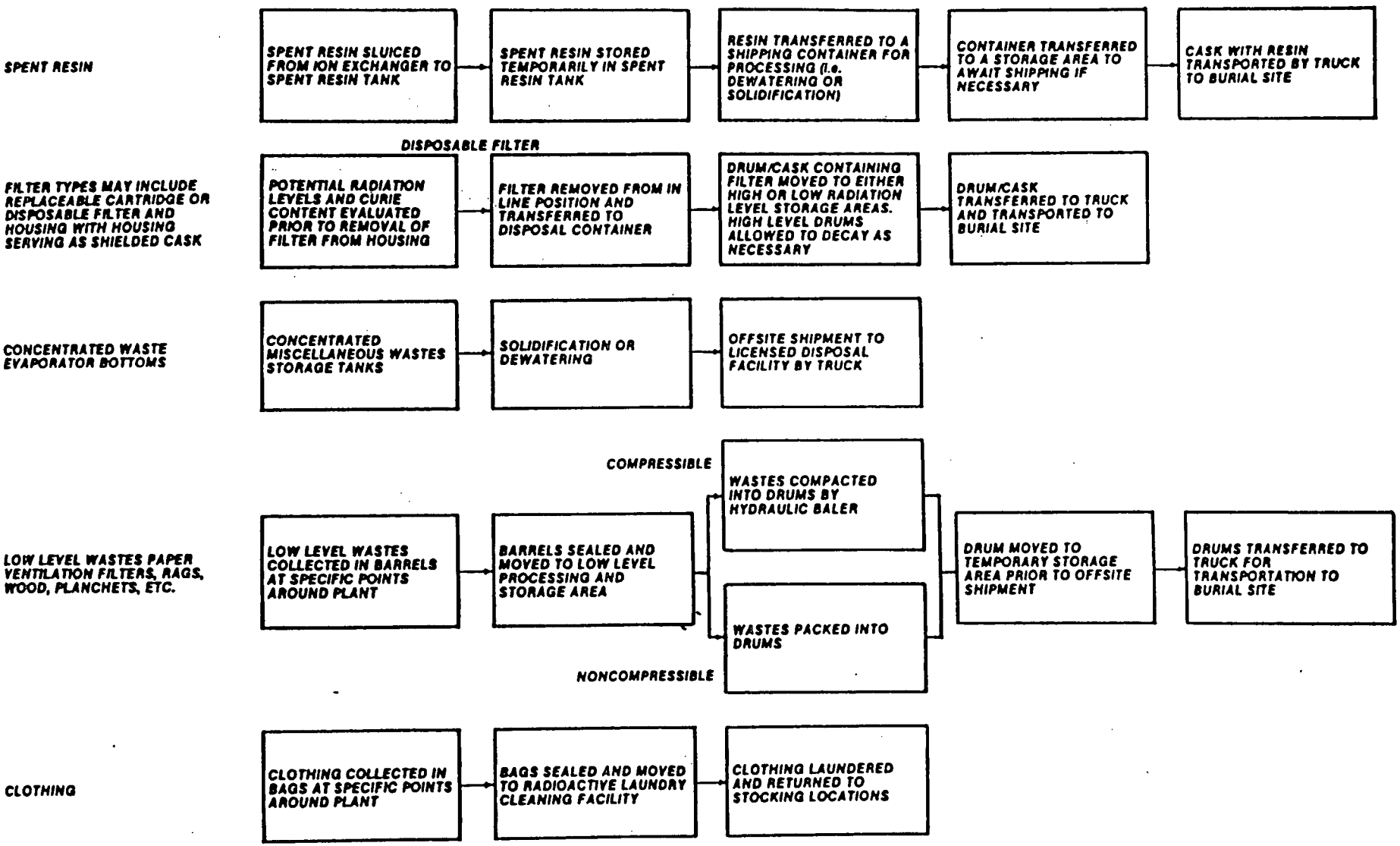


FIGURE 4-3 SOLID WASTE HANDLING

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5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING

The Radiological Environmental Monitoring Sample Locations are identified in Figure 5-1. These sample locations are described in Tables 5-1 and 5-2 and indicates the distance in miles and the direction, determined from degrees true north, from the center of the Units 2 and 3 building complex. Table 5-3 gives the sector and direction designation for the Radiological Environmental Monitoring Sample Location Map, Figure 5-1.

* If a milk producing dairy animal is discovered within the 5 mile radius of the Emergency Planning Zone (EPZ) during the annual land use census, a monthly sampling analysis of the milk will commence.

TABLE 5-1

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

	TYPE OF SAMPLE AND SAMPLING LOCATION***	DISTANCE* (miles)	DIRECTION*
Direct Radiation			
1	City of San Clemente (Former SDG&E Offices)	5.6	NW
2	Camp San Mateo (MCB, Camp Pendleton)	3.5	N
3	Camp San Onofre (MCB, Camp Pendleton)	2.6	NE
4	Camp Horno (MCB, Camp Pendleton)	4.5	E
5	Camp Las Pulgas (MCB, Camp Pendleton)	8.5	E
6	Old Route 101 (East-Southeast)	3.0	ESE
7	Old Route 101 (East-Northeast)	0.5	ENE
8	Noncommissioned Officers' Beach Club	1.5	NW
9	Basilone Road/I-5 Freeway Offramp	2.0	NW
10	Bluff (Adjacent to PIC #1)	0.7	WNW
11	Former Visitors' Center	0.3**	NW
12	South Edge of Switchyard	0.2**	E
13	Southeast Site boundary (Bluff)	0.4**	SE
14	Huntington Beach Generating Station	37	NW
15	Southeast Site Boundary (Office Building)	0.2**	SE
16	East Southeast Site Boundary	0.4**	ESE
17	Transit Dose	-	-
18	Transit Dose	-	-
19	San Clemente Highlands	5.0	NNW
20	San Clemente Pier	5.3	NW
21	Concordia Elementary School - San Clemente	3.5	NW
22	Former U.S. Coast Guard Station - San Mateo Point	2.7	WNW
23	San Clemente General Hospital	8.2	NW
24	San Clemente High School	6.0	NW

* Distance (miles) and Direction (sector) are measured relative to Units 2 and 3 midpoint. Direction is determined from degrees true north.

** Distances are within the Units 2 and 3 Site Boundary (0.4 mile in all sectors) and not required by Technical Specification.

*** MCB - Marine Corps Base PIC - Pressurized Ion Chamber

TABLE 5-1

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

	TYPE OF SAMPLE AND SAMPLING LOCATION***	DISTANCE* (miles)	DIRECTION*
Direct Radiation (Continued)			
25	Convalescent Home - San Clemente	8.0	NW
26	Dana Hills High School	11.0	NW
27	U.S. Post Office - Dana Point	10.6	NW
28	Doheny Fire Station - Capistrano Beach	9.5	NW
29	San Juan Capistrano Fire Station	10.8	NW
30	Laguna Beach Fire Station	17.5	NW
31	Aurora Park-Mission Viejo	18.7	NNW
32	Santa Ana Police Department	32.0	NW
33	Camp Talega (MCB, Camp Pendleton)	5.7	N
34	San Onofre School (MCB, Camp Pendleton)	1.9	NW
35	Range 312 (MCB, Camp Pendleton)	4.7	NNE
36	Range 208C (MCB, Camp Pendleton)	4.2	NE
37	Laguna Niguel Fire Station	14.2	NW
38	San Onofre State Beach Park	3.3	SE
39	Basilone Road Trailer Park (MCB, Camp Pendleton)	1.4	NNW
40	SCE Training Center - Mesa (Adjacent to PIC #3)	0.7	NNW
41	Old Route 101 - East	0.4	E
42	Horno Canyon (MCB, Camp Pendleton)	4.7	E
43	Edson Range (MCB, Camp Pendleton)	10.6	SE
44	Fallbrook Fire Station	18.0	E
45	Interstate 5 Weigh Station	2.0	ESE
46	San Onofre State Beach Park	1.0	SE
47	Camp Las Flores (MCB, Camp Pendleton)	8.6	SE
48	Mainside (MCB, Camp Pendleton)	15.0	ESE

* Distance (miles) and Direction (sector) are measured relative to Units 2 and 3 midpoint. Direction is determined from degrees true north.

** Distances are within the Units 2 and 3 Site Boundary (0.4 mile in all sectors) and not required by Technical Specification.

*** MCB - Marine Corps Base PIC - Pressurized Ion Chamber

TABLE 5-1

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

	TYPE OF SAMPLE AND SAMPLING LOCATION***	DISTANCE* (miles)	DIRECTION*
Direct Radiation (Continued)			
49	Camp Chappo (MCB, Camp Pendleton)	12.8	ESE
50	Oceanside Fire Station	15.5	SE
51	Carlsbad Fire Station	18.6	SE
52	Vista Fire Station	21	ESE
53	San Diego County Operations Center	45	SE
54	Escondido Fire Station	32	ESE
55	San Onofre State Beach (Unit 1, West Southwest)	0.2**	WSW
56	San Onofre State Beach (Unit 1, Southwest)	0.1**	SW
57	San Onofre State Beach (Unit 2)	0.1**	SSW
58	San Onofre State Beach (Unit 3)	0.1**	S
59	SONGS Meteorological Tower	0.3**	WNW
60	Transit Control Storage Area	-	-
61	Mesa - East Boundary (Adjacent to PIC #4)	0.7	N
62	MCB - Camp Pendleton (Adjacent to PIC #5)	0.6	NNE
63	MCB - Camp Pendleton (Adjacent to PIC #6)	0.6	NE
64	MCB - Camp Pendleton (Adjacent to PIC #7)	0.5	ENE
65	MCB - Camp Pendleton (Adjacent to PIC #8)	0.7	E
66	San Onofre State Beach (Adjacent to PIC #9)	0.6	ESE
67	Former SONGS Evaporation Pond (Adjacent to PIC #2)	0.6	NW
68	Range 210C (MCB, Camp Pendleton)	4.3	ENE
99	Transit Dose	-	-

* Distance (miles) and Direction (sector) are measured relative to Units 2 and 3 midpoint. Direction is determined from degrees true north.

** Distances are within the Units 2 and 3 Site Boundary (0.4 mile in all sectors) and not required by Technical Specification.

*** MCB - Marine Corps Base PIC - Pressurized Ion Chamber

TABLE 5-1

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

TYPE OF SAMPLE AND SAMPLING LOCATION		DISTANCE* (miles)	DIRECTION*
Airborne			
1	City of San Clemente (City Hall)	5.5	NW
2	Camp San Onofre (Camp Pendleton)	1.8	NE
3	Huntington Beach Generating Station	37.0	NW
5	Units 2 and 3 Switchyard	0.13**	NNE
6	SONGS Meteorological Tower	0.3**	WNW
9	State Beach Park	0.6	ESE
10	Bluff	0.7	WNW
11	Mesa EOF	0.7	NNW
12	Former SONGS Evaporation Pond	0.6	NW
13	Marine Corps Base (Camp Pendleton East)	0.7	E
Soil Samples			
1	Camp San Onofre	2.5	NE
2	Old Route 101 - East Southeast	3.0	ESE
3	Basilone Road/I-5 Freeway Offramp	2.0	NW
4	Huntington Beach Generating Station	37.0	NW
5	Former Visitor's Center	0.2**	NNW
Ocean Water			
A	Station Discharge Outfall - Unit 1	0.5	SSW
B	Outfall - Unit 2	0.7	SW
C	Outfall - Unit 3	0.7	SW
D	Newport Beach	30.0	NW

* Distance (miles) and Direction (sector) are measured relative to Units 2 and 3 midpoint. Direction is determined from degrees true north.

** Distances are within the Units 2 and 3 Site boundary (0.4 mile in all sectors) and not required by Technical Specification.

TABLE 5-1

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

	TYPE OF SAMPLE AND SAMPLING LOCATION	DISTANCE* (miles)	DIRECTION*
Drinking Water			
1	Tri-Cities Municipal Water District Reservoir	8.7	NW
2	San Clemente Golf Course Well	3.5	NNW
3	Huntington Beach	37.0	NW
Shoreline Sediment (Beach Sand)			
1	San Onofre State Beach (0.6 mile Southeast)	0.6	SE
2	San Onofre Surfing Beach	0.9	NW
3	San Onofre State Beach (3.1 miles Southeast)	3.1	SE
4	Newport Beach (North End)	30.0	NW
Local Crops			
1	San Mateo Canyon (San Clemente Canyon)	2.6	NW
2	Southeast of Oceanside	22.0	SE

D

* Distance (miles) and Direction (sector) are measured relative to Units 2 and 3 midpoint. Direction is determined from degrees true north.

TABLE 5-1

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

TYPE OF SAMPLE AND SAMPLING LOCATION		DISTANCE* (miles)	DIRECTION*
Non-Migratory Marine Animals			
A	Unit 1 Outfall	0.9	WSW
B	Units 2 and 3 Outfall	1.5	SSW
C	Newport Beach	18.2	NW
Kelp			
A	San Onofre Kelp Bed	1.5	S
B	San Mateo Kelp Bed	3.8	WNW
C	Barn Kelp Bed	6.3	SSE
D	Newport Beach	15.6	NW
Ocean Bottom Sediments			
A	Unit 1 Outfall (0.5 mile West)	0.6	W
B	Unit 1 Outfall (0.6 mile West)	0.8	SSW
C	Unit 2 Outfall	1.6	SW
D	Unit 3 Outfall	1.2	SSW
E	Newport Beach	18.2	NW

R

* Distance (miles) and Direction (sector) are measured relative to Units 2 and 3 midpoint. Direction is determined from degrees true north.

TABLE 5-2

PIC - RADIOLOGICAL ENVIRONMENTAL MONITORING LOCATIONS
SONGS 1

PRESSURIZED ION CHAMBERS		Theta (Degrees)*	DISTANCE* Meters	miles	DIRECTION/SECTOR*	
S1	San Onofre Beach	298°	1070	0.7	WNW	P
S2	SONGS Former Evap. Pnd	313°	890	0.6	NW	Q
S3	Japanese Mesa	340°	1150	0.7	NNW	R
S4	MCB - Camp Pendleton	3°	1120	0.7	N	A
S5	MCB - Camp Pendleton	19°	1050	0.6	NNE	B
S6	MCB - Camp Pendleton	46°	940	0.6	NE	C
S7	MCB - Camp Pendleton	70°	870	0.5	ENE	D
S8	MCB - Camp Pendleton	98°	1120	0.7	E	E
S9	San Onofre State Beach	121°	940	0.6	ESE	F

* Distance (meters/miles) and Direction (sector) are measured relative to Units 2 and 3 midpoint. Theta direction is determined from degrees true north.

TABLE 5-3

SECTOR AND DIRECTION DESIGNATION FOR RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATION MAP

DEGREES TRUE NORTH FROM SONGS 2 AND 3 MID-POINT			NOMENCLATURE	
Sector Limit	Center Line	Sector Limit	22.5° Sector*	Direction
348.75	0 & 360	11.25	A	N
11.25	22.5	33.75	B	NNE
33.75	45.0	56.25	C	NE
56.25	67.5	78.75	D	ENE
78.75	90.0	101.25	E	E
101.25	112.0	123.75	F	ESE
123.75	135.0	146.25	G	SE
146.25	157.0	168.75	H	SSE
168.75	180.0	191.25	J	S
191.25	202.5	213.75	K	SSW
213.75	225.0	236.25	L	SW
236.25	247.5	258.75	M	WSW
258.75	270.0	281.15	N	W
281.25	292.5	303.75	P	WNW
303.75	315.0	326.25	Q	NW
326.25	337.5	348.75	R	NNW

* Distance (miles) and Direction (sector) are measured relative to Units 2 and 3 midpoint. Direction is determined from degrees true North.

FIGURE 5-1
DECEMBER 1990
REVISION 1