ATTACHMENT C

ODCM, Revision 22

OFFSITE DOSE CALCULATION MANUAL

NUCLEAR GENERATION SITE

UNITS 2 AND 3

ODCM2
3081c.man

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Revision 22
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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 enumerates dose and concentration specifications, instrument requirements, as well as describes the methodology and parameters to be used in the calculation of offsite doses due to radioactive liquid and gaseous effluents. In order to meet release limitations it additionally calculates the liquid and gaseous effluent monitoring instrumentation alarm/trip setpoints. The environmental section 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 Specifications and acceptable methodologies and calculations to be used in implementing the 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.

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1.0 LIQUID EFFLUENTS

1.1 CONCENTRATION

SPECIFICATION

1.1.1 The concentration of radioactive material released from the site (see Figure 1-2) shall be limited to the concentrations specified in 10 CFR Part 20, Appendix B, Table II, column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2×10^{-4} microcuries/ml total activity.

APPLICABILITY: At all times

ACTION:

With the concentration of radioactive material released from the site exceeding the above limits, immediately restore the concentration to within the above limits.

SURVEILLANCE REQUIREMENTS

.1 Radioactive liquid wastes shall be sampled and analyzed according to the sampling and analysis program of Table 1-1. R

.2 The results of the radioactivity analyses shall be used in accordance with the methodology and parameters in Section 1.4 to assure that the concentrations at the point of release are maintained within the limits of Specification 1.1.1.

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TABLE 1-1

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) ($\mu Ci/ml$)[a]
A. Batch Waste Release[d]	P Each Batch	P Each Batch	Principal Gamma Emitters[f]	$5x10^{-7}$
			I-131	$1x10^{-6}$
	P One Batch/M	M	Dissolved and Entrained Gases (Gamma emitters)	$1x10^{-5}$
	P Each Batch	M Composite[b]	H-3	$1x10^{-5}$
			Gross Alpha	$1x10^{-7}$
	P Each Batch	Q Composite[b]	Sr-89, Sr-90	$5x10^{-8}$
			Fe-55	$1x10^{-6}$

NOTE BATCH RELEASE PATHWAYS: Primary Plant Makeup Storage Tanks, Radwaste Primary Tanks, Radwaste Secondary Tanks, Miscellaneous Waste Condensate Monitor Tanks, Blowdown Processing Sump, FFCPD sumps (high conductivity, low conductivity).

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) ($\mu Ci/ml$)[a]
B. Continuous Releases[e,*]	D Grab Sample	W Composite[c]	Principal Gamma Emitters[f]	$5x10^{-7}$
			I-131	$1x10^{-6}$
	M Grab Sample	M	Dissolved and Entrained Gases (Gamma emitters)	$1x10^{-5}$
	D Grab Sample	M Composite[c]	H-3	$1x10^{-5}$
			Gross Alpha	$1x10^{-7}$
	D Grab Sample	Q Composite[c]	Sr-89, Sr-90	$5x10^{-8}$
			Fe-55	$1x10^{-6}$

NOTE CONTINUOUS RELEASE PATHWAYS: Turbine Plant Sump, Blowdown Processing Sump,** S/G Blowdown Bypass Line***, S/G Blowdown, Salt Water Discharge from CCW Heat Exchanger.

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TABLE NOTATION

a. The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

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

$$LLD = \frac{4.66\ s_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

where:

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

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

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

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

2.22×10^6 is the number of transformations per minute per microcurie,

Y is the fractional radiochemical yield (when applicable),

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

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

The value of s_b used in the calculation of the LLD for a particular measurement system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance.

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

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

#For a more complete discussion of the LLD, and other detection limits, see the following:
(1) HASL Procedures Manual, HASL-300 (revised annually).
(2) Currie, L. A., "Limits for Qualitative Detection and Quantitative Determination - Application to Radiochemistry" Anal. Chem. 40, 586-93 (1968).
(3) Hartwell, J. K., "Detection Limits for Radioisotopic Counting Techniques," Atlantic Richfield Hanford Company Report ARH-2537 (June 22, 1972).

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TABLE 1-1 (Continued)

TABLE NOTATION

b. A composite sample is one in which the quantity of liquid sampled is proportional to the quantity of liquid waste discharged and in which the method of sampling employed results in a specimen which is representative of the liquids released.

c. To be representative of the quantities and concentrations of radioactive materials in liquid effluents, samples shall be collected continuously in proportion to the rate of flow of the effluent stream. Prior to analysis, all samples taken for the composite shall be thoroughly mixed in order for the composite sample to be representative of the effluent release.

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

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

f. The principal gamma emitters for which the LLD specification applies exclusively are the following radionuclides: Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141, and Ce-144. This list does not mean that only these nuclides are to be detected and reported. Other peaks which are measurable and identifiable, together with the above nuclides, shall also be identified and reported.

* Administrative controls shall provide for composite sampling of the continuous releases per note b vice note c until January 1, 1983. Continuous proportional sampling shall be in accordance with note c from January 1, 1983 and all times subsequent as required by Table 1-1.

** The first sump volume of BPS ion exchanger regeneration process shall be treated as a batch release. | A

*** Sampling of this flow is not required if at least once per 31 days blowdown bypass isolation valve (S21301MU618 for Steam Generator 2E088, S21301MU619 for Steam Generator 2E089, S31301MU618 for Steam Generator 3E088 and S31301MU619 for Steam Generator 3E089) is verified locked shut.

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1.2 DOSE

SPECIFICATION

1.2.1 The dose or dose commitment to an individual from radioactive materials in liquid effluents released, from each reactor unit, from the site (see Figure 1-2) shall be limited:

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

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

APPLICABILITY: At all times

ACTION:

a. With calculated dose from the release of radioactive materials in liquid effluents exceeding any of the above limits, in lieu of any other report required by Technical Specification 6.9.1, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions taken to reduce the releases and the proposed actions to be taken to assure that subsequent releases will be in compliance with Specification 1.2.1.

SURVEILLANCE REQUIREMENTS

.1 Dose Calculation. Cumulative dose contributions from liquid effluents shall be determined in accordance with Section 1.5 at least once per 31 days.

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1.0 **LIQUID EFFLUENTS** (Continued)

1.3 LIQUID WASTE TREATMENT

SPECIFICATION

1.3.1 The liquid radwaste treatment system shall be OPERABLE. The appropriate portions of the system shall be used to reduce the radioactive materials in liquid wastes prior to their discharge when the projected doses due to the liquid effluent from the site (see Figure 1-2) when averaged over 31 days, would exceed 0.06 mrem to the total body or 0.2 mrem to any organ.*

APPLICABILITY: At all times

ACTION:

a. With radioactive liquid waste being discharged without treatment and in excess of the above limits, in lieu of any other report required by Technical Specification 6.9.1, prepare and submit to the Commission within 30 days pursuant to Technical Specification 6.9.2 a Special Report which includes the following information: R

1. Explanation of why liquid radwaste was being discharged without treatment, identification of the inoperable equipment or subsystems and the reason for inoperability, R

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

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

SURVEILLANCE REQUIREMENTS

.1 Doses due to liquid releases shall be projected at least once per 31 days, in accordance with Section 3.1.

.2 During plant operation (Mode 1-4), the appropriate portions of the liquid radwaste treatment system shall be demonstrated OPERABLE by operating the liquid radwaste treatment system equipment for at least 15-minutes at least once per 92 days unless the liquid radwaste system has been utilized to process radioactive liquid effluents during the previous 92 days. R

.3 In plant shut-down (Mode 5, 6) the appropriate portions of the liquid radwaste treatment system shall be demonstrated OPERABLE by operating the liquid radwaste treatment system equipment for at least 15-minutes prior to processing liquids unless the appropriate liquid radwaste system has been utilized to process radioactive liquid effluents during the previous 92 days. R

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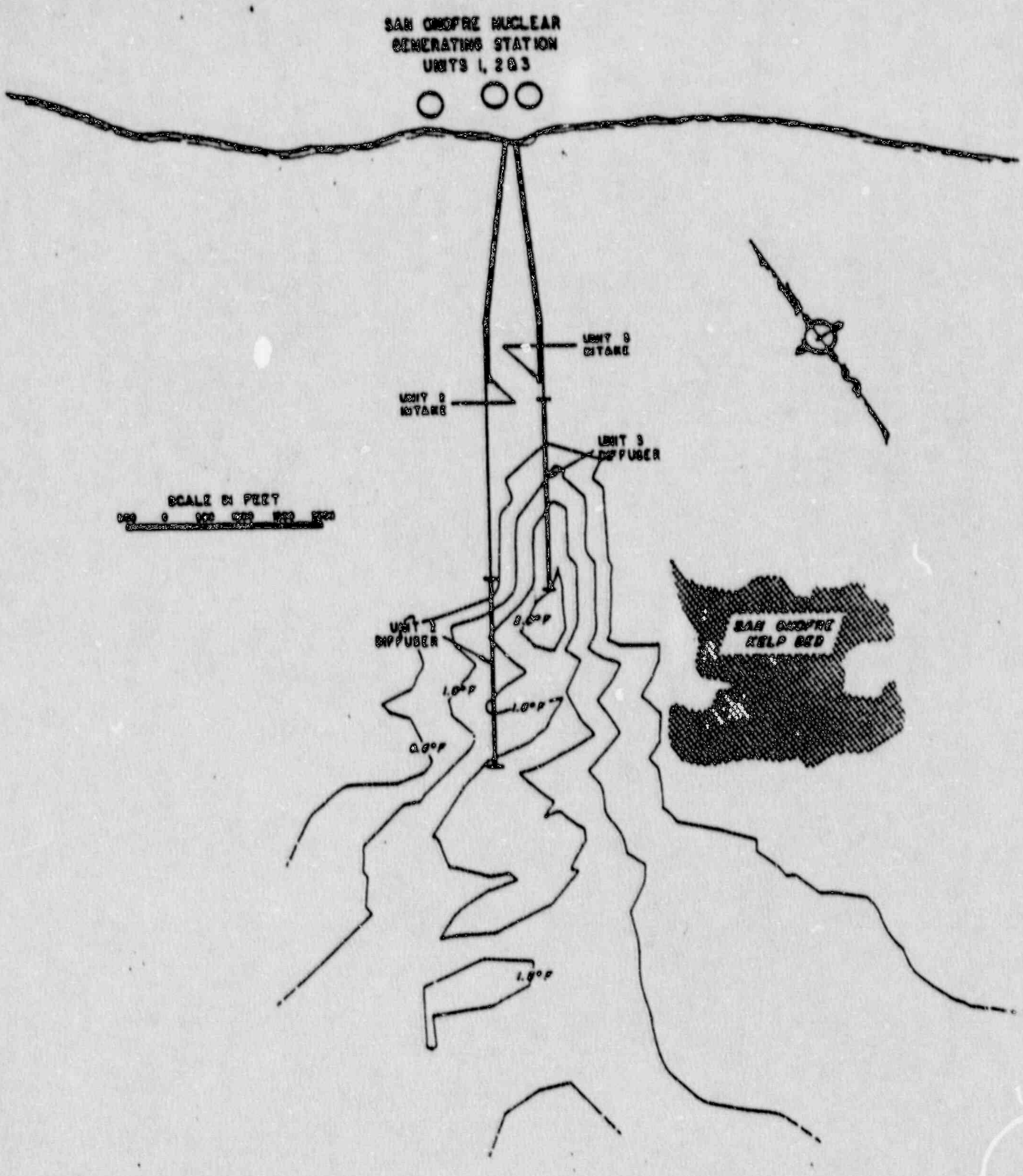
*Per reactor unit



SITE BOUNDARY FOR LIQUID EFFLUENTS

FIGURE 1-2

REFERENCE: TECHNICAL SPECIFICATIONS, FIGURE 5.1-4

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1.4 Liquid Effluent Monitor Methods of Setpoint Calculation

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 this specification and for the purpose of implementation of specification 1.1.1, 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,

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

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1.4 Liquid Effluent Monitor Methods of Setpoint Calculation (Continued)

where:

F_i = fractional concentration of the ith radionuclide as obtained by sample analysis.

N = number of radionuclides identified in sample analysis.

MPC_i = MPC of the ith 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 (F) is 185,000 gpm per circ pump (4 total) and 17,000 gpm per saltwater pump (2 total).

The design flowrate of each circulating water pump is 205,000 gpm. The value used in the determination of F takes into account factors such as frictional losses, pump inefficiency, and tidal flow, and provides reasonable assurance that the radioactive release concentration is not underestimated.

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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 rev... ... necessary. |R

1.4.1 Batch Release Setpoint Determination

The waste flow (R) and monitor setpoint (c) 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:

<u>STEP 1</u>: The isotopic concentration for each batch tank (or sump) to be released is obtained from the sum of the measured concentrations in the tank (or sump) 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 batch 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)

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1.4.1 **Batch Release Setpoint Determination** (Continued)

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

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 (or sump) is determined using:

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

$MPC_{\gamma i}$, 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.

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 (cpm) is taken from the applicable calibration constants given in Table 1-3 to correspond to the calculated monitor concentration limit C_m (μCi/ml).

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1.4.1 Batch Release Setpoint Determination (Continued)

1.4.1.1 RADWASTE DISCHARGE LINE MONITOR (2/3-7813)

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

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

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).

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

$(\sum_i C_{\gamma i})_1$, $(\sum_i C_{\gamma i})_2$, 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 Primary Tanks R = 140 gpm/pump (x no. of pumps to be run)

Radwaste Secondary Tanks R = 140 gpm/pump (x no. of pumps to be run)

Primary Plant Makeup Tank R = 160 gpm/pump (x no. of pumps to be run)

Condensate Monitor Tanks R = 100 gpm/pump (x no. of pumps to be run)

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1.4.1.1 <u>RADWASTE DISCHARGE LINE MONITOR (2/3-7813)</u> (Continued)

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_{7813} and SG_{88-2}, SG_{89-2}, SG_{88-3}, SG_{89-3}, B_2, B_3, T_2, T_3 are administrative values used for simultaneous releases from the Radwaste Effluent discharge and any or all of the four Steam Generators as well as continuous discharges from the two Blowdown Processing Systems and the two Turbine Plant Sumps. The fractions RW_{7813} and SG_{88-2}, SG_{89-2}, SG_{88-3}, SG_{89-3}, B_2, [illegible], T_2, T_3 will be assigned such that $RW_{7813} + SG_{88-2} + SG_{89-2} + SG_{88-3} + SG_{89-3} + B_2 + B_3 + T_2 + T_3 \leq 1.0$.

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1.4.1.1 RADWASTE DISCHARGE LINE MONITOR (2/3-7813) (Continued)

The 1.0 is an administrative value used to account for the potential activity released simultaneously from other release points. 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 10 CFR 20, Appendix B, Table II, Column 2 from the site.

NOTE: If $C_m \le C_{eff}$, then no release is possible. To increase C_m, increase dilution flow F (by running more circulating water 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 2/3FI-7643, 2FIC-4055, 2FIC-4056, 3FIC-4055 or 3FIC-4056 as appropriate) 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.

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1.0 LIQUID EFFLUENTS (Continued)

1.4.1.2 NEUTRALIZATION SUMP/FULL FLOW CONDENSATE POLISHER DEMINERALIZER (FFCPD) SUMP DISCHARGE LINE MONITOR (batch) (2RT-7817, 3RT-7817)

The value for C_2 or C_3, the concentration limit at the Unit 2 or Unit 3 detector, is determined by using:

$$C_2 \leq \frac{(B_2)(F)\sum_i C_{\gamma i}}{(R)(C/MPC_{eff})} \quad (1\text{-}7)$$

$$C_3 \leq \frac{(B_3)(F)\sum_i C_{\gamma i}}{(R)(C/MPC_{eff})} \quad (1\text{-}8)$$

where:

C, $\sum_i C_{\gamma i}$, MPC_{eff} = the values of C, $\sum_i C_{\gamma i}$ and MPC_{eff} as defined in STEPS 1) and 2) for the Neutralization Sump/FFCPD Sumps.

Neutralization Sump	R = 500 gpm
FFCPD High Conductivity Sump	R = 500 gpm
FFCPD Low Conductivity Sump	R = 600 gpm

C_2 = the instantaneous concentration at the detector (2RT-7817) in $\mu Ci/cc$

C_3 = the instantaneous concentration at the detector (3RT-7817) in $\mu Ci/cc$

B_2 and B_3 are administrative values used to account for simultaneous releases from both SONGS 2 and SONGS 3 neutralization sumps. The fractions B_2 and B_3 (each normally set to 0.05) will be assigned such that $RW_{7813} + SG_{88\text{-}2} + SG_{89\text{-}2} + SG_{88\text{-}3} + SG_{89\text{-}3} + B_2 + B_3 + T_2 + T_3 \leq 1.0$.

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1.4.1.2 NEUTRALIZATION SUMP/FULL FLOW CONDENSATE POLISHER DEMINERALIZER (FFCPD) SUMP DISCHARGE LINE MONITOR (batch) (2RT-7817, 3RT-7817) (Continued)

NOTE: If C_2 or $C_3 \le \sum_i C_{\gamma i}$, then no release is possible. To increase C_2 or C_3, increase dilution flow F (by running more pumps), and/or decrease the effluent flow rate R, (by throttling the flow as measured on 2FI-3722 and 3FI-3772), and recalculate C_2 or C_3 using the new F, R and equation (1-7) or (1-8).

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.

1.4.2 Continuous 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 the continuous releases are obtained for each release stream (steam generator blowdown, steam generator blowdown bypass, blowdown neutralization sump and turbine plant sump) from the sum of the respective measured concentrations as determined by analysis: R

$$C = \sum_i C_{\gamma i} + C_\alpha + C_t + C_s + C_{Fe} \quad (1\text{-}9)$$

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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.

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

C_t = the total measured H-3 concentration (μCi/ml) determined from the previously 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, blowdown neutralization sump, or turbine plant sump) is determined using:

$$MPC_{eff} = \frac{1}{\sum_i \frac{(C_{\gamma i}/C)}{(MPC_i)} + \frac{(C_s/C)}{(MPC_s)} + \frac{(C_\alpha/C)}{(MPC_\alpha)} + \frac{(C_{Fe}/C)}{(MPC_{Fe})} + \frac{(C_t/C)}{(MPC_t)}} \quad (1\text{-}10)$$

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1.4.2 Continuous Release Setpoint Determination (Continued)

STEP 3: The setpoint, C_m (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 (cpm) is taken from the applicable calibration constants given in Table 1-3 to correspond to the calculated monitor limit C_m (μCi/ml).

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1.4.2.1 NEUTRALIZATION SUMP DISCHARGE LINE MONITORS (2RT-7817, 3RT-7817)

The value for C_2 or C_3, the concentration limit at the Unit 2 or Unit 3 detector is determined by using:

$$C_2 \leq \frac{(B_2)(F)\sum_i C_{\gamma i}}{(R)(C/MPC_{eff})} \quad (1\text{-}11)$$

$$C_3 \leq \frac{(B_3)(F)\sum_i C_{\gamma i}}{(R)(C/MPC_{eff})} \quad (1\text{-}12)$$

where:

C, $\sum_i C_{\gamma i}$, MPC_{eff} = the values of C, $\sum_i C_{\gamma i}$ and MPC_{eff} as defined in STEPS 1 and 2 for the Steam Generator blowdown/BPS neutralization sump. R

R = The effluent flow rate at the radiation monitor as defined in STEP 2 (maximum of 500 gpm).

C_2 = the instantaneous concentration at the Unit 2 detector (2RT-7817) in μCi/cc

C_3 = the instantaneous concentration at the Unit 3 detector (3RT-7817) in μCi/cc

B_2 and B_3 are administrative values used to account for simultaneous releases from both SONGS 2 and SONGS 3 neutralization sumps. The fractions B_2 and B_3 will be assigned such that $RW_{7813} + SG_{88-2} + SG_{89-2} + SG_{88-3} + SG_{89-3} + B_2 + B_3 + T_2 + T_3 \leq 1.0$ APPROVED AUG 02 1990

1.4.2.1 <u>NEUTRALIZATION SUMP DISCHARGE LINE MONITOR (2RT-7817, 3RT-7817)</u> (Continued)

NOTE: If C_2 or $C_3 \leq \Sigma C_{\gamma i_i}$, then no release is possible. To increase C_2 or C_3, increase dilution flow F (by running more circulating water pumps), and/or decrease the effluent flow rate R, (by throttling the flow as measured on 2FI-3722 and 3FI-3772), and recalculate C_2 or C_3 using the new F, R and equation (1-11) or (1-12).

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.

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1.4.2.2 STEAM GENERATOR BLOWDOWN BYPASS DISCHARGE LINE MONITORS (2RT-6753, 2RT-6759, 3RT-6753, 3RT-6759)

The value for C_{59-2}, C_{53-2}, C_{59-3} or C_{53-3}, the concentration limit at the Unit 2 or Unit 3 detectors, is determined by using:

$$C_{59-2} \leq \frac{(SG_{88-2})(F)\sum_i C_{\gamma i}}{(R)(C/MPC_{eff})} \quad (1\text{-}13)$$

$$C_{53-2} \leq \frac{(SG_{89-2})(F)\sum_i C_{\gamma i}}{(R)(C/MPC_{eff})} \quad (1\text{-}14)$$

$$C_{59-3} \leq \frac{(SG_{88-3})(F)\sum_i C_{\gamma i}}{(R)(C/MPC_{eff})} \quad (1\text{-}15)$$

$$C_{53-3} \leq \frac{(SG_{89-3})(F)\sum_i C_{\gamma i}}{(R)(C/MPC_{eff})} \quad (1\text{-}16)$$

where:

C, $\sum_i C_{\gamma i}$, MPC_{eff} = values of C, $\sum_i C_{\gamma i}$ and MPC_{eff} (as defined in STEPS 1 and 2 above) for the steam generator blowdown bypass.

R = the maximum blowdown bypass effluent flowrate per steam generator, 200 gpm.

C_{59-2} = the instantaneous concentration at the Unit 2 detector (2RT-6759) in μCi/ml

C_{53-2} = the instantaneous concentration at the Unit 2 detector (2RT-6753) in μCi/ml

C_{59-3} = the instantaneous concentration at the Unit 3 detector (3RT-6759) in μCi/ml

C_{53-3} = the instantaneous concentration at the Unit 3 detector (3RT-6753) in μCi/ml

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1.4.2.2 STEAM GENERATOR BLOWDOWN BYPASS DISCHARGE LINE MONITORS (2RT-6753, 2RT-6759, 3RT-6753, 3RT-6759) (Continued)

RW_{7813} and SG_{88-2}, SG_{89-2}, SG_{88-3}, SG_{89-3}, B_2, B_3, T_2, T_3 are administrative values used for simultaneous releases from the Radwaste Effluent discharge and any or all of the four Steam Generators as well as continuous discharges from the two Blowdown Processing Systems and the two Turbine Plant Sumps. The fractions RW_{7813} and SG_{88-2}, SG_{89-2}, SG_{88-3}, SG_{89-3}, B_2, B_3, T_2, T_3 will be assigned such that $RW_{7813} + SG_{88-2} + SG_{89-2} + SG_{88-3} + SG_{89-3}$ $B_2 + B_3 + T_2 + T_3 \leq 1.0$.

The 1.0 is an administrative value used to account for the potential activity released simultaneously from other release points. 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 10 CFR 20, Appendix B, Table II, Column 2 from the site.

NOTE: If C_{59-2}, C_{53-2}, C_{59-3}, or $C_{53-3} \leq \sum_i C_{\gamma i}$ (for the respective steam generator), then no release is possible. To increase C_{59-2}, C_{53-2}, C_{59-3} or C_{53-3}, increase dilution flow F (by running more circulating water pumps), and/or decrease the effluent flow rate R (by throttling the flow as measured on 2FIC-4055, 2FIC-4056, 3FIC-4055, 3FIC-4056 or 2/3FI-7643, as appropriate) and recalculate C_{59-2}, C_{53-2}, C_{59-3} or C_{53-3} using the new values of F, R and equation (1-13), (1-14), (1-15) or (1-16).

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1.4.2.2 <u>STEAM GENERATOR BLOWDOWN BYPASS DISCHARGE LINE MONITORS (2RT-6753, 2RT-6759, 3RT-6753, 3RT-6759)</u> (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.

1.4.2.3 <u>TURBINE PLANT SUMP MONITORS (2RT-7821, 3RT-7821)</u>

The value for C_2 or C_3 (the concentration limit at the Unit 2 or Unit 3 detector) is determined by using:

$$C_2 \leq \frac{(T_2)(F)\sum_i C_{\gamma i}}{(R)(C/MPC_{eff})} \qquad (1\text{-}17)$$

$$C_3 \leq \frac{(T_3)(F)\sum_i C_{\gamma i}}{(R)(C/MPC_{eff})} \qquad (1\text{-}18)$$

where:

C, $\sum_i C_{\gamma i}$, MPC_{eff} = values of C, $\sum_i C_{\gamma i}$ and MPC_{eff} (as defined in STEPS 1 and 2 above) for the turbine plant sump

R = 50 gpm/pump (x no. sump pumps to be run)

C_2 = the instantaneous concentration at the Unit 2 detector (2RT-7821) in µCi/ml.

C_3 = the instantaneous concentration at the Unit 3 detector (3RT-7821) in µCi/ml.

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1.4.2.3 TURBINE PLANT SUMP MONITORS (2RT-7821, 3RT-7821) (Continued)

T_2 and T_3 are administrative values used to account for simultaneous releases from both SONGS 2 and SONGS 3 turbine plant sumps. The fractions T_2 and T_3 will be assigned such that $RW_{7813} + SG_{88-2} + SG_{89-2} + SG_{88-3} + SG_{89-3}\ B_2 + B_3 + T_2 + T_3 \leq 1.0$.

NOTE: If C_2 or $C_3 \leq \Sigma_i C_{vi}$ (for the respective sump), then no release is possible. To increase C_2 or C_3, increase the dilution flow F (by running more circulating water pumps) and recalculate C_2 or C_3 using the new value of F and equation (1-17) or (1-18).

Use of a temporary discharge path from the Turbine Plant Sump is allowed providing the radiation monitor, 7821, in service and the normal discharge path is used concurrently. Temporary pumps facilitate faster discharge when draining the condenser to the outfall via this pathway. The following conditions shall be met:

a. The release permit shall account for the entire volume of water discharged from the Turbine Plant Sump.

b. The alarm setpoint for the monitor shall be adjusted to take into account the entire discharge flow through both the normal and temporary paths.

c. Procedures shall require the immediate termination of the discharge via the temporary path if the monitor on the normal path alarms.

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1.4.2.3 TURBINE PLANT SUMP MONITORS (2RT-7821, 3RT-7821) (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.

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Table 1-3

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

MONITOR	Co-60	Ba-133	Cs-137
2RT-6753		1.80E-8	1.91E-8
2RT-6759		2.14E-8	1.99E-8
3RT-6753		1.79E-8	1.91E-8
3RT-6759		1.94E-8	1.94E-8
2/3RT-7813	2.10E-9	3.54E-9	5.17E-9
2RT-7817	2.12E-9	3.64E-9	5.25E-9
2RT-7821	2.10E-9	3.58E-9	5.21E-9
3RT-7817	2.13E-9	3.63E-9	5.26E-9
3RT-7821	2.11E-9	3.60E-9	5.19E-9

R

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

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1.0 LIQUID EFFLUENTS (Continued)

1.5 Dose Calculation for Liquid Effluents

The dose commitment to an individual from radioactive materials in liquid effluents released to unrestricted areas are calculated for the purpose of implementing Specification 1.2.1 using the following expression.

$$D_\tau = \sum_i [A_{i\tau} \sum_j (\Delta t_j \, C_{ij} \, F_j)] \qquad (1\text{-}19)$$

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 1-4 in mrem/hr per μCi/ml.

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

D_τ = the dose commitment to the total body or an organ, τ, from the liquid effluent for the time period, Δt_j, in mrem

F_j = the near field 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 $\dfrac{\text{maximum liquid radioactive waste flow}}{\text{discharge structure exit flow}}$

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

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TABLE 1-4

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

Radio-Nuclide	Total Body	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI
H-3	2.80E-1		2.80E-1	2.80E-1	2.80E-1	2.80E-1	2.80E-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	5.60E0			3.30E0	1.20E0	7.04E0	1.40E3
Mn-54	1.35E3		7.08E3		2.11E3		2.17E4
Mn-56	3.15E1		1.78E2		2.26E2		5.67E3
Fe-55	8.24E3	5.12E4	3.53E4			1.97E4	2.03E4
Fe-59	7.27E4	8.07E4	1.90E5			5.30E4	6.23E5
Co-57	2.36E2		1.42E2				3.60E3
Co-58	1.35E3		6.04E2				1.22E4
Co-60	3.83E3		1.74E3				3.26E4
Cu-64	1.01E2		2.14E2		5.40E2		1.83E4
Zn-65	2.32E5	1.61E5	5.13E5		3.43E5		3.23E5
Br-84	9.39E-2		2.14E2				7.37E-7
Rb-88	9.49E-1		1.79E0				0.00E0
Sr-89	1.43E2	4.99E3					8.00E2
Sr-90	3.01E4	1.23E5					3.55E3
Sr-91	3.71E0	9.18E1					4.37E2
Sr-92	1.50E0	3.48E1					6.90E2
Y-90	1.62E-1	6.06E0					6.42E4
Y-91m	2.22E-3	5.72E-2					1.68E-1
Y-92	1.55E-2	5.32E-1					9.32E3
Zr-95	3.47E0	1.60E1	5.12E0		8.03E0		1.62E4
Zr-97	8.14E-2	8.80E-1	1.80E-1		2.70E-1		5.51E4
Nb-95	5.51E-1	1.84E0	1.02E0		1.01E0		6.22E3
Nb-95m	5.51E-1	1.84E0	1.02E0		1.01E0		6.22E3
Nb-97	1.43E-3	1.55E-2	3.91E-3		4.56E-3		1.44E1
Mo-99	2.44E1		1.28E2		2.90E2		2.97E2
Tc-99m	4.66E-1	1.30E-2	3.66E-2		5.56E-1	1.79E-2	2.17E1
Ru-103	4.61E1	1.07E2			4.08E2		1.25E4
Ru-106	2.01E2	1.59E3			3.07E3		1.03E5
Ag-110m	8.61E2	1.57E3	1.45E3		2.85E3		5.91E5
Sn-113							2.20E5
Sb-124	1.10E2	2.77E2	5.23E0	6.70E-1			7.85E3
Sb-125	4.42E1	2.20E2	2.37E0	2.00E-1		2.30E4	1.94E3
Te-129m	1.48E2	9.33E2	3.48E2	3.20E2	3.89E3		4.67E3
Te-132	1.24E2	2.04E2	1.32E2	1.46E2	1.27E3		6.25E3
I -131	1.79E2	2.18E2	3.12E2	1.02E5	5.36E2		8.24E1
I- 132	9.96E0	1.06E1	2.84E1	9.96E2	4.54E1		5.35E0
I -133	3.95E1	7.46E1	1.30E2	1.91E4	2.26E2		1.17E2
I -134	5.40E0	5.56E0	1.51E1	2.52E2	2.40E1		1.32E-2
I -135	2.24E1	2.32E1	6.08E1	4.01E3	9.75E1		6.87E1

*Source: USNRC NUREG-0133, Section 4.3.1

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TABLE 1-4

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

Radio-Nuclide	Total Body	Bone	Liver	Thyroid	Kidney	Lung	GI-LLI
Cs-134	1.33E4	6.84E3	1.63E4		5.27E3	1.75E3	2.85E2
Cs-136	2.04E3	7.16E2	2.83E3		1.57E3	2.16E2	3.21E2
Cs-137	7.85E3	8.77E3	1.20E4		4.07E3	1.35E3	2.32E2
Cs-138	5.94E0	6.07E0	1.20E1		8.81E0	8.70E-1	5.11E-5
Ba-139	2.30E-1	7.85E0	5.59E-3		5.23E-3	3.17E-3	1.39E1
Ba-140	1.08E2	1.65E3	2.07E0		7.00E-1	1.18E0	3.39E3
La-140	2.10E-1	1.58E0	8.00E-1				5.84E4
Ce-141	2.60E-1	3.43E0	2.32E0		1.08E0		8.86E3
Ce-143	4.94E-2	6.00E-1	4.46E2		2.00E-1		1.67E4
Ce-144	9.59E0	1.99E2	7.47E1		4.43E1		6.04E4
Nd-147	2.74E-1	3.96E0	4.58E0		2.68E0		2.20E4
W -187	2.68E0	9.16E0	7.66E0				2.51E3
Np-239	1.92E-3	3.53E-2	3.47E-3		1.08E-2		7.13E2

*Source: USNRC NUREG-0133, Section 4.3.1

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1.0 LIQUID EFFLUENTS (Continued)

1.6 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-5.11. "Units 2/3 Liquid Effluent Release Permit" and SO123-III-5.2.23, "Units 2/3 Liquid Effluent Sample Collection".

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2.0 GASEOUS EFFLUENTS

2.1 DOSE RATE

SPECIFICATION

2.1.1 The dose rate in unrestricted areas due to radioactive materials released in gaseous effluents from the site (see Figure 2-2) shall be limited to the following:

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

b. For all radioiodines, tritium and for all radioactive materials in particulate form with half lives greater than 8 days: Less than or equal to 1500 mrem/yr to any organ.

APPLICABILITY: At all times

ACTION:

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

SURVEILLANCE REQUIREMENTS

.1 The dose rate due to noble gases in gaseous effluents shall be determined to be within the above limits in accordance with Section 2.7.

.2 The dose rate due to radioiodines, tritium and radioactive materials in particulate form with half lives greater than 8 days in gaseous effluents shall be determined to be within the above limits in accordance with Section 2.7 by obtaining representative samples and performing analyses in accordance with the sampling and analysis program specified in Table 2-1.

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TABLE 2-1

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

Gaseous Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (μCi/ml)[a]
Batch Waste Gas Decay Tank	P Each Tank Grab Sample	P Each Tank	Principal Gamma Emitters[g]	1×10^{-4}
Incinerated Oil[h]	Each Batch[i] Grab Sample	Each Batch[i]	Principal Gamma Emitters[g]	5×10^{-7}
Continuous	*	*	Principal Gamma Emitters[g]	1×10^{-4}
	*	*	Tritium	1×10^{-6}
	Continuous[f] Sampler	W[d] Charcoal Sample	I-131	1×10^{-12}
			I-133	1×10^{-10}
	Continuous[f] Sampler	W[d] Particulate Sample	Principal Gamma Emitters[g] (I-131 and Others)	1×10^{-11}
	Continuous[f] Sampler	M Composite Particulate Sample	Gross Alpha	1×10^{-11}
	Continuous[f] Sampler	Q Composite Particulate Sample	Sr-89 and Sr-90	1×10^{-11}
	Continuous[f] Monitor	Noble Gas Monitor	Noble Gases Gross Beta or Gamma	1×10^{-6}

*Sampling frequencies for noble gases and tritium are:

CONTINUOUS PATHWAYS:		
Containment Purge - 42"	:	Each Purge[b,c]
Containment Purge - 8"	:	Monthly Grab[b]
Condenser Air Ejector	:	Monthly Grab[b]
Plant Vent Stack	:	Weekly Grab[b,e]

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TABLE 2-1 (Continued)

TABLE NOTATION

a. The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

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

$$LLD = \frac{4.66\ s_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot \exp\ (-\lambda \Delta t)}$$

where:

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

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

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

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

2.22×10^6 is the number of transformations per minute per microcurie,

Y is the fractional radiochemical yield (when applicable),

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

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

The value of s_b used in the calculation of the LLD for a particular measurement system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance.

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

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

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*For a more complete discussion of the LLD, and other detection limits, see the following:
(1) HASL Procedures Manual, HASL-300 (revised annually).
(2) Currie, L. A., "Limits for Qualitative Detection and Quantitative Determination - Application to Radiochemistry" Anal. Chem. 40, 586-93 (1968).
(3) Hartwell, J. K., "Detection Limits for Radioisotopic Counting Techniques," Atlantic Richfield Hanford Company Report ARH-2537 (June 22, 1972).

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TABLE NOTATION

b. Analyses shall also be performed following shutdown, startup, or a THERMAL POWER change exceeding 15 percent of the RATED THERMAL POWER within a 1-hour period. This requirement does not apply if: (1) analysis shows that the DOSE EQUIVALENT I-131 concentration in the reactor coolant has not increased more than a factor of 3; and (2) the noble gas monitor shows that effluent activity has not increased more than a factor of 3. A

c. Tritium grab samples shall be taken at least once per 24 hours when the refueling canal is flooded.

d. Samples shall be changed at least once per 7 days and analyses shall be completed within 48 hours after changing (or after removal from sampler). Sampling shall also be performed at least once per 24 hours for at least 7 days following each shutdown, startup, or a THERMAL POWER change exceeding 15 percent of RATED THERMAL POWER in 1 hour and analyses shall be completed within 48 hours of changing. When samples collected for 24 hours are analyzed, the corresponding LLDs may be increased by a factor of 10. The latter requirement does not apply if: (1) analysis shows that the DOSE EQUIVALENT I-131 concentration in the reactor coolant has not increased more than a factor of 3; and (2) the noble gas monitor shows that effluent activity has not increased more than a factor of 3. A

e. Tritium grab samples shall be taken at least one per 7 days from the ventilation exhaust from the spent fuel pool area, whenever spent fuel is in the spent fuel pool.

f. The ratio of the sample flow rate to the sampled stream flow rate shall be known for the time period covered by each dose or dose rate calculation made in accordance with Specifications 2.1, 2.2, 2.3.

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

h. Incinerated oil may be discharged at points other than the plant vent stack. Release shall be accounted for based on pre-release grab sample data.

i. Samples for incinerated oil releases shall be collected from representative samples of filtered oil in liquid form.

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2.0 GASEOUS EFFLUENTS (Continued)

2.2 DOSE - NOBLE GASES

SPECIFICATION

2.2.1 The air dose due to noble gases released in gaseous effluents, from each reactor unit, from the site (see Figure 2-2) shall be limited to the following:

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

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

APPLICABILITY: At all times

ACTION:

a. With calculated air dose from radioactive noble gases in gaseous effluents exceeding any of the above limits, in lieu of any other report required by Technical Specification 6.9.1, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report which identifies the cause(s) for exceeding the limit(s) and defines the corrective actions taken to reduce releases and the proposed corrective actions to be taken to assure that subsequent releases will be in compliance with Specification 2.2.1.

SURVEILLANCE REQUIREMENTS

.1 Dose Calculations Cumulative dose contributions for the current calendar quarter and current calendar year shall be determined in accordance with Section 2.8 at least once per 31 days.

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2.3 DOSE - RADIOIODINES, RADIOACTIVE MATERIALS IN PARTICULATE FORM AND TRITIUM

SPECIFICATION

2.3.1 The dose to an individual from tritium, radioiodines and radioactive materials in particulate form with half-lives greater than 8 days in gaseous effluents released, from each reactor unit, from the site (see Figure 2-2) shall be limited to the following:

a. During any calendar quarter: Less than or equal to 7.5 mrem to any organ and,

b. During any calendar year: Less than or equal to 15 mrem to any organ.

c. Less than 0.1% of the limits of 2.3.1 (a) and (b) as a result of burning contaminated oil.

APPLICABILITY: At all times

ACTION:

a. With the calculated dose from the release of tritium, radioiodines, and radioactive materials in particulate form, with half lives greater than 8 days, in gaseous effluents exceeding any of the above limits, in lieu of any other report required by Technical Specification 6.9.1, prepare and submit to the Commission within 30 days pursuant to Technical Specification 6.9.2 a Special Report which identifies the cause(s) for exceeding the limit and defines the corrective actions taken to reduce releases and the proposed actions to be taken to assure that subsequent releases will be in compliance with Specification 2.3.1.

SURVEILLANCE REQUIREMENTS

.1 Dose Calculations Cumulative dose contributions for the current calendar quarter and current calendar year shall be determined in accordance with Section 2.8 at least once per 31 days.

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2.4 GASEOUS RADWASTE TREATMENT

SPECIFICATION

2.4.1 The GASEOUS RADWASTE TREATMENT SYSTEM and the VENTILATION EXHAUST TREATMENT SYSTEM shall be operable. The appropriate portions of the GASEOUS RADWASTE TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected gaseous effluent air doses due to gaseous effluent releases from the site (see Figure 2-2), when averaged over 31 days, would exceed 0.2 mrad for gamma radiation and 0.4 mrad for beta radiation. The appropriate portions of the VENTILATION EXHAUST TREATMENT SYSTEM shall be used to reduce radioactive materials in gaseous waste prior to their discharge when the projected doses due to gaseous effluent releases from the site (see Figure 2-2) when averaged over 31 days would exceed 0.3 mrem to any organ.*

APPLICABILITY: At all times

ACTION:

a. With gaseous waste being discharged without treatment and in excess of the above limits, in lieu of any other report required by Technical Specification 6.9.1, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report which includes the following information:

1. Explanation of why gaseous radwaste was being discharged without treatment, identification of the inoperable equipment or subsystems and the reason for inoperability, |A

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

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

SURVEILLANCE REQUIREMENTS

.1 Doses due to gaseous releases from the site shall be projected at least once per 31 days, in accordance with Section 3.2.

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*These doses are per reactor unit.

2.4 GASEOUS RADWASTE TREATMENT (Continued)

SURVEILLANCE REQUIREMENTS (Continued)

.2 During plant operation (Modes 1-4), the applicable portions of the GASEOUS RADWASTE TREATMENT SYSTEM and VENTILATION EXHAUST TREATMENT SYSTEM shall be demonstrated OPERABLE by operating the GASEOUS RADWASTE TREATMENT SYSTEM equipment and VENTILATION EXHAUST TREATMENT SYSTEM equipment for at least 15 minutes, at least once per 92 days unless the appropriate system has been utilized to process radioactive gaseous effluents during the previous 92 days. R

.3 In plant shut-down (Mode 5, 6) the applicable portions of the GASEOUS RADWASTE TREATMENT SYSTEM and VENTILATION EXHAUST TREATMENT SYSTEM shall be demonstrated OPERABLE by operating the GASEOUS RADWASTE TREATMENT SYSTEM equipment and VENTILATION EXHAUST TREATMENT SYSTEM equipment for at least 15-minutes prior to processing gases unless the appropriate gaseous radwaste system has been utilized to process radioactive gaseous effluents during the previous 92 days. R

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2.0 GASEOUS EFFLUENTS (Continued)

2.5 TOTAL DOSE

SPECIFICATION

2.5.1 The dose or dose commitment to any member of the public, due to releases of radioactivity and radiation, from uranium fuel cycle sources shall be limited to less than or equal to 25 mrem to the total body or any organ (except the thyroid, which shall be limited to less than or equal to 75 mrem) over 12 consecutive months.

APPLICABILITY: At all times

ACTION:

a. With the calculated doses from the release of radioactive materials in liquid or gaseous effluents exceeding twice the limits of Specifications 1.2.1.a, 1.2.1.b, 2.2.1.a, 2.2.1.b, 2.3.1.a, or 2.3.1.b in lieu of any other report required by Specification 6.9.1, prepare and submit a Special Report to the Director, Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, within 30 days, which defines the corrective action to be taken to reduce subsequent releases to prevent recurrence of exceeding the limits of Specification 2.5.1. This Special Report shall include an analysis which estimates the radiation exposure (dose) to a member of the public from uranium fuel cycle sources (including all effluent pathways and direct radiation) for a 12 consecutive month period that includes the release(s) covered by this report. If the estimated dose(s) exceeds the limits of Specification 2.5.1, and if the release condition resulting in violation of 40 CFR 190 has not already been corrected, the Special Report shall include a request for a variance in accordance with the provisions of 40 CFR 190 and including the specified information of paragraph 190.11(b). Submittal of the report is considered a timely request, and a variance is granted until staff action on the request is complete. The variance only relates to the limits of 40 CFR 190, and does not apply in any way to the requirements for dose limitation of 10 CFR Part 20, as addressed elsewhere in this ODCM.

SURVEILLANCE REQUIREMENTS

.1 Dose Calculations Cumulative dose contributions from liquid and gaseous effluents shall be determined in accordance with surveillance 1.2.1.1, 2.2.1.1, and 2.3.1.1.

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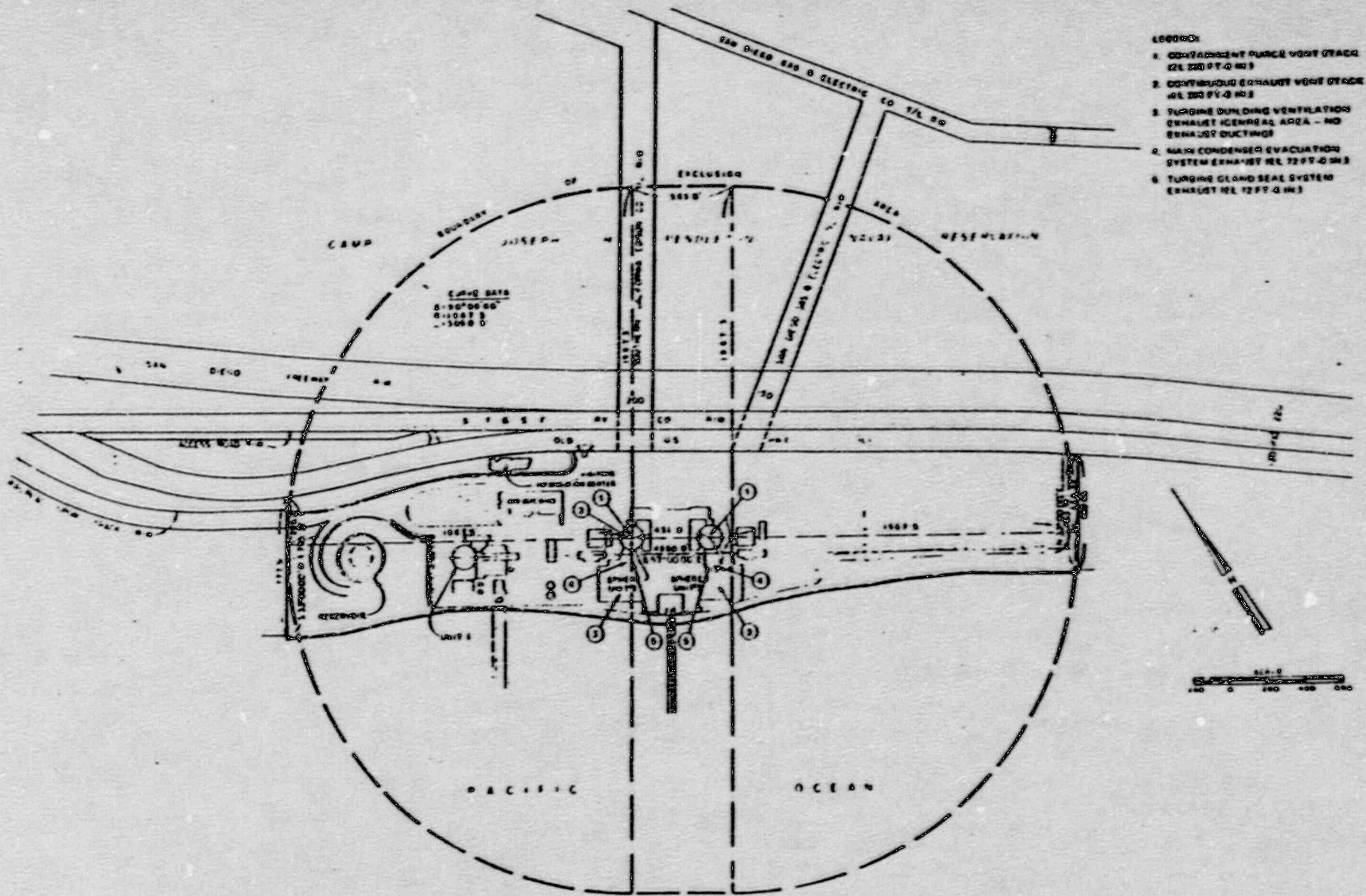

SITE BOUNDARY FOR GASEOUS EFFLUENTS

FIGURE 2-2

REFERENCE: TECHNICAL SPECIFICATIONS, FIGURE 5.1-3

2.6 Methods of Calculation for Gaseous Effluent Monitor Setpoints

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 and revised as required.

2.6.1 PLANT VENT STACK - 2/3RT-7808, 2RT-7865-1, 3RT-7865-1

2.6.1.1 2/3RT-7808 - Plant Vent Stack Monitor

For the purpose of implementation of Specification 2.1.1, the alarm setpoint level for noble gas monitors is based on the gaseous effluent flow rate and the meteorological dispersion factor.

Total Body

The concentration at the detector corresponding to a 500 mrem/yr total body dose rate at the exclusion area boundary is determined by:

$$C_{det} = \frac{(0.38)(2120 \frac{cfm}{m^3/sec})(500\ mrem/yr)(10^{-6}\ m^3/cc)}{(Flow\ rate,\ cfm)(X/Q,\ sec/m^3)[\sum_i (K_i,\ \frac{mrem/yr}{\mu Ci/m^3})(\frac{C_i}{C_{tot}})]} \quad (2\text{-}1)$$ |R

where:

C_{det} = the instantaneous concentration at the detector, $\mu Ci/cc$

0.38 = an administrative value used to account for potential activity from other gaseous release pathways |R

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2.6.1 PLANT VENT STACK - 2/3RT-7808, 2RT-7865-1, 3RT-7865-1 (Continued)

K_i = the total body dose conversion factor for the ith gamma emitting noble gas, mrem/yr per $\mu Ci/m^3$, from Table 2-4

C_i = concentration of the ith noble gas, as determined by sample analysis, $\mu Ci/cc$

C_{tot} = total concentration of noble gases, as determined by sample analysis, $(\mu Ci/cc) = \sum_i C_i$

Flow Rate = the plant vent flow rate, cfm
= 83,000 cfm/fan (x no. of fans to be run) + 17,500 cfm (laundry facility)

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

500 mrem/yr = total body dose rate limit, as specified by Specification 2.1.1.a

X/Q = historical annual average dispersion factor, sec/m^3
= 4.8E-6 sec/m^3

Skin

The concentration at the detector corresponding to a 3000 mrem/yr skin dose rate at the exclusion area boundary is determined by:

$$C_{det} = \frac{(0.38)(2120 \frac{cfm}{m^3/sec})\ (3000\ mrem/yr)\ (10^{-6}\ m^3/cc)}{(Flow\ rate,\ cfm)\ (X/Q,\ sec/m^3)[\sum_i (L_i + 1.1M_i,\ \frac{mrem/yr}{\mu Ci/m^3})(\frac{C_i}{C_{tot}})]} \quad (2\text{-}2)$$ | R

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2.6.1 PLANT VENT STACK - 2/3RT-7808, 2RT-7865-1, 3RT-7865-1 (Continued)

where:

L_i = skin Dose Conversion Factor for the ith noble gas, mrem/yr per $\mu Ci/m^3$, from Table 2-4

M_i = air Dose Conversion Factor for the ith noble gas, mrem/yr per $\mu Ci/m^3$, from Table 2-4

1.1 = conversion factor to convert gamma air dose to skin dose

3000 mrem/yr = skin dose rate limit, as specified by Specification 2.1.1.a

Other values in equation (2-2) are defined in equation (2-1).

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 2/3RT-7808 given in Table 2-3. The maximum permissible alarm setpoint is the value "cpm" 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 largest value in terms of $\mu Ci/cc/cpm$).

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

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2.6.1 PLANT VENT STACK - 2/3RT-7808, 2RT-7865-1, 3RT-7865-1 (Continued)

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

2.6.1.2 2RT-7865-1 and 3RT-7865-1 Wide Range Gas Monitors

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

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

where:

A_{max} = the maximum permissible release rate, μCi/sec

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

Flow Rate = flow rate, cc/sec

= (3.917×10^7 cc/sec per fan) (number of fans to be run) + 8.259×10^6 cc/sec (laundry facility)

2 = a factor to compensate for the split flow between Unit 2 and Unit 3 plant vent stacks

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 Specification 2.1.1.

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2.0 **GASEOUS EFFLUENTS** (Continued)

2.6.1 PLANT VENT STACK - 2/3RT-7808, 2RT-7865-1, 3RT-7865-1 (Continued)

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

2.6.2 CONDENSER EVACUATION SYSTEM - 2RT-7818, 2RT-7870-1, 3RT-7818 or 3RT-7870-1

2.6.2.1 2RT-7818 and 3RT-7818 Condenser Air Ejector Monitors

For the purpose of implementation of Specification 2.1.1, the alarm setpoint level for noble gas monitors is based on the gaseous effluent flow rate and the meteorological dispersion factor.

The concentration at the detector corresponding to a total body dose rate of 500 mrem/yr at the exclusion area boundary is determined by using:

Total Body

$$C_{det} = \frac{(0.1)(0.5)(2120\ \frac{cfm}{m^3/sec})\ (500\ mrem/yr)\ (10^{-6}\ m^3/cc)}{(Flow\ rate,\ cfm)\ (X/Q,\ sec/m^3)[\sum_i (K_i,\ \frac{mrem/yr}{\mu Ci/m^3})\ (\frac{C_i}{C_{tot}})]} \qquad (2\text{-}4)$$

The concentration at the detector corresponding to a 3000 mrem/yr skin dose rate at the exclusion area boundary is determined by using:

Skin

$$C_{det} = \frac{(0.1)(0.5)(2120\ \frac{cfm}{m^3/sec})\ (3000\ mrem/yr)\ (10^{-6}\ m^3/cc)}{(Flow\ rate,\ cfm)\ (X/Q,\ sec/m^3)[\sum_i (L_i + 1.1M_i,\ \frac{mrem/yr}{\mu Ci/m^3})(\frac{C_i}{C_{tot}})]} \qquad (2\text{-}4a)$$

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2.6.2 CONDENSER EVACUATION SYSTEM - 2RT-7818, 2RT-7870-1, 3RT-7818 or 3RT-7870-1 (Continued)

where:

0.1 is an administrative value used to account for potential activity from other gaseous release pathways. 0.5 is an administrative value used to account for releases from both SONGS 2 and SONGS 3 condenser air ejectors simultaneously. Other parameters are specified in 2.6.1.1, above.

The smaller of the values C_{det} from equations (2-4) or (2-4a) is to be used in determining the maximum permissible monitor alarm setpoint (cpm), as follows:

The maximum permissible alarm setting (cpm) is determined by using the calibration constant for the corresponding Condenser Evacuation System Monitor given in Table 2-3. The maximum permissible alarm setpoint is the cpm value corresponding to the concentration, C_{det}, [smaller value from equation (2-4) or (2-4a)].

The calibration constant used is based on Kr-85 or on Xe-133, whichever yields a lower detection efficiency (higher value in terms of μCi/cc/cpm). The alarm setpoint will not be set greater than the maximum permissible alarm setting determined above.

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2.6.2 CONDENSER EVACUATION SYSTEM - 2RT-7818, 2RT-7870-1, 3RT-7818 or 3RT-7870-1 (Continued)

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.

2.6.2.2 2RT-7870-1 and 3RT-7870-1 Wide Range Gas Monitors

The maximum release rate (μCi/sec) for Wide Range Gas Monitor is determined by converting the concentration at the detector, C_{det} (μCi/cc), to an equivalent release rate in μCi/sec.

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

where:

A_{max} = the maximum permissible release rate, μCi/sec

C_{det} = the smaller value of C_{det}, as obtained from equations (2-4) and (2-4a)

flow rate = flow rate of the condenser air ejector, cc/sec
= 4.719E5 cc/sec (conservatively assumed as design flow rate)

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.

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2.6.3 CONTAINMENT PURGE - 2RT-7828, 3RT-7828, 2RT-7865, 3RT-7865

For the purpose of implementation of Specification 2.1.1, the alarm setpoint level for noble gas monitors is based on the gaseous effluent flow rate and the meteorological dispersion factor.

The concentration at the detector corresponding to a total body dose rate of 500 mrem/yr at the exclusion boundary is determined by using:

Total Body

$$C_{det2} = \frac{(0.38)(P_2)\left(2120 \frac{cfm}{m^3/sec}\right)(500\ mrem/yr)(10^{-6}\ m^3/cc)}{(\text{Flow rate, cfm})(X/Q,\ sec/m^3)\left[\sum_i \left(K_i,\ \frac{mrem/yr}{\mu Ci/m^3}\right)\left(\frac{C_i}{C_{tot}}\right)\right]} \quad (2\text{-}6)$$ |R

$$C_{det3} = \frac{(0.38)(P_3)\left(2120 \frac{cfm}{m^3/sec}\right)(500\ mrem/yr)(10^{-6}\ m^3/cc)}{(\text{Flow rate, cfm})(X/Q,\ sec/m^3)\left[\sum_i \left(K_i,\ \frac{mrem/yr}{\mu Ci/m^3}\right)\left(\frac{C_i}{C_{tot}}\right)\right]} \quad (2\text{-}7)$$ |R

The concentration at the detector corresponding to a 3000 mrem/yr skin dose rate at the exclusion area boundary is determined by using:

Skin

$$C_{det2} = \frac{(0.38)(P_2)\left(2120 \frac{cfm}{m^3/sec}\right)(3000\ mrem/yr)(10^{-6}\ m^3/cc)}{(\text{Flow rate, cfm})(X/Q,\ sec/m^3)\left[\sum_i \left(L_i + 1.1M_i,\ \frac{mrem/yr}{\mu Ci/m^3}\right)\left(\frac{C_i}{C_{tot}}\right)\right]} \quad (2\text{-}6a)$$ |R

$$C_{det3} = \frac{(0.38)(P_3)\left(2120 \frac{cfm}{m^3/sec}\right)(3000\ mrem/yr)(10^{-6}\ m^3/cc)}{(\text{Flow rate, cfm})(X/Q,\ sec/m^3)\left[\sum_i \left(L_i + 1.1M_i,\ \frac{mrem/yr}{\mu Ci/m^3}\right)\left(\frac{C_i}{C_{tot}}\right)\right]} \quad (2\text{-}7a)$$ |R

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2.6.3 CONTAINMENT PURGE - 2RT-7828, 3RT-7828, 2RT-7865, 3RT-7865 (Continued)

where:

C_{det2} = The instantaneous concentration of the Unit 2 detector in μCi/cc.

C_{det3} = The instantaneous concentration of the Unit 3 detector in μCi/cc.

0.38 is an administrative values used to account for potential activity from other gaseous release pathways. | R

P_2 and P_3 are administrative values used to account for simultaneous purges of both SONGS 2 and SONGS 3. The fractions P_2 and P_3 will be assigned such that $P_2 + P_3 \leq 1.0$.

Flow rate = the observed maximum flowrate in cfm from the unit specific monitor 7828. Default values will be the following conservative measured flows:
= 50,000 cfm full purge
= 3,000 cfm mini-purge
(The above values replace the smaller design flowrates.)

Other parameters are as specified in 2.6.1.1 above.
The smaller of the values of maximum permissible C_{det2} from equation (2-6) or (2-6a) and C_{det3} from equations (2-7) or (2-7a) is to be used in determining the maximum permissible monitor alarm setpoints.

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2.0 **GASEOUS EFFLUENTS** (Continued)

2.6.3 CONTAINMENT PURGE - 2RT-7828, 3RT-7828, 2RT-7865, 3RT-7865 (Continued)

2.6.3.1 Maximum Permissible Alarm Setting (RT-7865)

The maximum permissible alarm setting for the Wide Range Gas Monitor expressed as a maximum release rate (μCi/sec) is determined by converting the concentration at the detector, C_{det} (μCi/cc), to an equivalent release rate in μCi/sec.

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

where:

A_{max} = the maximum permissible release rate (μCi/cc)

C_{det} = the smaller value of C_{det}, as obtained from equation (2-6, 2-6a) for Unit 2 or (2-7, 2-7a) for Unit 3.

flow rate = flow rate, cc/sec

= 1.416E6 cc/sec for mini-purge

= 2.360E7 cc/sec for main purge.

.2 Maximum Permissible Alarm Setting (RT-7828) R

The maximum permissible alarm setting for RT-7828 is in μCi/cc and is the smaller of the values of C_{det2} (μCi/cc) from equations (2-6) and (2-6a).

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.

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2.0 **GASEOUS EFFLUENTS** (Continued)

2.0.4 WASTE GAS HEADER - 3RT-7865, 2/3RT-7808

For the purpose of Specification 2.1.1, the alarm setpoint level for noble gas monitors is based on the gaseous effluent flow rate and the meteorological dispersion factor. Since the waste gas header discharges to the plant vent stack, either 3RT-7865 or 2/3RT-7808 may be used to monitor waste gas header releases.

The concentration at the detector corresponding to a total body dose rate of 500 mrem/yr or a skin dose rate of 3000 mrem/yr at the exclusion area boundary is determined by using equations (2-1) or (2-2) with sample concentration (C_i) and (C_{tot}) being obtained from the waste gas decay tank to be released.

The smaller of the values of maximum permissible concentration (C_{det}) from equation (2-1) or (2-2) is to be used in determining the maximum permissible monitor alarm setpoint.

2/3RT-7808

The maximum permissible alarm setting (cpm) is determined by using the calibration constant for plant vent stack monitor 7808 given in Table 2-3. The maximum permissible setpoint is the cpm value corresponding to the concentration C_{det}, (smaller value from equation (2-1) or (2-2)).

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2.6.4 WASTE GAS HEADER - 3RT-7865, 2/3RT-7808 (Continued)

3RT-7865

The maximum permissible alarm setting is expressed as a maximum release rate (μCi/sec) and is determined by converting the concentration at the detector, C_{det}, to an equivalent release rate in μCi/sec by equation (2-8).

$$A_{max} = \frac{(C_{det}, \mu Ci/cc)\ (flowrate,\ cc/sec)}{2} \qquad (2\text{-}8)$$

where:

A_{det} = the maximum permissible release rate, μCi/sec

C_{det} = the smaller value of C_{det}, as obtained from equation (2-1) or (2-2).

flowrate = flowrate, cc/sec

= 7.83E7 cc/sec for 2 fan operation or

= 3.92E7 cc/sec for 1 fan operation

2 = correction for 3-7865 viewing only 1/2 the total Plant Vent Stack Flow.

.1 A release from the waste gas header is not possible if:

$$(\sum_i C_i)\ (\frac{f}{F})\ > C_{det} \qquad (2\text{-}9)$$

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2.6.4 WASTE GAS HEADER - 3RT-7865, 2/3RT-7808 (Continued)

2.6.4.1 (Continued)

where:

$\sum_i C_i$ = total concentration in waste gas holdup tank to be released

f = waste gas header effluent flow rate, cfm

F = plant vent stack flowrate in cfm (166,000 cfm for 2 fan operation; 83,000 for 1 fan operation) + 17,500 cfm (laundry facility)

C_{det} = smaller of the values of C_{det} from equation (2-1) or (2-2) with C_i being obtained from the waste gas holdup tank to be released

If a release is not possible, adjust the waste gas header flow by determining the maximum permissible waste gas header effluent flow rate corresponding to the Vent Stack Monitor setpoint in accordance with the following:

$$f < \frac{(0.9)(C_{det})(F)}{\sum_i C_i} \qquad (2\text{-}10)$$

where:

f = waste gas header effluent flow rate (cfm)

F = plant vent stack flow rate (cfm) used in equation (2-1) or (2-2)

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2.6.4 WASTE GAS HEADER - 3RT-7865, 2/3RT-7808 (Continued)

2.6.4.1 (Continued)

C_{det} = the smaller of the value of C_{det} from equation (2-1) or (2-2)

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

The 0.9 is an administrative value to account for the potential activity from other releases in the same release pathway.

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Table 2-3[a]

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

MONITOR	Kr-85	Xe-133
2/3RT-7808C	3.90E-8	4.62E-8
2RT-7818A	4.27E-8	6.63E-8
2RT-7818B	7.31E-5	2.07E-5
3RT-7818A	3.73E-8	5.09E-8
3RT-7818B	9.31E-5	2.21E-5

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

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2.0 **GASEOUS EFFLUENTS** (Continued)

2.7 Gaseous Effluent Dose Rate

The methodology used for the purpose of implementation of Specification 2.1.1 for the dose rate above background to an individual in an unrestricted area is calculated by using the following expressions.

2.7.1 FOR NOBLE GASES:

$$\dot{D}_{TB} = \sum_i \left[K_i \ \overline{(X/Q)} \ \dot{Q}_i \right] \qquad (2\text{-}11)$$

$$\dot{D}_s = \sum_i \left[(L_i + 1.1M_i) \ \overline{(X/Q)} \ \dot{Q}_i \right] \qquad (2\text{-}12)$$

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 $\mu Ci/m^3$ from Table 2-4.

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2.7.1 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 2-4

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 2-4. (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

$\overline{(X/Q)}$ = 4.8E-6 sec/m^3. The maximum annual average atmospheric dispersion factor for any sector or distance at or beyond the unrestricted area boundary.

2.7.2 FOR ALL RADIOIODINES, TRITIUM AND FOR ALL RADIOACTIVE MATERIALS IN PARTICULATE FORM WITH HALF LIVES GREATER THAN EIGHT DAYS:

$$\dot{D}_o = \sum_i \left[\sum_k (P_{ik} \overline{W}_k)\, \dot{Q}_i\right] \qquad (2\text{-}13)$$

where:

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

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2.0 GASEOUS EFFLUENTS (Continued)

2.7.2 FOR ALL RADIOIODINES, TRITIUM AND FOR ALL RADIOACTIVE MATERIALS IN PARTICULATE FORM WITH HALF LIVES GREATER THAN EIGHT DAYS: (Continued)

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

P_{ik} = the dose parameter for radionuclide, i, for pathway, k, from Table 2-5 for the inhalation pathway in mrem/yr per μCi/m³. 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.

= 4.8E-6 sec/m³ for the inhalation pathway. The location is the unrestricted area in the NW sector.

= 4.3E-8 m^{-2} for the food and ground plane pathways. The location is the unrestricted area in the E sector.

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2.8 Gaseous Effluent Dose Calculation

2.8.1 DOSE FROM NOBLE GASES IN GASEOUS EFFLUENTS

The gaseous releases considered in the following dose calculations are described in Section 2.6.

The air dose in unrestricted areas due to noble gases released in gaseous effluents is calculated using the following expressions:

2.8.1.1 For historical meteorology:

$$D_\gamma = 3.17\times10^{-8} \sum_i M_i[\, \overline{(X/Q)}\, Q_i] \qquad (2\text{-}14)$$

$$D_\beta = 3.17\times10^{-8} \sum_i N_i[\, \overline{(X/Q)}\, Q_i] \qquad (2\text{-}15)$$

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

R

3.17×10^{-8} = (inverse seconds per year)

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 2-4

N_i = the air dose due to beta emissions for each identified noble gas radionuclide, i, in mrad/yr per $\mu Ci/m^3$ from Table 2-4

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2.8.1.1 For historical meteorology: (Continued)

$\overline{(X/Q)}$ = 4.8E-6 sec/m^3. The maximum annual average atmospheric dispersion factor for any sector or distance at or beyond the unrestricted area boundary.

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

2.8.1.2 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

$$D_{\gamma\theta} = 1.14\times10^{-4} \sum_i M_i [\sum_j (\Delta t_j \, (X/Q)_{j\theta} \, \dot{Q}_{ij})] \quad (2\text{-}16)$$

$$D_{\beta\theta} = 1.14\times10^{-4} \sum_i N_i [\sum_j (\Delta t_j \, (X/Q)_{j\theta} \, \dot{Q}_{ij})] \quad (2\text{-}17)$$

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 2-4.

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2.8.1.2 For meteorology concurrent with release: (Continued)

N_i = the air dose factor due to beta emissions for each identified noble gas radionuclide, i, in mrad/yr per $\mu Ci/m^3$ from Table 2-4.

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

$(X/Q)_{j\theta}$ = the atmospheric dispersion factor for time period Δt_j at exclusion boundary location in sector θ determined by concurrent meteorology, in sec/m^3

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

2.8.2 DOSE FROM TRITIUM, RADIOIODINES AND RADIOACTIVE MATERIALS IN PARTICULATE FORM WITH HALF LIVES GREATER THAN 8 DAYS IN GASEOUS EFFLUENTS

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

2.8.2.1 For historical meteorology:

$$D_o = 3.17 \times 10^{-8} \sum_i [(\sum_k R_{ik} W_k) Q_i] \quad (2\text{-}18)$$

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2.8.2.1 for historical meteorology: (Continued)

where:

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

Q_i = the amount of each radionuclide, i, (tritium, radioiodine, radioactive material in particulate form with half lives greater than eight days), 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 2-6. The given is the maximum $\sum_k R_{ik}W_k$ for all locations and is based on the most restrictive age groups.

R_{ik} = the dose factor for each identified radionuclide, i, for pathway k (for the inhalation pathway in mrem/yr per $\mu Ci/m^3$ and for the food and ground plane pathways in m^2 - mrem/yr per μCi/sec) at the controlling location. The R_{ik}'s for each controlling location for each age group are given in Tables 2-7 thru 2-16.

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2.8.2.1 For historical meteorology: (Continued)

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/m³. The $\overline{(X/Q)}$ for each controlling location is given in Tables 2-7 thru 2-16.

= $\overline{(D/Q)}$ for the food and ground plane pathways in m^{-2}. The $\overline{(D/Q)}$ for each controlling location are given in Tables 2-7 thru 2-16.

2.8.2.2 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

$$D_\theta = 1.14 \times 10^{-4} \sum_i^l \sum_j^m \sum_k^n [(\Delta t_j)\ (R_{ik\theta})\ (W_{jk\theta})\ (\dot{Q}_{ij})] \quad (2\text{-}19)$$

where:

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

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

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

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2.8.2.2 For meteorology concurrent with releases: (Continued)

$R_{ik\theta}$ = 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. A listing of R_{ik} for the controlling locations in each landward sector for each group is given in Tables 2-7 thru 2-16. The θ is determined by the concurrent meteorology.

$W_{jk\theta}$ = the dispersion parameter 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}

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TABLE 2-4

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	1.17E3*	1.46E3	1.23E3	1.97E3
Kr-85	1.61E1	1.34E3	1.72E1	1.95E3
Kr-87	5.92E3	9.73E3	6.17E3	1.03E4
Kr-88	1.47E4	2.37E3	1.52E4	2.93E3
Xe-131m	9.15E1	4.76E2	1.56E2	1.11E3
Xe-133m	2.51E2	9.94E2	3.27E2	1.48E3
Xe-133	2.94E2	3.06E2	3.53E2	1.05E3
Xe-135m	3.12E3	7.11E2	3.36E3	7.39E2
Xe-135	1.81E3	1.86E3	1.92E3	2.46E3
Xe-138	8.83E3	4.13E3	9.21E3	4.75E3
Ar-41	8.84E3	2.69E3	9.30E3	3.28E3

*1.17E3 = 1.17×10^3
**Source: USNRC Reg. Guide 1.109, Table B-1

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TABLE 2-5

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	1.1E3	I -131	1.6E7
Cr-51	1.7E4	I -132	1.9E5
Mn-54	1.6E6	I -133	3.8E6
Co-57	5.1E5	I -134	5.1E4
Co-58	1.1E6	I -135	7.9E5
Co-60	7.1E6	Cs-134	1.0E6
Sr-89	2.2E6	Cs-136	1.7E5
Sr-90	1.0E8	Cs-137	9.1E5
Zr-95	2.2E6	Ba-140	1.7E6
Nb-95	6.1E5	Ce-141	5.4E5
Te-129m	1.8E6	Ce-144	1.2E7

*Source: USNRC NUREG-0133, Section 5.2.1.1

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TABLE 2-6

CONTROLLING LOCATION FACTORS

Radionuclide	$\sum_k R_{ik}W_k$ mrem/yr per µCi/sec
H -3	9.62E-4
Cr-51	1.58E-2
Mn-54	4.02E0
Co-57	9.95E-1
Co-58	1.16E0
Co-60	6.14E1
Sr-89	4.34E1
Sr-90	1.82E3
Zr-95	1.66E0
Nb-95	6.81E0
Te-129m	4.90E0
Cs-134	3.36E1
Cs-136	5.73E-1
Cs-137	3.08E1
Ba-140	2.28E-1
Ce-141	5.74E-1
Ce-144	1.68E1
I -131	1.97E1
I -133	2.82E0
I -135	5.92E-1
UN-ID	3.50E0

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.

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<u>TABLE 2-7</u>

DOSE PARAMETER R_i FOR SECTOR P

Path ay = Surf Beach Distance = 0.4 miles
X/Q = 1.8E-6 sec/m^3 D/Q = 8.2E-9 m^{-2}

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	-0-	-0-	1.2E1	-0-	5.1E1	-0-	8.7E1	-0-
Cr-51	-0-	-0-	1.1E1	2.2E4	1.2E2	1.1E5	2.3E2	3.2E5
Mn-54	-0-	-0-	4.5E2	6.6E6	2.7E3	3.2E7	5.3E3	9.5E7
Co-57	-0-	-0-	1.4E2	1.6E6	1.3E3	7.9E6	2.2E3	2.3E7
Co-58	-0-	-0-	3.6E2	1.8E6	3.8E3	8.7E6	7.3E3	2.6E7
Co-60	-0-	-0-	1.0E3	1.0E8	1.0E4	4.9E8	2.0E4	1.5E9
Sr-89	-0-	-0-	6.2E3	1.0E2	1.8E4	4.9E2	2.1E4	1.5E3
Sr-90	-0-	-0-	1.1E6	-0-	4.4E6	-0-	6.8E6	-0-
Zr-95	-0-	-0-	6.3E2	1.2E6	6.0E3	5.8E6	1.0E4	1.7E7
Nb-95	-0-	-0-	3.8E2	6.6E5	3.9E3	3.1E6	7.1E3	9.4E6
Te-129m	-0-	-0-	5.2E2	9.4E4	2.1E3	4.5E5	2.5E3	1.3E6
Cs-134	-0-	-0-	1.1E4	3.3E7	4.5E4	1.6E8	5.8E4	4.7E8
Cs-136	-0-	-0-	1.8E3	7.2E5	7.8E3	3.4E6	1.0E4	1.0E7
Cs-137	-0-	-0-	8.6E3	4.9E7	3.4E4	2.4E8	4.3E4	7.1E8
Ba-140	-0-	-0-	7.7E2	9.9E4	9.2E3	4.7E5	1.5E4	1.4E6
Ce-141	-0-	-0-	5.9E2	6.6E4	5.1E3	3.1E5	8.2E3	9.4E5
Ce-144	-0-	-0-	4.0E3	3.3E5	3.5E4	1.6E6	5.6E4	4.8E6
I -131	-0-	-0-	1.7E5	8.3E4	5.9E5	3.9E5	8.2E5	1.2E6
I -133	-0-	-0-	4.0E4	1.2E4	1.2E5	5.6E4	1.5E5	1.7E5
I -135	-0-	-0-	8.2E3	1.2E4	2.5E4	5.8E4	3.1E4	1.7E5
UN-ID	-0-	-0-	1.2E3	3.6E6	5.4E3	1.7E7	7.1E3	5.1E7

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

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

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TABLE 2-7

DOSE PARAMETER R_i FOR SECTOR P

Pathway = Former Nixon Estate (no garden) Distance = 2.8 miles
X/Q = 1.2E-7 sec/m³ D/Q = 3.4E-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	6.5E2	-0-	1.1E3	-0-	1.3E3	-0-	1.3E3	-0-
Cr-51	3.6E2	3.7E6	1.1E3	3.7E6	3.0E3	3.7E6	3.3E3	3.7E6
Mn-54	2.5E4	1.1E9	4.3E4	1.1E9	6.7E4	1.1E9	7.7E4	1.1E9
Co-57	4.9E3	2.7E8	1.3E4	2.7E8	3.1E4	2.7E8	3.1E4	2.7E8
Co-58	1.1E4	3.0E8	3.4E4	3.0E8	9.5E4	3.0E8	1.1E5	3.0E8
Co-60	3.2E4	1.7E10	9.6E4	1.7E10	2.6E5	1.7E10	2.8E5	1.7E10
Sr-89	4.0E5	1.7E4	6.0E5	1.7E4	4.3E5	1.7E4	3.0E5	1.7E4
Sr-90	4.1E7	-0-	1.0E8	-0-	1.1E8	-0-	9.9E7	-0-
Zr-95	2.2E4	2.0E8	6.1E4	2.0E8	1.5E5	2.0E8	1.5E5	2.0E8
Nb-95	1.3E4	1.1E8	3.7E4	1.1E8	9.7E4	1.1E8	1.0E5	1.1E8
Te-129m	3.2E4	1.6E7	5.0E4	1.6E7	5.2E4	1.6E7	3.7E4	1.6E7
Cs-134	7.0E5	5.5E9	1.0E6	5.5E9	1.1E6	5.5E9	8.5E5	5.5E9
Cs-136	1.3E5	1.2E8	1.7E5	1.2E8	1.9E5	1.2E8	1.5E5	1.2E8
Cs-137	6.1E5	8.2E9	8.3E5	8.2E9	8.5E5	8.2E9	6.2E5	8.2E9
Ba-140	5.6E4	1.6E7	7.4E4	1.6E7	2.3E5	1.6E7	2.2E5	1.6E7
Ce-141	2.2E4	1.1E7	5.7E4	1.1E7	1.3E5	1.1E7	1.2E5	1.1E7
Ce-144	1.5E5	5.6E7	3.9E5	5.6E7	8.6E5	5.6E7	8.2E5	5.6E7
I -131	1.5E7	1.4E7	1.6E7	1.4E7	1.5E7	1.4E7	1.2E7	1.4E7
I -133	3.6E6	2.0E6	3.8E6	2.0E6	2.9E6	2.0E6	2.2E6	2.0E6
I -135	7.0E5	2.0E6	7.9E5	2.0E6	6.2E5	2.0E6	4.5E5	2.0E6
UN-ID	6.3E4	6.0E8	1.1E5	6.0E8	1.3E5	6.0E8	1.0E5	6.0E8

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

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

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TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = San Onofre Mobil Homes
X/Q = 7.4E-7 sec/m³

Distance = 1.3 miles
D/Q = 3.6E-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	6.5E2	-0-	1.1E3	-0-	1.3E3	-0-	1.3E3	-0-
Cr-51	3.6E2	3.7E6	1.1E3	3.7E6	3.0E3	3.7E6	3.3E3	3.7E6
Mn-54	2.5E4	1.1E9	4.3E4	1.1E9	6.7E4	1.1E9	7.7E4	1.1E9
Co-57	4.9E3	2.7E8	1.3E4	2.7E8	3.1E4	2.7E8	3.1E4	2.7E8
Co-58	1.1E4	3.0E8	3.4E4	3.0E8	9.5E4	3.0E8	1.1E5	3.0E8
Co-60	3.2E4	1.7E10	9.6E4	1.7E10	2.6E5	1.7E10	2.8E5	1.7E10
Sr-89	4.0E5	1.7E4	6.0E5	1.7E4	4.3E5	1.7E4	3.0E5	1.7E4
Sr-90	4.1E7	-0-	1.0E8	-0-	1.1E8	-0-	9.9E7	-0-
Zr-95	2.2E4	2.0E8	6.1E4	2.0E8	1.5E5	2.0E8	1.5E5	2.0E8
Nb-95	1.3E4	1.1E8	3.7E4	1.1E8	9.7E4	1.1E8	1.0E5	1.1E8
Te-129m	3.2E4	1.6E7	5.0E4	1.6E7	5.2E4	1.6E7	3.7E4	1.6E7
Cs-134	7.0E5	5.5E9	1.0E6	5.5E9	1.1E6	5.5E9	8.5E5	5.5E9
Cs-136	1.3E5	1.2E8	1.7E5	1.2E8	1.9E5	1.2E8	1.5E5	1.2E8
Cs-137	6.1E5	8.2E9	8.3E5	8.2E9	8.5E5	8.2E9	6.2E5	8.2E9
Ba-140	5.6E4	1.6E7	7.4E4	1.6E7	2.3E5	1.6E7	2.2E5	1.6E7
Ce-141	2.2E4	1.1E7	5.7E4	1.1E7	1.3E5	1.1E7	1.2E5	1.1E7
Ce-144	1.5E5	5.6E7	3.9E5	5.6E7	8.6E5	5.6E7	8.2E5	5.6E7
I -131	1.5E7	1.4E7	1.6E7	1.4E7	1.5E7	1.4E7	1.2E7	1.4E7
I -133	3.6E6	2.0E6	3.8E6	2.0E6	2.9E6	2.0E6	2.2E6	2.0E6
I -135	7.0E5	2.0E6	7.9E5	2.0E6	6.2E5	2.0E6	4.5E5	2.0E6
UN-ID	6.3E4	6.0E8	1.1E5	6.0E8	1.3E5	6.0E8	1.0E5	6.0E8

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

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

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TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = State Park Office Trailer Distance = 0.6 miles
X/Q = 2.2E-6 sec/m^3 D/Q = 1.2E-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-	-0-	-0-	-0-	-0-	5.8E1	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	1.5E2	2.1E5
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	3.5E3	6.3E7
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	1.4E3	1.6E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	4.9E3	1.7E7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	1.3E4	9.8E8
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	1.4E4	9.9E2
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	4.5E6	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	6.9E3	1.1E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	4.8E3	6.2E6
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	1.7E3	9.0E5
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	3.9E4	3.1E8
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	6.7E3	6.9E6
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	2.8E4	4.7E8
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	1.0E4	9.4E5
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	5.5E3	6.2E5
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	3.7E4	3.2E6
I -131	-0-	-0-	-0-	-0-	-0-	-0-	5.4E5	7.9E5
I -133	-0-	-0-	-0-	-0-	-0-	-0-	9.8E4	1.1E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	2.0E4	1.2E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	4.7E3	3.4E7

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

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

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TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = Surf. Beach Guard Shack — Distance = 0.7 miles

X/Q = 1.8E-06 sec/m^3 — D/Q = 9.9E-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-	7.2E1	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	1.9E2	2.7E5
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	4.4E3	7.9E7
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	1.8E3	2.0E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	6.1E3	2.2E7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	1.6E4	1.2E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	1.7E4	1.2E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	5.7E6	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	8.6E3	1.4E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	5.9E3	7.8E6
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	2.1E3	1.1E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	4.8E4	3.9E8
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	8.4E3	8.6E6
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	3.5E4	5.9E8
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	1.2E4	1.2E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	6.9E3	7.8E5
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	4.7E4	4.0E6
I -131	-0-	-0-	-0-	-0-	-0-	-0-	6.8E5	9.8E5
I -133	-0-	-0-	-0-	-0-	[illegible]	-0-	1.2E5	1.4E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	2.6E4	1.4E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	5.9E3	4.3E7

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

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

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TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = Enlisted Beach Check-In   Distance = 1.4 miles
X/Q = 6.8E-7 sec/m³   D/Q = 3.2E-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-	2.9E2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	7.6E2	1.1E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	1.8E4	3.2E8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	7.2E3	7.8E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	8.7E7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	6.5E4	4.9E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	6.9E4	4.9E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.3E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	3.4E4	5.7E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	3.1E7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	8.3E3	4.5E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.6E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	3.3E4	3.4E7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.4E5	2.3E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	5.0E4	4.7E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	2.7E4	3.1E6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.6E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	2.7E6	3.9E6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	4.9E5	5.6E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	5.8E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	1.7E8

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

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

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TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = Sheep (Meat) Distance = 1.6 miles
X/Q = 5.6E-7 sec/m^3 D/Q = 2.6E-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-	1.5E0	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E3	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	-0-	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	-0-	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	-0-	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	-0-	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.4E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

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

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

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TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = S. C. Res W Garden   Distance = 4.1 miles
X/Q = 1.2E-07 sec/m^3 D/Q = 4.1E-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-	4.0E3	-0-	2.6E3	1.3E3	2.3E3
Cr-51	-0-	-0-	-0-	6.1E6	-0-	1.0E7	3.3E3	1.5E7
Mn-54	-0-	-0-	-0-	6.5E8	-0-	9.2E8	7.7E4	2.0E9
Co-57	-0-	-0-	-0-	2.4E8	-0-	3.2E8	3.1E4	5.6E8
Co-58	-0-	-0-	-0-	3.7E8	-0-	5.9E8	1.1E5	9.1E8
Co-60	-0-	-0-	-0-	2.1E9	-0-	3.2E9	2.8E5	2.0E10
Sr-89	-0-	-0-	-0-	3.5E10	-0-	1.5E10	3.0E5	9.8E9
Sr-90	-0-	-0-	-0-	1.4E12	-0-	8.3E11	9.9E7	6.7E11
Zr-95	-0-	-0-	-0-	8.8E8	-0-	1.2E9	1.5E5	1.4E9
Nb-95	-0-	-0-	-0-	2.9E8	-0-	4.5E8	1.0E5	5.8E8
Te-129m	-0-	-0-	-0-	2.9E9	-0-	1.8E9	3.7E4	1.2E9
Cs-134	-0-	-0-	-0-	2.6E10	-0-	1.6E10	8.5E5	1.6E10
Cs-136	-0-	-0-	-0-	2.2E8	-0-	1.7E8	1.5E5	2.9E8
Cs-137	-0-	-0-	-0-	2.4E10	-0-	1.4E10	6.2E5	1.7E10
Ba-140	-0-	-0-	-0-	2.8E8	-0-	2.1E8	2.2E5	2.8E8
Ce-141	-0-	-0-	-0-	4.0E8	-0-	5.3E8	1.2E5	5.1E8
Ce-144	-0-	-0-	-0-	1.0E10	-0-	1.3E10	8.2E5	1.1E10
I -131	-0-	-0-	-0-	4.8E10	-0-	3.1E10	1.2E7	3.8E10
I -133	-0-	-0-	-0-	8.1E8	-0-	4.6E8	2.2E6	5.3E8
I -135	-0-	-0-	-0-	9.8E6	-0-	5.7E6	4.5E5	8.6E6
UN-ID	-0-	-0-	-0-	2.7E9	-0-	1.9E9	1.0E5	1.9E9

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

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

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TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = San Clemente Ranch (No Residents) Distance = 2.2 miles
X/Q = 3.3E-7 sec/m^3 D/Q = 1.4E-9 m^{-2}

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	3.8E3	-0-	2.4E3	-0-	1.9E3
Cr-51	-0-	-0-	-0-	4.8E6	-0-	7.4E6	-0-	6.7E6
Mn-54	-0-	-0-	-0-	6.1E8	-0-	8.3E8	-0-	8.0E8
Co-57	-0-	-0-	-0-	2.2E8	-0-	2.9E8	-0-	2.4E8
Co-58	-0-	-0-	-0-	3.3E8	-0-	5.1E8	-0-	4.7E8
Co-60	-0-	-0-	-0-	2.0E9	-0-	3.0E9	-0-	2.7E9
Sr-89	-0-	-0-	-0-	3.1E10	-0-	1.2E10	-0-	7.2E9
Sr-90	-0-	-0-	-0-	1.3E12	-0-	7.7E11	-0-	5.8E11
Zr-95	-0-	-0-	-0-	7.8E8	-0-	1.1E9	-0-	9.1E8
Nb-95	-0-	-0-	-0-	2.4E8	-0-	3.5E8	-0-	3.1E8
Te-129m	-0-	-0-	-0-	2.3E9	-0-	1.4E9	-0-	7.9E8
Cs-134	-0-	-0-	-0-	2.4E10	-0-	1.5E10	-0-	9.2E9
Cs-136	-0-	-0-	-0-	9.0E7	-0-	5.7E7	-0-	3.6E7
Cs-137	-0-	-0-	-0-	2.2E10	-0-	1.3E10	-0-	7.8E9
Ba-140	-0-	-0-	-0-	1.1E8	-0-	6.8E7	-0-	5.3E7
Ce-141	-0-	-0-	-0-	3.3E8	-0-	4.1E8	-0-	3.2E8
Ce-144	-0-	-0-	-0-	9.2E9	-0-	1.2E10	-0-	9.0E9
I -131	-0-	-0-	-0-	4.1E9	-0-	2.1E9	-0-	1.4E9
I -133	-0-	-0-	-0-	4.0E-11	-0-	1.7E-11	-0-	1.1E-11
I -135	-0-	-0-	-0-	6.9E-35	-0-	3.0E-35	-0-	1.9E-35
UN-ID	-0-	-0-	-0-	2.5E9	-0-	1.7E9	-0-	1.1E9

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

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

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TABLE 2-8

DOSE PARAMETER R_i FOR SECTOR Q

Pathway = San Clemente Ranch Adm. Offices Distance = 2.5 miles
X/Q = 2.7E-7 sec/(m^3) D/Q = 1.1E-9 m^{-2}

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	2.9E2	1.9E3
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	7.6E2	7.8E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	1.8E4	1.1E9
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	7.2E3	3.2E8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	5.6E8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	6.5E4	7.6E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	6.9E4	7.2E9
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.3E7	5.8E11
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	3.4E4	9.7E8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	3.4E8
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	8.3E3	7.9E8
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.1E10
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	3.3E4	7.0E7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.4E5	1.0E10
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	5.0E4	5.8E7
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	2.7E4	3.2E8
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	9.0E9
I -131	-0-	-0-	-0-	-0-	-0-	-0-	2.7E6	1.4E9
I -133	-0-	-0-	-0-	-0-	-0-	-0-	4.9E5	5.6E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	5.8E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	1.2E9

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

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

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TABLE 2-9

DOSE PARAMETER R_i FOR SECTOR R

Pathway = San Onofre Mobile Homes
X/Q = 5.3E-7 sec/m^3

Distance = 1.2 miles
D/Q = 3.2E-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	6.5E2	-0-	1.1E3	-0-	1.3E3	-0-	1.3E3	-0-
Cr-51	3.6E2	3.7E6	1.1E3	3.7E6	3.0E3	3.7E6	3.3E3	3.7E6
Mn-54	2.5E4	1.1E9	4.3E4	1.1E9	6.7E4	1.1E9	7.7E4	1.1E9
Co-57	4.9E3	2.7E8	1.3E4	2.7E8	3.1E4	2.7E8	3.1E4	2.7E8
Co-58	1.1E4	3.0E8	3.4E4	3.0E8	9.5E4	3.0E8	1.1E5	3.0E8
Co-60	3.2E4	1.7E10	9.6E4	1.7E10	2.6E5	1.7E10	2.8E5	1.7E10
Sr-89	4.0E5	1.7E4	6.0E5	1.7E4	4.3E5	1.7E4	3.0E5	1.7E4
Sr-90	4.1E7	-0-	1.0E8	-0-	1.1E8	-0-	9.9E7	-0-
Zr-95	2.2E4	2.0E8	6.1E4	2.0E8	1.5E5	2.0E8	1.5E5	2.0E8
Nb-95	1.3E4	1.1E8	3.7E4	1.1E8	9.7E4	1.1E8	1.0E5	1.1E8
Te-129m	3.2E4	1.6E7	5.0E4	1.6E7	5.2E4	1.6E7	3.7E4	1.6E7
Cs-134	7.0E5	5.5E9	1.0E6	5.5E9	1.1E6	5.5E9	8.5E5	5.5E9
Cs-136	1.3E5	1.2E8	1.7E5	1.2E8	1.9E5	1.2E8	1.5E5	1.2E8
Cs-137	6.1E5	8.2E9	8.3E5	8.2E9	8.5E5	8.2E9	6.2E5	8.2E9
Ba-140	5.6E4	1.6E7	7.4E4	1.6E7	2.3E5	1.6E7	2.2E5	1.6E7
Ce-141	2.2E4	1.1E7	5.7E4	1.1E7	1.3E5	1.1E7	1.2E5	1.1E7
Ce-144	1.5E5	5.6E7	3.9E5	5.6E7	8.6E5	5.6E7	8.2E5	5.6E7
I -131	1.5E7	1.4E7	1.6E7	1.4E7	1.5E7	1.4E7	1.2E7	1.4E7
I -133	3.6E6	2.0E6	3.8E6	2.0E6	2.9E6	2.0E6	2.2E6	2.0E6
I -135	7.0E5	2.0E6	7.9E5	2.0E6	6.2E5	2.0E6	4.5E5	2.0E6
UN-ID	6.3E4	6.0E8	1.1E5	6.0E8	1.3E5	6.0E8	1.0E5	6.0E8

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

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

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TABLE 2-9

DOSE PARAMETER R_i FOR SECTOR R

Pathway = San Clemente Ranch (No Residents) Distance = 2.3 miles
X/Q = 2.0E-7 sec/m^3 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-	3.8E3	-0-	2.4E3	-0-	1.9E3
Cr-51	-0-	-0-	-0-	4.8E6	-0-	7.4E6	-0-	6.7E6
Mn-54	-0-	-0-	-0-	6.1E8	-0-	8.3E8	-0-	8.0E8
Co-57	-0-	-0-	-0-	2.2E8	-0-	2.9E8	-0-	2.4E8
Co-58	-0-	-0-	-0-	3.3E8	-0-	5.1E8	-0-	4.7E8
Co-60	-0-	-0-	-0-	2.0E9	-0-	3.0E9	-0-	2.7E9
Sr-89	-0-	-0-	-0-	3.1E10	-0-	1.2E10	-0-	7.2E9
Sr-90	-0-	-0-	-0-	1.3E12	-0-	7.7E11	-0-	5.8E11
Zr-95	-0-	-0-	-0-	7.8E8	-0-	1.1E9	-0-	9.1E8
Nb-95	-0-	-0-	-0-	2.4E8	-0-	3.5E8	-0-	3.1E8
Te-129m	-0-	-0-	-0-	2.3E9	-0-	1.4E9	-0-	7.9E8
Cs-134	-0-	-0-	-0-	2.4E10	-0-	1.5E10	-0-	9.2E9
Cs-136	-0-	-0-	-0-	9.0E7	-0-	5.7E7	-0-	3.6E7
Cs-137	-0-	-0-	-0-	2.2E10	-0-	1.3E10	-0-	7.8E9
Ba-140	-0-	-0-	-0-	1.1E8	-0-	6.8E7	-0-	5.3E7
Ce-141	-0-	-0-	-0-	3.3E8	-0-	4.1E8	-0-	3.2E8
Ce-144	-0-	-0-	-0-	9.2E9	-0-	1.2E10	-0-	9.0E9
I -131	-0-	-0-	-0-	4.1E9	-0-	2.1E9	-0-	1.4E9
I -133	-0-	-0-	-0-	4.0E-11	-0-	1.7E-11	-0-	1.1E-11
I -135	-0-	-0-	-0-	6.9E-35	-0-	3.0E-35	-0-	1.9E-35
UN-ID	-0-	-0-	-0-	2.5E9	-0-	1.7E9	-0-	1.1E9

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

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

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TABLE 2-9

DOSE PARAMETER R_i FOR SECTOR R

Pathway = SC Ranch Packing Distance = 2.6 miles

X/Q = 1.7E-07 sec/m^3 D/Q = 8.2E-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	-0-	-0-	-0-	3.8E3	-0-	2.4E3	1.2E3	1.9E3
Cr-51	-0-	-0-	-0-	4.8E6	-0-	7.4E6	3.0E3	1.0E7
Mn-54	-0-	-0-	-0-	6.1E8	-0-	8.3E8	7.1E4	1.9E9
Co-57	-0-	-0-	-0-	2.2E8	-0-	2.9E8	2.9E4	5.2E8
Co-58	-0-	-0-	-0-	3.3E8	-0-	5.1E8	[illegible].8E4	7.8E8
Co-60	-0-	-0-	-0-	2.0E9	-0-	3.0E9	[illegible].6E5	2.0E10
Sr-89	-0-	-0-	-0-	3.1E10	-0-	1.2E10	[illegible].8E5	7.2E9
Sr-90	-0-	-0-	-0-	1.3E12	-0-	7.7E11	[illegible].1E7	5.8E11
Zr-95	-0-	-0-	-0-	7.8E8	-0-	1.1E9	[illegible].4E5	1.1E9
Nb-95	-0-	-0-	-0-	2.4E8	-0-	3.5E8	[illegible].5E4	4.2E8
Te-129m	-0-	-0-	-0-	2.3E9	-0-	1.4E9	3.4E4	8.0E8
Cs-134	-0-	-0-	-0-	2.4E10	-0-	1.5E10	7.8E5	1.5E10
Cs-136	-0-	-0-	-0-	9.0E7	-0-	5.7E7	1.3E5	1.6E8
Cs-137	-0-	-0-	-0-	2.2E10	-0-	1.3E10	5.7E5	1.6E10
Ba-140	-0-	-0-	-0-	1.1E8	-0-	6.8E7	2.0E5	7.0E7
Ce-141	-0-	-0-	-0-	3.3E8	-0-	4.1E8	1.1E5	3.3E8
Ce-144	-0-	-0-	-0-	9.2E9	-0-	1.2E10	7.5E5	9.0E9
I -131	-0-	-0-	-0-	4.1E9	-0-	2.1E9	1.1E7	1.4E9
I -133	-0-	-0-	-0-	4.0E-11	-0-	1.7E-11	2.0E6	2.0E6
I -135	-0-	-0-	-0-	6.9E-35	-0-	3.0E-35	4.1E5	2.0E6
UN-ID	-0-	-0-	-0-	2.5E9	-0-	1.7E9	9.5E4	1.7E9

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

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

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TABLE 2-9

DOSE PARAMETER R_i FOR SECTOR R

Pathway = Sheep Meat Distance = 0.9 miles
X/Q = 8.3E-7 sec/m³ D/Q = 5.2E-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-	1.5E0	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E3	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	[illegible]	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	-0-	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	-0-	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	-0-	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.4E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

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

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

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TABLE 2-9

DOSE PARAMETER R_i FOR SECTOR R

Pathway = Deer Consumer
X/Q = 1.8E-7 sec/m^3

Distance = 2.2 miles
D/Q = 8.8E-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-	2.8E1	-0-	2.3E1	3.5E1	3.9E1
Cr-51	-0-	-0-	-0-	5.0E4	-0-	1.0E5	9.1E1	3.2E5
Mn-54	-0-	-0-	-0-	7.7E5	-0-	1.4E6	2.1E3	4.1E7
Co-57	-0-	-0-	-0-	4.6E6	-0-	8.0E6	8.6E2	2.3E7
Co-58	-0-	-0-	-0-	9.6E6	-0-	1.9E7	2.9E3	4.7E7
Co-60	-0-	-0-	-0-	3.6E7	-0-	7.2E7	7.8E3	7.2E8
Sr-89	-0-	-0-	-0-	4.9E7	-0-	2.6E7	8.3E3	3.1E7
Sr-90	-0-	-0-	-0-	1.0E9	-0-	8.0E8	2.7E6	1.2E9
Zr-95	-0-	-0-	-0-	6.2E7	-0-	1.1E8	4.1E3	2.0E8
Nb-95	-0-	-0-	-0-	2.3E8	-0-	4.5E8	2.8E3	8.2E8
Te-129m	-0-	-0-	-0-	5.9E8	-0-	4.5E8	1.0E3	5.3E8
Cs-134	-0-	-0-	-0-	1.4E8	-0-	1.2E8	2.3E4	3.4E8
Cs-136	-0-	-0-	-0-	5.1E6	-0-	4.2E6	4.0E3	9.5E6
Cs-137	-0-	-0-	-0-	1.2E8	-0-	9.3E7	1.7E4	4.0E8
Ba-140	-0-	-0-	-0-	5.0E6	-0-	4.2E6	6.0E3	7.4E6
Ce-141	-0-	-0-	-0-	1.5E6	-0-	2.4E6	3.3E3	4.2E6
Ce-144	-0-	-0-	-0-	1.8E7	-0-	2.9E7	2.2E4	4.9E7
I -131	-0-	-0-	-0-	6.5E8	-0-	4.3E8	3.3E5	5.9E8
I -133	-0-	-0-	-0-	1.6E1	-0-	8.6E0	5.9E4	6.7E4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E4	6.9E4
UN-ID	-0-	-0-	-0-	1.1E8	-0-	9.4E7	2.8E[illegible]	1.4E8

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

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

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TABLE 2-10

DOSE PARAMETER R_i FOR SECTOR A

Pathway = Camp San Mateo — Distance = 3.6 miles
X/Q = 7.1E-8 sec/m³ — D/Q = 4.1E-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-	1.3E3	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	3.3E3	3.7E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	7.7E4	1.1E9
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	3.1E4	2.7E8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	1.1E5	3.0E8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	2.8E5	1.7E10
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	3.0E5	1.7E4
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	9.9E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.5E5	2.0E8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	1.1E8
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	3.7E4	1.6E7
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	8.5E5	5.5E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	1.5E5	1.2E8
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	6.2E5	8.2E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	2.2E5	1.6E7
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	1.2E5	1.1E7
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	8.2E5	5.6E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	1.2E7	1.4E7
I -133	-0-	-0-	-0-	-0-	-0-	-0-	2.2E6	2.0E6
I -135	-0-	-0-	-0-	-0-	-0-	-0-	4.5E5	2.0E6
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	6.0E8

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

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

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TABLE 2-10

DOSE PARAMETER R_i FOR SECTOR A

Pathway = Sheep (Meat) Distance = 0.2 miles
X/Q = 6.7E-6 sec/m³ D/Q = 5.2E-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-	-0-	1.5E0	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E3	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	-0-	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	-0-	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	-0-	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	-0-	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.4E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

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

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

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TABLE 2-10

DOSE PARAMETER R_i FOR SECTOR A

Pathway = Deer Consumer Distance = 2.2 miles
X/Q = 1.9E-7 sec/m³ D/Q = 1.4E-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-	2.8E1	-0-	2.3E1	[illegible]	3.9E1
Cr-51	-0-	-0-	-0-	5.0E4	-0-	1.0E5	[illegible]	3.2E5
Mn-54	-0-	-0-	-0-	7.7E5	-0-	1.4E6	[illegible]	4.1E7
Co-57	-0-	-0-	-0-	4.6E6	-0-	8.0E6	[illegible]	2.3E7
Co-58	-0-	-0-	-0-	9.6E6	-0-	1.9E7	[illegible]	4.7E7
Co-60	-0-	-0-	-0-	3.6E7	-0-	7.2E7	7.8E3	7.2E8
Sr-89	-0-	-0-	-0-	4.9E7	-0-	2.6E7	8.3E3	3.1E7
Sr-90	-0-	-0-	-0-	1.0E9	-0-	8.0E8	2.7E6	1.2E9
Zr-95	-0-	-0-	-0-	6.2E7	-0-	1.1E8	4.1E3	2.0E8
Nb-95	-0-	-0-	-0-	2.3E8	-0-	4.5E8	2.8E3	8.2E8
Te-129m	-0-	-0-	-0-	5.9E8	-0-	4.5E8	1.0E3	5.3E8
Cs-134	-0-	-0-	-0-	1.4E8	-0-	1.2E8	2.3E4	3.4E8
Cs-136	-0-	-0-	-0-	5.1E6	-0-	4.2E6	4.0E3	9.5E6
Cs-137	-0-	-0-	-0-	1.2E8	-0-	9.3E7	1.7E4	4.0E8
Ba-140	-0-	-0-	-0-	5.0E6	-0-	4.2E6	6.0E3	7.4E6
Ce-141	-0-	-0-	-0-	1.5E6	-0-	2.4E6	3.3E3	4.2E6
Ce-144	-0-	-0-	-0-	1.8E7	-0-	2.9E7	2.2E4	4.9E7
I -131	-0-	-0-	-0-	6.5E8	-0-	4.3E8	3.3E5	5.9E8
I -133	-0-	-0-	-0-	1.6E1	-0-	8.6E0	5.9E4	6.7E4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E4	6.9E4
UN-ID	-0-	-0-	-0-	1.1E8	-0-	9.4E7	2.8E3	1.4E8

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

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

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TABLE 2-11

DOSE PARAMETER R_i FOR SECTOR B

Pathway = Sheep (Meat) | Distance = 0.2 miles
$X/Q = 6.1E-6\ sec/m^3$ | $D/Q = 5.3E-8\ m^{-2}$

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-	1.5E0	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E3	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	-0-	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	-0-	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	-0-	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	-0-	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.4E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

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

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

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DOSE PARAMETER R_i FOR SECTOR B

Pathway = Deer Consumer   Distance = 1.1 miles
X/Q = 3.4E-7 sec/m^3 D/Q = 2.4E-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-	2.8E1	-0-	2.3E1	3.5E1	3.9E1
Cr-51	-0-	-0-	-0-	5.0E4	-0-	1.0E5	9.1E1	3.2E5
Mn-54	-0-	-0-	-0-	7.7E5	-0-	1.4E6	2.1E3	4.1E7
Co-57	-0-	-0-	-0-	4.6E6	-0-	8.0E6	8.6E2	2.3E7
Co-58	-0-	-0-	-0-	9.6E6	-0-	1.9E7	2.9E3	4.7E7
Co-60	-0-	-0-	-0-	3.6E7	-0-	7.2E7	7.8E3	7.2E8
Sr-89	-0-	-0-	-0-	4.9E7	-0-	2.6E7	8.3E3	3.1E7
Sr-90	-0-	-0-	-0-	1.0E9	-0-	8.0E8	2.7E6	1.2E9
Zr-95	-0-	-0-	-0-	6.2E7	-0-	1.1E8	4.1E3	2.0E8
Nb-95	-0-	-0-	-0-	2.3E8	-0-	4.5E8	2.8E3	8.2E8
Te-129m	-0-	-0-	-0-	5.9E8	-0-	4.5E8	1.0E3	5.3E8
Cs-134	-0-	-0-	-0-	1.4E8	-0-	1.2E8	2.3E4	3.4E8
Cs-136	-0-	-0-	-0-	5.1E6	-0-	4.2E6	4.0E3	9.5E6
Cs-137	-0-	-0-	-0-	1.2E8	-0-	9.3E7	1.7E4	4.0E8
Ba-140	-0-	-0-	-0-	5.0E6	-0-	4.2E6	6.0E3	7.4E6
Ce-141	-0-	-0-	-0-	1.5E6	-0-	2.4E6	3.3E3	4.2E6
Ce-144	-0-	-0-	-0-	1.8E7	-0-	2.9E7	2.2E4	4.9E7
I -131	-0-	-0-	-0-	6.5E8	-0-	4.3E8	3.3E5	5.9E8
I -133	-0-	-0-	-0-	1.6E1	-0-	8.6E0	5.9E4	6.7E4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E4	6.9E4
UN-ID	-0-	-0-	-0-	1.1E8	-0-	9.4E7	2.8E3	1.4E8

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

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

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TABLE 2-11

DOSE PARAMETER R_i FOR SECTOR B

Pathway = Sanitary Landfill
X/Q = 1.4E-7 sec/m³
Distance = 2.1 miles
D/Q = 1.2E-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-	2.9E2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	7.6E2	1.1E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	1.8E4	3.2E8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	7.2E3	7.8E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	8.7E7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	6.5E4	4.9E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	6.9E4	4.9E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.3E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	3.4E4	5.7E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	3.1E7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	8.3E3	4.5E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.6E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	3.3E4	3.4E7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.4E5	2.3E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	5.0E4	4.7E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	2.7E4	3.1E6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.6E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	2.7E6	3.9E6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	4.9E5	5.6E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.0E4	5.8E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	1.7E8

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

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

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TABLE 2-12

DOSE PARAMETER R_i FOR SECTOR C

Pathway = Camp San Onofre X/Q = 9.2E-8 sec/m³					Distance = 2.6 miles D/Q = 8.4E-10 m⁻²			
Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	1.3E3	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	3.3E3	3.7E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	7.7E4	1.1E9
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	3.1E4	2.7E8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	1.1E5	3.0E8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	2.8E5	1.7E10
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	3.0E5	1.7E4
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	9.9E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.5E5	2.0E8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	1.1E8
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	3.7E4	1.6E7
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	8.5E5	5.5E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	1.5E5	1.2E8
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	6.2E5	8.2E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	2.2E5	1.6E7
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	1.2E5	1.1E7
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	8.2E5	5.6E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	1.2E7	1.4E7
I -133	-0-	-0-	-0-	-0-	-0-	-0-	2.2E6	2.0E6
I -135	-0-	-0-	-0-	-0-	-0-	-0-	4.5E5	2.0E6
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	6.0E8

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

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

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TABLE 2-12

DOSE PARAMETER R_i FOR SECTOR C

Pathway = Camp San Onofre Fr. Stn Distance = 2.3 miles
X/Q = 1.1E-7 sec/m^3 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-	5.2E2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	1.4E3	1.9E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	3.2E4	5.7E8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	1.3E4	1.4E8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	4.4E4	1.6E8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	1.2E5	8.8E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	1.2E5	8.9E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	4.1E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	6.2E4	1.0E8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	4.3E4	5.6E7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	1.5E4	8.1E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	3.5E5	2.8E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	6.0E4	6.2E7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	2.6E5	4.2E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	9.0E4	8.4E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	4.9E4	5.6E6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	3.4E5	2.9E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	4.9E6	7.1E6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	8.8E5	1.0E6
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.8E5	1.0E6
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	4.2E4	3.1E8

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

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

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TABLE 2-12

DOSE PARAMETER R_i FOR SECTOR C

Pathway = Sewage Facility Distance = 2.2 miles
X/Q = 1.2E-7 sec/m³ D/Q = 1.2E-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-	2.9E2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	7.6E2	1.1E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	1.8E4	3.2E8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	7.2E3	7.8E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	8.7E7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	6.5E4	4.9E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	6.9E4	4.9E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.3E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	3.4E4	5.7E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	3.1E7
Te-129m	[illegible]	-0-	-0-	-0-	-0-	-0-	8.3E3	4.5E6
Cs-134	[illegible]	-0-	-0-	-0-	-0-	-0-	1.9E5	1.6E9
Cs-136	[illegible]	-0-	-0-	-0-	-0-	-0-	3.3E4	3.4E7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.4E5	2.3E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	5.0E4	4.7E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	2.7E4	3.1E6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.6E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	2.7E6	3.9E6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	4.9E5	5.6E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	5.8E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	1.7E8

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

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

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TABLE 2-12

DOSE PARAMETER R_i FOR SECTOR C

Pathway = Sheep (Meat) Distance = 0.2 miles
$X/Q = 6.5E-6\ sec/m^3$ $D/Q = 5.3E-8\ m^{-2}$

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-	1.5E0	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E3	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	-0-	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	-0-	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	-0-	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	-0-	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.1E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

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

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

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TABLE 2-12

DOSE PARAMETER R_i FOR SECTOR C

Pathway = Deer Consumer
X/Q = 3.4E-7 sec/m³

Distance = 1.0 miles
D/Q = 5.1E-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-	2.8E1	-0-	2.3E1	3.5E1	3.9E1
Cr-51	-0-	-0-	-0-	5.0E4	-0-	1.0E5	9.1E1	3.2E5
Mn-54	-0-	-0-	-0-	7.7E5	-0-	1.4E6	2.1E3	4.1E7
Co-57	-0-	-0-	-0-	4.6E6	-0-	8.0E6	8.6E2	2.3E7
Co-58	-0-	-0-	-0-	9.6E6	-0-	1.9E7	2.9E3	4.7E7
Co-60	-0-	-0-	-0-	3.6E7	-0-	7.2E7	7.8E3	7.2E8
Sr-89	-0-	-0-	-0-	4.9E7	-0-	2.6E7	8.3E3	3.1E7
Sr-90	-0-	-0-	-0-	1.0E9	-0-	8.0E8	2.7E6	1.2E9
Zr-95	-0-	-0-	-0-	6.2E7	-0-	1.1E8	4.1E3	2.0E8
Nb-95	-0-	-0-	-0-	2.3E8	-0-	4.5E8	2.8E3	8.2E8
Te-129m	-0-	-0-	-0-	5.9E8	-0-	4.5E8	1.0E3	5.3E8
Cs-134	-0-	-0-	-0-	1.4E8	-0-	1.2E8	2.3E4	3.4E8
Cs-136	-0-	-0-	-0-	5.1E6	-0-	4.2E6	4.0E3	9.5E6
Cs-137	-0-	-0-	-0-	1.2E8	-0-	9.3E7	1.7E4	4.0E8
Ba-140	-0-	-0-	-0-	5.0E6	-0-	4.2E6	6.0E3	7.4E6
Ce-141	-0-	-0-	-0-	1.5E6	-0-	2.4E6	3.3E3	4.2E6
Ce-144	-0-	-0-	-0-	1.8E7	-0-	2.9E7	2.2E4	4.9E7
I -131	-0-	-0-	-0-	6.5E8	-0-	4.3E8	3.3E5	5.9E8
I -133	-0-	-0-	-0-	1.6E1	-0-	8.6E0	5.9E4	6.7E4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E4	6.9E4
UN-ID	-0-	-0-	-0-	1.1E8	-0-	9.4E7	2.8E3	1.4E8

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

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

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TABLE 2-1

DOSE PARAMETER R_i FOR SECTOR D

Pathway = Camp San Onofre — Distance = 2.8 miles

$X/Q = 6.6E-8$ sec/m^3 — $D/Q = 6.4E-10$ 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-	1.3E3	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	3.3E3	3.7E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	7.7E4	1.1E9
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	3.1E4	2.7E8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	1.1E5	3.0E8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	2.8E5	1.7E10
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	3.0E5	1.7E4
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	9.9E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.5E5	2.0E8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	1.1E8
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	3.7E4	1.6E7
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	8.5E5	5.5E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	1.5E5	1.2E8
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	6.2E5	8.2E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	2.2E5	1.6E7
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	1.2E5	1.1E7
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	8.2E5	5.6E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	1.2E7	1.4E7
I -133	-0-	-0-	-0-	-0-	-0-	-0-	2.2E6	2.0E6
I -135	-0-	-0-	-0-	-0-	-0-	-0-	4.5E5	2.0E6
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	6.0E8

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

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

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TABLE 2-13

DOSE PARAMETER R_i FOR SECTOR D

Pathway = Sheep (Meat) Distance = 0.2 miles
$X/Q = 6.3E\text{-}6\ sec/m^3$ $D/Q = 6.6E\text{-}8\ m^{-2}$

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-	1.5E0	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E3	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	-0-	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	-0-	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	-0-	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	-0-	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.4E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

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

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

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TABLE 2-13

DOSE PARAMETER R_i FOR SECTOR D

Pathway = Deer Consumer | Distance = 1.0 miles
X/Q = 3.3E-7 sec/m³ | D/Q = 3.3E-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-	2.8E1	-0-	2.3E1	3.5E1	3.9E1
Cr-51	-0-	-0-	-0-	5.0E4	-0-	1.0E5	9.1E1	3.2E5
Mn-54	-0-	-0-	-0-	7.7E5	-0-	1.4E6	2.1E3	4.1E7
Co-57	-0-	-0-	-0-	4.6E6	-0-	8.0E6	8.6E2	2.3E7
Co-58	-0-	-0-	-0-	9.6E6	-0-	1.9E7	2.9E3	4.7E7
Co-60	-0-	-0-	-0-	3.6E7	-0-	7.2E7	7.8E3	7.2E8
Sr-89	-0-	-0-	-0-	4.9E7	-0-	2.6E7	8.3E3	3.1E7
Sr-90	-0-	-0-	-0-	1.0E9	-0-	8.0E8	2.7E6	1.2E9
Zr-95	-0-	-0-	-0-	6.2E7	-0-	1.1E8	4.1E3	2.0E8
Nb-95	-0-	-0-	-0-	2.3E8	-0-	4.5E8	2.8E3	8.2E8
Te-129m	-0-	-0-	-0-	5.9E8	-0-	4.5E8	1.0E3	5.3E8
Cs-134	-0-	-0-	-0-	1.4E8	-0-	1.2E8	2.3E4	3.4E8
Cs-136	-0-	-0-	-0-	5.1E6	-0-	4.2E6	4.0E3	9.5E6
Cs-137	-0-	-0-	-0-	1.2E8	-0-	9.3E7	1.7E4	4.0E8
Ba-140	-0-	-0-	-0-	5.0E6	-0-	4.2E6	6.0E3	7.4E6
Ce-141	-0-	-0-	-0-	1.5E6	-0-	2.4E6	3.3E3	4.2E6
Ce-144	-0-	-0-	-0-	1.8E7	-0-	2.9E7	2.2E4	4.9E7
I -131	-0-	-0-	-0-	6.5E8	-0-	4.3E8	3.3E5	5.9E8
I -133	-0-	-0-	-0-	1.6E1	-0-	8.6E0	5.9E4	6.7E4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E4	6.9E4
UN-ID	-0-	-0-	-0-	1.1E8	-0-	9.4E7	2.8E3	1.4E8

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

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

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TABLE 2-14

DOSE PARAMETER R_i FOR SECTOR E

Pathway = Camp Horno
X/Q = 6.6E-8 sec/m³
Distance = 4.0 miles
D/Q = 6.4E-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-	1.3E3	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	3.3E3	3.7E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	7.7E4	1.1E9
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	3.1E4	2.7E8
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	1.1E5	3.0E8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	2.8E5	1.7E10
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	3.0E5	1.7E4
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	9.9E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.5E5	2.0E8
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	1.1E8
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	3.7E4	1.6E7
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	8.5E5	5.5E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	1.5E5	1.2E8
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	6.2E5	8.2E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	2.2E5	1.6E7
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	1.2E5	1.1E7
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	8.2E5	5.6E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	1.2E7	1.4E7
I -133	-0-	-0-	-0-	-0-	-0-	-0-	2.2E6	2.0E6
I -135	-0-	-0-	-0-	-0-	-0-	-0-	4.5E5	2.0E6
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	6.0E8

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

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

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TABLE 2-14

DOSE PARAMETER R_i FOR SECTOR E

Pathway = Sheep (Meat)   Distance = 0.3 miles
X/Q = 4.5E-6 sec/m^3 D/Q = 5.9E-8 m^{-2}

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	1.5E3	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E4	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	-0-	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	-0-	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	-0-	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	-0-	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.4E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

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

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

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TABLE 2-14

DOSE PARAMETER R_i FOR SECTOR E

Pathway = Deer Consumer   Distance = 1.2 miles
X/Q = 3.7E-7 sec/m³   D/Q = 8.3E-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-	2.8E1	-0-	2.3E1	3.5E1	3.9E1
Cr-51	-0-	-0-	-0-	5.0E4	-0-	1.0E5	9.1E1	3.2E5
Mn-54	-0-	-0-	-0-	7.7E5	-0-	1.4E6	2.1E3	4.1E7
Co-57	-0-	-0-	-0-	4.6E6	-0-	8.0E6	8.6E2	2.3E7
Co-58	-0-	-0-	-0-	9.6E6	-0-	1.9E7	2.9E3	4.7E7
Co-60	-0-	-0-	-0-	3.6E7	-0-	7.2E7	7.8E3	7.2E8
Sr-89	-0-	-0-	-0-	4.9E7	-0-	2.6E7	8.3E3	3.1E7
Sr-90	-0-	-0-	-0-	1.0E9	-0-	8.0E8	2.7E6	1.2E9
Zr-95	-0-	-0-	-0-	6.2E7	-0-	1.1E8	4.1E3	2.0E8
Nb-95	-0-	-0-	-0-	2.3E8	-0-	4.5E8	2.8E3	8.2E8
Te-129m	-0-	-0-	-0-	5.9E8	-0-	4.5E8	1.0E3	5.3E8
Cs-134	-0-	-0-	-0-	1.4E8	-0-	1.2E8	2.3E4	3.4E8
Cs-136	-0-	-0-	-0-	5.1E6	-0-	4.2E6	4.0E3	9.5E6
Cs-137	-0-	-0-	-0-	1.2E8	-0-	9.3E7	1.7E4	4.0E8
Ba-140	-0-	-0-	-0-	5.0E6	-0-	4.2E6	6.0E3	7.4E6
Ce-141	-0-	-0-	-0-	1.5E6	-0-	2.4E6	3.3E3	4.2E6
Ce-144	-0-	-0-	-0-	1.8E7	-0-	2.9E7	2.2E4	4.9E7
I -131	-0-	-0-	-0-	6.5E8	-0-	4.3E8	3.3E5	5.9E8
I -133	-0-	-0-	-0-	1.6E1	-0-	8.6E0	5.9E4	6.7E4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E4	6.9E4
UN-ID	-0-	-0-	-0-	1.1E8	-0-	9.4E7	2.8E3	1.4E8

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

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

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TABLE 2-15

DOSE PARAMETER R_i FOR SECTOR F

Pathway = San Onofre State Park Guard Shack   Distance = 0.8 miles
X/Q = 8.1E-7 sec/m^3 D/Q = 7.1E-9 m^{-2}

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	7.2E1	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	1.9E2	2.7E5
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	4.4E3	7.9E7
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	1.8E3	2.0E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	6.1E3	2.2E7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	1.6E4	1.2E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	1.7E4	1.2E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	5.7E6	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	8.6E3	1.4E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	5.9E3	7.8E6
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	2.1E3	1.1E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	4.8E4	3.9E8
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	8.4E3	8.6E6
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	3.5E4	5.9E8
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	1.2E4	1.2E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	6.9E3	7.8E5
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	4.7E4	4.0E6
I -131	-0-	-0-	-0-	-0-	-0-	-0-	6.8E5	9.8E5
I -133	-0-	-0-	-0-	-0-	-0-	-0-	1.2E5	1.4E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	2.6E4	1.4E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	5.9E3	4.3E7

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

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

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TABLE 2-15

DOSE PARAMETER R_i FOR SECTOR F

Pathway = Beach Concession   Distance = 0.9 miles
X/Q = 6.9E-7 sec/m³   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-	-0-	-0-	-0-	1.2E2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	3.1E2	4.4E5
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	7.2E3	1.3E9
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	2.9E3	3.2E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	1.0E4	3.6E7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	2.7E4	2.0E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	2.8E4	2.0E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	9.3E6	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	1.4E4	2.4E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	9.7E3	1.3E7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	3.4E3	1.8E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	7.9E4	6.4E8
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	1.4E4	1.4E7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	5.8E4	9.6E8
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	2.0E4	1.9E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	1.1E4	1.3E6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	7.6E4	6.5E6
I -131	-0-	-0-	-0-	-0-	-0-	-0-	1.1E6	1.6E6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	2.0E5	2.3E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	4.2E4	2.4E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	9.7E3	7.0E7

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

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

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TABLE 2-15

DOSE PARAMETER R_i FOR SECTOR F

Pathway = Border Patrol Checkpt. Distance = 1.8 miles
$X/Q = 2.4E\text{-}7\ sec/m^3$ $D/Q = 1.8E\text{-}9\ m^{-2}$

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-	3.6E2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	9.5E2	1.3E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	2.2E4	3.9E8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	9.0E3	9.8E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	3.0E4	1.1E8
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	8.1E4	6.1E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	8.7E4	6.2E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.8E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	4.3E4	7.2E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	3.0E4	3.9E7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	1.0E4	5.6E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	2.4E5	1.9E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	4.2E4	4.3E7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.8E5	2.9E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	6.2E4	5.9E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	3.4E4	3.9E6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	2.3E5	2.0E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	3.4E6	4.9E6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	6.1E5	7.0E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.3E5	2.2E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.9E4	2.1E8

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

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

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TABLE 2-15

DOSE PARAMETER R_i FOR SECTOR F

Pathway = Sheep (Meat) Distance = 0.5 miles
X/Q = 1.9E-6 sec/m³ 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-	1.5E0	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E3	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	-0-	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	-0-	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	-0-	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	-0-	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	-0-	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.4E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

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

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

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TABLE 2-15

DOSE PARAMETER R_i FOR SECTOR F

Pathway = Deer Consumer
X/Q = 3.0E-7 sec/m³
Distance = 1.4 miles
D/Q = 2.3E-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-	2.8E1	-0-	2.3E1	3.5E1	3.9E1
Cr-51	-0-	-0-	-0-	5.0E4	-0-	1.0E5	9.1E1	3.2E5
Mn-54	-0-	-0-	-0-	7.7E5	-0-	1.4E6	2.1E3	4.1E7
Co-57	-0-	-0-	-0-	4.6E6	-0-	8.0E6	8.6E2	2.3E7
Co-58	-0-	-0-	-0-	9.6E6	-0-	1.9E7	2.9E3	4.7E7
Co-60	-0-	-0-	-0-	3.6E7	-0-	7.2E7	7.8E3	7.2E8
Sr-89	-0-	-0-	-0-	4.9E7	-0-	2.6E7	8.3E3	3.1E7
Sr-90	-0-	-0-	-0-	1.0E9	-0-	8.0E8	2.7E6	1.2E9
Zr-95	-0-	-0-	-0-	6.2E7	-0-	1.1E8	4.1E3	2.0E8
Nb-95	-0-	-0-	-0-	2.3E8	-0-	4.5E8	2.8E3	8.2E8
Te-129m	-0-	-0-	-0-	5.9E8	-0-	4.5E8	1.0E3	5.3E8
Cs-134	-0-	-0-	-0-	1.4E8	-0-	1.2E8	2.3E4	3.4E8
Cs-136	-0-	-0-	-0-	5.1E6	-0-	4.2E6	4.0E3	9.5E6
Cs-137	-0-	-0-	-0-	1.2E8	-0-	9.3E7	1.7E4	4.0E8
Ba-140	-0-	-0-	-0-	5.0E6	-0-	4.2E6	6.0E3	7.4E6
Ce-141	-0-	-0-	-0-	1.5E6	-0-	2.4E6	3.3E3	4.2E6
Ce-144	-0-	-0-	-0-	1.8E7	-0-	2.9E7	2.2E4	4.9E7
I -131	-0-	-0-	-0-	6.5E8	-0-	4.3E8	3.3E5	5.9E8
I -133	-0-	-0-	-0-	1.6E1	-0-	8.6E0	5.9E4	6.7E4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E4	6.9E4
UN-ID	-0-	-0-	-0-	1.1E8	-0-	9.4E7	2.8E3	1.4E8

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

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

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TABLE 2-16

DOSE PARAMETER R_i FOR SECTOR G

Pathway = San Onofre State Beach Campground — Distance = 0.8 miles
$X/Q = 7.7E\text{-}7\ sec/m^3$ — $D/Q = 3.9E\text{-}9\ m^{-2}$

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	8.0E1	-0-	1.4E2	-0-	1.6E2	-0-	1.6E2	-0-
Cr-51	4.4E1	5.7E5	1.3E2	5.7E5	3.7E2	5.7E5	4.1E2	5.7E5
Mn-54	3.1E3	1.7E8	5.3E3	1.7E8	8.2E3	1.7E8	9.5E3	1.7E8
Co-57	6.0E2	4.2E7	1.6E3	4.2E7	3.9E3	4.2E7	3.9E3	4.2E7
Co-58	1.4E3	4.7E7	4.2E3	4.7E7	1.2E4	4.7E7	1.3E4	4.7E7
Co-60	3.9E3	2.7E9	1.2E4	2.7E9	3.2E4	2.7E9	3.5E4	2.7E9
Sr-89	4.9E4	2.7E3	7.4E4	2.7E3	5.4E4	2.7E3	3.7E4	2.7E3
Sr-90	5.0E6	-0-	1.2E7	-0-	1.3E7	-0-	1.2E7	-0-
Zr-95	2.7E3	3.1E7	7.5E3	3.1E7	1.8E4	3.1E7	1.9E4	3.1E7
Nb-95	1.6E3	1.7E7	4.6E3	1.7E7	1.2E4	1.7E7	1.3E4	1.7E7
Te-129m	3.9E3	2.4E6	6.2E3	2.4E6	6.4E3	2.4E6	4.5E3	2.4E6
Cs-134	8.7E4	8.4E8	1.3E5	8.4E8	1.4E5	8.4E8	1.0E5	8.4E8
Cs-136	1.7E4	1.9E7	2.1E4	1.9E7	2.4E4	1.9E7	1.8E4	1.9E7
Cs-137	7.5E4	1.3E9	1.0E5	1.3E9	1.0E5	1.3E9	7.7E4	1.3E9
Ba-140	6.9E3	2.5E6	9.1E3	2.5E6	2.8E4	2.5E6	2.7E4	2.5E6
Ce-141	2.7E3	1.7E6	7.0E3	1.7E6	1.6E4	1.7E6	1.5E4	1.7E6
Ce-144	1.8E4	8.6E6	4.8E4	8.6E6	1.1E5	8.6E6	1.0E5	8.6E6
I -131	1.8E6	2.1E6	2.0E6	2.1E6	1.8E6	2.1E6	1.5E6	2.1E6
I -133	4.4E5	3.0E5	4.7E5	3.0E5	3.6E5	3.0E5	2.7E5	3.0E5
I -135	8.6E4	3.1E5	9.8E4	3.1E5	7.7E4	3.1E5	5.5E4	3.1E5
UN-ID	7.7E3	9.2E7	1.4E4	9.2E7	1.6E4	9.2E7	1.3E4	9.2E7

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

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

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TABLE 2-16

DOSE PARAMETER R_i FOR SECTOR G

Pathway = Hwy Patrol Weigh Station — Distance = 2.0 miles
X/Q = 2.0E-7 sec/m^3 — D/Q = 8.5E-10 m^{-2}

Radio-Nuclide	Infant		Child		Teen		Adult	
	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway	Inhala-tion Pathway	Food & Ground Pathway
H -3	-0-	-0-	-0-	-0-	-0-	-0-	2.9E2	-0-
Cr-51	-0-	-0-	-0-	-0-	-0-	-0-	7.6E2	1.1E6
Mn-54	-0-	-0-	-0-	-0-	-0-	-0-	1.8E4	3.2E8
Co-57	-0-	-0-	-0-	-0-	-0-	-0-	7.2E3	7.8E7
Co-58	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	8.7E7
Co-60	-0-	-0-	-0-	-0-	-0-	-0-	6.5E4	4.9E9
Sr-89	-0-	-0-	-0-	-0-	-0-	-0-	6.9E4	4.9E3
Sr-90	-0-	-0-	-0-	-0-	-0-	-0-	2.3E7	-0-
Zr-95	-0-	-0-	-0-	-0-	-0-	-0-	3.4E4	5.7E7
Nb-95	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	3.1E7
Te-129m	-0-	-0-	-0-	-0-	-0-	-0-	8.3E3	4.5E6
Cs-134	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.6E9
Cs-136	-0-	-0-	-0-	-0-	-0-	-0-	3.3E4	3.4E7
Cs-137	-0-	-0-	-0-	-0-	-0-	-0-	1.4E5	2.3E9
Ba-140	-0-	-0-	-0-	-0-	-0-	-0-	5.0E4	4.7E6
Ce-141	-0-	-0-	-0-	-0-	-0-	-0-	2.7E4	3.1E6
Ce-144	-0-	-0-	-0-	-0-	-0-	-0-	1.9E5	1.6E7
I -131	-0-	-0-	-0-	-0-	-0-	-0-	2.7E6	3.9E6
I -133	-0-	-0-	-0-	-0-	-0-	-0-	4.9E5	5.6E5
I -135	-0-	-0-	-0-	-0-	-0-	-0-	1.0E5	5.8E5
UN-ID	-0-	-0-	-0-	-0-	-0-	-0-	2.4E4	1.7E8

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

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

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<u>**TABLE 2-16**</u>

DOSE PARAMETER R_i FOR SECTOR G

Pathway = Sheep (Meat) X/Q = 1.2E-7 sec/m³					Distance = 2.7 miles D/Q = 4.8E-10 m⁻²			
	Infant		Child		Teen		Adult	
Radio-Nuclide	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-	1.5E0	-0-	1.2E0	7.0E0	2.1E0
Cr-51	-0-	-0-	-0-	5.1E1	-0-	1.0E2	1.8E1	2.6E4
Mn-54	-0-	-0-	-0-	7.8E2	-0-	1.4E3	4.3E2	7.6E6
Co-57	-0-	-0-	-0-	4.7E3	-0-	8.1E3	1.7E2	1.9E6
Co-58	-0-	-0-	-0-	9.7E3	-0-	2.0E4	5.9E2	2.1E6
Co-60	-0-	-0-	-0-	3.7E4	-0-	7.3E4	1.6E3	1.2E8
Sr-89	-0-	-0-	-0-	5.0E4	-0-	2.6E4	1.7E3	3.1E4
Sr-90	-0-	-0-	-0-	1.0E6	-0-	8.1E5	5.5E5	1.3E6
Zr-95	-0-	-0-	-0-	6.3E4	-0-	1.1E5	8.3E2	1.6E6
Nb-95	-0-	-0-	-0-	2.4E5	-0-	4.5E5	5.7E2	1.6E6
Te-129m	-0-	-0-	-0-	6.0E5	-0-	4.5E5	2.0E2	6.5E5
Cs-134	-0-	-0-	-0-	1.4E5	-0-	1.2E5	4.7E3	3.8E7
Cs-136	-0-	-0-	-0-	5.1E3	-0-	4.3E3	8.1E2	8.3E5
Cs-137	-0-	-0-	-0-	1.3E5	-0-	9.5E4	3.4E3	5.7E7
Ba-140	-0-	-0-	-0-	5.1E3	-0-	4.3E3	1.2E3	1.2E5
Ce-141	-0-	-0-	[illegible]	1.5E3	-0-	2.4E3	6.6E2	7.9E4
Ce-144	-0-	-0-	[illegible]	1.8E4	-0-	3.0E4	4.5E3	4.3E5
I -131	-0-	-0-	-0-	6.6E5	[illegible]	4.4E5	6.6E4	7.0E5
I -133	-0-	-0-	-0-	1.6E-2	[illegible]	8.7E-3	1.2E4	1.3E4
I -135	-0-	-0-	-0-	1.1E-18	-0-	6.4E-19	2.5E3	1.4E4
UN-ID	-0-	-0-	-0-	1.1E5	-0-	9.5E4	5.7E2	4.2E6

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

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

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TABLE 2-16

DOSE PARAMETER R_i FOR SECTOR G

Pathway = Deer Consumer
X/Q = 8.8E-6 sec/m³

Distance = 3.3 miles
D/Q = 3.2 -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-	2.8E1	-0-	2.3E1	3.5E1	3.9E1
Cr-51	-0-	-0-	-0-	5.0E4	-0-	1.0E5	9.1E1	3.2E5
Mn-54	-0-	-0-	-0-	7.7E5	-0-	1.4E6	2.1E3	4.1E7
Co-57	-0-	-0-	-0-	4.6E6	-0-	8.0E6	8.6E2	2.3E7
Co-58	-0-	-0-	-0-	9.6E6	-0-	1.9E7	2.9E3	4.7E7
Co-60	-0-	-0-	-0-	3.6E7	-0-	7.2E7	7.8E3	7.2E8
Sr-89	-0-	-0-	-0-	4.9E7	-0-	2.6E7	8.3E3	3.1E7
Sr-90	-0-	-0-	-0-	1.0E9	-0-	8.0E8	2.7E6	1.2E9
Zr-95	-0-	-0-	-0-	6.2E7	-0-	1.1E8	4.1E3	2.0E8
Nb-95	-0-	-0-	-0-	2.3E8	-0-	4.5E8	2.8E3	8.2E8
Te-129m	-0-	-0-	-0-	5.9E8	-0-	4.5E8	1.0E3	5.3E8
Cs-134	-0-	-0-	-0-	1.4E8	-0-	1.2E8	2.3E4	3.4E8
Cs-136	-0-	-0-	-0-	5.1E6	-0-	4.2E6	4.0E3	9.5E6
Cs-137	-0-	-0-	-0-	1.2E8	-0-	9.3E7	1.7E4	4.0E8
Ba-140	-0-	-0-	-0-	5.0E6	-0-	4.2E6	6.0E3	7.4E6
Ce-141	-0-	-0-	-0-	1.5E6	-0-	2.4E6	3.3E3	4.2E6
Ce-144	-0-	-0-	-0-	1.8E7	-0-	2.9E7	2.2E4	4.9E7
I -131	-0-	-0-	-0-	6.5E8	-0-	4.3E8	3.3E5	5.9E8
I -133	-0-	-0-	-0-	1.6E1	-0-	8.6E0	5.9E4	6.7E4
I -135	-0-	-0-	-0-	1.1E-15	-0-	6.3E-16	1.2E4	6.9E4
UN-ID	-0-	-0-	-0-	1.1E8	-0-	9.4E7	2.8E3	1.4E8

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

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

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2.9 TOTAL DOSE CALCULATIONS

2.9.1 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))

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

j = Units 1, 2 and 3

l = months 1 - 12**

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

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

where:

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

i = each isotope in specific organ category

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

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2.9.1 Total Dose to Most Likely Member of the Public (Continued)

n = number of isotopes in the specified organ category

C_{il} = total particulate gas curies released for the month

$R_{ik}W_k$ = controlling location factors from ODCM Tables 2-6, Units 1 and 2/3

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

$D^{H3}_{jl}(OG)$ = gas organ dose form tritium in mrem for the month. (Note: H^{-3} bone contribution = 0)

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

$$D_{TOT}(WB) = \sum_{l=1}^{12} \sum_{j=1}^{2/3} \left[D_{jl}(WBL) + D^{H3}_{jl}(OG) + 0.9\, D_{jl}(\gamma) \right] + D(Direct); \qquad (2\text{-}22)$$

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 ODCM Units 2/3 (1-19), Unit 1 ODCM (1-13)]

$D^{H3}_{jl}(OG)$ = 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 ODCM Units 2/3 (2-14), Unit 1 ODCM (2-10)]

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

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

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2.9 TOTAL DOSE CALCULATIONS (Continued)

2.9.1.2 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 plant surrounding area TLD. This value is the direct dose but must be prorated by the occupancy factor

Example: beach time of $\frac{300 \text{ hours}}{\text{yr}}$, or $\frac{8 \text{ hours}}{\text{yr}}$ for landward occupancy.

.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 ODCM Units 2/3 (1-19), Unit 1 ODCM (1-13)]

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3.0 PROJECTED DOSES

3.1 Liquid Dose Projection

The methodology used for projecting a liquid dose over 31 days for Specification 1.3.1 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

The methodology used for projecting a gaseous dose over 31 days for Specification 2.4.1 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.

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4.0 EQUIPMENT

4.1 RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

SPECIFICATION

4.1.1 The radioactive liquid effluent monitoring instrumentation channels shown in Table 4-1 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Specification 1.1.1 are not exceeded. The alarm/trip setpoints of these channels shall be determined in accordance with Section 1.4.

APPLICABILITY: At all times

ACTION:

a. With a radioactive liquid effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above specification, immediately suspend the release of radioactive liquid effluents monitored by the affected channel or declare the channel inoperable.

b. With less than the minimum number of radioactive liquid effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 4-1. Exert best efforts to return the instrument to OPERABLE status within 30 days and, additionally, if the inoperable instrument(s) remain inoperable for greater than 30 days, explain in the next Semiannual Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner.

SURVEILLANCE REQUIREMENTS

.1 Each radioactive liquid effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST operations at the frequencies shown in Table 4-2.

.2 At least once per 4 hours, all pumps required to be providing dilution to meet the site radioactive effluent concentration limits of Specification 1.1.1 shall be determined to be operating and providing dilution to the discharge structure.

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TABLE 4-1

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT*	MINIMUM CHANNELS OPERABLE	ACTION	
1. GROSS RADIOACTIVITY MONITORS PROVIDING ALARM TERMINATION OF RELEASE			
a. Liquid Radwaste Effluent Line - 2/3 RT-7813	1	28	
b. Steam Generator Blowdown (Neutralization Sump), Full Flow Condensate Polisher Effluent Line - 2(3)RT-7817	1	29	A
c. Turbine Plant Sumps Effluent Line - 2(3)RT-7821	1	30	
d. Steam Generator (E088) Blowdown Effluent Line - 2(3)RT6759	1	29	
e. Steam Generator (E089) Blowdown Effluent Line - 2(3)RT6753	1	29	
2. FLOW RATE MEASUREMENT DEVICES			
a. Liquid Radwaste Effluent Line	1	31	
b. Steam Generator Blowdown (Neutralization Sump), Full Flow Condensate Polisher Effluent Line	1	31	A
c. Steam Generator (E088) Blowdown Bypass Effluent Line	1	31	
d. Steam Generator (E089) Blowdown Bypass Effluent Line	1	31	

TABLE NOTATION

* Monitor Recorders are not required for the Operability of the monitor, providing the inoperable recorder does not cause the monitor to become inoperable (i.e., feedback signal). As long as the monitor has indication, alarm capability (if applicable), proper response (based upon surveillance requirements) and isolation function (if applicable), the loss of the recorder does not render the monitor inoperable.

ACTION 28 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirements, effluent releases may continue provided that prior to initiating a release:

a. At least two independent samples are analyzed in accordance with Specification 1.1.1 and

b. At least two technically qualified members of the Facility Staff independently verify the release rate calculation and discharge line valving;

Otherwise, suspend release of radioactive effluents via this pathway.

ACTION 29 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided grab samples are analyzed for gross radioactivity (beta or gamma) at a limit of detection of at least 10^{-7} microcuries/gram:

a. At least once per 8 hours when the specific activity of the secondary coolant is greater than 0.01 microcuries/gram DOSE EQUIVALENT I-131;

b. At least once per 24 hours when the specific activity of the secondary coolant is less than or equal to 0.01 microcuries/gram DOSE EQUIVALENT I-131; or

c. Lock closed valve HV-3773 and divert flow to T-064 for processing as liquid radwaste.

ACTION 30 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided that, at least once per 12 hours, grab samples are collected and analyzed within 4 hours of collection time for gross radioactivity (beta or gamma) at a limit of detection of at least 10^{-7} microcuries/ml or lock closed valve S22U19-MU077 or S22U19-MU078 and divert flow to the radwaste sump for processing as liquid radwaste. R

ACTION 31 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided the flow rate is estimated at least once per 4 hours during actual releases. Pump curves may be used to estimate flow.

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TABLE 4-2

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

INSTRUMENT**	CHANNEL CHECK	SOURCE CHECK	CHANNELS CALIBRATION	CHANNEL FUNCTIONAL TEST	
1. GROSS BETA OR GAMMA RADIOACTIVITY MONITORS PROVIDING ALARM AND AUTOMATIC TERMINATION OF RELEASE					
a. Liquid Radwaste Effluents Line - 2/3 RT-7813	D	P	R(2)	Q(1)	
b. Steam Generator Blowdown (Neutralization Sump), Full Flow Condensate Polisher Effluent Line - 2(3)RT-7817	D	M	R(2)	Q(1)	A
c. Turbine Plant Sump Effluent Line - 2(3)RT-7821	D	M	R(2)	Q(1)	
d. Steam Generator (E088) Blowdown Bypass Effluent Line - 2(3)RT-6759	D	M	R(2)	Q(1)	
e. Steam Generator (E089) Blowdown Bypass Line - 2(3)RT6753	D	M	R(2)	Q(1)	
2. FLOW RATE MEASUREMENT DEVICES					
a. Liquid Radwaste Effluent Line	D(3)	N.A	R	Q	
b. Steam Generator Blowdown (Neutralization Sump), Full Flow Condensate Polisher Effluent Line	D(3)	N.A	R	Q	A
c. Steam Generator (E088) Blowdown Bypass Effluent Line	D(3)	N.A	R	Q	
d. Steam Generator (E089) Blowdown Bypass Effluent Line	D(3)	N.A	R	Q	

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TABLE 4-2 (Continued)

TABLE NOTATION

** Monitor Recorders are not required for the Operability of the monitor, providing the inoperable recorder does not cause the monitor to become inoperable (i.e., feedback signal). As long as the monitor has indication, alarm capability (if applicable), proper response (based upon surveillance requirements) and isolation function (if applicable), the loss of the recorder does not render the monitor inoperable.

(1) The CHANNEL FUNCTIONAL TEST shall also demonstrate verification of effluent path isolation closure and Control Room alarm annunciation if any of the following conditions exist:*

1. Instrument indicates measured levels above the alarm/trip setpoint.
2. Circuit failure.
3. Instrument indicates a downscale failure.

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

(3) CHANNEL CHECK shall consist of verifying indication of flow during periods of release CHANNEL CHECK shall be made at least once per 24 hours on days on which continuous, periodic, or batch releases are made.

---

*If the instrument controls are not in the operate mode, procedures shall require that the channel be declared inoperable.

APPROVED AUG 0 2 1990

4.0 EQUIPMENT

4.2 RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

SPECIFICATION

4.2.1 The radioactive gaseous effluent monitoring instrumentation channels shown in Table 4-3 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Specification 2.1.1 are not exceeded. The alarm/trip setpoints of these channels shall be determined in accordance with ODCM.

APPLICABILITY: At all times

ACTION:

a. With a radioactive gaseous effluent monitoring instrumentation channel alarm/trip setpoint less conservative than required by the above specification, immediately suspend the release of radioactive gaseous effluents monitored by the affected channel or declare the channel inoperable.

b. With less than the minimum number of radioactive gaseous effluent monitoring instrumentation channels OPERABLE, take the ACTION shown in Table 4-3. Exert best efforts to return the instrument to OPERABLE status within 30 days and, additionally, if the inoperable instrument(s) remain inoperable for greater than 30 days, explain in the next Semiannual Radioactive Effluent Release Report why the inoperability was not corrected in a timely manner.

SURVEILLANCE REQUIREMENTS

.1 Each radioactive gaseous effluent monitoring instrumentation channel shall be demonstrated OPERABLE by performance of the CHANNEL CHECK, SOURCE CHECK, CHANNEL CALIBRATION and CHANNEL FUNCTIONAL TEST operations at the frequencies shown in Table 4-4.

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TABLE 4-3

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

INSTRUMENT***	MINIMUM CHANNELS OPERABLE	APPLICABILITY	ACTION
1. WASTE GAS HOLDUP SYSTEM			
a. Noble Gas Activity Monitor - Providing Alarm and Automatic Termination of Release - 2/3 RT-7808, 2 RT-7865-1 or 3 RT-7865-1	1	*	35
b. Process Flow Rate Monitoring Device	1	*	36
2. CONDENSER EVACUATION SYSTEM			
a. Noble Gas Activity Monitor - 2(3)RT-7818 or 2(3)RT-7870-1	1	**	37
b. Iodine Sampler	1	**	40
c. Particulate Sampler	1	**	40
d. Associated Sample Flow Measuring Device	1	**	36
e. Process Flow Rate Monitoring Device	1(1)	**	36
3. PLANT VENT STACK			
a. Noble Gas Activity Monitor - 2/3 RT - 7808, 2RT-7865-1 or 3RT-7865-1	1	*	37
b. Iodine Sampler	1	*	40
c. Particulate Sampler	1	*	40
d. Associated Sample Flow Measuring Device	1	*	36
e. Process Flow Rate Monitoring Device	1(2)	*	36
4. CONTAINMENT PURGE SYSTEM			
a. Noble Gas Activity Monitor - Providing Alarm and Automatic Termination of Release - 2(3)RT-7828, or 2(3)RT-7865-1	1	*	38
b. Iodine Sampler	1	*	40
c. Particulate Sampler	1	*	40
d. Process Flow Rate Monitoring Device	1	*	36
e. Associated Sample Flow Measuring Device	1	*	36

TABLE 4-3 (Continued)

TABLE NOTATION

* At all times.

** MODES 1-4 with any main steam isolation valve and/or any main steam isolating bypass valve not fully closed.

*** Monitor Recorders are not required for the Operability of the monitor, providing the inoperable recorder does not cause the monitor to become inoperable (i.e., feedback signal). As long as the monitor has indication, alarm capability (if applicable), proper response (based upon surveillance requirements) and isolation function (if applicable), the loss of the recorder does not render the monitor inoperable. A

(1) 2(3)RT-7818 is not equipped to monitor process flow. If another means of continuously monitoring process flow is not available, then comply with ACTION 36.

(2) 2/3 RT-7808 is not equipped to monitor process flow. If 2RT-7865 or 3RT-7865 is not available to continuously monitor plant vent stack flow, then comply with ACTION 36. R

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

a. At least two independent samples of the tank's contents are analyzed, and

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

Otherwise, suspend releases of radioactive effluents via this pathway.

ACTION 36 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided the flow rate is estimated at least once per 8 hours. System design characteristics may be used to estimate flow.

ACTION 37 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue provided grab samples are taken at least once per 12 hours and these samples are analyzed for gross activity within 24 hours.

ACTION 38 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, immediately suspend PURGING of radioactive effluents via this pathway.

ACTION 39 - Remaining in Technical Specifications.

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TABLE 4-3 (Continued)

TABLE NOTATION

ACTION 40 - With the number of channels OPFRABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via the effected pathway may continue provided samples are continuously collected with auxiliary sampling equipment as required in Table 2-1.

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TABLE 4-4

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

INSTRUMENT***	CHANNEL CHECK	SOURCE CHECK	CHANNELS CALIBRATION	CHANNEL FUNCTIONAL TEST	MODE FOR WHICH SURVEILLANCE IS REQUIRED
1. WASTE GAS HOLDUP SYSTEM					
a. Noble Gas Activity Monitor - Providing Alarm and Automatic Termination of Release - 2/3 RT-7808, 2RT-7865-1, 3RT-7865-1	P	P	R(3)	Q(1)	*
b. Process Flow Rate Monitoring Device	P	N.A	R	Q	*
2. CONDENSER EVACUATION SYSTEM					
a. Noble Gas Activity Monitor - 2(3)RT-7818, 2(3)RT-7870-1	D	M	R(3)	Q(2)	**
b. Iodine Sampler	W	N.A	N.A	N.A	**
c. Particulate Sampler	W	N.A	N.A	N.A	**
d. Associated S[illegible]le Flow Measuring Device	D	N.A	R	Q	**
e. Process Flow Rate Monitoring Device (2(3)RT-7870-1)	D	N.A	R	Q	**

TABLE 4-4 (Continued)

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION SURVEILLANCE REQUIREMENTS

INSTRUMENT***	CHANNEL CHECK	SOURCE CHECK	CHANNEL CALIBRATION	CHANNEL FUNCTIONAL TEST	MODE FOR WHICH SURVEILLANCE IS REQUIRED
3. PLANT VENT STACK					
a. Noble Gas Activity Monitor - 2/3 RT-7808, 2RT-7865-1, 3RT-7865-1	D	M	R(3)	Q(2)	*
b. Iodine Sampler	W	N.A	N.A	N.A	*
c. Particulate Sampler	W	N.A	N.A	N.A	*
d. Associated Sample Flow Measuring Device	D	N.A	R	Q	*
e. Process Flow Rate Monitoring Device	D	N.A	R	Q	*
4. CONTAINMENT PURGE SYSTEM					
a. Noble Gas Activity Monitor - Providing Alarm and Automatic Termination of Release - 2(3)RT-7828, 2(3)RT-27865-1	D	P(4)	R(3)	Q(1)	*
b. Iodine Sampler	W	N.A	N.A	N.A	*
c. Particulate Sampler	W	N.A	N.A	N.A	*
d. Process Flow Rate Monitoring Device	D	N.A	R	Q	*
e. Associated Sample Flow Measuring Device	D	N.A	R	Q	*

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TABLE 4-4 (Continued)

TABLE NOTATION

* At all times.

** Modes 1-4 with any main steam isolation valve and/or any main steam isolating bypass valve not fully closed.

*** Monitor Recorders are not required for the Operability of the monitor, providing the inoperable recorder does not cause the monitor to become inoperable (i.e., feedback signal). As long as the monitor has indication, alarm capability (if applicable), proper response (based upon surveillance requirements) and isolation function (if applicable), the loss of the recorder does not render the monitor inoperable. A

(1) The CHANNEL FUNCTIONAL TEST shall also demonstrate verification of effluent path isolation closure and control room alarm annunciation if any of the following conditions exist:# R

1. Instrument indicates measured levels above the alarm/trip setpoint.
2. Circuit failure.
3. Instrument indicates a downscale failure.

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

1. Instrument indicates measured levels above the alarm setpoint.
2. Circuit failure.
3. Instrument indicates a downscale failure.

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

(4) Prior to each release and at least once per month.

#If the instrument controls are not set in the operate mode, procedures shall call for declaring the channel inoperable.

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4.3 OPERABILITY OF RADIOACTIVE WASTE EQUIPMENT

The flow diagrams defining the treatment paths and the components of the radioactive liquid, gaseous and solid waste management systems are shown in Figures 4-5 thru 4-7.

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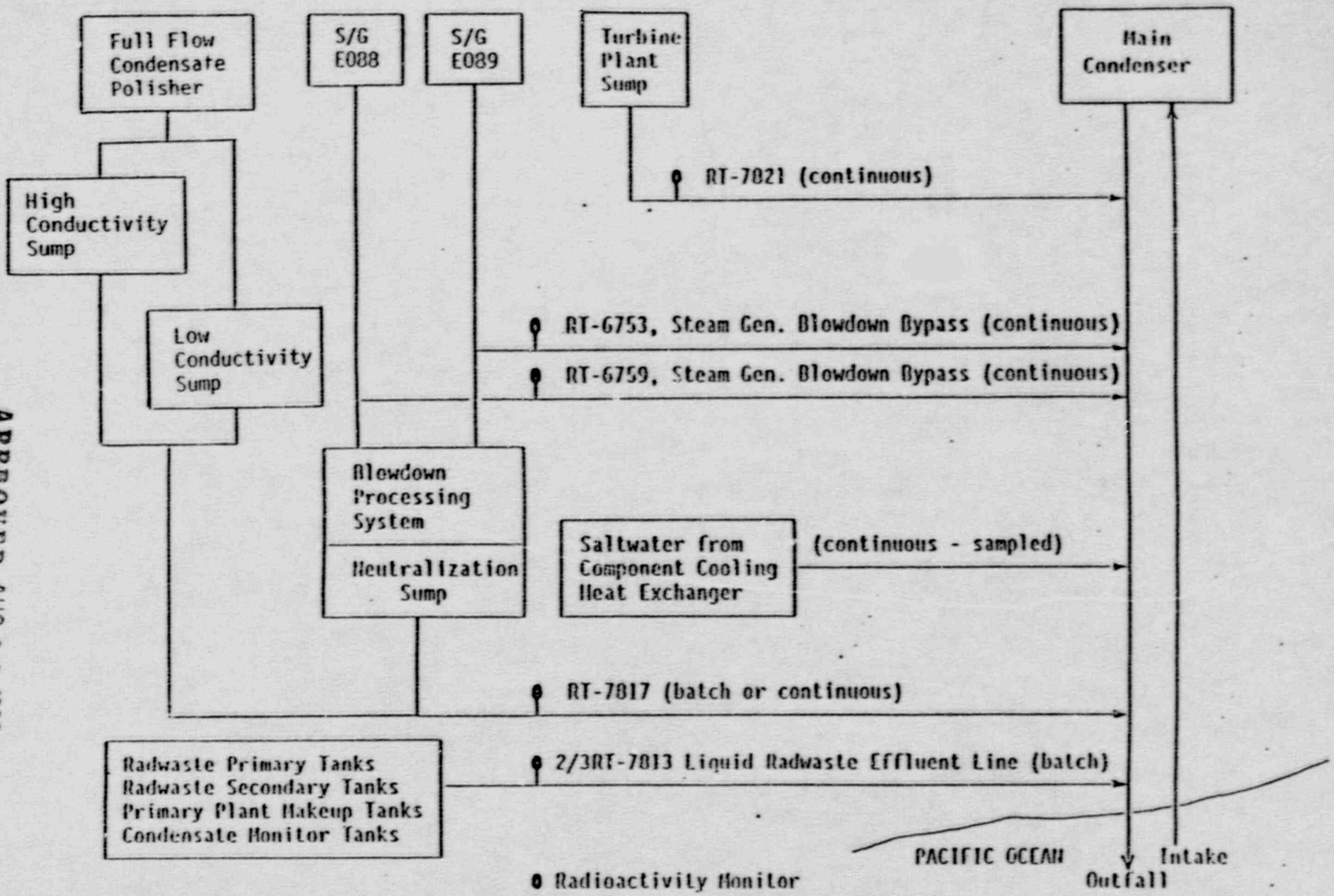

NOTE: Monitored pathways are unit specific unless indicated to be common to Units 2 and 3.

FIGURE 4-5 SONGS 2 and 3 Radioactive Liquid Waste Treatment Systems

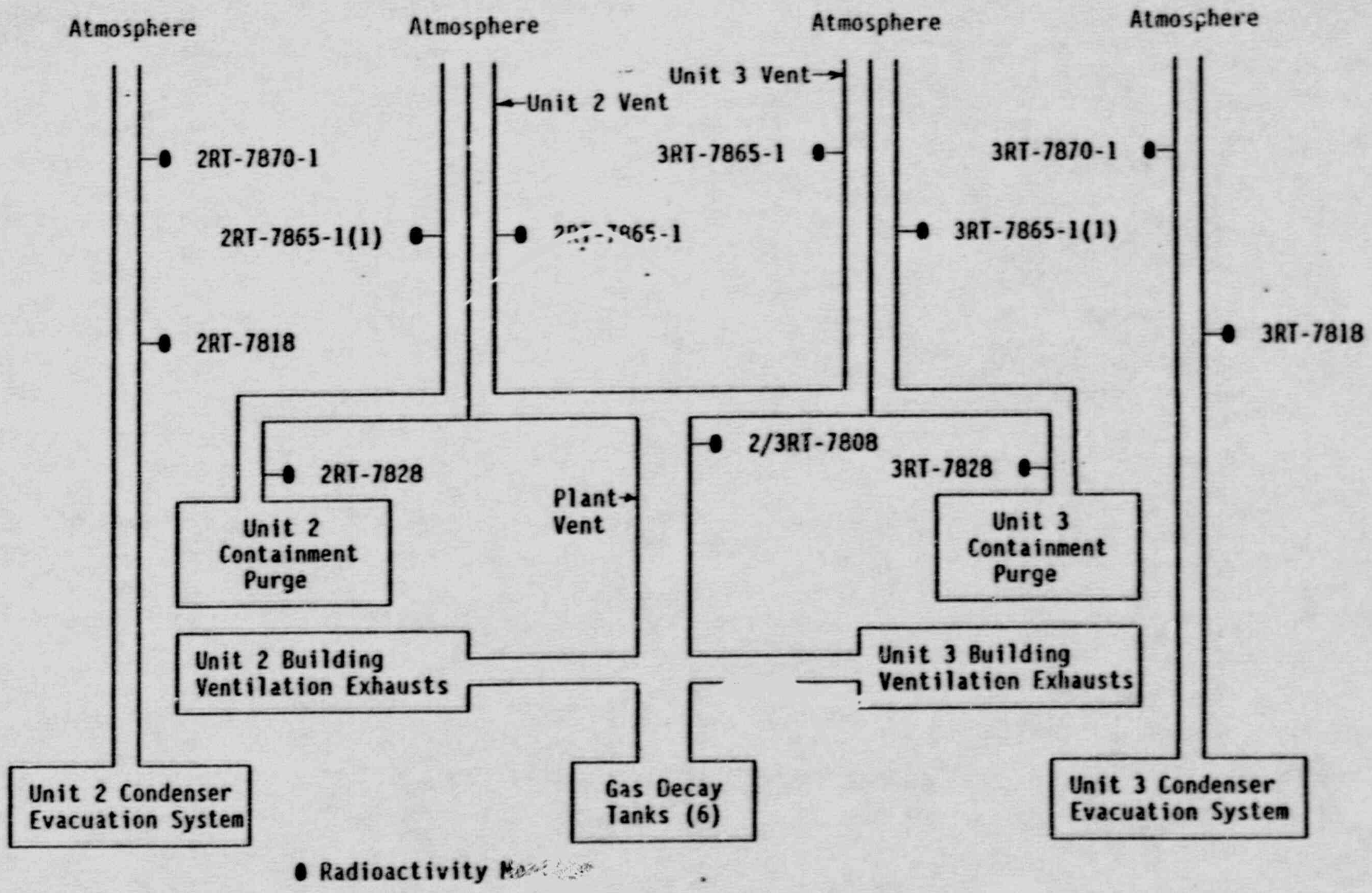

Figure 4-6 Release pathways and monitors of radioactive gaseous effluents for SONGS Units 2 and 3.

(1) RT-7865 can be aligned to either containment purge or the plant vent stack

FIGURE 4-6 SONGS 2 & 3 RADIOACTIVE GASEOUS WASTE TREATMENT SYSTEMS

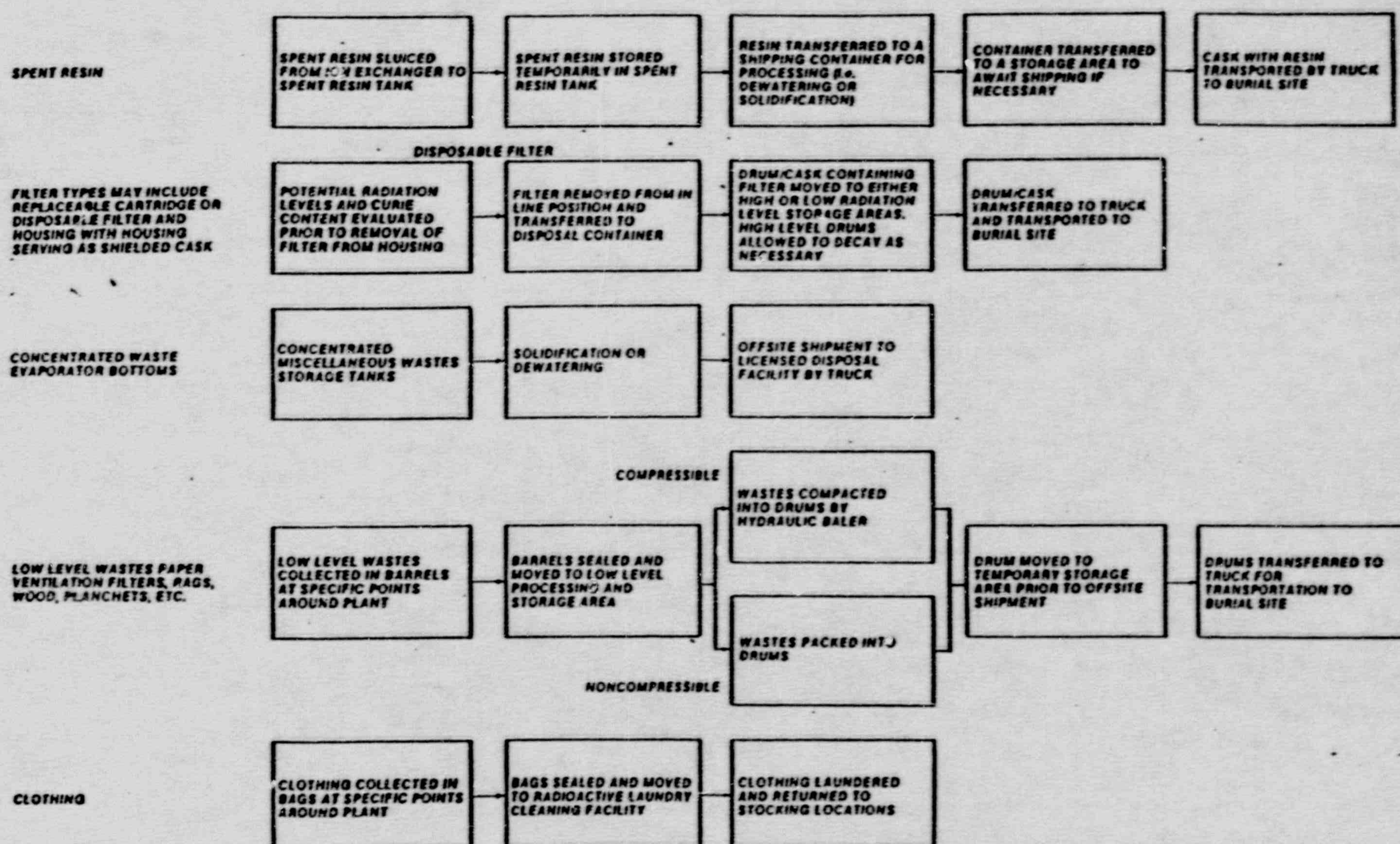

FIGURE 4-7 SOLID WASTE HANDLING

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5.0 RADIOLOGICAL ENVIRONMENTAL MONITORING

5.1 Monitoring Program

SPECIFICATION

5.1.1 The radiological environmental monitoring program shall be conducted as specified in Table 5-1. The requirements are applicable at all times.

APPLICABILITY: At all times

ACTION:

a. Should the radiological environmental monitoring program not be conducted as specified in Table 5-1, in lieu of any other report required by Technical Specification(s) 6.9.1, prepare and submit to the Commission, in the Annual Radiological Operating Report (see Section 5.4), a description of the reasons for not conducting the program as required and the plans for preventing a recurrence.

b. Should the level of radioactivity in an environmental sampling medium exceed the reporting levels of Table 5-2 when averaged over any calendar quarter, in lieu of any other report required by Technical Specification(s) 6.9.1, prepare and submit to the Commission, within 30 days from the end of the affected calendar quarter a Report pursuant to Technical Specification(s) 6.9.1.13. When more than one of the radionuclides in Table 5-2 are detected in the sampling medium, this report shall be submitted if:

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

c. When radionuclides other than those in Table 5-2 are detected and are the result of plant effluents, this report shall be submitted if the potential annual dose to an individual is equal to or greater than the calendar year limits of Specification(s) 1.2.1, 2.2.1 or 2.3.1, as appropriate. This report is not required if the measured level of radioactivity was not the result of plant effluents; however, in such an event, the condition shall be reported and described in the Annual Radiological Environmental Operating Report (see Section 5.4).

d. With fresh leafy vegetable samples or fleshy vegetable samples unavailable from one or more of the sample locations required by Table 5-1, in lieu of any other report required by Technical Specification 6.9.1, prepare and submit to the commission within 30 days, pursuant to Technical Specifications 6.9.2, a Special Report which identifies the cause of the unavailability of samples and identifies locations for obtaining replacement samples. The locations from which samples were unavailable may then be deleted from those required by Table 5-1, provided the locations from which the replacement samples were obtained are added to the environmental monitoring program as replacement locations.

R

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SURVEILLANCE REQUIREMENTS

.1 The radiological environmental monitoring samples shall be collected pursuant to Table 5-1 from the locations given in Tables 5-4 and 5-5 and Figure 5-1 and shall be analyzed pursuant to the requirements of Tables 5-1 and 5-3.

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TABLE 5-1

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples and Sample Locations[a]	Sampling and Collection Frequency[a]	Type and Frequency of Analyses
1. AIRBORNE Radioiodine and Particulates	Samples from at least 5 locations 3 samples from offsite locations (in different sectors) of the highest calculated annual average ground level D/Q. 1 sample from the vicinity of a community having the the highest calculated annual average ground-level D/Q. 1 sample from a control location 15-30 km (10-20 miles) distant and in the least prevalent wind direction[c]	Continuous operation of sampler with sample collection , required by dust loading, but at least once per 7 days.[d]	Radioiodine cartridge. Analyze at least once per 7 days for I-131. Particulate sampler. Analyze for gross beta radioactivity ≥ 24 hours following filter change. Perform gamma isotopic[b] analysis on each sample when gross beta activity is > 10 times the yearly mean of control samples. Perform gamma isotopic analysis on composite (by location) sample at least once per 92 days.
2. DIRECT RADIATION[e]	At least 30 locations including an inner ring of stations in the general area of the site boundary and an outer ring approximately in the 4 to 5 mile range from the site with a station in each sector of each ring. The balance of the stations are in special interest areas such as population centers, nearby residences, schools, and in 2 or 3 areas to serve as control stations.	At least once per 92 days.	Gamma dose. At least once per 92 days.

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TABLE 5-1 (Continued)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples and Sample Locations[a]	Sampling and Collection Frequency[a]	Type and Frequency of Analyses	
3. WATERBORNE				
a. Ocean	4 locations	At least once per month and composited[f] quarterly	Gamma isotopic analysis of each monthly sample. Tritium analysis of composite sample at least once per 92 days.	
b. Drinking	2 locations	Monthly at each location.	Gamma isotopic and tritium analyses of each sample.	
c. Sediment	4 locations from Shoreline	At least once per 184 days.	Gamma isotopic analysis of each sample.	|R
d. Ocean	5 locations Bottom Sediments	At least once per 184 days.	Gamma isotopic analysis of each sample.	|R

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RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Number of Samples and Sample Locations[a]	Sampling and Collection Frequency[a]	Type and Frequency of Analyses
4. INGESTION			
a. Nonmigratory Marine Animals	3 locations	One sample in season, or at least once per 184 days if not seasonal. One sample of each of the following species: 1. Fish-2 adult species such as perch or sheephead. 2. Crustaceae-such as crab or lobster. 3. Mollusks-such as limpets, seahares or clams.	Gamma isotopic analysis on edible portions.
b. Local Crops	2 locations	Representative vegetables, normally 1 leafy and 1 fleshy collected at harvest time. At least 2 vegetables collected semiannually from each location.	Gamma isotopic analysis on edible portions semiannually and I-131 analysis for leafy crops.

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TABLE NOTATION

|R

a. Sample locations are indicated on Figure 5-1.

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

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

d. Canisters for the collection of radioiodine in air are subject to channeling. These devices should be carefully checked before operation in the field or several should be mounted in series to prevent loss of iodine.

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

f. Composite samples should be collected with equipment (or equivalent) which is capable of collecting an aliquot at time intervals which are very short (e.g., hourly) relative to the compositing period (e.g., monthly).

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TABLE 5-2

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Reporting Levels

Analysis	Water (pCi/l)	Airborne Particulate or Gases (pCi/m^3)	Marine Animals (pCi/Kg, wet)	Local Crops (pCi/Kg, wet)
H-3	2×10^4 (a)			
Mn-54	1×10^3		3×10^4	
Fe-59	4×10^2		1×10^4	
Co-58	1×10^3		3×10^4	
Co-60	3×10^2		1×10^4	
Zn-65	3×10^2		2×10^4	
Zr-Nb-95	4×10^2			
I-131	2	0.9		1×10^2
Cs-134	30	10	1×10^3	1×10^3
Cs-137	50	20	2×10^3	2×10^3
Ba-La-140	2×10^2			

(a) For drinking water samples. This is 40 CFR Part 141 value.

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TABLE 5-3

MAXIMUM VALUES FOR THE LOWER LIMITS OF DETECTION (LLD) [a,c]

Analysis	Water (pCi/l)	Airborne Particulate or Gases (pCi/m^3)	Marine Animals (pCi/Kg, wet)	Local Crops (pCi/Kg, wet)	Sediment (pCi/kg, dry)
gross beta	4	1×10^{-2}			
H-3	2000				
Mn-54	15		130		
Fe-59	30		260		
Co-58, 60	15		130		
Zn-65	30		260		
Zr-95	30				
Nb-95	15				
I-131	1 [b]	7×10^{-2}		60	
Cs-134	15	5×10^{-2}	130	60	150
Cs-137	18	6×10^{-2}	150	80	180
Ba-140	60				
La-140	15				

TABLE 5-3 (Continued)

TABLE NOTATION

a. The LLD is the smallest concentration of radioactive material in a sample that will be detected with 95% probability with 5% probability of falsely concluding that a blank observation represents a "real" signal.

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

$$LLD = \frac{4.66 \, s_b}{E \cdot V \cdot 2.22 \times 10^6 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

where:

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

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

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

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

2.22×10^6 is the number of transformations per minute per microcurie,

Y is the fractional radiochemical yield (when applicable),

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

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

The value of s_b used in the calculation of the LLD for a detection system shall be based on the actual observed variance of the background counting rate or of the counting rate of the blank samples (as appropriate) rather than on an unverified theoretically predicted variance. In calculating the LLD for a radionuclide determined by gamma-ray Spectrometry, the background shall include the typical contributions of other radionuclides normally present in the samples (e.g., potassium-40 in milk samples). Typical values of E, V, Y and Δt shall be used in the calculations. | R

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TABLE 5-3 (Continued)

TABLE NOTATION

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

b. LLD for drinking water.

c. Other peaks which are measurable and identifiable, together with the radionuclides in Table 5-3, shall be identified and reported.

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*For a more complete discussion of the LLD, and other detection limits, see the following:

(1) HASL Procedures Manual, HASL-300 (revised annually).
(2) Currie, L. A., "Limits for Qualitative Detection and Quantitative Determination - Application to Radiochemistry" Anal. Chem. 40, 586-93 (1968).
(3) Hartwell, J. K., "Detection Limits for Radioisotopic Counting Techniques," Atlantic Richfield Hanford Company Report ARH-2537 (June 22, 1972).

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5.2 LAND USE CENSUS

SPECIFICATION

5.2.1 A land use census shall be conducted and shall identify the location of the nearest milk animal, the nearest residence and the nearest garden* of greater than 500 square feet producing fresh leafy vegetables in each of the 16 meteorological sectors within a distance of five miles. For elevated releases as defined in Regulatory Guide 1.111, Revision 1, July 1977, the land use census shall also identify the locations of all milk animals and all gardens of greater than 500 square feet producing fresh leafy vegetables in each of the 16 meteorological sectors within a distance of three miles.

APPLICABILITY: At all times

ACTION:

a. With a land use census identifying a location(s) which yields a calculated dose or dose commitment greater than the values currently being calculated in Technical Specification 2.3.1, in lieu of any other report required by Technical Specification 6.9.1, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report which identifies the new location(s).

b. With a land use census identifying a location(s) which yields a calculated dose or dose commitment via the same exposure pathway 20 percent greater than at a location from which samples are currently being obtained in accordance with Section 5.1, in lieu of any other report required by Technical Specification 6.9.1, prepare and submit to the Commission within 30 days, pursuant to Technical Specification 6.9.2, a Special Report which identifies the new location. The new location shall be added to the radiological environmental monitoring program within 30 days. The sampling location, excluding the control station location, having the lowest calculated does or dose commitment via the same exposure pathway may be deleted from this monitoring program after October 31 of the year in which this land use census was conducted.

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SURVEILLANCE REQUIREMENTS

.1 The land use census shall be conducted at least once per 12 months between the dates of June 1 and October 1 using that information which will provide the best results, such as by a door-to-door survey, aerial survey, or by consulting local agriculture authorities.

*Broad leaf vegetation sampling may be performed at the site boundary in the direction sector with the highest D/Q in lieu of the garden census.

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5.0 **RADIOLOGICAL ENVIRONMENTAL MONITORING** (Continued)

5.3 INTERLABORATORY COMPARISON PROGRAM

SPECIFICATION

5.3.1 Analyses shall be performed on radioactive materials supplied as part of an Interlaboratory Comparison Program which has been approved by the Commission.

APPLICABILITY: At all times

ACTION:

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

SURVEILLANCE REQUIREMENTS

.1 A summary of the results obtained as part of the above [illegible] red Interlaboratory Comparison Program and in accordance w[illegible] ection 5.4.1 of this document shall be included in the Annual Radiological Environmental Operating Report (se[illegible] ction 5.4).

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5.4 ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT*

5.4.1 The annual radiological environmental operating reports shall include summaries, interpretations, and an analysis of trends of the results of the radiological environmental surveillance activities for the report period, including a comparison with preoperational studies, operational controls (as appropriate), and previous environmental surveillance reports and an assessment of the observed impacts of the plant operation on the environment. The reports shall also include the results of land use censuses required by Section 5.2. If harmful effects or evidence of irreversible damage are detected by the monitoring, the report shall provide an analysis of the problem and a planned course of action to alleviate the problem.

The annual radiological environmental operating reports shall include summarized and tabulated results in the format of Regulatory Guide 4.8, December 1975 of all radiological environmental samples taken during the report period. In the event that some results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted as soon as possible in a supplementary report.

The reports shall also include the following: a summary description of the radiological environmental monitoring program; a map of all sampling locations keyed to a table giving distances and directions from the mid-point of reactor Units 2 and 3; and the results of licensee participation in the Interlaboratory Comparison Program, required by Section 5.3.

* A single submittal may be made for a multiple unit station, combining those sections that are common to all units at the station.

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5.5 SAMPLE LOCATIONS

The Radiological Environmental Monitoring Sample Locations are identified in Figure 5-1. These sample locations are described in Tables 5-4 and 5-5 and indicate the distance in miles and the direction, determined from degrees true north, from the center of the Units 2 and 3 building complex. Table 5-6 gives the sector and direction designation for the Radiological Environmental Monitoring Sample Location on Map, Figure 5-1.

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TABLE 5-4

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

	TYPE OF SAMPLE AND SAMPLING LOCATION***	DISTANCE* (miles)	DIRECTION*
Direct Radiation			
1	City of San Clemente (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 Visitor's 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	37.0	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 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

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TABLE 5-4

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	Edison 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 [illegible]ores (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

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TABLE 5-4

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	21.0	ESE
53	San Diego County Operations Center	45.0	SE
54	Escondido Fire Station	32.0	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

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TABLE 5-4

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.

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TABLE 5-4

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 Ranch)	2.6	NW
2	Southeast of Oceanside	22.0	SE
3	San Clemente Resident with Garden	4.1	NW

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

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TABLE 5-4

RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

TYPE OF SAMPLE AND SAMPLING LOCATION		DISTANCE* (miles)	DIRECTION*
Non-Migratory Marine Animals			
A	Unit 1 Outfall	0.6	WSW
B	Units 2 and 3 Outfall	0.7	SSW
C	Newport Beach	30.0	NW
Kelp			
A	San Onofre Kelp Bed	1.5	S
B	San Mateo Kelp Bed	3.5	WNW
C	Barn Kelp Bed	6.6	SSE
D	Newport Beach	30.0	NW
Ocean Bottom Sediments			
A	Unit 1 Outfall (0.5 mile West)	0.5	W
B	Unit 1 Outfall (0.6 mile West)	0.6	W
C	Unit 2 Outfall	0.8	SSW
D	Unit 3 Outfall	0.9	S
E	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.

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TABLE 5-5

PIC - RADIOLOGICAL ENVIRONMENTAL MONITORING LOCATIONS

PRESSURIZED ION CHAMBERS	Theta (Degrees)*	DISTANCE* Meters	DISTANCE* 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.

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TABLE 5-6

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.

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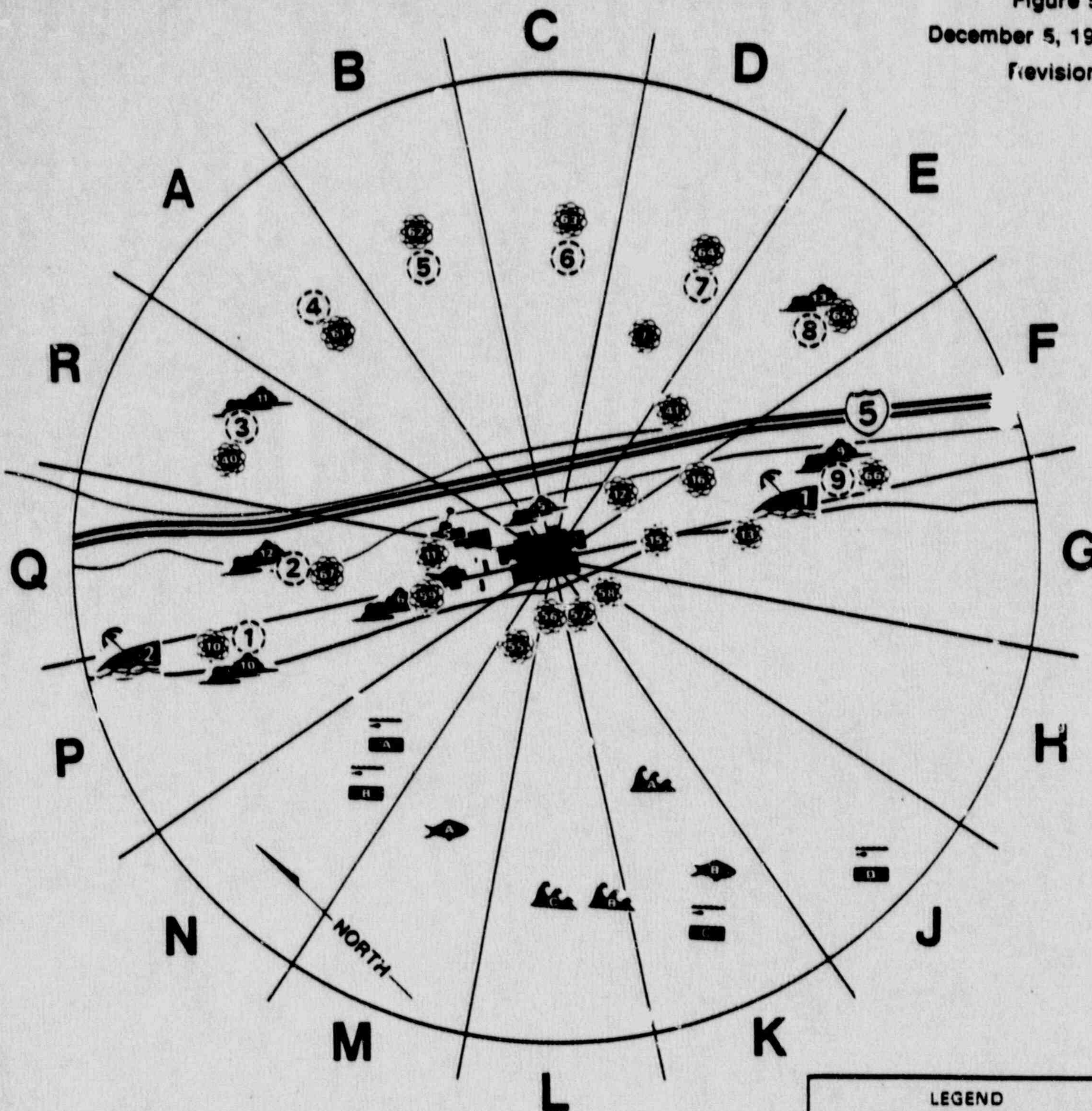
Figure 5-1
December 5, 1989
Revision 0



LEGEND
RADIOLOGICAL ENVIRONMENTAL MONITORING SAMPLE LOCATIONS

- Pressurized Ion Chamber
- Direct Radiation
- Air
- Soil
- Ocean Water
- Drinking Water
- Non-Migratory Marine Animals
- Local Crops
- Kelp
- Ocean Bottom Sediments
- Sediment From Shoreline

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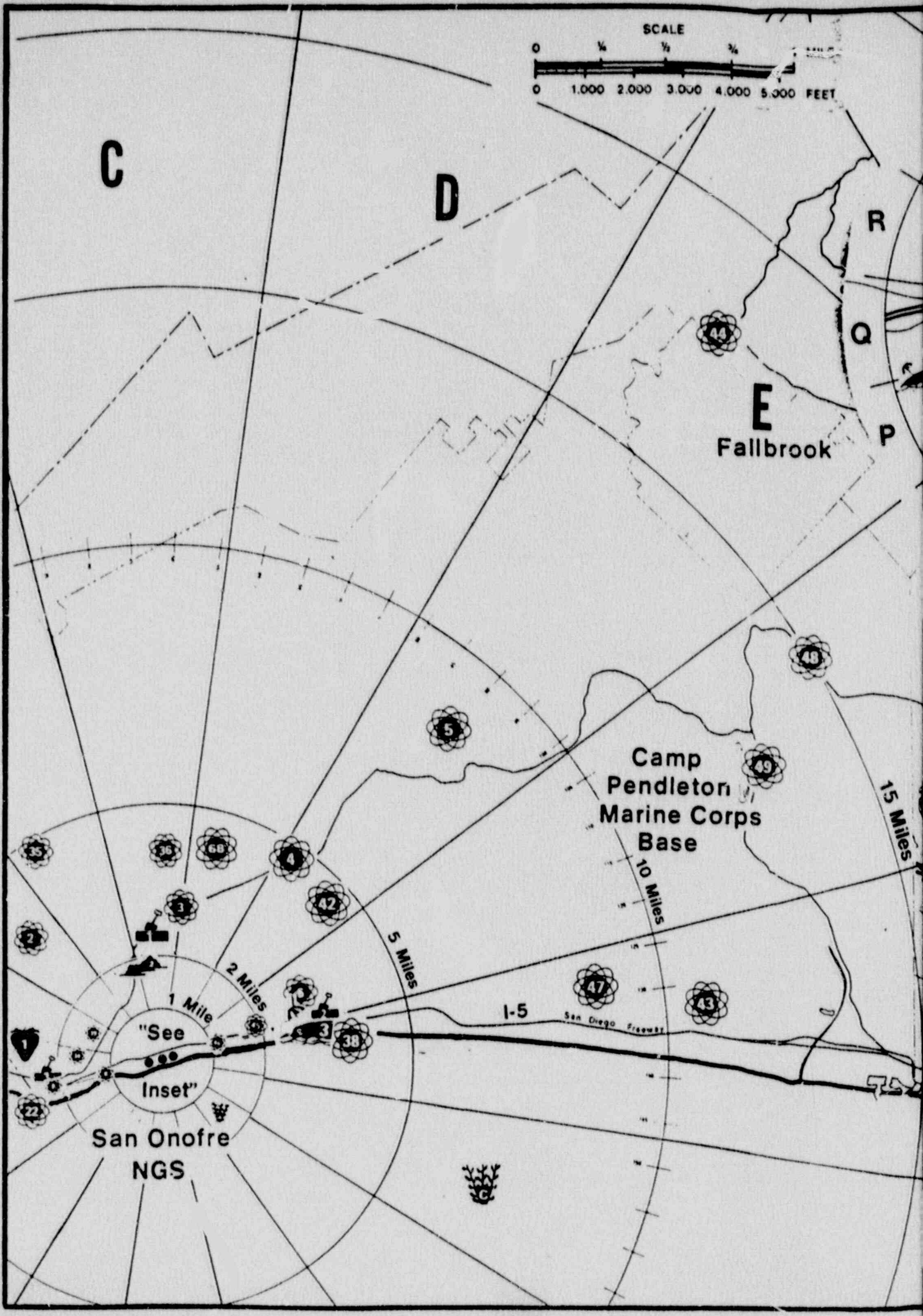
SCALE

¼ ½ ¾ 1 MILE

0 1,000 2,000 3,000 4,000 5,000 FEET



SCALE
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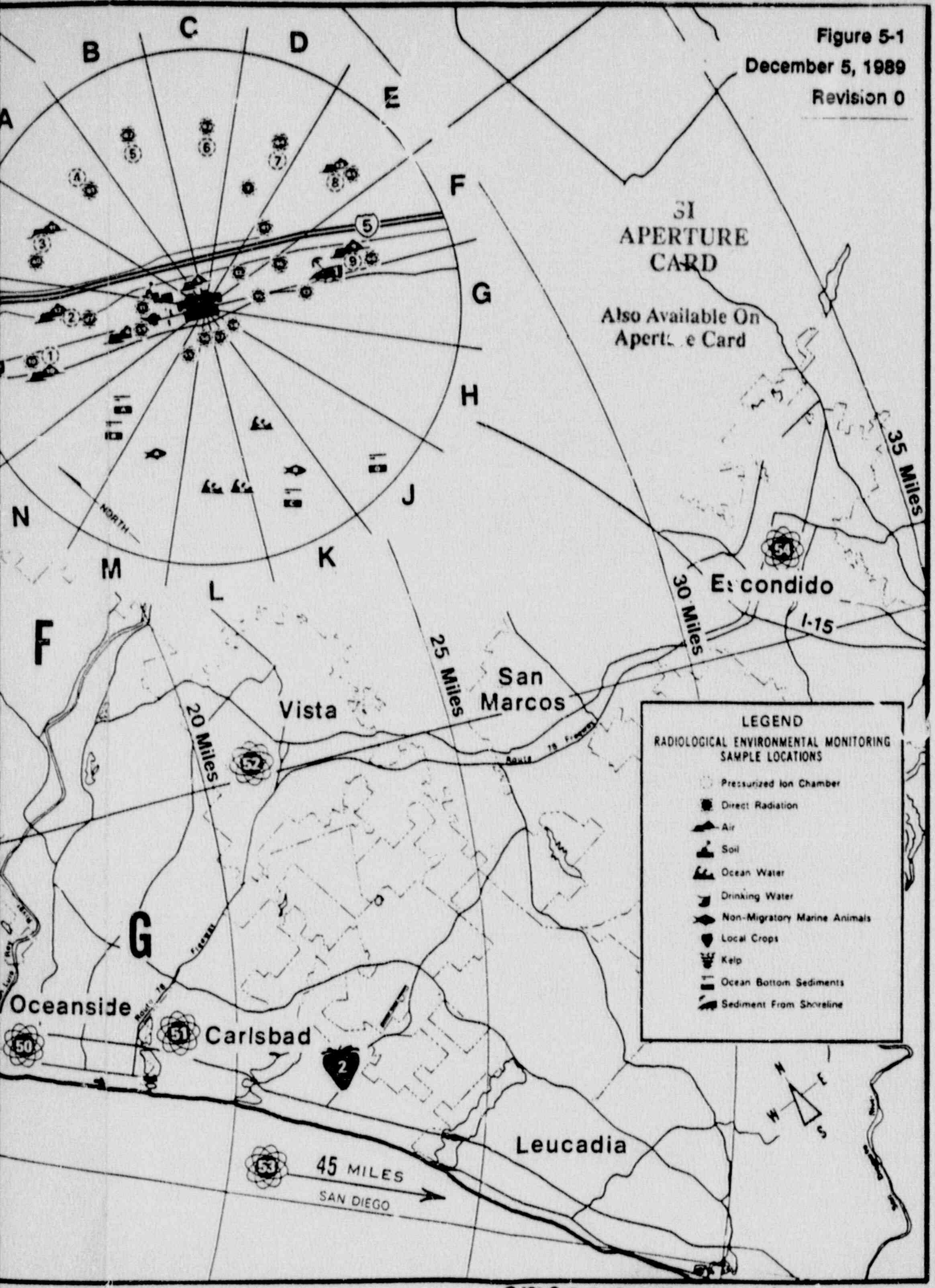
FEET
C
D
E
R
Q
P
Fallbrook
Camp Pendleton Marine Corps Base
15 Miles
10 Miles
5 Miles
2 Miles
1 Mile
"See Inset"
San Onofre NGS
I-5
San Diego Freeway

Figure 5-1
December 5, 1989
Revision 0



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APERTURE
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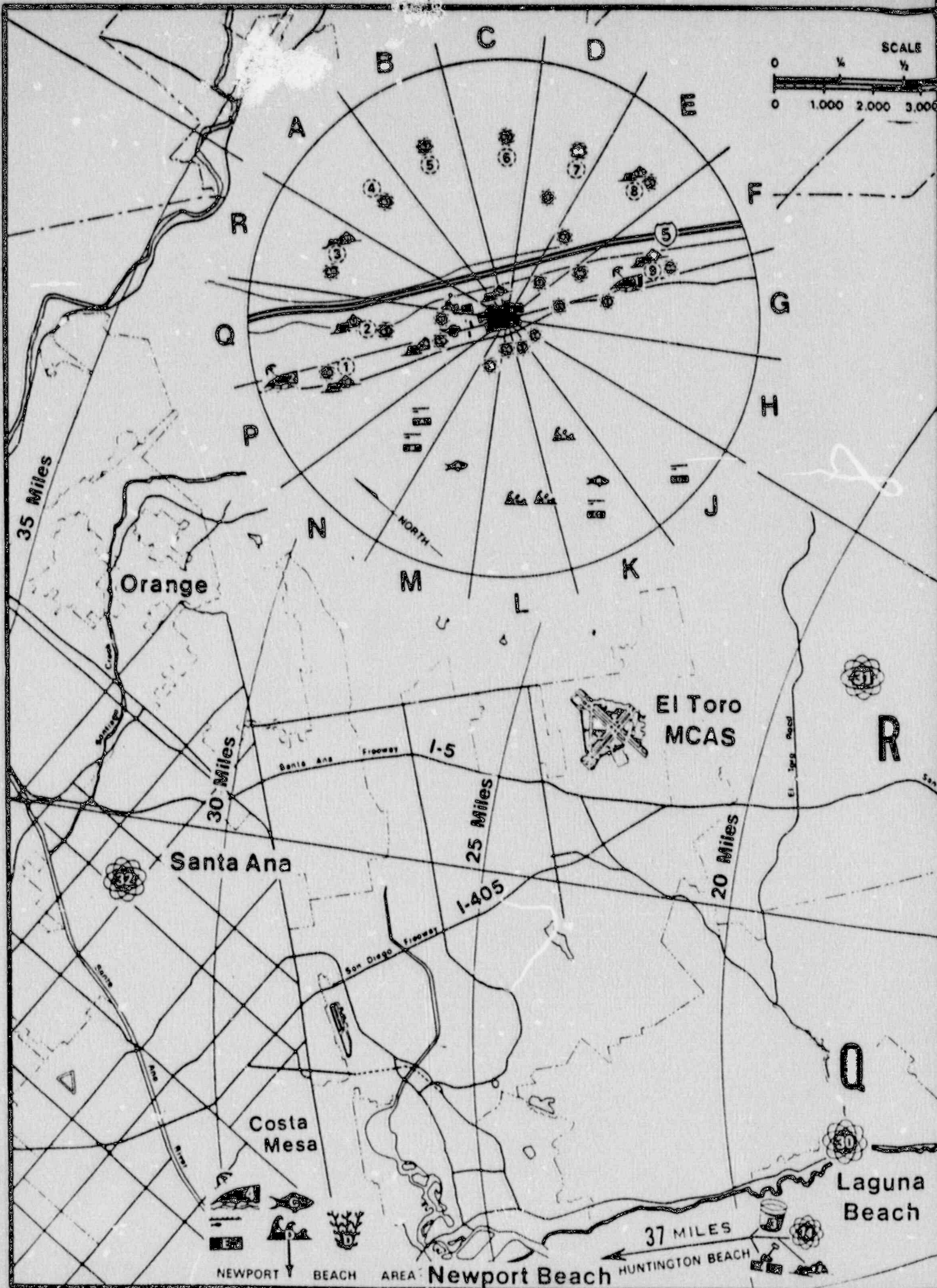

SCALE
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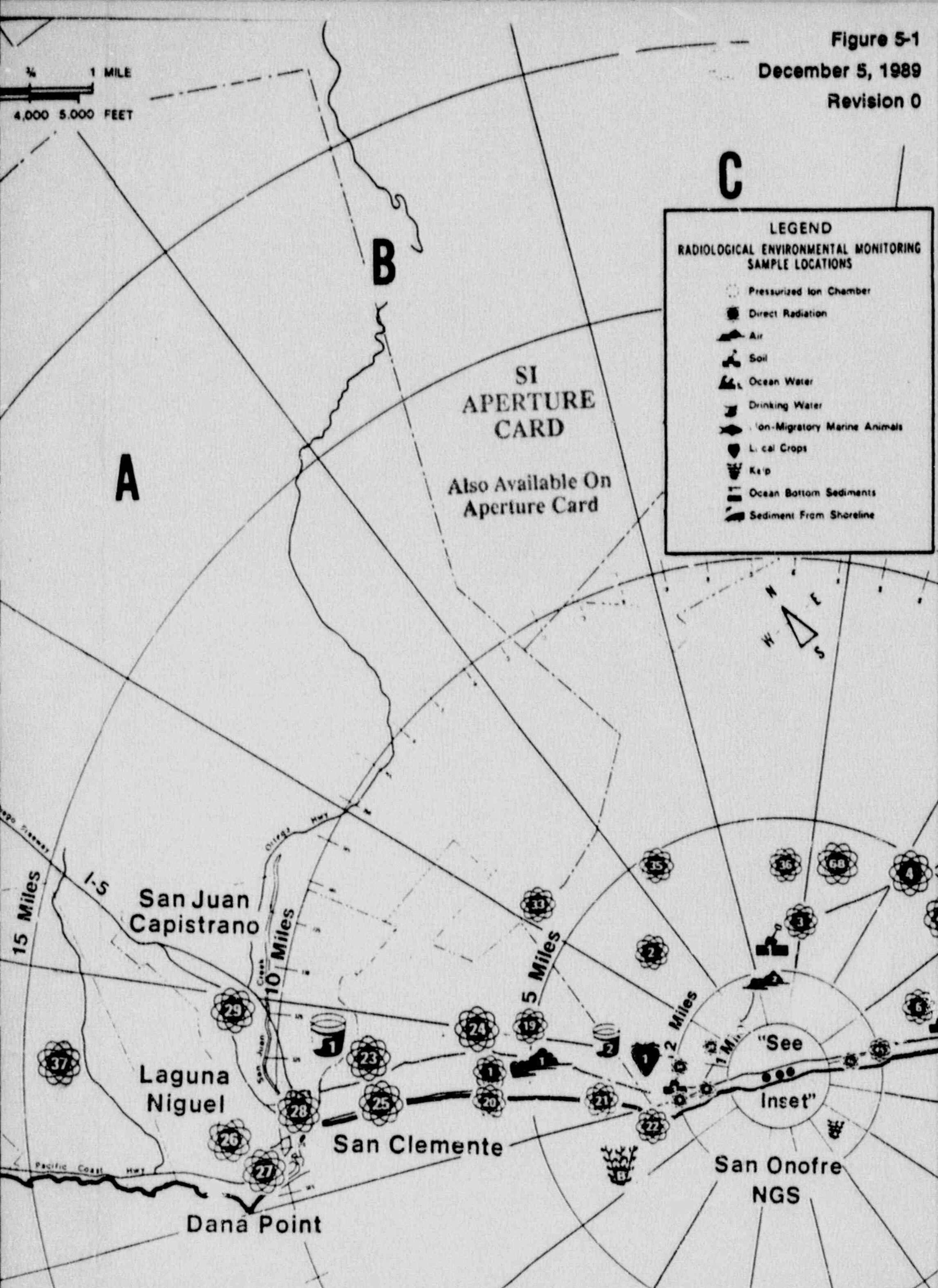
NORTH
35 Miles
30 Miles
25 Miles
20 Miles
Orange
Santa Ana
Costa Mesa
El Toro MCAS
I-5
Santa Ana Freeway
I-405
San Diego Freeway
R
Q
Laguna Beach
37 MILES
HUNTINGTON BEACH
NEWPORT BEACH AREA
Newport Beach

Figure 5-1
December 5, 1989
Revision 0



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6.0 ADMINISTRATIVE

6.1 DEFINITIONS

The defined terms of this section appear in capitalized type and are applicable through these Specifications.

ACTION

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

CHANNEL CALIBRATION

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

CHANNEL CHECK

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

CHANNEL FUNCTIONAL TEST

6.1.4 A CHANNEL FUNCTIONAL TEST shall be:

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

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

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

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DOSE EQUIVALENT I-131

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

FREQUENCY NOTATION

6.1.6 The FREQUENCY NOTATION specified for the performance of Surveillance Requirements shall correspond to the intervals defined in Table 6.2.

GASEOUS RADWASTE TREATMENT SYSTEM

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

MEMBERS OF THE PUBLIC

6.1.8 MEMBER(S) OF THE PUBLIC shall include all individuals who by virtue of their occupational status have no formal association with the plant. This category shall include nonemployees of the licensee who are permitted to use portions of the site for recreational, occupational, or purposes not associated with plant functions. This category shall not include non-employees such as vending machine servicemen or postmen who, as part of their formal job function, occasionally enter an area that is controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials A

OPERABLE - OPERABILITY

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

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PURGE - PURGING

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

SITE BOUNDARY

6.1.11 The SITE BOUNDARY shall be that line beyond which the land is not owned, leased, or otherwise controlled by the licensee. A

SOLIDIFICATION

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

SOURCE CHECK

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

THERMAL POWER

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

VENTING

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

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TABLE 6-1

OPERATIONAL MODES

OPERATION MODE	REACTIVITY CONDITION, K_{eff}	% OF RATED THERMAL POWER*	AVERAGE COOLANT TEMPERATURE
1. POWER OPERATION	$\geq$ 0.99	> 5%	$\geq$ 350°F
2. STARTUP	$\geq$ 0.99	$\leq$ 5%	$\geq$ 350°F
3. HOT STANDBY	< 0.99	0	$\geq$ 350°F
4. HOT SHUTDOWN	< 0.99	0	350°F> T_{avg}>200°F
5. COLD SHUTDOWN	< 0.99	0	$\leq$ 200°F
6. REFUELING**	$\leq$ 0.95	0	$\leq$ 140°F

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

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TABLE 6-2

FREQUENCY NOTATION

NOTATION	FREQUENCY
S	At least once per 12 hours
D	At least once per 24 hours
W	At least once per 7 days
M	At least once per 31 days
Q	At least once per 92 days
SA	At least once per 184 days
R	At least once per 18 months*
S/U	Prior to each reactor startup
P	Completed prior to each release
N.A.	Not applicable
Refueling Interval	Not to exceed 24 months

|R

*A month is defined as a 31-day period. |A

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6.2 ADMINISTRATIVE CONTROLS

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT*

6.2.1 Routine radioactive effluent release reports covering the operation of the unit during the previous 6 months of operation shall be submitted within 60 days after January 1 and July 1 of each year. The period of the first report shall begin with the date of initial criticality.

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

The radioactive effluent release report to be submitted 60 days after January 1 each year shall include an annual summary of hourly meteorological data collected over the previous year. This annual summary may be either in the form of an hour-by-hour listing of wind speed, wind direction, and atmospheric stability, and precipitation (if measured) on magnetic tape, or in the form of joint frequency distributions of wind speed, wind direction, and atmospheric stability. This same report shall include an assessment of the radiation doses due to the radioactive liquid and gaseous effluents released from the unit or station during the previous calendar year. This same report shall also include an assessment of the radiation doses from radioactive liquid and gaseous effluents to MEMBERS OF THE PUBLIC due to their activities inside the SITE BOUNDARY (Figure 1-2 and 2-2) during the report period. All assumptions used in making these assessments (i.e., specific activity, exposure time and location) shall be included in these reports. The meteorological conditions concurrent with the time of release of radioactive materials in gaseous effluents (as determined by sampling frequency and measurement) shall be used for determining the gaseous pathway doses. The assessment of radiation doses shall be performed in accordance with the OFFSITE DOSE CALCULATION MANUAL (ODCM). R

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6.0 ADMINISTRATIVE (Continued)

6.2 ADMINISTRATIVE CONTROLS (Continued)

The radioactive effluent release report to be submitted 60 days after January 1 of each year shall also include an assessment of radiation doses to the likely most exposed MEMBER OF THE PUBLIC from reactor releases and other nearby uranium fuel cycle sources (including doses from primary effluent pathways and direct radiation) for the previous 12 consecutive months to show conformance with 40 CFR 190, Environmental Radiation Protection Standards for Nuclear Power Operation. Acceptable methods for calculating the dose contribution from liquid and gaseous effluents are given in Regulatory Guide 1.109, Rev. 1.

The radioactive effluents release shall include the following information for each type of solid waste shipped offsite during the report period:

a. Container volume,

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

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

d. Type of waste (e.g., spent resin, compacted dry waste, evaporator bottoms),

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

f. Solidification Agent (e.g., cement, urea formaldehyde).

The radioactive effluent release reports shall include unplanned releases from the site to unrestricted areas of radioactive materials in gaseous and liquid effluents on a quarterly basis.

The radioactive effluent release reports shall include any changes to the PROCESS CONTROL PROGRAM (PCP) made during the reporting period.

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

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6.3 MAJOR CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS (Liquid, & Gaseous)

Licensee initiated major changes to the radioactive waste systems (liquid & gaseous):

1. Shall be reported to the Commission in the Monthly Operating Report for the period in which the evaluation was performed pursuant to Technical Specification 6.5.2. The discussion of each change shall contain: | R

   a. A summary of the evaluation that led to the determination that the change could be made in accordance with 10 CFR 50.59;

   b. Sufficient detailed information to totally support the reason for the change without benefit of additional or supplemental information;

   c. A detailed description of the equipment, components and processes involved and the interfaces with other plant systems;

   d. An evaluation of the change which shows the predicted releases of radioactive materials in liquid and gaseous effluents that differ from those previously predicted in the license application and amendments thereto;

   e. An evaluation of the change which shows the expected maximum exposures to individual in the unrestricted area and to the general population that differ from those previously estimated in the license application and amendments thereto;

   f. A comparison of the predicted releases of radioactive materials, in liquid and gaseous effluents to the actual release for the period prior to when the changes are to be made;

   g. An estimate of the exposure to plant operating personnel as a result of the change; and

   h. Documentation of the fact that the change was reviewed and found acceptable pursuant to Technical Specification 6.5.2. | R

2. Shall become effective upon review and acceptance pursuant to Technical Specification 6.5.2. | R

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6.4 BASES

LIQUID EFFLUENTS

CONCENTRATION (1.1)

6.4.1 This specification is provided to ensure that the concentration of radioactive materials released in liquid waste effluents from the site will be less than the concentration levels specified in 10 CFR Part 20, Appendix B, Table II, Column 2. This limitation provides additional assurance that the levels of radioactive materials in bodies of water outside the site will result in exposures within (1) the Section II.A design objectives of Appendix I, 10 CFR 50, to an individual, and (2) the limits of 10 CFR 20.106(e) to the population. The concentration limit for dissolved or entrained noble gases is based upon the assumption that Xe-135 is the controlling radioisotope and its MPC in air (submersion) was converted to an equivalent concentration in water using the methods described in International Commission on Radiological Protection (ICRP) Publication 2.

DOSE (1.2)

6.4.2 This specification is provided to implement the requirements of Section II.A, III.A and IV.A of Appendix I, 10 CFR Part 50. The Limiting Condition for Operation implements the guides set forth in Section II.A of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in liquid effluents will be kept "as low as is reasonably achievable." The dose calculations in the ODCM implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data, such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The equations specified in the ODCM for calculating the doses due to the actual release rates of radioactive materials in liquid effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.113, "Estimating Aquatic Dispersion of Effluents from Accidental and Routine Reactor Releases for the Purpose of Implementing Appendix I," April 1977.

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

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6.4 BASES (Continued)

LIQUID WASTE TREATMENT (1.3)

6.4.3 The OPERABILITY of the liquid radwaste treatment system ensures that this system will be available for use whenever liquid effluents require treatment prior to release to the environment. The requirement that the appropriate portions of this system be used when specified provides assurance that the releases of radioactive materials in liquid effluents will be kept "as low as is reasonably achievable." This specification implements the requirements of 10 CFR Part 50.36a, General Design Criterion 60 of Appendix A to 10 CFR Part 50 and the design objective given in Section II.D of Appendix I to 10 CFR Part 50. The specified limits governing the use of appropriate portions of the liquid radwaste treatment system were specified as a suitable fraction of the dose design objectives set forth in Section II.A of Appendix I, 10 CFR Part 50, for liquid effluents.

GASEOUS EFFLUENTS

DOSE RATE (2.1)

6.4.4 This specification is provided to ensure that the dose at any time at the site boundary from gaseous effluents from all units on the site will be within the annual dose limits of 10 CFR Part 20 for unrestricted areas. The annual dose limits are the doses associated with the concentrations of 10 CFR Part 20, Appendix B, Table II, Column 1. These limits provide reasonable assurance that radioactive material discharged in gaseous effluents will not result in the exposure of an individual in an unrestricted area, either within or outside the site boundary, to annual average concentrations exceeding the limits specified in Appendix B, Table II of 10 CFR Part 20 (10 CFR Part 20.106(b)). For individuals who may at times be within the site boundary, the occupancy of the individual will be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the site boundary. The specified release rate limits restrict, at all times, the corresponding gamma and beta dose rates above background to an individual at or beyond the site boundary to less than or equal to 500 mrem/year to the total body or to less than or equal to 3000 mrem/year to the skin. These release rate limits also restrict, at all times, the corresponding thyroid dose rate above background to a child via the inhalation pathway to less than or equal to 1500 mrem/year.

This specification applies to the release of gaseous effluents from all reactors at the site. For units with shared radwaste treatment systems, the gaseous effluents from the shared system are proportioned among the units sharing that system.

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DOSE - NOBLE GASES (2.2)

6.4.5 This specification is provided to implement the requirements of Sections II.B, III.A and IV.A of Appendix I, 10 CFR Part 50. The Limiting Condition for Operation implements the guides set forth in Section II.B of Appendix I. The ACTION statements provide the required operating flexibility and at the same time implement the guides set forth in Section IV.A of Appendix I to assure that the releases of radioactive material in gaseous effluents will be kept "as low as is reasonably achievable." The Surveillance Requirements implement the requirements in Section III.A of Appendix I that conformance with the guides of Appendix I be shown by calculational procedures based on models and data such that the actual exposure of an individual through appropriate pathways is unlikely to be substantially underestimated. The dose calculations established in the ODCM for calculating the doses due to the actual release rates of radioactive noble gases in gaseous effluents are consistent with the methodology provided in Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977 and Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water Cooled Reactors," Revision 1, July 1977. For individuals who may at times be within the site boundary, the occupancy of the individual will be sufficiently low to compensate for any increase in the atmospheric diffusion factor above that for the SITE BOUNDARY. For MEMBERS OF THE PUBLIC who traverse the SITE BOUNDARY via highway I-5, the residency time shall be considered negligible and hence the dose "0". The ODCM equations provided for determining the air doses at the SITE BOUNDARY are based upon the historical average atmospheric conditions. A

DOSE - RADIOIODINES, RADIOACTIVE MATERIALS IN PARTICULATE FORM AND TRITIUM (2.3)

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

GASEOUS RADWASTE TREATMENT (2.4)

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

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TOTAL DOSE (2.5)

6.4.8 This specification is provided to meet the dose limitations of 40 CFR 190. The specification requires the preparation and submittal of a Special Report whenever the calculated doses from plant radioactive effluents exceed twice the design objective doses of Appendix I. For sites containing up to 4 reactors, it is highly unlikely that the resultant dose to a member of the public will exceed the dose limits of 40 CFR 190 if the individual reactors remain within the reporting requirement level. The Special Report will describe a course of action which should result in the limitation of dose to a member of the public for 12 consecutive months to within the 40 CFR 190 limits. For the purposes of the Special Report, it may be assumed that the dose commitment to the member of the public from other uranium fuel cycle sources is negligible, with the exception that dose contributions from other nuclear fuel cycle facilities at the same site or within a radius of 5 miles must be considered. If the dose to any member of the public is estimated to exceed the requirements of 40 CFR 190, the Special Report with a request for a variance in accordance with the provisions of 40 CFR 190.11, is considered to be a timely request and fulfills the requirements of 40 CFR 190 until NRC staff action is completed provided the release conditions resulting in violation of 40 CFR 190 have not already been corrected. An individual is not considered a member of the public during any period in which he/she is engaged in carrying out any operation which is part of the nuclear fuel cycle.

RADIOACTIVE LIQUID EFFLUENT INSTRUMENTATION (4.1)

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

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RADIOACTIVE GASEOUS EFFLUENT INSTRUMENTATION (4.2)

6.4.10 The radioactive gaseous effluent instrumentation is provided to monitor and control, as applicable, the releases of radioactive materials in gaseous effluents during actual or potential releases of gaseous effluents. The alarm/trip setpoints for these instruments shall be calculated in accordance with the procedures in the ODCM to ensure that the alarm/trip will occur prior to exceeding the limits of 10 CFR Part 20. This instrumentation also includes provisions for monitoring and controlling the concentrations of potentially explosive gas mixtures in the waste gas holdup system. The OPERABILITY and use of this instrumentation is consistent with the requirements of General Design Criteria 60, 63 and 64 of Appendix A to 10 CFR Part 50.

MONITORING PROGRAM (5.1)

6.4.11 The radiological monitoring program required by this specification provides measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides, which lead to the highest potential radiation exposures of individuals resulting from the station operation. This monitoring program thereby supplements the radiological effluent monitoring program by verifying that the measurable concentrations of radioactive materials and levels of radiation are not higher than expected on the basis of the effluent measurements and modeling of the environmental exposure pathways. The initially specified monitoring program will be effective for at least the first three years of commercial operation. Following this period, program changes may be initiated based on operational experience.

The detection capabilities required by Table 5-1 are state-of-the-art for routine environmental measurements in industrial laboratories. It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally background fluctuations, unavoidably small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors will be identified and described in the Annual Radiological Environmental Operating Report.

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LAND USE CENSUS (5.2)

6.4.12 This specification is provided to ensure that changes in the use of UNRESTRICTED AREAS are identified and that modifications to the monitoring program are made if required by the results of this census. The best survey information from the door-to-door, aerial or consulting with local agricultural authorities shall be used. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10 CFR Part 50. Restricting the census to gardens of greater than 500 square feet provides assurance that significant exposure pathways via leafy vegetables will be identified and monitored since a garden of this size is the minimum required to produce the quantity (26 kg/year) of leafy vegetables assumed in Regulatory Guide 1.109 for consumption by a child. To determine this minimum garden size, the following assumptions were used, 1) that 20% of the garden was used for growing broad leaf vegetation (i.e., similar to lettuce and cabbage), and 2) a vegetation yield of 2 kg/square meter.

INTERLABORATORY COMPARISON PROGRAM (5.3)

6.4.13 The requirement for participation in an Interlaboratory Comparison Program is provided to ensure that independent checks on the precision and accuracy of the measurements of radioactive material in environmental sample matrices are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are reasonably valid.

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ATTACHMENT B

Responses to Comments on Revision 19 of the

SONGS Units 2 and 3 ODCM

The following provides responses to the points raised in the Conclusions section of EG&G's "Technical Evaluation Report for the Evaluation of ODCM (Updated Through Revision 19)."

<u>Response to Comments Under the Heading of "The following discrepancies should be addressed:"</u>

Comment 1: "Section 1.1.1 and 1.1.2, respectively, should require that the analyses required by Technical Specifications 4.11.1.1.1 and 4.11.1.1.3 be used to determine the setpoints for the liquid effluent monitors."

Response: The comment was addressed with the implementation of Comment 21. SCE has always used the results of the radioactivity analyses surveillances to determine the setpoints for the liquid effluent monitors in Section 1.4. Section 1.4 has always stated explicitly its purpose to comply with ODCM Specification 1.1.1. ODCM Surveillance Requirement (SR) 1.1.1.2 was revised to clearly state this requirement with the implementation of Comment 21.

Note: ODCM, Revision 19, Section 1.1.1, "Batch Release Setpoint Determination," is now Section 1.4.1 in Revision 22. ODCM, Revision 19, Section 1.1.2, "Continuous Release Setpoint Determination," is now Section 1.4.2 in Revision 22. The Radioactive Effluent Technical Specifications (RETS) were relocated from the Technical Specifications (TS) to the ODCM with License Amendment Nos. 83 and 73 for SONGS Units 2 and 3, respectively. TS SR 4.11.1.1.1 is now ODCM SR 1.1.1.1, and TS SR 4.11.1.1.3 was relocated to ODCM SR 1.1.1.3. However, ODCM SR 1.1.1.3 was deleted in Revision 22 in order to implement the recommendations in Comment 21 of EG&G's Technical Evaluation Report (TER). ODCM SR 1.1.1.3 was no longer needed with the revised wording of ODCM SR 1.1.1.2.

Comment 2: "Section 1.2 should identify the liquid releases considered in the dose calculations, the individuals exposed, the exposure pathways considered, and the consumption and occupation factors used."

Response: SCE agrees with the comment. However, the revisions will be made in the February 1991 ODCM update. A complete description of these items requires SCE to document the algorithms of the NRC's PARTS computer code from NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," October 1978. SCE uses the PARTS code to obtain parameters for the liquid dose calculations, and its documentation requires additional time to complete. The code's documentation will identify the required items. ODCM Section 1.5 will reference the code's documentation.

Note: ODCM, Revision 19, Section 1.2, "Dose Calculation for Liquid Effluents," is now Section 1.5 in Revision 22.

Comment 3: "Table 1.2 should apparently be corrected as shown below (See Section 3.7):

Nuclide	T. Body	Bone	Liver	Kidney	GI-LLI
Na-24				4.57E-01	
Zr-97			1.80E-01		
Sr-91	3.71E+00	9.18E+01			
Ru-103					1.25E+04
Te-132		2.04E+02			
Ce-143			4.46+02 "		

Response: The corrections were incorporated.

Note: ODCM, Revision 19, Table 1-2, "Dose Commitment Factors, $A_{i\tau}$," is now Table 1-4 in Revision 22.

Comment 4: "Sections 2.1 and 2.2, respectively, for the setpoints of gaseous effluent monitors and gaseous effluent dose rate should account for releases from Unit 1."

Response: The comment was incorporated. The Units 2 and 3 administrative factors for the monitor setpoints were changed in Revision 22 to account for Unit 1 gaseous releases from its single release point. The gaseous effluent release from Unit 1 is only a small percentage of the sum of the gaseous effluent releases from the site. The administrative factors for Units 2 and 3 were lowered by the percentage that Unit 1 is expected to contribute to the total release. The reduction in the monitor setpoints automatically limits the gaseous dose rates.

Note: ODCM, Revision 19, Section 2.1, "Methods of Calculation for Gaseous Effluent Monitor Setpoints," is now Section 2.6 in Revision 22. ODCM, Revision 19, Section 2.2, "Gaseous Effluent Dose Rate," is now Section 2.7 in Revision 22.

Comment 5: "Table 2-1 should include calibration constants for all gaseous effluent monitors or identify the mixture or means of determining the mixture of radionuclides assumed for the calibration."

Response: SCE disagrees with this comment. The calibration constants needed for calculations in the ODCM are contained in Table 2-1. The table does not contain calibration constants for monitors 2RT-7865, 3RT-7865, 2RT-7870, and 3RT-7870 since the release units for these monitors are µCi/sec and not µCi/cc.

In addition, a single radionuclide (Xe^{133}) is assumed for the radionuclide calibration mixture. The Semiannual Reports, from 1985 through 1989, verify that more than 85% of all inert gaseous releases are Xe^{133}. For monitors 2RT-7865, 3RT-7865, 2RT-7870, and 3RT-7870, the Xe^{133} calibration constant is used internally to derive the µCi/sec instrument readings used for evaluating effluent releases.

Note: ODCM, Revision 19, Table 2-1, "Gaseous Effluent Radiation Monitor Calibration Constants," is now Table 2-3 in Revision 22.

Comment 6: "Sections 2.2.1 and 2.2.2 should be expanded to include descriptions of the methods used to determine release rates used in the calculation of dose rates due to gaseous effluents."

Response: SCE expanded the definition of the release rates in Sections 2.7.1 and 2.7.2. However, the detailed methods for determining either the measured or calculated release rates are documented in site chemistry procedures. The detailed step-by-step descriptions are best retained in the procedures and not in the ODCM.

Note: ODCM, Revision 19, Section 2.2.1, "For Noble Gases:," is now Section 2.7.1 in Revision 22. ODCM, Revision 19, Section 2.2.2, "For all Radioiodines, Tritium and for all Radioactive Materials in Particulate Form with Half Lives Greater Than Eight Days:," is now Section 2.7.2 in Revision 22.

Comment 7: "Section 2.3 should identify the releases considered in the calculation of doses due to gaseous effluents and the methods used to determine the total releases or release rates."

Response: The comment was incorporated. Section 2.8 was revised to reference Section 2.6. Section 2.6 identifies the different gaseous effluent releases considered in the dose calculations.

Note: ODCM, Revision 19, Section 2.3, "Gaseous Effluent Dose Calculation," is now Section 2.8 in Revision 22.

Comment 8: "Section 2.2.2 [sic] should include all parameters necessary for the calculation of the dose parameters, R_i, in Tables 2-5 through 2-14. The equations used to calculate the values of R_i should also be identified, either by giving the equations or by reference."

Response: SCE agrees with the comment. However, the revisions will be made in the February 1991 ODCM update. The values of the parameters R_i are calculated using the PARTS computer code. Section 2.8.2 will be revised to reference the code's documentation.

Note: ODCM, Revision 19, Section 2.3.2, "Dose From Tritium, Radioiodines and Radioactive Materials in Particulate Form With Half Lives Greater Than 8 Days in Gaseous Effluents," is now Section 2.8.2 in Revision 22. ODCM, Revision 19, Tables 2-5 through 2-14, "Dose Parameter R_i for Sector ...," are now Tables 2-7 through 2-16 in Revision 22.

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Note: ODCM, Revision 19, Tables 2-5 through 2-14, "Dose Parameter R_i for Sector ...," are now Tables 2-7 through 2-16 in Revision 22.

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Response: SCE does not agree with the comment. The dose projection requirements of ODCM SR 1.3.1.1 and 2.4.1.1 serve to indicate when the radwaste treatment systems should be used to reduce effluent activity. However, the radwaste treatment systems are always used, as a matter of practice, to reduce effluent radioactivity prior to release. Dose projection increases due to anticipated unusual releases would not require any further action than what is already a station practice. Thus, adding anticipated unusual releases would not enhance the ODCM and was not included in the Revision 22 update.

Note: TS SR 4.11.1.3.1 is now ODCM SR 1.3.1.1. TS SR 4.11.2.4.1 is now ODCM SR 2.4.1.1.

Comment 11: "A map of environmental monitoring locations should be added to Section 5.0."

Response: The comment was resolved. Figure 5-1, Revision 0, "Radiological Environmental Monitoring Sample Locations," dated December 5, 1989, was added to ODCM, Revision 21.

Responses to Comments Under the Heading of "The following discrepancies, which apparently arise from typographical errors or editorial omissions, should be corrected:"

Comment 12: "In Table 1-2, the signs of the exponents of the liver factors for Zr-97 and Ce-143 should be changed, and the GI-LLI factor for Ru-103 should apparently be 1.25E+04 instead of 2.25E+04."

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Comment 13: "Page 2-13 of Revision 19 should be corrected so Eq. (2-9) and the definitions of terms in Eq. (2-8) are not deleted, and the top of page 2-14 not duplicated."

Response: The comment was not incorporated. The cause appears to have been a reproduction error limited to the reviewer's copy of the ODCM, Revision 19. The enclosed copy of the ODCM, Revision 22, has been checked for completeness and is free of any such errors.

Comment 14: "Sections 2.1.3 and 2.1.4 should be edited so setpoints of all gaseous effluent monitors are specifically addressed in the headings, subheadings, and tests."

Response: The comment was incorporated. The consistency of Sections 2.6.3 and 2.6.4 between headings, subheadings, and text were reviewed and corrected where necessary.

Note: ODCM, Revision 19, Section 2.1.3, "Containment Purge - 2RT-7828, 3RT-7828, 2RT-7865, 3RT-7865," is now Section 2.6.3 in Revision 22. ODCM, Revision 19, Section 2.1.4, "Waste Gas Header - 3-7865, 2/3RT-7808," is now Section 2.6.4 in Revision 22.

Comment 15: "In Sections 2.3.1.1 and 2.3.2.1, the term "projected" should be removed, since it implies doses in the future instead of doses or dose commitments due to releases already made."

Response: The comment was incorporated. The term "projected" was deleted from Sections 2.8.1.1 and 2.8.2.1.

Note: ODCM, Revision 19, Section 2.3.1.1, "For historical meteorology:," is now Section 2.8.1.1 in Revision 22. ODCM, Revision 19, Section 2.3.2.1, "For historical meteorology:," is now Section 2.8.2.1 in Revision 22.

Comment 16: "One of the "Unit 2" designations associated with Primary System Degassing and Tank Cover Gases in Figure 4-1 should be changed to "Unit 3.""

Response: The comment was resolved. Figures 4-5 and 4-6 were revised in Revision 21, and they correctly reflect unit designations.

Note: ODCM, Revision 19, Figure 4-1, "SONGS 2 and 3 Radioactive Liquid Waste Treatment Systems," is now Figure 4-5 in Revision 22. ODCM, Revision 19, Figure 4-2, "SONGS 2 & 3 Radioactive Gaseous Waste Treatment Systems," is now Figure 4-6 in Revision 22.

Comment 17: "Figures 4.1 and 4.2 should indicate all release pathways and monitors of liquid and gaseous effluents consistent with the release pathways and monitors identified in Sections 1.1 and 2.1."

Response: The comment was incorporated. Figures 4-5 and 4-6 were revised and are consistent with Sections 1.4 and 2.6.

Note: ODCM, Revision 19, Figure 4-1, "SONGS 2 and 3 Radioactive Liquid Waste Treatment Systems," is now Figure 4-5 in Revision 22. ODCM, Revision 19, Figure 4-2, "SONGS 2 & 3 Radioactive Gaseous Waste Treatment Systems," is now Figure 4-6 in Revision 22. ODCM, Revision 19, Section 1.1, "Liquid Effluent Monitor Setpoints," is now Section 1.4 in Revision 22. ODCM, Revision 19, Section 2.1, "Gaseous Effluent Monitor Setpoints," is now Section 2.6 in Revision 22.

<u>Responses to Comments Under the Heading of "Additionally, the Licensee may want to consider the following changes:"</u>

Comment 18: "In Section 1.2, the Licensee may wish to use the average dilutions flow for the reporting period in the calculations of doses due to liquid effluents, a method allowed by the NRC Staff."

Response: SCE agrees with the comment and is evaluating the implementation of this recommendation. The present method calculates the liquid effluent dose on a permit-by-permit basis summed over a quarter. The NRC's method, in general, would arrive at the same dose. However, SCE's method may on occasion overestimate the dose. Any ODCM revisions resulting from SCE's evaluation will be incorporated into the February 1991 update.

Note: ODCM, Revision 19, Section 1.2, "Dose Calculations for Liquid Effluents," is now Section 1.5 in Revision 22.

Comment 19: "The Licensee may wish to modify the requirements in Section 2.2.2 to match the recommendations in the bases statement for Technical Specification 3.11.2.1.b for SONGS Units 2 and 3 and in NUREG-0472: i.e, that the organ dose rate limit may be applied to the thyroid of a child via the inhalation pathway."

Response: SCE agrees with the comment and is evaluating its implementation. Currently, the dose is calculated for all organs and age groups, and the maximum chosen. This is an acceptable, yet a more conservative, method. Any ODCM revisions resulting from SCE's evaluation will be incorporated into the February 1991 update.

Note: ODCM, Revision 19, Section 2.2.2, "Radioiodines and Particulates," is now Section 2.7.2 in Revision 22. TS 3.11.2.1, "Dose Rate," is now ODCM Specification 2.1 in Revision 22, and its Bases is in Section 6.4.4.

Comment 20: "The Licensee may wish to modify Section 2.3.2 to calculate the highest calculated dose to a single organ at the critical location for comparison with the technical specification organ dose limit."

Response: This comment will not be implemented. SCE uses the sum of the highest organ doses for individual radionuclides to calculate the maximum organ doses. This is an acceptable, yet a more conservative, methodology. The method does overestimate the liquid doses. However, this is acceptable to SCE and will not be changed.

Note: ODCM, Revision 19, Section 2.3.2, "Radioiodines and Particulates," is now Section 2.8.2 in Revision 22.

Comment 21: "The Licensee may wish to amend Technical Specifications 4.11.1.1.1, 4.11.1.1.2, and 4.11.1.1.3 to more nearly agree with Specifications 4.11.1.1.1 and 4.11.1.1.2 of Revision 3, Draft 7" [sic] or NUREG-0472."

Response: The comment was incorporated. ODCM SR 1.1.1.1 and 1.1.1.2 were revised to agree with Draft 7 of NUREG-0472, Revision 3, "Standard Radiological Effluent Technical Specifications for Pressurized Water Reactors," September 1982, as recommended.

Note: TS SR 4.11.1.1.1 is now ODCM SR 1.1.1.1, and TS SR 4.11.1.1.2 is now ODCM SR 1.1.1.2. TS SR 4.11.1.1.3 was relocated to ODCM SR 1.1.1.3. However, ODCM SR 1.1.1.3 was deleted in Revision 22 in order to implement the recommendations in Comment 21 of EG&G's Technical Evaluation Report.

ATTACHMENT D

Responses to Comments on Revision 19 of the

SONGS Units 2 and 3 ODCM

The following provides responses to the points raised in the Conclusions section of EG&G's "Technical Evaluation Report for the Evaluation of ODCM (Updated Through Revision 19)."

<u>Response to Comments Under the Heading of "The following discrepancies should be addressed:"</u>

Comment 1: "Section 1.1.1 and 1.1.2, respectively, should require that the analyses required by Technical Specifications 4.11.1.1.1 and 4.11.1.1.3 be used to determine the setpoints for the liquid effluent monitors."

Response: The comment was addressed with the implementation of Comment 21. SCE has always used the results of the radioactivity analyses surveillances to determine the setpoints for the liquid effluent monitors in Section 1.4. Section 1.4 has always stated explicitly its purpose to comply with ODCM Specification 1.1.1. ODCM Surveillance Requirement (SR) 1.1.1.2 was revised to clearly state this requirement with the implementation of Comment 21.

Note: ODCM, Revision 19, Section 1.1.1, "Batch Release Setpoint Determination," is now Section 1.4.1 in Revision 22. ODCM, Revision 19, Section 1.1.2, "Continuous Release Setpoint Determination," is now Section 1.4.2 in Revision 22. The Radioactive Effluent Technical Specifications (RETS) were relocated from the Technical Specifications (TS) to the ODCM with License Amendment Nos. 83 and 73 for SONGS Units 2 and 3, respectively. TS SR 4.11.1.1.1 is now ODCM SR 1.1.1.1, and TS SR 4.11.1.1.3 was relocated to ODCM SR 1.1.1.3. However, ODCM SR 1.1.1.3 was deleted in Revision 22 in order to implement the recommendations in Comment 21 of EG&G's Technical Evaluation Report (TER). ODCM SR 1.1.1.3 was no longer needed with the revised wording of ODCM SR 1.1.1.2.

Comment 2: "Section 1.2 should identify the liquid releases considered in the dose calculations, the individuals exposed, the exposure pathways considered, and the consumption and occupation factors used."

Response: SCE agrees with the comment. However, the revisions will be made in the February 1991 ODCM update. A complete description of these items requires SCE to document the algorithms of the NRC's PARTS computer code from NUREG-0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," October 1978. SCE uses the PARTS code to obtain parameters for the liquid dose calculations, and its documentation requires additional time to complete. The code's documentation will identify the required items. ODCM Section 1.5 will reference the code's documentation.

Note: ODCM, Revision 19, Section 1.2, "Dose Calculation for Liquid Effluents," is now Section 1.5 in Revision 22.

Comment 3: "Table 1.2 should apparently be corrected as shown below (See Section 3.7):

Nuclide	T. Body	Bone	Liver	Kidney	GI-LLI
Na-24				4.57E-01	
Zr-97			1.80E-01		
Sr-91	3.71E+00	9.18E+01			
Ru-103					1.25E+04
Te-132		2.04E+02			
Ce-143			4.46+02 "		

Response: The corrections were incorporated.

Note: ODCM, Revision 19, Table 1-2, "Dose Commitment Factors, A_{ir}," is now Table 1-4 in Revision 22.

Comment 4: "Sections 2.1 and 2.2, respectively, for the setpoints of gaseous effluent monitors and gaseous effluent dose rate should account for releases from Unit 1."

Response: The comment was incorporated. The Units 2 and 3 administrative factors for the monitor setpoints were changed in Revision 22 to account for Unit 1 gaseous releases from its single release point. The gaseous effluent release from Unit 1 is only a small percentage of the sum of the gaseous effluent releases from the site. The administrative factors for Units 2 and 3 were lowered by the percentage that Unit 1 is expected to contribute to the total release. The reduction in the monitor setpoints automatically limits the gaseous dose rates.

Note: ODCM, Revision 19, Section 2.1, "Methods of Calculation for Gaseous Effluent Monitor Setpoints," is now Section 2.6 in Revision 22. ODCM, Revision 19, Section 2.2, "Gaseous Effluent Dose Rate," is now Section 2.7 in Revision 22.

Comment 5: "Table 2-1 should include calibration constants for all gaseous effluent monitors or identify the mixture or means of determining the mixture of radionuclides assumed for the calibration."

Response: SCE disagrees with this comment. The calibration constants needed for calculations in the ODCM are contained in Table 2-1. The table does not contain calibration constants for monitors 2RT-7865, 3RT-7865, 2RT-7870, and 3RT-7870 since the release units for these monitors are μCi/sec and not μCi/cc.

In addition, a single radionuclide (Xe^{133}) is assumed for the radionuclide calibration mixture. The Semiannual Reports, from 1985 through 1989, verify that more than 85% of all inert gaseous releases are Xe^{133}. For monitors 2RT-7865, 3RT-7865, 2RT-7870, and 3RT-7870, the Xe^{133} calibration constant is used internally to derive the μCi/sec instrument readings used for evaluating effluent releases.

Note: ODCM, Revision 19, Table 2-1, "Gaseous Effluent Radiation Monitor Calibration Constants," is now Table 2-3 in Revision 22.

Comment 6: "Sections 2.2.1 and 2.2.2 should be expanded to include descriptions of the methods used to determine release rates used in the calculation of dose rates due to gaseous effluents."

Response: SCE expanded the definition of the release rates in Sections 2.7.1 and 2.7.2. However, the detailed methods for determining either the measured or calculated release rates are documented in site chemistry procedures. The detailed step-by-step descriptions are best retained in the procedures and not in the ODCM.

Note: ODCM, Revision 19, Section 2.2.1, "For Noble Gases:," is now Section 2.7.1 in Revision 22. ODCM, Revision 19, Section 2.2.2, "For all Radioiodines, Tritium and for all Radioactive Materials in Particulate Form with Half Lives Greater Than Eight Days:," is now Section 2.7.2 in Revision 22.

Comment 7: "Section 2.3 should identify the releases considered in the calculation of doses due to gaseous effluents and the methods used to determine the total releases or release rates."

Response: The comment was incorporated. Section 2.8 was revised to reference Section 2.6. Section 2.6 identifies the different gaseous effluent releases considered in the dose calculations.

Note: ODCM, Revision 19, Section 2.3, "Gaseous Effluent Dose Calculation," is now Section 2.8 in Revision 22.

Comment 8: "Section 2.2.2 [sic] should include all parameters necessary for the calculation of the dose parameters, R_i, in Tables 2-5 through 2-14. The equations used to calculate the values of R_i should also be identified, either by giving the equations or by reference."

Response: SCE agrees with the comment. However, the revisions will be made in the February 1991 ODCM update. The values of the parameters R_i are calculated using the PARTS computer code. Section 2.8.2 will be revised to reference the code's documentation.

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Note: TS SR 4.11.1.3.1 is now ODCM SR 1.3.1.1. TS SR 4.11.2.4.1 is now ODCM SR 2.4.1.1.

Comment 11: "A map of environmental monitoring locations should be added to Section 5.0."

Response: The comment was resolved. Figure 5-1, Revision 0, "Radiological Environmental Monitoring Sample Locations," dated December 5, 1989, was added to ODCM, Revision 21.

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Response: The comment was incorporated. The term "projected" was deleted from Sections 2.8.1.1 and 2.8.2.1.

Note: ODCM, Revision 19, Section 2.3.1.1, "For historical meteorology:," is now Section 2.8.1.1 in Revision 22. ODCM, Revision 19, Section 2.3.2.1, "For historical meteorology:," is now Section 2.8.2.1 in Revision 22.

Comment 16: "One of the "Unit 2" designations associated with Primary System Degassing and Tank Cover Gases in Figure 4-1 should be changed to "Unit 3.""

Response: The comment was resolved. Figures 4-5 and 4-6 were revised in Revision 21, and they correctly reflect unit designations.

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Note: ODCM, Revision 19, Section 2.2.2, "Radioiodines and Particulates," is now Section 2.7.2 in Revision 22. TS 3.11.2.1, "Dose Rate," is now ODCM Specification 2.1 in Revision 22, and its Bases is in Section 6.4.4.

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Response: This comment was not incorporated. SCE uses the sum of the highest organ doses for individual radionuclides to calculate the maximum organ doses. This is an acceptable, yet a more conservative, methodology. The method does overestimate the doses.

Note: ODCM, Revision 19, Section 2.3.2, "Dose From Tritium, Radioiodines and Radioactive Materials in Particulate Form With Half Lives Greater Than 8 Days in Gaseous Effluents," is now Section 2.8.2 in Revision 22.

Comment 21: "The Licensee may wish to amend Technical Specifications 4.11.1.1.1, 4.11.1.1.2, and 4.11.1.1.3 to more nearly agree with Specifications 4.11.1.1.1 and 4.11.1.1.2 of Revision 3, Draft 7" [sic] of NUREG-0472."

Response: The comment was incorporated. ODCM SR 1.1.1.1 and 1.1.1.2 were revised to agree with Draft 7 of NUREG-0472, Revision 3, "Standard Radiological Effluent Technical Specifications for Pressurized Water Reactors," September 1982, as recommended.

Note: TS SR 4.11.1.1.1 is now ODCM SR 1.1.1.1, and TS SR 4.11.1.1.2 is now ODCM SR 1.1.1.2. TS SR 4.11.1.1.3 was relocated to ODCM SR 1.1.1.3. However, ODCM SR 1.1.1.3 was deleted in Revision 22 in order to implement the recommendations in Comment 21 of EG&G's Technical Evaluation Report.