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SACRAMENTO MUNICIPAL UTILITY DISTRICT ☐ 6201 S Street, P.O. Box 15830, Sacramento CA 95852-1830, (916) 452-3211
AN ELECTRIC SYSTEM SERVING THE HEART OF CALIFORNIA

MPC&D 05-031

March 21, 2005

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555-0001

Docket 50-312
Rancho Seco Nuclear Station
License DPR-54
Docket 72-11
Rancho Seco Independent Spent Fuel Storage Installation
License SNM-2510

2004 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

Attention: John Hickman:

In accordance with 10 CFR 50.36(a)(2), 10 CFR 72.44(d), Rancho Seco ISFSI Technical Specification 5.5.2d, and Rancho Seco Quality Manual Appendix A, Section 1.5.3, the District submits the enclosed Rancho Seco Annual Radioactive Effluent Release Report for the period January 1, 2004 through December 31, 2004.

You or members of your staff requiring additional information or clarification may contact Penny Luce at (916) 732-4904.

Sincerely,

for SR

Steve J. Redeker
Manager, Plant Closure and Decommissioning

Enclosure

cc w/Encl: J. Hickman, NRC, Mail Stop T-7-F27, Washington, DC 20555
Administrator, NRC Region IV, Arlington
R. Hall, NMSS, NRC, Washington DC

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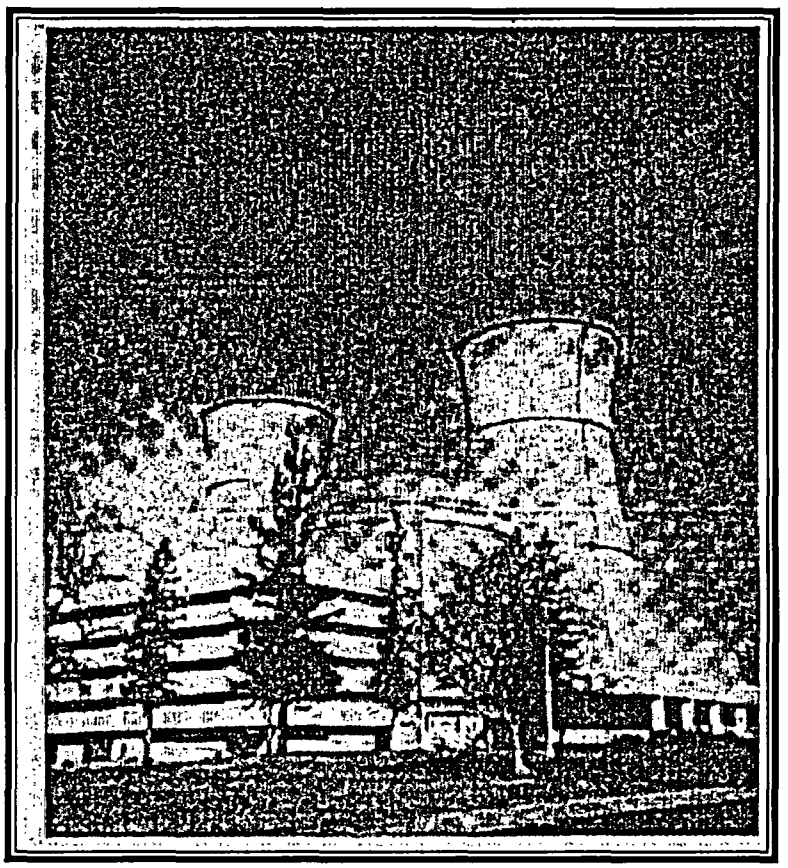
RANCHO SECO
NUCLEAR GENERATING STATION

LICENSE NUMBERS DPR-54 and SNM-2510



ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY – DECEMBER 2004

TABLE OF CONTENTS

INTRODUCTION

Rancho Seco Nuclear Generating Station (RSNGS) Unit No. 1 is located in Sacramento County, California approximately 25 miles southeast of Sacramento and 26 miles north-northeast of Stockton. Rancho Seco Unit No. 1 began commercial operation on April 17, 1975. The single unit on the Rancho Seco site was a pressurized water reactor supplied by Babcock and Wilcox. The rated capacity was 963 gross megawatts electrical. Because of a public vote on June 6, 1989, the District shutdown the Rancho Seco Nuclear Generating Station and completed defueling operations on December 8, 1989. Transfer of the spent fuel rod assemblies from the Spent Fuel Pool into dry storage at the Interim Spent Fuel Storage Installation (ISFSI) was completed on August 21, 2002.

This Annual Radioactive Effluent Release Report (ARERR) provides a summary of gaseous and liquid effluent releases made from Rancho Seco during the period of January 1 through December 31, 2004. Also presented in this report is the projected radiological impact from these releases and a summary of solid radioactive waste shipments.

This report has been prepared by the Sacramento Municipal Utility District to meet the requirements of Rancho Seco Quality Manual (RSQM), Appendix A, Section 1.5.3 and Offsite Dose Calculation Manual (ODCM) Revision 17, Step 6.13. It is presented in accordance with the format of USNRC Regulatory Guide 1.21. The radiation doses reported in this ARERR are calculated for a hypothetical individual who receives the maximum possible exposure at or beyond the applicable Site Boundary.

Releases of radioactivity in gaseous and liquid effluents during this report period did not exceed the limits of 10 CFR 20 or the numerical guidelines of 10 CFR 50, Appendix I. A 40 CFR 190 dose evaluation is not required because radioactive effluent releases did not exceed twice the numerical guidelines of 10 CFR 50, Appendix I.

This report also summarizes gaseous and liquid effluent releases made from the Rancho Seco ISFSI during the period of January 1 through December 31, 2004, and concludes there were no radionuclides released into the environment due to ISFSI operations. The ISFSI radioactive effluent report has been prepared to meet the requirements of 10 CFR 72.44(d) and Rancho Seco ISFSI Technical Specification 5.5.2.d.

I. SUPPLEMENTAL INFORMATION

A. REGULATORY LIMITS & GUIDELINES FOR EFFLUENT RELEASES

1. Gaseous Effluents

a. Dose rate limit at or beyond the Site Boundary for Gaseous Effluents for Tritium and radioactive material in particulate form with half-lives greater than 8 days (ODCM, Technical Requirement 6.12.6):

1500 mrem/year to any organ

b. Dose commitment to a member of the public at or beyond the Site Boundary for Gaseous Effluents from Tritium and radioactive material in particulate form with half-lives greater than 8 days (ODCM Technical Requirement 6.12.7, numerical guidelines of 10 CFR 50, Appendix I):

7.5 mrem per calendar quarter to any organ
15 mrem per calendar year to any organ

2. Liquid Effluents

a. The concentration of radioactive material in liquid effluents released beyond the Site Boundary for Liquid Effluents shall not exceed the limits of 10 CFR 20, Appendix B, Table 2, Column 2. This applies to all radionuclides except dissolved or entrained noble gases (ODCM Technical Requirement 6.12.2).

b. Dose commitment to a member of the public at or beyond the Site Boundary for Liquid Effluents from radioactive materials in liquid effluents shall be limited to (ODCM Technical Requirement 6.12.3, numerical guidelines of 10 CFR 50, Appendix I):

1.5 mrem per calendar quarter to the total body
5 mrem per calendar quarter to any organ
3 mrem per calendar year to the total body
10 mrem per calendar year to any organ

NOTE: The noble gas source term was removed when spent fuel transfer to the ISFSI was completed in August 2002. Reference to noble gases was completely removed from the ODCM.

B. MAXIMUM EFFLUENT CONCENTRATIONS

1. Gaseous Effluents

The concentrations listed in 10 CFR 20, Appendix B, Table 2, Column 1 (air) are not directly used in calculations for determining permissible gaseous effluent release rates. The annual dose limits of 10 CFR 20 for unrestricted areas are the doses associated with the concentrations of 10 CFR 20, Appendix B, Table 2, Column 1. ODCM Technical Requirement dose rate limits (mrem/yr) for gaseous effluents are provided to ensure that the dose rate from gaseous effluents at any time at the Site Boundary for Gaseous Effluents will be within the annual dose limits of 10 CFR 20 for unrestricted areas. These dose rate limits (listed above in part A) are used for determining permissible gaseous effluent release rates.

2. Liquid Effluents

The concentration values listed in 10 CFR 20, Appendix B, Table 2, Column 2 are used in calculations to determine permissible liquid discharge flow rates. The most conservative Maximum Effluent Concentration (MEC) value for each radionuclide detected in the liquid effluent sample (excluding dissolved or entrained noble gases) is used in the calculations.

C. MEASUREMENT METHODS FOR TOTAL RADIOACTIVITY

1. Gaseous Effluents

Liquid Scintillation (H-3)

Gamma Spectroscopy (HPGe)

Beta Proportional (Sr-90, gross beta)

Alpha Proportional (gross alpha)

2. Liquid Effluents

Gamma Spectroscopy (HPGe)

Liquid Scintillation (H-3)

Beta Proportional (Sr-90, gross beta)

Alpha Proportional (gross alpha)

NOTE: HPGe refers to Hyper-Pure Germanium

D. BATCH RELEASES (via monitored pathways)

1. Liquid (Retention Basin Discharges)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
a. Number of batch releases	0	1	1	1
b. Total time period for batch releases (hours)	N/A	9.00	8.58	13.33
c. Maximum time period for a batch release (hours)	N/A	9.00	8.58	13.33
d. Average time period for a batch release (hours)	N/A	9.00	8.58	13.33
e. Minimum time period for a batch release (hours)	N/A	9.00	8.58	13.33

E. UNPLANNED RELEASES

This section describes unplanned releases of radioactivity in liquid and gaseous effluent.

Gaseous

None

Liquid

Due to a heavy rain storm on September 19, 2004, the plant experienced a loss of off-site power that lead to a series of events causing multiple equipment failures. The multiple equipment failures resulted in all water entering the site from Folsom South Canal or Rancho Seco Lake to be diverted into the Retention Basins. Subsequently, the South Retention Basin overflowed. Based on the plant flow recorder, the overflow started at 1915 (7:15 PM) and stopped at 2115 (9:15PM). The volume of water released was approximately 270,000 gallons.

A sample of the South Retention Basin while overflowing was taken on September 19, 2004 at 2030 (8:30 PM). The sample was analyzed for gamma emitters and results showed no detectable radionuclides, except for naturally occurring radioisotopes. Since this sample was taken during the overflow condition and not just prior to the discharge, the sample may not be representative of the radioactivity discharged off site.

To conservatively estimate the maximum activity that may have been discharged off site as a result of the overflow condition, plant staff used the analysis results of a Retention Basin sample taken prior to the overflow condition and applied these results to the entire estimated volume discharged during the overflow condition. Based on this pre-overflow condition sample, the calculated maximum concentration discharged for Tritium was 2.44 E-06 μCi/ml, for Cobalt 60 was 1.58 E-08 μCi/ml, and for Cesium 137 was 1.10 E-08 μCi/ml. The maximum organ dose associated with these concentrations was 9.76 E-06 mrem to a Child/Bone. The highest Total Body dose was 4.84 E-03 mrem to an Adult.

The plant corrective action program was used to resolve and implement the actions necessary to prevent recurrence. Documentation for this incident can be found in the plant commitment tracking system under CTS item number 53590 or PDQ 04-0025.

F. RADIOACTIVE EFFLUENT MONITORING INSTRUMENTATION INOPERABLE FOR GREATER THAN 30 DAYS

R15017A, Retention Basin Effluent Discharge Monitor, was inoperable for greater than 30 days. On July 20, 2004, R15017A failed to return to service after restoration of site power. A broken electronic component was determined to be the cause of the failure. The electronic component was replaced and the monitor was successfully fixed.

In order to restore the monitor back to operability, plant staff had to perform a source calibration check on the R15017A detector. However, it was discovered that the calibration source, was prematurely disposed of earlier in the year during a campaign to remove radioactive sources no longer needed on site.

The original vendor for the detector was contacted and it was determined that a new source and calibration of the detector would be required to restore the monitor back to operability. Due to the specific requirements for the source, the new source could not be manufactured and used

for calibration until February 2005. The detector was shipped to the vendor for the calibration in February and returned to the plant on March 3, 2005.

Although the monitor could not be calibrated during its period of inoperability, the monitor was capable of performing its function. After successfully passing its operability test, R15017A was returned to service on March 10, 2005.

II. ESTIMATION OF ERROR

The methods for establishing error estimates included review of applicable station procedures, inspection of sampling equipment, engineering estimates, statistical applications, review of calibration setpoint data, and communication with plant personnel. The various sources of error (s) in reported values of gaseous effluents, liquid effluents, and solid waste are assumed to be independent, and thus the total error is calculated according to the formula:

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

where: σ_i = *relative error associated with component i*

Sources of error for gaseous effluents include fan error (flow), grab sampling, collection, filter efficiency, counting, and calibration.

Sources of error for liquid effluents include retention basin volume, dilution water flow rate, grab sampling, counting, and calibration.

Sources of error for solid waste include offsite lab smear analysis, dose rate meter calibration, dose rate meter reading, computer program dose-to-curie calculation, sample volume measurement, gamma spec counting, gamma spec calibration, and waste volume determination.

III. GASEOUS EFFLUENTS

Table III-A, Gaseous Effluents - Summation of All Releases, provides a detailed summary of gaseous effluent releases per quarter. This table summarizes releases of tritium and particulates with half-lives greater than 8 days. The methodology used to calculate the Percent of ODCM Technical Requirement limit is as follows:

$$\%\ \text{Tech Req Limit} = \frac{\sum_{i}\left[(F_i)(\text{Avg Rel Rate})(X/Q)(\text{Dose Factor})\right]}{(\text{Dose Rate Limit})} \times 100\%$$

where:

Fi = The fraction of the total number of Curies of nuclide i out of the total curies in that category for that quarter (unitless).

NOTE: F_i always equals 1.0 for H-3 because it is the only nuclide in the category.

$$\text{Avg Rel Rate} = \frac{(\text{Total Curies per category per quarter})\left(\frac{1\text{E}+06\ \mu\text{Ci}}{\text{Ci}}\right)}{(\#\ \text{seconds in the quarter})}$$

X/Q = A default dispersion factor determined to be conservative when compared to the use of actual data (sec/m3).

Dose Factor = The values derived for each nuclide i from NRC Regulatory Guide 1.109 (Ki, Li+1.1Mi, or Raij). [Units in (mrem/yr)/(µCi/m3)]

Dose Rate Limit = The Technical Requirement (i.e., Regulatory) limits for dose rate listed in Section I of this report (mrem/yr).

NOTE: Particulates with half-lives less than 8 days are not included in this calculation.

The methodology used to calculate the Estimated Total Error (%) in Table III-A is presented in Section II of this report.

Table III-B, Gaseous Effluents - Ground Level Releases, provides a complete quarterly summary of the amount of radioactivity (Ci) released per radionuclide in each quarter. Data from continuous and batch releases are provided for particulates and tritium. Data reported for batch releases results only from unplanned releases.

Table III-C, Gaseous Effluents - Typical Lower Limits of Detection, provides a listing of the typical lower limit of detection (LLD) concentrations in µCi/cc for various radionuclides.

Table III-D, Radiological Impact on Man Due to Gaseous Effluent Releases, provides a summary of calculated radiation doses delivered to a maximum exposed hypothetical individual at the Site Boundary for Gaseous Effluents (actual doses will be assessed in the 2004 Annual REMP Report). The maximum calculated organ dose is listed for each quarter along with an annual total. The direct radiation dose results, based on monitoring badge dosimetry, are also listed. Presented in this table for each category is a comparison versus ODCM Technical Requirement dose limits with the exception of direct radiation measurements.

RSNGS ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY - DECEMBER 2004

TABLE III-A

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error, %
A. Particulates						
1. Particulates with half-lives>8 days	Ci	2.13 E-06	0.00 E+00	0.00 E+00	0.00 E+00	2.3 E+01
2. Average Release Rate for period	µCi/sec	2.71 E-07	0.00 E+00	0.00 E+00	0.00 E+00	
3. Percent of Tech Req limit	%	1.64 E-06	N/A	N/A	N/A	
4. Gross Alpha radioactivity[1]	Ci	1.55 E-08	0.00 E+00	1.03 E-08	6.94 E-09	
B. Tritium						
1. Total Release	Ci	2.04 E-02	1.30 E-03	1.01 E-02	9.18 E-03	2.3 E+01
2. Average Release Rate for period	µCi/sec	2.59 E-03	1.65 E-04	1.27 E-03	1.15 E-03	
3. Percent of Tech Req limit	%	2.19 E-05	1.40 E-06	1.07 E-05	9.78 E-06	

[1] Gross alpha activity has been determined to be naturally occurring and not the result of the fuel cycle.

RSNGS ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY - DECEMBER 2004

TABLE III-B

GASEOUS EFFLUENTS - GROUND LEVEL RELEASES

		Continuous Mode			
Nuclides Released	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
1. Particulates					
Cs-137	Ci	2.13 E-06	0.00 E+00	0.00 E+00	0.00 E+00
2. Tritium					
H-3	Ci	2.04 E-02	1.30 E-03	1.01 E-02	9.18 E-03

TABLE III-C

GASEOUS EFFLUENTS - TYPICAL LOWER LIMITS OF DETECTION

RADIONUCLIDES		LLD (µCi/cc)
1.	Tritium (H-3)	2.27 E-10
2.	Particulates:	
	Manganese-54	2.08 E-12
	Cobalt-58	2.29 E-12
	Iron-59	5.89 E-12
	Cobalt-60	3.11 E-12
	Strontium-89	2.00 E-15
	Strontium-90	5.00 E-15
	Cesium-134	1.52 E-12
	Cesium-137	1.88 E-12
	Barium-140	3.06 E-12
	Cerium-141	1.15 E-12
	Cerium-144	3.69 E-12

TABLE III-D

RADIOLOGICAL IMPACT ON MAN DUE TO GASEOUS EFFLUENT RELEASES

CALCULATED RADIATION DOSES AT THE SITE BOUNDARY FOR GASEOUS EFFLUENTS:

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	2004 Annual
A. Tritium, Particulate						
1. Maximum Organ Dose	mrem	1.35 E-02 (a)	4.23 E-05 (b)	3.27 E-04 (b)	2.98 E-04 (b)	1.42 E-02
Percent Tech Req limit	%	5.16 E-01	3.93 E-01	1.72 E-02	3.73 E-03	4.65 E-01
B. Direct Radiation						
1. Dose (Monitoring Badges)	mrem	0.00 E+00*	0.00 E+00*	0.00 E+00*	0.00 E+00*	0.00 E+00*
2. Percent of Tech Req limit	%	N/A	N/A	N/A	N/A	N/A

NOTE: The quarterly doses listed above were calculated using dose factors from GASPAR and default meteorological data for each quarter. Annual doses are the sum of quarterly doses.

(a) Infant - Liver
(b) Child – All Except Bone

* None of the Indicator stations indicate significant radiation attributable to Plant operations.

IV. LIQUID EFFLUENTS

Table IV-A, Liquid Effluents - Summation of All Releases, provides a detailed summary of liquid effluent releases per quarter. This table summarizes releases of fission and activation products, tritium, dissolved and entrained gases, and gross alpha radioactivity. Also listed is the volume of waste released prior to dilution and the volume of dilution water used during each quarter.

The following methodology is used to calculate the Average Diluted Concentration and the Percent of ODCM Technical Requirement Limit in Table IV-A:

$$\%\ \text{Tech Req Limit} = \sum_{i}^{n}\left[\frac{C_i}{MEC_i}\right]$$

where: n = The total number of radionuclides identified

C_i = The average diluted concentration of radionuclide i

$$= \frac{(\text{Total Release per Category per Quarter in } \mu\text{Ci})}{(\text{Total Release Volume (part F in Table IV - A) in ml})}$$

MEC_i = The MEC of the i^{th} radionuclide, from 10 CFR 20, Appendix B, Table 2, Column 2

The methodology used to calculate the estimated total error in Table IV-A is presented in Section II of this report.

Table IV-B, Liquid Effluents, provides a complete quarterly summary of the amount of radioactivity (Ci) released per radionuclide in each quarter. Data is provided for fission and activation products, and for dissolved and entrained gases. Tritium and gross alpha are not included in this table (they are listed in Table IV-A). Since no continuous releases of liquid radioactive effluent are made from RSNGS, data is provided only for batch releases.

Table IV-C, Liquid Effluents - Typical Lower Limits of Detection, provides a listing of the typical lower limit of detection (LLD) concentrations in µCi/ml for various radionuclides.

Table IV-D, Radiological Impact on Man Due To Liquid Effluent Releases, provides a summary of calculated radiation doses delivered to a maximum exposed hypothetical individual at the Site Boundary for Liquid Effluents (actual doses will be assessed in the 2004 Annual REMP Report). The maximum calculated total body dose and organ dose are listed for each quarter along with an annual total. A comparison versus ODCM Technical Requirement dose limits is also presented.

RSNGS ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY - DECEMBER 2004

TABLE IV-A

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Est. Total Error, %
A. Fission & Activation Products						
1. Total Release (not including tritium, gases, alpha)	Ci	0.00 E+00	1.70 E-05	1.12 E-05	1.13 E-05	2.3 E+01
2. Average diluted concentration during period	µCi/ml	0.00 E+00	4.74 E-12	2.97 E-12	2.43 E-12	
3. Percent of Tech Req limit	%	N/A	3.18 E-04	1.73 E-04	1.61 E-04	
B. Tritium						
1. Total Release	Ci	0.00 E+00	6.70 E-03	0.00 E+00	2.05 E-03	2.3 E+01
2. Average diluted concentration during period	µCi/ml	0.00 E+00	1.86 E-09	0.00 E+00	4.42 E-10	
3. Percent of Tech Req limit	%	N/A	1.86 E-04	N/A	4.42 E-05	
C. Dissolved and Entrained Gases (i.e., Noble Gases)						
1. Total Release	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	N/A
2. Average diluted concentration during period	µCi/ml	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	
D. Gross Alpha radioactivity						
1. Total Release	Ci	0.00 E+00	0.00 E+00	0.00 E+00	0.00 E+00	2.3 E+01
E. Volume of Waste Released						
Retention Basins (prior to dilution)	Liters	0.00 E+00	1.39 E+06	1.54 E+06	1.35 E+06	5.0 E+00
F. Volume of dilution water used during period	Liters	5.44 E+09	4.86 E+09	2.99 E+09	4.27 E+09	2.0 E+01

TABLE IV-B

LIQUID EFFLUENTS

Nuclides Released		Batch Mode			
1. Fission and activation products (excluding tritium, gases alpha)	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Co-60	Ci	0.00 E+00	9.13 E-06	7.01 E-06	5.70 E-06
Sr-90	Ci	0.00 E+00	4.94 E-07	0.00 E+00	0.00 E+00
Cs-137	Ci	0.00 E+00	7.42 E-06	4.16 E-06	5.58 E-06
Total (for quarter)	Ci	0.00 E+00	1.70 E-05	1.12 E-05	1.13 E-05
2. Dissolved and entrained gases					
None					

NOTE: No continuous releases of liquid radioactive effluent are made from Rancho Seco Nuclear Generating Station.

TABLE IV-C

LIQUID EFFLUENTS - TYPICAL LOWER LIMITS OF DETECTION

	RADIONUCLIDES	BATCH MODE: LLD (µCi/ml)
1.	Tritium (H-3)	2.60 E-06
2.	Particulates:	
	Manganese-54	2.11 E-09
	Iron-59	3.71 E-09
	Cobalt-57	2.12 E-09
	Cobalt-58	1.93 E-09
	Cobalt-60	1.98 E-09
	Zinc-65	4.34 E-09
	Strontium-90	5.00 E-10
	Ruthenium-106	1.79 E-08
	Silver-110m	1.94 E-09
	Antimony-125	5.78 E-09
	Cesium-134	1.93 E-09
	Cesium-136	2.23 E-09
	Cesium-137	2.30 E-09
	Barium-140	7.75 E-09
	Cerium-141	3.60 E-09
	Cerium-144	1.59 E-08
3.	Dissolved and Entrained Gases:	
	Krypton-85	4.87 E-07

TABLE IV-D

RADIOLOGICAL IMPACT ON MAN DUE TO LIQUID EFFLUENT RELEASES

CALCULATED RADIATION DOSE COMMITMENTS FOR LIQUID EFFLUENTS:

	Unit	Quarter 1	Quarter 2	Quarter 3	Quarter 4	2004 Annual
A. Maximum Total Body Dose	mrem	0.00 E+00	2.21 E-03 (a)	6.56 E-03 (a)	1.59 E-03 (a)	1.04 E-02
Percent Tech Req limit	%	0.00 E+00	1.47 E-01	4.37 E-01	1.06 E-01	3.45 E-01
B. Maximum Organ Dose	mrem	0.00 E+00	6.99 E-03 (b)	1.32 E-02 (b)	3.24 E-03 (b)	2.34 E-02
Percent Tech Req limit	%	0.00 E+00	1.40 E-01	2.64 E-01	6.48 E-02	2.34 E-01

Note: The quarterly doses listed above were calculated using dose factors from LADTAP and the average dilution flow (cfs) for each respective quarter. Annual doses are the sum of quarterly doses.

(a) Adult
(b) Child - Bone

V. SOLID WASTE

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

1. Type of Waste:

	Volume (m^3)	Total Activity (Curies)	Est. Total Error (%)
A. Spent Resins, filter sludges, evaporator bottoms, etc.	0.00 E+00	0.00 E+00	N/A
B. Dry compressible waste, contaminated equipment, etc	7.99 E+02	1.24 E+02	2.5E+01
C. Irradiated components, control rods, etc.	3.17 E+00	7.14 E-04	2.5E+01
D. Other (primary metals, valves, piping)	1.17 E+02	7.13 E+00	2.5E+01

2. Estimate of major nuclide composition Category A and Category B waste

	Category A		Category B	
Radionuclide	Activity (Ci)	Percentage (%)	Activity (Ci)	Percentage (%)
H-3			1.31E-02	1.07E-02
C-14			1.12E+00	9.12E-01
Fe-55			4.29E+00	3.50E+00
Co-60			3.44E+01	2.80E+01
Ni-63			8.06E+01	6.57E+01
Sr-90			2.02E-01	1.65E-01
Nb-94			1.30E-03	1.06E-03
Tc-99			1.10E-03	9.00E-04
Sb-125				
Cs-134				
Cs-137			2.77E-01	2.26E-01
Pu-238			6.18E-02	5.03E-02
Pu-239			6.42E-02	5.23E-02
Pu-241			1.66E+00	1.35E+00
Pu-242			9.47E-07	7.72E-07
Am-241			7.27E-03	5.92E-03
Cm-242			3.51E-06	2.86E-06
Cm-244			4.51E-04	3.67E-04

3. Estimate of major nuclide composition Category C and Category D waste

	Category C		Category D	
Radionuclide	Activity (Ci)	Percentage (%)	Activity (Ci)	Percentage (%)
H-3			1.59E-03	2.23E-02
C-14			1.35E-01	1.89E+00
Fe-55			2.22E-01	3.11E+00
Co-60	4.55E-04	6.38E+01	5.54E-01	7.78E+00
Ni-63			6.13E+00	8.61E+01
Sr-90			9.17E-03	1.29E-01
Nb-94				
Tc-99			1.54E-03	2.17E-02
Sb-125				
Cs-134				
Cs-137			4.33E-02	6.08E-01
Eu-152	1.42E-04	1.98E+01		
Eu-154	1.17E-04	1.64E+01		
Pu-238			6.31E-04	8.85E-03
Pu-239			7.35E-04	1.03E-02
Pu-241			2.48E-02	3.48E-01
Pu-242				
Am-241			1.37E-03	1.93E-02
Cm-242			2.45E-09	3.44E-08
Cm-244			1.37E-04	1.92E-03

4. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
43	Highway	Envirocare of Utah, Inc.
3	Rail	Envirocare of Utah, Inc.
10	Highway	RACE, Tennessee
1	Rail	RACE, Tennessee

5. Type of Container

   a. All shipment containers were strong tight containers (STC) except for the steam generators. Two steam generators were shipped as IP-2 packages.

6. Solidification Agent

   a. Not applicable

B. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments

None

VI. RANCHO SECO INDEPENDENT SPENT FUEL STORAGE INSTALLATION ANNUAL REPORT

The operation of the Rancho Seco Independent Spent Fuel Storage Installation (ISFSI) does not create any radioactive material or result in liquid or gaseous radioactive effluent releases. There were no radionuclides released into the environment from liquid or gaseous effluent from the Rancho Seco ISFSI during the period of January 1, 2004 through December 31, 2004.