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

DAGM/NUC 94-040

February 28, 1994

U. S. Nuclear Regulatory Commission
Attn: Kenneth L. Perkins, Regional Administrator
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596-5368

Docket No. 50-312
Rancho Seco Nuclear Station
License No. DPR-54

JULY-DECEMBER 1993 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

Dear Mr. Perkins:

In accordance with 10 CFR 50.36a(a)(2) and Rancho Seco Permanently Defueled Technical Specification D6.9.3, the District submits the enclosed Rancho Seco Semiannual Radioactive Effluent Release Report for the period July 1 through December 31, 1993.

Members of your staff requiring additional information or clarification may contact Einar Ronningen at (916) 452-3211, extension 4467.

Sincerely,

Steve Redeker

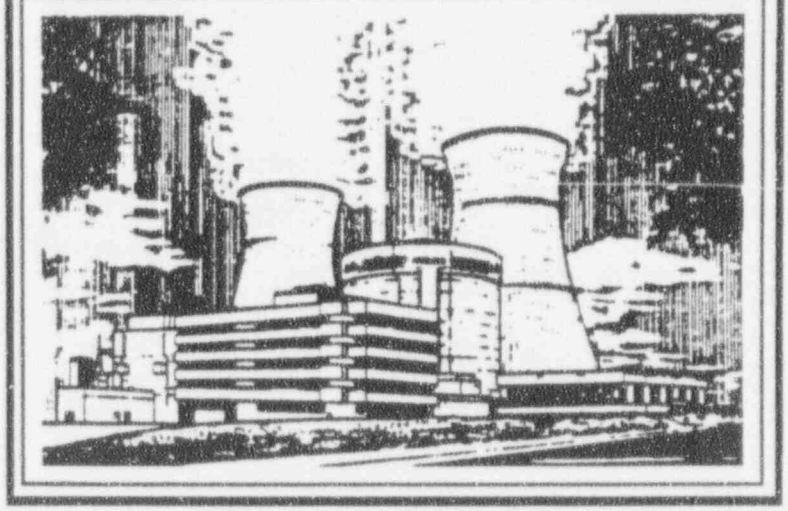
for James R. Shetler
Deputy Assistant General Manager
Nuclear

Attachment

080030

cc w/atch: Document Control Desk, NRC, Washington D.C. 20555
M. Cillis, NRC, Walnut Creek
T. Markley, NRC, Rockville

IE48



RANCHO SECO
Nuclear Generating Station

LICENSE NUMBER DPR-54

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JULY - DECEMBER 1993

RSNGS SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JULY - DECEMBER 1993

TABLE OF CONTENTS

RSNGS SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JULY - DECEMBER 1993

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 is a pressurized water reactor supplied by Babcock and Wilcox. The rated capacity is 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.

This Semiannual Radioactive Effluent Release Report (SRERR) provides a summary of gaseous and liquid effluent releases made from Rancho Seco during the period July 1 through December 31, 1993. Also presented in this report is the projected radiological impact from these releases and a summary of solid radwaste shipments.

This report has been prepared by the Sacramento Municipal Utility District to meet the requirements of Rancho Seco Technical Specification D6.9.3 and Offsite Dose Calculation Manual (ODCM) Step 6.15. It is presented in accordance with the format of USNRC Regulatory Guide 1.21. The radiation doses reported in this SRERR 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.

B. MAXIMUM PERMISSIBLE CONCENTRATIONS

1. Gaseous Effluents

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

For dissolved or entrained noble gases, the total allowable concentration in the liquid at the point of offsite discharge is limited to 2.0E-04 μCi/ml.

C. MEASUREMENT METHODS FOR TOTAL RADIOACTIVITY

1. Fission and Activation Gases

Gamma Spectroscopy (HPGe)
Liquid Scintillation (H-3)

2. Particulates

Gamma Spectroscopy (HPGe)
Beta Proportional (Sr-89, Sr-90, gross beta)
Alpha Proportional (gross alpha)

3. Liquid Effluents

Gamma Spectroscopy (HPGe)
Liquid Scintillation (H-3)
Beta Proportional (Sr-89, Sr-90, gross beta)
Alpha Proportional (gross alpha)

NOTE: HPGe refers to Hyper-Pure Germanium

RSNGS SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JULY - DECEMBER 1993

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 is a pressurized water reactor supplied by Babcock and Wilcox. The rated capacity is 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.

This Semiannual Radioactive Effluent Release Report (SRERR) provides a summary of gaseous and liquid effluent releases made from Rancho Seco during the period July 1 through December 31, 1993. Also presented in this report is the projected radiological impact from these releases and a summary of solid radwaste shipments.

This report has been prepared by the Sacramento Municipal Utility District to meet the requirements of Rancho Seco Technical Specification D6.9.3 and Offsite Dose Calculation Manual (ODCM) Step 6.15. It is presented in accordance with the format of USNRC Regulatory Guide 1.21. The radiation doses reported in this SRERR 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.

I. SUPPLEMENTAL INFORMATION

A. REGULATORY LIMITS & GUIDELINES FOR EFFLUENT RELEASES

1. Gaseous Effluents

a. Noble Gas dose rate limit at or beyond the Site Boundary for Gaseous Effluents (Offsite Dose Calculation Manual (ODCM) Technical Requirement 6.14.6):

500 mrem/year to the total body
3000 mrem/year to the skin

b. Noble Gas air dose limit at or beyond the Site Boundary for Gaseous Effluents (ODCM Technical Requirement 6.14.7, numerical guidelines of 10 CFR 50, Appendix I):

5 mrad per calendar quarter for gamma radiation
10 mrad per calendar quarter for beta radiation
10 mrad per calendar year for gamma radiation
20 mrad per calendar year for beta radiation

c. 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 6.14.6):

1500 mrem/year to any organ

d. 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 6.14.8, 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 II, Column 2. This applies to all radionuclides except dissolved or entrained noble gases (ODCM Technical Requirement 6.14.2).

b. The total concentration of dissolved or entrained noble gases shall not exceed 2.0E-04 μCi/ml (ODCM Technical Requirement 6.14.2).

c. 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 6.14.3, 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

B. MAXIMUM PERMISSIBLE CONCENTRATIONS

1. Gaseous Effluents

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

For dissolved or entrained noble gases, the total allowable concentration in the liquid at the point of offsite discharge is limited to 2.0E-04 μCi/ml.

C. MEASUREMENT METHODS FOR TOTAL RADIOACTIVITY

1. Fission and Activation Gases

Gamma Spectroscopy (HPGe)
Liquid Scintillation (H-3)

2. Particulates

Gamma Spectroscopy (HPGe)
Beta Proportional (Sr-89, Sr-90, gross beta)
Alpha Proportional (gross alpha)

3. Liquid Effluents

Gamma Spectroscopy (HPGe)
Liquid Scintillation (H-3)
Beta Proportional (Sr-89, Sr-90, gross beta)
Alpha Proportional (gross alpha)

NOTE: HPGe refers to Hyper-Pure Germanium

D. BATCH RELEASES (via monitored pathways)

		Quarter 3	Quarter 4
1.	**Liquid (RHUT Releases)**		
	a. Number of batch releases	3	3
	b. Total time period for batch releases (hours)	15	13
	c. Maximum time period for a batch release (hours)	7	6
	d. Average time period for a batch release (hours)	5	4
	e. Minimum time period for a batch release (hours)	1	3
3.	**Liquid (Retention Basin Discharges)**		
	a. Number of batch releases	3	3
	b. Total time period for batch releases (hours)	12	30
	c. Maximum time period for a batch release (hours)	5	17
	d. Average time period for a batch release (hours)	4	10
	e. Minimum time period for a batch release (hours)	3	4
	f. Average stream flow during periods of release of effluent into a flowing stream (cfs)	17.2	17.8

NOTE: The Regenerant Holdup Tanks (RHUTs) are released to the Retention Basins. The Retention Basins are discharged offsite. All 10 CFR 50, Appendix I dose calculations are based on the RHUT releases. All 10 CFR 20 calculations are based on the Retention Basin discharges.

E. UNPLANNED RELEASES

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

Gaseous

None

Liquid

On December 26, 1993, the tank agitator mechanical shaft seal for the "A" Regenerative Hold-up Tank (RHUT), T-950A, suffered a mechanical failure. This resulted in a leak of approximately 5 gpm from the shaft seal, some of which was eventually released off-site through the Storm Drain System. After discovering the leak and the flow path of the leaking water, the affected Storm Drain was sealed. A conservative estimate of 450 gallons of the contents of the "A" RHUT was released off-site before the affected Storm Drain was sealed. The activity released was conservatively estimated as:

H-3	3.73 E-05 Ci
Co-60	8.33 E-09 Ci
Cs-134	3.15 E-09 Ci
Cs-137	8.52 E-08 Ci

The calculated dose to the most limiting receptor (Adult, Total Body) was calculated to be 2.49 E-05 mrem or 0.0083 percent of the annual limit set forth in Technical Requirement 6.14.3 of the ODCM, which complies with the numerical guidelines of 10 CFR 50, Appendix I. Once the leak was discovered, the affected Storm Drain was sealed, stopping the unplanned release. The remaining contents of T-950A were transferred into T-950B, and the leakage, which continued until the level of T-950A was lowered below the level of the agitator shaft seal, was collected and also transferred into T-950B. Complete replacement of the agitator mechanism, including the shaft seal, is underway. Programmatic action to prevent recurrence was not necessary.

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

None

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 (σ) 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:

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

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 RHUT 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, Wastetrak 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 fission and activation gases, particulates with half-lives greater than 8 days, and tritium. The methodology used to calculate the Percent of ODCM Technical Requirement limit is as follows:

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

where:

F_i = 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.

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

X/Q = A default value determined to be conservative when compared to the use of actual data (sec/m^3).

Dose Factor = The values derived for each nuclide i from NRC Regulatory Guide 1.109 (K_i, $L_i+1.1M_i$, or R_{aij}). [Units in $(mrem/yr)/(\mu Ci/m^3)$]

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 fission gases, 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 $\mu Ci/ml$ 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 1993 Annual REMP Report). The maximum calculated organ dose, gamma air dose, and beta air dose are listed for quarter 3, quarter 4 and 1993. The dose due to direct radiation based on Thermoluminescent Dosimeter (TLD) results is 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 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JULY - DECEMBER 1993

TABLE III-A

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Quarter 3	Quarter 4	Est. Total Error, %
A. Fission & Activation Gases (i.e., Noble Gases)				
1. Total Release	Ci	0.00 E+00	0.00 E+00	N/A
2. Average Release Rate for period	μCi/sec	0.00 E+00	0.00 E+00	
3. Percent of Tech Req limit	%	N/A	N/A	
B. Particulates				
1. Particulates with half-lives>8 days	Ci	0.00 E+00	0.00 E+00	2.5 E+01
2. Average Release Rate for period	μCi/sec	0.00 E+00	0.00 E+00	
3. Percent of Tech Req limit	%	N/A	N/A	
4. Gross Alpha radioactivity[1]	Ci	1.98 E-07	1.94 E-07	
C. Tritium				
1. Total Release	Ci	1.75 E+00	8.70 E-01	2.5 E+01
2. Average Release Rate for period	μCi/sec	2.20 E-01	1.09 E-01	
3. Percent of Tech Req limit	%	1.86 E-03	9.27 E-04	

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

TABLE III-B

GASEOUS EFFLUENTS - GROUND LEVEL RELEASES

		Continuous Mode		Batch Mode	
Nuclides Released	Unit	Quarter 3	Quarter 4	Quarter 3	Quarter 4
1. Fission Gases (i.e., Noble Gases)					
None					
2. Particulates					
None					
3. Tritium					
H-3	Ci	1.75 E+00	8.70 E-01	0.00 E+00	0.00 E+00

NOTE: Batch releases of gaseous effluent are no longer planned to be made from Rancho Seco Nuclear Generating Station.

TABLE III-C

GASEOUS EFFLUENTS - TYPICAL LOWER LIMITS OF DETECTION

	RADIONUCLIDES	LLD (μCi/cc)
1.	Tritium (H-3)	2.27 E-10
2.	Fission & Activation Gases:	
	Krypton-85	3.47 E-06
3.	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

RSNGS SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JULY - DECEMBER 1993

TABLE III-D

RADIOLOGICAL IMPACT ON MAN DUE TO GASEOUS EFFLUENT RELEASES

CALCULATED RADIATION DOSES AT THE SITE BOUNDARY FOR GASEOUS EFFLUENTS:

	UNIT	Quarter 3	Quarter 4	1993 Annual
A. Tritium, Particulate				
1. Maximum Organ dose	mrem	5.67 E-02 (a)	2.82 E-02 (a)	2.44 E-01 (a)
Percent Tech Req Limit	%	7.56 E-01	3.76 E-01	1.63 E+00
B. Noble Gas				
1. Gamma air dose	mrad	0.00 E+00	0.00 E+00	0.00 E+00
Percent Tech Req Limit	%	N/A	N/A	N/A
2. Beta air dose	mrad	0.00 E+00	0.00 E+00	0.00 E+00
Percent Tech Req Limit	%	N/A	N/A	N/A
C. Direct Radiation				
1. Dose (TLD results)	mrem	0.00 E+00*	0.00 E+00*	0.00 E+00
Percent Tech Req Limit	%	N/A	N/A	N/A

(a) Child - All Except Bone

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.

* Averages of all doses at TLD Indicator Stations are less than the averages for all control stations for this Period. 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:

$$\% \text{ Tech Spec Limit} = \sum_i \left[\frac{C_i}{MPC_i} \times 100\% \right]$$

where: n = The total number of radionuclides identified

C_i = The average diluted concentration of radionuclide i

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

MPC_i = The MPC of the i^{th} radionuclide, from 10 CFR 20, Appendix B, Table II, 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 1993 Annual REMP Report). The maximum calculated total body dose and organ dose for quarter 3, quarter 4, and 1993 are listed. A comparison versus ODCM Technical Requirement dose limits is also presented.

RSNGS SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JULY - DECEMBER 1993

TABLE IV-A

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Quarter 3	Quarter 4	Est. Total Error, %
A. Fission & Activation Products				
1. Total Release (not including tritium, gases, alpha)	Ci	1.62 E-04	5.33 E-05	2.3 E+01
2. Average diluted concentration during period	µCi/ml	4.20 E-11	1.33 E-11	
3. Percent of applicable limit	%	3.32 E-04	7.03 E-05	
B. Tritium				
1. Total Release	Ci	5.65 E-03	7.40 E+00	2.3 E+01
2. Average diluted concentration during period	µCi/ml	1.46 E-09	1.85 E-06	
3. Percent of applicable limit	%	4.87 E-05	6.17 E-02	
C. Dissolved and Entrained Gases (i.e., Noble Gases)				
1. Total Release	Ci	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	
3. Percent of applicable limit	%	N/A	N/A	
D. Gross Alpha radioactivity				
1. Total Release	Ci	0.00 E+00	0.00 E+00	N/A
E. Volume of waste released				
Retention Basins (prior to dilution)	Liters	2.48 E+06	3.65 E+06	5.0 E+00
RHUTs (prior to dilution)	Liters	7.72 E+05	8.40 E+05	5.0 E+00
F. Volume of dilution water used during period	Liters	3.87 E+09	4.00 E+09	1.0 E+01

TABLE IV-B

LIQUID EFFLUENTS

Nuclides Released		Batch Mode	
1. Fission and activation products (excluding tritium, gases, alpha)	Unit	Quarter 3	Quarter 4
Cobalt-60	Ci	5.27 E-06	7.50 E-07
Strontium-90	Ci	1.32 E-06	0.00 E+00
Cesium-134	Ci	7.67 E-06	2.56 E-06
Cesium-137	Ci	1.48 E-04	5.00 E-05
Total for period (above)	Ci	1.62 E-04	5.33 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-89	1.00 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 3	Quarter 4	1993 Annual
A.	1. Maximum Total Body dose	mrem	4.94 E-02 (a)	9.06 E-02 (b)	1.68 E-01 (a)
	2. Percent Tech Spec Limit	%	3.29 E+00	6.04 E+00	5.59 E+00
B.	1. Maximum Organ dose	mrem	1.09 E-01 (c)	1.17 E-01 (d)	3.19 E-01 (d)
	2. Percent Tech Spec Limit	%	2.18 E+00	2.34 E+00	3.19 E+00

(a) Adult
(b) Child
(c) Child - Bone
(d) Child - Liver

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.

V. SOLID WASTE

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

No shipments of radioactive waste were made to a disposal site during the reporting period.

B. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments

None

RSNGS SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JULY - DECEMBER 1993

APPENDIX A - REVISION TO THE PROCESS CONTROL PROGRAM

PROCESS CONTROL PROGRAM
Revision 1

RANCHO SECO NUCLEAR GENERATING STATION

PROCESS CONTROL PROGRAM

Rev. 1

EFFECTIVE DATE:
08-09-93

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF FIGURES

DEFINITIONS

Terms in this manual which have a specific definition or meaning are capitalized (e.g.,
1→ OPERABILITY). Definitions for such capitalized terms are found in Section D1.0 of Technical Specifications (Reference 7.4), with the exception of the following terms which are defined below:

PROCESSING

The conversion of radioactive waste into a form that meets shipping and disposal requirements.

SOLIDIFICATION

A type of waste PROCESSING where a wet waste is converted into a dry, solid mass.

DEWATERING

A type of waste PROCESSING where water is removed from a wet waste (normally resin).

STABILITY (STABLE)

Having structural stability so that the waste will generally maintain its physical dimensions and
← form under expected disposal conditions.

SECTION 1.0

INTRODUCTION

1.1 PURPOSE

The purposes of the Process Control Program (PCP) are to:

(1) Establish a program which will provide reasonable assurance that all radioactive wastes generated at Rancho Seco that are to be disposed of at a land disposal facility are PROCESSED and packaged such that applicable Federal regulations, State rules and regulations, and disposal site criteria are satisfied.

1→← (2) Assure that major changes to the Liquid, Ventilation, and Solid Radwaste Systems are properly reviewed, evaluated and approved.

The PCP contains a general description of the methods for controlling the PROCESSING and packaging of solid and liquid radioactive wastes, specific parameters for each method, and the administrative controls and quality assurance required to ensure compliance with applicable regulations and requirements.

1.2 SCOPE

This program defines criteria for the PROCESSING of the following waste streams for disposal at a land disposal facility:

(1) Wet Wastes

- (a) Resins (bead)
- (b) Cartridge Filters
- (c) Evaporator Concentrates
- (d) Sludge
- (e) Miscellaneous liquids

(2) Dry Active Wastes (DAW)

- (a) Compactible
- (b) Noncompactible

1→← This program defines the requirements for major changes to Liquid, Ventilation, and Solid Radwaste Treatment Systems.

1.3 PRECAUTIONS/LIMITATIONS

Except as specifically described in this document, the following general precautions and limitations apply to the PROCESSING and packaging of all radioactive wastes generated at Rancho Seco for disposal at a land disposal facility. These precautions and limitations shall be included in appropriate station or vendor implementing procedures.

(1) No liquid materials within the scope of this program shall be packaged for disposal without being processed.

(2) No package shall be loaded for shipment if it has any indication of a hole or failure. These packages shall either be repacked, or placed in an overpack.

(3) Radioactive waste shall not be packaged for disposal in cardboard or fiberboard boxes.

(4) Only High Integrity Containers (HIC) approved for burial at a land disposal facility shall be utilized for packaging dewatered wastes when waste form stability is required per 10 CFR 61.

(5) No objects or materials shall be placed into HICs that may cause chemical or physical damage to the container per the vendors 10 CFR 61 Topical Report or other Federal, State or Burial Facility requirements.

(6) As much as practical, polyethylene HICs shall be kept out of direct sunlight to prevent ultraviolet light degradation. Protection from direct sunlight shall be provided when HICs are stored for extended periods.

(7) Radioactive waste shall not be packaged for disposal if it is pyrophoric. Pyrophoric materials contained in radioactive waste shall be treated, prepared, and packaged to be nonflammable prior to disposal.

(8) Radioactive waste in gaseous form shall not be packaged for disposal.

1→ (9) Radioactive waste shall be stored to reduce, to the maximum extent practicable, the potential for getting contaminated with non-radiological hazardous material. Biological, pathogenic or infectious material is not ← expected to be produced.

(10) Radioactive wastes shall not be packaged for disposal if it is readily capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures, or of explosive reaction with water.

(11) Radioactive waste shall not be packaged for disposal if it contains, or is capable of generating quantities of toxic gases, vapors, or fumes harmful to persons transporting, handling or disposing of the waste.

(12) Samples shall be handled and collected in accordance with applicable Rancho Seco procedures and in keeping with ALARA principles.

(13) PROCESSING evolutions should be periodically monitored for adverse chemical reactions and temperature changes in accordance with the Vendor's Topical Report or Vendor's Operating Procedures.

(14) Any mishaps regarding LLW forms prepared for disposal shall be reported to the NRC in accordance with guidelines set forth in Generic Letter 91-02 (Reference 7.2.2). The requirements of RSAP-0903 (Reference 7.8.2) shall be followed in these circumstances.

1.4 RESPONSIBILITIES

1.4.1 Deputy Assistant General Manager, Nuclear

It is the responsibility of the Deputy AGM, Nuclear, to ensure that the requirements contained in this manual are achieved during the PROCESSING of radioactive waste through appropriate administrative and implementing procedures.

The Deputy AGM, Nuclear, is responsible for approving changes to this PROCESS CONTROL PROGRAM, as required by Technical Specification D6.13.

1.4.2 Plant Review Committee

The Plant Review Committee (PRC) shall review the Topical Reports and Process Control Programs of vendors selected to provide waste processing services or products prior to their initial use at the station. Any subsequent revision to these documents shall also be reviewed by PRC prior to the initial use of the revision. These reviews shall ensure compatibility with Station equipment and operation.

Additionally, the PRC is responsible for reviewing changes to this PCP prior to implementation. The PRC also reviews station administrative and implementing procedures for radioactive waste processing activities.

1.4.3 Radiation Protection Manager

The Radiation Protection Manager (RPM) [Nuclear Radiation Protection, Emergency Preparedness, Environmental Monitoring and Chemistry Manager] is responsible for developing, coordinating, and approving appropriate administrative, implementing, and vendor procedures for waste processing prior to the initial use of the documents at the station. The Manager shall also approve any revisions to these documents prior to initial use of the revision.

Review of vendor procedures for waste processing shall also include technical reviews by the Operations and Technical Services departments.

1.4.4 Operations/Security Manager

The Operations/Security Manager shall ensure technical reviews of procedures are completed in accordance with the PCP.

1.4.5 Technical Services Manager

The Technical Services Manager shall ensure technical reviews of procedures are completed in accordance with the PCP.

1.4.6 Radiation Protection Supervision

RP Supervision shall ensure the tests and inspections required by this PCP are completed. During the PROCESSING of radioactive waste, RP supervision shall ensure all the requirements of appropriate administrative and implementing procedures and other sections of this PCP, as required, are followed.

SECTION 2.0

RADIOACTIVE WASTE PROCESSING REQUIREMENTS

2.1 SOLID RADIOACTIVE WASTES

2.1.1 Operability Criteria

1→← Radioactive wastes shall be PROCESSED in accordance with this PROCESS CONTROL PROGRAM to meet shipping requirements during transit, and disposal site requirements when received at the disposal site.

The solid radwaste system shall be demonstrated OPERABLE at least once every 92 days by:

a. Operating the solid radwaste system in accordance with the PROCESS CONTROL PROGRAM, or

b. Verify the existence of a valid contract for SOLIDIFICATION/ DEWATERING to be performed by a contractor in accordance with an approved PROCESS CONTROL PROGRAM.

APPLICABILITY: At all times.

COMPENSATORY MEASURES:

1→ a. If the PROCESSED waste does not meet disposal site or shipping requirements, then suspend shipment of the wastes and correct, as necessary, this PROCESS CONTROL PROGRAM, the applicable procedures, and the applicable Waste Processing Systems to prevent recurrence.

b. If the PROCESSING is not performed in accordance with this PROCESS ← CONTROL PROGRAM, then test the PROCESSED waste in each container to ensure that it meets disposal and shipping requirements and take appropriate administrative action to prevent recurrence.

2.1.2 Tests/Inspections

Satisfactory PROCESSING of wet radioactive wastes (e.g., filter sludges, spent resins, evaporator bottoms and boric acid solutions) shall be verified in accordance with this PROCESS CONTROL PROGRAM:

a. If any required test specimen fails to verify satisfactory PROCESSING, the PROCESSING of the batch under test shall be suspended until such time as additional testing can be performed, alternative PROCESSING parameters can be determined in accordance with this PROCESS

CONTROL PROGRAM, and subsequent testing verifies satisfactory PROCESSING. PROCESSING of the batch may then be resumed using the alternative PROCESSING parameters determined by this PROCESS CONTROL PROGRAM.

This PROCESS CONTROL PROGRAM shall be modified as required to assure satisfactory PROCESSING of subsequent batches of waste.

1→ ← b. If the installed equipment is incapable of meeting the Operability Criteria 2.1.1, above, or is declared inoperable, then restore the equipment to OPERABLE status or provide for contract capability to process wastes as necessary to satisfy all applicable transportation and disposal requirements.

2.1.3 Bases

This requirement implements the requirements of 10 CFR 50.36a and General Design Criterion 60 of Appendix A to 10 CFR Part 50. The process parameters included in establishing this PROCESS CONTROL PROGRAM may include, but are not limited to, waste's type, pH, liquid/solidification agent/catalyst ratios, oil content, principal chemical constituents, mixing and curing times, or dewatering parameters.

1→ 2.2 MAJOR CHANGES TO RADIOACTIVE WASTE TREATMENT SYSTEMS (LIQUID, VENTILATION, AND SOLID)

The radioactive waste treatment systems (liquid, ventilation, and solid) are those ← systems described in the facility Defueled Safety Analysis Report (DSAR) which are used to maintain control over radioactive materials in gaseous and liquid effluents and in solid waste packaged for off-site shipment.

1→← Major changes to the radioactive waste systems shall be made by the following method. For the purpose of this specification, "major changes" is defined in Section 2.2.3.

2.2.1 Licensee-Initiated Changes

1→← a. The Commission shall be informed of all changes by the inclusion of a suitable discussion of each change in the biennial DSAR update for the period in which the changes were made. The discussion of each change shall contain:

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

2) Sufficient information to support the reason for the change without benefit of additional or supplemental information;

3) A description of the equipment, components, and processes involved, and the interfaces with other plant systems;

4) An evaluation of the change with regard to the predicted releases of radioactive materials in liquid and gaseous effluents and/or quantity of solid waste if different from those previously predicted in the license application and amendments thereto;

5) An evaluation of the change with regard to the expected maximum exposures to a MEMBER OF THE PUBLIC in the UNRESTRICTED AREA and to the general population if different from those previously estimated in the license application and amendments thereto;

6) A comparison of the predicted releases of radioactive materials in liquid and gaseous effluents and in solid waste to the actual releases following performance of the change for the period in which the changes were made;

7) An estimate of the exposure to plant operating personnel as a result of the changes; and

8) Documentation of the fact that the change was reviewed and found acceptable by the PRC.

b. The Change shall become effective upon review and acceptance by the PRC and approval by the Deputy AGM, Nuclear.

2.2.2 Background

a. 10 CFR Part 50, Section 50.34a (a) requires that each application to construct a nuclear power reactor provide a description of the equipment installed to maintain control over radioactive material in gaseous and liquid effluents produced during normal reactor operations, including operational occurrences.

b. 10 CFR Part 50, Section 50.34a (b) (2) requires that each application to construct a nuclear power reactor provide an estimate of the quantity of radionuclides expected to be released annually to unrestricted areas in liquid and gaseous effluents produced during normal reactor operation.

c. 10 CFR Part 50, Section 50.34a (b) (3) requires that each application to construct a nuclear power reactor provide a description of the provisions for packaging, storage, and shipment off-site of solid waste containing radioactive materials resulting from treatment of gaseous and liquid effluents and from other sources.

d. 10 CFR Part 50, Section 50.34a (c) requires that each application to operate a nuclear power reactor shall include (1) a description of the equipment and procedures for the control of gaseous and liquid effluents and for the maintenance and use of equipment installed in radioactive waste systems, and (2) a revised estimate of the information required in (b)(2) if the expected releases and exposures differ significantly from the estimate submitted in the construction permit.

e. The NRC's Safety Evaluation Report and Amendments thereto issued prior to the issuance of an operating license contains a description of the radioactive waste systems installed in the nuclear power reactor and a detailed evaluation (including estimated releases of radioactive materials in liquid and gaseous waste and quantities of solid waste produced from normal operation, estimated annual maximum exposures to an individual in the unrestricted area and estimated exposures to the general population) which shows the capability of these systems to meet the appropriate regulations.

f. The NRC's Final Environmental Statement issued prior to the issuance of an operating license contains a detailed evaluation as to the expected environmental impact from the estimated releases of radioactive material in liquid and gaseous effluents.

2.2.3 Definition

1→← "Major Changes" to radioactive waste treatment systems (liquid, ventilation, and solid) shall include the following:

(1) Major changes in process equipment, components, structures, and
1→← effluent monitoring instrumentation from those described in the DSAR and evaluated in the NRC's Safety Evaluation Report (SER) (e.g., deletion of evaporators and installation of demineralizers; use of fluidized bed calciner/incineration in place of cement solidification systems);

(2) Major changes in the design of radwaste treatment systems (liquid,
1→← ventilation, and solid) that could significantly alter the characteristics and/or quantities of effluents released or volumes of solid waste stored
1→← or shipped off-site from those previously considered in the DSAR and SER (e.g., use of asphalt system in place of cement);

(3) Changes in system design which may invalidate the accident analysis as described in the SER (e.g., changes in tank capacity that would alter the curies released); and

(4) Changes in system design that could potentially result in a significant increase in occupational exposure of operating personnel (e.g., use of skid-mounted equipment, use of mobile processing equipment).

SECTION 3.0

PROGRAM DESCRIPTION

3.1 PROCESSING OF WET RADIOACTIVE WASTE

3.1.1 PROCESSING Methods

Wet radioactive waste generated at Rancho Seco shall be PROCESSED into a form acceptable for disposal at a licensed facility by dewatering, drying, absorption or solidification. PROCESSING shall be performed utilizing equipment operated in accordance with the specific Process Control Program (PCP) requirements and procedures. Vendors selected to provide services or products used in compliance with 10 CFR 61 STABILITY requirements shall have a topical report addressing 10 CFR 61 requirements under review or approved by the NRC. When a vendor is initially selected, this PROCESS CONTROL PROGRAM shall be revised to incorporate by reference the vendor's Topical Report and PCP. The Topical Reports and PCPs of multiple vendors may be referenced in this PCP even if all vendors are not actively providing services or products at Rancho Seco. However, if any vendor is selected whose documents are not referenced, this PCP shall be revised to reference them.

3.1.2 Processing System Description

Detailed descriptions of a vendor's PROCESSING system shall be included in the vendor's Topical Report.

3.1.3 Prequalification Testing (Class B and C Wastes Only)

Prequalification tests shall be performed on each type of wet radioactive waste stream to demonstrate the ability of the process to produce an acceptable waste form per the requirements of 10 CFR 61. This prequalification testing is performed by the vendor and documented in the vendor's Topical Report.

3.1.4 System Qualification Tests (Class B and C Wastes Only)

Prior to the initial PROCESSING of a given waste stream type using a specified process, a test shall be conducted to demonstrate the ability of the process system to produce an acceptable waste form over the range of critical parameters identified during the prequalification testing. Bounds for critical parameters and specific operating limits shall be specified in the specific PCP or Topical Report.

These tests shall be performed on laboratory scale or full scale specimens and shall ensure that the acceptance criteria specified in Section 3.1.8 are achieved.

1→← 3.1.5 Equipment/System Operability Requirements (Class B and C Wastes Only)

Prior to each PROCESSING evolution, operability of the processing equipment which shall be demonstrated, including, but not be limited to, the following:

(1) Control Panel
(2) Instrumentation and Controls
(3) Mechanical Equipment
(4) Electrical Equipment

The operability test shall be performec in accordance with the specific PCP requirements and procedures.

1→← 3.1.6 Batch Preprocessing Sampling (Class B and C Wastes Only)

Each batch of waste offered for PROCESSING shall be sampled and analyzed, as appropriate, in accordance with the specific PCP requirements and procedures and the Topical Report that addresses the 10 CFR 61
1→← STABILITY requirements, as appropriate. This sampling shall:

(1) Provide necessary data to estimate curie content and perform the waste classification analysis.

(2) Ensure that waste stream parameters are within the bounds for critical parameters established in the PCP and 10 CFR 61 Topical Report.

NOTE: Results of waste stream chemical analyses shall be reviewed to ensure chemical constituents do not exist which could cause adverse chemical reactions during the dewatering process or react adversely with the waste container.

1→← 3.1.7 Testing/Inspections (Class B and C Wastes Only)

To satisfy the Test/Inspection requirements of Section 2.1.2 of this Prog am, a test or inspection shall be performed for each PROCESSING evoluti n to ensure that the applicable acceptance criteria of Section 3.1.8 are achi ved. This is accomplished by verifying that a specified end point is achiev d for each PROCESSING evolution of the actual waste stream.

If the test results fail to meet the acceptance criteria, the following steps, as per the Compensatory Measures of Section 2.1.1, shall be followed:

(1) PROCESSING of the batch under test shall be suspended until such time as additional testing can be performed, alternative PROCESSING parameters can be determined, and subsequent testing verifies satisfactory PROCESSING of the waste. PROCESSING of the batch may then be resumed using the alternative PROCESSING parameters if the alternative parameters will produce a product that falls within the vendor's qualification envelope.

1→← The specific PCP requirements shall provide the method for determining the alternative PROCESSING parameters. Alternative PROCESSING parameters which fall within the qualification testing envelope shall be approved by the Radwaste Superintendent or his designee and shall be documented in accordance with the PCP requirements. The PCP requirements shall be modified as required to assure adequate PROCESSING of subsequent batches of waste. Any changes should be consistent with the conditions, limitations, and restrictions addressed in the vendor's 10 CFR 61 Topical Report, as appropriate.

(2) If the test results failure is due to malfunction of a vendor's processing equipment or the processing equipment is inoperable, the equipment shall be returned to an OPERABLE condition or an alternate vendor shall be obtained to process waste, as necessary, to satisfy applicable
1→← shipping and disposal requirements.

3.1.8 Acceptance Criteria

1→ (1) Non-STABLE Waste Form

For wastes PROCESSED without the intent of meeting the 10 CFR 61 STABILITY requirements, the maximum amount of free standing water allowed in a waste container is one-half of one percent (0.5%) of the internal volume of the container.

(2) STABLE Waste Form

If the PROCESSED waste will be disposed of in a HIC, then the maximum amount of free standing water allowed in the HIC is one percent (1%) of the internal volume of the HIC.

If the waste is PROCESSED in such a way so the waste itself meets the STABILITY requirements of 10 CFR 61, then a SOLIDIFICATION media will be used that is approved by the NRC or submitted to the NRC that
← shows compliance with 10 CFR 61.

Documents for the dewatering process shall include a specified end-point for each dewatering evolution which ensures that these acceptance criteria are achieved.

3.1.9 Corrective Actions

1→ If the PROCESSING does not meet the above acceptance criteria or otherwise does not meet disposal site or shipping requirements, then suspend shipment of the waste and correct, as necessary, the PROCESS CONTROL PROGRAM, the applicable procedures, and the applicable Waste Processing System to prevent a recurrence. Additionally, an evaluation of similar wastes PROCESSED since the last successful surveillance test shall be conducted to determine the extent of the inadequately PROCESSED waste. If such wastes have been shipped for disposal, the disposal site operator shall be contacted and the problem addressed.

If PROCESSING is not performed in accordance with this PCP, the improperly ← PROCESSED waste shall be tested to ensure that it meets disposal site and shipping requirements. Appropriate corrective actions shall be taken to prevent recurrence.

Disposition of inadequately PROCESSED wastes will be handled on a case-by-case basis.

Improperly processed waste may need to be reported to the Nuclear Regulatory Commission in accordance with Generic Letter 91-02 as specified in RSAP-0903.

3.2 PROCESSING OF DRY ACTIVE WASTE

Dry Active Waste (DAW) generated at Rancho Seco shall be processed by segregation, sorting, and/or compaction. Processing of DAW is performed to accomplish the following functions:

(1) Package DAW in a fashion acceptable for disposal at a licensed disposal facility.

(2) Remove constituents not acceptable for disposal as DAW.

(3) Minimize volumes of DAW shipped for disposal by:

(a) removing reuseable and uncontaminated items; and
(b) reducing shipped volumes by compaction.

All processing of DAW at Rancho Seco shall be performed in accordance with approved station procedures or vendor procedures that have been reviewed by the Radiation Protection Manager. Vendor equipment, personnel and procedures may be used for DAW processing and packaging.

The segregation of uncontaminated waste from DAW is performed to minimize volumes of DAW shipped for disposal. In order to provide reasonable assurance that radioactive

materials are not released as clean waste, the following requirements shall be included in the segregation program, as discussed in Reference 7.3.3:

(1) Surveys, using equipment and techniques for detecting low levels of radioactivity, shall be made of materials that may be contaminated and that are to be disposed of as clean wastes.

(2) Surveys may be conducted on individual items using portable survey instruments, such as pancake GM probes. However, in all cases, final measurements of each package (e.g., bag or box) of aggregated waste to be released as clean waste shall be performed to ensure that there has not been an accumulation of radioactive material due to the buildup of multiple quantities of contamination which were nondetectable with portable instrumentation. Final measurements shall be performed using sensitive detectors in a low background area, such as scintillation detectors.

3.3 MIXED WASTE

Mixed Waste is defined as waste that contains constituents that satisfy the definition of radioactive waste, subject to the Atomic Energy Act, and contains hazardous waste that either (1) is listed as hazardous waste in 40 CFR 261, Subpart D, or (2) causes the waste to exhibit any of the hazardous waste characteristics identified in 40 CFR 261, Subpart C. Under current federal law, this waste is subject to dual regulation by the NRC and EPA where both agencies have control over the same waste. Due to the complex regulatory issues that must be resolved pertaining to mixed waste, there are currently no authorized disposal sites in the United States which are licensed to receive
1→← and dispose of mixed waste.

Since there is currently no avenue for disposal of mixed waste, efforts shall be made to reduce the generation of such waste at Rancho Seco. To accomplish this, station procedures for chemical control and radioactive waste processing shall include the following requirements:

(1) In areas where mixed waste generation is likely to occur, consider substitution of products which are evaluated as non-hazardous per 40 CFR 261.

(2) Radioactive waste processing procedures shall include provisions for segregation and removal of non-radioactive hazardous constituents. Upon removal, such constituents would be handled as hazardous waste as required by the EPA.

1→← (3) Mixed waste generated at Rancho Seco shall not be shipped for disposal to a low-level radioactive waste disposal facility unless specific approval for such disposal is granted by the appropriate regulatory agencies. Such wastes shall be stored at Rancho Seco until regulatory changes allow for disposal or they are otherwise approved for disposal by appropriate regulatory agencies.

SECTION 4.0

WASTE CLASSIFICATION AND CHARACTERIZATION

4.1 WASTE CLASSIFICATION

Radioactive waste generated at Rancho Seco shall be classified as Class A, B or C in accordance with the requirements of 10 CFR 61, Section 61.55, using one or more of the classification methods given in the USNRC's "Low-Level Waste Licensing Branch Technical Position on Radioactive Waste Classification (May 1983)". Waste classification shall be performed in accordance with approved station procedures.

The following specific requirements shall be incorporated in the program for sampling and analysis for waste classification:

1→← (1) Every two years, analyses or an engineering evaluation shall be performed on representative samples of each waste stream or, alternatively, a process stream associated with the generation of the waste, for the nuclides listed in Table 1 and Table 2 of 10 CFR 61, Section 61.55.

(2) The results of these analyses shall be used to develop isotopic abundances and scaling factors for difficult to measure nuclides (i.e., beta emitters and transuranics) based on correlations between those nuclides and more easily measured gamma emitters.

(3) Gamma spectroscopy or gross radioactivity measurements shall be made for each container of waste processed for disposal. Calculational methods for determining the total activity in each container shall be developed which use the results of the gamma spectroscopy, container dose rate and/or gross activity measurements, and the percent isotopic abundances and scaling
1→ factors from the biennial analyses, or engineering evaluation.

(4) The classification program shall establish criteria for increased frequency for the sampling, analysis and evaluation required by paragraph (1), above, to
← detect cobalt 60 to cesium 137 ratio changes by a factor of 10 or more.

(5) Each package of waste shall be clearly labeled as Class A, Class B, or Class C.

4.2 WASTE CHARACTERISTICS

Waste PROCESSED for disposal at Rancho Seco shall meet the applicable characteristics specified in 10 CFR 61, Section 61.56. Waste classified as Class B, Class C, or Class A waste that will not be segregated from Class B and C wastes at the burial facility, shall be processed into a stable waste form. This shall be accomplished by placement into a HIC or use of a solidification media which meets the stability requirements of 10 CFR 61.56, per Section 3.1 of this manual.

A vendor's Topical Report shall include documentation of testing which verifies that the HIC or solidification media meets these stability requirements. Additionally, Rancho Seco shall comply with Federal or State requirements imposed specifically on an approved HIC or solidification media which limits the type and/or radioactive concentration of the waste to be placed in the approved HIC or solidification media.

SECTION 5.0

SPECIFIC WASTE STREAM PROCESSING DESCRIPTIONS

5.1 WET RADIOACTIVE WASTE STREAMS

5.1.1 Resins

Resins will be accumulated from one or more of the following systems:

1→ (1) Spent Fuel Pool Cooling System
(2) Miscellaneous Liquid Rad Waste System
← (3) Other miscellaneous ion exchange medium as generated

Spent Primary resins are collected in the Spent Resin Storage Tank (SRT).
1→← These resins are transferred directly to the processing skid from the SRT.

Spent resins will be processed for disposal by dewatering or within an approved Solidification Media. The curie content and waste classification of each resin batch shall be estimated prior to sluicing of the spent resin to the dewatering skid. Based on these estimates, the proper liner or HIC and cask for transportation and disposal are selected.

The resin is transferred to the liner or HIC where it is PROCESSED in accordance with Section 3.1 of this manual. A representative sample of the resin is collected for final calculations of curie content and waste classification, unless an actual sample was collected prior to the transfer. Containers are sealed, surveyed, and labeled, as appropriate, and stored in a designated storage area until they are shipped for disposal.

A flow chart of a typical resin processing path is shown on Figure 5-1.

5.1.2 Cartridge Filters

Cartridge filters will be accumulated from one or more of the following systems:

1→←

(1) Spent Fuel Pool Cooling System
(2) Miscellaneous Liquid Radwaste System
(3) Coolant Radwaste System
(4) Miscellaneous

Spent filter cartridges are surveyed for dose rate upon removal from the system. The measured dose rate is used to calculate isotopic content using a dose-to-curie conversion factor and scaling factors per Section 4.1 of this manual. Based on the calculated isotopic content, the waste classification and the appropriate process and container for disposal are determined.

Normally filters are placed in a liner or HIC. However, filters may be dried and handled as DAW, if conditions allow. Upon completion of the processing, containers are sealed, surveyed, and labeled, as appropriate, and stored in a designated storage area until they are shipped for disposal.

For purposes of waste classification, isotopic concentrations of filters in a liner or HIC should be determined as calculated over the volume of the cartridge filter itself, rather than averaged over the gross volume of the container.

5.1.3 Evaporator Concentrates

Evaporator concentrates result from operation of evaporators for processing
1→ of liquid wastes (e.g., floor drains). The miscellaneous waste evaporator is available to PROCESS liquid waste. If PROCESSING of evaporator
← concentrates is required, the liquid and/or the boron concentrates will be solidified or dried in accordance with specific PCP requirements and procedures, as reviewed and approved by the PRC.

A flow chart of the liquid processing path is shown on Figure 5-2.

5.1.4 Sludge

Radioactive sludge is accumulated and handled on a case-by-case basis by periodically removing the sludge from various tanks and sumps throughout the plant. Each batch of sludge is sampled for PCP parameters and isotopic content, chemically conditioned, if necessary, and PROCESSED in accordance with this manual. Containers are sealed, surveyed, and labeled, as appropriate, and stored in a designated storage area until they are shipped for disposal.

5.1.5 Miscellaneous Liquids

Miscellaneous liquids generated in the station will be collected and processed on a case-by-case basis. Such wastes may include decontamination wastes and chemical wastes collected from the Chemistry Labs. Batches of such waste are isolated, sampled for PCP parameters and isotopic content, chemically conditioned, if necessary, and transferred to the processing skid where it is PROCESSED per Section 3.1 of this manual. Containers are sealed, surveyed, and labeled, as appropriate, and stored in a designated storage area until they are shipped for disposal.

5.2 DRY ACTIVE WASTE

Dry Active Waste (DAW) consists of radioactively contaminated or activated waste which contains no liquids. DAW may be compactible, such as paper, plastic and protective clothing, or non-compactible, such as tools or plant equipment. This waste is segregated by station workers at the point of generation into receptacles designated

for "clean" or "contaminated" trash. "Clean" receptacles are used to collect trash that is potentially not contaminated. "Contaminated" containers are used to collect waste that is known or suspected to be contaminated. However, for purposes of DAW processing, all waste collected in Radiation Controlled Areas (i.e., that collected in both the "clean" and "contaminated" receptacles) is assumed to be contaminated until it is surveyed and proven clean. Bags are collected from the receptacles, surveyed for external dose rate, and taken to a designated sorting area for processing. Bags below a specified dose rate level, per station procedures, may be opened and the contents surveyed individually for radioactivity. Items found to be not contaminated per station procedures, reuseable items, and items not acceptable for disposal as DAW are removed. In general, the contents of bags above the specified dose rate level are not surveyed for contamination, but are examined for reuseable items and items not acceptable for disposal as DAW. Contaminated items are then disposed of as DAW. Cornpactible items are collected and compressed into approved containers. Noncompactible items are placed directly into approved containers. Containers are sealed, surveyed, and labeled, as appropriate and stored in a designated storage area until they are shipped for disposal.

A flow chart of the DAW processing path is shown on Figure 5-3.

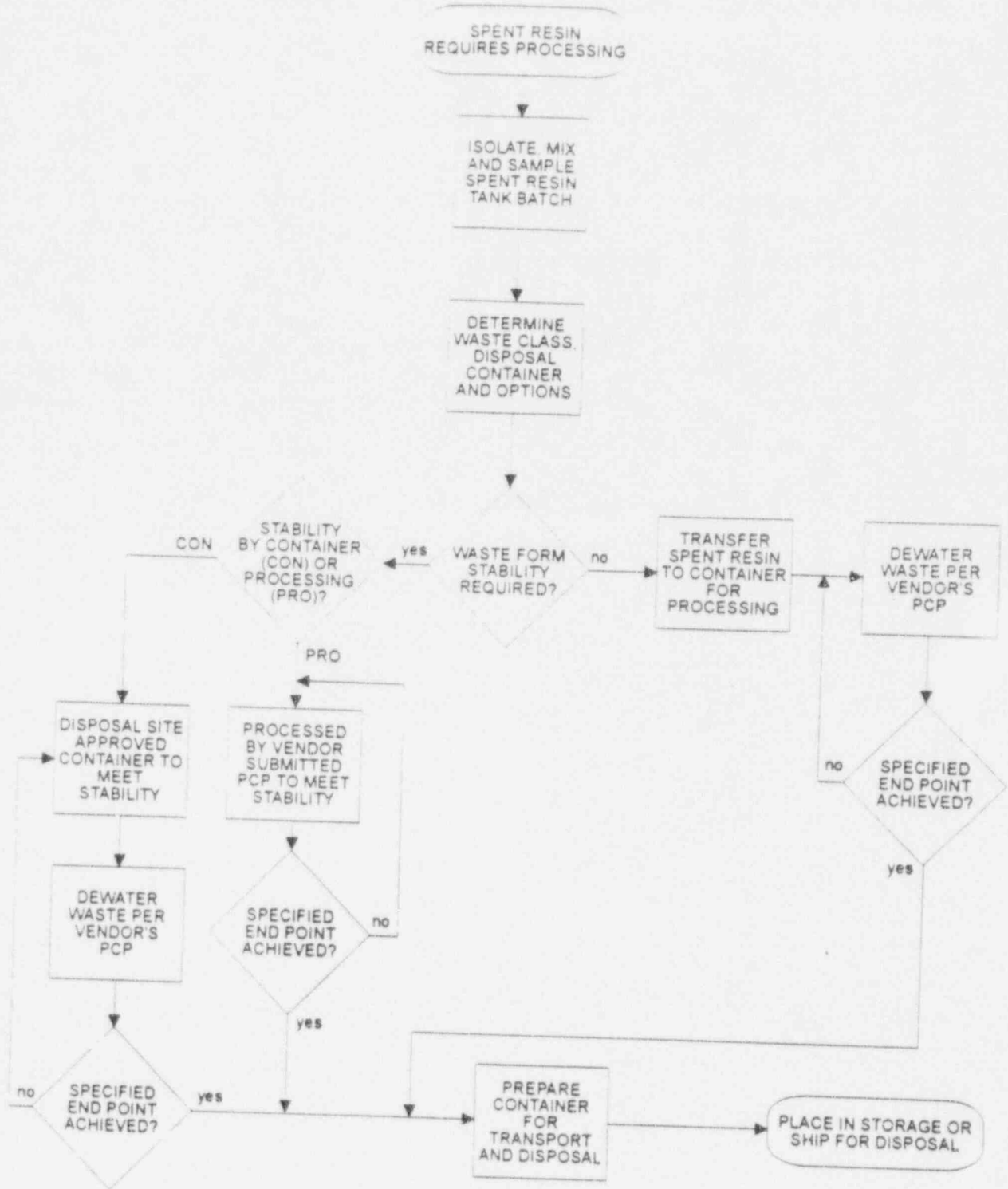


FIGURE 5-1

DEWATERING PROCESS FLOW CHART

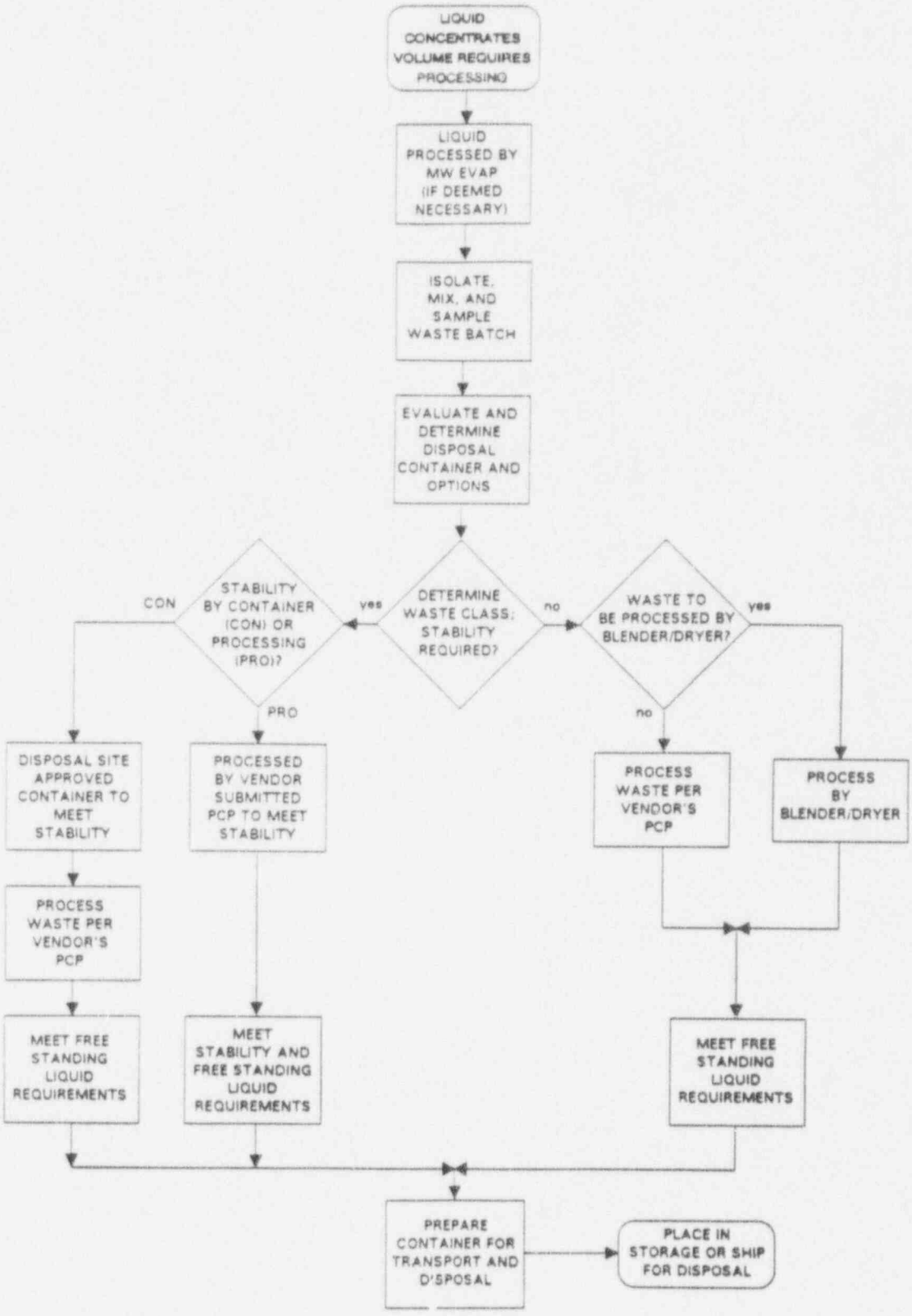


FIGURE 5-2

LIQUID PROCESS FLOW CHART

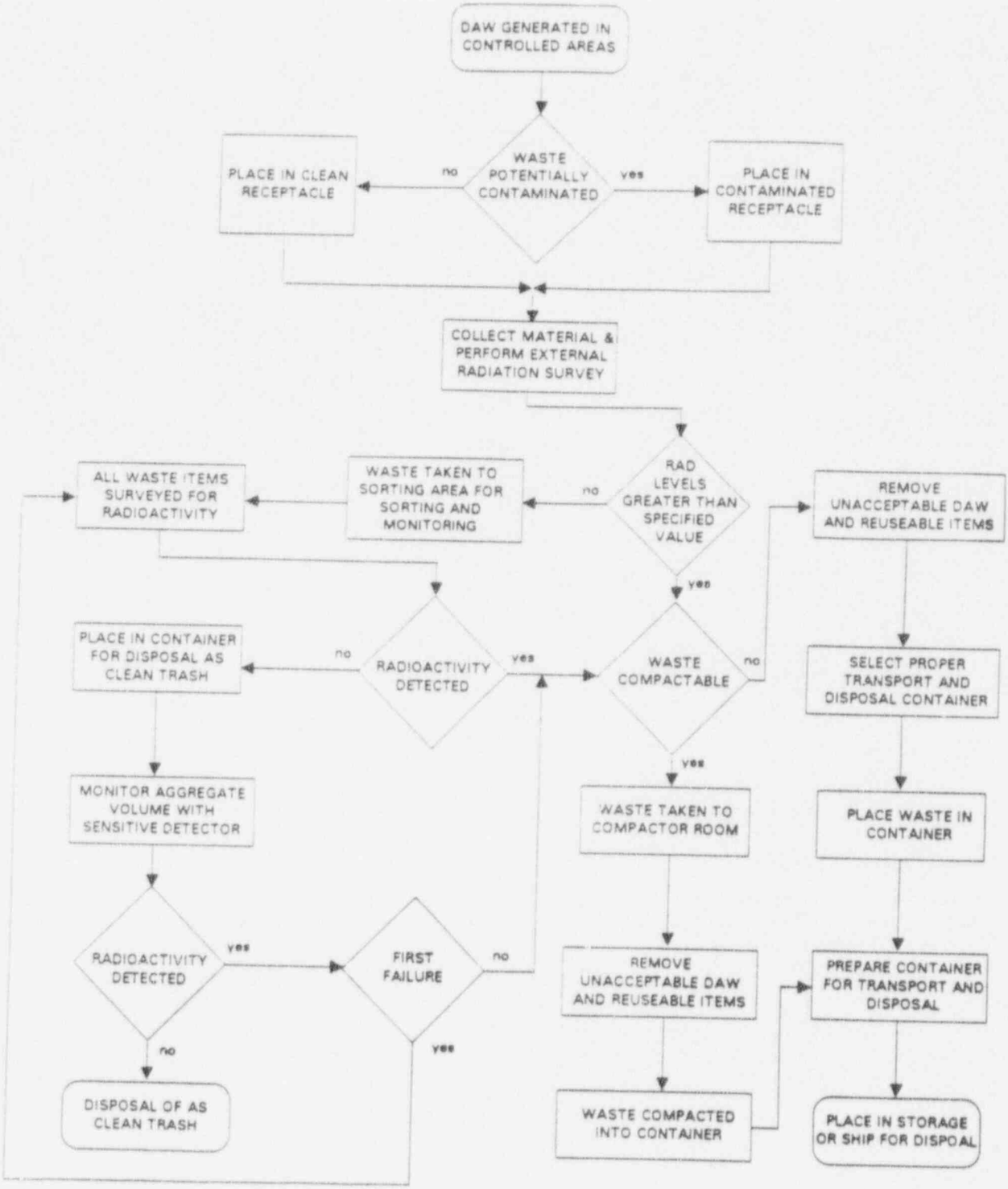


FIGURE 5-3

DAW PROCESS FLOW CHART

SECTION 6.0

ADMINISTRATIVE CONTROLS

6.1 PROCEDURES

Activities associated with the implementation of the requirements of this program shall be conducted in accordance with approved station procedures or vendor documents and procedures that have been reviewed and approved per Section 1.4.

6.2 QUALITY ASSURANCE

Radioactive waste processing activities shall be performed in accordance with the Rancho Seco Quality Manual. Specific activities performed by the Quality Assurance organization include:

(1) Audits of the Process Control Program as required by the Rancho Seco Technical Specifications.

(2) Inspections as designated in applicable processing, packaging and shipping procedures.

These activities provide assurance that the final waste form, packaging, labeling, and transportation are in accordance with applicable regulations and requirements.

6.3 CHANGES TO THE PCP

Changes to this PCP shall be made in accordance with Technical Specification D6.13.

6.4 DOCUMENTATION

Procedures for radioactive waste PROCESSING, packaging, and transportation shall include requirements for maintaining and retaining LLW processing, packaging, and transportation records. Detailed records for each container of waste shall be maintained.

6.5 TRAINING

Rancho Seco and vendor personnel responsible for waste processing, packaging and transportation activities shall be trained and qualified to ensure that waste PROCESSING is performed in accordance with applicable requirements. Training programs shall establish a schedule for periodic requalification of at least once every two years. Rancho Seco personnel shall verify the training of vendor personnel.

SECTION 7.0

REFERENCES

7.1 Code of Federal Regulations

7.1.1 Title 10, Parts 20, 61, and 71

7.1.2 Title 49, Part 173

7.1.3 Title 40, Part 261

7.2 USNRC Guidelines

7.2.1 USNRC, Final Waste Classification and Waste Form Technical Position Papers, May 1983

7.2.2 USNRC, Generic Letter 91-02, Reporting Mishaps Involving LLW Forms Prepared for Disposal, December 1990

7.2.3 USNRC, Waste Form Technical Position, Revision 1, January 1991

7.2.4 USNRC, (Proposed) Concentration Averaging and Encapsulation Technical Position, June 1992

7.3 USNRC, Office of Inspection and Enforcement, IE Information Notices

7.3.1 IEN 79-09, "Spill of Radioactively Contaminated Resins"

7.3.2 IEN 83-14, "Dewatered Spent Ion Exchange Resin Susceptibility to Exothermic Chemical Reaction"

7.3.3 IEN 85-92, "Surveys of Wastes Before Disposal from Nuclear Reactor Facilities"

7.3.4 IEN 86-20, "Low-Level Radioactive Waste Scaling Factors, 10 CFR Part 61"

7.3.5 IEN 87-03, "Segregation of Hazardous and Low-Level Radioactive Wastes"

7.3.6 IEN 87-07, "Quality Control of On-site Dewatering/Solidification Operations By Outside Contractors"

7.3.7 IEN 88-08, "Chemical Reactions With Radioactive Waste Solidification Agents"

7.3.8 IEN 89-27, "Limitations on the Use of Waste Forms and High Integrity Containers for the Disposal of Low-Level Radioactive Waste"

7.3.9 IEN 90-31, "Update on Waste Form and High Integrity Container Topical Report Review Status, Identification of Problems with Cement Solidification, and Reporting of Waste Mishaps"

7.3.10 IEN 90-50, "Minimization of Methane Gas in Plant Systems and Radwaste Shipping Containers"

7.3.11 IEN 79-19, "Packaging of Low-Level Radioactive Waste for Transport and Burial"

1→← 7.4 Rancho Seco Permanently Defueled Technical Specifications

7.5 Radwaste Control Manual

1→ 7.5.1 RP.309.II.01, Resin and Filter Media Dewatering

7.5.2 RP.309.II.04, Solidification

7.5.3 RP.309.II.09, Segregation and Free Release of Controlled Area Waste

← 7.5.4 A.17B, Blender/Dryer

7.6 Rancho Seco Quality Manual

7.7 Vendor Documents

7.7.1 TP-05, Radwaste Solidification System Topical Report

7.7.2 TP-02-P, Nuclear Packaging, Inc. Dewatering System Topical Report

7.8 Rancho Seco Procedures

7.8.1 RSAP-0303, Plant Modifications

7.8.2 RSAP-0903, External Plant Reports and Posting of Notices

7.8.3 STP-410, Determination of Liquid Absorbency Efficiencies

1→← 7.8.4 SP.1108, Semi-annual Waste Stream Verification

7.8.5 SP.1110, Variable Process Control Program Verification

1→← 7.8.6 SP.1111, Biennial Waste Stream Analysis

7.9 SMUD Office Memorandums

7.9.1 RPC 92-116 "10 CFR Part 61 Compliance Program," October 6, 1992

7.9.2 RPC 92-122 "Revision of SP.1108, Variable Frequency Waste Stream Identification, Rev. 0," October 21, 1992