

GEORGIA POWER COMPANY

PLANT E. I. HATCH

UNITS NO. 1 & 2

SEMIANNUAL RADIOACTIVE

EFFLUENT RELEASE REPORT

July 1, 1991 - December 31, 1991

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PLANT E. I. HATCH  
SEMIANNUAL RADIOACTIVE  
EFFLUENT RELEASE REPORT

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## RADIOACTIVE EFFLUENT RELEASE REPORT

### 1 LIQUID EFFLUENTS

#### 1.1. REGULATORY LIMITS

1. The Technical Specifications presented in this section are for Unit 1. Requirements for Unit 2 are the same as Unit 1; however, the Technical Specification numbers are not the same.

#### TECHNICAL SPECIFICATIONS

3.14.1 The radioactive liquid effluent monitoring instrumentation channels shown in table 3.14.1-1 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Specification 3.15.1 are not exceeded. The alarm/trip setpoints of these channels shall be determined in accordance with the OFFSITE DOSE CALCULATION MANUAL (ODCM). (Technical Specification Table 3.14.1-1 is included in this section as Table 1-1).

3.15.1.1 The concentration of radioactive material released at any time from the site to UNRESTRICTED AREAS (figure 3.15-1) shall be limited to the concentrations specified in 10 CFR Part 20, Appendix B, Table II (column 2) for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to  $2.0E-04$  uCi/ml total activity.

3.15.1.2 The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released, from each reactor unit, from the site (figure 3.15-1) shall be limited to:

- a. During any calendar quarter to less than or equal to 1.5 mrem to the total body and to less than or equal to 5 mrem to any organ.
- b. During any calendar year to less than or equal to 3 mrem to the total body and to less than or equal to 10 mrem to any organ.

3.15.1.3 The liquid radwaste treatment system, as described in the ODCM, shall be used to reduce the radioactive materials in liquid wastes prior to their discharge when the projected doses due to the liquid effluent per Unit from the site (figure 3.15-1) when projected over the calendar quarter would exceed 0.18 mrem to the total body or 0.62 mrem to any organ.

3.15.1.4<sup>(a)</sup> The contents within any outside temporary tank shall be limited to less than or equal to 10 curies, excluding tritium and dissolved or entrained noble gases.

(a) An outside temporary tank is not surrounded by liners, dikes, or walls that are capable of holding the tank contents and not having tank overflows and drains connected to the liquid radioactive waste treatment system.

6.9.1.9 states in part: "The Radioactive Effluent Release Report shall include (on a quarterly basis) unannounced releases from the site to unrestricted areas of radioactive materials in gaseous and liquid effluents that were in excess of 1 Ci, excluding dissolved and entrained gases and tritium for liquid effluents, or those in excess of 150 Ci of noble gases or 0.02 Ci of radioiodines for gaseous releases".

TABLE 1-1  
 TECHNICAL SPECIFICATION  
 TABLE 3.14.1-1 (SHEET 1 of 2)

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

<u>Instrument</u>	<u>Minimum Channels OPERABLE</u>	<u>Applicability</u>	<u>ACTION</u>
1. Gross Radioactivity Monitors Providing Automatic Termination of Release			
Liquid Radwaste Effluent Line	1	(a)	100
2. Gross Radioactivity Monitors not Providing Automatic Termination of Release			
Service Water System Effluent Line	1	(b)	101
3. Flowrate Measurement Devices**			
Liquid Radwaste Effluent Line	1	(a)	102
Discharge Canal	1	(b) (a)	102
4. Service Water System to Closed Cooling Water System Differential Pressure	1	At all times	103

\*\*Flow curves may be utilized to estimate flow; in such cases, ACTION statement 102 is not required.

(a) Whenever the radwaste discharge valves are not locked closed.

(b) Whenever the service water system pressure is below the closed cooling water system pressure or differential pressure indication is not available.

TABLE 1-1 (CONTINUED)  
TECHNICAL SPECIFICATION  
TABLE 3.14.1-1 (SHEET 2 of 2)

RADIOACTIVE LIQUID EFFLUENT MONITORING INSTRUMENTATION

TABLE NOTATIONS

ACTION 100 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases may be continued, provided that prior to initiating a release:

- a. At least two independent samples are analyzed in accordance with Specification 4.15.1.1.1.
- b. At least two technically qualified individuals independently verify the release rate calculations and discharge valving.

Otherwise, suspend release of radioactive effluents via this pathway. If the channel remains inoperable for over 30 days, an explanation of the circumstances shall be included in the next semi-annual effluent release report.

ACTION 101 - With the numbers of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue, provided that once per shift grab samples are collected and analyzed for gross radioactivity (beta or gamma) at a Lower Limit of Detection of at least  $10^{-7}$  uCi/ml. If the channel remains inoperable for over 30 days, an explanation of the circumstances shall be included in the next semi-annual effluent release report.

ACTION 102 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue, provided the flowrate is estimated at least once per 4 hours during actual releases. If the channel remains inoperable for over 30 days, an explanation of the circumstances shall be included in the next semi-annual effluent release report.

ACTION 103 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, assure that the service water system effluent system monitor is OPERABLE.



## 1.2 MAXIMUM PERMISSIBLE CONCENTRATIONS

The MPC values used in determining allowable liquid radwaste release rates and concentrations for principal gamma emitters, I-131, tritium, Sr-89, Sr-90 and Fe-55 are taken from 10CFR Part 20, Appendix B, Table II, Column 2.

For dissolved or entrained noble gases in liquid radwaste, the MPC is taken from Technical Specification 3.15.1.1 (Unit 1) and 3.11.1.1 (Unit 2) as 2.0E-04 uCi/ml.

For gross alpha in liquid radwaste, the MPC is taken from 10 CFR Part 20, Appendix B, Note 2.b as 3.0E-08 uCi/ml.

Further, for all the above radionuclides or categories of radioactivity, the overall MPC fraction is determined in accordance with 10 CFR Part 20, Appendix B, Note 1.

The method whereby the MPC fraction is used to determine release rates and liquid radwaste effluent radiation monitor setpoints is described in Section 1.3 of this report.

## 1.3 MEASUREMENTS AND APPROXIMATIONS OF TOTAL RADIOACTIVITY

Prior to release of any tank containing liquid radwaste, and following the required recirculation, samples are collected and analyzed in accordance with Technical Specification Tables 4.15.1-1 (Unit 1) and 4.11.1-1 (Unit 2). A sample from each tank planned for release is analyzed for principal gamma emitters, I-131, and dissolved and entrained noble gases by gamma spectrometry. Monthly and quarterly composites are prepared for analysis by extracting aliquots from each sample taken from tanks which are released. Liquid radwaste sample analyses are performed as follows:

<u>Measurement</u>	<u>Frequency</u>	<u>Method</u>
1. Gamma Isotopic	Each Batch	Gamma spectroscopy with computerized data reduction
2. Dissolved or Entrained Noble Gases	Each Batch	Gamma spectroscopy with computerized data reduction

<u>Measurement</u>	<u>Frequency</u>	<u>Method</u>
3. Tritium	Monthly Composite	Distillation and liquid scintillation counting
4. Gross Alpha	Monthly Composite	Gas flow proportional counting
5. Sr-89 and Sr-90	Quarterly Composite	Chemical separation and gas flow proportional counting
6. Fe-55	Quarterly Composite	Chemical separation and low energy photon detector.

Gamma isotopic measurements are performed in-house in the radiochemistry lab using germanium spectrometry. Three germanium detectors are available: a 20% efficient and two 15% efficient intrinsic germanium detectors, with 2.0 FWHM resolution and housed in 4 inch-thick lead shields. A one-liter liquid radwaste sample is poured into a Marinelli beaker in preparation for a 3000 second count. A peak search of the resulting gamma ray spectrum is performed by the computer system. Energy and net count data for all significant peaks are determined, and quantitative reduction or LLD calculations are performed for the nuclides specified in Table Notation e of Technical Specification Tables 4.15.1-1 (Unit 1) and 4.11.1-1 (Unit 2): Mn-54, Fe-59, Co-58, Co-60, Zn-65, Mo-99, Cs-134, Cs-137, Ce-141 and Ce-144. The quantitative calculations include corrections for counting time, decay time, sample volume, sample geometry, detector efficiency, baseline counts, and branching ratio. LLD calculations, including the above corrections, are made based on the counts in two standard deviations of the baseline count at the location on the spectrum where a peak for that radionuclide would be located if present.

The radionuclide concentrations determined by gamma spectroscopic analysis of a sample taken from a tank planned for release and the most current sample analysis results available for tritium, gross alpha, Sr-89, Sr-90, and Fe-55 are used along with the corresponding MPC values to determine an MPC fraction for the tank planned for release. This MPC fraction is then used, with appropriate safety factors, along with the expected dilution stream flow to calculate a maximum permissible release rate and a liquid effluent monitor setpoint. The monitor setpoint is calculated to assure that the limits of Technical Specifications 3.15.1.1 (Unit 1) or 3.11.1.1 (Unit 2) are not exceeded.

A monitor reading in excess of the calculated setpoint therefore results in an automatic termination of the liquid radwaste discharge. Liquid effluent discharge is also automatically terminated if the dilution stream flow rate falls below the dilution flow rate used in the setpoint calculations and established as a setpoint on the dilution stream flow monitor.

Radionuclide concentrations, safety factors, dilution stream flow rate, and liquid effluent radiation monitor calibration factor are entered into the computer and a prerelease printout is generated. If the release is not permissible appropriate warnings will be included on the prerelease printout. If the release is permissible it is approved by the Chemistry Foreman on duty. The pertinent information is transferred manually from the prerelease printout to a one-page release permit which is forwarded to Radwaste Operations. When the release is completed the release permit is returned from Radwaste Operations with actual release data included. These data are input to the computer and a post release printout is generated. The post release printout contains actual release rates, actual release concentrations and quantities, actual dilution flow, and calculated doses to an individual.

#### 1.4 LIQUID EFFLUENT RELEASE DATA

Regulatory Guide 1.21 Tables 2A and 2B are found in this report as Table 1-2a for Unit 1, Table 1-2b for Unit 2 and Table 1-2c for the site; and Table 1-3a for Unit 1, 1-3b for Unit 2, and Table 1-3c for the site.

The values for the four categories of Tables 1-2a and 1-2b, and 1-2c are calculated and the Tables completed as follows:

1. Fission and activation products - The total release values (not including tritium, gases, and alpha) are comprised of the sum of the measured individual radionuclide activities. This sum is for each batch released to the river for the respective

quarter. Percent of applicable limit is determined from a mixed nuclide MPC fraction calculation. The average concentration for each nuclide over all released batches is divided by the corresponding individual MPC value. The sum over all nuclides of the C/MPC ratios times 100 is the percent of applicable limit for effluent releases during the quarter.

2. Tritium - The measured tritium concentrations in the monthly composite samples are used to calculate the total release and average diluted concentration during each period. Average diluted concentration divided by the MPC limit,  $3.0E-03$  uCi/ml, is converted to percent to give the percent of applicable limit.
3. Dissolved and entrained gases - Concentrations of dissolved and entrained gases in liquid effluents are measured by germanium spectroscopy on a one liter sample from each liquid radwaste batch. The average concentration of dissolved or entrained noble gases for all released batches is divided by the MPC value stated in Technical Specifications 3.15.1.1 and 3.11.1.1 ( $2.0E-04$  uCi/ml) to determine the MPC fraction. The result x100 is the percent of applicable limit for noble gases in liquid effluent releases during the quarter. Radioisotopes of iodine in any form are also determined during the isotopic analysis for each batch; therefore, a separate analysis for possible gaseous forms is not performed because it would not provide additional information.
4. Gross alpha radioactivity - The measured gross alpha concentrations in the monthly composite samples are used to calculate the total release of alpha radioactivity.

Other data pertinent to batch releases of radioactive liquid effluent from both units are as follows:

Number of batch releases:	632
Total time period for batch releases:	72,120 minutes
Maximum time period for a batch release:	221.0 minutes
Average time period for batch releases:	114.1 minutes
Minimum time period for a batch release:	7.0 minutes
Average stream flow during periods of release of liquid effluent into a flowing stream:	6,917 CFS

#### 1.5 RADIOLOGICAL IMPACT ON MAN DUE TO LIQUID RELEASES

Doses to an individual, due to radioactivity in liquid effluent, were calculated in accordance with Technical Specifications 3/4.15.1.2 (Unit 1) and 3/4.11.1.2 (Unit 2) using the methodology presented in the Plant Edwin I. Hatch Offsite Dose Calculation Manual. As required by the above Technical Specifications, doses were calculated separately for Unit 1 and Unit 2. Results are presented in Table 1-4a for Unit 1 and Table 1-4b for Unit 2.

TABLE 1-2a  
 E. I. HATCH NUCLEAR PLANT - UNIT 1  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Quarter 3	Quarter 4	Est. Total Error (%)
A. Fission and activation products				
1. Total release	Ci	3.27E-02	3.79E-01	4.70E+01
2. Average diluted concentration during period	uCi/ml	2.59E-08	4.88E-07	
3. % of applicable limit	%	3.19E-01	8.12E-01	
B. Tritium				
1. Total release	Ci	4.32E+00	3.56E+00	3.70E+01
2. Average diluted concentration during period	uCi/ml	3.43E-06	4.58E-06	
3. % of applicable limit	%	1.14E-01	1.53E-01	
C. Dissolved and entrained gases				
1. Total release	Ci	1.02E-03	4.12E-04	1.00E+02
2. Average diluted concentration during period	uCi/ml	8.11E-10	5.30E-10	
3. % of applicable limit	%	4.05E-04	2.65E-04	
D. Gross Alpha radioactivity				
1. Total release	Ci	0.00E+00	0.00E+00	1.20E+02
E. Volume of waste (prior to dilution)				
	liters	4.79E+06	3.84E+06	1.00E+01
F. Volume of dilution water used				
	liters	1.26E+09	7.77E+08	1.60E+02

TABLE 1-2b  
 E. I. HATCH NUCLEAR PLANT - UNIT 2  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Quarter 3	Quarter 4	Est. Total Error (%)
A. Fission and activation products				
1. Total release	Ci	2.89E-02	6.97E-02	4.70E+01
2. Average diluted concentration during period	uCi/ml	3.74E-08	8.35E-08	
3. % of applicable limit	%	1.13E-01	1.34E+00	
B. Tritium				
1. Total release	Ci	1.39E+00	3.58E+00	3.70E+01
2. Average diluted concentration during period	uCi/ml	1.80E-06	4.29E-06	
3. % of applicable limit	%	6.01E-02	1.43E-01	
C. Dissolved and entrained gases				
1. Total release	Ci	3.77E-04	3.95E-03	1.00E+02
2. Average diluted concentration during period	uCi/ml	4.88E-10	4.73E-09	
3. % of applicable limit	%	2.44E-04	2.37E-03	
D. Gross Alpha radioactivity				
1. Total release	Ci	0.00E+00	0.00E+00	1.20E+02
E. Volume of waste (prior to dilution)				
	liters	3.36E+06	3.64E+06	1.00E+01
F. Volume of dilution water used				
	liters	7.73E+08	8.34E+08	1.60E+02

TABLE 1-2c  
 E. I. HATCH NUCLEAR PLANT - SITE  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Quarter 3	Quarter 4	Est. Total Error (%)
-----				
A. Fission and activation products				
1. Total release	Ci	6.16E-02	4.45E-01	4.70E+01
2. Average diluted concentration during period	uCi/ml	3.03E-08	2.78E-07	
3. % of applicable limit	%	2.41E-01	1.09E+00	
B. Tritium				
1. Total release	i	5.71E+00	7.13E+00	3.70E+01
2. Average diluted concentration during period	uCi/ml	2.81E-06	4.43E-06	
3. % of applicable limit	%	9.37E-02	1.48E-01	
C. Dissolved and entrained gases				
1. Total release	Ci	1.40E-03	4.36E-03	1.00E+02
2. Average diluted concentration during period	uCi/ml	6.88E-10	2.71E-09	
3. % of applicable limit	%	3.44E-04	1.35E-03	
D. Gross Alpha radioactivity				
1. Total release	Ci	0.00E+00	0.00E+00	1.20E+02
E. Volume of waste (prior to dilution)	liters	8.15E+06	7.48E+06	1.00E+01
F. Volume of dilution water used	liters	2.03E+09	1.61E+09	1.60E+02
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TABLE 1-3a\*  
 E. I. HATCH NUCLEAR PLANT - UNIT 1  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 LIQUID EFFLUENTS

Nuclides Released	Unit	Continuous Mode**		Batch Mode	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
K-3	Ci			4.32E+00	3.56E+00
Fission and activation products:					
Na-24	Ci			2.02E-03	7.56E-05
Cr-51	Ci			1.13E-04	1.11E-01
Mn-54	Ci			1.08E-03	1.74E-02
Fe-55	Ci			0.00E+00	1.84E-02
Fe-59	Ci			0.00E+00	3.99E-03
Co-58	Ci			4.73E-04	8.79E-03
Co-60	Ci			5.89E-03	7.72E-02
Zn-65	Ci			6.78E-03	9.81E-02
As-76	Ci			3.92E-05	6.48E-06
Sr-90	Ci			4.41E-05	0.00E+00
Sr-92	Ci			9.18E-07	8.19E-05
Y-91m	Ci			2.61E-06	6.79E-06
Zr-95	Ci			1.41E-06	8.61E-05
Nb-95	Ci			2.76E-06	5.13E-04
Nb-97	Ci			1.38E-05	7.64E-04
Mo-99	Ci			5.26E-05	0.00E+00
Tc-99m	Ci			1.84E-04	0.00E+00
Ru-103	Ci			0.00E+00	2.28E-04
Sb-125	Ci			1.32E-05	2.83E-03
I-131	Ci			5.09E-04	0.00E+00
I-132	Ci			9.03E-06	0.00E+00
I-133	Ci			9.41E-04	5.24E-06
I-134	Ci			0.00E+00	6.45E-04
I-135	Ci			1.53E-04	0.00E+00
Cs-134	Ci			2.16E-03	4.48E-03
Cs-137	Ci			1.20E-02	3.39E-02
Ba-140	Ci			5.80E-05	0.00E+00
La-140	Ci			9.34E-05	0.00E+00
Ce-141	Ci			1.01E-05	1.06E-05
Ce-144	Ci			0.00E+00	5.19E-04
Total	Ci			3.27E-02	3.79E-01
Dissolved and entrained gases:					
Kr-88	Ci			0.00E+00	1.28E-05
Xe-131m	Ci			0.00E+00	7.21E-05
Xe-133	Ci			1.30E-04	3.29E-05
Xe-135m	Ci			4.06E-05	0.00E+00
Xe-135	Ci			8.49E-04	2.81E-04
Ar-41	Ci			1.49E-06	1.30E-05
Total	Ci			1.02E-03	4.12E-04
Gr-Alpha	Ci			0.00E+00	0.00E+00

\*Zeros in this table indicate that no radioactivity was present above detectable levels. See Table 1-5 for typical lower limits of detection for liquid sample analyses.

\*\*There are no continuous mode radioactive liquid release pathways at Plant Hatch.

TABLE 1-3b\*  
 E. I. HATCH NUCLEAR PLANT - UNIT 2  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 LIQUID EFFLUENTS

Nuclides Released	Unit	Continuous Mode**		Batch Mode	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
H-3	Ci			1.39E+00	3.58E+00
Fission and activation products:					
Na-24	Ci			1.47E-03	1.37E-02
Cr-51	Ci			1.15E-03	5.33E-03
Mn-54	Ci			3.96E-04	3.37E-04
Fe-55	Ci			1.75E-02	0.00E+00
Co-58	Ci			9.35E-05	8.82E-04
Co-60	Ci			2.45E-03	2.22E-03
Zn-65	Ci			1.30E-03	5.15E-03
As-76	Ci			4.47E-04	5.22E-03
Sr-92	Ci			0.00E+00	1.99E-06
Y-91m	Ci			2.67E-05	1.13E-03
Nb-97	Ci			5.59E-06	1.74E-04
Mo-99	Ci			0.00E+00	2.89E-04
Tc-99m	Ci			1.67E-04	1.78E-03
Ru-103	Ci			0.00E+00	6.93E-05
Sb-125	Ci			8.33E-06	0.00E+00
I-131	Ci			3.11E-05	2.19E-03
I-132	Ci			1.38E-06	7.42E-06
I-133	Ci			3.56E-04	2.38E-03
I-135	Ci			0.00E+00	2.80E-04
Cs-134	Ci			6.39E-04	8.01E-04
Cs-137	Ci			2.91E-03	3.64E-03
Ba-140	Ci			0.00E+00	1.66E-05
La-140	Ci			0.00E+00	4.25E-05
Ce-141	Ci			1.55E-06	1.41E-06
Zn-69m	Ci			0.00E+00	5.77E-06
Np-239	Ci			0.00E+00	2.18E-06
Co-57	Ci			0.00E+00	2.45E-04
Br-82	Ci			0.00E+00	3.98E-04
Sb-124	Ci			0.00E+00	1.64E-03
Total	Ci			2.89E-02	6.97E-02
Dissolved and entrained gases:					
Xe-133	Ci			2.14E-05	6.76E-04
Xe-135m	Ci			4.76E-06	8.57E-04
Xe-135	Ci			3.51E-04	2.41E-03
Total	Ci			3.77E-04	3.95E-03
Gr-Alpha	Ci			0.00E+00	0.00E+00

\*Zeros in this table indicate that no radioactivity was present above detectable levels. See Table 1-5 for typical lower limits of detection for liquid sample analyses.

\*\*There are no continuous mode radioactive liquid release pathways at Plant Hatch.

TABLE 1-3c\*  
 E. J. HATCH NUCLEAR PLANT - SITE  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 LIQUID EFFLUENTS

Nuclides Released	Unit	Continuous Mode**		Batch Mode	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
H-3	Ci			5.71E+00	7.13E+00
Fission and activation products:					
Na-24	Ci			3.49E-03	1.38E-02
Cr-51	Ci			1.27E-03	1.16E-01
Mn-54	Ci			1.47E-03	1.77E-02
Fe-55	Ci			1.75E-02	1.84E-02
Fe-59	Ci			0.00E+00	3.99E-03
Co-58	Ci			5.66E-04	9.68E-03
Co-60	Ci			8.35E-03	7.94E-02
Zn-65	Ci			8.08E-03	1.03E-01
As-76	Ci			4.86E-04	5.23E-03
Sr-90	Ci			4.41E-05	0.00E+00
Sr-92	Ci			9.18E-07	8.39E-05
Y-91m	Ci			2.93E-05	1.14E-03
Zr-95	Ci			1.41E-06	8.61E-05
Nb-95	Ci			2.76E-06	5.13E-04
Nb-97	Ci			1.94E-05	9.39E-04
Mo-99	Ci			5.26E-05	2.69E-04
Tc-99m	Ci			3.51E-04	1.78E-03
Ru-103	Ci			0.00E+00	2.97E-04
Sb-125	Ci			2.16E-05	2.83E-03
I-131	Ci			5.40E-04	2.18E-03
I-132	Ci			1.04E-05	7.42E-06
I-133	Ci			1.30E-03	2.38E-03
I-134	Ci			0.00E+00	6.15E-04
I-135	Ci			1.53E-04	2.80E-04
Cs-134	Ci			2.80E-03	5.28E-03
Cs-137	Ci			1.50E-02	3.75E-02
Ba-140	Ci			5.80E-05	1.66E-05
La-140	Ci			9.34E-05	4.25E-05
Ce-141	Ci			1.16E-05	1.20E-05
Ce-144	Ci			0.00E+00	5.19E-04
Zn-69m	Ci			0.00E+00	5.77E-06
Np-239	Ci			0.00E+00	2.18E-02
Co-57	Ci			0.00E+00	2.45E-04
Br-82	Ci			0.00E+00	3.98E-04
Sb-124	Ci			0.00E+00	1.64E-03
Total	Ci			6.16E-02	4.49E-01
Dissolved and entrained gases:					
Kr-88	Ci			0.00E+00	1.28E-05
Xe-131m	Ci			0.00E+00	7.21E-05
Xe-133	Ci			1.52E-04	7.09E-04
Xe-135m	Ci			4.53E-05	8.57E-04
Xe-135	Ci			1.20E-03	2.69E-03
Ar-41	Ci			1.49E-06	1.30E-05
Total	Ci			1.40E-03	4.36E-03
Gr-Alpha	Ci			0.00E+00	0.00E+00

\*Zeroes in this table indicate that no radioactivity was present above detectable levels. See Table 1-5 for typical lower limits of detection for liquid sample analyses.

\*\*There are no continuous mode radioactive liquid release pathways at Plant Hatch.

TABLE 1-4a  
 E. I. HATCH NUCLEAR PLANT - Unit 1  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 INDIVIDUAL DOSES DUE TO LIQUID RELEASES

Cumulative Doses per Quarter

Organ	Tech Spec Limit	Unit	Quarter 3	% of Tech Spec Limit	Quarter 4	% of Tech Spec Limit
Bone	5.0	mrem	4.16E-02	8.32E-01	1.63E-01	3.26E+00
Liver	5.0	mrem	6.33E-02	1.27E+00	2.61E-01	5.22E+00
TBody	1.5	mrem	4.32E-02	2.88E+00	1.73E-01	1.15E+01
Thyroid	5.0	mrem	2.75E-03	5.49E-02	3.06E-05	6.12E-04
Kidney	5.0	mrem	2.19E-02	4.38E-01	9.94E-02	1.99E+00
Lung	5.0	mrem	6.87E-03	1.37E-01	2.48E-02	4.96E-01
GILLI	5.0	mrem	5.23E-03	1.05E-01	7.71E-02	1.54E+00

Cumulative Doses This Year

Organ	Tech Spec Limit	Unit	Quarters 1, 2, 3, & 4	% of Tech Spec Limit
Bone	10.0	mrem	2.60E-01	2.60E+00
Liver	10.0	mrem	4.10E-01	4.10E+00
TBody	3.0	mrem	2.74E-01	9.14E+00
Thyroid	10.0	mrem	2.67E-02	2.67E-01
Kidney	10.0	mrem	1.51E-01	1.51E+00
Lung	10.0	mrem	4.09E-02	4.09E-01
GILLI	10.0	mrem	9.10E-02	9.10E-01

TABLE 1-4b  
 E. I. HATCH NUCLEAR PLANT - Unit 2  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 INDIVIDUAL DOSES DUE TO LIQUID RELEASES

Cumulative Doses per Quarter

Organ	Tech Spec Limit	Unit	Quarter 3	% of Tech Spec Limit	Quarter 4	% of Tech Spec Limit
Bone	5.0	mrem	1.47E-02	2.94E-01	1.90E-02	3.81E-01
Liver	5.0	mrem	2.27E-02	4.55E-01	3.01E-02	6.01E-01
TBody	1.5	mrem	1.57E-02	1.05E+00	2.04E-02	1.36E+00
Thyroid	5.0	mrem	4.69E-04	9.38E-03	1.65E-02	3.30E-01
Kidney	5.0	mrem	7.79E-03	1.56E-01	1.09E-02	2.18E-01
Lung	5.0	mrem	2.48E-03	4.97E-02	3.17E-03	6.33E-02
GILLI	5.0	mrem	2.42E-03	4.84E-02	3.91E-03	7.82E-02

Cumulative Doses This Year

Organ	Tech Spec Limit	Unit	Quarters 1, 2, 3, & 4	% of Tech Spec Limit
Bone	10.0	mrem	1.10E-01	1.10E+00
Liver	10.0	mrem	1.78E-01	1.78E+00
TBody	3.0	mrem	1.22E-01	4.05E+00
Thyroid	10.0	mrem	1.83E-02	1.83E-01
Kidney	10.0	mrem	6.51E-02	6.51E-01
Lung	10.0	mrem	1.78E-02	1.78E-01
GILLI	10.0	mrem	4.72E-02	4.72E-01

TABLE 1-5  
 LOWER LIMITS OF DETECTION - LIQUID SAMPLE ANALYSES

The values in this table represent apriori lower limits of detection (LLD) which are typically achieved in laboratory analyses of liquid radwaste samples.

<u>RADIONUCLIDE</u>	<u>LLD</u>	<u>UNITS</u>
Mn-54	5.38E-08	uCi/ml
Fe-59	7.78E-08	
Co-58	4.67E-08	
Co-60	4.78E-08	
Zn-65	1.31E-07	
Mo-99	5.10E-07*	
Cs-134	7.18E-08	
Cs-137	6.05E-08	
Ce-141	1.41E-07	
Ce-144	6.30E-07*	
I-131	6.51E-08	
Xe-135	8.45E-08	
Fe-55	2.00E-06	
Sr-89	5.00E-08	
Sr-90	5.00E-08	
H-3	1.00E-05	

\*In accordance with Technical Specification Tables 4.15.1-1 (Unit 1) and 4.11.1-1 (Unit 2), Table Notation b, the permissible Lower Limit of Detection may be increased inversely proportional to the magnitude of the gamma yield. However, the LLD determined in this manner must not exceed 10 percent of the Maximum Permissible Concentration (MPC) value specified in 10 CFR20, Appendix B, Table II (Column 2).

## 2 GASEOUS EFFLUENTS

### 2.1 REGULATORY LIMITS

The Technical Specifications presented in this section are for Unit 1. Requirements for Unit 2 are the same as for Unit 1; however, the Technical Specification numbers are not the same.

#### TECHNICAL SPECIFICATIONS

3.14.2 The radioactive gaseous effluent monitoring instrumentation channels shown in table 3.14.2-1 shall be OPERABLE with their alarm/trip setpoints set to ensure that the limits of Specification 3.15.2.1 (a) are not exceeded. The alarm/trip setpoints of these channels shall be determined in accordance with the ODCM. (Technical Specification Table 3.14.2-1 is included in this section as Table 2-1).

3.15.2.1 The dose rate at any time in the UNRESTRICTED AREAS (figure 3.15-1) due to radioactive materials released in gaseous effluents from the site shall be limited to the following values:

- a. The dose rate limit for noble gases shall be less than or equal to 500 mrem/year to the total body and less than or equal to 3000 mrem/year to the skin.
- b. The dose rate limit for I-131, I-133, tritium, and for all radioactive materials in particulate form and radionuclides other than noble gases with half-lives greater than 8 days shall be less than or equal to 1500 mrem/year to any organ.

3.15.2.2 The air dose in UNRESTRICTED AREAS (figure 3.15-1) due to noble gases released in gaseous effluents from each reactor unit shall be limited to the following:

- a. During any calendar quarter, to less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation.
- b. During any calendar year, to less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation.

3.15.2.3 The dose to any organ of a MEMBER OF THE PUBLIC from I-131, I-133, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released to UNRESTRICTED AREAS (figure 3.15-1) from each reactor unit shall be limited to the following:

- a. During any calendar quarter to less than or equal to 7.5 mrem to any organ.
- b. During any calendar year to less than or equal to 15 mrem to any organ.

3.15.2.4 The GASEOUS RADWASTE TREATMENT SYSTEM as described in the ODCM shall be in operation. (This Technical Specification applies whenever the main condenser air ejector system is in operation.)

4.15.2.4 GASEOUS RADWASTE TREATMENT SYSTEM operability shall be demonstrated by administrative controls which assure that the offgas treatment system is not bypassed.

3.15.2.5 The annual (calendar year) dose or dose commitment to any MEMBER OF THE PUBLIC due to releases of radioactivity and to radiation from uranium fuel cycle sources shall be limited to less than or equal to 25 mrem to the total body or any organ, except the thyroid, which shall be limited to less than or equal to 75 mrem.

(With the calculated doses from the release of radioactive materials in liquid or gaseous effluents exceeding twice the limits of Specifications 3.15.1.2(a), 3.15.1.2(b), 3.15.2.2.(a), 3.15.2.2.(b), 3.15.2.3(a), or 3.15.2.3(b), calculations shall be made including direct radiation contributions from the reactor units and from outside storage tanks to determine whether the above limits of Specification 3.15.2.5 have been exceeded.

3.15.2.6 The concentration of hydrogen downstream of the recombiners in the main condenser offgas treatment system shall be limited to less than or equal to 4 percent by volume.

3.15.2.7 The gross gamma radioactivity rate of the noble gases Xe-133, Xe-135, Xe-138, Kr-85m, Kr-87, and Kr-88 measured at the main condenser evacuation system pretreatment monitor station shall be limited to less than or equal to 240,000 uCi/second.

6.9.1.9 states in part:

"The Radioactive Effluent Release Report shall include (on a quarterly basis) unplanned releases from the site to unrestricted areas of radioactive materials in gaseous and liquid effluents that were in excess of 1 Ci, excluding dissolved and entrained gases and tritium for liquid effluents, or those in excess of 150 Ci of noble gases or 0.02 Ci of radiiodines for gaseous releases."



TABLE 3.14.2-1 (SHEET 1 OF 4)

## RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

<u>Instrument</u>	<u>Minimum Channels OPERABLE</u>	<u>Applicability</u>	<u>Parameter</u>	<u>ACTION</u>
1. Main Condenser Offgas Treatment System Explosive Gas Monitoring System				
Hydrogen Monitor	(1)	**	% Hydrogen	106
2. Reactor Building Vent Stack Monitoring System				
a. Noble Gas Activity Monitor	(1)	*	Radioactivity Rate Measurement +	105
b. Iodine Sampler Cartridge	(1)	*	Verify Presence of Cartridge	107
c. Particulate Sampler Filter	(1)	*	Verify Presence of Filter	107
d. Effluent System Flowrate Measurement Device	(1)	*	System Flowrate Measurement	104
e. Sampler Flowrate Measurement Device	(1)	*	Sampler Flowrate Measurement	104
3. Recombiner Building Ventilation Monitoring System				
a. Noble Gas Activity Monitor	(1)	*	Radioactivity Rate Measurement +	105
b. Iodine Sampler Cartridge	(1)	-	Verify Presence of Cartridge	107
c. Particulate Sampler Filter	(1)	*	Verify Presence of Filter	107
d. Sampler Flowrate Measurement Device	(1)	-	Sampler Flowrate Measurement	104

TABLE 3.14.2-1 (SHEET 7 OF 4)

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

<u>Instrument</u>	<u>Minimum Channels OPERABLE</u>	<u>Applicability</u>	<u>Parameter</u>	<u>ACTION</u>
4. Main Stack Monitoring System				
a. Noble Gas Activity Monitor	(1)	*	Radioactivity Rate Measurement †	105
b. Iodine Sampler Cartridge	(1)	*	Verify Presence of Cartridge	107
c. Particulate Sampler Filter	(1)	*	Verify Presence of Filter	107
d. Effluent System Flowrate Measuring Devices	(1)	*	System Flowrate Measurement	104
e. Sampler Flowrate Measuring Device	(1)	*	Sampler Flowrate Measurement	104
5. Condenser Offgas Pretreatment Monitor				
Noble Gas Activity Monitor	(1)	***	Radioactivity Rate Measurement	108

TABLE 3.14.2-1 (SHEET 3 OF 4)

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Table Notations

\*Monitor must be capable of responding to a Lower Limit of Detection of  $1 \times 10^{-6}$   $\mu\text{Ci/ml}$ .

\*During releases via this pathway.

\*\*During main condenser offgas treatment system operation.

\*\*\*During operation of the main condenser air ejector.

ACTION 104 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue, provided the flowrate is estimated at least once per 4 hours.

If the number of channels OPERABLE remains less than required by the Minimum Channels OPERABLE requirement for over 30 days, an explanation of the circumstances shall be included in the next semi-annual effluent release report.

ACTION 105 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue, provided grab samples are taken daily and analyzed daily for gross activity within 24 hours. With the number of main stack monitoring system channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, without delay suspend drywell purge.

If the number of channels OPERABLE remains less than required by the Minimum Channels OPERABLE requirement for over 30 days, an explanation of the circumstances shall be included in the next semi-annual effluent release report.

ACTION 106 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, operation of the main condenser offgas treatment system may continue provided:

- (a) Gas samples are collected once per 4 hours and analyzed within the ensuing 4 hours, or
- (b) Using a temporary hydrogen analyzer installed in the offgas system line downstream of the recombiner, hydrogen concentration readings are taken and logged every 4 hours.

TABLE 3.14.2-1 (SHEET 4 OF 4)

RADIOACTIVE GASEOUS EFFLUENT MONITORING INSTRUMENTATION

Table Notations (Continued)

If the number of channels OPERABLE remains less than required by the Minimum Channels OPERABLE requirement for over 30 days, an explanation of the circumstances shall be included in the next semi-annual effluent release report.

ACTION 107 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, effluent releases via this pathway may continue, provided samples are continuously collected with auxiliary sampling equipment for periods on the order of 7 days and analyzed within 48 hours after the end of the sampling period.

If the number of channels OPERABLE remains less than required by the Minimum Channels OPERABLE requirement for over 30 days, an explanation of the circumstances shall be included in the next semi-annual effluent release report.

ACTION 108 - With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, release to the environment may continue for up to 72 hours provided:

- a. The offgas system is not bypassed, and
- b. The offgas post-treatment monitor (D11-K615) or the main stack monitor (D11-K600) is OPERABLE.

Otherwise, be in at least HOT STANDBY within 12 hours.

If the number of channels OPERABLE remains less than required by the Minimum Channels OPERABLE requirement for over 30 days, an explanation of the circumstances shall be included in the next semi-annual effluent release report.

## 2.2 MEASUREMENT AND APPROXIMATIONS OF TOTAL RADIOACTIVITY

Waste gas release at Plant Hatch is confined to four paths: main stack (also called the offgas vent), Unit 1 reactor building vent, Unit 2 reactor building vent, and the recombiner building vent. Each of these four paths is continuously monitored for gaseous radioactivity. Each is equipped with an integrating-type sample collection device for collecting particulates and iodines. Sample collection is in accordance with Technical Specification Tables 4.15.2-1 (Unit 1) and 4.11.2-1 (Unit 2). Unless required more frequently under certain circumstances specified in Table Notations to the above mentioned tables, samples are collected as follows:

1. Noble gas samples are collected by grab sampling monthly.
2. Tritium samples are collected by grab sampling monthly.
3. Radioiodine samples are collected by pulling the sample stream through a charcoal cartridge over a 7-day period.
4. Particulates are collected by pulling the sample stream through a particulate filter over a 7-day period.
5. The 7-day particulate filters above are analyzed for gross alpha activity.
6. Quarterly composite samples are prepared from the particulate filters collected over the previous quarter and the quarterly composite sample is analyzed for Sr-89 and Sr-90.

Sample analyses results and release flow rates from the four release points form the basis for calculating released quantities of radionuclide-specific radioactivity, dose rates associated with gaseous releases, and cumulative doses for the current quarter and year. This task is normally performed with computer assistance.

The noble gas grab sample analysis results are used along with maximum expected release flow rates from each of the four vents to calculate monitor setpoints for the gaseous effluent monitors serving the four release points, to assure that the limits of Technical Specifications 3.15.2.1.a (Unit 1) or 3.11.2.1.a (Unit 2) are not exceeded. Calculation of monitor setpoints is described in the Plant Hatch ODCM.

With each release period released radioactivity, dose rates, and cumulative doses are calculated. Cumulative dose results are tabulated along with percent of Technical Specification limits (3.15.2.2 and 3.15.2.3 (Unit 1); 3.11.2.2 and 3.11.2.3 (Unit 2) for each release, for the current quarter and year.

After each calendar quarter (13 weeks) a summary of waste gas releases from the four vents is compiled for preparation of the Semiannual Effluent Release Report required by Technical Specifications 6.9.1.8 and 6.9.1.9 and described in NRC Regulatory Guide 1.21.

The methods for determining released quantities of radioactivity, dose rates and cumulative doses are as follows:

1. FISSION AND ACTIVATION GAS

The radionuclide-specific released radioactivity is determined from sample analyses results collected as described above and average release flow rates over the period represented by the collected sample.

Instantaneous dose rates due to noble gases and due to radioiodines, tritium, and particulates are calculated (with computer assistance). Calculated dose rates are compared to the dose rate limits specified in 3.15.2.1.a (Unit 1) and 3.11.2.1.a (Unit 2) for noble gases; and 3.15.2.1.b (Unit 1) and 3.11.2.1.b (Unit 2) for radioiodine, tritium, and particulates. Dose rate calculation methodology is presented in the Plant Hatch ODCM.

Beta and gamma air doses due to noble gases are calculated for the location in the unrestricted area with the potential for the highest exposure due to gaseous releases. Air doses are calculated for each release period and cumulative totals are kept for each unit for the current calendar quarter and year. Cumulative air doses are compared to the dose limits specified in Technical Specifications 3.15.2.2 (Unit 1) and 3.11.2.2 (Unit 2). Current percent of technical specification limits are shown on the printout for each release period. Air dose calculation methodology is presented in the Plant Hatch ODCM.

## 2. RADIOIODINE, TRITIUM, AND PARTICULATE RELEASES

Released quantities of radioiodines are determined from the weekly samples and release flow rates for the four release points. Radioiodine concentrations are determined by gamma spectroscopy.

Released quantities of particulates are determined from the weekly (filter) samples and release flow rates for the four release points. Gamma spectroscopy is used to quantify concentrations of principal gamma emitters.

After each calendar quarter the particulate filters from each vent are combined, fused, and strontium separation is performed. Since sample flows and vent flows are almost constant over each quarterly period the filters from each vent can be dissolved together. Decay corrections are made back to the middle of the quarterly collection period. Where significant Sr-89 or Sr-90 is not detected, LLD's are calculated. Strontium concentrations are input to the composite file of the computer to be used in release, dose rate and individual dose calculations.

Tritium samples are obtained monthly from each vent by passing the sample stream through a cold trap. The grams of water vapor/cubic foot gas is measured upstream of the cold trap in order to alleviate the difficulties in determining water vapor collection efficiencies. The tritium samples are analyzed by an independent laboratory and results are furnished in  $\mu\text{Ci/ml}$  of water. The tritium concentration in water is converted to tritium concentration in air and this value is input into the composite file of the computer to be used in release, dose rate, and individual dose calculations.

Dose rates due to radioiodine, tritium, and particulates are calculated for a hypothetical child, exposed to the inhalation pathway, at the location in the unrestricted area where the potential dose rate is expected to be the highest. Dose rates are calculated for each release point, for each release period, and the total dose rate from all four release points are compared to the dose rate limits specified in Technical Specifications 3.15.2.1.b (Unit 1) or 3.11.2.1.b (Unit 2).

Individual doses due to radioiodine, tritium, and particulates are calculated for the critical receptor, which is described in the Plant Hatch ODCM. Individual doses are calculated for each release period and cumulative totals are kept for each unit for the current calendar quarter and year. Cumulative individual doses are compared to the dose limits specified in Technical Specifications 3.15.2.3 (Unit 1) and 3.11.2.3 (Unit 2). Current percent of technical specification limits are shown on the printout for each release period.

### 3. GROSS ALPHA RELEASE

The gross alpha release is computed each month by counting the particulate filters each week for gross alpha activity in a gas flow proportional counter. The four or five weeks' numbers are then recorded on a data sheet and the activity is summed at the end of the month. The summed activity is then divided by the total monthly volume to determine the concentration. This concentration is input to the composite file of the computer and is used for release calculations.

### 4. ERROR ESTIMATES

Regulatory Guide 1.21 requires that estimated total error in analysis techniques be reported. These estimates are required for the total fission and activation gas release, total I-131 release, total particulates with half-lives greater than 8-day release, and total tritium release.



"The total or maximum error associated with the effluent measurement will include the cumulative errors resulting from the total operation of sampling and measurement. Because it may be very difficult to assign error terms for each parameter affecting the final measurement, detailed statistical evaluation of error are not suggested. The objective should be to obtain an overall estimate of the error associated with measurements of radioactive materials released in liquid and gaseous effluents and solid waste."

Estimated errors are based on errors in counting equipment calibration, counting statistics, vent flow rates, vent sample flow rates, non-steady release rates, chemical yield factors, and sample losses for such items as charcoal cartridges.

- (1) Fission and Activation Total Release was calculated from sample analysis results and release point flow rates.

Statistical Error	60%
Counting Equipment Calibration	10%
Vent Flow Rates	10%
Non-Steady Release Rates	<u>20%</u>
	100%

- (2) I-131 Release was calculated from each weekly sample:

Statistical Error	60%
Counting Equipment Calibration	10%
Vent Flow Rates	10%
Vent Sample Flow Rates	10%
Non-Steady Release Rates	10%
Losses From Charcoal Cartridge	<u>10%</u>
	110%

- (3) Particulates with half-lives greater than 8 days release was calculated from sample analysis results and release point flow rates.

Statistical Error at LLD concentration	60%
Counting Equipment Calibration	10%
Vent Flow Rates	10%
Vent Sample Flow Rates	10%
Non-Steady Release Rates	<u>10%</u>
	100%

- (4) Total Tritium Release was dominated by the reactor building vent tritium release; hence, the larger statistical errors of the off-gas vent and recombiner building vent tritium releases do not affect the error in the total tritium release:

Water Vapor in Sample Stream Determination	20%
Vent Flow Rates	10%
Counting Calibration and Statistics	10%
Non-Steady Release	50%
	<u>90%</u>

### 2.3 GASEOUS EFFLUENT RELEASE DATA

Regulatory Guide 1.21 Tables 1A, 1B, and 1C are found in this report as Tables 2-2a-c, 2-3a-c, and 2-4a-c. Data are presented on a quarterly basis as required by Regulatory Guide 1.21.

To complete Tables 2-2a-c, total release for each of the four categories (fission and activation gases; iodines; particulates; and tritium) was divided by the number of seconds in the quarter to obtain a release rate in  $\mu\text{Ci}/\text{second}$  for each category.

However, the applicable Technical Specification limits are not in terms of release rate in  $\mu\text{Ci}/\text{second}$  but in terms of dose rate in  $\text{mrem}/\text{year}$ , as presented in Technical Specifications 3.15.2.1 (Unit 1) and 3.11.2.1 (Unit 2). Noble gases are limited as specified in 3.15.2.1.a and 3.11.2.1.a. The other three categories (tritium, radioiodines, and particulates) are limited as a group as specified in 3.15.2.1.b and 3.11.2.1.b. Further the limits specified in Technical Specifications 3.15.2.1 and 3.11.2.1 are site limits, not unit limits. Dose rates due to noble gas releases and due to radioiodine, tritium, and particulates are presented in Table 2-5 along with percent of technical specification limits.

Gross alpha radioactivity is reported in Tables 2-2a, 2-2b, and 2-2c as curies released in each quarter.

Limits for cumulative beta and gamma air doses, due to noble gases, are specified in Technical Specifications 3.15.2.2 (Unit 1) and 3.11.2.2 (Unit 2). These limits are unit limits. Cumulative air doses are presented in Tables 2-6a and 2-6b, along with percent of technical specification limits.

Limits for cumulative individual doses, due to radioiodine, tritium, and particulates, are specified in Technical Specifications 3.15.2.3 (Unit 1) and 3.11.2.3 (Unit 2). These limits are also unit limits. Cumulative individual doses are presented in Tables 2-7a and 2-7b, with percent of technical specification limits.

#### 2.4 RADIOLOGICAL IMPACT DUE TO GASEOUS RELEASES

Dose rates due to noble gas releases were calculated for the site in accordance with Technical Specifications 3/4.15.2.1.a (Unit 1) and 3/4.11.2.1.a (Unit 2). Results are presented in Table 2-5. Dose rates due to radioiodine, tritium, and particulates in gaseous releases were calculated in accordance with Technical Specifications 3/4.15.2.1.b (Unit 1) and 3/4.11.2.1.b (Unit 2). These results are also in Table 2-5.

Cumulative air doses due to noble gas releases were calculated for each unit in accordance with Technical Specification 3/4.15.2.2 (Unit 1) and 3/4.11.2.2 (Unit 2). These results are presented in Tables 2-6a and 2-6b.

Cumulative doses to an individual due to radioiodine, tritium, and particulates were calculated for each unit in accordance with Technical Specifications 3/4.15.2.3 (Unit 1) and 3/4.11.2.3 (Unit 2). These results are presented in Tables 2-7a and 2-7b.

Dose rates and doses were calculated using the methodology presented in the Plant Hatch Offsite Dose Calculation Manual.

TABLE 2-2a  
 E. I. HATCH NUCLEAR PLANT - UNIT 1  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Quarter 3	Quarter 4	Est. Total Error (%)
-----				
A.	Fission and Activation Gases			
1.	Total Release	Ci 5.63E+01	1.66E+01	1.00E+02
2.	Average Release Rate For Period	uCi/sec 7.16E+00	2.11E+00	
*3.	% of Tech Spec Limit	%		
B.	Iodines			
1.	Total Iodine-131	Ci 6.82E-04	5.24E-05	1.10E+02
2.	Average Release Rate For Period	uCi/sec 8.67E-05	6.66E-06	
*3.	% of Tech Spec Limit	%		
C.	Particulates			
1.	Particulates with half-lives > 8 days	Ci 3.51E-04	4.51E-05	1.00E+02
2.	Average Release Rate For Period	uCi/sec 4.46E-05	5.74E-06	
*3.	% of Tech Spec Limit	%		
4.	Gross Alpha Radioactivity	Ci 6.77E-07	8.50E-07	
D.	Tritium			
1.	Total	Ci 7.61E+00	4.07E-01	9.00E+01
2.	Average Release Rate For Period	uCi/sec 9.68E-01	5.18E-02	
*3.	% of Tech Spec Limit	%		

\*Technical Specification limits are in terms of dose rate (mrem/yr) and dose (mrem). See Tables 2-5, 2-6a, 2-6b, 2-7a, and 2-7b.

TABLE 2-2b  
 E. I. HATCH NUCLEAR PLANT - UNIT 2  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Quarter 3	Quarter 4	Est. Total Error (%)
-----				
A. Fission and Activation Gases				
1. Total Release	Ci	4.70E+01	4.16E+01	1.00E+02
2. Average Release Rate For Period	uCi/sec	5.18E+00	5.29E+00	
*3. % of Tech Spec Limit	%			
B. Iodines				
1. Total Iodine-131	Ci	7.46E-04	1.10E-04	1.10E+02
2. Average Release Rate For Period	uCi/sec	9.49E-05	1.40E-05	
*3. % of Tech Spec Limit	%			
C. Particulates				
1. Particulates with half-lives > 8 days	Ci	5.82E-05	4.58E-05	1.00E+02
2. Average Release Rate For Period	uCi/sec	7.40E-06	5.82E-06	
*3. % of Tech Spec Limit	%			
4. Gross Alpha Radioactivity	Ci	5.72E-07	7.59E-07	
D. Tritium				
1. Total	Ci	5.34E+00	4.90E+00	9.00E+01
2. Average Release Rate For Period	uCi/sec	6.80E-01	6.23E-01	
*3. % of Tech Spec Limit	%			

\*Technical Specification limits are in terms of dose rate (mrem/yr) and dose (mrem). See Tables 2-5, 2-6a, 2-6b, 2-7a, and 2-7b.

TABLE 2-2c  
 E. I. HATCH NUCLEAR PLANT - SITE  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Quarter 3	Quarter 4	Est. Total Error (%)
-----				
A. Fission and Activation Gases				
1. Total Release	Ci	1.03E+02	5.82E+01	1.00E+02
2. Average Release Rate For Period	uCi/sec	1.31E+01	7.40E+00	
*3. % of Tech Spec Limit	%			
B. Iodines				
1. Total Iodine-131	Ci	1.43E-03	1.62E-04	1.10E+02
2. Average Release Rate For Period	uCi/sec	1.82E-04	2.07E-05	
*3. % of Tech Spec Limit	%			
C. Particulates				
1. Particulates with half-lives > 8 days	Ci	4.09E-04	9.09E-05	1.00E+02
2. Average Release Rate For Period	uCi/sec	5.20E-05	1.16E-05	
*3. % of Tech Spec Limit	%			
4. Gross Alpha Radioactivity	Ci	1.25E-06	1.61E-06	
D. Tritium				
1. Total	Ci	1.30E+01	5.30E+00	9.00E+01
2. Average Release Rate For Period	uCi/sec	1.65E+00	6.74E-01	
*3. % of Tech Spec Limit	%			

\*Technical Specification limits are in terms of dose rate (mrem/yr) and dose (mrem). See Tables 2-5, 2-6a, 2-6b, 2-7a, and 2-7b.

TABLE 2-3a  
 E. I. HATCH NUCLEAR PLANT - UNIT 1  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 GASEOUS EFFLUENTS - ELEVATED RELEASES\*

Nuclides Released	Unit	Continuous Mode		Batch Mode**	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
<b>1. Fission Gases</b>					
Kr-85m	Ci	1.65E-01	4.25E-01		
Kr-87	Ci	0.00E+00	7.65E-02		
Xe-133	Ci	3.14E+00	0.00E+00		
Xe-135m	Ci	1.26E+01	6.88E-01		
Xe-135	Ci	1.34E+01	7.08E-01		
Xe-138	Ci	3.45E+00	2.86E+00		
Ar-41	Ci	9.34E-02	5.74E-01		
<b>Total For Period</b>	<b>Ci</b>	<b>3.29E+01</b>	<b>5.33E+00</b>		
<b>2. Iodines</b>					
I-131	Ci	5.68E-04	2.95E-05		
I-133	Ci	6.69E-04	1.04E-04		
I-135	Ci	1.77E-03	1.44E-04		
<b>Total For Period</b>	<b>Ci</b>	<b>3.01E-03</b>	<b>2.77E-04</b>		
<b>3. Particulates</b>					
Cr-51	Ci	0.00E+00	9.53E-08		
Mn-54	Ci	5.78E-08	5.12E-08		
Co-58	Ci	0.00E+00	2.77E-08		
Co-60	Ci	3.45E-08	6.92E-07		
Zn-65	Ci	8.85E-08	5.18E-07		
Sr-89	Ci	2.79E-06	6.84E-07		
Sr-90	Ci	3.10E-08	4.29E-09		
Ba-140	Ci	1.29E-05	4.02E-06		
La-140	Ci	2.37E-05	7.20E-06		
I-131	Ci	2.65E-07	0.00E+00		
<b>Total For Period</b>	<b>Ci</b>	<b>3.98E-05</b>	<b>1.33E-05</b>		

\*Zeroes in this table indicate that no radioactivity was present above detectable levels. See Table 2-8 for typical lower limits of detection for gaseous sample analyses.

\*\*There are no batch mode radioactive gaseous release pathways at Plant Hatch.

TABLE 2-3b  
 E. I. HATCH NUCLEAR PLANT - UNIT 2  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 GASEOUS EFFLUENTS - ELEVATED RELEASES\*

Nuclides Released	Unit	Continuous Mode		Batch Mode**	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
<b>1. Fission Gases</b>					
Kr-85m	Ci	2.60E-01	1.12E+00		
Kr-87	Ci	0.00E+00	1.20E+00		
Xe-133	Ci	3.14E+00	2.41E+00		
Xe-135m	Ci	1.37E+01	7.35E+00		
Xe-135	Ci	1.37E+01	3.35E+00		
Xe-138	Ci	6.02E+00	1.62E+01		
Ar-41	Ci	9.34E-02	8.81E-01		
Total For Period	Ci	3.70E+01	3.25E+01		
<b>2. Iodines</b>					
I-131	Ci	7.04E-04	4.16E-05		
I-133	Ci	7.10E-04	1.60E-04		
I-135	Ci	1.80E-03	2.10E-04		
Total For Period	Ci	3.22E-03	4.11E-04		
<b>3. Particulates</b>					
Cr-51	Ci	0.00E+00	8.57E-07		
Mn-54	Ci	5.78E-08	4.89E-07		
Co-58	Ci	0.00E+00	2.49E-07		
Co-60	Ci	3.45E-08	6.31E-06		
Zn-65	Ci	2.65E-07	4.66E-06		
Sr-89	Ci	3.76E-06	3.27E-06		
Sr-90	Ci	4.18E-08	2.05E-08		
Cs-137	Ci	0.00E+00	3.05E-08		
Ba-140	Ci	1.56E-05	8.97E-06		
La-140	Ci	2.88E-05	1.29E-05		
I-131	Ci	3.42E-07	0.00E+00		
Total For Period	Ci	4.90E-05	3.78E-05		

\*Zeros in this table indicate that no radioactivity was present above detectable levels. See Table 2-8 for typical lower limits of detection for gaseous sample analyses.

\*\*There are no batch mode radioactive gaseous release pathways at Plant Hatch.



TABLE 2-3c  
 E. I. HATCH NUCLEAR PLANT - SITE  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 GASEOUS EFFLUENTS - ELEVATED RELEASES\*

Nuclides Released	Unit	Continuous Mode		Batch Mode**	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
<b>1. Fission Gases</b>					
Kr-85m	Ci	4.25E-01	1.54E+00		
Kr-87	Ci	0.00E+00	1.28E+00		
Xe-133	Ci	6.28E+00	2.41E+00		
Xe-135m	Ci	2.64E+01	8.04E+00		
Xe-135	Ci	2.71E+01	4.06E+00		
Xe-138	Ci	9.46E+00	1.90E+01		
Ar-41	Ci	1.87E-01	1.46E+00		
Total For Period	Ci	6.99E+01	3.78E+01		
<b>2. Iodines</b>					
I-131	Ci	1.27E-03	7.11E-05		
I-133	Ci	1.38E-03	2.63E-04		
I-135	Ci	3.58E-03	3.54E-04		
Total For Period	Ci	6.23E-03	6.89E-04		
<b>3. Particulates</b>					
Cr-51	Ci	0.00E+00	9.53E-07		
Mn-54	Ci	1.16E-07	5.40E-07		
Co-58	Ci	0.00E+00	2.77E-07		
Co-60	Ci	6.91E-08	7.00E-06		
Zn-65	Ci	3.53E-07	5.18E-06		
Sr-89	Ci	6.56E-06	3.95E-06		
Sr-90	Ci	7.29E-08	2.48E-08		
Cs-137	Ci	0.00E+00	3.05E-08		
Ba-140	Ci	2.85E-05	1.30E-05		
La-140	Ci	5.25E-05	2.01E-05		
I-131	Ci	6.07E-07	0.00E+00		
Total For Period	Ci	8.88E-05	5.11E-05		

\*Zercoes in this table indicate that no radioactivity was present above detectable levels. See Table 2-8 for typical lower limits of detection for gaseous sample analyses.

\*\*There are no batch mode radioactive gaseous release pathways at Plant Hatch.

TABLE 2-4a  
 E. I. HATCH NUCLEAR PLANT - UNIT 1  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 GASEOUS EFFLUENTS - GROUND-LEVEL RELEASES\*

Nuclides Released	Unit	Continuous Mode		Batch Mode**	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
<b>1. Fission Gases</b>					
Kr-85	Ci	1.03E+01	0.00E+00		
Xe-133	Ci	3.02E-02	6.15E-02		
Xe-135	Ci	1.31E+01	1.12E+01		
Total For Period	Ci	2.35E+01	1.13E+01		
<b>2. Iodines</b>					
I-131	Ci	1.14E-04	2.29E-05		
I-133	Ci	4.73E-03	4.88E-05		
I-135	Ci	3.06E-03	0.00E+00		
Total For Period	Ci	7.90E-03	7.17E-05		
<b>3. Particulates</b>					
Mn-54	Ci	6.91E-06	4.07E-07		
Co-58	Ci	7.68E-06	0.00E+00		
Co-60	Ci	3.18E-05	1.47E-05		
Zn-65	Ci	1.73E-04	8.56E-06		
Sr-89	Ci	4.29E-06	9.30E-07		
Sr-90	Ci	8.72E-08	0.00E+00		
Mo-99	Ci	0.00E+00	5.04E-06		
Cs-137	Ci	8.52E-05	9.46E-07		
Ba-140	Ci	2.03E-06	0.00E+00		
I-131	Ci	0.00E+00	1.30E-06		
Total For Period	Ci	3.11E-04	3.18E-05		

\*Zeroes in this table indicate that no radioactivity was present above detectable levels. See Table 2-8 for typical lower limits of detection for gaseous sample analyses.

\*\*There are no batch mode radioactive gaseous release pathways at Plant Hatch.

TABLE 2-4b  
 E. I. HATCH NUCLEAR PLANT - UNIT 2  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 GASEOUS EFFLUENTS - GROUND-LEVEL RELEASES\*

Nuclides Released	Unit	Continuous Mode		Batch Mode**	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
<b>1. Fission Gases</b>					
Xe-135	Ci	1.00E+01	9.08E+00		
Total For Period	Ci	1.00E+01	9.08E+00		
<b>2. Iodines</b>					
I-131	Ci	4.19E-05	6.85E-05		
I-133	Ci	2.06E-04	1.34E-04		
I-135	Ci	0.00E+00	0.00E+00		
Total For Period	Ci	2.48E-04	2.02E-04		
<b>3. Particulates</b>					
Co-58	Ci	1.53E-06	0.00E+00		
Co-60	Ci	2.65E-06	0.00E+00		
Zn-65	Ci	0.00E+00	9.27E-07		
Sr-89	Ci	5.02E-06	3.32E-06		
I-131	Ci	0.00E+00	3.78E-06		
Total For Period	Ci	9.20E-06	8.03E-06		

\*Zeros in this table indicate that no radioactivity was present above detectable levels. See Table 2-8 for typical lower limits of detection for gaseous sample analyses.

\*\*There are no batch mode radioactive gaseous release pathways at Plant Hatch.

TABLE 2-4c  
 E. I. HATCH NUCLEAR PLANT - SITE  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 GASEOUS EFFLUENTS - GROUND-LEVEL RELEASES\*

Nuclides Released	Unit	Continuous Mode		Batch Mode**	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
<b>1. Fission Gases</b>					
Kr-85	Ci	1.03E+01	0.00E+00		
Xe-133	Ci	3.02E-02	6.15E-02		
Xe-135	Ci	2.31E+01	2.03E+01		
Total For Period	Ci	3.35E+01	2.03E+01		
<b>2. Iodines</b>					
I-131	Ci	1.56E-04	9.14E-05		
I-133	Ci	4.94E-03	1.83E-04		
I-135	Ci	3.06E-03	0.00E+00		
Total For Period	Ci	8.15E-03	2.74E-04		
<b>3. Particulates</b>					
Mn-54	Ci	6.91E-06	4.07E-07		
Co-58	Ci	9.21E-06	0.00E+00		
Co-60	Ci	3.44E-05	1.47E-05		
Zn-65	Ci	1.73E-04	9.49E-06		
Sr-89	Ci	9.30E-06	4.25E-06		
Sr-90	Ci	8.72E-08	0.00E+00		
Mo-99	Ci	0.00E+00	5.04E-06		
Cs-137	Ci	8.52E-05	9.46E-07		
Ba-140	Ci	2.03E-06	0.00E+00		
I-131	Ci	0.00E+00	5.09E-06		
Total For Period	Ci	3.20E-04	3.99E-05		

\*Zeros in this table indicate that no radioactivity was present above detectable levels. See Table 2-8 for typical lower limits of detection for gaseous sample analyses.

\*\*There are no batch mode radioactive gaseous release pathways at Plant Hatch.

Table 2-5  
 E. I. HATCH NUCLEAR PLANT - SITE  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 GASEOUS EFFLUENTS - DOSE RATES

Dose Rates Due to Noble Gases

Organ	Tech Spec Limit	Unit	Quarter 3	% of Tech Spec Limit	Quarter 4	% of Tech Spec Limit
TBody	500	mrem/yr	4.68E-02	9.36E-03	4.11E-02	8.22E-03
Skin	3000	mrem/yr	1.16E-01	3.86E-03	8.87E-02	2.96E-03

Dose Rates Due to Radioiodine, Tritium, and Particulates

Organ	Tech Spec Limit	Unit	Quarter 3	% of Tech Spec Limit	Quarter 4	% of Tech Spec Limit
Bone	1500	mrem/yr	2.01E-04	1.34E-05	1.20E-05	8.02E-07
Liver	1500	mrem/yr	1.51E-02	1.01E-03	6.12E-03	4.08E-04
TBody	1500	mrem/yr	1.50E-02	1.00E-03	6.12E-03	4.08E-04
Thyroid	1500	mrem/yr	3.80E-02	2.53E-03	8.45E-03	5.63E-04
Kidney	1500	mrem/yr	1.52E-02	1.01E-03	6.13E-03	4.08E-04
Lung	1500	mrem/yr	1.54E-02	1.03E-03	6.24E-03	4.16E-04
GILLI	1500	mrem/yr	1.50E-02	9.98E-04	6.12E-03	4.08E-04

TABLE 2-6a  
 E. I. HATCH NUCLEAR PLANT - UNIT 1  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 AIR DOSES DUE TO NOBLE GAS RELEASES

Cumulative Doses per Quarter

Type of Radiation	Tech Spec Limit	Unit	Quarter 3	% of Tech Spec Limit	Quarter 4	% of Tech Spec Limit
Gamma	5.0	mrads	6.96E-03	1.39E-01	5.79E-03	1.16E-01
Beta	10.0	mrads	1.40E-02	1.40E-01	7.35E-03	7.35E-02

Cumulative Doses This Year

Type of Radiation	Tech Spec Limit	Unit	Quarters 1, 2, 3, & 4	% of Tech Spec Limit
Gamma	10.0	mrads	1.92E-02	1.92E-01
Beta	20.0	mrads	4.28E-02	2.14E-01

TABLE 2-6b  
 E. I. HATCH NUCLEAR PLANT - UNIT 2  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 AIR DOSES DUE TO NOBLE GAS RELEASES

Cumulative Doses per Quarter

Type of Radiation	Tech Spec Limit	Unit	Quarter 3	% of Tech Spec Limit	Quarter 4	% of Tech Spec Limit
Gamma	5.0	mrads	5.41E-03	1.08E-01	5.07E-03	1.01E-01
Beta	10.0	mrads	6.65E-03	6.65E-02	6.07E-03	6.07E-02

Cumulative Doses This Year

Type of Radiation	Tech Spec Limit	Unit	Quarters 1, 2, 3, & 4	% of Tech Spec Limit
Gamma	10.0	mrads	1.91E-02	1.91E-01
Beta	20.0	mrads	2.37E-02	1.19E-01

TABLE 2-7a  
 E. I. HATCH NUCLEAR PLANT - Unit 1  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 INDIVIDUAL DOSES DUE TO RADIOIODINE, TRITIUM,  
 AND PARTICULATES IN GASEOUS RELEASES

Cumulative Doses per Quarter

Organ	Tech Spec Limit	Unit	Quarter 3	% of Tech Spec Limit	Quarter 4	% of Tech Spec Limit
Bone	7.5	mrem	1.35E-03	1.80E-02	1.28E-04	1.71E-03
Liver	7.5	mrem	5.14E-03	6.85E-02	3.01E-04	4.02E-03
TBody	7.5	mrem	4.57E-03	6.09E-02	2.96E-04	3.95E-03
Thyroid	7.5	mrem	1.05E-02	1.40E-01	7.63E-04	1.02E-02
Kidney	7.5	mrem	4.69E-03	6.25E-02	2.94E-04	3.92E-03
Lung	7.5	mrem	4.49E-03	5.98E-02	2.98E-04	3.97E-03
GILLI	7.5	mrem	4.43E-03	5.90E-02	2.97E-04	3.96E-03

Cumulative Doses This Year

Organ	Tech Spec Limit	Unit	Quarters 1,2,3,& 4	% of Tech Spec Limit
Bone	15.0	mrem	1.97E-03	1.31E-02
Liver	15.0	mrem	7.86E-03	5.24E-02
TBody	15.0	mrem	7.25E-03	4.83E-02
Thyroid	15.0	mrem	1.94E-02	1.30E-01
Kidney	15.0	mrem	7.36E-03	4.91E-02
Lung	15.0	mrem	7.12E-03	4.75E-02
GILLI	15.0	mrem	7.07E-03	4.72E-02



TABLE 2-7b  
 E. I. HATCH NUCLEAR PLANT - Unit 2  
 SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT 1991  
 INDIVIDUAL DOSES DUE TO RADIOIODINE, TRITIUM,  
 AND PARTICULATES IN GASEOUS RELEASES

Cumulative Doses per Quarter

Organ	Tech Spec Limit	Unit	Quarter 3	% of Tech Spec Limit	Quarter 4	% of Tech Spec Limit
Bone	7.5	mrem	9.19E-05	1.22E-03	5.54E-05	7.39E-04
Liver	7.5	mrem	2.65E-03	3.54E-02	2.47E-03	3.30E-02
TBody	7.5	mrem	2.65E-03	3.54E-02	2.47E-03	3.30E-02
Thyroid	7.5	mrem	4.98E-03	6.64E-02	3.78E-03	5.04E-02
Kidney	7.5	mrem	2.66E-03	3.54E-02	2.48E-03	3.30E-02
Lung	7.5	mrem	2.65E-03	3.53E-02	2.47E-03	3.29E-02
GILLI	7.5	mrem	2.65E-03	3.53E-02	2.47E-03	3.30E-02

Cumulative Doses This Year

Organ	Tech Spec Limit	Unit	Quarters 1,2,3,& 4	% of Tech Spec Limit
Bone	15.0	mrem	3.78E-04	2.52E-03
Liver	15.0	mrem	1.10E-02	7.35E-02
TBody	15.0	mrem	1.10E-02	7.34E-02
Thyroid	15.0	mrem	2.95E-02	1.96E-01
Kidney	15.0	mrem	1.11E-02	7.38E-02
Lung	15.0	mrem	1.10E-02	7.31E-02
GILLI	15.0	mrem	1.10E-02	7.32E-02

TABLE 2-8  
 LOWER LIMITS OF DETECTION - GASEOUS SAMPLE ANALYSES

The values in this table represent a priori lower limits of detection (LLD) which are typically achieved in laboratory analyses of gaseous radwaste samples.

<u>RADIONUCLIDE</u>	<u>LLD</u>	<u>UNITS</u>
Kr-87	1.31E-07	uCi/ml
Kr-88	2.10E-07	
Xe-133	1.62E-07	
Xe-133m	6.07E-08	
Xe-135	5.77E-08	
Xe-138	2.85E-06	
I-131	4.37E-14	
I-133	6.16E-13	
Mn-54	2.78E-14	
Fe-59	4.62E-14	
Co-58	2.46E-14	
Co-60	2.88E-14	
Zn-65	7.51E-14	
Mo-99	6.02E-13	
Cs-134	3.64E-14	
Cs-137	2.88E-14	
Ce-141	4.94E-14	
Ce-144	2.02E-13	
Sr-89	1.00E-11	
Sr-90	1.00E-11	
H-3	1.00E-06	

### 3. SOLID WASTE

#### 3.1 REGULATORY REQUIREMENTS

The Technical Specifications presented in this section are for Unit 1. Requirements for Unit 2 are the same as for Unit 1; however, the Technical Specification numbers are not the same.

#### TECHNICAL SPECIFICATIONS

3.15.3.1 The solid radwaste system shall be used in accordance with the PROCESS CONTROL PROGRAM to provide for the SOLIDIFICATION of wet solid wastes and for the SOLIDIFICATION and packaging of other radioactive wastes, as required, to ensure the meeting of the requirements of 10 CFR Part 20 and of 10 CFR Part 71 prior to shipment of radioactive wastes from the site.

6.9.1.9 states in part:

The Radioactive Effluent Release Report shall include the following information for each type of solid waste shipped offsite during the report period:

- a. Container volume
- b. Total curie quantity (specify whether determined by measurement or estimate)
- c. Principal radionuclides (specify whether determined by measurement or estimate)
- d. Type of waste, e.g., spent resin, compacted dry waste, evaporator bottoms
- e. Type of container, e.g., LSA, type A, type B, large quantity
- f. Solidification agent, e.g., cement.

#### 3.2 SOLID WASTE DATA

Regulatory guide 1.21 Table 3 is found in this report as Table 3-1a. and 3-1b.

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT 1991  
 July 1, 1991 - December 31, 1991  
 SOLID WASTE AND IRRADIATED FUEL SHIPMENTS  
 FOR UNITS I AND II

TABLE 3-1A

PERIOD COVERED: FROM 7 / 1 / 91 TO 12 / 31 / 91 FOR UNIT: 1 & 2

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

1. Type of waste	UNIT	6 month period	Est. Total ERROR%
a. Spent resins, filter sludges, evaporator bottoms, etc.	m <sup>3</sup>	1.35E2	
	CI	1.03E3	1.0 E 01
b. Dry compressible waste, contaminated equip, etc.	m <sup>3</sup>	1.75E2	
	CI	1.40E0	1.0 E 01
c. Irradiated components, control rods,	m <sup>3</sup>	0.00E0	
	CI	0.00E0	2.0 E 01
d. Control Rod Drive Filters	m <sup>3</sup>	1.59E0	
	CI	2.53E1	2.0 E 01
e. Other (describe) equip, etc. Vendor to Barnwell (DAW)	m <sup>3</sup>	1.11E1	
	CI	1.07E-1	2.0 E 01
2. Estimate of major nuclide composition (by type of waste)			

	ISOTOPE	PERCENT	CURIES
a.	Zn-65	3.38E+01	3.48E+02
	Fe-55	2.52E+01	2.60E+02
	Co-60	2.07E+01	2.13E+02
	Cs-137	2.20E+00	2.27E+01
	OTHER	1.81E+01	1.86E+02
b.	Zn-65	4.38E+01	6.13E-01
	Fe-55	8.59E+00	1.20E-01
	Co-60	3.17E+01	4.44E-01
	Cs-137	5.92E+00	8.29E-02
	OTHER	1.00E+01	1.4E-01
c.	Zn-65	0.00E+00	0.00E+00
	Fe-55	0.00E+00	0.00E+00
	Co-60	0.00E+00	0.00E+00
	Cs-137	0.00E+00	0.00E+00
	OTHER	0.00E+00	0.00E+00
d.	Zn-65	6.48E+00	1.64E-00
	Fe-55	2.37E+01	5.98E+00
	Co-60	3.75E+01	9.49E+00
	Cs-137	0.00E+00	0.00E+00
	OTHER	3.23E+01	8.17E+00
e.	Zn-65	4.28E+01	4.69E-02
	Fe-55	8.59E+00	9.19E-03
	Co-60	3.17E+01	3.39E-02
	Cs-137	5.92E+00	6.33E-03
	OTHER	1.00E+01	1.07E-02

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
34	Tractor Trailer	Barnwell

B. IRRADIATED FUEL SHIPMENTS (Disposition)

Number of Shipments	Mode of Transportation	Destination
N/A	N/A	N/A

EFFLUENT AND WASTE DISPOSAL SEMIANNUAL REPORT 1991  
 July 1, 1991 - December 31, 1991  
 SOLID WASTE AND IRRADIATED FUFL SHIPMENTS  
 FOR UNITS I AND II

TABLE 3-1B

TYPE OF WASTE	CURIE QUANTITY / DETERMINED	PRINCIPLE NUCLIDES / DETERMINATION	BURIAL CONTAINER DESCRIPTION	NUMBER OF CONTAINERS SHIPPED	VOLUME OF EACH CONTAINER CURIC FEET (ft. 3)	TYPE SHIPMENT / CONTAINER	SOLIDIFICATION AGENT
Dewatered Resins	646.7 measured	Zn65, Co60 Cs137, Fe55 Measured	High Integrity Container	4	132.4	Type B Cask 10-142	n/a
Dewatered Resins	378.72 measured	Zn65, Co60 Cs137, Fe55 Measured	High Integrity Container	20	202.1	Type A Cask 14-210	n/a
Torus Cleanup Filters	4.58 measured	Zn65, Co60 Cs137, Fe55 Measured	High Integrity Container	1	202.1	Type A Cask 14-210	n/a
DAW (DRY) (ACTIVE) (WASTE)	1.40 measured	Zn65, Co60 Cs137, Fe55 Measure	Strong Tight Container B-25	67	92	Strong Tight Boxes	n/a
CRD Filters	25.3 measured	Zn65, Co60 Fe55 measure	High Integrity Container	2	28.07	Type B Cask 10-142	n/a
Vendor to Barnwell	.107 measured	Zn65, Co60 Cs137, Fe55 measured	Strong tight	unknown	unknown	strong tight container	n/a

4 CHANGES TO THE PLANT HATCH ODCM AND PCP

There were no changes for this period.

## 5. METEOROLOGY

In accordance with Technical Specification 6.9.1.9, the annual summary of meteorological data collected at Plant Hatch over 1991 is presented in this section.

### 5.1 1991 Meteorological Data

- Attachment 1 Joint Frequency Tables of Wind Speed and Wind Direction 10m vs Delta Temperature 60-10m.
- Attachment 2 Joint Frequency Tables of Wind Speed and Wind Direction 60m vs Delta Temperature 60-10m.
- Attachment 3 Joint Frequency Tables of Wind Speed and Wind Direction 100m vs Delta Temperature 100-10m.
- Attachment 4 Wind Roses from 10m (Seasonal and Annual).
- Attachment 5 Wind Roses from 60m (Seasonal and Annual).
- Attachment 6 Wind Roses from 100m (Seasonal and Annual).
- Attachment 7 Wind Roses from 23m Backup (Seasonal and Annual).
- Attachment 8 Percent Data Recovery by Parameter and for Pertinent Composite Parameters for 1991.
- Attachment 9 Plots of Monthly Averages and Averages of Daily Extremes of Ambient Temperature and Dew Point Temperature.
- Attachment 10 Daily, Monthly, and Annual Precipitation for the Period of January through December 1991.
- Attachment 11 Descriptive Paragraph Comparing 1991 with Previous Years.

ATTACHMENT 1. JOINT FREQUENCY TABLES OF WIND SPEED AND WIND DIRECTION 10m  
 VS DELTA TEMPERATURE 60-10m  
 JANUARY 1, 1991 THROUGH DECEMBER 31, 1991

1 of 8

SITE: PLANT HATCH

HOURS AT EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD = 91010101-91123124  
 STABILITY CLASS: A DT/DZ  
 ELEVATION: SPEED:SPD10M DIRECTION:DIR10M LAPSE:DT60-

WIND DIRECTION	WIND SPEED(MPH)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	4	34	2	0	0	0	40
NNE	8	41	2	0	0	0	51
NE	4	122	18	0	0	0	144
ENE	5	88	9	0	0	0	102
E	5	41	1	0	0	0	47
ESE	5	35	6	0	0	0	46
SE	10	23	8	0	0	0	41
SSE	10	23	10	0	0	0	43
S	7	40	17	0	0	0	64
SSW	11	58	19	0	0	0	88
SW	11	80	10	0	0	0	101
WSW	11	62	9	0	0	0	82
W	7	104	10	0	0	0	121
WNW	13	83	16	0	0	0	112
NW	11	78	16	0	0	0	105
NNW	6	38	10	0	0	0	54
TOTAL	128	950	163	0	0	0	1241

PERIODS OF CALM(HOURS): 0  
 VARIABLE DIRECTION 483  
 HOURS OF MISSING DATA: 68



SITE: PLANT HATCH

HOURS AT EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD = 91010101-91123124  
 STABILITY CLASS: B DT/DZ  
 ELEVATION: SPEED:SPD10M DIRECTION:DIR10M LAPSE:D160-

WIND DIRECTION	WIND SPEED(MPH)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	2	13	2	1	0	0	18
NNE	6	10	0	0	0	0	16
NE	3	33	1	0	0	0	37
ENE	2	38	1	0	0	0	41
E	4	11	0	0	0	0	15
ESE	4	11	1	0	0	0	16
SE	0	10	1	0	0	0	11
SSE	6	8	2	0	0	0	16
S	6	19	2	0	0	0	27
SSW	5	20	3	0	0	0	28
SW	5	14	0	1	0	0	20
WSW	14	26	1	0	0	0	41
W	7	29	1	0	0	0	37
WNW	5	32	3	1	0	0	41
NW	8	39	6	0	0	0	53
NNW	11	11	3	0	0	0	25
TOTAL	88	324	27	3	0	0	442

PERIODS OF CALM(HOURS): 0  
 VARIABLE DIRECTION 251  
 HOURS OF MISSING DATA: 68

SITE: PLANT HATCH

## HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 91010101-91123124

STABILITY CLASS: C DT/DZ

ELEVATION: SPEED:SPD10M DIRECTION:DIR10M LAPSE:DT60-

WIND DIRECTION	WIND SPEED(MPH)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	8	17	1	0	0	0	26
NNE	5	8	0	0	0	0	13
NE	6	42	3	0	0	0	51
ENE	4	27	0	0	0	0	31
E	4	9	0	0	0	0	13
ESE	7	10	0	0	0	0	17
SE	11	14	0	0	0	0	25
SSE	3	6	1	0	0	0	10
S	4	18	5	1	0	0	28
SSW	5	18	4	0	0	0	27
SW	9	19	3	0	0	0	31
WSW	10	13	0	0	0	0	23
W	7	13	2	0	0	0	22
WNW	9	22	3	1	0	0	35
NW	7	17	1	0	0	0	25
NNW	8	13	0	0	0	0	21
TOTAL	107	266	23	2	0	0	398

PERIODS OF CALM(HOURS): 0

VARIABLE DIRECTION 260

HOURS OF MISSING DATA: 68

SITE: PLANT HATCH

## HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 91010101-91123124

STABILITY CLASS: D DT/DZ

ELEVATION: SPEED:SPD10M DIRECTION:DIR10M LAPSE:DT60-

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WIND DIRECTION	WIND SPEED(MPH)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	33	42	17	0	0	0	92
NNE	39	59	1	0	0	0	99
NE	77	271	15	0	0	0	363
ENE	62	164	5	0	0	0	231
E	52	68	3	0	0	0	123
ESE	50	56	2	0	0	0	108
SE	39	54	9	0	0	0	102
SSE	21	57	3	0	0	0	81
S	38	90	20	1	0	0	149
SSW	48	69	11	8	0	0	136
SW	51	67	9	0	0	0	127
WSW	42	41	9	0	0	0	92
W	51	49	19	0	0	0	119
WNW	38	54	14	1	0	0	107
NW	31	76	17	0	0	0	124
NNW	23	69	9	0	0	0	101
TOTAL	695	1286	163	10	0	0	2154

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PERIODS OF CALM(HOURS): 0

VARIABLE DIRECTION 1340

HOURS OF MISSING DATA: 68

SITE: PLANT HATCH

HOURS AT EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD = 91010101-91123124  
 STABILITY CLASS: E DT/DZ  
 ELEVATION: SPEED:SPD10M DIRECTION:DIR10M LAPSE:DT60-

WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	31	36	8	0	0	0	75
NNE	31	33	0	0	0	0	64
NE	141	196	2	0	0	0	339
ENE	109	66	1	0	0	0	176
E	78	15	1	0	0	0	94
ESE	99	33	1	0	0	0	133
SE	144	91	2	0	0	0	237
SSE	102	64	6	0	0	0	172
S	131	86	2	0	0	0	219
SSW	138	66	6	0	0	0	210
SW	211	62	4	0	0	0	277
WSW	130	37	0	0	0	0	167
W	95	54	1	0	0	0	150
WNW	75	73	16	2	0	0	166
NW	41	81	10	0	0	0	132
NNW	30	50	1	0	0	0	81
TOTAL	1586	1043	61	2	0	0	2692

PERIODS OF CALM(HOURS): 0  
 VARIABLE DIRECTION 1757  
 HOURS OF MISSING DATA: 68

SITE: PLANT HATCH

HOURS AT EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD = 91010101-91123124  
 STABILITY CLASS: F DZ/DZ  
 ELEVATION: SPEED:SPD10M DIRECTION:DIR10M LAPSE:DT60-

WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	21	3	1	0	0	0	25
NNE	16	4	0	0	0	0	20
NE	63	29	0	0	0	0	92
ENE	51	11	0	0	0	0	62
E	21	0	0	0	0	0	21
ESE	24	1	0	0	0	0	25
SE	41	2	1	0	0	0	44
SSE	38	1	0	0	0	0	39
S	60	12	0	0	0	0	72
SSW	81	4	0	0	0	0	85
SW	73	3	0	0	0	0	76
WSW	99	1	0	0	0	0	100
W	60	8	0	0	0	0	68
WNW	48	12	0	0	0	0	60
NW	27	15	0	0	0	0	42
NNW	17	5	1	0	0	0	23
TOTAL	740	111	3	0	0	0	854

PERIODS OF CALM(HOURS): 0  
 VARIABLE DIRECTION 520  
 HOURS OF MISSING DATA: 68

ATTACHMENT 1 (continued)

SITE: PLANT HATCH

HOURS AT EACH WIND SPEED AND DIRECTION  
 PERIOD OF RECORD = 91010101-91123124  
 STABILITY CLASS: G DT/DZ  
 ELEVATION: SPEED:SPD10M DIRECTION:DIR10M LAPSE:DT60-

WIND SPEED (MPH)

WIND DIRECTION	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	7	0	0	0	0	0	7
NNE	9	0	0	0	0	0	9
NE	18	3	0	0	0	0	21
ENE	20	1	0	0	0	0	21
E	15	1	0	0	0	0	16
ESE	9	0	0	0	0	0	9
SE	32	1	0	0	0	0	33
SSE	26	0	0	0	0	0	26
S	46	3	0	0	0	0	49
SSW	134	2	0	0	0	0	136
SW	170	1	0	0	0	0	171
WSW	188	2	0	0	0	0	190
W	121	9	0	0	0	0	130
WNW	43	4	0	0	0	0	47
NW	21	3	0	0	0	0	24
NNW	21	1	0	0	0	0	22
TOTAL	880	31	0	0	0	0	911

PERIODS OF CALM(HOURS): 0  
 VARIABLE DIRECTION 364  
 HOURS OF MISSING DATA: 68

SITE: PLANT HATCH

## HOURS AT EACH WIND SPEED AND DIRECTION

PERIOD OF RECORD = 91010101-91123124

STABILITY CLASS: ALL DT/DZ

ELEVATION: SPEED:SPD10M DIRECTION:DIR10M LAPSE:DT60-

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WIND DIRECTION	WIND SPEED (MPH)						TOTAL
	1-3	4-7	8-12	13-18	19-24	>24	
N	106	145	31	1	0	0	283
NNE	114	155	3	0	0	0	272
NE	312	696	39	0	0	0	1047
ENE	253	395	16	0	0	0	664
E	179	145	5	0	0	0	329
ESE	198	146	10	0	0	0	354
SE	277	195	21	0	0	0	493
SSE	206	159	22	0	0	0	387
S	292	268	46	2	0	0	608
SSW	422	237	43	8	0	0	710
SW	530	246	26	1	0	0	803
WSW	494	182	19	0	0	0	695
W	343	266	33	0	0	0	647
WNW	231	280	52	5	0	0	568
NW	146	309	50	0	0	0	505
NNW	116	187	24	0	0	0	327
TOTAL	4224	4011	440	17	0	0	8692

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PERIODS OF CALM(HOURS): 0

VARIABLE DIRECTION 4975

HOURS OF MISSING DATA: 68