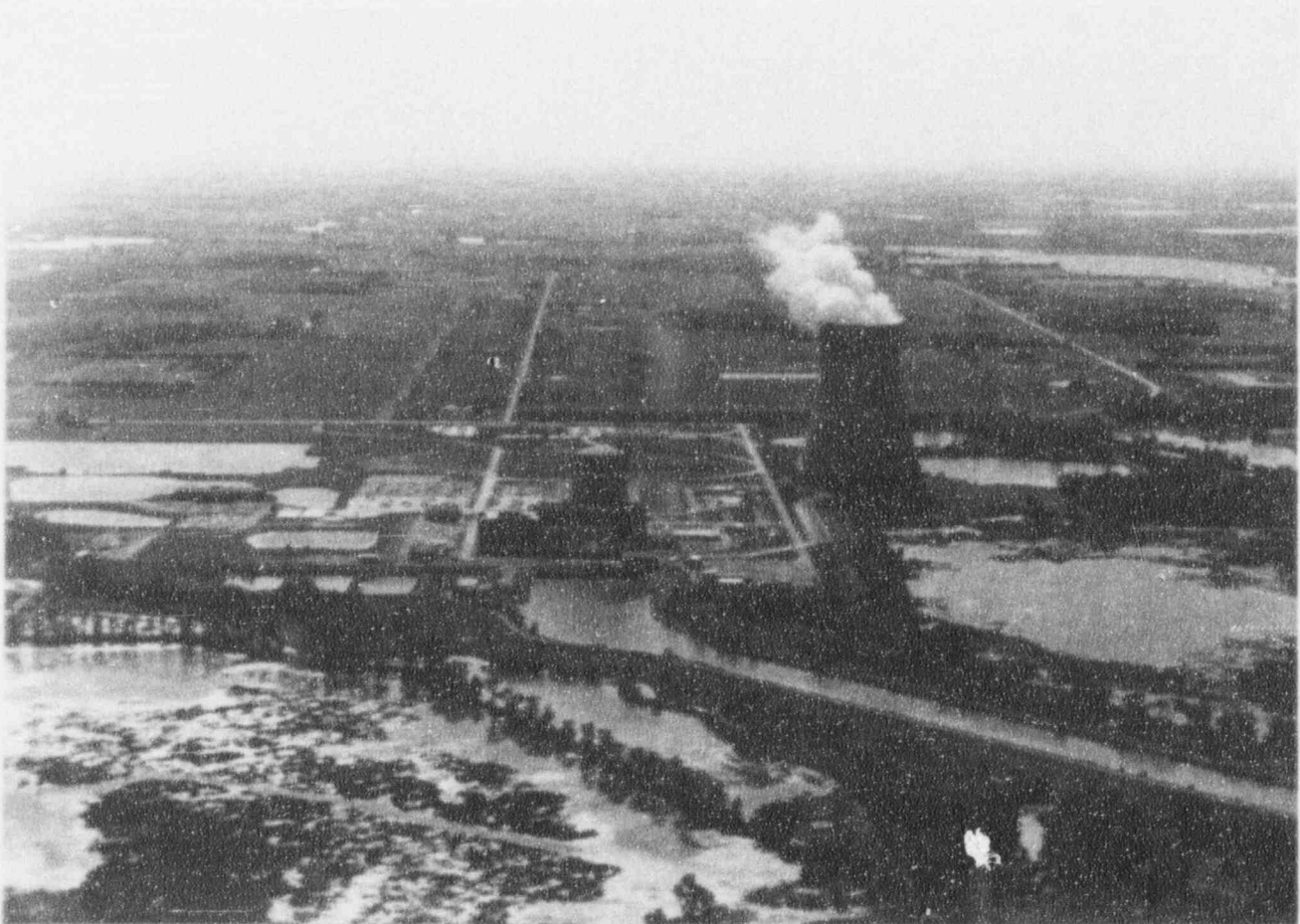


**The Davis-Besse Nuclear Power Station
Radioactive Effluent Release Report
July 1, 1993 - June 30, 1994**



**Radiation Protection
Section**

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RADIOACTIVE EFFLUENT RELEASE REPORT

Davis-Besse Nuclear Power Station

Unit No. 1

July 1, 1993 through June 30, 1994

Docket Number 50-346
License Number NPF-3

Toledo Edison Company
300 Madison Avenue
Toledo, Ohio 43652

August 1994

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SUMMARY

The Radioactive Effluent Release Report is a detailed listing of radioactivity released from the Davis-Besse Nuclear Power Station during the period from July 1, 1993 through June 30, 1994.

This report provides the following information:

- . Summation of the quantities of radioactivity released in gaseous and liquid effluents,
- . Summation of the quantities of radioactivity contained in solid waste packaged and shipped for offsite disposal at federally approved sites, and
- . A listing of all radioactive effluent monitoring instrumentation required by the Offsite Dose Calculation Manual (ODCM), but which were inoperable for more than 30 days.

Environmental samples were available from the locations specified in Table 6-1 of the Offsite Dose Calculation Manual (ODCM) during this reporting period. Sampling of milk at location T-8 was discontinued in December, 1993. The individual at that location ceased his dairy operation; there is no other dairy animal within 8 km (5 miles) of the plant. Broad Leaf Vegetation sampling was substituted for milk sampling according to paragraph 4.c of the ODCM, Table 6-1. The locations used for dose calculations and environmental monitoring were those identified by the 1993 Land Use Census.

During the period of July 1, 1993 through June 30, 1994, the estimated maximum individual offsite dose due to radioactivity released in effluents was:

Liquid Effluents:

- . 6.05E-02 mrem, whole body
- . 7.87E-02 mrem, liver

Gaseous Effluents:

Noble Gas:

- . 1.06E-03 mrad, whole body
- . 3.87E-03 mrad, skin

Iodine - 131, Tritium, and Particulates with Half-lives greater than 8 Days:

- . 5.54E-04 mrem, whole body
- . 7.92E-03 mrem, thyroid

These doses represent an extremely small fraction of the limits set by the NRC in the Davis-Besse ODCM.

Additional normal release pathways from the secondary system exist. For gaseous effluents, these pathways include the auxiliary feed pump turbine exhausts, the main steam safety valve system and the atmospheric vent valve system. For liquid effluents, the additional pathways include the Turbine Building drains via the settling basins. Releases via these pathways are included in the normal release tables in this report.

There were no abnormal liquid releases this reporting period. Three abnormal gaseous releases occurred during this reporting period.

No changes to the Process Control Program (PCP) occurred during this time period. Revision 6 to the Offsite Dose Calculation Manual was written during this reporting period and accompanies this report. Additionally, ODCM Rev 5.2 and PCP Rev 5.0 accompany this report in compliance with Technical Specification requirements.

SUPPLEMENTAL INFORMATION

1. Regulatory Limits

A. Gaseous Effluents

1. In accordance with 10CFR20, Appendix B, Table II, dose rates due to radioactivity released in gaseous effluents from the site to areas at and beyond the site boundary shall be limited to the following:
 - a. Noble gases:
 - Less than or equal to 500 mrem/year to the whole body.
(Davis Besse ODCM limit is 50 mrem in a year)
 - Less than or equal to 3000 mrem/year to the skin.
 - b. Iodine - 131, tritium, and all radionuclides in particulate form with half-lives greater than 8 days:
 - Less than or equal to 1500 mrem/year to any organ.
2. In accordance with 10CFR50, Appendix I, Sec. IIB.1, air dose due to radioactivity released in gaseous effluents to areas at and beyond the site boundary shall be limited to the following:
 - a. Less than or equal to 5 mrad for gamma radiation and less than or equal to 10 mrad for beta radiation in any calendar quarter.
 - b. Less than or equal to 10 mrad for gamma radiation and less than or equal to 20 mrad for beta radiation in any calendar year.

In accordance with 10 CFR 50, Appendix I, Sec. IIC, dose to a member of the public from Iodine-131, tritium, and all radionuclides in particulate form with half-lives greater than 8 days in gaseous effluents released to areas at and beyond the site boundary shall be limited to the following:

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

B. Liquid Effluents

In accordance with 10CFR50, Appendix I, Sec IIA, the dose or dose commitment to a member of the public from radioactivity in liquid effluents released to unrestricted areas shall be limited to:

1. Less than or equal to 1.5 mrem to the total body and less than or equal to 5 mrem to any organ in any calendar quarter.
2. Less than or equal to 3 mrem to the total body and less than or equal to 10 mrem to any organ in any calendar year.

2. EFFLUENT CONCENTRATION LIMITS

The Effluent Concentration Limits (ECs) for liquid and gaseous effluents at and beyond the site boundary are listed in 10CFR20, Appendix B, Table II, Column 2, with the most restrictive EC being used in all cases. For dissolved and entrained gases the EC of $2.0\text{E-}04 \mu\text{Ci/ml}$ is applied. This EC is based on the Xe-135 DAC of $1 \times 10^{-5} \mu\text{Ci/ml}$ of air (submersion dose) converted to an equivalent concentration in water as discussed in the International Commission on Radiological Protection (ICRP), Publication 2.

3. AVERAGE ENERGY

The Davis-Besse ODCM limits the dose equivalent rates due to the release of fission and activation products to less than or equal to 50 mrem in a year to the total body and less than or equal to 3000 mrem/year to the skin. Therefore, the average beta and gamma energies (E) for gaseous effluents as described in Regulatory Guide 1.21, "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants," are not applicable.

4. MEASUREMENTS AND APPROXIMATIONS OF TOTAL ACTIVITY

A. Fission and Activation Gases:

1. These gases, excluding tritium, are collected in a marinelli beaker specially modified for gas sampling, steel bombs, or glass vials and are counted on a germanium detector for principal gamma emitters. Detected radionuclides are quantified via gamma spectroscopy.
 2. Tritium gas is collected using a bubbler apparatus and counted by liquid scintillation.
- b. Iodines are collected on a charcoal cartridge filter and counted on a germanium detector. Specific quantification of each iodine radionuclide is via gamma spectroscopy.
 - c. Particulates are collected on filter paper and counted on a germanium detector. Specific quantification of each radionuclide present on the filter paper is via gamma spectroscopy.
 - d. Liquid effluents are collected in a marinelli beaker and counted on a germanium detector. Specific quantification of each radionuclide present in liquid samples is via gamma spectroscopy.

5. BATCH RELEASES

A. Liquid from 7/1/93 to 6/30/94

1. Number of batch releases: 32
2. Total time period for the batch releases: 50.9 hours
3. Maximum time period for a batch release: 197 minutes
4. Minimum time period for batch releases: 58 minutes
5. Average time period for a batch release: 95.4 minutes

B. Gaseous from 7/1/93 to 6/30/94

1. Number of batch releases: 7
2. Total time period for the batch releases: 70.1 hours
3. Maximum time period for a batch release: 1389 minutes
4. Minimum time period for a batch release: 198 minutes
5. Average time period for batch releases: 601 minutes

6. ABNORMAL RELEASES

On October 8, 1993 a small amount of radioactive steam was released from the Main Steam Safety Valves and Atmospheric Vent Valve due to a Reactor Trip. There were $9.30\text{E-}6$ curies of tritium released which resulted in no quantifiable gamma and beta gas air dose. A dose of $3.07\text{E-}9$ mrem resulted from iodine and particulates which is $2.05\text{E-}8$ percent of the annual limit. (PCAQ 93-0455)

On December 21, 1993, while purging the Makeup Tank gas space to the Reactor Coolant Drain Tank (RCDT) in preparation for taking a Makeup Tank Gas Sample, a release of noble gas occurred. The noble gas leak occurred due to multiple causes. The release was vented through the station vent. A total of 16.5 curies of noble gas was released. The resulting gamma air dose at the site boundary was $8.8\text{E-}4$ mrad and beta air dose was $1.3\text{E-}3$ mrad. The percent of limit was $8.8\text{E-}3$ percent and $6.5\text{E-}3$ percent for gamma and beta air dose, respectively. (LER 93-008 and PCAQ 93-0603)

On January 28, 1994, while venting RCL60 to a poly bottle from the RCDT a small amount of radioactive gas was released. The release was vented through the station vent to the atmosphere. A total of $6.77\text{E-}1$ curies of Xe-133 was released. The resulting gamma air dose was $1.39\text{E-}5$ mrad and beta air dose was $4.12\text{E-}5$ mrad. The percent of limit for this release was $1.4\text{E-}4$ percent and $2.1\text{E-}4$ percent for gamma and beta air dose, respectively. (PCAQ 94-0107)

The resultant dose from these releases represent a small fraction of the Davis-Besse Offsite Dose Calculation manual (ODCM) release limits.

7. PERCENT OF ODCM RELEASE LIMITS

The following table presents the ODCM dose limits and the associated offsite dose to the public, in percent of limits, for July 1, 1993 through June 30, 1994.

Specification	Limit	Percent of Limit
A. Report Period July 1, 1993 - June 30, 1994 (Gaseous)		
Noble gases (gamma)	10 mrad	1.06E-02
Noble gases (beta)	20 mrad	1.94E-02
I-131, tritium, and particulates with half-lives greater than 8 days.	15 mrem	5.20E-02
B. Reporting Period July 1, 1993 June 30, 1994 (liquid)		
Total body	3 mrem	2.02E+00
Organ	10 mrem	7.87E-01

8. DOSE ASSESSMENT

Sources of input data include:

- A. Water Usage: Appendix I analysis, NRC Docket 50-346, "Evaluation of Compliance with Appendix I to 10 CFR 50, June 4, 1976, Davis-Besse Nuclear Power Station."
- B. 0-50 mile meat, milk, vegetable production, and population data: 1982 Annual Environmental Operating Report, report entitled, "Evaluation of Compliance with Appendix I to 10 CFR 50: Updated Population, Agricultural, Meat - Animal, and Milk Production Data Tables for 1982." This evaluation was based on the 1980 census; the Agricultural Ministry of Ontario 1980 Marketing Account, 1980"; the Agricultural Ministry of Ontario 1980 report entitled "Agricultural Statistics for Ontario - 1980 Publication 21, 1980"; the Michigan Department of Agriculture, July, 1981"; the Ohio Crop Reporting Service, 1981 report entitled, "Ohio Agricultural Statistics, 1981."
- C. Gaseous and liquid source terms: Tables 1 through 5 of this report.
- D. Location of the nearest individuals and pathways by sector out to 5 miles: Report entitled, "1993 Land Use Census," included in the 1993 Annual Radiological Environmental Operating Report for Davis-Besse.

9. DOSE TO PUBLIC DUE TO ACTIVITIES INSIDE THE SITE BOUNDARY

In accordance with ODCM Section 7.2, the Radioactive Effluent Release Report includes an assessment of radiation doses from radioactivity released in liquid and gaseous effluents to members of the public due to activities inside the site boundary.

In special instance, members of the public are permitted access to the Radiologically Restricted Area within the Davis-Besse station. Tours for the public are conducted with the assurance that no individual will receive any appreciable dose due to radioactivity released in gaseous or liquid effluents (i.e., not more than a small fraction of the 40 CFR 190 dose standards.)

The Visitor Center located inside the Davis-Besse Administration Building (DBAB) is also accessible to members of the public. Considering the frequency and duration of the visits, the resultant dose would be a small fraction of the calculated maximum site boundary dose. For purposes of assessing the dose to members of the public in accordance with ODCM Section 7.2, the following exposure assumptions are used:

- Exposure time for maximally-exposed visitors is 20 hours (4 visits, 5 hours per visit is a maximum).
- Annual average meteorological dispersion (conservative, default use of maximum site boundary dispersion).

The equations in the ODCM may be used for calculating the potential dose to a member of the public for activities inside the site boundary. Based on these assumptions, this dose would be at least a factor of 400 less than the maximum site boundary air dose as calculated in the ODCM.

There are no areas onsite accessible to the public where exposure to liquid effluents could occur. Therefore, the modeling of the ODCM conservatively estimates the maximum potential dose to members of the public.

10. INOPERABLE RADIOACTIVE EFFLUENT MONITORING EQUIPMENT

The following radioactive effluent monitoring equipment required to be operable by ODCM Section 2.1 and 3.1 was inoperable for more than 30 days during this reporting period.

- . Total Dilution Flow, Computer Point F-201, was unavailable for greater than thirty days due to FE-3611 dilution flow element probe malfunctioning. Upon completion of maintenance activity, the computer point was returned to service. During the time period that the computer point was out of service, total dilution flow was estimated using other methods.
(PCAQ 93-0514)
- . The following radioactive effluent monitors were unavailable for more than thirty days due to modification (Mod 92-0046) which replaced the detectors and Control Room readouts. The logarithmic meter readouts were replaced with digital readouts. The detectors were replaced with new detectors. Effected monitors were:
 - RE 1770 A Clean Radwaste System Outlet
 - RE 1770 B Clean Radwaste System Outlet
 - RE 1878 A Miscellaneous Radwaste System Outlet

Upon completion of maintenance activities, the RE's were returned to service. During the time period that the instruments were out of service, releases were conducted in accordance with ODCM requirements.

11. CHANGE TO THE ODCM AND PCP

There were no changes to the PCP and one revision (6.0) to the ODCM. The previous revisions, ODCM 5.2 and PCP 5.0, are accompanying this report in accordance with Technical Specifications.

12. CHANGES TO THE LAND USE

Pathway Location and Corresponding Atmospheric Dispersion (X/Q) and Deposition (D/Q) Parameters					
SECTOR	METERS	CRITICAL PATHWAY	AGE GROUP	X/Q (SEC/M ³)	D/Q (M ⁻²)
N	880	INHALATION	CHILD	9.15E-07	8.40E-09
NNE	870	INHALATION	CHILD	1.27E-06	1.47E-08
NE	900	INHALATION	CHILD	1.26E-06	1.58E-08
ENE*	-	-	-	-	-
E*	-	-	-	-	-
ESE*	-	-	-	-	-
SE*	-	-	-	-	-
SSE	2880	VEGETATION	CHILD	6.85E-08	8.02E-10
S	1440	VEGETATION	CHILD	1.22E-07	2.48E-09
SSW	1560	VEGETATION	CHILD	1.03E-07	2.28E-09
SW	1050	VEGETATION	CHILD	2.92E-07	5.33E-09
WSW	4270	COW/MILK	INFANT	5.71E-08	5.31E-10
W	6530	GOAT/MILK	INFANT	4.54E-08	2.79E-10
WNW	1750	VEGETATION	CHILD	1.46E-07	1.72E-09
NW**	2660	VEGETATION	CHILD	5.89E-08	4.41E-10
NNW	1490	VEGETATION	CHILD	1.64E-07	1.26E-09

* Since these sectors are located over marsh areas and Lake Erie, no ingestion pathways are present.

** Changes since 1992.

TABLE 1. GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

TYPE	UNIT	THIRD QUARTER 1993	FOURTH QUARTER 1993	EST. TOTAL (PERCENT ERROR)
A. <u>Fission and Activation Gases</u>				
1. Total Release	Ci	1.48E+00	1.91E+01	2.50E+01
2. Average Release Rate for period	μCi/sec	1.86E-01	2.43E+00	
3. Percent of ODCM Limits	%	See Supplemental Information, Section 7		
B. <u>Iodines</u>				
1. Total Iodine	Ci	9.75E-05	3.68E-04	2.50E+01
2. Average Release Rate for Period	μCi/sec	1.23E-05	4.63E-05	
3. Percent of ODCM Limits	%	See Supplemental Information, Section 7		
C. <u>Particulates</u>				
1. Particulates with Half-lives greater than 8 days	Ci	2.14E-06	N/A	2.50E+01
2. Average Release Rate for Period	μCi/sec	2.69E-07	N/A	
3. Percent of ODCM Limits	%	See Supplemental Information, Section 7		
4. Gross Alpha Activity	Ci	4.45E-07	1.80E-07	2.50E+01
D. <u>Tritium</u>				
1. Total Release	Ci	7.53E+00	4.55E+00	2.50E+01
2. Average Release Rate for Period	μCi/sec	9.47E-01	5.72E-01	
3. Percent of ODCM Limits	%	See Supplemental Information, Section 7		

TABLE 1. GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES (continued)

TYPE	UNIT	FIRST QUARTER 1994	SECOND QUARTER 1994	EST. TOTAL (PERCENT ERROR)
A. <u>Fission and Activation Gases</u>				
1. Total Release	Ci	5.04E+00	3.97E+01	2.50E+01
2. Average Release Rate for Period	μCi/sec	5.48E-01	2.38E+00	
3. Percent of ODCM Limits	%	See Supplemental Information, Section 7		
B. <u>Iodines</u>				
1. Total Iodine	Ci	1.32E-04	6.50E-04	2.50E+01
2. Average Release Rate for Period	μCi/sec	1.70E-05	8.27E-05	
3. Percent of ODCM Limits	%	See Supplemental Information, Section 7		
C. <u>Particulates</u>				
1. Particulates with Half-lives greater than 8 days	Ci	4.55E-07	2.79E-05	2.50E+01
2. Average Release Rate for Period	μCi/sec	5.85E-08	3.55E-06	
3. Percent of ODCM Limits	%	See Supplemental Information, Section 7		
4. Gross Alpha Activity	Ci	3.94E-07	6.23E-08	2.50E+01
D. <u>Tritium</u>				
1. Total Release	Ci	4.09E+00	4.02E+00	2.50E+01
2. Average Release Rate for Period	μCi/sec	5.26E-01	5.11E-01	
3. Percent of ODCM Limits	%	See Supplemental Information, Section 7		

TABLE 2. GASEOUS EFFLUENTS - GROUND-LEVEL RELEASES^a

NUCLIDES	UNIT	BATCH MODE			
		THIRD QUARTER 1993	FOURTH QUARTER 1993	FIRST QUARTER 1994	SECOND QUARTER 1994
1. Fission Gases	Ci				
Kr-85		N/A	N/A	N/A	N/A
Kr-85m		N/A	N/A	N/A	N/A
Kr-87		N/A	N/A	N/A	N/A
Kr-88		N/A	N/A	N/A	N/A
Xe-133		N/A	N/A	N/A	N/A
Xe-135		N/A	N/A	N/A	N/A
Xe-135M		N/A	N/A	N/A	N/A
Xe-138		<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Total for Period:		N/A	N/A	N/A	N/A
2. Iodines	Ci				
I-131		N/A	N/A	N/A	N/A
I-133		N/A	N/A	N/A	N/A
I-135		<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Total for Period:		N/A	N/A	N/A	N/A
3. Particulates	Ci				
H-3		N/A	N/A	N/A	N/A
Sr-89		N/A	N/A	N/A	N/A
Sr-90		N/A	N/A	N/A	N/A
Cs-134		N/A	N/A	N/A	N/A
Cs-137		N/A	N/A	N/A	N/A
Ba-140		<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
Total for Period:		N/A	N/A	N/A	N/A

TABLE 2. GASEOUS EFFLUENTS - GROUND-LEVEL RELEASES^a

CONTINUOUS MODE					
NUCLIDES	UNIT	THIRD QUARTER 1993	FOURTH QUARTER 1993	FIRST QUARTER 1994	SECOND QUARTER 1994
1. Fission Gases	Ci				
Kr-85		LLD ^b	LLD	LLD	LLD
Kr-85m		LLD	LLD	LLD	LLD
Kr-87		LLD	LLD	LLD	LLD
Kr-88		LLD	LLD	LLD	LLD
Xe-133		LLD	LLD	LLD	LLD
Xe-135		LLD	LLD	LLD	LLD
Xe-135m		LLD	LLD	LLD	LLD
Xe-138		LLD	LLD	LLD	LLD
Total for Period:		N/A	N/A	N/A	N/A
2. Iodines	Ci				
I-131		LLD	LLD	LLD	LLD
I-133		LLD	LLD	LLD	LLD
I-135		LLD	LLD	LLD	LLD
Total for Period:		N/A	N/A	N/A	N/A
3. Particulates	Ci				
H-3		7.36E-06	9.96E-06	1.74E-06	7.42E-06
Sr-89		LLD	LLD	LLD	LLD
Sr-90		LLD	LLD	LLD	LLD
Cs-134		LLD	LLD	LLD	LLD
Cs-137		LLD	LLD	LLD	LLD
Ba-140		LLD	LLD	LLD	LLD
Total for Period:		7.36E-06	9.96E-06	1.74E-06	7.42E-06

^a Includes Atmospheric Vent Valve weepage, Auxiliary Feed Pump Turbine tests, and Main Steam Safety valve testing and Reactor Trip which are listed as continuous releases. All batch releases are mixed-mode.

^b These radionuclides were not identified in concentrations above the lower limit of detection (LLD) listed below:

H-3:	<3.6E-06	μCi/ml	Ar-41:	<2.2E-08	μCi/ml
Xe-133:	<4.6E-08	μCi/ml	Kr-85:	<6.2E-06	μCi/ml
Xe-133m:	<1.6E-07	μCi/ml	Kr-85m:	<2.0E-08	μCi/ml
Xe-135:	<1.9E-08	μCi/ml	Kr-87:	<3.5E-08	μCi/ml
Xe-138:	<2.5E-07	μCi/ml	I-131:	<1.0E-06	μCi/ml
Cs-134:	<2.1E-08	μCi/ml	I-133:	<2.1E-08	μCi/ml
I-135:	<2.1E-08	μCi/ml	Sr-89:	<5.0E-08	μCi/ml
Sr-90:	<6.0E-09	μCi/ml	Kr-88:	<4.0E-08	μCi/ml
Cs-137:	<3.0E-08	μCi/ml	Xe-135m:	<4.0E-07	μCi/ml
Ba-140:	<7.0E-08	μCi/ml			

TABLE 3. GASEOUS EFFLUENTS - MIXED-MODE RELEASES^a

NUCLIDES	UNIT	BATCH MODE			
		THIRD QUARTER 1993	FOURTH QUARTER 1993	FIRST QUARTER 1994	SECOND QUARTER 1994
1. <u>Fission Gases</u>	Ci				
Ar-41		LLD ^b	LLD	LLD	3.59E-02
Kr-85		2.05E-01	1.24E+00	LLD	2.81E+00
Kr-85m		LLD	LLD	LLD	2.19E-03
Kr-87		LLD	LLD	LLD	LLD
Kr-88		LLD	LLD	LLD	LLD
Xe-131m		LLD	LLD	LLD	3.00E-01
Xe-133		9.91E-04	3.12E-02	LLD	1.31E+01
Xe-133m		LLD	LLD	LLD	6.62E-02
Xe-135		LLD	LLD	LLD	4.48E-02
Xe-135m		LLD	LLD	LLD	LLD
Xe-138		LLD	LLD	LLD	LLD
Total for Period:		2.06E-01	1.27E+00	N/A	1.64E+01
2. <u>Iodines</u>	Ci				
I-131		LLD	LLD	LLD	1.59E-04
I-132		LLD	LLD	LLD	1.91E-05
I-133		LLD	LLD	LLD	1.18E-04
I-135		LLD	LLD	LLD	6.84E-05
Total for Period:		N/A	N/A	N/A	3.65E-4
3. <u>Particulates</u>	Ci				
H-3		4.87E-03	3.93E-03	LLD	2.17E-01
Na-24		LLD	LLD	LLD	1.19E-06
Co-58		LLD	LLD	LLD	3.10E-06
Co-60		LLD	LLD	LLD	2.97E-07
Ru-106		LLD	LLD	LLD	1.07E-06
Cs-134		LLD	LLD	LLD	8.45E-06
Cs-137		LLD	LLD	LLD	1.22E-05
Ba-140		LLD	LLD	LLD	LLD
Total for Period:		4.87E-03	3.93E-03	N/A	2.17E-01

TABLE 3. GASEOUS EFFLUENTS - MIXED-MODE RELEASES* (continued)

NUCLIDES	UNIT	CONTINUOUS MODE			
		THIRD QUARTER 1993	FOURTH ^e QUARTER 1993	FIRST ^f QUARTER 1994	SECOND QUARTER 1994
1. <u>Fission Gases</u>	Ci				
Ar-41		LLD	1.36E-02	LLD	LLD
Kr-85		LLD	LLD	LLD	LLD
Kr-85m		LLD	2.67E-01	LLD	LLD
Kr-87		LLD	9.67E-02	LLD	LLD
Kr-88		LLD	3.07E-01	LLD	LLD
Xe-131m		LLD	LLD	LLD	LLD
Xe-133		1.27E+00	1.44E+01	4.70E+00	2.33E+01
Xe-133m		LLD	2.59E-01	LLD	LLD
Xe-135		LLD	2.44E+00	3.36E-01	LLD
Xe-135m		LLD	3.51E-02	LLD	LLD
Xe-138		LLD	LLD	LLD	LLD
Total for Period:		1.27E+00	1.78E+01	5.04E+00	2.33E+01
2. <u>Iodines</u>	Ci				
I-131		4.99E-05	2.77E-04	7.55E-05	1.32E-04
I-132		LLD	LLD	LLD	1.91E-05
I-133		4.76E-05	9.12E-05	5.60E-05	1.34E-04
I-135		LLD	LLD	LLD	LLD
Total for Period:		9.75E-05	3.68E-04	1.32E-04	2.85E-04
3. <u>Particulates</u>	Ci				
H-3		7.53E+00	4.55E+00	4.09E+00	3.80E+00
Sr-89 ^{c, d}		LLD	LLD	LLD	LLD
Sr-90 ^{c, d}		LLD	LLD	LLD	LLD
Cs-134		LLD	LLD	LLD	LLD
Cs-137		2.14E-06	LLD	4.55E-07	1.62E-06
Ba-140		LLD	LLD	LLD	LLD
Total for Period:		7.53E+00	4.55E+00	4.09E+00	3.80E+00

TABLE 3. GASEOUS EFFLUENTS - MIXED-MODE RELEASES^a (continued)^a Abnormal releases included.^b These radionuclides were not identified in concentrations above the lower limit of detection (LLD) listed below. The largest LLD value is listed.

Continuous Mode			Batch Mode		
Ar-41:	<2.9 E-08	μCi/ml	Ar-41:	<2.9 E-06	μCi/ml
Kr-85:	<3.3 E-06	μCi/ml	Kr-85m:	<2.2 E-06	μCi/ml
Kr-85m:	<1.3 E-08	μCi/ml	Kr-87:	<4.5 E-06	μCi/ml
Kr-87:	<6.0 E-08	μCi/ml	Kr-88:	<6.6 E-06	μCi/ml
Kr-88:	<6.0 E-08	μCi/ml	Xe-133m	<1.8 E-05	μCi/ml
Xe-131m:	<4.4 E-07	μCi/ml	Xe-135m	<1.4 E-05	μCi/ml
Xe-133m:	<7.2 E-08	μCi/ml	I-135:	<1.0 E-05	μCi/ml
Xe-133:	<2.0 E-08	μCi/ml	Co-60:	<3.7 E-06	μCi/ml
Xe-135m:	<5.9 E-06	μCi/ml	Ru-103:	<2.8 E-06	μCi/ml
Xe-135:	<1.1 E-08	μCi/ml	Ba-140:	<1.1 E-05	μCi/ml
I-135:	<3.9 E-10	μCi/ml	Ce-144:	<1.4 E-05	μCi/ml
Mn-54:	<2.6 E-14	μCi/ml	Mn-54:	<9.5 E-07	μCi/ml
Co-58:	<1.6 E-14	μCi/ml	Na-24:	<9.8 E-07	μCi/ml
Co-60:	<2.5 E-14	μCi/ml	H-3	<1.6 E-09	μCi/ml
Sr-89:	<9.3 E-16	μCi/ml	Co-58	<3.0 E-06	μCi/ml
Sr-90:	<3.1 E-16	μCi/ml	Kr-85	<3.1 E-04	μCi/ml
Cs-134:	<1.8 E-14	μCi/ml	Xe-131m	<3.2 E-05	μCi/ml
Ba-140:	<8.4 E-15	μCi/ml	Xe-133	<3.9 E-06	μCi/ml
Ce-144:	<1.2 E-13	μCi/ml	Xe-135	<2.1 E-06	μCi/ml
Ru-103:	<2.4 E-14	μCi/ml	Xe-138	<2.8 E-05	μCi/ml
Xe-138	<2.0 E-05	μCi/ml	I-131	<2.7 E-06	μCi/ml
Cs-137	<2.4 E-14	μCi/ml	I-132	<1.1 E-06	μCi/ml
			I-133	<3.0 E-06	μCi/ml
			Ru-106	<1.2 E-05	μCi/ml
			Cs-134	<2.8 E-06	μCi/ml
			Cs-137	<3.3 E-06	μCi/ml

^c Quarterly composite sample for continuous mode.^d Analysis not required for batch release.^e Fourth Quarter Fission Gases curies include the Make-up Tank release. The tritium curies for fourth quarter includes the Reactor Trip.^f First Quarter Fission Gases curies include RCDT release.

TABLE 4. LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

TYPE	UNIT	THIRD QUARTER 1993	FOURTH QUARTER 1993	EST. TOTAL PERCENT ERROR
<u>A. FISSION AND ACTIVATION PRODUCTS</u>				
1. Total Release (without Tritium, Gases, Alpha)	Ci	1.07E-02	1.66E-03	2.00E+01
2. Average Diluted Concentration during Period ^a	μCi/ml	1.69E-07	2.84E-08	
3. Percent of ODCM Limit	%	See Supplemental Information, Section 7		
4. Percent of 10CFR20 Limit	%	3.55E+00	7.81E-01	
<u>B. Tritium</u>				
1. Total Release	Ci	2.22E+01	3.98E+01	2.00E+01
2. Average Diluted Concentration During Period ^a	μCi/ml	2.37E-06	3.83E-06	
3. Percent of 10CFR20 Limit	%	2.37E-01	3.83E-01	
<u>C. Dissolved and Entrained Gases</u>				
1. Total Release	Ci	N/A	2.39E-05	2.00E+01
2. Average Diluted Concentration During Period ^a	μCi/ml	N/A	4.09E-10	
3. Percent of 10CFR20 Limit	%		N/A	2.05E-04
<u>D. Gross Alpha</u>				
1. Total Release	Ci	2.72E-06	N/A	2.00E+01
<u>E. Volume of Waste Released (prior to dilutions)</u>				
1. Batch	liters	2.30E+05	2.12E+05	2.00E+01
2. Continuous		4.60E+07	5.19E+07	
<u>F. Volume of Dilution Water (used during releases)</u>				
1. Batch	liters	6.34E+07	5.85E+07	2.00E+01
2. Continuous		9.30E+09	1.03E+10	
G. <u>Total Volume of Water Released</u>	liters	9.36E+09	1.04E+10	2.00E+01

^a Tritium is found in both continuous and batch releases. Fission & Activation products and Dissolved and Entrained Gases are only found in batch releases.

TABLE 4. LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES (continued)

TYPE	UNIT	FIRST QUARTER 1994	SECOND QUARTER 1994	EST. TOTAL (PERCENT ERROR)
<u>A. FISSION AND ACTIVATION PRODUCTS</u>				
1. Total Release (without Tritium, Gases, Alpha)	Ci	2.16E-03	7.80E-03	2.00E+01
2. Average Diluted Concentration during Period ^a	μCi/ml	5.12E-09	7.03E-08	
3. Percent of ODCM Limit	%	See Supplemental Information, Section 7		
4. Percent of 10CFR20 Limit	%	2.16E-01	1.85E+00	
<u>B. Tritium</u>				
1. Total Release	Ci	3.25E+01	1.41E+02	2.00E+01
2. Average Diluted Concentration During Period ^a	μCi/ml	3.55E-06	1.31E-05	
3. Percent of 10CFR20 Limit	%	3.55E-01	1.31E+00	
<u>C. Dissolved and Entrained Gases</u>				
1. Total Release	Ci	N/A	1.61E-01	2.00E+01
2. Average Diluted Concentration During Period ^a	μCi/ml	N/A	1.45E-06	
3. Percent of 10CFR20 Limit	%		N/A	7.25E-01
<u>D. Gross Alpha</u>				
1. Total Release	Ci	N/A	3.96E-06	2.00E+01
<u>E. Volume of Waste Released (prior to dilutions)</u>				
1. Batch	liters	1.68E+05	3.77E+05	2.00E+01
2. Continuous		1.06E+08	8.20E+07	
<u>F. Volume of Diluted Water (used during releases)</u>				
1. Batch	liters	4.22E+08	1.11E+08	2.00E+01
2. Continuous		8.74E+09	1.07E+10	
<u>G. Total Volume of Water Released</u>				
	liters	9.16E+09	1.08E+10	2.00E+01

^a Tritium is found in both continuous & batch releases. Fission and Activation products & Dissolved and Entrained Gases are only found in batch releases.

TABLE 5. LIQUID EFFLUENTS - NUCLIDES RELEASED

BATCH RELEASES^c

Nuclides	Unit	THIRD Quarter 1993	FOURTH Quarter 1993	FIRST Quarter 1994	SECOND Quarter 1994
1. <u>Fission and Activation Products</u>					
Cr-51	Ci	LLD	LLD	LLD	LLD
Mn-54		2.59E-05	3.72E-06	2.22E-06	7.71E-06
Fe-55		1.81E-03	7.00E-04	5.88E-04	2.00E-03
Co-57		2.18E-05	9.33E-07	4.00E-06	2.46E-05
Co-58		4.22E-03	1.85E-04	1.34E-04	3.73E-04
Co-60		1.12E-03	1.83E-04	2.24E-04	1.35E-03
Zn-65		LLD	LLD	LLD	LLD
Se-75		9.08E-05	LLD	2.24E-06	LLD
Sr-89 ^{a, b}		LLD	LLD	LLD	LLD
Sr-90 ^{a, b}		LLD	LLD	LLD	LLD
Nb-95		7.56E-05	LLD	LLD	LLD
Nb-97		9.62E-06	4.05E-06	LLD	LLD
Zr-95		5.15E-05	1.18E-06	LLD	LLD
Zr-97		7.62E-05	2.49E-06	1.87E-05	7.19E-05
Mo-99		LLD	LLD	LLD	LLD
Tc-99m		LLD	LLD	LLD	LLD
Ru-103		1.00E-05	LLD	LLD	LLD
Ru-106		LLD	LLD	LLD	1.71E-06
Ag-110m		1.42E-03	1.28E-04	3.33E-04	1.84E-03
Sn-113		1.87E-04	6.76E-05	9.26E-05	4.59E-05
Sb-125		2.57E-04	4.86E-05	2.23E-05	8.84E-04
I-131		LLD	LLD	LLD	LLD
Cs-134		5.08E-04	1.20E-04	2.47E-04	3.86E-04
Cs-137		8.47E-04	2.20E-04	4.87E-04	8.08E-04
Cs-138		LLD	LLD	LLD	2.45E-06
Ce-141		LLD	LLD	LLD	LLD
Ce-144		LLD	LLD	LLD	7.52E-06
Total for Period:		1.07E-02	1.66E-03	2.16E-03	7.80E-03
2. <u>Tritium</u>					
	Ci	2.19E+01	3.90E+01	3.16E+01	1.40E+02
3. <u>Dissolved and Entrained Gases</u>					
Kr-85	Ci	LLD	LLD	LLD	1.02E-02
Xe-131m		LLD	LLD	LLD	4.69E-03
Xe-133		LLD	2.39E-05	LLD	1.46E-01
Xe-133m		LLD	LLD	LLD	4.36E-04
Xe-135		LLD	LLD	LLD	2.14E-05
Total for Period:		N/A	2.39E-05	N/A	1.61E-01

TABLE 5. LIQUID EFFLUENTS - NUCLIDES RELEASED (continued)

CONTINUOUS RELEASES ^c					
NUCLIDES	UNIT	THIRD QUARTER 1993	FOURTH QUARTER 1993	FIRST QUARTER 1994	SECOND QUARTER 1994
1. <u>Fission and Activation Products</u>					
Cr-51	Ci	LLD	LLD	LLD	LLD
Mn-54		LLD	LLD	LLD	LLD
Fe-59		LLD	LLD	LLD	LLD
Co-58		LLD	LLD	LLD	LLD
Co-60		LLD	LLD	LLD	LLD
Zn-65		LLD	LLD	LLD	LLD
Sr-89 ^{a, b}		LLD	LLD	LLD	LLD
Sr-90 ^{a, b}		LLD	LLD	LLD	LLD
Zr-95		LLD	LLD	LLD	LLD
Nb-95		LLD	LLD	LLD	LLD
Mo-99		LLD	LLD	LLD	LLD
Tc-99m		LLD	LLD	LLD	LLD
I-131		LLD	LLD	LLD	LLD
Cs-134		LLD	LLD	LLD	LLD
Cs-137		LLD	LLD	LLD	LLD
Ba-140		LLD	LLD	LLD	LLD
Ce-141		LLD	LLD	LLD	LLD
Total for Period:		N/A	N/A	N/A	N/A
2. <u>Tritium</u>	Ci	2.84E-01	7.94E-01	9.03E-01	8.88E-01
3. <u>Dissolved and Entrained Gases</u>					
Xe-133	Ci	LLD	LLD	LLD	LLD
Xe-135		LLD	LLD	LLD	LLD
Total for Period:		N/A	N/A	N/A	N/A

TABLE 5. LIQUID EFFLUENTS - NUCLIDES RELEASED (continued)

These radionuclides were not identified in concentrations above the lower limit of detection (LLD) listed below. The largest LLD value is used for each radionuclide.

Na-24:	<2.0 E-08	μCi/ml	I-131:	<2.5 E-08	μCi/ml
Cr-51:	<1.7 E-07	μCi/ml	I-132:	<2.2 E-08	μCi/ml
Mn-54:	<2.1 E-08	μCi/ml	I-133:	<2.1 E-08	μCi/ml
Fe-55:	<7.0 E-07	μCi/ml	Kr-85:	<6.2 E-06	μCi/ml
Fe-59:	<4.2 E-08	μCi/ml	Xe-131m:	<7.7 E-07	μCi/ml
Co-57:	<1.6 E-08	μCi/ml	Xe-133:	<4.6 E-08	μCi/ml
Co-58:	<1.9 E-08	μCi/ml	Xe-133m:	<1.6 E-07	μCi/ml
Co-60:	<2.5 E-08	μCi/ml	Xe-135:	<1.9 E-08	μCi/ml
Zn-65:	<5.2 E-08	μCi/ml			
Se-75:	<2.4 E-08	μCi/ml			
Sr-89:	<3.0 E-08	μCi/ml			
Sr-90:	<8.0 E-09	μCi/ml			
Zr-95:	<4.0 E-08	μCi/ml			
Zr-97:	<2.5 E-08	μCi/ml			
Nb-95:	<2.1 E-08	μCi/ml			
Nb-97:	<2.5 E-08	μCi/ml			
Mo-99:	<1.6 E-07	μCi/ml			
Tc-99m:	<1.8 E-08	μCi/ml			
Ru-103:	<2.2 E-08	μCi/ml			
Ru-106:	<2.1 E-07	μCi/ml			
Ag-110m:	<2.5 E-08	μCi/ml			
Sn-113:	<2.8 E-08	μCi/ml			
Sb-124:	<1.7 E-08	μCi/ml			
Sb-125:	<1.7 E-08	μCi/ml			
Te-132:	<1.8 E-08	μCi/ml			
Ce-141:	<3.0 E-08	μCi/ml			
Ce-144:	<1.7 E-07	μCi/ml			
Cs-134:	<2.1 E-08	μCi/ml			
Cs-136:	<2.8 E-08	μCi/ml			
Cs-137:	<2.7 E-08	μCi/ml			
Cs-138:	<6.7 E-08	μCi/ml			
Ba-140:	<7.0 E-08	μCi/ml			
Np-239:	<1.2 E-07	μCi/ml			

^a Quarterly composite sample

^b LLDs are applicable to both batch and continuous modes due to identical sample and analysis methods.

^c There were no abnormal liquid releases during the reporting period.

TABLE 6. SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

A. Solid Waste Shipped Offsite for Burial or Disposal (not irradiated fuel)

1. TYPE OF WASTE	UNIT	QUANTITY	EST. TOTAL PERCENT ERROR
a. Spent resins, filter sludges, evaporator bottoms, etc.	m ³ Ci	3.62E+01 7.68E+02	2.5 E+01
b. Dry compressible waste, contaminated equipment, etc.	m ³ Ci	2.93E+01 2.35E+00	2.5 E+01
c. Irradiated components, control rods, etc.	m ³ Ci	0.00E+00 0.00E+00	2.5 E+01
d. Other:			
1. Dewatered Primary System Cartridge Filters	m ³ Ci	1.74E+00 9.79E+00	2.5 E+01

2. Estimate of Major Nuclide Composition (by type of waste)

	Percent Abundance	
Type a.	Fe-55	4.30E+00
	Co-58	1.46E+00
	Co-60	9.19E+00
	Ni-63	1.70E+01
	Cs-134	2.10E+01
	Cs-137	4.71E+01
Type b.	Fe-55	3.92E+00
	Co-58	6.90E-01
	Co-60	4.13E+00
	Sn-113	3.12E+00
	Ni-63	1.44E+00
	Cs-134	6.84E+00
	Cs-137	1.29E+01
	Ba/La-140	6.64E+01
Type c.	N/A	
Type d.	Fe-55	2.27E+00
	Co-58	7.01E+01
	Co-60	1.36E+00
	Cr-51	2.70E+00
	Mn-54	1.34E+00
	Ni-63	1.60E+00
	Zr-95	1.20E+00
	Nb-95	1.46E+00
	Ba/La-140	1.46E+01

TABLE 6. SOLID WASTE AND IRRADIATED FUEL SHIPMENTS (continued)

3. Solid Waste Disposition

Number of Shipments: 3
Mode of Transportation: Truck
Destination: Barnwell, S.C.
Type of Container (Container Volume): 2 Resin HIC (3.75m³ each) Buried.
1 Resin HIC (5.73m³) Buried.
Solidification Agents: None

Number of Shipments: 2
Mode of Transportation: Truck
Destination: Scientific Ecology Group, Oak Ridge, TN.
Type of Container (Container Volume): 3 - 20 foot Sealands of dry activated waste and contaminated metal (5.0 m³) buried
Solidification Agents: None

Number of Shipments: 1
Mode of Transportation: Truck
Destination: American Ecology, Oak Ridge, TN.
Type of Container (Container volume): 4 steel liners of (5.67m³) each
of dewatered powdered resin for use as waste package filler. (22.68m³)
buried.
Solidification Agents: None

Number of Shipments: 1
Mode of Transportation: Truck
Destination: Scientific Ecology Group, Oak Ridge, TN.
Type of Container (Container Volume): 1 filter HIC
Sent for additional processing, (1.73 m³) Buried.
Solidification Agents: None

Number of Shipments: 2
Mode of Transportation: Truck
Destination: Barnwell, S.C.
Type of Container (Container Volume): 7 Steel Boxes (18.88m³) Buried
5- 55 gal drums (1.06m³) Buried
Solidification Agents: None

Number of Shipments: 3
Mode of Transportation: Truck
Destination: Scientific Ecology Group, Oak Ridge, TN.
Type of Container (Container Volume): 13 Steel Boxes
10 Wood Boxes
1 - 55 gal drum
Sent for additional processing, (1.73m³) Buried.
Solidification agents: None

B. Irradiated Fuel Shipments

There were no shipments of irradiated fuel.

TABLE 7. ANNUAL DOSES DUE TO GASEOUS RELEASES

A. Maximum Individual doses due to I-131, H-3 and Particulates with Half-Lives Greater than 8 Days.		
1. Whole Body Dose		5.54E-04 mrem
2. Significant Organ Dose		7.92E-03 mrem
B. Maximum Individual Dose Due to Noble Gas		
1. Whole Body Dose		1.06E-03 mrad
2. Skin Dose		3.87E-03 mrad
C. Population Doses due to I-131, H-3, and Particulates with Half-Lives Greater than 8 Days.		
1. Total Integrated Population Dose		8.60E-03 rem
2. Average Dose to Individual in Population		4.52E-06 mrem
D. Population Dose due to Noble Gas		
1. Total Integrated Population Dose		1.74E-03 rem
2. Average Dose to Individual in Population		9.15E-07 mrem

TABLE 8. ANNUAL DOSES DUE TO LIQUID RELEASES

A. Maximum Individual Whole Body Dose	6.05E-02 mrem
B. Maximum Individual Significant Organ Dose	7.87E-02 mrem
C. Population Dose	
1. Total Integrated Population Dose	7.21E-01 rem
2. Average Dose to Individual	3.79E-04 mrem

TABLE 9. ANNUAL DOSE TO THE MOST-EXPOSED MEMBER OF THE PUBLIC

	ANNUAL DOSE (mrem)	40 CFR 190 LIMITS (mrem)	PERCENT OF LIMITS
<u>Whole Body Dose</u>			
- Noble Gas	1.06E-03		
- Iodine, Tritium, Particulates	5.54E-04		
- Liquid	6.05E-02		
Total Whole Body Dose	6.21E-02	25	2.48E-01
<u>Thyroid Dose</u>			
- Iodine, Tritium, Particulates	7.92E-03	75	1.06E-02
<u>Skin Dose</u>			
- Noble Gas	3.87E-03	25	1.55E-02
<u>Significant Organ</u>			
<u>Liver Dose</u>			
- Liquid	7.87E-02	25	3.15E-01

METEOROLOGICAL DATA

Meteorological data on 3 1/2 inch microdisk for July 1, 1993 through June 30, 1994 has been submitted with this document to the U. S. Nuclear Regulatory Commission, Document Control Desk, Washington, D. C. 20555.