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U. S. Nuclear Regulatory Commission
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Subject: Arkansas Nuclear One - Units 1 and 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6
Semiannual Radiological Effluent Release Report
for the Third and Fourth Quarters Of 1993

Gentlemen:

Arkansas Nuclear One, Units 1 and 2 (ANO-1 & 2) Technical Specifications 6.12.2.6 and 6.9.3, respectively, require the submittal of a Semiannual Radioactive Effluent Release Report. The purpose of this letter is to complete this reporting requirement for the third and fourth quarters of 1993 at ANO. This submittal also includes the additional information required by Technical Specifications 6.12.2.6 and 6.9.3 which is to be provided in the first report filed each year.

Should you have any questions regarding this submittal, please contact me.

Very truly yours,

Dwight C. Mims

Dwight C. Mims
Director, Licensing

DCM/jjd

Attachment

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ARKANSAS NUCLEAR ONE

UNIT 1 AND UNIT 2
OPERATING LICENSE NO. DPR-51 AND NPF-6

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JULY 1, 1993 THROUGH DECEMBER 31, 1993

TABLE OF CONTENTS

1. INTRODUCTION

Arkansas Nuclear One is a two unit plant consisting of a B&W (Unit 1) and a CE (Unit 2) design. Both liquid and gaseous effluents are released in accordance with the Technical Specifications for each unit. This report is a summary of the effluent data in accordance with Unit 1 Technical Specification 6.12.2.6 and Unit Two Technical Specification 6.9.3. This report provides the following information:

A. Routine radioactive effluent release reports covering the operation of the units during the reporting period.

B. Description of unplanned releases to unrestricted areas.

C. Description of changes to Offsite Dose Calculation Manual (ODCM).

D. Description of changes to Process Control Program (PCP).

E. Summary of radiation doses due to radiological effluents during the previous calendar year. This data is included in the first report of each year.

F. Radiation dose to members of the public due to their activities inside the site boundary. This data is included in the first report of each year.

G. Description of licensee initiated major changes to the radioactive waste systems during the previous calendar year. This data is included in the first report of each year.

H. Items to be reported in the Semiannual Report per other miscellaneous Technical Specifications.

This report covers the period of July 1, 1993 through December 31, 1993.

2. REGULATORY LIMITS

Unit One and Unit Two Technical Specifications contain the limits to which Arkansas Nuclear One must adhere. Because of the "as low as reasonably achievable" (ALARA) philosophy at ANO, an attempt is made to reduce the amount of radiation released to the environment. The following are the limits required by the Technical Specifications.

A. Gaseous Effluents

1. Dose rate due to radioactive materials released in gaseous effluent to unrestricted areas shall be limited to the following:

a. Noble gases

Less than or equal to 500 mrem/year to the total body
Less than or equal to 3000 mrem/year to the skin

b. Iodine-131, tritium, and for all radionuclides in particulate form with half lives greater than 8 days

Less than or equal to 1500 mrem/yr

2. Dose - Noble Gases

Quarterly

Less than or equal to 5 mrads gamma
Less than or equal to 10 mrads beta

Yearly

Less than or equal to 10 mrads gamma
Less than or equal to 20 mrads beta

3. Dose - Iodine-131, Tritium, and Radionuclides in Particulate Form

Quarterly

Less than or equal to 7.5 mrems to any organ

Yearly

Less than or equal to 15 mrems to any organ

B. Liquid Effluents

1. Concentration

The concentration of radioactive material released to the discharge canal shall be limited to the concentration specified in 10CFR20, Appendix B, Table II, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the total concentration released shall be limited to 2E-4 microcuries/ml.

2. Dose

Quarterly

Less than or equal to 1.5 mrem total body
Less than or equal to 5 mrem critical organ

Yearly

Less than or equal to 3 mrem total body
Less than or equal to 10 mrem critical organ

3. SUMMARY OF LIQUID EFFLUENT DATA

The following data is a summary of the number and times of releases for both Unit 1 and Unit 2. These releases occurred between July 1, 1993 and December 31, 1993.

	Unit 1	Unit 2
Number of releases:	197	37
Total time for all releases (minutes):	29269	12324
Maximum time for a release (minutes):	295	1847
Average time for a release (minutes):	147	333
Minimum time for a release (minutes):	12	144

As required by Regulatory Guide 1.21 Rev. 1, a summary of data for liquid releases is to be provided in the Semiannual Report. One unplanned liquid release from Unit 1 occurred during this period, as discussed in Section 9. The following five pages provide a summary of liquid effluents for both Unit 1 and Unit 2:

SEMIANNUAL SUMMATION FOR ALL RELEASES BY QUARTER
(ALL LIQUID EFFLUENTS)
July 1993 through December 1993

Unit 1

Type of Effluent	Units	Quarter 3	Quarter 4	Est. Tot Error %
A. Fission and Activation Products				
1. Total Release (Not Including Tritium, Gases, Alpha)	Curies	7.467E-1	6.444E-1	0
2. Average Diluted Concentration During Period	µCi/ml	2.965E-8	3.757E-8	
3. Percent of Applicable Limit	%	9.884E+0	1.252E+1	
B. Tritium				
1. Total Release	Curies	1.231E+2	1.314E+2	0
2. Average Diluted Concentration During Period	µCi/ml	4.887E-6	7.662E-6	
3. Percent of Applicable Limit	%	1.629E-1	2.554E-1	
C. Dissolved and Entrained Gases				
1. Total Release	Curies	7.305E-1	4.977E-2	0
2. Average Diluted Concentration	µCi/ml	2.901E-8	2.902E-9	
3. Percent of Applicable Limit	%	1.451E-2	1.451E-3	
D. Gross Alpha Radioactivity				
1. Total Release	Curies	3.477E-3	0.000E+0	0
E. Waste Vol Released (Pre-Dilution)	Liters	8.316E+6	7.118E+6	0
F. Volume of Dilution Water Used	Liters	8.745E+10	6.885E+10	0

UNIT 1
REPORT CATEGORY : SEMIANNUAL LIQUID CONTINUOUS AND BATCH RELEASES
: TOTALS FOR EACH NUCLIDE RELEASED.
TYPE OF ACTIVITY : ALL RADIONUCLIDES
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4 YEAR 1993

		CONTINUOUS RELEASES		BATCH RELEASES	
NUCLIDE	UNIT	QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
SR-92	CURIES	0.00E+00	0.00E+00	1.26E-05	0.00E+00
MO-99	CURIES	0.00E+00	0.00E+00	2.48E-05	0.00E+00
KR-85M	CURIES	0.00E+00	0.00E+00	2.52E-05	0.00E+00
RU-103	CURIES	0.00E+00	0.00E+00	1.66E-04	0.00E+00
SN-113	CURIES	0.00E+00	0.00E+00	4.55E-04	0.00E+00
SB-127	CURIES	0.00E+00	0.00E+00	9.88E-04	0.00E+00
XE-131M	CURIES	0.00E+00	0.00E+00	1.01E-03	0.00E+00
TE-132	CURIES	0.00E+00	0.00E+00	1.86E-03	0.00E+00
TC-99M	CURIES	0.00E+00	0.00E+00	3.46E-03	0.00E+00
G-ALPHA	CURIES	0.00E+00	0.00E+00	3.48E-03	0.00E+00
SE-75	CURIES	0.00E+00	0.00E+00	4.09E-03	0.00E+00
MO-99	CURIES	0.00E+00	0.00E+00	4.12E-03	0.00E+00
Y-90	CURIES	0.00E+00	0.00E+00	3.81E-02	0.00E+00
NB-97	CURIES	0.00E+00	0.00E+00	3.84E-04	2.68E-05
OTHER	CURIES	0.00E+00	0.00E+00	0.00E+00	2.94E-05
I-131	CURIES	0.00E+00	0.00E+00	1.14E-02	3.42E-05
I-133	CURIES	0.00E+00	0.00E+00	7.66E-04	3.55E-05
NA-24	CURIES	0.00E+00	0.00E+00	2.29E-05	4.79E-05
BA-140	CURIES	0.00E+00	0.00E+00	0.00E+00	1.39E-04
SR-89	CURIES	0.00E+00	0.00E+00	0.00E+00	2.10E-04
FE-59	CURIES	0.00E+00	0.00E+00	1.96E-04	2.18E-04
XE-133M	CURIES	0.00E+00	0.00E+00	9.73E-03	2.19E-04
XE-135M	CURIES	0.00E+00	0.00E+00	0.00E+00	2.31E-04
AR-41	CURIES	0.00E+00	0.00E+00	1.03E-05	2.32E-04
I-132	CURIES	0.00E+00	0.00E+00	5.48E-03	2.67E-04
Y-91M	CURIES	0.00E+00	0.00E+00	0.00E+00	3.85E-04
SB-126	CURIES	0.00E+00	0.00E+00	2.43E-03	4.48E-04
LA-140	CURIES	0.00E+00	0.00E+00	2.78E-04	5.92E-04
SB-122	CURIES	0.00E+00	0.00E+00	7.41E-03	8.00E-04
XE-135	CURIES	0.00E+00	0.00E+00	2.15E-03	8.62E-04
CO-57	CURIES	0.00E+00	0.00E+00	1.76E-03	8.73E-04
ZR-95	CURIES	0.00E+00	0.00E+00	3.14E-03	1.15E-03
MN-54	CURIES	0.00E+00	0.00E+00	1.26E-03	1.44E-03
AG-110M	CURIES	0.00E+00	0.00E+00	1.09E-02	1.68E-03

NUCLIDE	UNIT	CONTINUOUS RELEASES QUARTER 3	CONTINUOUS RELEASES QUARTER 4	BATCH RELEASES QUARTER 3	BATCH RELEASES QUARTER 4
NB-95	CURIES	0.00E+00	0.00E+00	4.88E-03	2.41E-03
CS-134	CURIES	0.00E+00	0.00E+00	5.52E-03	3.10E-03
CO-60	CURIES	0.00E+00	0.00E+00	2.01E-02	7.37E-03
CS-137	CURIES	0.00E+00	0.00E+00	1.39E-02	1.05E-02
CR-51	CURIES	0.00E+00	0.00E+00	1.76E-02	1.16E-02
FE-55	CURIES	0.00E+00	0.00E+00	6.57E-03	2.34E-02
SB-124	CURIES	0.00E+00	0.00E+00	2.73E-02	2.79E-02
XE-133	CURIES	0.00E+00	0.00E+00	7.18E-01	4.82E-02
SB-125	CURIES	0.00E+00	0.00E+00	1.59E-01	2.02E-01
CO-58	CURIES	0.00E+00	0.00E+00	3.93E-01	3.48E-01
H-3	CURIES	0.00E+00	0.00E+00	1.23E+02	1.31E+02
Total for Period	CURIES	0.00E+00	0.00E+00	1.25E+02	1.32E+02

SEMIANNUAL SUMMATION FOR ALL RELEASES BY QUARTER
(ALL LIQUID EFFLUENTS)
July 1993 through December 1993
Unit 2

Type of Effluent	Units	Quarter 3	Quarter 4	Est. Tot Error %
A. Fission and Activation Products				
1. Total Release (Not Including Tritium, Gases, Alpha)	Curies	9.632E-2	4.073E-2	0
2. Average Diluted Concentration During Period	μCi/ml	7.965E-9	7.031E-9	
3. Percent of Applicable Limit	%	2.655E+0	2.344E+0	
B. Tritium				
1. Total Release	Curies	2.047E+2	4.677E+1	0
2. Average Diluted Concentration During Period	μCi/ml	1.694E-5	8.072E-6	
3. Percent of Applicable Limit	%	5.647E-1	2.691E-1	
C. Dissolved and Entrained Gases				
1. Total Release	Curies	2.033E-1	3.526E-2	0
2. Average Diluted Concentration During Period	μCi/ml	1.682E-8	6.086E-9	
3. Percent of Applicable Limit	%	8.412E-3	3.043E-3	
D. Gross Alpha Radioactivity				
1. Total Release	Curies	2.475E-3	5.814E-4	0
E. Waste Vol Released (Pre-Dilution)	Liters	4.899E+6	1.168E+6	0
F. Volume of Dilution Water Used	Liters	8.745E+10	6.885E+10	0

UNIT 2
REPORT CATEGORY : SEMIANNUAL LIQUID CONTINUOUS AND BATCH RELEASES
: TOTALS FOR EACH NUCLIDE RELEASED.
TYPE OF ACTIVITY : ALL RADIONUCLIDES
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4 YEAR 1993

		CONTINUOUS RELEASES		BATCH RELEASES	
NUCLIDE	UNIT	QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
XE-135	CURIES	0.00E+00	0.00E+00	3.92E-05	0.00E+00
SN-113	CURIES	0.00E+00	0.00E+00	5.28E-05	0.00E+00
CO-57	CURIES	0.00E+00	0.00E+00	1.51E-04	0.00E+00
XE-133M	CURIES	0.00E+00	0.00E+00	2.54E-04	0.00E+00
NA-24	CURIES	0.00E+00	0.00E+00	2.96E-04	0.00E+00
SR-90	CURIES	0.00E+00	0.00E+00	3.65E-04	0.00E+00
CR-51	CURIES	0.00E+00	0.00E+00	1.32E-03	0.00E+00
KR-85	CURIES	0.00E+00	0.00E+00	1.65E-01	0.00E+00
I-132	CURIES	0.00E+00	0.00E+00	1.50E-03	2.42E-06
SB-127	CURIES	0.00E+00	0.00E+00	0.00E+00	2.47E-05
ZR-95	CURIES	0.00E+00	0.00E+00	4.30E-04	3.58E-05
MN-54	CURIES	0.00E+00	0.00E+00	9.26E-04	4.03E-05
NB-95	CURIES	0.00E+00	0.00E+00	9.99E-04	4.91E-05
AG-110M	CURIES	0.00E+00	0.00E+00	2.72E-03	4.99E-05
SR-89	CURIES	0.00E+00	0.00E+00	6.92E-04	1.37E-04
TC-99M	CURIES	0.00E+00	0.00E+00	1.02E-04	1.47E-04
W-187	CURIES	0.00E+00	0.00E+00	0.00E+00	1.71E-04
MO-99	CURIES	0.00E+00	0.00E+00	5.16E-05	1.84E-04
SB-124	CURIES	0.00E+00	0.00E+00	6.36E-04	2.56E-04
CO-60	CURIES	0.00E+00	0.00E+00	5.13E-03	4.40E-04
CS-134	CURIES	0.00E+00	0.00E+00	7.97E-03	4.59E-04
G-ALPHA	CURIES	0.00E+00	0.00E+00	2.47E-03	5.81E-04
I-133	CURIES	0.00E+00	0.00E+00	1.19E-03	6.07E-04
CS-137	CURIES	0.00E+00	0.00E+00	1.57E-02	1.18E-03
FE-55	CURIES	0.00E+00	0.00E+00	4.60E-03	2.52E-03
I-131	CURIES	0.00E+00	0.00E+00	3.82E-03	4.06E-03
SB-125	CURIES	0.00E+00	0.00E+00	1.34E-02	8.83E-03
CO-58	CURIES	0.00E+00	0.00E+00	3.42E-02	2.15E-02
XE-133	CURIES	0.00E+00	0.00E+00	3.79E-02	3.53E-02
H-3	CURIES	0.00E+00	0.00E+00	2.05E+02	4.68E+01
Total for Period	CURIES	0.00E+00	0.00E+00	2.05E+02	4.68E+01

4. SUMMARY OF GASEOUS EFFLUENT DATA

As required by Regulatory Guide 1.21 Rev. 1, a summary of data for gaseous releases is provided in the Semiannual Report. This summary covers releases from July 1, 1993, to December 31, 1993. The summary of gaseous effluents for both Unit 1 and Unit 2 is as follows:

	Unit 1	Unit 2
Number of releases:	66	73
Total time for all releases (minutes):	377297	443108
Maximum time for a release (minutes):	11832	10393
Average time for a release (minutes):	5716	6070
Minimum time for a release (minutes):	1	2

The Unit 1 gaseous releases consisted of:

7 emergency feedwater (EFW) pump releases - These releases were a result of surveillances to the steam driven EFW pump.

6 waste gas decay tank releases.

48 weekly vent releases.

2 unplanned releases.

1 main steam dump release.

2 reactor building purges.

The Unit 2 gaseous releases consisted of:

13 emergency feedwater (EFW) pump releases - These releases were a result of surveillances to the steam driven EFW pump.

59 weekly vent releases.

1 steam release from steam generator blowdown through the flash tank.

The two unplanned releases are discussed in more detail in Section 9. Additional gaseous effluent data is contained in the following summaries (4 pages):

SEMIANNUAL SUMMATION FOR ALL RELEASES BY QUARTER
(ALL AIRBORNE EFFLUENTS)
July 1993 through December 1993
Unit 1

Type of Effluent	Units	Quarter 3	Quarter 4	Est. Total Error %
A. Fission and Activation Products				
1. Total Release	Curies	1.735E+1	5.804E-1	0
2. Average Release Rate For Period	μCi/Sec	2.182E+0	7.302E-2	
3. Percent of Applicable Limit	%	3.055E-2	1.022E-3	
B. Radioiodines				
1. Total Iodine-131	Curies	1.263E-6	1.166E-8	0
2. Average Release Rate For Period	μCi/Sec	1.588E-7	1.467E-9	
3. Percent of Applicable Limit	%	4.448E-7	4.106E-9	
C. Particulates				
1. Particulates(Half-Lives>8 Days)	Curies	0.000E+0	5.764E-7	0
2. Average Release Rate For Period	μCi/Sec	0.000E+0	7.252E-8	
3. Percent of Applicable Limit	%	0.000E+0	2.030E-7	
4. Gross Alpha Radioactivity	Curies	5.798E-7	1.182E-6	
D. Tritium				
1. Total Release	Curies	6.767E-1	2.623E+0	0
2. Average Release Rate For Period	μCi/Sec	8.514E-2	3.300E-1	
3. Percent Of Applicable Limit	%	1.192E-4	4.620E-4	

UNIT 1

REPORT CATEGORY : SEMIANNUAL AIRBORNE GROUND LEVEL
: CONTINUOUS AND BATCH RELEASES.
: TOTALS FOR EACH NUCLIDE RELEASED.
TYPE OF ACTIVITY : FISSION GASES, IODINES, AND PARTICULATES
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4 YEAR 1993

		CONTINUOUS RELEASES		BATCH RELEASES	
NUCLIDE	UNIT	QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
Fission Gases					
KR-85	CURIES	0.00E+00	0.00E+00	0.00E+00	3.68E-04
XE-131M	CURIES	0.00E+00	0.00E+00	1.68E-03	5.39E-04
XE-135	CURIES	0.00E+00	0.00E+00	5.99E-02	7.27E-03
XE-133M	CURIES	0.00E+00	0.00E+00	1.49E+01	1.52E-02
XE-133	CURIES	0.00E+00	0.00E+00	2.36E+00	5.57E-01
Total for Period	CURIES	0.00E+00	0.00E+00	1.73E+01	5.80E-01
Iodines					
I-131	CURIES	0.00E+00	0.00E+00	8.38E-06	0.00E+00
I-132	CURIES	0.00E+00	0.00E+00	1.26E-06	1.17E-08
Total for Period	CURIES	0.00E+00	0.00E+00	9.65E-06	1.17E-08
Particulates					
CO-58	CURIES	0.00E+00	0.00E+00	0.00E+00	2.55E-08
Total for Period	CURIES	0.00E+00	0.00E+00	0.00E+00	2.55E-08
Other					
SR-89	CURIES	0.00E+00	0.00E+00	0.00E+00	5.51E-07
G-ALPHA	CURIES	0.00E+00	0.00E+00	5.80E-07	1.18E-06
H-3	CURIES	0.00E+00	0.00E+00	6.77E-01	2.62E+00
Total for Period	CURIES	0.00E+00	0.00E+00	6.77E-01	2.62E+00

SEMIANNUAL SUMMATION FOR ALL RELEASES BY QUARTER
(ALL AIRBORNE EFFLUENTS)
July 1993 through December 1993
Unit 2

Type of Effluent	Units	Quarter 3	Quarter 4	Est. Total Error %
A. Fission and Activation Products				
1. Total Release	Curies	3.627E+1	0.000E+0	0
2. Average Release Rate For Period	μCi/Sec	4.563E+0	0.000E+0	
3. Percent of Applicable Limit	%	6.388E-2	0.000E+0	
B. Radioiodines				
1. Total Iodine-131	Curies	0.000E+0	0.000E+0	0
2. Average Release Rate For Period	μCi/Sec	0.000E+0	0.000E+0	
3. Percent of Applicable Limit	%	0.000E+0	0.000E+0	
C. Particulates				
1. Particulates(Half-Lives>8 Days)	Curies	4.065E-6	1.946E-7	0
2. Average Release Rate For Period	μCi/Sec	5.117E-7	2.448E-8	
3. Percent of Applicable Limit	%	1.432E-6	6.855E-8	
4. Gross Alpha Radioactivity	Curies	0.000E+0	2.809E-6	
D. Tritium				
1. Total Release	Curies	1.068E+0	1.951E+0	0
2. Average Release Rate For Period	μCi/Sec	1.343E-1	2.455E-1	
3. Percent Of Applicable Limit	%	1.881E-4	3.436E-4	

UNIT 2

REPORT CATEGORY : SEMIANNUAL AIRBORNE GROUND LEVEL
: CONTINUOUS AND BATCH RELEASES .
: TOTALS FOR EACH NUCLIDE RELEASED
TYPE OF ACTIVITY : FISSION GASES, IGDINES, AND PARTICULATES
REPORTING PERIOD : QUARTER # 3 AND QUARTER # 4 YEAR 1993

		CONTINUOUS RELEASES		BATCH RELEASES	
NUCLIDE	UNIT	QUARTER 3	QUARTER 4	QUARTER 3	QUARTER 4
Fission Gases					
XE-133	CURIES	0.00E+00	0.00E+00	3.63E+01	0.00E+00
Total for Period	CURIES	0.00E+00	0.00E+00	3.63E+01	0.00E+01
Iodines					
I-132	CURIES	0.00E+00	0.00E+00	0.00E+00	1.21E-06
I-133	CURIES	0.00E+00	0.00E+00	0.00E+00	1.87E-06
Total for Period	CURIES	0.00E+00	0.00E+00	0.00E+00	3.08E-06
Particulates					
CO-57	CURIES	0.00E+00	0.00E+00	4.54E-07	0.00E+00
CO-58	CURIES	0.00E+00	0.00E+00	3.61E-06	0.00E+00
Total for Period	CURIES	0.00E+00	0.00E+00	4.0[illegible]-06	0.00E+00
Other					
SR-89	CURIES	0.00E+00	0.00E+00	4.61E-09	1.95E-07
G-ALPHA	CURIES	0.00E+00	0.00E+00	0.00E+00	2.81E-06
H-3	CURIES	0.00E+00	0.00E+00	1.07E+00	1.95E+00
Total for Period	CURIES	0.00E+00	0.00E+00	1.07E+00	1.95E+00

5. SUMMARY OF RADIATION DOSES

The following is a summary of the annual radiation doses due to radiological effluents during 1993 calculated in accordance with the Offsite Dose Calculation Manual.

UNIT 1

Liquid Radwaste Effluents (mRem)

Dose Limits: Total Body = 1.5/Qtr 3/Yr, Other Organs = 5/Qtr 10/Yr

Organ	Qtr 1	%	Qtr 2	%	Qtr 3	%	Qtr 4	%	Year	%
TBody	0.0070	0.46	0.0097	0.65	0.0103	0.68	0.0120	0.80	0.0389	1.30
Bone	0.0086	0.17	0.0084	0.17	0.0084	0.17	0.0101	0.20	0.0355	0.35
Liver	0.0085	0.17	0.0135	0.27	0.0138	0.28	0.0163	0.33	0.0521	0.52
Thyroid	0.0008	0.02	0.0013	0.03	0.0084	0.10	0.0003	0.01	0.0074	0.07
Kidney	0.0029	0.06	0.0046	0.09	0.0048	0.10	0.0055	0.11	0.0178	0.18
Lung	0.0011	0.02	0.0017	0.03	0.0017	0.03	0.0021	0.04	0.0065	0.07
GI-LLI	0.0388	0.78	0.0202	0.40	0.0517	1.03	0.0448	0.90	0.1554	1.55

Gaseous Radwaste Effluents

Iodine, H-3, and Particulate, and H-3 (ITP) - Dose Limits (mRem) = 7.5/Qtr 15/Yr

Organ	Qtr 1	%	Qtr 2	%	Qtr 3	%	Qtr 4	%	Year	%
TBody	0.0022	0.03	0.0020	0.03	0.0004	0.01	0.0016	0.02	0.0062	0.04
Bone	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
Liver	0.0022	0.03	0.0020	0.03	0.0004	0.01	0.0016	0.02	0.0062	0.04
Thyroid	0.0032	0.04	0.0021	0.03	0.0007	0.01	0.0016	0.02	0.0076	0.05
Kidney	0.0022	0.03	0.0020	0.03	0.0004	0.01	0.0016	0.02	0.0062	0.04
Lung	0.0022	0.03	0.0020	0.03	0.0004	0.01	0.0016	0.02	0.0062	0.04
GI-LLI	0.0022	0.03	0.0020	0.03	0.0004	0.01	0.0016	0.02	0.0062	0.04

Noble Gas Air Dose Limits (mRad) = Gamma 5/Qtr 10/Yr, Beta 10/Qtr 20/Yr

Type	Qtr 1	%	Qtr 2	%	Qtr 3	%	Qtr 4	%	Year	%
Gamma	0.0000	0.00	0.0000	0.00	0.0005	0.01	0.0000	0.00	0.0005	0.00
Beta	0.0000	0.00	0.0000	0.00	0.0022	0.03	0.0001	0.00	0.0023	0.02

UNIT 2

Liquid Radwaste Effluents (mRem)

Dose Limits : Total Body = 1.5/Qtr 3/Yr, Other Organs =/Qtr 10/Yr

Organ	Qtr 1	%	Qtr 2	%	Qtr 3	%	Qtr 4	%	Year	%
TBody	0.0091	0.61	0.0417	2.78	0.0124	0.83	0.0014	0.10	0.0646	2.15
Bone	0.0071	0.14	0.0342	0.68	0.0112	0.22	0.0012	0.02	0.0537	0.54
Liver	0.0127	0.25	0.0575	1.15	0.0166	0.33	0.0019	0.04	0.0888	0.89
Thyroid	0.0001	0.00	0.0010	0.02	0.0112	0.04	0.0028	0.06	0.0060	0.06
Kidney	0.0042	0.08	0.0205	0.41	0.0057	0.11	0.0007	0.01	0.0311	0.31
Lung	0.0014	0.03	0.0064	0.13	0.0021	0.04	0.0003	0.01	0.0101	0.10
GI-LLI	0.0056	0.11	0.0157	0.31	0.0103	0.21	0.0014	0.03	0.0330	0.33

Gaseous Radwaste Effluents

Iodine, H-3, and Particulate - Dose Limits (mRem) = 7.5/Qtr 15/Yr

Organ	Qtr 1	%	Qtr 2	%	Qtr 3	%	Qtr 4	%	Year	%
TBody	0.0017	0.02	0.0009	0.01	0.0007	0.01	0.0012	0.02	0.0045	0.03
Bone	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.00
Liver	0.0017	0.02	0.0009	0.01	0.0007	0.01	0.0012	0.02	0.0045	0.03
Thyroid	0.0017	0.02	0.0010	0.01	0.0007	0.01	0.0012	0.02	0.0045	0.03
Kidney	0.0017	0.02	0.0009	0.01	0.0007	0.01	0.0012	0.02	0.0045	0.03
Lung	0.0017	0.02	0.0009	0.01	0.0007	0.01	0.0012	0.02	0.0045	0.03
GI-LLI	0.0017	0.02	0.0009	0.01	0.0007	0.01	0.0012	0.02	0.0045	0.03

Noble Gas Air dose Limits (mRad) = Gamma 5/Qtr 10/Yr, Beta 10/Qtr 20/Yr

Type	Qtr 1	%	Qtr 2	%	Qtr 3	%	Qtr 4	%	Year	%
Gamma	0.0000	0.00	0.0001	0.00	0.0011	0.02	0.0000	0.00	0.0012	0.01
Beta	0.0000	0.00	0.0026	0.03	0.0034	0.05	0.0000	0.00	0.0060	0.04

6. SUMMARY OF DOSE TO MEMBERS OF THE PUBLIC

The following is a summary of the annual radiation dose to members of the public due to activities inside the site boundary.

UNIT 1

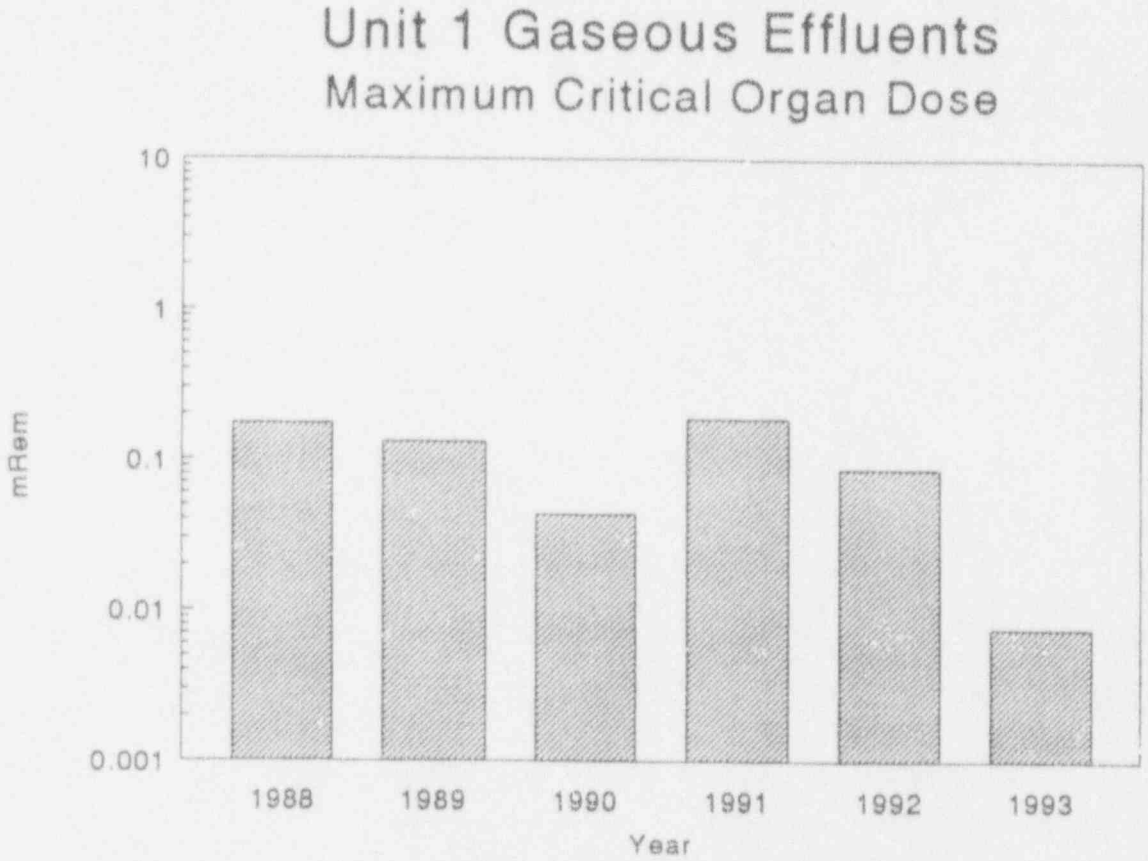
	BONE	LIVER	TBODY	THYROID	KIDNEY	GI-LLI	LUNG	SKIN
Gaseous Effluent								
ITP	8.38E-6	2.73E-3	2.73E-3	3.31E-3	2.73E-3	2.73E-3	2.73E-3	
Noble Gas			1.28E-4					6.12E-4
Liquid Effluent								
Fish	3.55E-2	5.21E-2	3.89E-2	7.45E-3	1.78E-2	6.51E-3	1.55E-1	
Sediment			2.09E-3					2.45E-3
Unit 1 Total	3.55E-2	5.49E-2	4.17E-2	1.08E-2	2.05E-2	9.24E-3	1.58E-1	3.06E-3

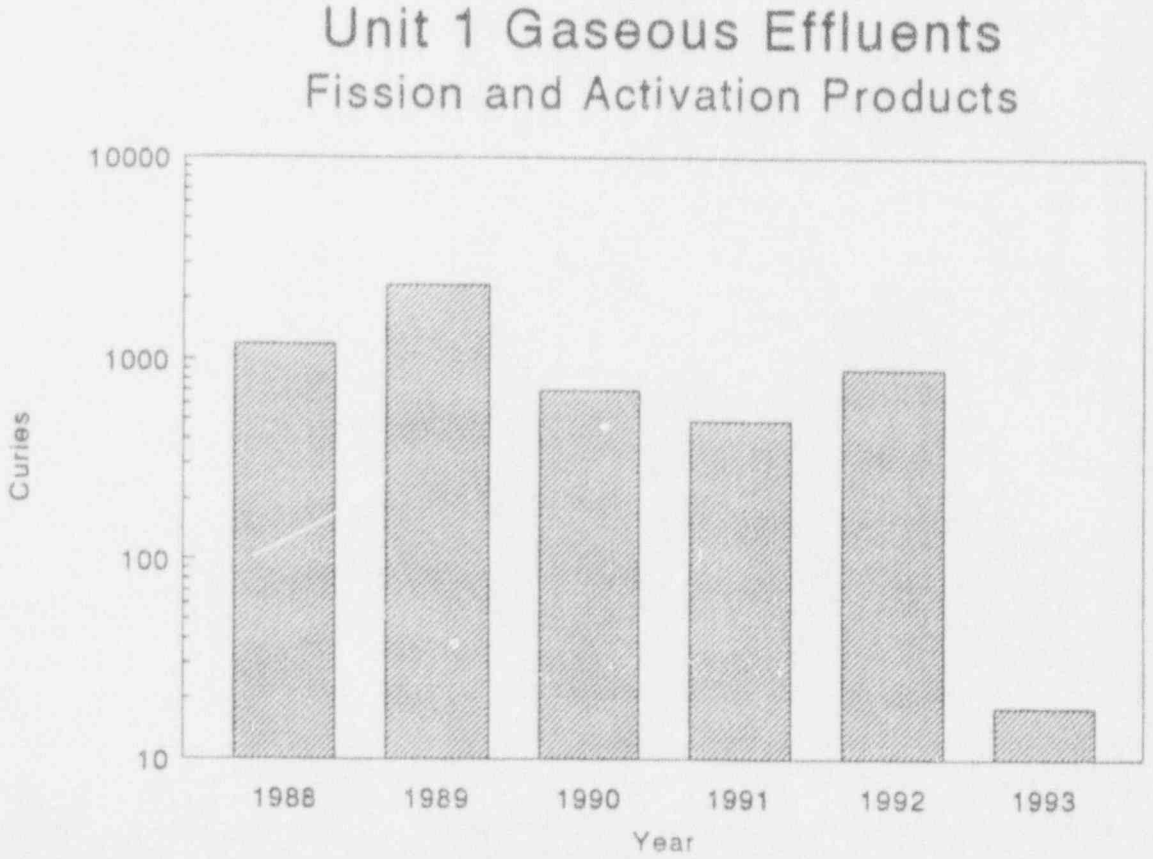
UNIT 2

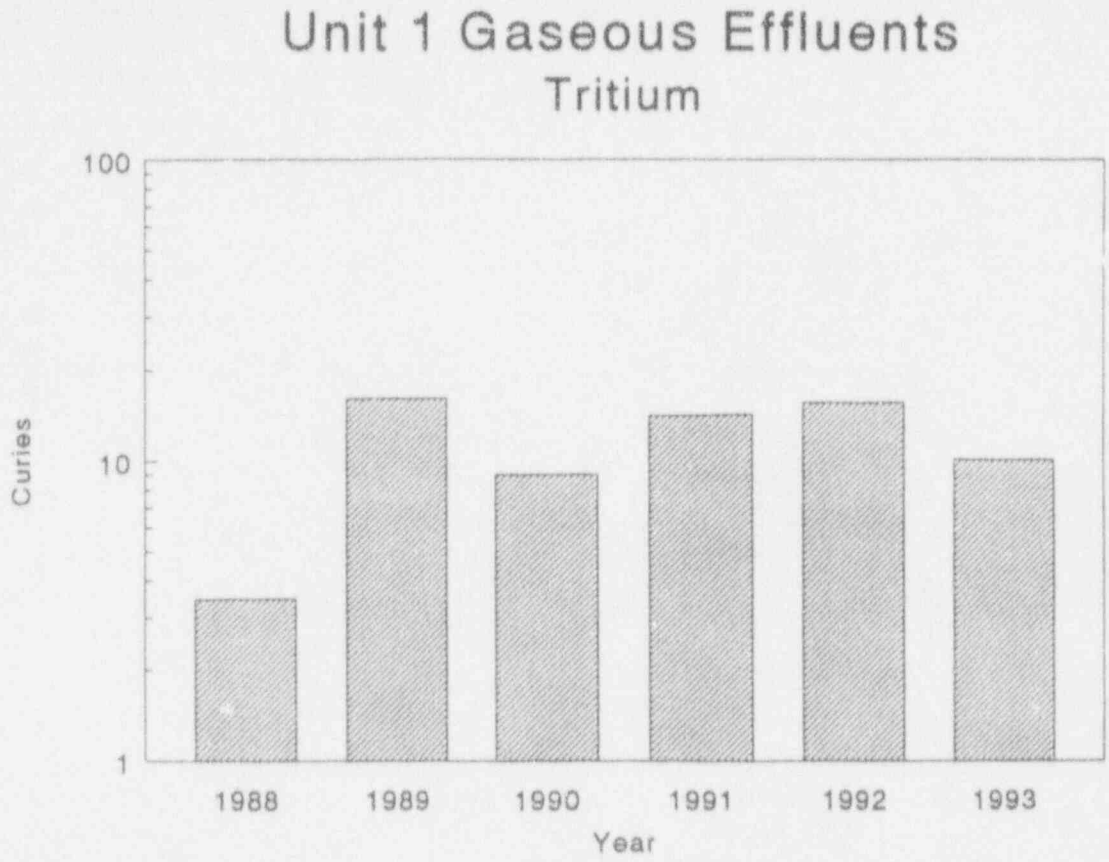
Gaseous Effluent								
ITP	2.49E-6	2.96E-3	1.96E-3	1.98E-3	1.96E-3	1.96E-3	1.96E-3	
Noble Gas			3.18E-4					1.25E-3
Liquid Effluent								
Fish	5.37E-2	8.88E-2	6.46E-2	6.01E-3	3.11E-2	1.01E-2	3.30E-2	
Sediment			9.77E-4					1.14E-3
Unit 2 Total	5.37E-2	9.07E-2	6.69E-2	7.99E-3	3.31E-2	1.21E-2	3.50E-2	2.39E-3
Site Total	8.92E-2	1.46E-1	1.09E-1	1.87E-2	5.36E-2	2.13E-2	1.93E-1	5.45E-3
Limit (40CFR190)	25	25	25	75	25	25	25	25
% Limit	3.57E-1	5.82E-1	4.36E-1	2.49E-2	2.15E-1	8.53E-2	7.73E-1	2.18E-2

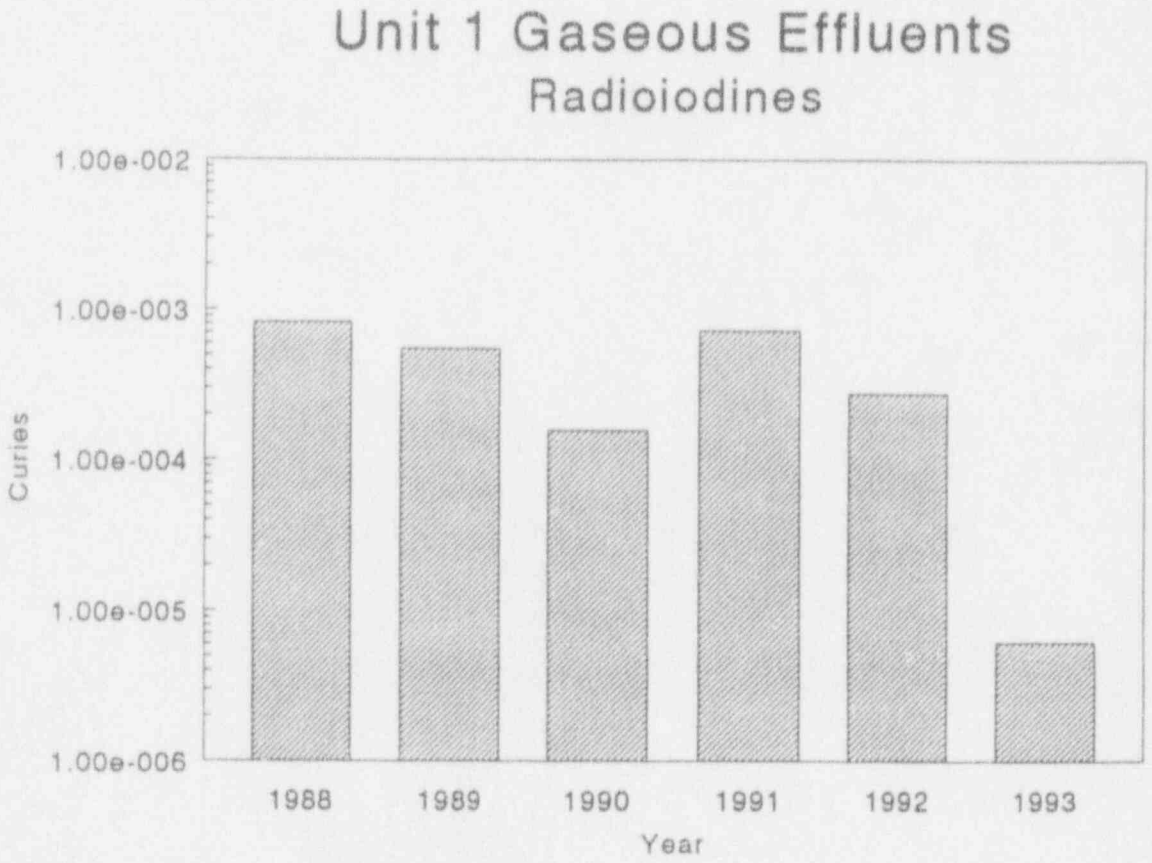
7. HISTORICAL EFFLUENT DATA

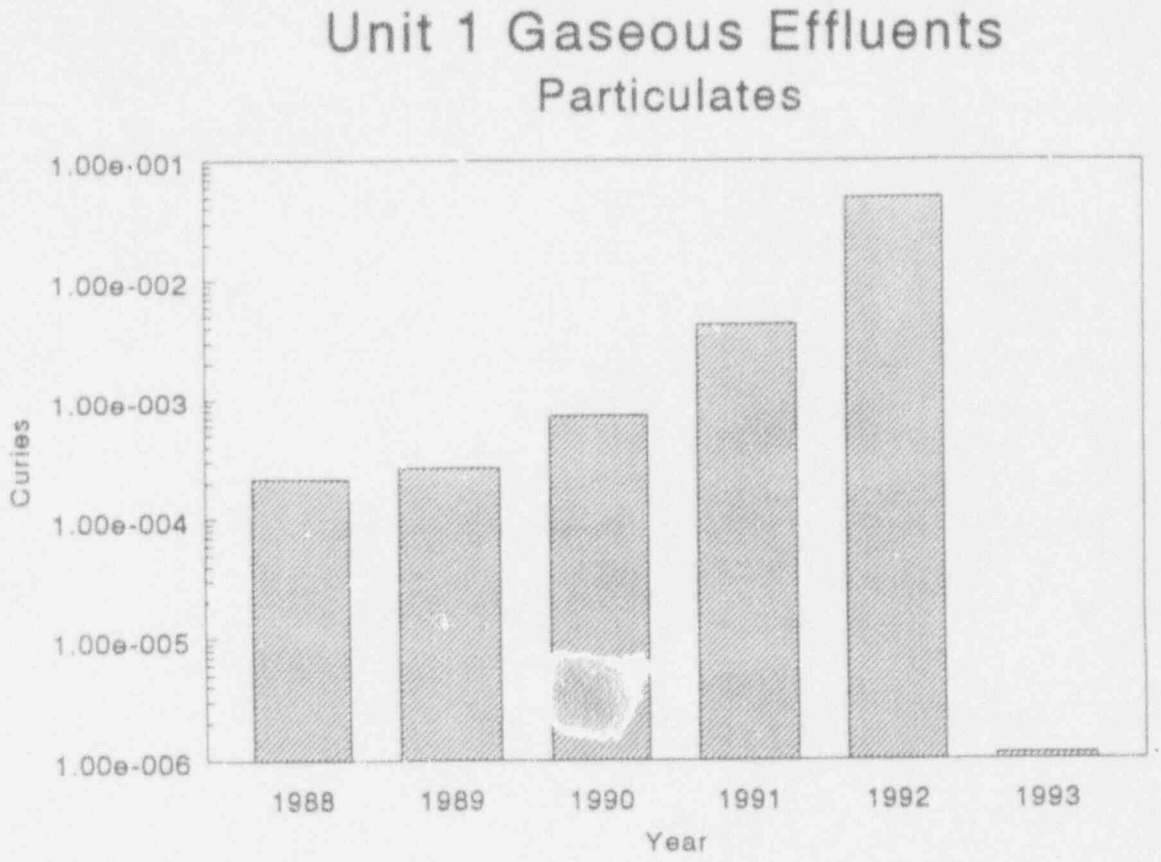
The following graphs show the historical release data for both units on a yearly basis. These graphs compare data from 1988 through 1993.

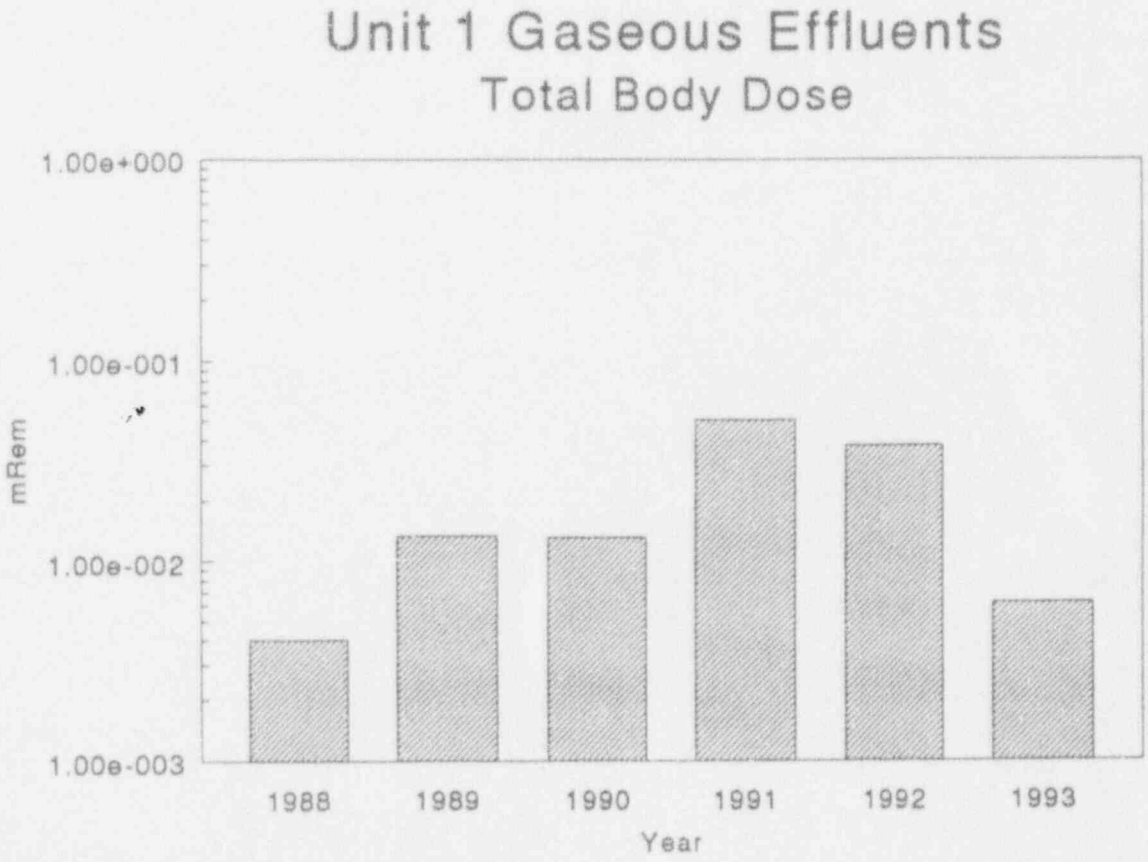




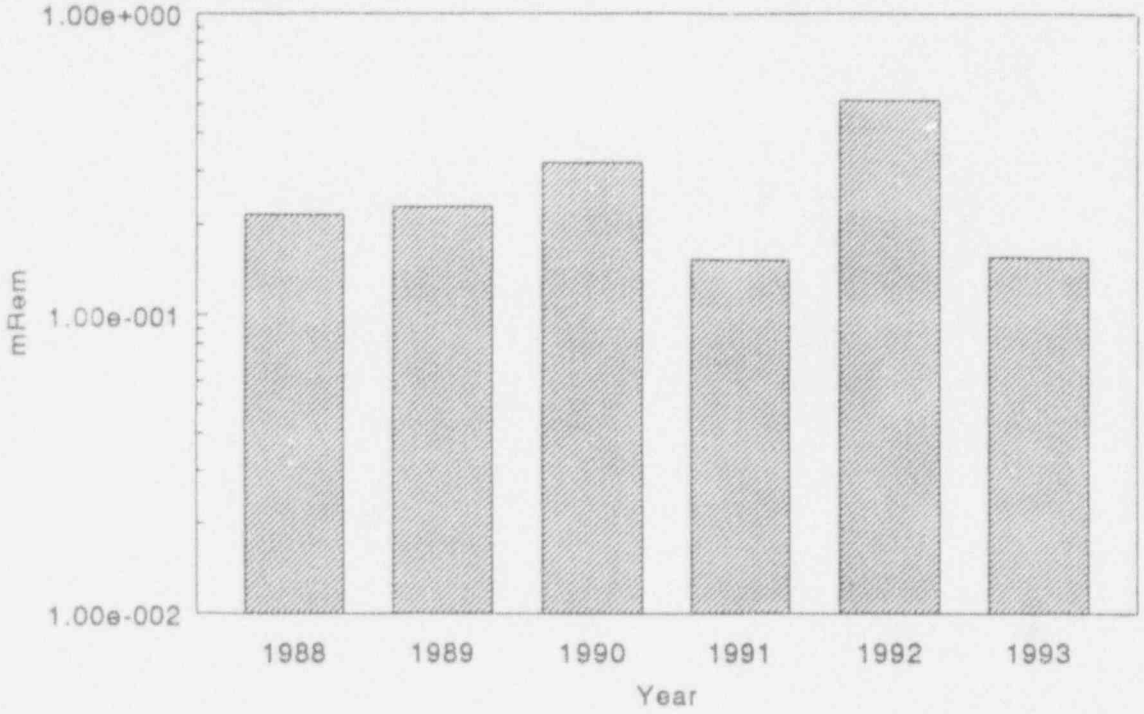

Unit 1 Gaseous Effluents
Tritium
100
10
1
Curies
1988
1989
1990
1991
1992
1993
Year


Unit 1 Gaseous Effluents
Radioiodines
1.00e-002
1.00e-003
1.00e-004
1.00e-005
1.00e-006
Curies
1988
1989
1990
1991
1992
1993
Year

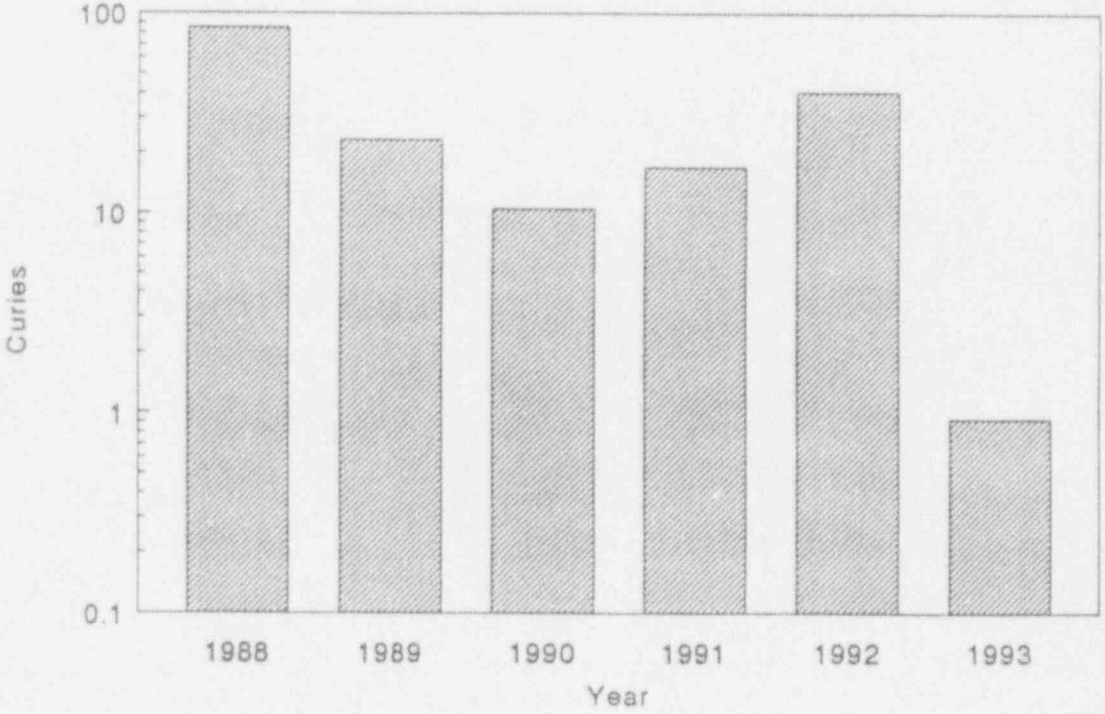

Unit 1 Gaseous Effluents
Particulates
1.00e-001
1.00e-002
1.00e-003
1.00e-004
1.00e-005
1.00e-006
Curies
1988
1989
1990
1991
1992
1993
Year

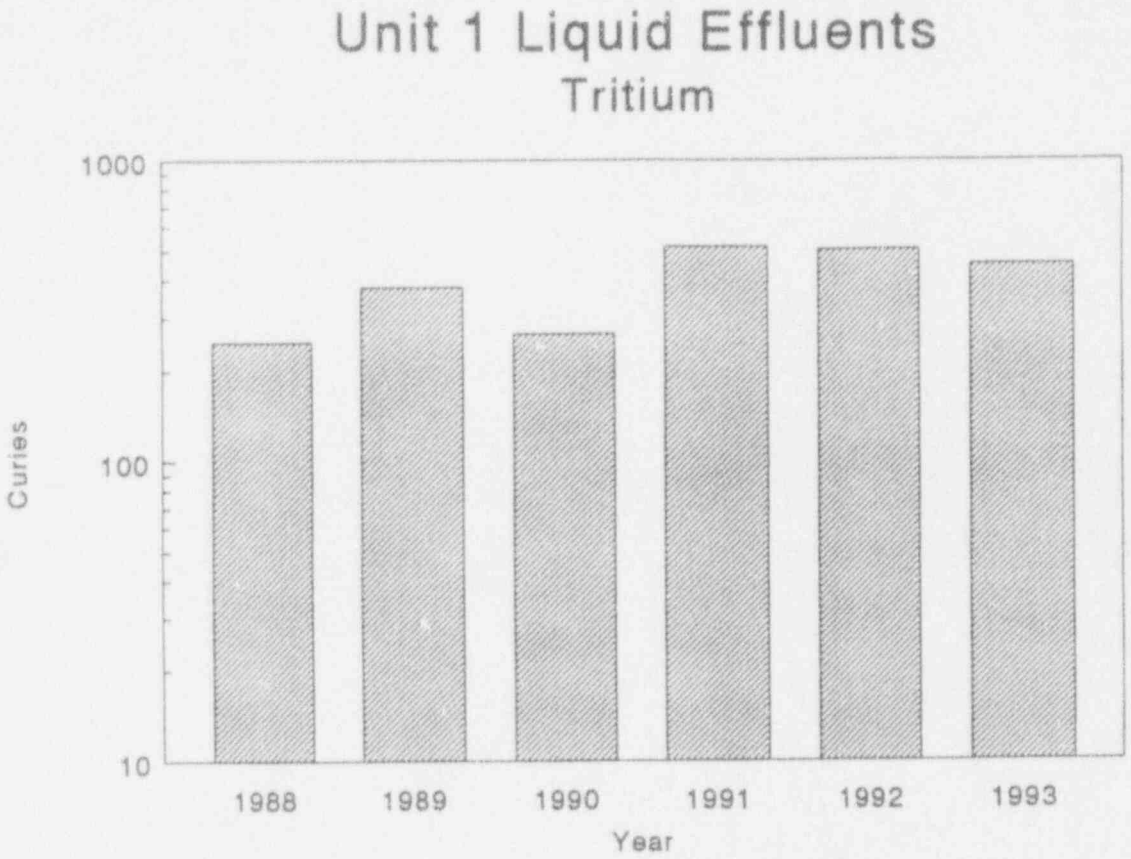

Unit 1 Gaseous Effluents
Total Body Dose
1.00e+000
1.00e-001
1.00e-002
1.00e-003
mRem
1988
1989
1990
1991
1992
1993
Year

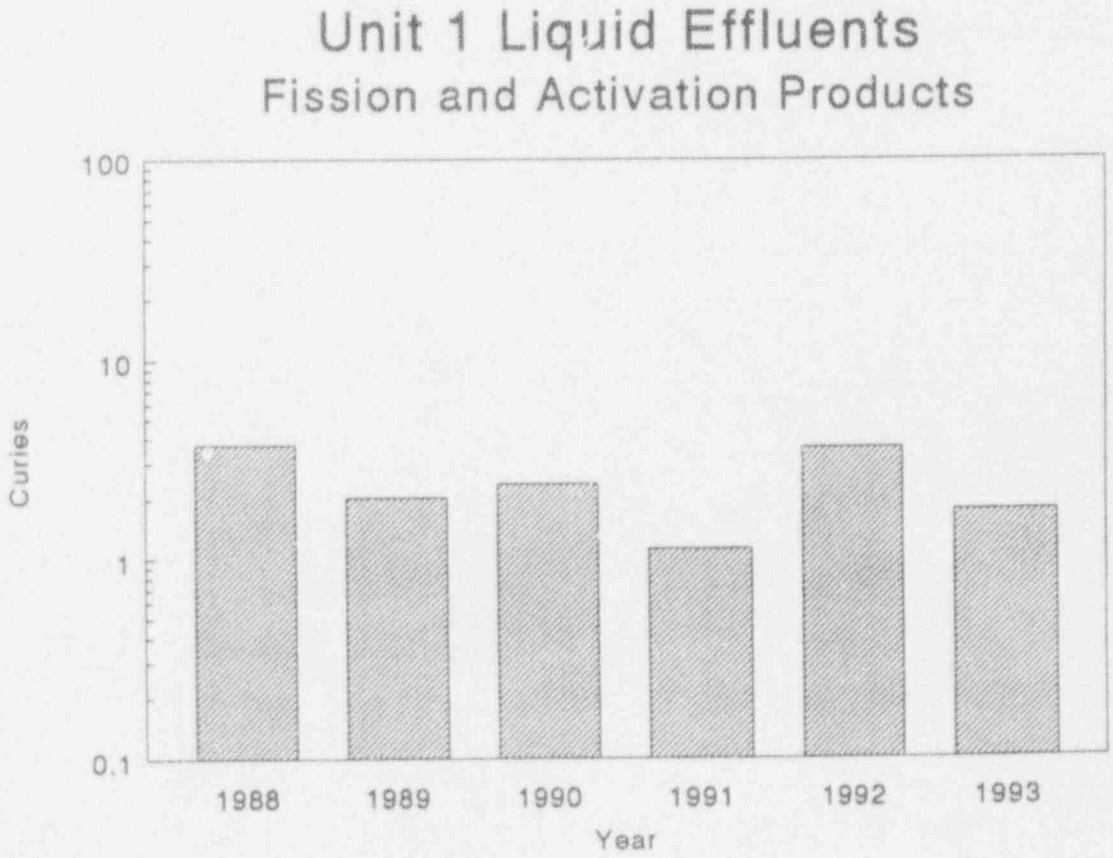
Unit 1 Liquid Effluents
Maximum Critical Organ Dose

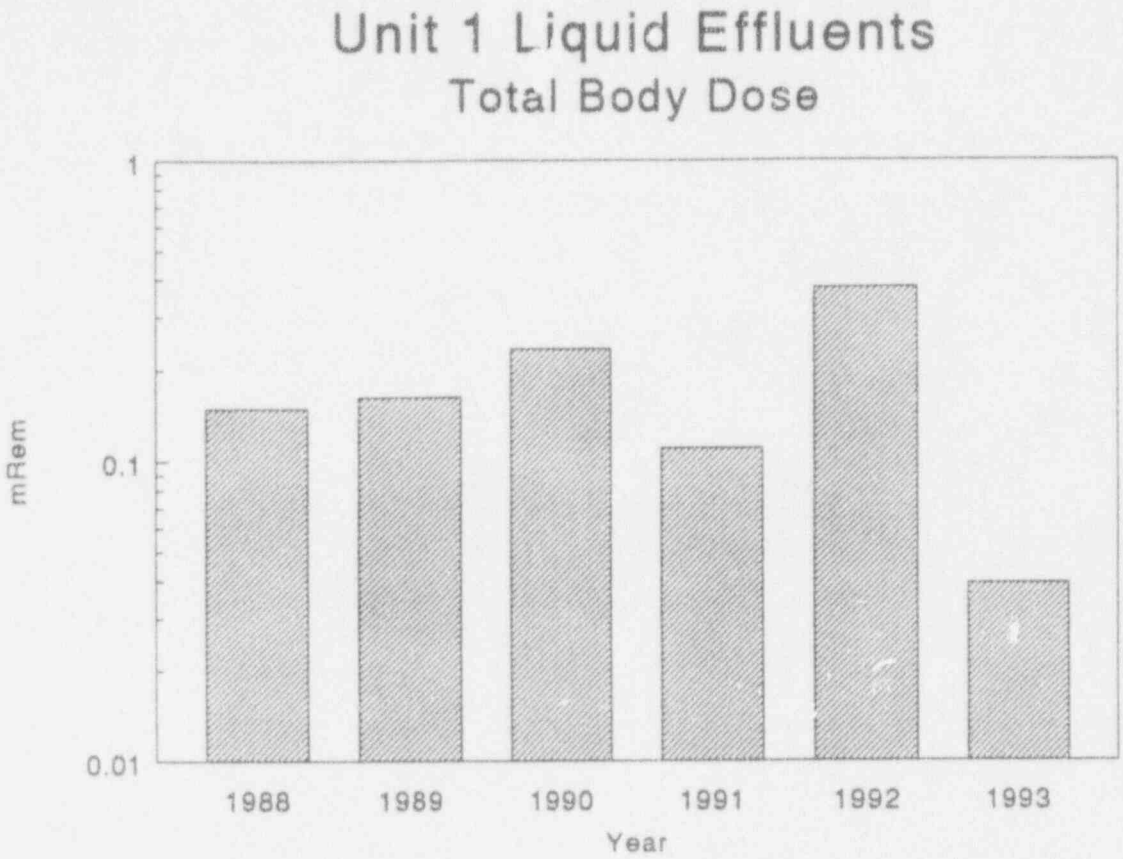


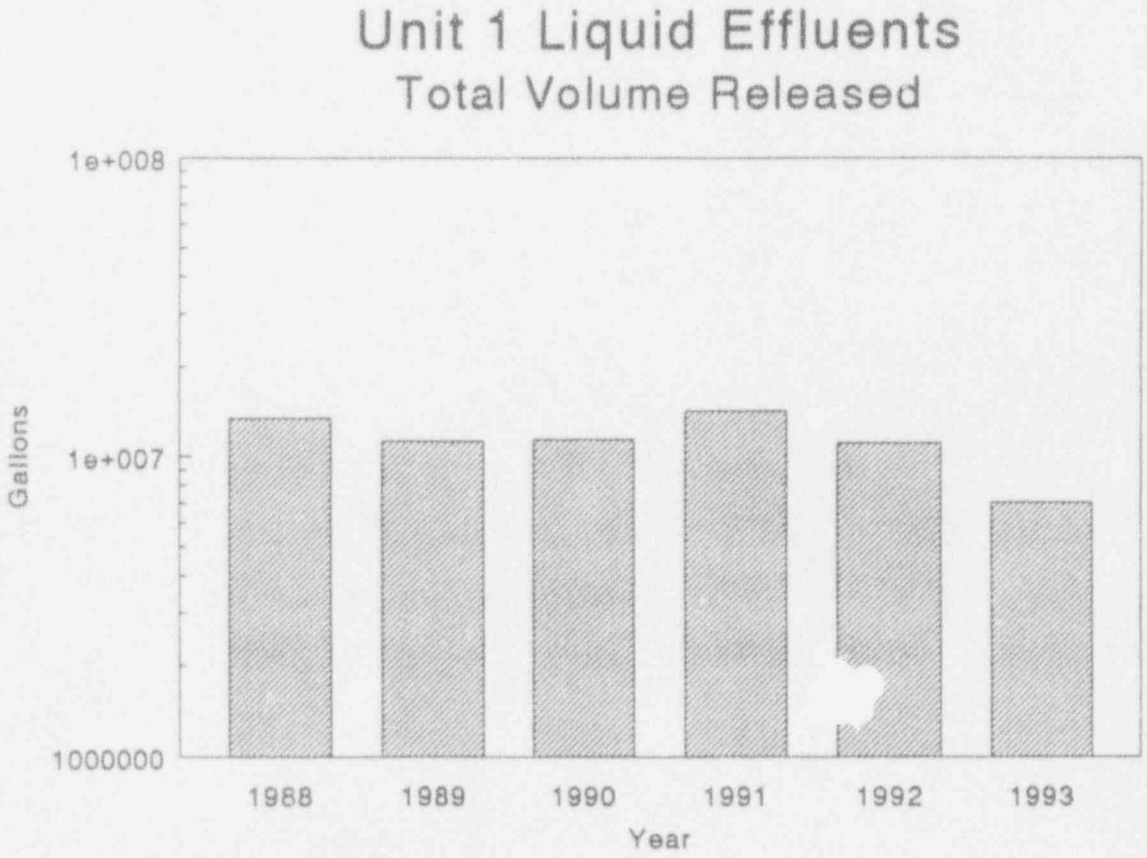
Unit 1 Liquid Effluents
Dissolved and Entrained Gases

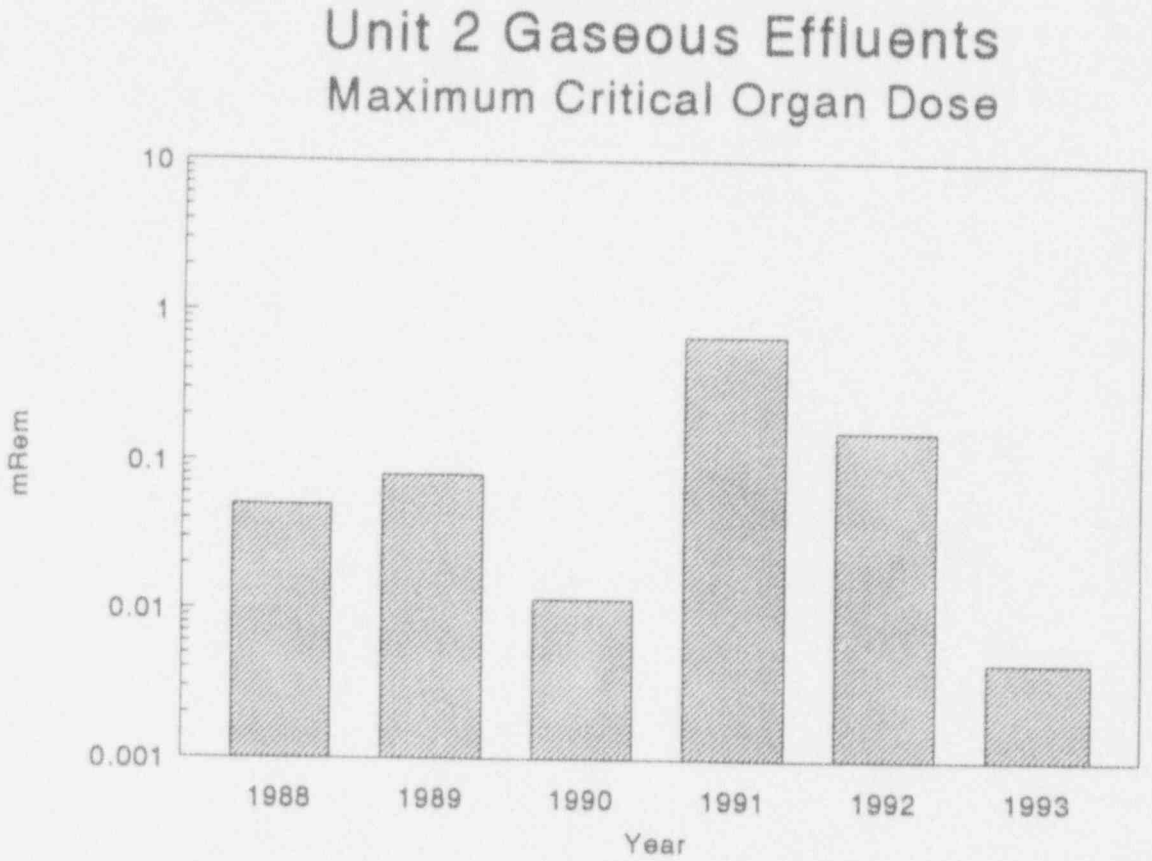


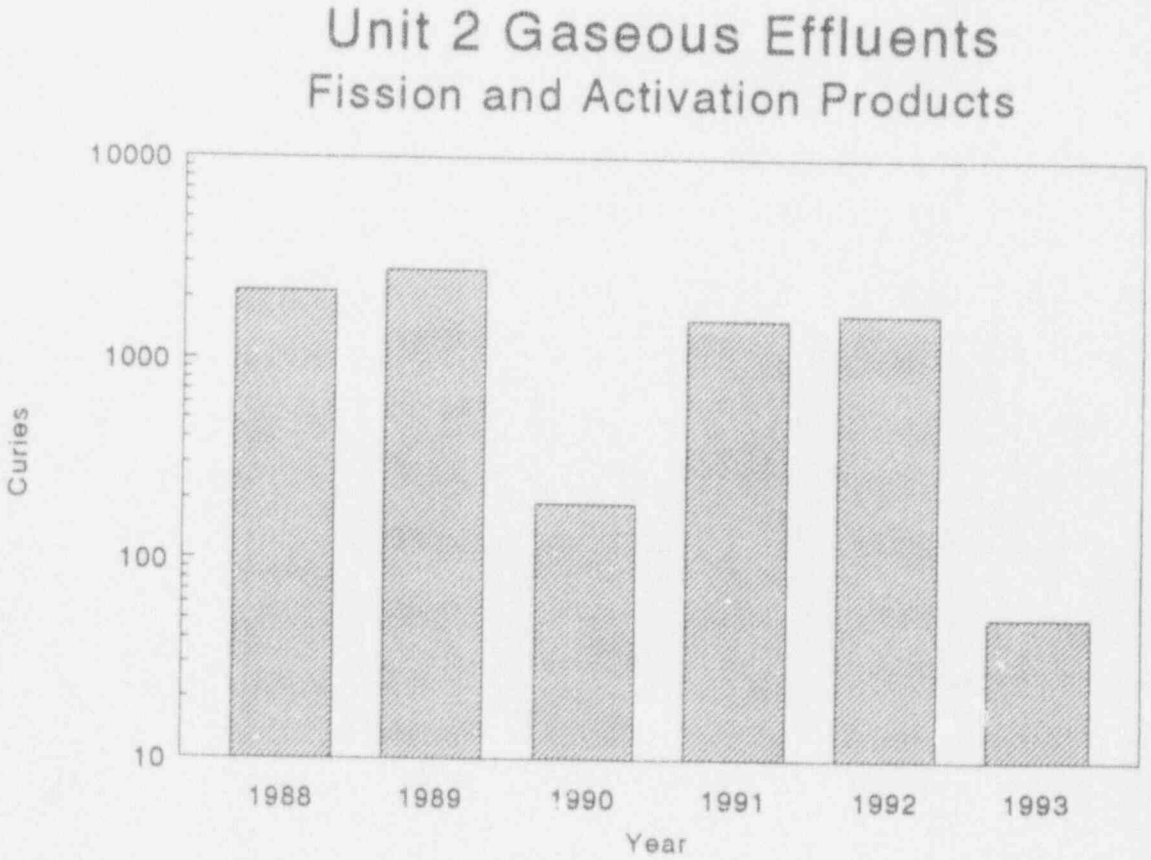

Unit 1 Liquid Effluents
Tritium
1000
100
10
Curies
1988
1989
1990
1991
1992
1993
Year

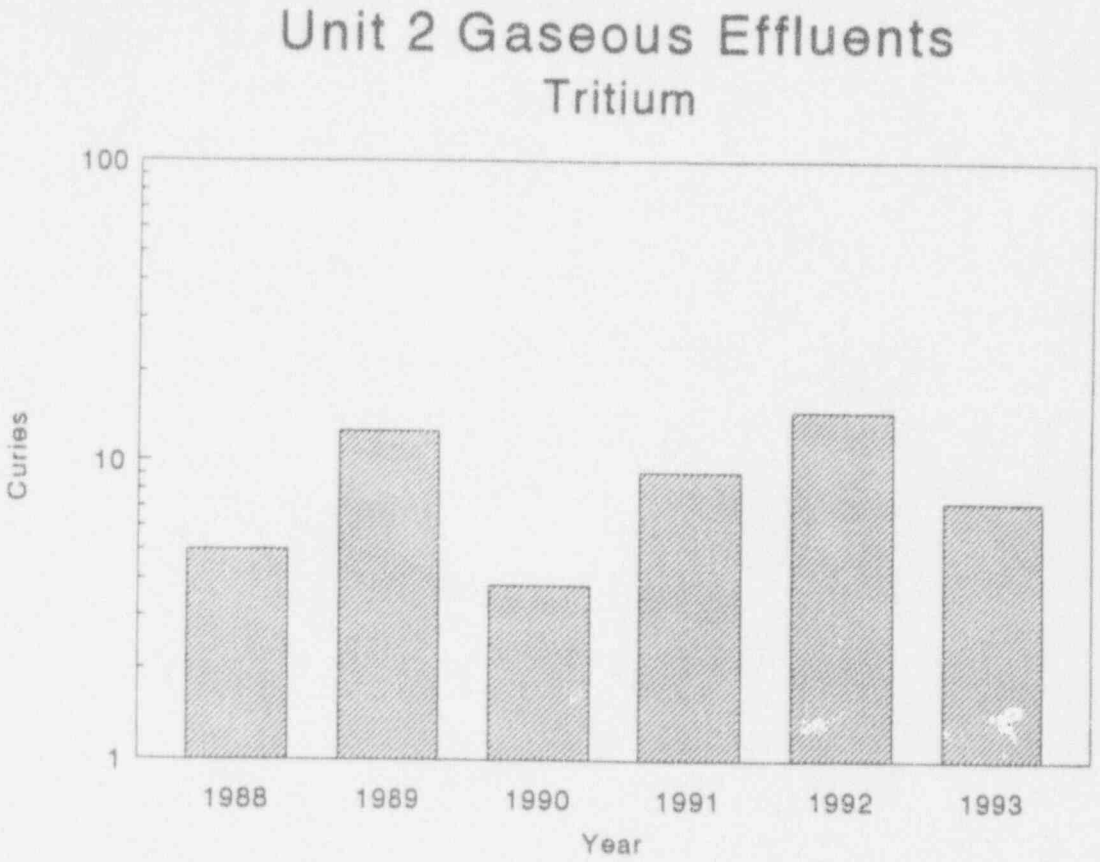

Unit 1 Liquid Effluents
Fission and Activation Products
100
10
1
0.1
Curies
1988
1989
1990
1991
1992
1993
Year

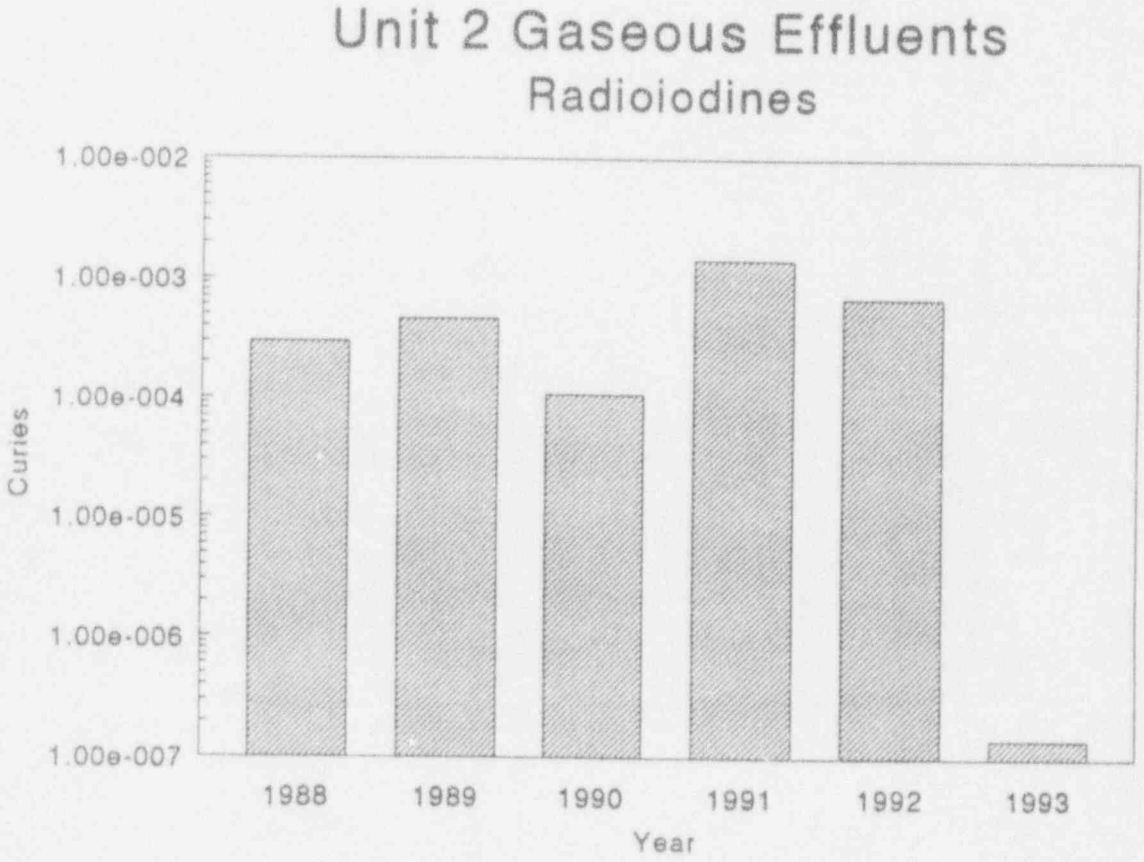

Unit 1 Liquid Effluents
Total Body Dose
1
0.1
0.01
mRem
1988
1989
1990
1991
1992
1993
Year

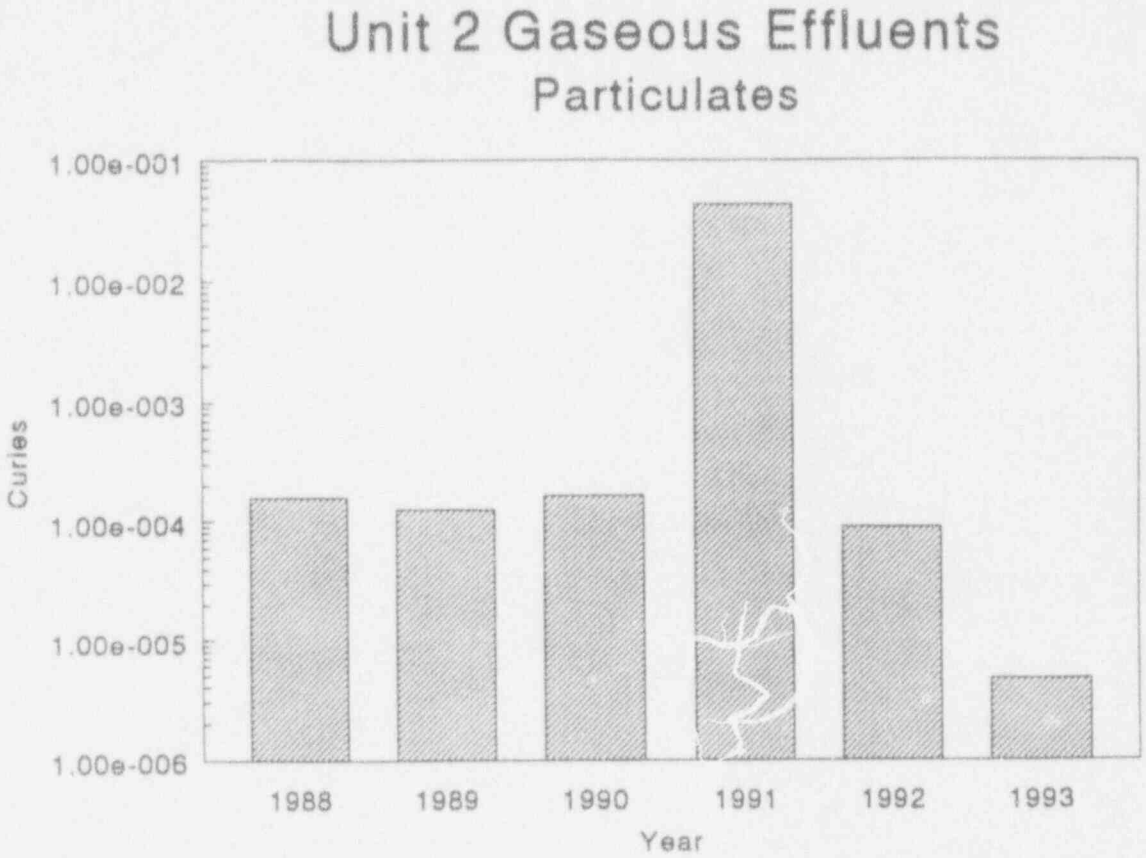

Unit 1 Liquid Effluents
Total Volume Released
1e+008
1e+007
1000000
Gallons
1988
1989
1990
1991
1992
1993
Year

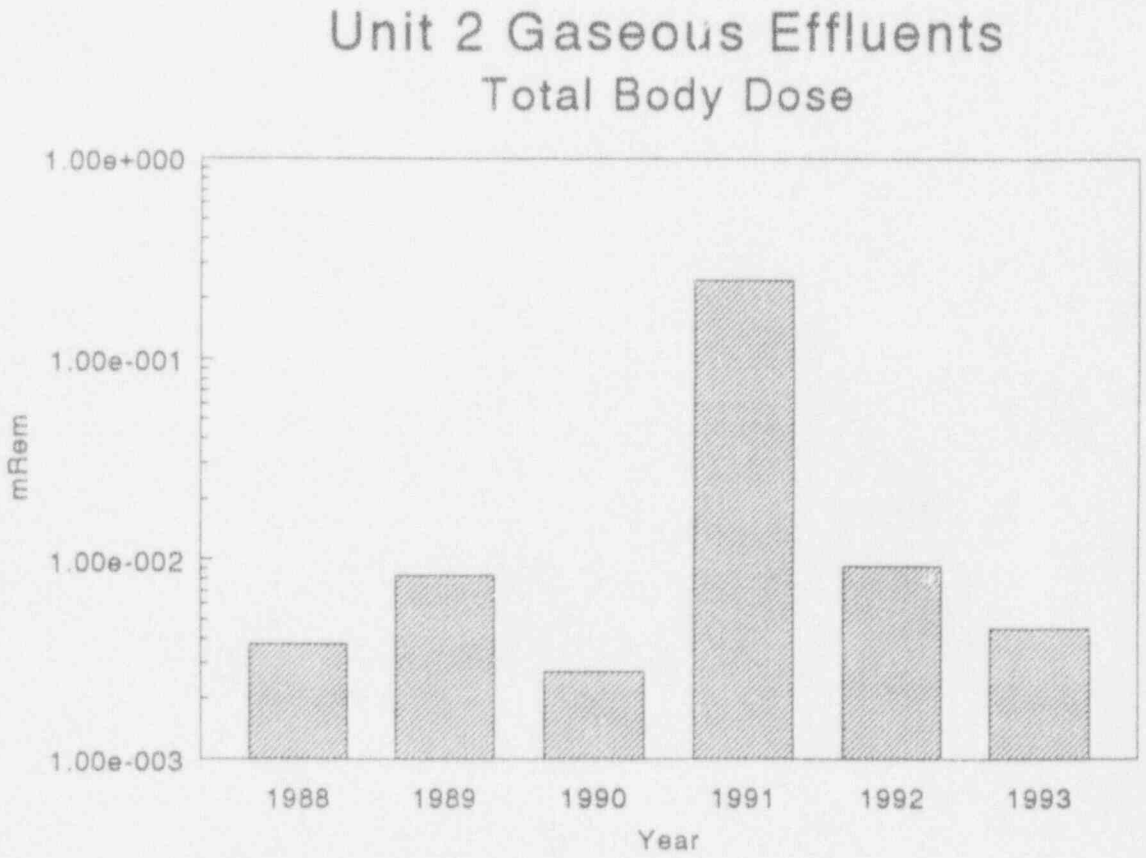

Unit 2 Gaseous Effluents
Maximum Critical Organ Dose
10
1
0.1
0.01
0.001
mRem
1988
1989
1990
1991
1992
1993
Year

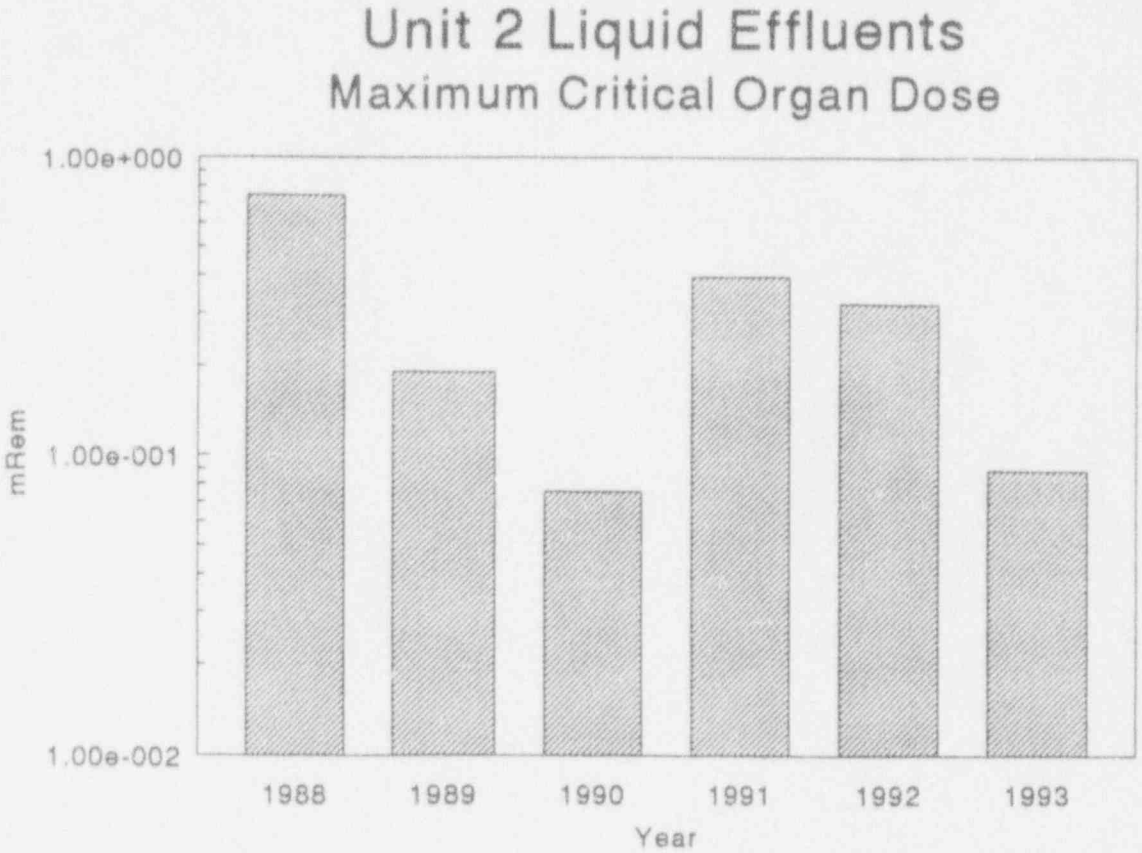

Unit 2 Gaseous Effluents
Fission and Activation Products
10000
1000
100
10
Curies
1988
1989
1990
1991
1992
1993
Year

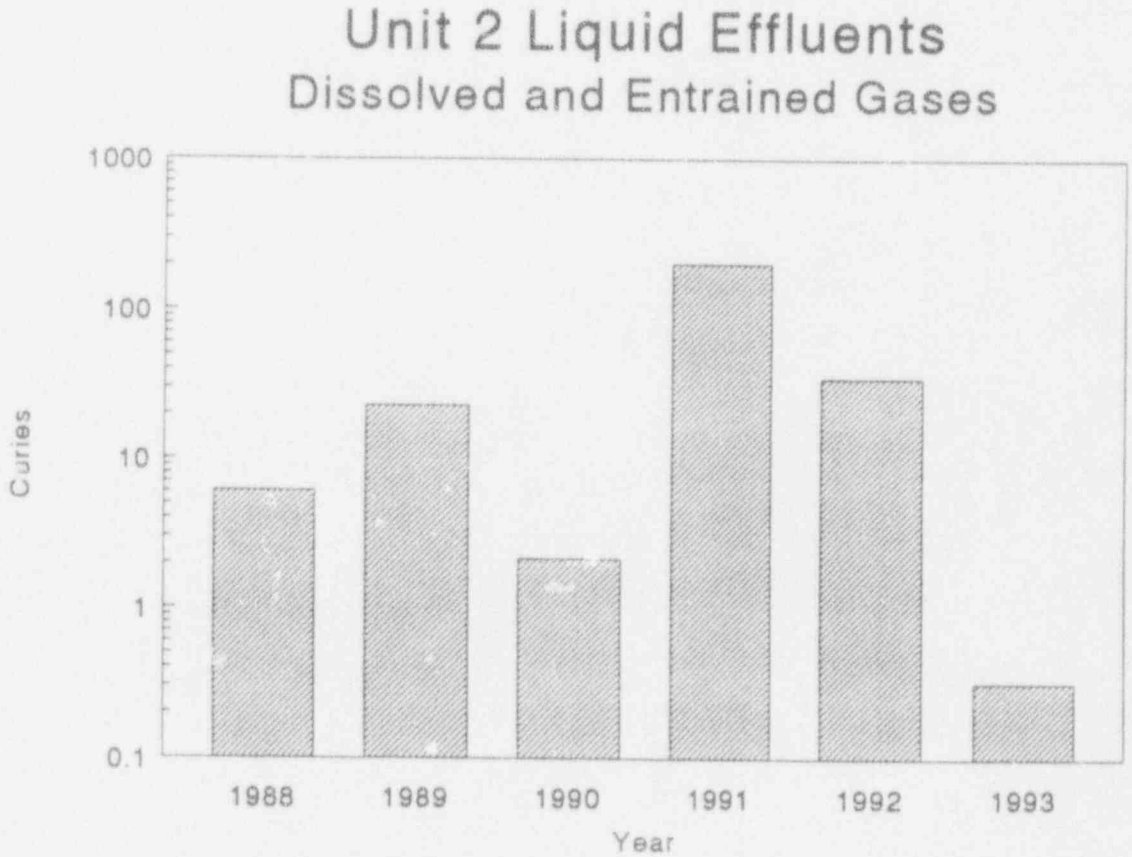

Unit 2 Gaseous Effluents
Tritium
100
10
1
Curies
1988
1989
1990
1991
1992
1993
Year

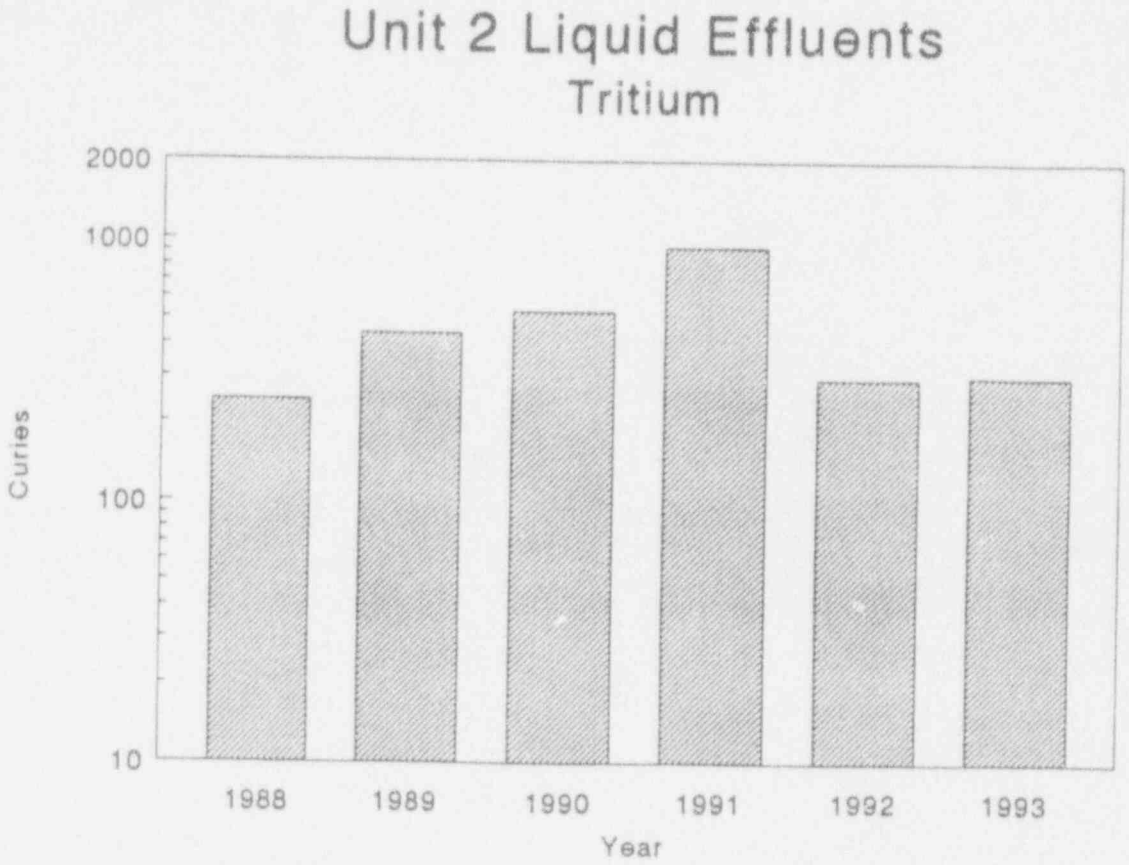

Unit 2 Gaseous Effluents
Radioiodines
1.00e-002
1.00e-003
1.00e-004
1.00e-005
1.00e-006
1.00e-007
Curies
1988
1989
1990
1991
1992
1993
Year

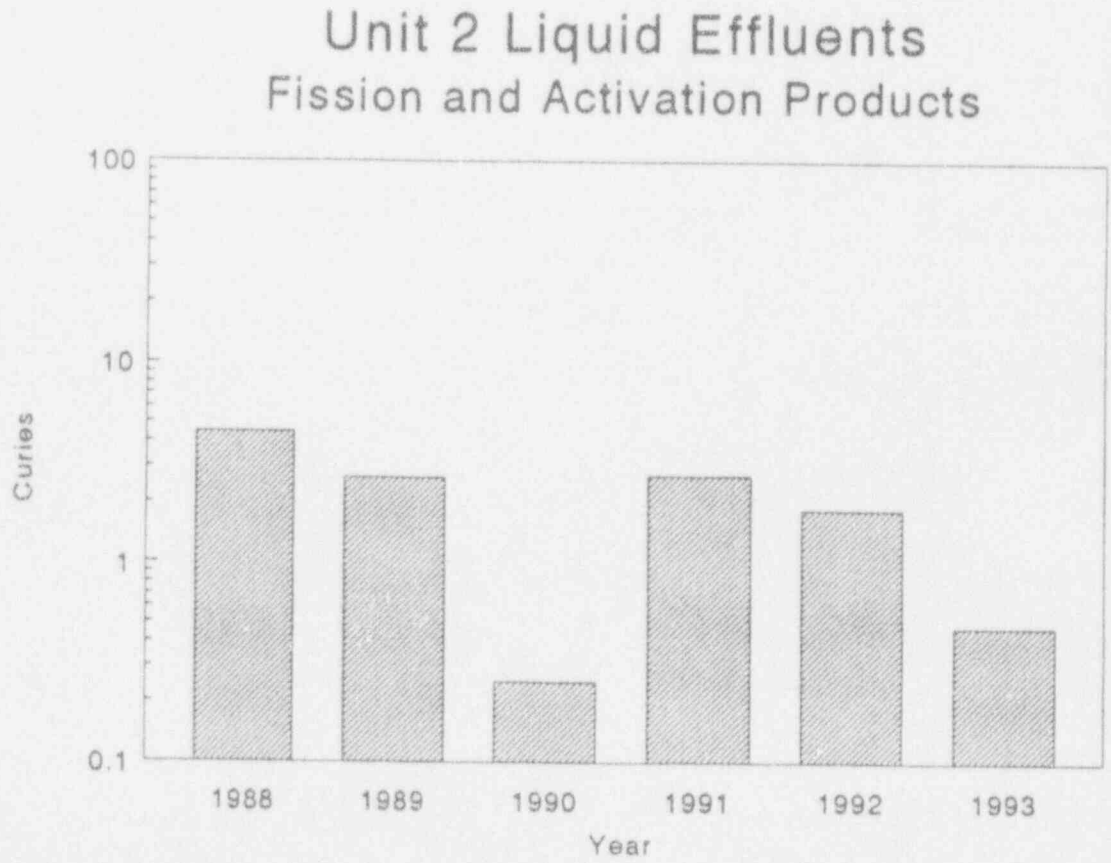

Unit 2 Gaseous Effluents
Particulates
1.00e-001
1.00e-002
1.00e-003
1.00e-004
1.00e-005
1.00e-006
Curies
1988
1989
1990
1991
1992
1993
Year

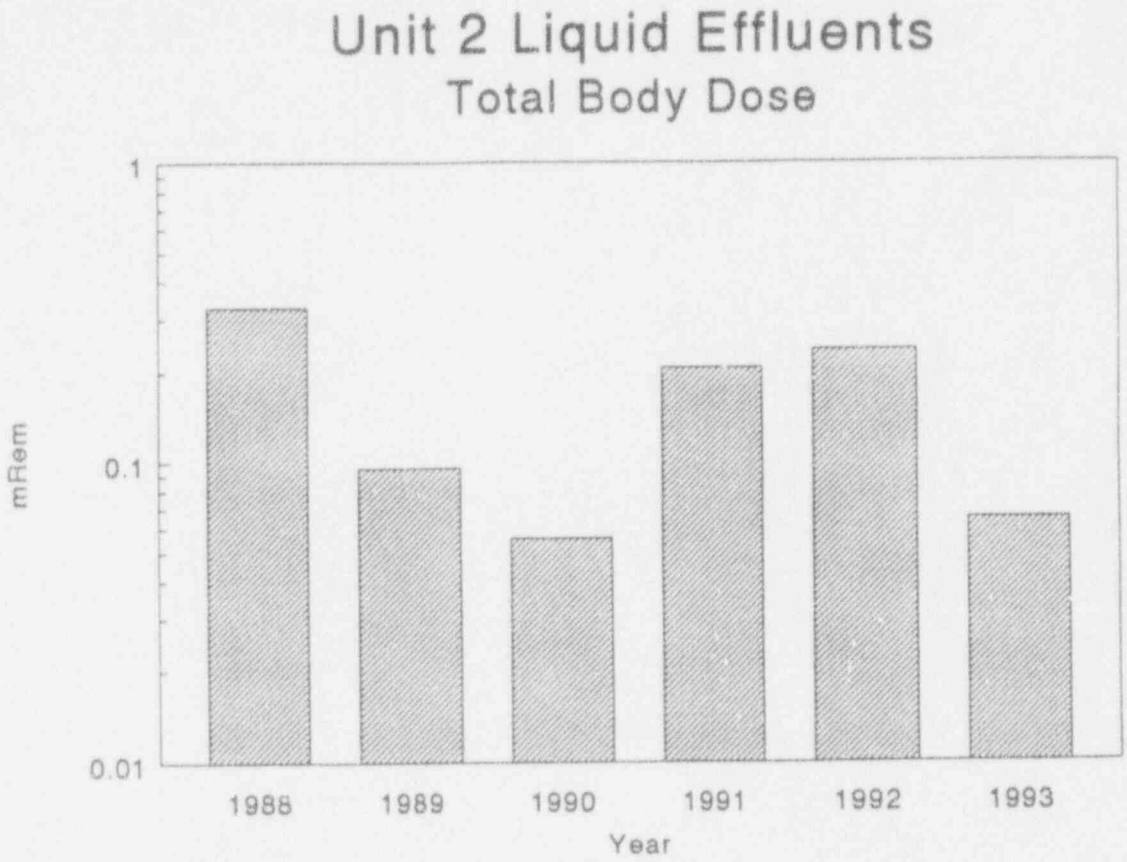

Unit 2 Gaseous Effluents
Total Body Dose
1.00e+000
1.00e-001
1.00e-002
1.00e-003
mRem
1988
1989
1990
1991
1992
1993
Year

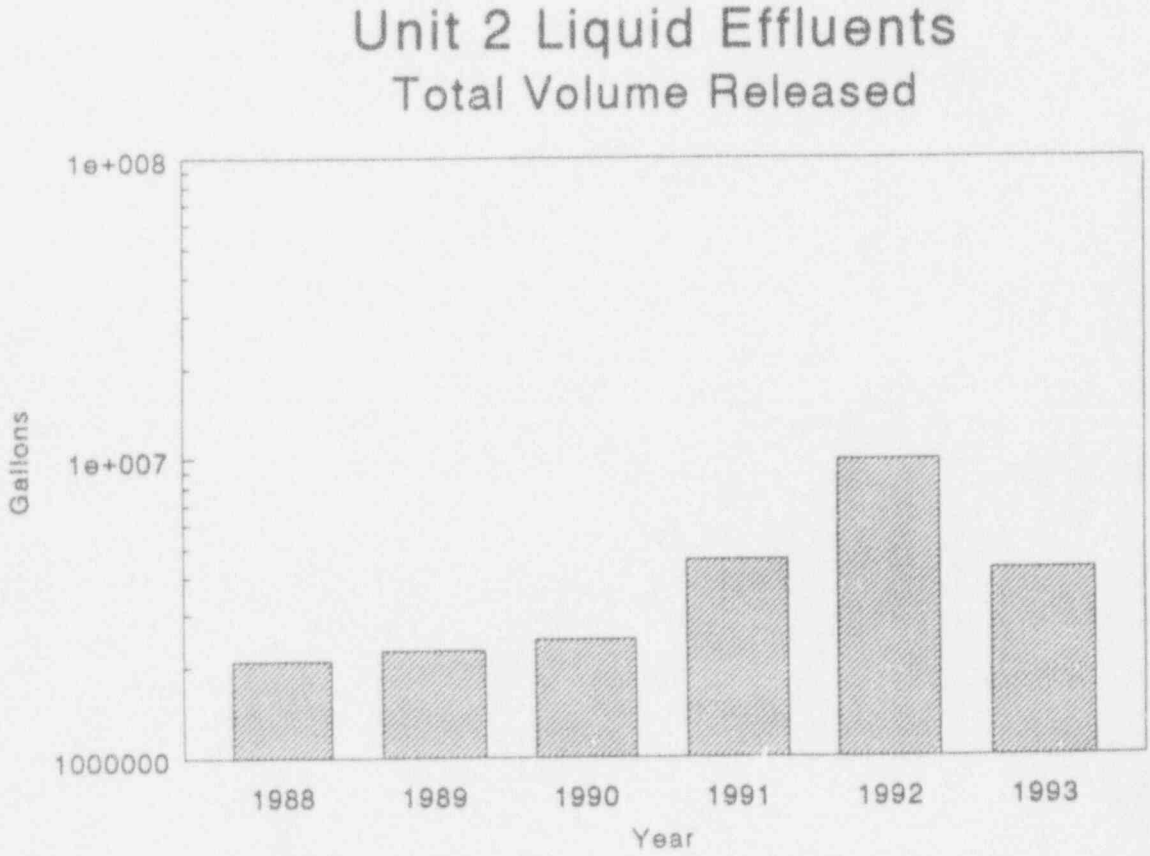

Unit 2 Liquid Effluents
Maximum Critical Organ Dose
1.00e+000
1.00e-001
1.00e-002
mRem
1988
1989
1990
1991
1992
1993
Year


Unit 2 Liquid Effluents
Dissolved and Entrained Gases
1000
100
10
1
0.1
Curies
1988
1989
1990
1991
1992
1993
Year


Unit 2 Liquid Effluents
Tritium
2000
1000
100
10
Curies
1988
1989
1990
1991
1992
1993
Year


Unit 2 Liquid Effluents
Fission and Activation Products
100
10
1
0.1
Curies
1988
1989
1990
1991
1992
1993
Year


Unit 2 Liquid Effluents
Total Body Dose
1
0.1
0.01
mRem
1988
1989
1990
1991
1992
1993
Year


Unit 2 Liquid Effluents
Total Volume Released
1e+008
1e+007
1000000
Gallons
1988
1989
1990
1991
1992
1993
Year

8. SOLID WASTE SUMMARY

The following is a summary of the solid wastes shipped offsite, both annually and during the last six months of 1993.

REGULATORY GUIDE 1.21 REPORT
WASTE DISPOSAL ANNUAL SUMMARY REPORT
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS
JANUARY 1993 THROUGH DECEMBER 1993

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

1. Type of Waste	Unit	12-Month Period	Est. Total Error, %
a. Spent resins, filter sludges, evaporator bottoms, etc.	m^3	7.87E+00	
	Ci	1.94E+04	2.50E+00
b. Dry compressible waste, contaminated equip, etc.	m^3	7.07E+01	
	Ci	5.67E+00	2.09E+00
c. Irradiated components, control rods, etc.	m^3	0.00E+00	
	Ci	0.00E+00	0.00E+00
d. Other (describe)	m^3	0.00E+00	
	Ci	0.00E+00	0.00E+00

2. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
8	Unshielded Van/Truck	Oak Ridge, TN
1	Cask Shipment (Type A)	Barnwell, SC
1	Cask Shipment (Type B)	Barnwell, SC

B. Irradiated Fuel Shipments (Disposition)

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

REGULATORY GUIDE 1.21 REPORT
WASTE DISPOSAL ANNUAL SUMMARY REPORT
SOLID WASTE AND IRRADIATED FUEL SHIPMENTS
JULY 1993 THROUGH DECEMBER 1993

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^3	3.75E+00	
		Ci	1.79E+02	2.06E+00
b.	Dry compressible waste, contaminated equip, etc.	m^3	3.90E+01	
		Ci	3.89E+00	2.66E+00
c.	Irradiated components, control rods, etc.	m^3	0.00E+00	
		Ci	0.00E+00	0.00E+00
d.	Other (describe)	m^3	0.00E+00	
		Ci	0.00E+00	0.00E+00

2. Estimate of major nuclide composition (by type of waste)

a.	CS-137	23.0%	4.06E+01
	NI-63	15.9%	2.81E+01
	FE-55	15.3%	2.71E+01
	CS-134	15.0%	2.65E+01
	SB-125	12.4%	2.19E+01
	CO-58	8.3%	1.46E+01
	CO-60	4.6%	8.15E+00
	TE-125M	2.8%	4.90E+00
	MN-54	2.3%	4.00E+00
	AG-110M	0.5%	8.41E-01
b.	CS-137	87.0%	3.39E+00
	CS-134	4.7%	1.81E-01
	NI-63	3.1%	1.21E-01
	FE-55	2.7%	1.04E-01
	CO-60	2.1%	8.30E-02
	C-14	0.3%	1.21E-02
	TC-99	0.08%	3.12E-03
	I-129	0.06%	2.34E-03
	H-3	0.01%	3.89E-04

c. N/A

d. N/A

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
5	Unshielded Van/Truck	Oak Ridge, TN
1	Cask Shipment (Type B)	Barnwell, SC

B. Irradiated Fuel Shipments (Disposition)

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

9. UNPLANNED RELEASES

An unplanned release is defined as any release of radioactive material to the environment that does not meet the following criteria:

A. Sample analysis prior to release, and

B. Release calculations performed prior to release.

During the third and fourth quarters of 1993, there were three unplanned releases (1GR93-0112, 1GR93-0103 and 1LR93-0257). The following is a summary of the unplanned releases:

1GR93-0112 - T-18A Release

Release start time	: November 1, 1993 at 0000
Release stop time	: November 2, 1993 at 2021
Release volume	: 1.1537E3 cubic feet
Release duration	: 2661 minutes
Gamma Air Dose	: 8.50E-6 mRad - Percent of yearly limit < 0.01
Beta Air Dose	: 2.46E-5 mRad - Percent of yearly limit < 0.01
ITP	: 7.14E-10 mRem - Percent of yearly limit < 0.01

A. Description of occurrence

On November 1, 1993, gaseous waste decay tank (T18A) decreased in pressure from 56 psig to 3 psig in approximately 44 hours resulting in an unplanned release. It was assumed that the contents of this tank were consistent with the contents of the T18C since both tanks were filled at approximately the same time from the same source. T18C was later released with no problems.

B. Identify cause for exceeding limits.

No limits were exceeded due to this release.

C. Corrective actions taken to mitigate occurrence.

No corrective actions were taken to mitigate the occurrence. The T18A outlet isolation valve (GZ-13A) leaked past the seat.

D. Actions taken to prevent recurrence.

A job order was written to repair the valve and a subsequent successful leak test of T18A was conducted. However, an additional unplanned release occurred in January 1994 prior to the scheduled repair date for the valve. This subsequent unplanned release, which had contents similar to 1GR93-0112, will be discussed in the radiological effluent release report covering operations during the first quarter of 1994. Since this subsequent release, T18A has been tagged-out and will not be utilized until appropriate repairs have been made to valve GZ-13A. The cause of both releases is being addressed through the ANO corrective action program.

E. Summary of consequences of occurrence.

Although the release through T18A was unplanned, the contents of the tank were released through the normal release pathway. Samples were obtained from the T18C waste tank and used for input for the unplanned release to calculate offsite doses. This data was determined to be representative of the T18A tank since both tanks were filled at approximately the same time from the same source of influent. The weekly unit vent sample showed no increase in activity during this time period. The dose from this release is listed above and is low in comparison to the Technical Specification limit. No abnormal consequences would be expected to occur due to this release. See data above for dose contribution from this release.

1GR93-0103 - Release of Main Steam via Main Steam Safety Valves

Release start time	: October 28, 1993 at 1836
Release stop time	: October 28, 1993 at 1837
Release volume	: 7.5504E5 cubic feet
Release duration	: 1 minute
Gamma Air Dose	: 4.707E-10 mRad - Percent of yearly limit < 0.01
Beta Air Dose	: 6.031E-10 mRad - Percent of yearly limit < 0.01
ITP	: 1.061E-07 mRem - Percent of yearly limit < 0.01

A. Description of occurrence

On October 18, 1993, the Unit 1 turbine was tripped manually. This resulted in the release of steam from the main steam system to the atmosphere via the main steam safety valves.

B. Identify cause for exceeding limits.

No limits were exceeded due to this release.

C. Corrective actions taken to mitigate occurrence.

No corrective actions were taken. The design of the Unit 1 turbine system is to release secondary steam when the turbine trips.

D. Actions taken to prevent recurrence.

No actions were taken to prevent recurrence since the system is designed to function in this manner and the concentrations of radionuclides released were small.

E. Summary of consequences of occurrence.

The Unit 1 secondary system is designed to release steam to the atmosphere whenever the turbine trips. However, due to a small primary to secondary leak (< 0.01 gpm), the contents of this release contained radioactivity. Sample results revealed that the steam contained H-3 and Xe-135 in levels above minimum detectable concentrations. The dose due to this release is low in comparison to the yearly limits specified in the Unit 1 Technical Specifications. No abnormal consequences would be expected to occur due to this release. See data above for dose contribution from this release.

1LR93-0257 - Inadvertent Release of T16B

Release start time	: October 16, 1993 at 1800
Release stop time	: October 16, 1993 at 1945
Release volume	: 605 gallons
Release duration	: 105 minutes
Total Body Dose	: 3.73E-6 mRem - Percent of yearly limit < 0.01
Critical Organ Dose	: 1.30E-4 mRem - Percent of yearly limit < 0.01

A. Description of occurrence

On October 16, 1993, treated waste monitor tank T16A was released to the discharge canal. After completing the release of T16A, a non-licensed operator noticed that the effluent flow meter to flume was not reading zero. Investigation revealed that CZ-55B (treated waste discharge to header from T16B transfer pump) was still open. CZ-55B is the tank isolation valve for T16B. As a result of this valve being open, T16B was also released to the flume. This resulted in an unplanned release.

B. Identify cause for exceeding limits.

No limits were exceeded due to this release.

C. Corrective actions taken to mitigate occurrence.

Upon discovery that CZ-55B was open, the operator isolated the valve to terminate the release.

D. Actions taken to prevent recurrence.

CZ-55B was checked prior to release of T16A and determined to be in the closed position. Subsequent investigation revealed that valve was not closed because more than the normally required force was necessary to secure the valve. Valve CZ-55B was repaired to correct the binding problems. Additionally, the damaged position indicator was repaired.

E. Summary of consequences of occurrence.

The Unit 1 treated waste monitor tanks are the normal release tanks for radioactive liquid effluents. T16B was in the recirculation mode during the release. Samples obtained from T16B revealed that the contents of this tank were consistent with previous tanks released from this pathway. Because the release pathway and activities were consistent with previous releases, no abnormal consequences would be expected to occur due to this release. See data above for dose contribution from this release.

10. RADIATION INSTRUMENTATION

As required by Unit 1 and Unit 2 Technical Specifications, any radioactive effluent instrumentation inoperable for more than 30 days shall be reported in the next Semiannual Radioactive Effluent Release Report. During the third and fourth quarters of 1993, no instrumentation was inoperable longer than 30 days.

11. CHANGES TO THE PROCESS CONTROL PROGRAM

As required by Unit 1 and Unit 2 Technical Specifications, a description of changes made to the Process Control Program (PCP) during the reporting period shall be included in the next Semiannual Radioactive Effluent Release Report. During the third and fourth quarters of 1993, there were no changes to the PCP.

12. CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL

During the third and fourth quarters of 1993, no changes were made to the Offsite Dose Calculation Manual.

13. LLD LEVELS

In accordance with Unit 1 and Unit 2 Technical Specifications, lower limits of detection (LLDs) higher than required shall be documented in the Semiannual Radioactive Effluent Release Report. During the report period, there were no LLDs higher than required.

14. RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

A. There were no environmental sample location changes during the reporting period.

B. During the reporting period, there were no sampling locations identified which would yield a calculated dose commitment greater than the values currently being calculated.

15. SUMMARY OF HOURLY METEOROLOGICAL DATA

In accordance with ANO-1 and 2 Technical Specification 6.12.2.6(e) and 6.9.3.4.1, respectively, in lieu of including a summary of the meteorological data in this report, the 1993 data is retained at ANO. This data is available for NRC review.

16. DESCRIPTION OF MAJOR CHANGES TO RADWASTE SYSTEMS

During 1993, the liquid radwaste processing systems contract was awarded to a different vendor. The new system is identical to the previously used vendor system with the exception of some minor details such as tank size. This is not considered a major change and no revisions to the SARs were necessary. No major changes to the gaseous or solid radwaste systems occurred during 1993.