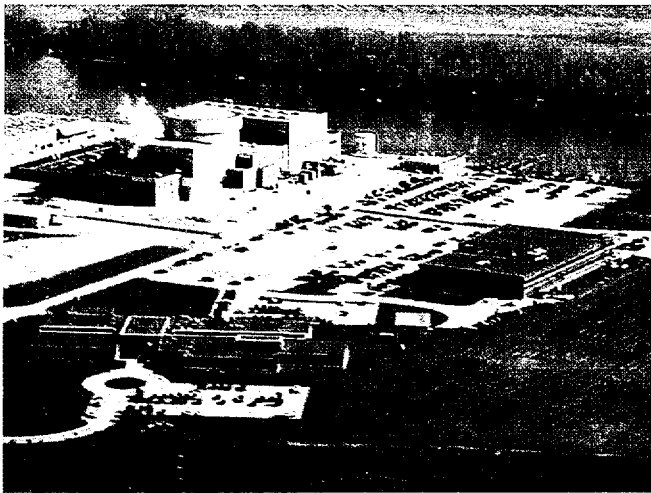


# **Omaha Public Power District Fort Calhoun Station Unit No. 1**

## **Annual Report For Technical Specification Section 5.9.4.A**

**January 1, 2001 to December 31, 2001**



**Omaha Public Power District  
Fort Calhoun Station Unit No. 1**

Annual Report  
For  
Technical Specification,  
Section 5.9.4.a

January 1, 2001 to December 31, 2001

DOCKET NO. 50-285

OPERATING LICENSE DPR-40

Annual Radiological Effluent Release Report

This report is submitted in accordance with Section 5.9.4.a of the Technical Specifications of Fort Calhoun Station Unit No. 1, Facility Operating License DPR-40 for the period January 1, 2001 through December 31, 2001. The Effluent Report is presented in the format outlined in Regulatory Guide 1.21, Revision 1.

In addition, this report provides the results of quarterly dose calculations performed in accordance with the Offsite Dose Calculation Manual. Results are presented by quarter for the period January 1, 2001 through December 31, 2001.

Further description of any changes made during the preceding twelve months to the Offsite Dose Calculation Manual and/or the Process Control Program for the Fort Calhoun Station are presented.

**PRC RECOMMENDS  
APPROVAL**

MAR 27 2002

**PRC MTG. MINUTES**

MT Frano

*for* Manager-Fort Calhoun Station

# TABLE OF CONTENTS

<b><u>Section</u></b>	<b><u>Section Title</u></b>
<b>I.</b>	<b>1.0 Introduction</b>
	1.1 Executive Summary
	<b>2.0 Supplemental Information</b>
	2.1 Regulatory Limits
	2.2 Effluent Concentration Limits
	2.3 Measurements and Approximations of Total Radioactivity
	2.4 Estimation of Total Percent Error
	2.5 Batch Releases
	2.6 Abnormal Releases
	<b>3.0 Gaseous Effluents</b>
	<b>4.0 Liquid Effluents</b>
	<b>5.0 Solid Wastes</b>
	<b>6.0 Related Information</b>
	6.1 Operability of Liquid and Gaseous Monitoring Instrumentation
	6.2 Changes to Offsite Dose Calculation Manual (ODCM) or Process Control Program (PCP)
	6.3 New Locations or Modifications for Dose Calculations or Environmental Monitoring
	6.4 Noncompliance with Radiological Effluent Control Requirements
	6.5 Modifications to Liquid and Gaseous Waste Treatment and Ventilation Exhaust Systems
	6.6 Meteorological Monitoring Program
	6.7 Assessment of Doses
<b>II.</b>	<b>Quarterly Doses from Effluents, Offsite Dose Calculation Manual</b>

# **TABLE OF CONTENTS**

## **III. Radiological Effluent Releases, Technical Specification (5.9.4a)**

Table III-1; Batch Liquid and Gas Release Summary  
Table III-2; Abnormal Batch Liquid and Gaseous Release Summary  
Table III-3; Gaseous Effluents -Summation of All Releases  
Table III-4; Gaseous Effluent Releases - Batch Mode  
Table III-5; Gaseous Effluent Releases - Continuous Mode  
Table III-6; Liquid Effluents - Summation of All Releases  
Table III-7; Liquid Effluent Releases - Batch Mode  
Table III-8; Liquid Effluent Releases - Continuous Mode

## **IV. Dose From Gaseous Effluents - GASPAR II Output**

Tables IV-A-1 to IV-A-40 - Receptor Dose Projections  
Table IV-B-1 - Dose Contributions at Unrestricted Area Boundary  
Table IV-C-1 - ALARA Annual Integrated Dose Summary

## **V. Dose From Liquid Effluents - LADTAP II Output**

Summary Dose Projections from Liquid Effluent Releases

## **VI. Radioactive Effluent Releases-Solid Radioactive Waste, Technical Specifications (5.9.4.a)**

## **VII. ATTACHMENTS**

1. Offsite Dose Calculation Manual (ODCM) and Process Control Program (PCP) Revisions, Technical Specifications (5.17.d and 5.18.d)
2. Joint Frequency Distribution Wind Direction vs. Wind Speed by Stability Class and Meteorological Data
3. Annual Occupational Exposure Report, Technical Specification (5.9.1.b)

## 1.0 INTRODUCTION

This Annual Radiological Effluent Release Report, for Fort Calhoun Station Unit No. 1, is submitted as required by Technical Specification 5.9.4.a for the period January 1, 2001 through December 31, 2001.

### 1.1 Executive Summary

The Radioactive Effluent Monitoring program for the year 2001 was conducted as described in the following report. Major efforts were made to maintain the release of radioactive effluents to the environment as low as reasonably achievable. Activity released was similar to the previous year primarily due to fuel-cladding degradation.

The total gaseous activity released for 2001 was 3330 Curies. This was 2.4% less than the 3411.1 Curies released in 2000. The fuel status is similar to 2000 levels thus the 2002 refueling outage originally scheduled for the fall of 2002 has been rescheduled for the spring to remove defective fuel.

Dose contributions from gaseous effluents at the unrestricted area boundary were  $3.34\text{E-}01$  millirad maximum gamma air dose, and  $1.23\text{E+}00$  millirad maximum beta air dose. This was an increase from the 2000 values of  $2.98\text{E-}01$  millirad and  $1.11\text{E+}00$  millirad respectively.

Total activity (excluding tritium, dissolved gases and alpha) released in 2001 in liquid effluents was  $5.60\text{E-}01$  Curies. This was lower than the 2000 value of  $5.96\text{E-}01$  Curies.

The total tritium activity released in 2001 in liquid effluents was 175.4 Curies. This was a decrease from the 2000 value of 494.9 Curies.

The calculated whole body dose due to liquid effluents at the site discharge from all sources in 2001 was  $4.41\text{E-}01$  mRem. This was an increase from the 2000 dose of  $3.20\text{E-}01$  mRem.

The calculated critical organ dose due to liquid effluents at the site discharge from all sources in 2001 was  $5.94\text{E-}01$  mRem. This was an increase from the 2000 dose of  $4.30\text{E-}01$  mRem.

The Fort Calhoun Station meteorological system achieved a cumulative availability rate of 99.01% for the joint frequency parameters required by Regulatory Guide 1.23 of wind speed, wind direction and delta temperature.

There were no abnormal releases during 2001.

During 2001 there were no changes to either the ODCM or the PCP.

For 2001, the total volume of buried solid radwaste was 21.80 cubic meters, essentially unchanged from the 16.76 cubic meters of solid waste buried in 2000. The majority was due to shipments of dry compressible materials. The total buried activity for 2001 was 729.36 Curies, 728 of which came from spent resin. This value is considerably higher than the 2000 value of 54.04 Curies primarily due to fuel rod failure and the release of fission products.

Overall, the radioactive effluent monitoring program was conducted in a manner to ensure the activity released and associated dose to the public were maintained as low as reasonably achievable.

## 2.0 SUPPLEMENTAL INFORMATION

### 2.1 Regulatory Limits

The ODCM Radiological Effluent Control Specifications applicable to the release of radioactive material in liquid and gaseous effluents are described in the following sections.

#### 2.1.1 Fission and Activation Gases (Noble Gases)

The release rate of radioactive material in airborne effluents shall be controlled such that the instantaneous concentrations of radionuclides do not exceed the values specified in 10 CFR 20 for airborne effluents at the unrestricted area boundary. To support plant operations, Supervisor - System Chemistry may increase this limit up to the limits specified in Technical Specification 5.16.1.g.

Technical Specification 5.16.1.g establishes the administrative control limit on the concentration resulting from radioactive material, other than noble gases, released in gaseous effluents to unrestricted areas conforming to ten times

10 CFR 20.1001-20.2401, Appendix B, Table 2, Column 1. For noble gases, the concentration shall be limited to five times 10 CFR 20.1001-20.2401, Appendix B, Table 2, Column 1.

The air dose due to noble gases released in gaseous effluents to areas at or beyond the unrestricted area boundary shall be limited to the following:

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

2.1.2 Dose - Iodine-131, Radioactive Material in Particulate Form with Half Lives Greater than 8 Days (Other than Noble Gases) and Tritium

- a. The dose to an individual or dose commitment to any organ of an individual in unrestricted areas due to the release of I-131, Tritium, and radioactive materials in particulate form with half-lives greater than eight days (excluding noble gases) in airborne effluents shall not exceed 7.5 millirem from all exposure pathways during any calendar quarter.
- b. The dose to an individual or dose commitment to any organ of an individual in unrestricted areas due to the release of I-131, Tritium, and radioactive materials in particulate form with half-lives greater than eight days (excluding noble gases) in airborne effluents shall not exceed 15 millirem from all exposure pathways during any calendar year.



### 2.1.3 Liquid Effluents

The release rate of radioactive material in liquid effluents shall be controlled such that the instantaneous concentrations for radionuclides, other than dissolved or entrained noble gases, do not exceed the values specified in 10 CFR 20 for liquid effluents at site discharge. To support plant operations, Supervisor - System Chemistry may increase this limit up to the limit specified in Technical Specifications 5.16.1.b.

Technical Specification 5.16.1.b establishes the administrative control limit on concentration of radioactive material, other than dissolved or entrained noble gases, released in liquid effluents to unrestricted areas conforming to ten times 10 CFR 20.1001-20.2401, Appendix B, Table 2, Column 2. For dissolved or entrained noble gases, the concentration shall be limited to  $2.0\text{E-}04 \mu\text{Ci/ml}$  total activity.

The dose or dose commitment to a MEMBER OF THE PUBLIC from radioactive materials in liquid effluents released to unrestricted areas shall be limited to:

- a. During any calendar quarter: Less than or equal to 1.5 mRem to the whole body and less than or equal to 5 mRem to any organ, and
- b. During any calendar year: Less than or equal to 3 mRem to the whole body and less than or equal to 10 mRem to any organ.

### 2.1.4 Total Dose-Uranium Fuel Cycle

The dose to any real individual from uranium fuel cycle sources shall be limited to  $\leq 25$  mRem to the total body or any organ (except the thyroid, which shall be limited to  $\leq 75$  mRem) during each calendar year.

## 2.2 Effluent Concentration Limits (ECL)

### 2.2.1 Liquid Effluents

The values specified in 10 CFR Part 20, Appendix B, Column 2 are used as the ECL for liquid radioactive effluents released to unrestricted areas. A value of  $2.0\text{E-}04 \mu\text{Ci/ml}$  is used as the ECL for dissolved and entrained noble gases in liquid effluents.

### 2.2.2 Gaseous Effluents

The values specified in 10 CFR Part 20, Appendix B, Column 1 are used as the ECL for gaseous radioactive effluents released to unrestricted areas.

## 2.3 Measurements and Approximations of Total Radioactivity

Measurements of total radioactivity in liquid and gaseous radioactive effluents were accomplished in accordance with the sampling and analysis requirements of Tables 3.1 and 3.2 of Part I of the ODCM.

### 2.3.1 Liquid Radioactive Effluents

Each batch was sampled and analyzed for gamma emitting radionuclides using gamma spectroscopy, prior to release. Composite samples were analyzed monthly and quarterly for the Monitor and Hotel Waste Tanks. Composite samples were analyzed monthly in the onsite laboratory for tritium and gross alpha radioactivity using liquid scintillation and proportional counting techniques respectively. Composite samples were analyzed quarterly for Sr-89, Sr-90 and Fe-55 by a contract laboratory (Teledyne Brown Engineering). A software program was used to project the total body and critical organ dose contribution at the unrestricted area boundary for each release and the percent contribution to the annual objective dose.

For continuous releases from the Steam Generator blowdown, daily grab samples were obtained for weekly, monthly and quarterly composites, in proportion to the rate of blowdown. Samples were analyzed using gamma spectroscopy techniques

weekly. Composites were also analyzed monthly in the onsite laboratory for tritium and gross alpha radioactivity using liquid scintillation and proportional counting techniques, respectively. Composite samples were analyzed quarterly for Sr-89, Sr-90, and Fe-55 by a contract laboratory (Teledyne Brown Engineering).

### 2.3.2 Gaseous Radioactive Effluents

Each gaseous batch release was sampled and analyzed for radioactivity prior to release. For release of Waste Gas Decay Tanks, noble gas grab samples were analyzed for gamma emitting radionuclides using gamma spectroscopy. For releases from the Containment Building, samples were taken using charcoal and particulate filters, in addition to noble gas and tritium grab samples, and analyzed for gamma emitting radionuclides prior to each release. The results of the analysis and the total volume of effluent released were used to determine the total amount of radioactivity released in the batch mode. A software program was developed and installed that can project the total body and critical organ dose contribution at the unrestricted area boundary for each release and the percent contribution to the annual objective dose. This program also adds the projected dose to the current actual dose totals in a temporary file, until it is updated with actual release data at the completion of a purge.

Continuous release effluent pathways were continuously sampled using charcoal and particulate filters and analyzed weekly for gamma emitting radionuclides using gamma spectroscopy. Weekly particulate filters were analyzed for gross alpha radioactivity in the onsite laboratory using proportional counting techniques. Quarterly composites of particulate filters were analyzed for Sr-89 and Sr-90 by an offsite laboratory (Teledyne Brown Engineering).

## 2.4 Estimation of Total Percent Error

The estimated total percent error is calculated as follows:

$$\text{Total Percent Error} = (E_1^2 + E_2^2 + E_3^2 + \dots + E_n^2)^{1/2}$$

Where  $E_n$  = Percent Error Associated with each contributing parameter.

Sample counting error is estimated by the Canberra Genie System Software for samples analyzed by gamma spectroscopy. This calculation can include the error associated with peak area determination, gamma ray abundance, efficiency and half-life. Systematic error is estimated for gaseous and liquid effluent analyses and dilution and wastewater volume.

## 2.5 Batch Releases

A summary of information for gaseous and liquid batch releases is included in Table III-1.

## 2.6 Abnormal Releases

Abnormal Releases are defined as unplanned and unmonitored releases of radioactive material from the site.

A summary of information for gaseous and liquid abnormal releases is included in Table III-2.

## 3.0 GASEOUS EFFLUENTS

The quantities of radioactive material released in gaseous effluents are summarized in Tables III-3, III-4 and III-5. All radioactive material released in gaseous form is considered to be ground level releases.

## 4.0 LIQUID EFFLUENTS

The quantities of radioactive material released in liquid effluents are summarized in Tables III-6, III-7 and III-8.

## 5.0 SOLID WASTES

The quantities of radioactive material released as solid effluents are summarized in Section VI.

## 6.0 RELATED INFORMATION

### 6.1 Operability of Liquid and Gaseous Monitoring Instrumentation

During the reporting period the Condenser Off-Gas Radiation Monitor, RM-057, was out of service from April 28, 2001 at 0821 to June 14, 2001 at 1131. During troubleshooting it was discovered that approximately 6 inches of the detector was missing due to corrosion. EC-26574 was issued for a minor modification to replace the carbon steel detector with a stainless steel unit. The monitor was removed from service for an extended period of time due to problems acquiring the replacement detector from the vendor. The parts arrived on site and the monitor was calibrated and returned to service. During the period the monitor was out of service condenser off-gas flow was routed through the auxiliary building exhaust stack for monitoring. Routine sampling was performed in accordance with ODCM Table 2.2.1.

### 6.2 Changes to the Offsite Dose Calculation Manual (ODCM) or Process Control Program (PCP)

During 2001 there were no changes made to either the ODCM or PCP.

### 6.3 New Locations or Modifications for Dose Calculations or Environmental Monitoring

No new receptor locations were identified which resulted in changes to our environmental monitoring sample locations.

### 6.4 Noncompliance with Radiological Effluent Control Requirements

This section provides a list of any event that did not comply with the applicable requirements of the Radiological Effluent Controls given in the Offsite Dose Calculation Manual (ODCM). Detailed documentation concerning the evaluations and corrective actions is maintained onsite.

#### 6.4.1 Abnormal Gaseous and Liquid Releases

There was no abnormal releases made during the calendar year of 2001.

#### 6.4.2 Failure to Meet Specified Sampling Requirements

During 2001 there were no instances in which specified sampling requirements were not met.

#### 6.5 Modifications to Liquid and Gaseous Waste Treatment and Ventilation Exhaust Systems

During the reporting period no design modifications were approved nor implemented involving major changes to the Liquid and Gaseous Waste Treatment Systems.

#### 6.6 Meteorological Monitoring Program

A summary of hourly meteorological data, collected during 2001, is retained onsite. This data is available for review by the Nuclear Regulatory Commission upon request. Joint Frequency tables are included in Section VII, Attachment 2.

Real time hourly meteorological data is used to calculate the annual air effluent dose to individuals. For quarterly estimates during the year an annual average X/Q is used which is an average of the highest X/Qs calculated for each of the previous three years.

#### 6.7 Assessment of Doses

##### 6.7.1 Doses Due to Liquid Effluents

Total body, skin, and organ dose for liquid releases were calculated in mRem for all significant liquid pathways using the annual configuration of the LADTAP II program. The site discharge location was chosen to present a most conservative estimate of dose for an average adult, teenager, child and infant. A conservative approach is also presented by the assumption that Omaha and Council Bluffs receive all drinking water from the Missouri River.

The LADTAP II program in its annual configuration was also used to calculate the total body and organ doses for the population of 853,274 within a 50 mile radius of the plant (based on the 2000 census). The results of the calculations are listed in Section V.

The dose due to liquid effluents for total body and critical organ are also calculated quarterly using the methods in the ODCM. The results are listed in Section II.

#### 6.7.2 Doses Due to Gaseous Effluents

Total body, skin and organ doses from ground releases were calculated in mRem to an average adult, teenager, child, and infant in each receptor using the annual configuration of the GASPARD II program. Also, the doses to the same groups, in units of mrad, due to gamma and beta radiation carried by air, were computed using GASPARD II.

The GASPARD II program in its annual configuration was also used to calculate the ALARA integrated population dose summary for the total body, skin and organ doses in person-rem for all individuals within a 50-mile radius. The results of the calculations are shown in Section IV.

The dose due to gaseous effluents for total body gamma and beta noble gas air dose are calculated quarterly using the methods in the ODCM with an annual average X/Q. The results are listed in Section II.

#### 6.7.3 Doses Due to I-131, Tritium and Particulates with Half Lives Greater than 8 days.

The doses due to I-131, Tritium and Particulates with half lives greater than 8 days for total body and critical organ dose are calculated quarterly using the highest of infant or child dose factors and an annual average X/Q. The results are listed in Section II for inhalation, ground and food.

#### 6.7.4 Direct Radiation Dose to Individuals and Populations

Direct radiation doses attributed to the gamma radiation emitted from the containment structure were not observed above local background at any TLD sample locations for this annual period.

#### 6.7.5 40 CFR 190 Dose Evaluation

ODCM Radiological Effluent Controls require dose evaluations to demonstrate compliance with 40 CFR Part 190 only if calculated yearly doses exceed two times the annual design objectives for liquid and/or gaseous effluents. At no time during 2001 were any of these limits exceeded, therefore, no evaluations were required.



**SECTION II**  
**QUARTERLY DOSES FROM EFFLUENTS**

**Offsite Dose Calculation Manual**

**January 1, 2001 - December 31, 2001**

## Quarterly Dose Calculation Results

January 1, 2001 through December 31, 2001

With the implementation of the Fort Calhoun Station Radiological Effluent Technical Specifications (RETS) on October 1, 1985, radiation doses in the unrestricted area from liquid and gaseous effluents must be calculated on a quarterly basis in accordance with the Offsite Dose Calculation Manual (ODCM). These calculations are performed to ensure the annual dose limits delineated in Appendix I of 10 CFR 50 and implemented by RETS are not exceeded. If the results of the quarterly calculations exceed fifty percent (50%) of the annual limits of Appendix I, actions are taken to reduce effluents so that the resultant doses do not exceed the annual limits during the remainder of the year and a special report is submitted to the Nuclear Regulatory Commission.

This section presents the results of the quarterly dose calculations performed during the period January 1, 2001 through December 31, 2001. Details are shown as to the types, sources and resultant doses from the effluents, the annual limits and a comparison to the annual limits.

The quarterly totals are well below the 50% annual dose acceptance criteria. In addition, the summation of the quarterly totals shows OPPD to be less than the annual limits and in compliance with the regulations and the ODCM. The total projected dose estimates from liquid effluents for the first and second quarter were higher than the proceeding quarters due to changes in the dose calculations. The new method standardizes dilution flow for all the quarters based on a two-year average dilution rate.

QUARTERLY CUMULATIVE DOSE CONTRIBUTION FROM RADIOACTIVE EFFLUENTS  
FORT CALHOUN FIRST QUARTER 2001, DOSE PROJECTIONS

I. Liquid Effluents: -----	Total Body Dose (mrem) -----	Critical Organ Dose (mrem) -----
Batch:	1.37E-01	1.81E-01
Continuous:	0.00E+00	0.00E+00
-----	-----	-----
Totals:	1.37E-01	1.81E-01
ODCM Quarterly Objective:	1.50E+00	5.00E+00
-----	-----	-----
Percent of Quarterly Obj:	9.13 %	3.62 %
ODCM Annual Objective:	3.00E+00	1.00E+01
-----	-----	-----
YTD Percent of Annual Obj:	4.57 %	1.81 %
II. Gaseous Effluents: -----	Total Body Gamma Dose (mrad) -----	Total Body Beta Dose (mrad) -----
A. Noble Gas Air Dose:	3.20E-01	1.16E+00
ODCM Quarterly Objective:	5.00E+00	1.00E+01
-----	-----	-----
Percent of Quarterly Obj:	6.40 %	11.60 %
ODCM Annual Objective:	1.00E+01	2.00E+01
-----	-----	-----
YTD Percent of Annual Obj:	3.20 %	5.80 %
B. I-131, H-3, and Particulates with Half-lives > 8 Days:	Total Body Dose (mrem) -----	Critical Organ Dose (mrem) -----
Inhalation:	2.77E-04	1.70E-02
Ground and Food:	2.12E-03	5.87E-01
-----	-----	-----
Totals:	2.40E-03	6.04E-01
ODCM Quarterly Objective:	7.50E+00	7.50E+00
-----	-----	-----
Percent of Quarterly Obj:	0.03 %	8.05 %
ODCM Annual Objective:	1.50E+01	1.50E+01
-----	-----	-----
YTD Percent of Annual Obj:	0.02 %	4.03 %

Reviewed by: TRD



QUARTERLY CUMULATIVE DOSE CONTRIBUTION FROM RADIOACTIVE EFFLUENTS  
FORT CALHOUN SECOND QUARTER 2001, DOSE PROJECTIONS

I. Liquid Effluents:		Total Body Dose (mrem)	Critical Organ Dose (mrem)
-----		-----	-----
Batch:		2.68E-01	3.62E-01
Continuous:		3.23E-05	5.15E-05
-----		-----	-----
Totals:		2.68E-01	3.62E-01
ODCM Quarterly Objective:		1.50E+00	5.00E+00
-----		-----	-----
Percent of Quarterly Obj:		17.87 %	7.24 %
ODCM Annual Objective:		3.00E+00	1.00E+01
-----		-----	-----
YTD Percent of Annual Obj:		13.50 %	5.43 %
-----		-----	-----
II. Gaseous Effluents:		Total Body Gamma Dose (mrad)	Total Body Beta Dose (mrad)
-----		-----	-----
A. Noble Gas Air Dose:		1.05E-02	7.56E-02
ODCM Quarterly Objective:		5.00E+00	1.00E+01
-----		-----	-----
Percent of Quarterly Obj:		0.21 %	0.76 %
ODCM Annual Objective:		1.00E+01	2.00E+01
-----		-----	-----
YTD Percent of Annual Obj:		3.31 %	6.18 %
-----		-----	-----
B. I-131, H-3, and Particulates with Half-lives > 8 Days:		Total Body Dose (mrem)	Critical Organ Dose (mrem)
		-----	-----
Inhalation:		1.13E-04	2.06E-02
Ground and Food:		1.29E-03	7.26E-01
-----		-----	-----
Totals:		1.40E-03	7.47E-01
ODCM Quarterly Objective:		7.50E+00	7.50E+00
-----		-----	-----
Percent of Quarterly Obj:		0.02 %	9.95 %
ODCM Annual Objective:		1.50E+01	1.50E+01
-----		-----	-----
YTD Percent of Annual Obj:		0.03 %	9.01 %
-----		-----	-----

Reviewed by: TRD

QUARTERLY CUMULATIVE DOSE CONTRIBUTION FROM RADIOACTIVE EFFLUENTS  
FORT CALHOUN THIRD QUARTER 2001 DOSE PROJECTIONS

I. Liquid Effluents:		Total Body Dose (mrem)	Critical Organ Dose (mrem)
-----		-----	-----
Batch:		6.79E-02	9.19E-02
Continuous:		0.00E+00	0.00E+00
-----		-----	-----
Totals:		6.79E-02	9.19E-02
-----		-----	-----
ODCM Quarterly Objective:		1.50E+00	5.00E+00
-----		-----	-----
Percent of Quarterly Obj:		4.53 %	1.84 %
-----		-----	-----
ODCM Annual Objective:		3.00E+00	1.00E+01
-----		-----	-----
YTD Percent of Annual Obj:		10.53 %	4.24 %
-----		-----	-----
II. Gaseous Effluents:		Total Body Gamma Dose (mrad)	Total Body Beta Dose (mrad)
-----		-----	-----
A. Noble Gas Air Dose:		2.05E-02	6.56E-02
-----		-----	-----
ODCM Quarterly Objective:		5.00E+00	1.00E+01
-----		-----	-----
Percent of Quarterly Obj:		0.41 %	0.66 %
-----		-----	-----
ODCM Annual Objective:		1.00E+01	2.00E+01
-----		-----	-----
YTD Percent of Annual Obj:		3.50 %	6.50 %
-----		-----	-----
B. I-131, H-3, and Particulates with Half-lives > 8 Days:		Total Body Dose (mrem)	Critical Organ Dose (mrem)
-----		-----	-----
Inhalation:		2.57E-05	1.21E-04
Ground and Food:		1.60E-04	3.46E-03
-----		-----	-----
Totals:		1.86E-04	3.58E-03
-----		-----	-----
ODCM Quarterly Objective:		7.50E+00	7.50E+00
-----		-----	-----
Percent of Quarterly Obj:		0.00 %	0.05 %
-----		-----	-----
ODCM Annual Objective:		1.50E+01	1.50E+01
-----		-----	-----
YTD Percent of Annual Obj:		0.03 %	9.05 %
-----		-----	-----

Reviewed by:  

QUARTERLY CUMULATIVE DOSE CONTRIBUTION FROM RADIOACTIVE EFFLUENTS  
FORT CALHOUN FORTH QUARTER 2001 DOSE PROJECTIONS

I. Liquid Effluents:		Total Body Dose (mrem)	Critical Organ Dose (mrem)
-----		-----	-----
Batch:		8.99E-02	1.22E-01
Continuous:		0.00E+00	0.00E+00
-----		-----	-----
Totals:		8.99E-02	1.22E-01
-----		-----	-----
ODCM Quarterly Objective:		1.50E+00	5.00E+00
-----		-----	-----
Percent of Quarterly Obj:		5.99 %	2.44 %
-----		-----	-----
ODCM Annual Objective:		3.00E+00	1.00E+01
-----		-----	-----
YTD Percent of Annual Obj:		13.53 %	5.47 %
-----		-----	-----
II. Gaseous Effluents:		Total Body Gamma Dose (mrad)	Total Body Beta Dose (mrad)
-----		-----	-----
A. Noble Gas Air Dose:		3.07E-02	9.64E-02
-----		-----	-----
ODCM Quarterly Objective:		5.00E+00	1.00E+01
-----		-----	-----
Percent of Quarterly Obj:		0.61 %	0.96 %
-----		-----	-----
ODCM Annual Objective:		1.00E+01	2.00E+01
-----		-----	-----
YTD Percent of Annual Obj:		3.81 %	7.00 %
-----		-----	-----
B. I-131, H-3, and Particulates with Half-lives > 8 Days:		Total Body Dose (mrem)	Critical Organ Dose (mrem)
-----		-----	-----
Inhalation:		2.62E-05	1.80E-04
Ground and Food:		1.93E-04	3.81E-03
-----		-----	-----
Totals:		2.19E-04	3.99E-03
-----		-----	-----
ODCM Quarterly Objective:		7.50E+00	7.50E+00
-----		-----	-----
Percent of Quarterly Obj:		0.00 %	0.05 %
-----		-----	-----
ODCM Annual Objective:		1.50E+01	1.50E+01
-----		-----	-----
YTD Percent of Annual Obj:		0.03 %	9.05 %
-----		-----	-----

Reviewed by: 

**SECTION III**  
**RADIOLOGICAL EFFLUENT RELEASES**  
**Technical Specification (5.9.4a)**

<b>Table III-1</b>	<b>Batch Liquid and Gas Release Summary</b>
<b>Table III-2</b>	<b>Abnormal Batch Liquid and Gaseous Release Summary</b>
<b>Table III-3</b>	<b>Gaseous Effluents - Summation of all Releases</b>
<b>Table III-4</b>	<b>Gaseous Effluent Releases - Batch Mode</b>
<b>Table III-5</b>	<b>Gaseous Effluent Releases - Continuous Mode</b>
<b>Table III-6</b>	<b>Liquid Effluents - Summation of all Releases</b>
<b>Table III-7</b>	<b>Liquid Effluent Releases - Batch Mode</b>
<b>Table III-8</b>	<b>Liquid Effluent Releases - Continuous Mode</b>

January 1, 2001 - December 31, 2001

TABLE III.1  
BATCH LIQUID AND GASEOUS RELEASE SUMMARY  
JANUARY THROUGH DECEMBER 2001

<u>A. Liquid Releases All Sources</u>	<u>1st Quarter</u>	<u>2nd Quarter</u>	<u>3rd Quarter</u>	<u>4th Quarter</u>
1. Number of Batch Releases:	66	66	24	27
2. Total Time Period for Batch Releases(min) :	24,691	19,836	2,786	3,202
3. Maximum Time Period for Batch Releases(min) :	6,193	7,200	142	157
4. Average Time Period for Batch Releases(min) :	374	301	116	119
5. Minimum Time Period for Batch Releases(min) :	99	8	45	65
6. Average Dilution Stream Flow During Periods of Release into the Missouri River(mls/min) :	7.525E+08	7.712E+08	1.363E+09	1.363E+09
 <u>B. Gaseous Releases All Sources</u>	 <u>1st Quarter</u>	 <u>2nd Quarter</u>	 <u>3rd Quarter</u>	 <u>4th Quarter</u>
1. Number of Batch Releases:	66	59	16	17
2. Total Time Period for Batch Releases(min) :	80,977	72,442	64,455	69,244
3. Maximum Time Period for Batch Releases(min) :	7,676	6,035	5,060	6,478
4. Average Time Period for Batch Releases(min) :	1,227	1,228	4,028	4,073
5. Minimum Time Period for Batch Releases(min) :	5	47	352	350



TABLE III.2  
 ABNORMAL BATCH LIQUID AND GASEOUS RELEASE SUMMARY  
 JANUARY THROUGH DECEMBER 2001

<u>A. Liquid Releases All Sources</u>	<u>1st Quarter</u>	<u>2nd Quarter</u>	<u>3rd Quarter</u>	<u>4th Quarter</u>
Number of Releases:	0	0	0	0
Total Activity Releases (Ci):	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>B. Gaseous Releases All Sources</u>				
Number of Releases:	0	0	0	0
Total Activity Releases (Ci):	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE III.3  
GASEOUS EFFLUENTS--SUMMATION OF ALL RELEASES  
JANUARY THROUGH DECEMBER 2001

	<u>1st Quarter</u>	<u>2nd Quarter</u>	<u>3rd Quarter</u>	<u>4th Quarter</u>
A. Fission & Activation Gases				
Total Release (Ci):	2.79E+03	1.40E+02	1.61E+02	2.39E+02
Avg. Release Rate				
for period (uCi/sec):	3.63E+02	1.80E+01	2.04E+01	3.04E+01
Total Error(%): <u>31.97</u>				
 B. Iodines				
Total Release (Ci):	3.14E-03	3.49E-03	1.85E-05	5.69E-05
Avg. Release Rate				
for period (uCi/sec):	4.08E-04	4.49E-04	2.35E-06	7.24E-06
Total Error(%): <u>52.20</u>				
 C. Particulates				
Total Release (Ci):	0.00E+00	0.00E+00	3.15E-07	2.31E-06
Avg. Release Rate				
for period (uCi/sec):	0.00E+00	0.00E+00	4.01E-08	2.93E-07
Total Error(%): <u>131.92</u>				
 Gross Alpha				
Total Error(%): <u>20.62</u>	3.27E-06	8.95E-06	1.15E-05	1.00E-05
 D. Tritium				
Total Release (Ci):	9.54E-01	3.02E-01	9.76E-02	9.80E-02
Avg. Release Rate				
for period (uCi/sec):	1.24E-01	3.89E-02	1.24E-02	1.25E-02
Total Error(%): <u>25.08</u>				

NOTE: Values reported as zero are determined to be below the Lower Limit of Detection (LLD).

TABLE III.4  
GASEOUS EFFLUENTS--GROUND LEVEL RELEASES  
JANUARY THROUGH DECEMBER 2001  
Batch Mode

<u>Nuclides (Ci)</u>	<u>1st Quarter</u>	<u>2nd Quarter</u>	<u>3rd Quarter</u>	<u>4th Quarter</u>
Fission & Activation Gases				
AR-41	1.91E-01	1.52E-01	2.23E-01	2.37E-01
KR-85	2.35E+02	6.70E+01	1.12E+01	1.27E+01
KR-85M	1.10E-01	3.12E-02	4.44E-02	4.78E-02
KR-87	3.31E-03	3.12E-03	7.88E-04	3.04E-04
KR-88	8.16E-02	2.91E-02	3.46E-02	3.30E-02
XE-131	0.00E+00	0.00E+00	8.31E-04	0.00E+00
XE-131M	6.30E+01	4.02E+00	2.42E+00	3.48E+00
XE-133	1.90E+03	6.24E+01	1.39E+02	1.96E+02
XE-133M	1.40E+01	5.04E-01	1.15E+00	1.60E+00
XE-135	3.83E+00	5.63E-01	7.75E-01	7.77E-01
Totals for Period:	2.21E+03	1.35E+02	1.55E+02	2.15E+02
Iodines				
I-131	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-132	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-133	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Totals for Period:	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Pariculates				
CS-134	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Totals for Period:	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium and Gross Alpha				
ALPHA	0.00E+00	0.00E+00	0.00E+00	0.00E+00
H-3	9.54E-01	3.02E-01	9.76E-02	9.80E-02

NOTE: Values reported as zero are determined to be below the Lower Limit of Detection (LLD).

TABLE III.5  
GASEOUS EFFLUENTS--GROUND LEVEL RELEASES  
JANUARY THROUGH DECEMBER 2001  
Continuous Mode

<u>Nuclides (Ci)</u>	<u>1st Quarter</u>	<u>2nd Quarter</u>	<u>3rd Quarter</u>	<u>4th Quarter</u>
Fission & Activation Gases				
AR-41	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-85	5.65E+01	0.00E+00	0.00E+00	0.00E+00
KR-85M	1.98E-02	0.00E+00	0.00E+00	3.16E-02
KR-87	0.00E+00	0.00E+00	0.00E+00	0.00E+00
KR-88	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-131	0.00E+00	0.00E+00	0.00E+00	0.00E+00
XE-131M	1.91E+01	0.00E+00	0.00E+00	0.00E+00
XE-133	4.96E+02	5.58E+00	5.26E+00	2.31E+01
XE-133M	4.76E+00	0.00E+00	0.00E+00	0.00E+00
XE-135	2.74E+00	0.00E+00	2.85E-01	1.05E+00
Totals for Period:	5.79E+02	5.58E+00	5.55E+00	2.42E+01
Iodines				
I-131	2.82E-03	3.49E-03	1.62E-05	1.74E-05
I-132	1.98E-04	0.00E+00	0.00E+00	0.00E+00
I-133	1.21E-04	2.91E-06	2.30E-06	3.95E-05
Totals for Period:	3.14E-03	3.49E-03	1.85E-05	5.69E-05
Particulates				
CS-134	0.00E+00	0.00E+00	0.00E+00	2.70E-07
CS-137	0.00E+00	7.41E-06	3.15E-07	2.04E-06
Totals for Period:	0.00E+00	7.41E-06	3.15E-07	2.31E-06
Tritium and Gross Alpha				
ALPHA	3.22E-06	8.83E-06	1.14E-05	9.93E-06
H-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00

NOTE: Values reported as zero are determined to be below the Lower Limit of Detection (LLD).

TABLE III.6  
LIQUID EFFLUENTS--SUMMATION OF ALL RELEASES  
JANUARY THROUGH DECEMBER 2001

	<u>1st Quarter</u>	<u>2nd Quarter</u>	<u>3rd Quarter</u>	<u>4th Quarter</u>
A. Fission & Activation Products	9.07E-02	3.69E-01	6.89E-02	3.09E-02
Total Release				
(No Tritium, Gas, Alpha) (Ci):	3.21E-10	1.49E-09	1.93E-10	8.65E-11
Avg Diluted Concentration				
(uCi/ml):				
10 CFR 20, App. B Limit				
1.00E-06 uCi/ml	3.21E-02	1.49E-01	1.93E-02	8.65E-03
Percent of Limit (%):				
Total Error (%): <u>24.64</u>				
 B. Tritium	6.88E+01	3.22E+01	2.59E+01	4.85E+01
Total Release (Ci):				
Avg Diluted Concentration	2.43E-07	1.30E-07	7.28E-08	1.36E-07
(uCi/ml):				
10 CFR 20, App. B Limit				
1.00E-03 uCi/ml	2.43E-02	1.30E-02	7.28E-03	1.36E-02
Percent of Limit (%):				
Total Error (%): <u>25.08</u>				
 C. Dissolved & Entrained Gases	1.99E-01	1.22E-02	9.62E-04	3.46E-03
Total Release (Ci):				
Avg Diluted Concentration	7.02E-10	4.92E-11	2.70E-12	9.69E-12
(uCi/ml):				
ODCM Limit				
2.00E-04 uCi/ml	3.51E-04	2.46E-05	1.35E-06	4.85E-06
Percent of Limit (%):				
Total Error (%): <u>29.19</u>				
 D. Gross Alpha Radioactivity	1.98E-04	7.11E-03	1.26E-02	7.28E-04
Total Release (Ci):				
Total Error (%): <u>25.08</u>				
 E. Volume of Waste Released				
Prior to Dilution (Liters):	3.70E+07	2.79E+07	4.68E+07	5.45E+07
 F. Volume of Dilution Water				
This Period (Liters):	2.83E+11	2.48E+11	3.56E+11	3.57E+11

NOTE: Values reported as zero are determined to be below the Lower Limit of Detection (LLD).

TABLE III.7  
LIQUID EFFLUENTS  
JANUARY THROUGH DECEMBER 2001  
Batch Mode

Nuclides(Ci)	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
<b>Fission &amp; Activation Gases</b>				
AG-110M	5.61E-03	1.67E-02	3.56E-03	1.50E-03
BA-140	0.00E+00	2.37E-04	0.00E+00	0.00E+00
CE-141	3.50E-04	1.27E-03	0.00E+00	0.00E+00
CE-144	5.29E-04	4.54E-03	6.61E-04	5.44E-05
CO-57	5.70E-05	2.29E-04	1.50E-04	6.13E-05
CO-58	2.55E-02	6.90E-02	1.94E-02	2.83E-03
CO-60	2.71E-03	1.07E-02	5.28E-03	1.94E-03
CR-51	4.49E-03	4.08E-02	1.61E-03	3.37E-05
CS-134	1.05E-02	8.73E-03	4.97E-03	6.01E-03
CS-136	2.05E-05	2.40E-05	0.00E+00	0.00E+00
CS-137	8.23E-03	7.21E-03	4.78E-03	7.17E-03
CS-139	2.34E-05	0.00E+00	0.00E+00	0.00E+00
FE-55	3.92E-03	6.71E-03	2.84E-03	2.72E-03
FE-59	7.34E-05	4.67E-04	3.54E-05	0.00E+00
HF-181	3.13E-05	4.05E-04	2.55E-05	0.00E+00
HG-203	0.00E+00	0.00E+00	7.15E-06	4.25E-06
I-131	4.31E-03	3.84E-03	9.01E-05	1.07E-04
I-132	5.21E-05	4.17E-05	0.00E+00	0.00E+00
LA-140	2.68E-04	1.39E-03	5.10E-05	2.14E-05
MN-54	3.64E-04	1.97E-03	7.51E-04	2.04E-04
MO-99	1.06E-04	3.08E-06	0.00E+00	0.00E+00
NB-95	5.15E-03	4.00E-02	8.25E-03	1.23E-03
NB-95M	0.00E+00	3.37E-05	0.00E+00	0.00E+00
ND-147	5.21E-05	2.58E-05	0.00E+00	0.00E+00
NP-239	2.93E-05	0.00E+00	0.00E+00	0.00E+00
PM-149	0.00E+00	1.54E-04	0.00E+00	0.00E+00
PR-144	5.29E-04	4.54E-03	6.61E-04	5.44E-05
RH-103M	2.44E-04	1.76E-03	1.19E-04	0.00E+00
RU-103	2.44E-04	1.76E-03	1.19E-04	0.00E+00
SB-124	7.52E-04	7.64E-03	2.32E-04	2.57E-05
SB-125	1.36E-02	1.08E-01	1.11E-02	6.30E-03
SB-126	2.66E-05	9.26E-05	0.00E+00	0.00E+00
SE-75	6.48E-06	0.00E+00	9.44E-05	1.33E-04
SN-113	8.40E-05	6.89E-04	1.38E-04	1.22E-05
SN-117M	0.00E+00	4.46E-05	0.00E+00	0.00E+00
SR-90	0.00E+00	3.26E-05	9.43E-06	1.40E-05
TA-182	0.00E+00	7.81E-05	0.00E+00	0.00E+00
TC-99M	1.06E-04	3.08E-06	0.00E+00	0.00E+00
TE-129	0.00E+00	1.18E-03	0.00E+00	0.00E+00
TE-129M	0.00E+00	5.71E-03	0.00E+00	0.00E+00
TE-132	5.57E-05	1.87E-04	0.00E+00	0.00E+00
Y-90	0.00E+00	3.26E-05	9.43E-06	1.40E-05
ZN-65	0.00E+00	7.29E-08	0.00E+00	0.00E+00
ZR-95	2.66E-03	2.29E-02	3.92E-03	4.36E-04
Totals for Period:	9.07E-02	3.69E-01	6.89E-02	3.09E-02
<b>Dissolved &amp; Entrained Gases</b>				
AR-41	0.00E+00	4.29E-06	0.00E+00	0.00E+00
KR-85	6.02E-05	2.99E-03	0.00E+00	0.00E+00
KR-85M	1.23E-06	0.00E+00	0.00E+00	0.00E+00
XE-131M	5.58E-03	1.17E-03	0.00E+00	0.00E+00
XE-133	1.92E-01	8.00E-03	9.62E-04	3.41E-03
XE-133M	8.97E-04	0.00E+00	0.00E+00	1.23E-05
XE-135	1.45E-04	1.43E-05	0.00E+00	3.50E-05
Totals for Period:	1.99E-01	1.22E-02	9.62E-04	3.46E-03
<b>Tritium and Gross Alpha</b>				
ALPHA	1.98E-04	6.99E-03	2.44E-04	8.90E-05
H-3	6.88E+01	3.22E+01	2.59E+01	4.85E+01

NOTE: Values reported as zero are determined to be below the Lower Limit of Detection (LLD) values.

TABLE III.8  
LIQUID EFFLUENTS  
JANUARY THROUGH DECEMBER 2001  
Continuous Mode

<u>Nuclides (Ci)</u>	<u>1st Quarter</u>	<u>2nd Quarter</u>	<u>3rd Quarter</u>	<u>4th Quarter</u>
Fission & Activation Products				
CS-137	0.00E+00	7.41E-06	0.00E+00	0.00E+00
Totals for Period:	0.00E+00	7.41E-06	0.00E+00	0.00E+00
Dissolved & Entrained Gases				
Totals for Period:	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium and Gross Alpha				
ALPHA	0.00E+00	1.20E-04	1.23E-02	6.39E-04
H-3	0.00E+00	0.00E+00	0.00E+00	0.00E+00

NOTE: Values reported as zero are determined to be below the Lower Limit of Detection (LLD).

**SECTION IV**  
**DOSE FROM GASEOUS EFFLUENTS**

**Technical Specification 5.9.4a**

**GASPAR II OUTPUT**

**January 1, 2001 - December 31,2001**



## Radioactive Effluent Releases - First, Second, Third and Fourth Quarters 2001

### GASEOUS EFFLUENTS

Radioactive gaseous releases for the reporting period totaled  $3.33\text{E}+03$  Curies of inert gas. The gross gaseous activity release rates were  $3.63\text{E}+02$   $\mu\text{Ci/sec}$  for the first quarter,  $1.80\text{E}+01$   $\mu\text{Ci/sec}$  for the second quarter,  $2.04\text{E}+01$   $\mu\text{Ci/sec}$  for the third quarter, and  $3.04\text{E}+01$   $\mu\text{Ci/sec}$  for the fourth quarter.

Radioactive halogens and Particulates with half-lives greater than eight days released during the reporting period totaled  $6.71\text{E}-03$  Curies. The halogen release rates were  $4.08\text{E}-04$   $\mu\text{Ci/sec}$  for the first quarter,  $4.49\text{E}-04$   $\mu\text{Ci/sec}$  for the second quarter,  $2.35\text{E}-06$   $\mu\text{Ci/sec}$  for the third quarter, and  $7.24\text{E}-06$   $\mu\text{Ci/sec}$  for the fourth quarter. The release rates for Particulates with half-lives greater than eight days were  $0.00\text{E}+00$   $\mu\text{Ci/sec}$  for the first quarter,  $0.00\text{E}+00$   $\mu\text{Ci/sec}$  for the second quarter,  $4.01\text{E}-08$   $\mu\text{Ci/sec}$  for the third quarter and  $2.93\text{E}-07$   $\mu\text{Ci/sec}$  for the fourth quarter.

Radioactive tritium released during the reporting period totaled  $1.45\text{E}+00$  Curies. Gross alpha radioactivity released during the reporting period totaled  $3.37\text{E}-05$  Curies.

## POTENTIAL DOSES TO INDIVIDUALS AND POPULATIONS

### A. Potential Annual Doses to Individuals from Gaseous Releases

Total body, skin, and organ doses from ground releases were calculated in mRem to an average adult, teenager, child, and infant using the annual configuration of the GASPARD II program. Results to each receptor are shown in Tables IV-A-1 through IV-A-40. Also, the doses to the same groups, Table IV-B-1, in units of mrad, due to gamma and beta radiation carried by air, were computed using GASPARD II. In its annual configuration, GASPARD II assumes that all release rates are entered in curies per year (Ci/yr).

The inputs to GASPARD II for the annual period from January 1, 2001 through December 31, 2001 were as follows:

- (1) All gaseous effluents
- (2) Entrained gases (Ar-41, Xe-131M, Xe-133M, Xe-133, Xe-135M, Xe-135, Kr-85M, Kr-87, and Kr-88) from liquid effluents.
- (3) Annual X/Qs at the actual receptor locations, which are corrected for open terrain and plume depletion, are calculated according to Regulatory Guideline 1.111. Also included are annual deposition rates corrected for the open terrain factor.
- (4) The production, intake and grazing fractions were as follows: 1.0 for leafy vegetables grown in garden of interest, 0.76 for produce grown in garden of interest, 0.5 for the pasture grazing season of the milk animal, 1.0 for pasture grazing season of the meat animal, and 8 g/m<sup>3</sup> for the air water (humidity) concentrations.
- (5) All dose factors, transport times from receptor to individual, and usage factors are defined by Regulatory Guide 1.109 and NUREG-0172.
- (6) Site specific information, within a five-mile radius of the plant, on types of receptors located in each sector was used. That is, if a cow was not present in a sector, then the milk pathway for that sector was not considered. If it was present, then the actual sector distance was used.

These inputs introduce a most conservative approach for the following reasons:

- (1) The open terrain and deposition corrections increase annual  $X/Q$ s by a factor ranging between 1.0 and 4.0
- (2) The production, intake, and grazing fractions, as defined in the input definition statement, represent the environment in an extremely conservative manner.

**B. Potential Semiannual Doses to Population from Gaseous Releases**

The GASPAR II program in its annual configuration was also used to calculate the ALARA integrated population dose summary for the total body, skin, and organ doses in man-rem for all individuals within a 50-mile radius. The population-integrated dose is the summation of the dose received by all individuals and has units of man-thyroid-rem when applied to the summation of thyroid doses. The same inputs were used as in the individual case with the addition of the following:

- (1) A total population of 853,274 (based on the 2000 census) was used to define the sector segments within a 50-mile radius of the plant.
- (2) Production of milk, meat, and vegetation is based on 1973 annual data for Nebraska as recommended by the Nuclear Regulatory Commission for use in GASPAR II.

TABLE IV-A-1

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 1 RES  
 AT 4.57 MILES N

ANNUAL\_BETA\_AIR\_DOSE = 1.67E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 4.47E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 2.60E-03	: 2.60E-03	: 2.60E-03	: 2.60E-03	: 2.60E-03	: 2.60E-03	: 2.77E-03	: 9.80E-03
GROUND	: 1.15E-06	: 1.15E-06	: 1.15E-06	: 1.15E-06	: 1.15E-06	: 1.15E-06	: 1.15E-06	: 1.37E-06
INHAL	:	:	:	:	:	:	:	:
ADULT	: 5.15E-06	: 4.79E-06	: 6.47E-07	: 5.55E-06	: 6.20E-06	: 3.08E-04	: 4.63E-06	: 4.63E-06
TEEN	: 5.35E-06	: 4.84E-06	: 9.11E-07	: 5.93E-06	: 6.82E-06	: 3.77E-04	: 4.67E-06	: 4.67E-06
CHILD	: 4.82E-06	: 4.20E-06	: 1.24E-06	: 5.36E-06	: 6.14E-06	: 4.18E-04	: 4.13E-06	: 4.12E-06
INFANT	: 2.87E-06	: 2.40E-06	: 9.74E-07	: 3.51E-06	: 3.70E-06	: 3.80E-04	: 2.37E-06	: 2.37E-06

TABLE IV-A-2

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 2 RES  
 AT 1.93 MILES NNE

ANNUAL\_BETA\_AIR\_DOSE = 7.93E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 2.15E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.25E-02	: 1.25E-02	: 1.25E-02	: 1.25E-02	: 1.25E-02	: 1.25E-02	: 1.33E-02	: 4.67E-02
GROUND	: 6.41E-06	: 6.41E-06	: 6.41E-06	: 6.41E-06	: 6.41E-06	: 6.41E-06	: 6.41E-06	: 7.63E-06
INHAL	:	:	:	:	:	:	:	:
ADULT	: 2.41E-05	: 2.23E-05	: 3.17E-06	: 2.60E-05	: 2.92E-05	: 1.50E-03	: 2.15E-05	: 2.15E-05
TEEN	: 2.50E-05	: 2.25E-05	: 4.46E-06	: 2.79E-05	: 3.22E-05	: 1.84E-03	: 2.17E-05	: 2.17E-05
CHILD	: 2.26E-05	: 1.95E-05	: 6.05E-06	: 2.52E-05	: 2.90E-05	: 2.04E-03	: 1.92E-05	: 1.92E-05
INFANT	: 1.35E-05	: 1.12E-05	: 4.76E-06	: 1.66E-05	: 1.75E-05	: 1.86E-03	: 1.10E-05	: 1.10E-05

TABLE IV-A-3

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 3 RES  
 AT 1.52 MILES NE

ANNUAL\_BETA\_AIR\_DOSE = 1.08E-01 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 2.93E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.71E-02	: 1.71E-02	: 1.71E-02	: 1.71E-02	: 1.71E-02	: 1.71E-02	: 1.81E-02	: 6.37E-02
GROUND	: 6.41E-06	: 6.41E-06	: 6.41E-06	: 6.41E-06	: 6.41E-06	: 6.41E-06	: 6.41E-06	: 7.63E-06
INHAL	:	:	:	:	:	:	:	:
ADULT	: 3.30E-05	: 3.05E-05	: 4.35E-06	: 3.56E-05	: 4.00E-05	: 2.06E-03	: 2.94E-05	: 2.94E-05
TEEN	: 3.42E-05	: 3.08E-05	: 6.11E-06	: 3.82E-05	: 4.41E-05	: 2.53E-03	: 2.97E-05	: 2.97E-05
CHILD	: 3.09E-05	: 2.67E-05	: 8.30E-06	: 3.45E-05	: 3.98E-05	: 2.80E-03	: 2.62E-05	: 2.62E-05
INFANT	: 1.84E-05	: 1.53E-05	: 6.54E-06	: 2.27E-05	: 2.40E-05	: 2.55E-03	: 1.51E-05	: 1.51E-05

TABLE IV-A-4

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 4 RES  
 AT 4.79 MILES ENE

ANNUAL\_BETA\_AIR\_DOSE = 9.14E-03 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 2.45E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.43E-03	: 1.43E-03	: 1.43E-03	: 1.43E-03	: 1.43E-03	: 1.43E-03	: 1.52E-03	: 5.36E-03
GROUND	: 3.08E-07	: 3.08E-07	: 3.08E-07	: 3.08E-07	: 3.08E-07	: 3.08E-07	: 3.08E-07	: 3.67E-07
INHAL	:	:	:	:	:	:	:	:
ADULT	: 2.80E-06	: 2.60E-06	: 3.56E-07	: 3.02E-06	: 3.38E-06	: 1.69E-04	: 2.51E-06	: 2.51E-06
TEEN	: 2.91E-06	: 2.63E-06	: 5.00E-07	: 3.23E-06	: 3.72E-06	: 2.07E-04	: 2.54E-06	: 2.54E-06
CHILD	: 2.62E-06	: 2.28E-06	: 6.79E-07	: 2.92E-06	: 3.35E-06	: 2.30E-04	: 2.24E-06	: 2.24E-06
INFANT	: 1.56E-06	: 1.30E-06	: 5.35E-07	: 1.92E-06	: 2.02E-06	: 2.09E-04	: 1.29E-06	: 1.29E-06

TABLE IV-A-5

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 5 RES  
 AT 4.67 MILES E

ANNUAL\_BETA\_AIR\_DOSE = 1.30E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 3.47E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 2.02E-03	: 2.02E-03	: 2.02E-03	: 2.02E-03	: 2.02E-03	: 2.02E-03	: 2.15E-03	: 7.63E-03
GROUND	: 4.29E-07	: 4.29E-07	: 4.29E-07	: 4.29E-07	: 4.29E-07	: 4.29E-07	: 4.29E-07	: 5.11E-07
INHAL	:	:	:	:	:	:	:	:
ADULT	: 4.05E-06	: 3.77E-06	: 5.10E-07	: 4.36E-06	: 4.87E-06	: 2.43E-04	: 3.64E-06	: 3.64E-06
TEEN	: 4.20E-06	: 3.80E-06	: 7.17E-07	: 4.67E-06	: 5.36E-06	: 2.97E-04	: 3.67E-06	: 3.67E-06
CHILD	: 3.79E-06	: 3.30E-06	: 9.74E-07	: 4.22E-06	: 4.83E-06	: 3.29E-04	: 3.24E-06	: 3.24E-06
INFANT	: 2.26E-06	: 1.89E-06	: 7.67E-07	: 2.76E-06	: 2.91E-06	: 3.00E-04	: 1.86E-06	: 1.86E-06



TABLE IV-A-6

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 6 RES  
 AT 4.22 MILES ESE

ANNUAL\_BETA\_AIR\_DOSE = 1.60E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 4.35E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 2.53E-03	: 2.53E-03	: 2.53E-03	: 2.53E-03	: 2.53E-03	: 2.53E-03	: 2.69E-03	: 9.41E-03
GROUND	: 7.67E-07	: 7.67E-07	: 7.67E-07	: 7.67E-07	: 7.67E-07	: 7.67E-07	: 7.67E-07	: 9.14E-07
INHAL	:	:	:	:	:	:	:	:
ADULT	: 4.80E-06	: 4.46E-06	: 6.24E-07	: 5.19E-06	: 5.81E-06	: 2.96E-04	: 4.30E-06	: 4.30E-06
TEEN	: 4.99E-06	: 4.50E-06	: 8.77E-07	: 5.56E-06	: 6.41E-06	: 3.63E-04	: 4.34E-06	: 4.34E-06
CHILD	: 4.50E-06	: 3.91E-06	: 1.19E-06	: 5.02E-06	: 5.78E-06	: 4.02E-04	: 3.83E-06	: 3.83E-06
INFANT	: 2.69E-06	: 2.23E-06	: 9.37E-07	: 3.30E-06	: 3.48E-06	: 3.66E-04	: 2.20E-06	: 2.20E-06

TABLE IV-A-7

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 7 RES  
 AT 1.67 MILES SE

ANNUAL\_BETA\_AIR\_DOSE = 9.28E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 2.52E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.47E-02	: 1.47E-02	: 1.47E-02	: 1.47E-02	: 1.47E-02	: 1.47E-02	: 1.56E-02	: 5.46E-02
GROUND	: 1.20E-05	: 1.20E-05	: 1.20E-05	: 1.20E-05	: 1.20E-05	: 1.20E-05	: 1.20E-05	: 1.43E-05
INHAL	:	:	:	:	:	:	:	:
ADULT	: 2.81E-05	: 2.61E-05	: 3.72E-06	: 3.04E-05	: 3.42E-05	: 1.76E-03	: 2.51E-05	: 2.51E-05
TEEN	: 2.92E-05	: 2.63E-05	: 5.23E-06	: 3.26E-05	: 3.77E-05	: 2.16E-03	: 2.54E-05	: 2.54E-05
CHILD	: 2.64E-05	: 2.28E-05	: 7.10E-06	: 2.95E-05	: 3.40E-05	: 2.40E-03	: 2.24E-05	: 2.24E-05
INFANT	: 1.58E-05	: 1.30E-05	: 5.59E-06	: 1.94E-05	: 2.05E-05	: 2.18E-03	: 1.29E-05	: 1.29E-05

TABLE IV-A-8

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 8 RES  
 AT 0.94 MILES SSE

ANNUAL BETA AIR DOSE = 1.23E-01 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 3.34E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.95E-02	: 1.95E-02	: 1.95E-02	: 1.95E-02	: 1.95E-02	: 1.95E-02	: 2.07E-02	: 7.24E-02
GROUND	: 2.70E-05	: 2.70E-05	: 2.70E-05	: 2.70E-05	: 2.70E-05	: 2.70E-05	: 2.70E-05	: 3.21E-05
INHAL	:	:	:	:	:	:	:	:
ADULT	: 3.71E-05	: 3.43E-05	: 5.00E-06	: 4.02E-05	: 4.52E-05	: 2.37E-03	: 3.31E-05	: 3.31E-05
TEEN	: 3.86E-05	: 3.47E-05	: 7.03E-06	: 4.31E-05	: 5.00E-05	: 2.91E-03	: 3.34E-05	: 3.34E-05
CHILD	: 3.48E-05	: 3.01E-05	: 9.55E-06	: 3.90E-05	: 4.51E-05	: 3.22E-03	: 2.95E-05	: 2.95E-05
INFANT	: 2.08E-05	: 1.72E-05	: 7.52E-06	: 2.58E-05	: 2.72E-05	: 2.93E-03	: 1.70E-05	: 1.69E-05

TABLE IV-A-9

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 9 RES  
 AT 0.74 MILES S

ANNUAL\_BETA\_AIR\_DOSE = 8.11E-03 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 2.21E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.29E-03	: 1.29E-03	: 1.29E-03	: 1.29E-03	: 1.29E-03	: 1.29E-03	: 1.37E-03	: 4.78E-03
GROUND	: 5.18E-07	: 5.18E-07	: 5.18E-07	: 5.18E-07	: 5.18E-07	: 5.18E-07	: 5.18E-07	: 6.17E-07
INHAL	:	:	:	:	:	:	:	:
ADULT	: 2.45E-06	: 2.27E-06	: 3.30E-07	: 2.65E-06	: 2.98E-06	: 1.56E-04	: 2.18E-06	: 2.18E-06
TEEN	: 2.55E-06	: 2.29E-06	: 4.63E-07	: 2.85E-06	: 3.30E-06	: 1.91E-04	: 2.20E-06	: 2.20E-06
CHILD	: 2.30E-06	: 1.98E-06	: 6.29E-07	: 2.58E-06	: 2.97E-06	: 2.12E-04	: 1.95E-06	: 1.94E-06
INFANT	: 1.37E-06	: 1.13E-06	: 4.95E-07	: 1.70E-06	: 1.79E-06	: 1.93E-04	: 1.12E-06	: 1.12E-06

TABLE IV-A-10

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 10 RES  
 AT 0.65 MILES SSW

ANNUAL BETA AIR DOSE = 8.84E-03 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 2.41E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.40E-03	: 1.40E-03	: 1.40E-03	: 1.40E-03	: 1.40E-03	: 1.40E-03	: 1.49E-03	: 5.21E-03
GROUND	: 2.07E-07	: 2.07E-07	: 2.07E-07	: 2.07E-07	: 2.07E-07	: 2.07E-07	: 2.07E-07	: 2.47E-07
INHAL	:	:	:	:	:	:	:	:
ADULT	: 2.67E-06	: 2.47E-06	: 3.60E-07	: 2.89E-06	: 3.26E-06	: 1.71E-04	: 2.38E-06	: 2.38E-06
TEEN	: 2.78E-06	: 2.50E-06	: 5.07E-07	: 3.11E-06	: 3.60E-06	: 2.09E-04	: 2.40E-06	: 2.40E-06
CHILD	: 2.51E-06	: 2.16E-06	: 6.88E-07	: 2.81E-06	: 3.25E-06	: 2.32E-04	: 2.12E-06	: 2.12E-06
INFANT	: 1.50E-06	: 1.24E-06	: 5.42E-07	: 1.86E-06	: 1.96E-06	: 2.11E-04	: 1.22E-06	: 1.22E-06

TABLE IV-A-11

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 11 RES  
 AT 0.73 MILES SW

ANNUAL\_BETA\_AIR\_DOSE = 7.07E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 1.91E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.12E-02	: 1.12E-02	: 1.12E-02	: 1.12E-02	: 1.12E-02	: 1.12E-02	: 1.19E-02	: 4.16E-02
GROUND	: 6.00E-06	: 6.00E-06	: 6.00E-06	: 6.00E-06	: 6.00E-06	: 6.00E-06	: 6.00E-06	: 7.14E-06
INHAL	:	:	:	:	:	:	:	:
ADULT	: 2.15E-05	: 1.99E-05	: 2.87E-06	: 2.33E-05	: 2.61E-05	: 1.36E-03	: 1.92E-05	: 1.92E-05
TEEN	: 2.23E-05	: 2.01E-05	: 4.04E-06	: 2.50E-05	: 2.89E-05	: 1.67E-03	: 1.94E-05	: 1.93E-05
CHILD	: 2.02E-05	: 1.74E-05	: 5.48E-06	: 2.26E-05	: 2.60E-05	: 1.85E-03	: 1.71E-05	: 1.71E-05
INFANT	: 1.20E-05	: 9.96E-06	: 4.31E-06	: 1.49E-05	: 1.57E-05	: 1.68E-03	: 9.83E-06	: 9.83E-06

TABLE IV-A-12

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 12 RES  
 AT 1.06 MILES WSW

ANNUAL BETA AIR DOSE = 1.02E-01 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 2.78E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.62E-02	: 1.62E-02	: 1.62E-02	: 1.62E-02	: 1.62E-02	: 1.62E-02	: 1.72E-02	: 6.01E-02
GROUND	: 8.09E-06	: 8.09E-06	: 8.09E-06	: 8.09E-06	: 8.09E-06	: 8.09E-06	: 8.09E-06	: 9.63E-06
INHAL	:	:	:	:	:	:	:	:
ADULT	: 3.08E-05	: 2.85E-05	: 4.13E-06	: 3.33E-05	: 3.75E-05	: 1.96E-03	: 2.75E-05	: 2.74E-05
TEEN	: 3.20E-05	: 2.88E-05	: 5.80E-06	: 3.58E-05	: 4.14E-05	: 2.40E-03	: 2.77E-05	: 2.77E-05
CHILD	: 2.89E-05	: 2.50E-05	: 7.87E-06	: 3.24E-05	: 3.73E-05	: 2.66E-03	: 2.45E-05	: 2.45E-05
INFANT	: 1.73E-05	: 1.43E-05	: 6.20E-06	: 2.13E-05	: 2.25E-05	: 2.42E-03	: 1.41E-05	: 1.41E-05

TABLE IV-A-13

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 13 RES  
 AT 1.20 MILES W

ANNUAL\_BETA\_AIR\_DOSE = 1.60E-01 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 4.35E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 2.53E-02	: 2.53E-02	: 2.53E-02	: 2.53E-02	: 2.53E-02	: 2.53E-02	: 2.69E-02	: 9.41E-02
GROUND	: 1.10E-05	: 1.10E-05	: 1.10E-05	: 1.10E-05	: 1.10E-05	: 1.10E-05	: 1.10E-05	: 1.31E-05
INHAL	:	:	:	:	:	:	:	:
ADULT	: 4.82E-05	: 4.46E-05	: 6.39E-06	: 5.21E-05	: 5.85E-05	: 3.03E-03	: 4.30E-05	: 4.30E-05
TEEN	: 5.00E-05	: 4.51E-05	: 8.99E-06	: 5.59E-05	: 6.46E-05	: 3.71E-03	: 4.34E-05	: 4.34E-05
CHILD	: 4.52E-05	: 3.91E-05	: 1.22E-05	: 5.05E-05	: 5.83E-05	: 4.12E-03	: 3.83E-05	: 3.83E-05
INFANT	: 2.70E-05	: 2.23E-05	: 9.61E-06	: 3.33E-05	: 3.51E-05	: 3.75E-03	: 2.20E-05	: 2.20E-05



TABLE IV-A-14

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 14 RES  
 AT 2.27 MILES WNW

ANNUAL\_BETA\_AIR\_DOSE = 7.07E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 1.91E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.12E-02	: 1.12E-02	: 1.12E-02	: 1.12E-02	: 1.12E-02	: 1.12E-02	: 1.19E-02	: 4.16E-02
GROUND	: 3.31E-06	: 3.31E-06	: 3.31E-06	: 3.31E-06	: 3.31E-06	: 3.31E-06	: 3.31E-06	: 3.94E-06
INHAL	:	:	:	:	:	:	:	:
ADULT	: 2.15E-05	: 1.99E-05	: 2.81E-06	: 2.32E-05	: 2.60E-05	: 1.33E-03	: 1.92E-05	: 1.92E-05
TEEN	: 2.23E-05	: 2.01E-05	: 3.95E-06	: 2.48E-05	: 2.87E-05	: 1.63E-03	: 1.94E-05	: 1.93E-05
CHILD	: 2.01E-05	: 1.74E-05	: 5.36E-06	: 2.25E-05	: 2.58E-05	: 1.81E-03	: 1.71E-05	: 1.71E-05
INFANT	: 1.20E-05	: 9.96E-06	: 4.22E-06	: 1.48E-05	: 1.56E-05	: 1.65E-03	: 9.83E-06	: 9.83E-06

TABLE IV-A-15

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 15 RES  
 AT 2.40 MILES NW

ANNUAL\_BETA\_AIR\_DOSE = 7.44E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 2.02E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.17E-02	: 1.17E-02	: 1.17E-02	: 1.17E-02	: 1.17E-02	: 1.17E-02	: 1.25E-02	: 4.38E-02
GROUND	: 3.93E-06	: 3.93E-06	: 3.93E-06	: 3.93E-06	: 3.93E-06	: 3.93E-06	: 3.93E-06	: 4.68E-06
INHAL	:	:	:	:	:	:	:	:
ADULT	: 2.26E-05	: 2.09E-05	: 2.96E-06	: 2.44E-05	: 2.74E-05	: 1.41E-03	: 2.02E-05	: 2.02E-05
TEEN	: 2.34E-05	: 2.11E-05	: 4.17E-06	: 2.61E-05	: 3.02E-05	: 1.72E-03	: 2.04E-05	: 2.04E-05
CHILD	: 2.12E-05	: 1.83E-05	: 5.65E-06	: 2.36E-05	: 2.72E-05	: 1.91E-03	: 1.80E-05	: 1.80E-05
INFANT	: 1.26E-05	: 1.05E-05	: 4.45E-06	: 1.56E-05	: 1.64E-05	: 1.74E-03	: 1.03E-05	: 1.03E-05

TABLE IV-A-16

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 16 RES  
 AT 2.08 MILES NNW

ANNUAL\_BETA\_AIR\_DOSE = 9.73E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 2.63E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.53E-02	: 1.53E-02	: 1.53E-02	: 1.53E-02	: 1.53E-02	: 1.53E-02	: 1.63E-02	: 5.72E-02
GROUND	: 7.23E-06	: 7.23E-06	: 7.23E-06	: 7.23E-06	: 7.23E-06	: 7.23E-06	: 7.23E-06	: 8.61E-06
INHAL	:	:	:	:	:	:	:	:
ADULT	: 2.96E-05	: 2.74E-05	: 3.87E-06	: 3.20E-05	: 3.58E-05	: 1.84E-03	: 2.65E-05	: 2.65E-05
TEEN	: 3.07E-05	: 2.77E-05	: 5.44E-06	: 3.42E-05	: 3.95E-05	: 2.25E-03	: 2.67E-05	: 2.67E-05
CHILD	: 2.77E-05	: 2.40E-05	: 7.38E-06	: 3.10E-05	: 3.56E-05	: 2.49E-03	: 2.36E-05	: 2.36E-05
INFANT	: 1.65E-05	: 1.37E-05	: 5.81E-06	: 2.04E-05	: 2.15E-05	: 2.27E-03	: 1.36E-05	: 1.36E-05

TABLE IV-A-17

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 17 VEG  
 AT 1.93 MILES NNE

ANNUAL\_BETA\_AIR\_DOSE = 7.93E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 2.15E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.25E-02	: 1.25E-02	: 1.25E-02	: 1.25E-02	: 1.25E-02	: 1.25E-02	: 1.33E-02	: 4.67E-02
GROUND	: 6.41E-06	: 6.41E-06	: 6.41E-06	: 6.41E-06	: 6.41E-06	: 6.41E-06	: 6.41E-06	: 7.63E-06
VEGET	:	:	:	:	:	:	:	:
ADULT	: 7.63E-05	: 5.55E-05	: 4.53E-05	: 1.04E-04	: 1.47E-04	: 2.05E-02	: 3.92E-05	: 3.89E-05
TEEN	: 9.33E-05	: 6.20E-05	: 6.57E-05	: 1.37E-04	: 1.98E-04	: 2.58E-02	: 4.50E-05	: 4.45E-05
CHILD	: 1.53E-04	: 8.22E-05	: 1.51E-04	: 2.21E-04	: 3.10E-04	: 4.82E-02	: 6.99E-05	: 6.92E-05

TABLE IV-A-18

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 18 VEG  
 AT 3.29 MILES NE

ANNUAL\_BETA\_AIR\_DOSE = 1.72E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 4.68E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 2.73E-03	: 2.73E-03	: 2.73E-03	: 2.73E-03	: 2.73E-03	: 2.73E-03	: 2.90E-03	: 1.01E-02
GROUND	: 8.30E-07	: 8.30E-07	: 8.30E-07	: 8.30E-07	: 8.30E-07	: 8.30E-07	: 8.30E-07	: 9.88E-07
VEGET	:	:	:	:	:	:	:	:
ADULT	: 1.32E-05	: 1.05E-05	: 5.87E-06	: 1.68E-05	: 2.24E-05	: 2.66E-03	: 8.42E-06	: 8.39E-06
TEEN	: 1.59E-05	: 1.19E-05	: 8.51E-06	: 2.15E-05	: 2.94E-05	: 3.34E-03	: 9.66E-06	: 9.59E-06
CHILD	: 2.57E-05	: 1.66E-05	: 1.96E-05	: 3.46E-05	: 4.61E-05	: 6.25E-03	: 1.50E-05	: 1.49E-05

TABLE IV-A-19

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 19 VEG  
 AT 4.79 MILES ENE

ANNUAL\_BETA\_AIR\_DOSE = 9.14E-03 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 2.45E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.43E-03	: 1.43E-03	: 1.43E-03	: 1.43E-03	: 1.43E-03	: 1.43E-03	: 1.52E-03	: 5.36E-03
GROUND	: 3.08E-07	: 3.08E-07	: 3.08E-07	: 3.08E-07	: 3.08E-07	: 3.08E-07	: 3.08E-07	: 3.67E-07
VEGET	:	:	:	:	:	:	:	:
ADULT	: 6.34E-06	: 5.34E-06	: 2.17E-06	: 7.66E-06	: 9.71E-06	: 9.83E-04	: 4.57E-06	: 4.55E-06
TEEN	: 7.54E-06	: 6.04E-06	: 3.15E-06	: 9.61E-06	: 1.25E-05	: 1.24E-03	: 5.23E-06	: 5.21E-06
CHILD	: 1.21E-05	: 8.71E-06	: 7.24E-06	: 1.54E-05	: 1.96E-05	: 2.31E-03	: 8.12E-06	: 8.09E-06

TABLE IV-A-20

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 20 VEG  
 AT 1.74 MILES SE

ANNUAL\_BETA\_AIR\_DOSE = 8.72E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 2.37E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.38E-02	: 1.38E-02	: 1.38E-02	: 1.38E-02	: 1.38E-02	: 1.38E-02	: 1.47E-02	: 5.14E-02
GROUND	: 1.12E-05	: 1.12E-05	: 1.12E-05	: 1.12E-05	: 1.12E-05	: 1.12E-05	: 1.12E-05	: 1.33E-05
VEGET	:	:	:	:	:	:	:	:
ADULT	: 1.08E-04	: 7.14E-05	: 7.93E-05	: 1.56E-04	: 2.31E-04	: 3.58E-02	: 4.30E-05	: 4.25E-05
TEEN	: 1.34E-04	: 7.93E-05	: 1.15E-04	: 2.10E-04	: 3.17E-04	: 4.51E-02	: 4.95E-05	: 4.86E-05
CHILD	: 2.22E-04	: 9.83E-05	: 2.64E-04	: 3.41E-04	: 4.97E-04	: 8.43E-02	: 7.69E-05	: 7.56E-05

TABLE IV-A-21

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 21 VEG  
 AT 0.94 MILES SSE

ANNUAL\_BETA\_AIR\_DOSE = 1.23E-01 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 3.34E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.95E-02	: 1.95E-02	: 1.95E-02	: 1.95E-02	: 1.95E-02	: 1.95E-02	: 2.07E-02	: 7.24E-02
GROUND	: 2.70E-05	: 2.70E-05	: 2.70E-05	: 2.70E-05	: 2.70E-05	: 2.70E-05	: 2.70E-05	: 3.21E-05
VEGET	:	:	:	:	:	:	:	:
ADULT	: 2.17E-04	: 1.29E-04	: 1.91E-04	: 3.33E-04	: 5.14E-04	: 8.62E-02	: 6.11E-05	: 5.99E-05
TEEN	: 2.74E-04	: 1.42E-04	: 2.77E-04	: 4.56E-04	: 7.13E-04	: 1.08E-01	: 7.06E-05	: 6.85E-05
CHILD	: 4.59E-04	: 1.61E-04	: 6.36E-04	: 7.47E-04	: 1.12E-03	: 2.03E-01	: 1.10E-04	: 1.06E-04



TABLE IV-A-22

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 22 VEG  
 AT 0.74 MILES S

ANNUAL\_BETA\_AIR\_DOSE = 8.11E-03 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 2.21E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.29E-03	: 1.29E-03	: 1.29E-03	: 1.29E-03	: 1.29E-03	: 1.29E-03	: 1.37E-03	: 4.78E-03
GROUND	: 5.18E-07	: 5.18E-07	: 5.18E-07	: 5.18E-07	: 5.18E-07	: 5.18E-07	: 5.18E-07	: 6.17E-07
VEGET	:	:	:	:	:	:	:	:
ADULT	: 6.98E-06	: 5.29E-06	: 3.67E-06	: 9.20E-06	: 1.27E-05	: 1.66E-03	: 3.98E-06	: 3.95E-06
TEEN	: 8.47E-06	: 5.94E-06	: 5.32E-06	: 1.20E-05	: 1.69E-05	: 2.09E-03	: 4.56E-06	: 4.52E-06
CHILD	: 1.38E-05	: 8.08E-06	: 1.22E-05	: 1.93E-05	: 2.66E-05	: 3.91E-03	: 7.08E-06	: 7.02E-06

TABLE IV-A-23

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 23 VEG  
 AT 0.65 MILES SSW

ANNUAL\_BETA\_AIR\_DOSE = 8.84E-03 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 2.41E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.40E-03	: 1.40E-03	: 1.40E-03	: 1.40E-03	: 1.40E-03	: 1.40E-03	: 1.49E-03	: 5.21E-03
GROUND	: 2.07E-07	: 2.07E-07	: 2.07E-07	: 2.07E-07	: 2.07E-07	: 2.07E-07	: 2.07E-07	: 2.47E-07
VEGET	:	:	:	:	:	:	:	:
ADULT	: 5.53E-06	: 4.85E-06	: 1.47E-06	: 6.41E-06	: 7.81E-06	: 6.67E-04	: 4.32E-06	: 4.31E-06
TEEN	: 6.51E-06	: 5.50E-06	: 2.13E-06	: 7.91E-06	: 9.89E-06	: 8.39E-04	: 4.95E-06	: 4.93E-06
CHILD	: 1.04E-05	: 8.08E-06	: 4.90E-06	: 1.26E-05	: 1.55E-05	: 1.57E-03	: 7.69E-06	: 7.66E-06

TABLE IV-A-24

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 24 VEG  
 AT 1.41 MILES SW

ANNUAL\_BETA\_AIR\_DOSE = 1.35E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 3.68E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 2.14E-03	: 2.14E-03	: 2.14E-03	: 2.14E-03	: 2.14E-03	: 2.14E-03	: 2.28E-03	: 7.96E-03
GROUND	: 1.10E-06	: 1.10E-06	: 1.10E-06	: 1.10E-06	: 1.10E-06	: 1.10E-06	: 1.10E-06	: 1.31E-06
VEGET	:	:	:	:	:	:	:	:
ADULT	: 1.30E-05	: 9.43E-06	: 7.78E-06	: 1.77E-05	: 2.51E-05	: 3.52E-03	: 6.64E-06	: 6.59E-06
TEEN	: 1.59E-05	: 1.05E-05	: 1.13E-05	: 2.33E-05	: 3.38E-05	: 4.43E-03	: 7.62E-06	: 7.54E-06
CHILD	: 2.61E-05	: 1.39E-05	: 2.59E-05	: 3.78E-05	: 5.31E-05	: 8.28E-03	: 1.18E-05	: 1.17E-05

TABLE IV-A-25

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 25 VEG  
 AT 1.21 MILES WSW

ANNUAL\_BETA\_AIR\_DOSE = 6.95E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 1.88E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.10E-02	: 1.10E-02	: 1.10E-02	: 1.10E-02	: 1.10E-02	: 1.10E-02	: 1.17E-02	: 4.09E-02
GROUND	: 5.58E-06	: 5.58E-06	: 5.58E-06	: 5.58E-06	: 5.58E-06	: 5.58E-06	: 5.58E-06	: 6.65E-06
VEGET	:	:	:	:	:	:	:	:
ADULT	: 6.67E-05	: 4.85E-05	: 3.94E-05	: 9.06E-05	: 1.28E-04	: 1.78E-02	: 3.44E-05	: 3.41E-05
TEEN	: 8.15E-05	: 5.43E-05	: 5.72E-05	: 1.19E-04	: 1.72E-04	: 2.24E-02	: 3.95E-05	: 3.91E-05
CHILD	: 1.34E-04	: 7.20E-05	: 1.32E-04	: 1.93E-04	: 2.71E-04	: 4.20E-02	: 6.13E-05	: 6.07E-05

TABLE IV-A-26

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 26 VEG  
 AT 1.23 MILES W

ANNUAL\_BETA\_AIR\_DOSE = 1.47E-01 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 4.01E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 2.34E-02	: 2.34E-02	: 2.34E-02	: 2.34E-02	: 2.34E-02	: 2.34E-02	: 2.49E-02	: 8.69E-02
GROUND	: 1.04E-05	: 1.04E-05	: 1.04E-05	: 1.04E-05	: 1.04E-05	: 1.04E-05	: 1.04E-05	: 1.23E-05
VEGET	:	:	:	:	:	:	:	:
ADULT	: 1.32E-04	: 9.87E-05	: 7.34E-05	: 1.77E-04	: 2.46E-04	: 3.32E-02	: 7.23E-05	: 7.19E-05
TEEN	: 1.61E-04	: 1.11E-04	: 1.06E-04	: 2.31E-04	: 3.30E-04	: 4.18E-02	: 8.30E-05	: 8.22E-05
CHILD	: 2.63E-04	: 1.49E-04	: 2.45E-04	: 3.74E-04	: 5.18E-04	: 7.81E-02	: 1.29E-04	: 1.28E-04

TABLE IV-A-27

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 27 VEG  
 AT 2.64 MILES WNW

ANNUAL\_BETA\_AIR\_DOSE = 4.62E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 1.25E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 7.26E-03	: 7.26E-03	: 7.26E-03	: 7.26E-03	: 7.26E-03	: 7.26E-03	: 7.72E-03	: 2.71E-02
GROUND	: 2.06E-06	: 2.06E-06	: 2.06E-06	: 2.06E-06	: 2.06E-06	: 2.06E-06	: 2.06E-06	: 2.46E-06
VEGET	:	:	:	:	:	:	:	:
ADULT	: 3.48E-05	: 2.81E-05	: 1.46E-05	: 4.36E-05	: 5.74E-05	: 6.60E-03	: 2.29E-05	: 2.28E-05
TEEN	: 4.17E-05	: 3.17E-05	: 2.11E-05	: 5.56E-05	: 7.53E-05	: 8.30E-03	: 2.62E-05	: 2.60E-05
CHILD	: 6.74E-05	: 4.46E-05	: 4.86E-05	: 8.93E-05	: 1.18E-04	: 1.55E-02	: 4.07E-05	: 4.04E-05

TABLE IV-A-28

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 28 VEG  
 AT 2.63 MILES NW

ANNUAL\_BETA\_AIR\_DOSE = 5.80E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 1.56E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 9.08E-03	: 9.08E-03	: 9.08E-03	: 9.08E-03	: 9.08E-03	: 9.08E-03	: 9.65E-03	: 3.40E-02
GROUND	: 2.88E-06	: 2.88E-06	: 2.88E-06	: 2.88E-06	: 2.88E-06	: 2.88E-06	: 2.88E-06	: 3.43E-06
VEGET	:	:	:	:	:	:	:	:
ADULT	: 4.55E-05	: 3.62E-05	: 2.03E-05	: 5.78E-05	: 7.71E-05	: 9.19E-03	: 2.89E-05	: 2.88E-05
TEEN	: 5.47E-05	: 4.07E-05	: 2.95E-05	: 7.41E-05	: 1.02E-04	: 1.16E-02	: 3.31E-05	: 3.29E-05
CHILD	: 8.86E-05	: 5.69E-05	: 6.78E-05	: 1.19E-04	: 1.59E-04	: 2.16E-02	: 5.14E-05	: 5.11E-05

TABLE IV-A-29

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 29 VEG  
 AT 4.01 MILES NNW

ANNUAL BETA AIR DOSE = 2.41E-02 MILLRADS  
 ANNUAL GAMMA AIR DOSE = 6.46E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 3.76E-03	: 3.76E-03	: 3.76E-03	: 3.76E-03	: 3.76E-03	: 3.76E-03	: 4.00E-03	: 1.41E-02
GROUND	: 1.42E-06	: 1.42E-06	: 1.42E-06	: 1.42E-06	: 1.42E-06	: 1.42E-06	: 1.42E-06	: 1.69E-06
VEGET	:	:	:	:	:	:	:	:
ADULT	: 2.02E-05	: 1.56E-05	: 9.99E-06	: 2.63E-05	: 3.57E-05	: 4.52E-03	: 1.20E-05	: 1.20E-05
TEEN	: 2.44E-05	: 1.76E-05	: 1.45E-05	: 3.40E-05	: 4.74E-05	: 5.68E-03	: 1.38E-05	: 1.37E-05
CHILD	: 3.97E-05	: 2.41E-05	: 3.33E-05	: 5.48E-05	: 7.44E-05	: 1.06E-02	: 2.14E-05	: 2.13E-05



TABLE IV-A-30

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 30 BEEF  
 AT 4.73 MILES SE

ANNUAL\_BETA\_AIR\_DOSE = 9.85E-03 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 2.66E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.55E-03	: 1.55E-03	: 1.55E-03	: 1.55E-03	: 1.55E-03	: 1.55E-03	: 1.65E-03	: 5.79E-03
GROUND	: 9.50E-07	: 9.50E-07	: 9.50E-07	: 9.50E-07	: 9.50E-07	: 9.50E-07	: 9.50E-07	: 1.13E-06
MEAT	:	:	:	:	:	:	:	:
ADULT	: 9.62E-07	: 8.08E-07	: 3.17E-07	: 1.15E-06	: 1.42E-06	: 1.37E-04	: 7.02E-07	: 6.97E-07
TEEN	: 6.08E-07	: 4.83E-07	: 2.64E-07	: 7.85E-07	: 1.01E-06	: 9.91E-05	: 4.20E-07	: 4.16E-07
CHILD	: 7.66E-07	: 5.44E-07	: 4.88E-07	: 9.95E-07	: 1.26E-06	: 1.50E-04	: 5.08E-07	: 5.03E-07

TABLE IV-A-31

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 31 BEEF  
 AT 1.82 MILES SSE

ANNUAL\_BETA\_AIR\_DOSE = 2.58E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 7.02E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 4.09E-03	: 4.09E-03	: 4.09E-03	: 4.09E-03	: 4.09E-03	: 4.09E-03	: 4.35E-03	: 1.52E-02
GROUND	: 5.18E-06	: 5.18E-06	: 5.18E-06	: 5.18E-06	: 5.18E-06	: 5.18E-06	: 5.18E-06	: 6.17E-06
MEAT	:	:	:	:	:	:	:	:
ADULT	: 3.25E-06	: 2.41E-06	: 1.74E-06	: 4.29E-06	: 5.78E-06	: 7.48E-04	: 1.83E-06	: 1.81E-06
TEEN	: 2.13E-06	: 1.45E-06	: 1.44E-06	: 3.10E-06	: 4.32E-06	: 5.41E-04	: 1.10E-06	: 1.08E-06
CHILD	: 2.74E-06	: 1.53E-06	: 2.67E-06	: 3.99E-06	: 5.43E-06	: 8.17E-04	: 1.33E-06	: 1.31E-06

TABLE IV-A-32

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 32 BEEF  
 AT 2.01 MILES S

ANNUAL\_BETA\_AIR\_DOSE = 7.69E-04 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 2.08E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.21E-04	: 1.21E-04	: 1.21E-04	: 1.21E-04	: 1.21E-04	: 1.21E-04	: 1.29E-04	: 4.52E-04
GROUND	: 4.55E-08	: 4.55E-08	: 4.55E-08	: 4.55E-08	: 4.55E-08	: 4.55E-08	: 4.55E-08	: 5.42E-08
MEAT	:	:	:	:	:	:	:	:
ADULT	: 6.69E-08	: 5.95E-08	: 1.52E-08	: 7.60E-08	: 8.91E-08	: 6.59E-06	: 5.45E-08	: 5.42E-08
TEEN	: 4.16E-08	: 3.56E-08	: 1.26E-08	: 5.00E-08	: 6.07E-08	: 4.77E-06	: 3.25E-08	: 3.23E-08
CHILD	: 5.17E-08	: 4.11E-08	: 2.34E-08	: 6.27E-08	: 7.53E-08	: 7.19E-06	: 3.94E-08	: 3.92E-08

TABLE IV-A-33

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 33 BEEF  
 AT 2.07 MILES SSW

ANNUAL\_BETA\_AIR\_DOSE = 6.04E-04 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 1.63E-04 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 9.47E-05	: 9.47E-05	: 9.47E-05	: 9.47E-05	: 9.47E-05	: 9.47E-05	: 1.01E-04	: 3.55E-04
GROUND	: 1.22E-08	: 1.22E-08	: 1.22E-08	: 1.22E-08	: 1.22E-08	: 1.22E-08	: 1.22E-08	: 1.45E-08
MEAT	:	:	:	:	:	:	:	:
ADULT	: 4.64E-08	: 4.45E-08	: 4.05E-09	: 4.89E-08	: 5.23E-08	: 1.78E-06	: 4.31E-08	: 4.31E-08
TEEN	: 2.81E-08	: 2.65E-08	: 3.37E-09	: 3.04E-08	: 3.32E-08	: 1.29E-06	: 2.57E-08	: 2.57E-08
CHILD	: 3.44E-08	: 3.16E-08	: 6.24E-09	: 3.74E-08	: 4.07E-08	: 1.93E-06	: 3.11E-08	: 3.11E-08

TABLE IV-A-34

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 34 BEEF  
 AT 0.85 MILES SW

ANNUAL\_BETA\_AIR\_DOSE = 5.04E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 1.37E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 7.99E-03	: 7.99E-03	: 7.99E-03	: 7.99E-03	: 7.99E-03	: 7.99E-03	: 8.49E-03	: 2.97E-02
GROUND	: 4.36E-06	: 4.36E-06	: 4.36E-06	: 4.36E-06	: 4.36E-06	: 4.36E-06	: 4.36E-06	: 5.19E-06
MEAT	:	:	:	:	:	:	:	:
ADULT	: 4.74E-06	: 4.04E-06	: 1.46E-06	: 5.62E-06	: 6.87E-06	: 6.30E-04	: 3.55E-06	: 3.53E-06
TEEN	: 2.99E-06	: 2.41E-06	: 1.21E-06	: 3.80E-06	: 4.83E-06	: 4.56E-04	: 2.12E-06	: 2.10E-06
CHILD	: 3.75E-06	: 2.73E-06	: 2.24E-06	: 4.81E-06	: 6.01E-06	: 6.88E-04	: 2.57E-06	: 2.55E-06

TABLE IV-A-35

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 35 BEEF  
 AT 2.42 MILES WSW

ANNUAL\_BETA\_AIR\_DOSE = 1.30E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 3.47E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 2.02E-03	: 2.02E-03	: 2.02E-03	: 2.02E-03	: 2.02E-03	: 2.02E-03	: 2.15E-03	: 7.63E-03
GROUND	: 8.99E-07	: 8.99E-07	: 8.99E-07	: 8.99E-07	: 8.99E-07	: 8.99E-07	: 8.99E-07	: 1.07E-06
MEAT	:	:	:	:	:	:	:	:
ADULT	: 1.20E-06	: 1.05E-06	: 2.98E-07	: 1.37E-06	: 1.63E-06	: 1.29E-04	: 9.51E-07	: 9.47E-07
TEEN	: 7.45E-07	: 6.28E-07	: 2.48E-07	: 9.11E-07	: 1.12E-06	: 9.32E-05	: 5.68E-07	: 5.64E-07
CHILD	: 9.30E-07	: 7.22E-07	: 4.59E-07	: 1.15E-06	: 1.39E-06	: 1.40E-04	: 6.88E-07	: 6.84E-07

TABLE IV-A-36

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 36 BEEF  
 AT 3.25 MILES W

ANNUAL\_BETA\_AIR\_DOSE = 1.43E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 3.80E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 2.21E-03	: 2.21E-03	: 2.21E-03	: 2.21E-03	: 2.21E-03	: 2.21E-03	: 2.35E-03	: 8.36E-03
GROUND	: 8.18E-07	: 8.18E-07	: 8.18E-07	: 8.18E-07	: 8.18E-07	: 8.18E-07	: 8.18E-07	: 9.74E-07
MEAT	:	:	:	:	:	:	:	:
ADULT	: 1.26E-06	: 1.13E-06	: 2.72E-07	: 1.42E-06	: 1.65E-06	: 1.18E-04	: 1.04E-06	: 1.03E-06
TEEN	: 7.81E-07	: 6.73E-07	: 2.26E-07	: 9.32E-07	: 1.12E-06	: 8.50E-05	: 6.19E-07	: 6.16E-07
CHILD	: 9.70E-07	: 7.80E-07	: 4.18E-07	: 1.17E-06	: 1.39E-06	: 1.28E-04	: 7.50E-07	: 7.46E-07

TABLE IV-A-37

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 37 BEEF  
 AT 2.74 MILES WNW

ANNUAL\_BETA\_AIR\_DOSE = 4.13E-02 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 1.11E-02 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 6.48E-03	: 6.48E-03	: 6.48E-03	: 6.48E-03	: 6.48E-03	: 6.48E-03	: 6.89E-03	: 2.43E-02
GROUND	: 1.90E-06	: 1.90E-06	: 1.90E-06	: 1.90E-06	: 1.90E-06	: 1.90E-06	: 1.90E-06	: 2.26E-06
MEAT	:	:	:	:	:	:	:	:
ADULT	: 3.46E-06	: 3.15E-06	: 6.34E-07	: 3.83E-06	: 4.38E-06	: 2.75E-04	: 2.94E-06	: 2.93E-06
TEEN	: 2.13E-06	: 1.88E-06	: 5.26E-07	: 2.48E-06	: 2.93E-06	: 1.99E-04	: 1.75E-06	: 1.74E-06
CHILD	: 2.64E-06	: 2.19E-06	: 9.75E-07	: 3.09E-06	: 3.62E-06	: 3.00E-04	: 2.12E-06	: 2.11E-06



TABLE IV-A-38

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 38 COW  
 AT 2.77 MILES S

ANNUAL\_BETA\_AIR\_DOSE = 3.07E-04 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 8.36E-05 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 4.87E-05	: 4.87E-05	: 4.87E-05	: 4.87E-05	: 4.87E-05	: 4.87E-05	: 5.18E-05	: 1.81E-04
GROUND	: 1.66E-08	: 1.66E-08	: 1.66E-08	: 1.66E-08	: 1.66E-08	: 1.66E-08	: 1.66E-08	: 1.98E-08
COW MILK	:	:	:	:	:	:	:	:
ADULT	: 1.11E-07	: 7.72E-08	: 7.31E-08	: 1.55E-07	: 2.24E-07	: 3.30E-05	: 5.10E-08	: 5.06E-08
TEEN	: 1.64E-07	: 1.01E-07	: 1.33E-07	: 2.51E-07	: 3.76E-07	: 5.21E-05	: 6.67E-08	: 6.58E-08
CHILD	: 2.83E-07	: 1.32E-07	: 3.22E-07	: 4.28E-07	: 6.19E-07	: 1.03E-04	: 1.06E-07	: 1.04E-07
INFANT	: 4.94E-07	: 1.85E-07	: 6.65E-07	: 9.43E-07	: 1.05E-06	: 2.50E-04	: 1.61E-07	: 1.58E-07

TABLE IV-A-39

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
 SPECIAL LOCATION NO. 39 GOAT  
 AT 0.65 MILES SSW

ANNUAL\_BETA\_AIR\_DOSE = 8.84E-03 MILLRADS  
 ANNUAL\_GAMMA\_AIR\_DOSE = 2.41E-03 MILLRADS

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 1.40E-03	: 1.40E-03	: 1.40E-03	: 1.40E-03	: 1.40E-03	: 1.40E-03	: 1.49E-03	: 5.21E-03
GROUND	: 2.07E-07	: 2.07E-07	: 2.07E-07	: 2.07E-07	: 2.07E-07	: 2.07E-07	: 2.07E-07	: 2.47E-07
COW MILK	:	:	:	:	:	:	:	:
ADULT	: 2.21E-06	: 1.79E-06	: 9.14E-07	: 2.76E-06	: 3.63E-06	: 4.13E-04	: 1.46E-06	: 1.46E-06
TEEN	: 3.13E-06	: 2.34E-06	: 1.66E-06	: 4.22E-06	: 5.77E-06	: 6.53E-04	: 1.91E-06	: 1.89E-06
CHILD	: 5.23E-06	: 3.35E-06	: 4.02E-06	: 7.04E-06	: 9.44E-06	: 1.29E-03	: 3.02E-06	: 3.00E-06
INFANT	: 8.76E-06	: 4.89E-06	: 8.31E-06	: 1.44E-05	: 1.57E-05	: 3.13E-03	: 4.59E-06	: 4.55E-06
GOATMILK	:	:	:	:	:	:	:	:
ADULT	: 4.84E-06	: 3.77E-06	: 2.25E-06	: 6.20E-06	: 8.21E-06	: 9.91E-04	: 2.99E-06	: 2.97E-06
TEEN	: 6.88E-06	: 4.93E-06	: 4.09E-06	: 9.59E-06	: 1.32E-05	: 1.57E-03	: 3.91E-06	: 3.86E-06
CHILD	: 1.15E-05	: 6.96E-06	: 9.91E-06	: 1.61E-05	: 2.16E-05	: 3.09E-03	: 6.20E-06	: 6.12E-06
INFANT	: 1.94E-05	: 1.01E-05	: 2.04E-05	: 3.33E-05	: 3.63E-05	: 7.51E-03	: 9.42E-06	: 9.29E-06

TABLE IV-B-1

FORT CALHOUN 1

DOSE CONTRIBUTIONS FROM GASEOUS EFFLUENTS  
UNRESTRICTED AREA BOUNDARY

REQUIRED BY TECHNICAL SPECIFICATION 5.9.4.a.

ANNUAL FOR JANUARY 1, 2001 TO DECEMBER 31, 2001

MAXIMUM SITE BOUNDARY GAMMA AIR DOSE - 3.34E-01 MILLRADS

MAXIMUM SITE BOUNDARY BETA AIR DOSE - 1.23E+00 MILLRADS

TABLE IV-C-1

FORT CALHOUN ANNUAL 2001, DOSE PROJECTIONS  
ALARA ANNUAL INTEGRATED POPULATION DOSE SUMMARY (PERSON-REM)

PATHWAY	T.BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG	SKIN
PLUME	: 6.86E-02 : : 98.73% :	: 6.86E-02 : : 98.92% :	: 6.86E-02 : : 99.56% :	: 6.86E-02 : : 98.52% :	: 6.86E-02 : : 98.24% :	: 6.86E-02 : : 40.33% :	: 7.47E-02 : : 99.07% :	: 3.26E-01 : : 99.79% :
GROUND	: 2.50E-05 : : 0.04% :	: 2.50E-05 : : 0.04% :	: 2.50E-05 : : 0.04% :	: 2.50E-05 : : 0.04% :	: 2.50E-05 : : 0.04% :	: 2.50E-05 : : 0.01% :	: 2.50E-05 : : 0.03% :	: 2.98E-05 : : 0.01% :
INHAL	: 1.90E-04 : : 0.27% :	: 1.75E-04 : : 0.25% :	: 2.84E-05 : : 0.04% :	: 2.06E-04 : : 0.30% :	: 2.32E-04 : : 0.33% :	: 1.22E-02 : : 7.16% :	: 1.69E-04 : : 0.22% :	: 1.69E-04 : : 0.05% :
VEGET	: 3.55E-04 : : 0.51% :	: 3.47E-04 : : 0.50% :	: 1.52E-05 : : 0.02% :	: 3.65E-04 : : 0.52% :	: 3.59E-04 : : 0.51% :	: 2.00E-03 : : 1.18% :	: 3.48E-04 : : 0.46% :	: 3.46E-04 : : 0.11% :
COW MILK	: 2.20E-04 : : 0.32% :	: 1.20E-04 : : 0.17% :	: 2.13E-04 : : 0.31% :	: 3.32E-04 : : 0.48% :	: 4.95E-04 : : 0.71% :	: 7.99E-02 : : 46.95% :	: 7.78E-05 : : 0.10% :	: 7.68E-05 : : 0.02% :
MEAT	: 9.21E-05 : : 0.13% :	: 8.31E-05 : : 0.12% :	: 1.88E-05 : : 0.03% :	: 1.03E-04 : : 0.15% :	: 1.17E-04 : : 0.17% :	: 7.42E-03 : : 4.36% :	: 7.83E-05 : : 0.10% :	: 7.81E-05 : : 0.02% :
*TOTAL*	: 6.95E-02 : : 98.73% :	: 6.94E-02 : : 98.92% :	: 6.89E-02 : : 99.56% :	: 6.96E-02 : : 98.52% :	: 6.98E-02 : : 98.24% :	: 1.70E-01 : : 40.33% :	: 7.54E-02 : : 99.07% :	: 3.27E-01 : : 99.79% :

**SECTION V**

**DOSE FROM LIQUID EFFLUENTS**

**LADTAP II OUTPUT**

**Technical Specification 5.9.4a**

**January 1, 2001 - December 31, 2001**

## Radioactive Effluent Releases - First, Second, Third, and Fourth Quarters 2001

### LIQUID EFFLUENTS

During the reporting period, a total of  $5.60\text{E-}01$  Curies of radioactive liquid materials less tritium, dissolved noble gases, and alpha was released to the Missouri River at an average concentration of  $5.23\text{E-}10$   $\mu\text{Ci/mL}$ . This represents  $2.09\text{E-}01\%$  of the limits specified in Appendix B to 10 CFR 20 ( $1.0\text{E-}06$   $\mu\text{Ci/mL}$  for unrestricted areas),  $175.4$  Curies of tritium were discharged at an average diluted concentration of  $1.45\text{E-}07$   $\mu\text{Ci/mL}$  or  $5.82\text{E-}02\%$  of ECL ( $1.0\text{E-}03$   $\mu\text{Ci/mL}$ ). Gross alpha radioactivity released during the reporting period total  $2.06\text{E-}02$  Curies.

Dilution water during the period amounted to  $1.24\text{E+}12$  liters, while radioactive liquid waste volume was  $1.66\text{E+}08$  liters.

#### A. Potential Annual Doses to Individuals from Liquid Releases

Total body, skin, and organ mRem for liquid releases were calculated for all significant liquid pathways using the annual configuration of the LADTAP II program.

The inputs to LADTAP II for the annual period from January 1, 2001 through December 31, 2001 were as follows:

- (1) All liquid effluents were as described in Section IV except for entrained noble gases (Ar-41, Xe-131M, Xe-133M, Xe-133, Xe-135M, Xe-135, Kr-85M, Kr-87, and Kr-88)
- (2) An average plant discharge rate of 794.7 cubic feet per second (CFS) was utilized for 2001. The average discharge rate during releases was 792.2 cubic feet per second (CFS).
- (3) Dilution factors (inverse of the mixing ratios) were computed based on Regulatory Guide 1.113 (equation 7 in Section 2.a.1 of Appendix A) for a one dimensional transport model.
- (4) Drinking water transport times of 6.6 hours to the Omaha intake and 7.0 hours to the Council Bluffs intake for the ALARA doses were used. A transport time of 0.0 was used from the plant to the discharge site.
- (5) A shorewidth factor of 0.2 was used.
- (6) All dose factors, transport times from receptor to individual, and usage factors are defined by Regulatory Guide 1.109 and NUREG-0172.

The discharge site was chosen to present the most conservative estimate of mRem dose for an average adult, teenager, child, and infant. A conservative approach is also presented by the assumption that Omaha and Council Bluffs receive all drinking water from the Missouri River.

#### B. Potential Annual Doses to Population from Liquid Releases

The LADTAP II program in its annual configuration was also used to calculate to total body and organ doses for the population of 760,413 within a 50-mile radius of the plant. The same input was used as in the individual cases with the addition of the following:

- (1) Dilution factors and transport times for the pathways of sport fish, commercial fish, recreation and biota were calculated based on a distance of two miles downstream as approximately the distance to the nearest recreation facility - DeSoto National Wildlife Preserve.
- (2) The total fish harvest for both sport and commercial purposes was calculated using an average commercial fish catch for Nebraska.





# A D U L T     D O S E S

PATHWAY	DOSE (MREM PER YEAR INTAKE)							
	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		4.18E-02	7.63E-02	5.74E-02	1.24E-03	2.57E-02	8.39E-03	1.75E-01
DRINKING		2.10E-04	7.66E-04	6.95E-04	1.08E-03	5.60E-04	4.85E-04	9.24E-04
SHORELINE	1.36E-04	1.17E-04	1.17E-04	1.17E-04	1.17E-04	1.17E-04	1.17E-04	1.17E-04
SWIMMING		2.46E-06	2.46E-06	2.46E-06	2.46E-06	2.46E-06	2.46E-06	2.46E-06
BOATING		1.23E-06	1.23E-06	1.23E-06	1.23E-06	1.23E-06	1.23E-06	1.23E-06
TOTAL	1.36E-04	4.21E-02	7.71E-02	5.82E-02	2.44E-03	2.64E-02	9.00E-03	1.76E-01

	USAGE (KG/YR,HR/YR)	DILUTION	TIME (HR)	SHOREWIDTH FACTOR=0.2
FISH	21.0	7.3	24.00	
DRINKING	730.0	30.8	18.60	
SHORELINE	12.0	7.3	0.00	
SWIMMING	12.0	7.3	0.00	
BOATING	12.0	7.3	0.00	

# T E E N A G E R     D O S E S

PATHWAY	DOSE (MREM PER YEAR INTAKE)							
	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		4.39E-02	7.82E-02	3.27E-02	1.15E-03	2.62E-02	9.85E-03	1.24E-01
DRINKING		1.99E-04	6.16E-04	4.50E-04	8.60E-04	4.22E-04	3.58E-04	6.32E-04
SHORELINE	7.60E-04	6.54E-04	6.54E-04	6.54E-04	6.54E-04	6.54E-04	6.54E-04	6.54E-04
SWIMMING		1.37E-05	1.37E-05	1.37E-05	1.37E-05	1.37E-05	1.37E-05	1.37E-05
BOATING		6.86E-06	6.86E-06	6.86E-06	6.86E-06	6.86E-06	6.86E-06	6.86E-06
TOTAL	7.60E-04	4.48E-02	7.95E-02	3.38E-02	2.69E-03	2.73E-02	1.09E-02	1.25E-01

	USAGE (KG/YR,HR/YR)	DILUTION	TIME (HR)	SHOREWIDTH FACTOR=0.2
FISH	16.0	7.3	24.00	
DRINKING	510.0	30.8	18.60	
SHORELINE	67.0	7.3	0.00	
SWIMMING	67.0	7.3	0.00	
BOATING	67.0	7.3	0.00	

# C H I L D   D O S E S

PATHWAY	DOSE (MREM PER YEAR INTAKE)							
	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		5.42E-02	6.78E-02	1.26E-02	1.19E-03	2.20E-02	7.73E-03	4.44E-02
DRINKING		5.65E-04	1.21E-03	7.47E-04	1.91E-03	8.16E-04	6.84E-04	8.73E-04
SHORELINE	1.59E-04	1.37E-04	1.37E-04	1.37E-04	1.37E-04	1.37E-04	1.37E-04	1.37E-04
SWIMMING		2.87E-06	2.87E-06	2.87E-06	2.87E-06	2.87E-06	2.87E-06	2.87E-06
BOATING		1.43E-06	1.43E-06	1.43E-06	1.43E-06	1.43E-06	1.43E-06	1.43E-06
TOTAL	1.59E-04	5.49E-02	6.91E-02	1.35E-02	3.25E-03	2.30E-02	8.56E-03	4.54E-02

	USAGE (KG/YR,HR/YR)	DILUTION	TIME (HR)	SHOREWIDTH FACTOR=0.2
FISH	6.9	7.3	24.00	
DRINKING	510.0	30.8	18.60	
SHORELINE	14.0	7.3	0.00	
SWIMMING	14.0	7.3	0.00	
BOATING	14.0	7.3	0.00	

# I N F A N T   D O S E S

PATHWAY	DOSE (MREM PER YEAR INTAKE)							
	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
DRINKING		5.77E-04	1.34E-03	6.94E-04	2.65E-03	8.11E-04	6.86E-04	7.52E-04
SHORELINE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	0.00E+00	5.77E-04	1.34E-03	6.94E-04	2.65E-03	8.11E-04	6.86E-04	7.52E-04

	USAGE (KG/YR,HR/YR)	DILUTION	TIME (HR)	SHOREWIDTH FACTOR=0.2
FISH	0.0	7.3	24.00	
DRINKING	330.0	30.8	18.60	

LOCATION IS SITE DISCHG.

A D U L T     D O S E S								
PATHWAY	DOSE (MREM PER YEAR INTAKE)							
	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		3.05E-01	5.57E-01	4.19E-01	9.04E-03	1.88E-01	6.13E-02	1.28E+00
DRINKING		6.46E-03	2.36E-02	2.14E-02	3.38E-02	1.73E-02	1.49E-02	2.85E-02
SHORELINE	9.94E-04	8.55E-04	8.55E-04	8.55E-04	8.55E-04	8.55E-04	8.55E-04	8.55E-04
SWIMMING		1.79E-05	1.79E-05	1.79E-05	1.79E-05	1.79E-05	1.79E-05	1.79E-05
BOATING		8.96E-06	8.96E-06	8.96E-06	8.96E-06	8.96E-06	8.96E-06	8.96E-06
TOTAL	9.94E-04	3.13E-01	5.81E-01	4.41E-01	4.37E-02	2.06E-01	7.71E-02	1.31E+00

	USAGE (KG/YR,HR/YR)	DILUTION	TIME (HR)	SHOREWIDTH FACTOR=0.2
FISH	21.0	1.0	24.00	
DRINKING	730.0	1.0	12.00	
SHORELINE	12.0	1.0	0.00	
SWIMMING	12.0	1.0	0.00	
BOATING	12.0	1.0	0.00	

T E E N A G E R     D O S E S								
PATHWAY	DOSE (MREM PER YEAR INTAKE)							
	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		3.20E-01	5.71E-01	2.39E-01	8.41E-03	1.91E-01	7.19E-02	9.04E-01
DRINKING		6.13E-03	1.90E-02	1.39E-02	2.69E-02	1.30E-02	1.10E-02	1.95E-02
SHORELINE	5.55E-03	4.78E-03	4.78E-03	4.78E-03	4.78E-03	4.78E-03	4.78E-03	4.78E-03
SWIMMING		1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04	1.00E-04
BOATING		5.00E-05	5.00E-05	5.00E-05	5.00E-05	5.00E-05	5.00E-05	5.00E-05
TOTAL	5.55E-03	3.31E-01	5.94E-01	2.57E-01	4.02E-02	2.09E-01	8.79E-02	9.29E-01

	USAGE (KG/YR,HR/YR)	DILUTION	TIME (HR)	SHOREWIDTH FACTOR=0.2
FISH	16.0	1.0	24.00	
DRINKING	510.0	1.0	12.00	
SHORELINE	67.0	1.0	0.00	
SWIMMING	67.0	1.0	0.00	
BOATING	67.0	1.0	0.00	

LOCATION IS SITE DISCHG.

# C H I L D   D O S E S

PATHWAY	DOSE (MREM PER YEAR INTAKE)							
	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		3.96E-01	4.95E-01	9.22E-02	8.72E-03	1.61E-01	5.64E-02	3.24E-01
DRINKING		1.74E-02	3.73E-02	2.30E-02	5.98E-02	2.51E-02	2.11E-02	2.69E-02
SHORELINE	1.16E-03	9.98E-04	9.98E-04	9.98E-04	9.98E-04	9.98E-04	9.98E-04	9.98E-04
SWIMMING		2.09E-05	2.09E-05	2.09E-05	2.09E-05	2.09E-05	2.09E-05	2.09E-05
BOATING		1.05E-05	1.05E-05	1.05E-05	1.05E-05	1.05E-05	1.05E-05	1.05E-05
TOTAL	1.16E-03	4.14E-01	5.33E-01	1.16E-01	6.96E-02	1.87E-01	7.85E-02	3.52E-01

	USAGE (KG/YR,HR/YR)	DILUTION	TIME (HR)	SHOREWIDTH FACTOR=0.2
FISH	6.9	1.0	24.00	
DRINKING	510.0	1.0	12.00	
SHORELINE	14.0	1.0	0.00	
SWIMMING	14.0	1.0	0.00	
BOATING	14.0	1.0	0.00	

# I N F A N T   D O S E S

PATHWAY	DOSE (MREM PER YEAR INTAKE)							
	SKIN	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH		0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
DRINKING		1.78E-02	4.11E-02	2.14E-02	8.32E-02	2.50E-02	2.11E-02	2.32E-02
SHORELINE	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
TOTAL	0.00E+00	1.78E-02	4.11E-02	2.14E-02	8.32E-02	2.50E-02	2.11E-02	2.32E-02

	USAGE (KG/YR,HR/YR)	DILUTION	TIME (HR)	SHOREWIDTH FACTOR=0.2
FISH	0.0	1.0	24.00	
DRINKING	330.0	1.0	12.00	

\* \* \* FISH CONSUMPTION POPULATION DOSES \* \* \*

PERSON-REM

SPORT HARVEST

		-----DOSE (PERSON-REM)-----							
PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH	ADULT	6.10E+04	1.21E-01	2.21E-01	1.66E-01	2.23E-03	7.43E-02	2.43E-02	4.51E-01
FISH	TEENAGER	7.12E+03	1.95E-02	3.46E-02	1.45E-02	3.18E-04	1.16E-02	4.37E-03	4.90E-02
FISH	CHILD	4.93E+03	3.86E-02	4.82E-02	8.98E-03	5.28E-04	1.56E-02	5.50E-03	2.82E-02
FISH	TOTAL	7.30E+04	1.79E-01	3.03E-01	1.89E-01	3.08E-03	1.01E-01	3.41E-02	5.29E-01

LOCATION DILUTION CATCH TIME(HR) - INCLUDES FOOD PROCESSING TIME OF 1.68E+02 HR POPULATION=1.24E+04  
 7.30E+00 7.30E+04 1.69E+02  
 AVERAGE INDIVIDUAL CONSUMPTION (KG/YR) ADULT=6.90E+00 TEEN=5.20E+00 CHILD=2.20E+00

COMMERCIAL HARVEST

		-----DOSE (PERSON-REM)-----							
PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH	ADULT	3.73E+06	1.22E-02	2.23E-02	1.68E-02	1.80E-04	7.51E-03	2.46E-03	4.32E-02
FISH	TEENAGER	4.35E+05	1.97E-03	3.51E-03	1.46E-03	2.56E-05	1.17E-03	4.42E-04	4.68E-03
FISH	CHILD	3.01E+05	3.91E-03	4.88E-03	9.08E-04	4.25E-05	1.58E-03	5.57E-04	2.70E-03
FISH	TOTAL	4.46E+06	1.81E-02	3.07E-02	1.92E-02	2.48E-04	1.03E-02	3.46E-03	5.06E-02

LOCATION DILUTION CATCH TIME(HR) - INCLUDES FOOD PROCESSING TIME OF 2.40E+02 HR POPULATION=7.60E+05  
 7.30E+00 7.30E+04 2.41E+02  
 AVERAGE INDIVIDUAL CONSUMPTION (KG/YR) ADULT=6.90E+00 TEEN=5.20E+00 CHILD=2.20E+00

\* \* \* POPULATION WATER CONSUMPTION DOSES \* \* \*

SUPPLIER-OMAHA

-----DOSE (PERSON-REM)-----									
PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
DRINKING	ADULT	1.39E+08	3.99E-02	1.46E-01	1.32E-01	2.01E-01	1.07E-01	9.24E-02	1.75E-01
DRINKING	TEENAGER	1.51E+07	5.90E-03	1.83E-02	1.34E-02	2.48E-02	1.25E-02	1.06E-02	1.87E-02
DRINKING	CHILD	2.48E+07	2.74E-02	5.87E-02	3.63E-02	9.01E-02	3.96E-02	3.32E-02	4.23E-02
DRINKING	TOTAL	1.79E+08	7.31E-02	2.23E-01	1.82E-01	3.16E-01	1.59E-01	1.36E-01	2.36E-01

POPULATION=5.29E+05      DILUTION=3.08E+01      TRANSIT TIME=3.06E+01 HR (INCLUDING 24 HR FOR TREATMENT FACILITY)

AVERAGE INDIVIDUAL CONSUMPTION (L/YR)      ADULT=3.70E+02      TEEN=2.60E+02      CHILD=2.60E+02

SUPPLIER-COUNCIL BLUFFS

-----DOSE (PERSON-REM)-----									
PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
DRINKING	ADULT	2.29E+07	6.45E-03	2.36E-02	2.14E-02	3.25E-02	1.72E-02	1.49E-02	2.84E-02
DRINKING	TEENAGER	2.49E+06	9.54E-04	2.95E-03	2.16E-03	4.01E-03	2.03E-03	1.72E-03	3.03E-03
DRINKING	CHILD	4.07E+06	4.43E-03	9.50E-03	5.87E-03	1.46E-02	6.41E-03	5.37E-03	6.85E-03
DRINKING	TOTAL	2.94E+07	1.18E-02	3.60E-02	2.94E-02	5.10E-02	2.57E-02	2.20E-02	3.83E-02

POPULATION=8.70E+04      DILUTION=3.13E+01      TRANSIT TIME=3.10E+01 HR (INCLUDING 24 HR FOR TREATMENT FACILITY)

AVERAGE INDIVIDUAL CONSUMPTION (L/YR)      ADULT=3.70E+02      TEEN=2.60E+02      CHILD=2.60E+02

-----CUMULATIVE TOTAL-----

PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
DRINKING	CUMUL TOTAL	2.08E+08	8.50E-02	2.59E-01	2.11E-01	3.67E-01	1.84E-01	1.58E-01	2.75E-01

NEPA DOSES

NOTE--TOTAL NEPA DOSE INCLUDES SPORT CATCH

-----DOSE (PERSON-REM)-----									
PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
FISH	ADULT	1.22E+05	2.42E-01	4.41E-01	3.32E-01	4.01E-03	1.48E-01	4.85E-02	8.77E-01
FISH	TEENAGER	1.42E+04	3.89E-02	6.92E-02	2.89E-02	5.70E-04	2.31E-02	8.73E-03	9.52E-02
FISH	CHILD	9.85E+03	7.71E-02	9.64E-02	1.79E-02	9.48E-04	3.12E-02	1.10E-02	5.48E-02
FISH	TOTAL	1.46E+05	3.58E-01	6.06E-01	3.78E-01	5.53E-03	2.03E-01	6.82E-02	1.03E+00

HYDROSPHERE TRITIUM DOSE

AVERAGE INDIVIDUAL WATER CONSUMPTION = 3.0 L/DAY

PATHWAY	AGE GROUP	USAGE	BONE	LIVER	TOTAL BODY	THYROID	KIDNEY	LUNG	GI-LLI
WATER	TOTAL	2.86E+11	0.00E+00	1.34E-03	1.34E-03	1.34E-03	1.34E-03	1.34E-03	1.34E-03

\* \* \* RECREATION POPULATION DOSES \* \* \*

LOCATION- DOWN STREAM SWIMMING

DILUTION= 7.30E+00      TRANSIT TIME= 6.70E-01 HR      SWF= 0.2

		DOSE (PERSON-REM)			
PATHWAY	AGE GROUP	USAGE	SKIN	TOTAL BODY	THYROID
SHORELINE	TOTAL POPUL	4.10E+07	4.65E-01	4.00E-01	4.00E-01

LOCATION- DOWN STREAM SWIMMING

DILUTION= 7.30E+00      TRANSIT TIME= 6.70E-01 HR

		DOSE (PERSON-REM)			
PATHWAY	AGE GROUP	USAGE	SKIN	TOTAL BODY	THYROID
SWIMMING	TOTAL POPUL	4.10E+07		8.38E-03	8.38E-03

LOCATION- DOWN STREAM BOATING

DILUTION= 7.30E+00      TRANSIT TIME= 6.70E-01 HR

		DOSE (PERSON-REM)			
PATHWAY	AGE GROUP	USAGE	SKIN	TOTAL BODY	THYROID
BOATING	TOTAL POPUL	4.10E+07		4.19E-03	4.19E-03

\* \* \* DOSE TO BIOTA \* \* \*

MRADS PER YEAR

BIOTA	DILUTION=	1.00E+00	TRANSIT TIME=	0.00E+00 HR
	INTERNAL	EXTERNAL	TOTAL	
FISH	6.07E+00	3.13E+00	9.20E+00	
INVERTEBRATE	2.74E+00	6.26E+00	9.00E+00	
ALGAE	4.37E+00	1.31E-02	4.39E+00	
MUSKRAT	6.61E+00	2.09E+00	8.69E+00	
RACCOON	2.61E+00	1.56E+00	4.17E+00	
HERON	3.82E+01	2.08E+00	4.02E+01	
DUCK	5.71E+00	3.13E+00	8.84E+00	



## **SECTION VI**

### **RADIOACTIVE EFFLUENT RELEASES - SOLID RADIOACTIVE WASTE** **Technical Specifications 5.9.4a, 5.17d and 5.18d**

**January 1, 2001 - December 31, 2001**

### III. RADIOACTIVE EFFLUENT RELEASES-SOLID RADIOACTIVE WASTE EFFLUENT AND WASTE DISPOSAL REPORT

January 1, 2001 through December 31, 2001

#### SOLID WASTE AND IRRADIATED FUEL SHIPMENTS

#### A. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (NOT IRRADIATED)

1. Type of Waste	Month Shipped	Number of Shipments	Volume Cu.Meter	Curie Content	Est.Total % Error
a. Spent resins,	January	0	0.00E+00	0.00E+00	N/A
Filter sludges,	February	0	0.00E+00	0.00E+00	N/A
evaporator	March	0	0.00E+00	0.00E+00	N/A
bottoms, etc.	April	0	0.00E+00	0.00E+00	N/A
	May	0	0.00E+00	0.00E+00	N/A
	June	0	0.00E+00	0.00E+00	N/A
	July	0	0.00E+00	0.00E+00	N/A
	August	0	0.00E+00	0.00E+00	N/A
	September	0	0.00E+00	0.00E+00	N/A
	October	0	0.00E+00	0.00E+00	N/A
	November	1	3.40E+00	7.28E+02	20
	December	0	0.00E+00	0.00E+00	N/A
Total	(Type a)	1	3.40E+00	7.28E+02	20
b. Dry	January	2	2.60E+00	3.70E-02	20
compressable,	February	0	0.00E+00	0.00E+00	N/A
contaminated	March	0	0.00E+00	0.00E+00	N/A
equipment, etc.	April	1	6.10E-01	5.90E-03	20
	May	1	4.10E-01	3.25E-02	20
	June	2	1.20E+00	2.88E-02	20
	July	4	1.36E+00	1.29E-01	20
	August	2	1.36E+00	1.27E-01	20
	September	6	2.54E+00	1.73E-01	20
	October	3	1.12E+00	7.02E-02	20
	November	2	1.90E-01	1.13E-02	20
	December	11	6.98E+00	7.47E-01	20
Total	(Type b)	34	1.84E+01	1.36E+00	20

c.	Irradiated components and evaporator bottoms, etc.	January	0	0	0	N/A
		February	0	0	0	N/A
		March	0	0	0	N/A
		April	0	0	0	N/A
		May	0	0	0	N/A
		June	0	0	0	N/A
		July	0	0	0	N/A
		August	0	0	0	N/A
		September	0	0	0	N/A
		October	0	0	0	N/A
		November	0	0	0	N/A
		December	0	0	0	N/A
		Total	(Type c)	0	0	0
d.	Other	January	0	0	0	N/A
		February	0	0	0	N/A
		March	0	0	0	N/A
		April	0	0	0	N/A
		May	0	0	0	N/A
		June	0	0	0	N/A
		July	0	0	0	N/A
		August	0	0	0	N/A
		September	0	0	0	N/A
		October	0	0	0	N/A
		November	0	0	0	N/A
		December	0	0	0	N/A
		Total	(Type d)	0	0	0

## B. ESTIMATE OF MAJOR NUCLIDE COMPOSITION (By Type of Waste)

### 1. Percentage of Curies from Represented Isotopes

	Isotope	Percent	Curies	
a.	Cs-134	50.0%	3.64E+02	All other nuclides constitute less than 1%
	Cs-137	40.8%	2.97E+02	
	Ni-63	4.7%	3.39E+01	
	Co-58	2.5%	1.81E+01	
	Co-60	1.0%	6.60E+00	
b.	Cs-137	42.6%	5.80E-01	All other nuclides constitute less than 1%
	Co-58	18.5%	2.52E-01	
	Ni-63	10.5%	1.43E-01	
	Cs-134	8.1%	1.11E-01	
	Co-60	6.3%	8.64E-02	
	Nb-95	2.6%	3.50E-02	
	Ag-110m	2.3%	3.20E-02	
	Cr-51	1.9%	2.58E-02	
	Pu-241	1.7%	2.29E-02	
	Fe-55	1.7%	2.26E-02	
	H-3	1.1%	1.45E-02	
c.	N/A	N/A	N/A	
d.	N/A	N/A	N/A	

## C. SOLID WASTE (DISPOSITION)

Number of Shipments	Transportation Mode	Destination
3	Closed Sole Use Vehicle	Barnwell, SC
32	Closed Sole Use Vehicle	Clive, Utah

## D. IRRADIATED FUEL SHIPMENTS (DISPOSITION)

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

## SECTION VII

### ATTACHMENT 1

ODCM and PCP revisions for the period January 1, 2001 through December 31, 2001 in accordance with Technical Specification 5.17d and 5.18d, the radioactive effluent release report shall include any revisions to the Offsite Dose Calculation Manual (ODCM) and the Process Control Program (PCP).

  0   revisions were made to the Offsite Dose Calculation Manual (ODCM).

  0   revisions were made to the Process Control Program (PCP).

January 1, 2001 - December 31, 2001

SECTION VII

ATTACHMENT 2

JOINT FREQUENCY DISTRIBUTION WIND DIRECTION VS. WIND SPEED  
BY STABILITY CLASS AND METEOROLOGICAL DATA

(Regulatory Guide 1.21)

January 1, 2001 - December 31, 2001

## JOINT FREQUENCY DISTRIBUTION WIND DIRECTION VS. WIND SPEED BY STABILITY CLASS AND METEOROLOGICAL DATA

### A. Meteorological Data Recovery

Data availability from the on-site weather tower for the period January 1, 2001 through December 31, 2001 was more than the previous 12 months. The regulatory guide availability was met with a cumulative availability rate of 99.01% from the meteorological tower with the remaining 0.99% provided by the National Weather Service. The following table is a summary of the parameters and their respective recovery rates for the period.

Hourly meteorological data used to replace missing tower data for the period January 1, 2001 through December 31, 2001 originated at Eppley Airfield Weather Station, a branch of the National Weather Service. The hourly data was treated in accordance with monthly correction factors and a proceduralized Pasquill-Turner transformation which utilizes solar angle, time of day, cloud cover, and wind speed to determine the Pasquill Class,

The tabulations of the Weather Tower Data for the period January 1, 2001 through December 31, 2001 look appropriate for the season indicated. The Pasquill Classes observed for the twelve-month period are detailed below.

Pasquill								
Class	A	B	C	D	E	F	G	Total
% Obs.	7.11	5.79	5.75	39.18	27.07	9.70	5.40	100

The data when corrected and/or supplemented by synthetic data derived from the National Weather Service brought the recovery rate up above that required for maintaining adequate availability as specified by the Nuclear Regulatory Commission. Recovery of synthetic and actual data requires a minimum recovery rate of 90% for the period.

On the basis of the data and its cross-checks, the weather data as amended is completely valid for use in tabulating reactor vent releases.

Omaha Public Power District  
Fort Calhoun Nuclear Station  
JOINT FREQUENCY DISTRIBUTION BY EVENTS  
EXTREMELY UNSTABLE ( $\Delta T / \Delta z < -1.9$ )  
PERIOD OF RECORD: JAN 2001 - DEC 2001  
PASQUILL A  
WIND SPEED (mph) AT 10-m LEVEL

Wind	1.0- Direct	4.0- 7.9	8.0- 12.9	13.0- 18.9	19.0- 24.0	+24.0	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	2	14	2	0	0	0	18
ENE	6	15	0	0	0	0	21
E	2	21	4	0	0	0	27
ESE	6	17	17	1	0	0	41
SE	6	11	15	12	0	0	44
SSE	6	12	14	6	0	0	38
S	5	13	28	39	5	5	95
SSW	4	18	21	13	4	0	60
SW	8	17	12	2	0	0	39
WSW	4	19	8	0	0	0	31
W	2	22	5	5	0	0	34
WNW	7	29	11	0	0	0	47
NW	2	25	48	19	0	0	94
NNW	2	7	19	6	0	0	34
Total	62	240	204	103	9	5	623
Number of Calms 0							
Number of Invalid Hours 0							
Number of Valid Hours 623							



Omaha Public Power District  
Fort Calhoun Nuclear Station  
JOINT FREQUENCY DISTRIBUTION BY EVENTS  
MODERATELY UNSTABLE ( $-1.9 \leq \Delta T / \Delta z \leq -1.7$ )  
PERIOD OF RECORD: JAN 2001 - DEC 2001  
PASQUILL B  
WIND SPEED (mph) AT 10-m LEVEL

Wind	1.0- Direct	4.0- 7.9	8.0- 12.9	13.0- 18.9	19.0- 24.0	+24.0	Total
N	0	1	0	0	0	0	1
NNE	0	0	0	0	0	0	0
NE	2	5	0	0	0	0	7
ENE	7	10	6	0	0	0	23
E	1	8	8	0	0	0	17
ESE	7	11	5	1	0	0	24
SE	3	12	14	1	0	1	31
SSE	5	6	17	21	2	0	51
S	7	15	19	27	8	0	76
SSW	6	17	16	16	1	0	57
SW	5	15	2	3	0	0	25
WSW	6	14	3	0	0	0	23
W	7	12	4	0	0	0	23
WNW	3	18	9	0	0	0	30
NW	11	33	29	0	0	0	73
NNW	0	23	20	3	0	0	46
Total	70	200	152	72	11	1	506

Number of Calms 1  
Number of Invalid Hours 0  
Number of Valid Hours 507

Omaha Public Power District  
Fort Calhoun Nuclear Station  
JOINT FREQUENCY DISTRIBUTION BY EVENTS  
SLIGHTLY UNSTABLE ( $-1.7 < \Delta T / \Delta z \leq -1.5$ )  
PERIOD OF RECORD: JAN 2001 - DEC 2001  
PASQUILL C  
WIND SPEED (mph) AT 10-m LEVEL

Wind	1.0- Direct	4.0- 7.9	8.0- 12.9	13.0- 18.9	19.0- 24.0	+24.0	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	3	1	0	0	0	4
ENE	4	6	3	0	0	0	13
E	2	15	11	0	0	0	28
ESE	4	12	14	2	0	0	32
SE	0	13	9	6	0	0	28
SSE	5	16	18	7	4	0	50
S	7	15	19	19	3	0	63
SSW	7	21	15	11	2	0	56
SW	8	16	11	1	0	0	36
WSW	5	13	1	1	0	0	20
W	6	12	1	1	0	0	20
WNW	6	18	17	1	0	0	43
NW	3	32	31	6	0	0	72
NNW	0	10	27	2	0	0	39
Total	57	202	178	57	9	0	503

Number of Calms 1  
Number of Invalid Hours 0  
Number of Valid Hours 504

Omaha Public Power District  
Fort Calhoun Nuclear Station  
JOINT FREQUENCY DISTRIBUTION BY EVENTS  
NEUTRAL (-1.5 < delta T/ delta z <= -0.5)  
PERIOD OF RECORD: JAN 2001 - DEC 2001  
PASQUILL D  
WIND SPEED (mph) AT 10-m LEVEL

Wind	1.0-	4.0-	8.0-	13.0-	19.0-		
Direct	3.9	7.9	12.9	18.9	24.0	+24.0	Total
N	1	0	1	0	0	0	2
NNE	0	1	0	0	0	0	1
NE	12	14	1	0	0	0	27
ENE	44	58	20	0	0	0	122
E	49	127	59	2	0	0	237
ESE	54	110	93	11	0	0	268
SE	38	101	92	37	6	0	275
SSE	39	97	157	117	7	1	418
S	29	84	172	110	12	1	408
SSW	29	80	72	67	12	1	261
SW	37	49	29	14	4	2	136
WSW	31	37	6	0	2	0	76
W	45	44	10	1	0	0	100
WNW	40	106	46	18	0	0	210
NW	42	293	170	26	0	0	531
NNW	11	173	155	21	0	0	360
Total	501	1374	1083	424	43	5	3430

Number of Calms 2  
Number of Invalid Hours 0  
Number of Valid Hours 3432

Omaha Public Power District  
Fort Calhoun Nuclear Station  
JOINT FREQUENCY DISTRIBUTION BY EVENTS  
SLIGHTLY STABLE ( $-0.5 < \Delta T / \Delta z \leq 1.5$ )  
PERIOD OF RECORD: JAN 2001 - DEC 2001  
PASQUILL E  
WIND SPEED (mph) AT 10-m LEVEL

Wind	1.0- Direct	4.0- 7.9	8.0- 12.9	13.0- 18.9	19.0- 24.0	+24.0	Total
N	1	0	1	0	0	0	2
NNE	0	0	0	0	0	0	0
NE	3	4	0	0	0	0	7
ENE	24	6	0	0	0	0	30
E	46	25	3	0	0	0	74
ESE	69	84	8	0	0	0	161
SE	74	172	48	4	1	0	300
SSE	40	141	186	22	1	1	394
S	40	86	157	54	5	2	346
SSW	49	37	92	48	3	0	230
SW	44	27	21	25	2	0	121
WSW	63	18	14	1	0	0	97
W	104	41	3	0	0	0	150
WNW	118	87	6	0	0	0	211
NW	85	104	13	0	0	0	202
NNW	9	32	4	1	0	0	46
Total	769	864	556	155	12	3	2359

Number of Calms 12  
Number of Invalid Hours 0  
Number of Valid Hours 2371

Omaha Public Power District  
Fort Calhoun Nuclear Station  
JOINT FREQUENCY DISTRIBUTION BY EVENTS  
MODERATELY STABLE ( $1.5 < \Delta T / \Delta z \leq 4.0$ )  
PERIOD OF RECORD: JAN 2001 - DEC 2001  
PASQUILL F

WIND SPEED (mph) AT 10-m LEVEL

Wind	1.0- Direct	4.0- 7.9	8.0- 12.9	13.0- 18.9	19.0- 24.0	+24.0	Total
N	1	1	0	0	0	0	10
NNE	0	0	0	0	0	0	0
NE	1	0	0	0	0	0	1
ENE	1	0	0	0	0	0	1
E	28	1	0	0	0	0	29
ESE	49	31	1	0	0	0	81
SE	51	83	12	0	0	0	146
SSE	48	34	0	0	0	0	83
S	42	24	18	2	0	0	94
SSW	34	11	19	0	0	0	67
SW	44	6	8	0	0	0	66
WSW	49	2	1	0	0	0	62
W	77	1	0	0	0	0	85
WNW	83	8	2	0	0	0	97
NW	20	4	0	0	0	0	24
NNW	2	2	0	0	0	0	4
Total	530	208	61	2	0	0	801

Number of Calms 49  
Number of Invalid Hours 0  
Number of Valid Hours 850

Omaha Public Power District  
Fort Calhoun Nuclear Station  
JOINT FREQUENCY DISTRIBUTION BY EVENTS  
EXTREMELY STABLE ( $\Delta T / \Delta z > 4.0$ )  
PERIOD OF RECORD: JAN 2001 - DEC 2001  
PASQUILL G  
WIND SPEED (mph) AT 10-m LEVEL

Wind	1.0- Direct	4.0- 7.9	8.0- 12.9	13.0- 18.9	19.0- 24.0	+24.0	Total
N	0	0	0	0	0	0	0
NNE	1	0	0	0	0	0	1
NE	4	0	0	0	0	0	4
ENE	11	0	0	0	0	0	12
E	18	2	0	0	0	0	24
ESE	60	8	0	0	0	0	70
SE	74	9	1	0	0	0	86
SSE	59	7	0	0	0	0	71
S	46	3	2	0	0	0	62
SSW	34	12	1	0	0	0	54
SW	27	2	0	0	0	0	38
WSW	19	0	0	0	0	0	21
W	18	1	0	0	0	0	23
WNW	6	0	0	0	0	0	7
NW	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0
Total	377	44	4	0	0	0	425

Number of Calms 48  
Number of Invalid Hours 0  
Number of Valid Hours 473  
Hours Accounted For: 8760

Omaha Public Power District  
Fort Calhoun Nuclear Station  
JOINT FREQUENCY DISTRIBUTION BY PERCENT  
EXTREMELY UNSTABLE ( $\Delta T / \Delta z < -1.9$ )  
PERIOD OF RECORD: JAN 2001 - DEC 2001  
PASQUILL A

WIND SPEED (mph) AT 10-m LEVEL

Wind	1.0- Direct	4.0- 3.9	8.0- 7.9	13.0- 12.9	19.0- 18.9	24.0- 24.0	+24.0	Total
N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NNE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.02	0.16	0.02	0.00	0.00	0.00	0.00	0.21
ENE	0.07	0.17	0.00	0.00	0.00	0.00	0.00	0.24
E	0.02	0.24	0.05	0.00	0.00	0.00	0.00	0.31
ESE	0.07	0.19	0.19	0.01	0.00	0.00	0.00	0.47
SE	0.07	0.13	0.17	0.14	0.00	0.00	0.00	0.50
SSE	0.07	0.14	0.16	0.07	0.00	0.00	0.00	0.43
S	0.06	0.15	0.32	0.45	0.06	0.06	0.06	1.08
SSW	0.05	0.21	0.24	0.15	0.05	0.00	0.00	0.68
SW	0.09	0.19	0.14	0.02	0.00	0.00	0.00	0.45
WSW	0.05	0.22	0.09	0.00	0.00	0.00	0.00	0.35
W	0.02	0.25	0.06	0.06	0.00	0.00	0.00	0.39
WNW	0.08	0.33	0.13	0.00	0.00	0.00	0.00	0.54
NW	0.02	0.29	0.55	0.22	0.00	0.00	0.00	1.07
NNW	0.02	0.08	0.22	0.07	0.00	0.00	0.00	0.39
Total	0.71	2.74	2.33	1.18	0.10	0.06	0.06	7.11

Percent of Calms 0.00  
Percent of Invalid Hours 0.00  
Percent of Valid Hours 7.11

Omaha Public Power District  
Fort Calhoun Nuclear Station  
JOINT FREQUENCY DISTRIBUTION BY PERCENT  
MODERATELY UNSTABLE ( $-1.9 \leq \Delta T / \Delta z \leq -1.7$ )  
PERIOD OF RECORD: JAN 2001 - DEC 2001  
PASQUILL B  
WIND SPEED (mph) AT 10-m LEVEL

Wind	1.0- Direct	4.0- 7.9	8.0- 12.9	13.0- 18.9	19.0- 24.0	+24.0	Total
N	0.00	0.01	0.00	0.00	0.00	0.00	0.01
NNE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.02	0.06	0.00	0.00	0.00	0.00	0.08
ENE	0.08	0.11	0.07	0.00	0.00	0.00	0.26
E	0.01	0.09	0.09	0.00	0.00	0.00	0.19
ESE	0.08	0.13	0.06	0.01	0.00	0.00	0.27
SE	0.03	0.14	0.16	0.01	0.00	0.01	0.35
SSE	0.06	0.07	0.19	0.24	0.02	0.00	0.58
S	0.08	0.17	0.22	0.31	0.09	0.00	0.87
SSW	0.07	0.19	0.18	0.18	0.01	0.00	0.65
SW	0.06	0.17	0.02	0.03	0.00	0.00	0.29
WSW	0.07	0.16	0.03	0.00	0.00	0.00	0.26
W	0.08	0.14	0.05	0.00	0.00	0.00	0.26
WNW	0.03	0.21	0.10	0.00	0.00	0.00	0.34
NW	0.13	0.38	0.33	0.00	0.00	0.00	0.83
NNW	0.00	0.26	0.23	0.03	0.00	0.00	0.53
Total	0.80	2.28	1.74	0.82	0.13	0.01	5.78
Percent of Calms	0.01						
Percent of Invalid Hours	0.00						
Percent of Valid Hours	5.79						



Omaha Public Power District  
Fort Calhoun Nuclear Station  
JOINT FREQUENCY DISTRIBUTION BY PERCENT  
SLIGHTLY UNSTABLE ( $-1.7 < \Delta T / \Delta z \leq -1.5$ )  
PERIOD OF RECORD: JAN 2001 - DEC 2001  
PASQUILL C  
WIND SPEED (mph) AT 10-m LEVEL

Wind	1.0- Direct	4.0- 7.9	8.0- 12.9	13.0- 18.9	19.0- 24.0	+24.0	Total
N	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NNE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.00	0.03	0.01	0.00	0.00	0.00	0.05
ENE	0.05	0.07	0.03	0.00	0.00	0.00	0.15
E	0.02	0.17	0.13	0.00	0.00	0.00	0.32
ESE	0.05	0.14	0.16	0.02	0.00	0.00	0.37
SE	0.00	0.15	0.10	0.07	0.00	0.00	0.32
SSE	0.06	0.18	0.21	0.08	0.05	0.00	0.57
S	0.08	0.17	0.22	0.22	0.03	0.00	0.72
SSW	0.08	0.24	0.17	0.13	0.02	0.00	0.64
SW	0.09	0.18	0.13	0.01	0.00	0.00	0.41
WSW	0.06	0.15	0.01	0.01	0.00	0.00	0.23
W	0.07	0.14	0.01	0.01	0.00	0.00	0.23
WNW	0.07	0.21	0.19	0.01	0.00	0.00	0.49
NW	0.03	0.37	0.35	0.07	0.00	0.00	0.82
NNW	0.00	0.11	0.31	0.02	0.00	0.00	0.45
Total	0.65	2.31	2.03	0.65	0.10	0.00	5.74

Percent of Calms 0.01  
Percent of Invalid Hours 0.00  
Percent of Valid Hours 5.75

Omaha Public Power District  
Fort Calhoun Nuclear Station  
JOINT FREQUENCY DISTRIBUTION BY PERCENT  
NEUTRAL (-1.5 < delta T/ delta z <= -0.5)  
PERIOD OF RECORD: JAN 2001 - DEC 2001  
PASQUILL D  
WIND SPEED (mph) AT 10-m LEVEL

Wind	1.0-	4.0-	8.0-	13.0-	19.0-		Total
Direct	3.9	7.9	12.9	18.9	24.0	+24.0	
N	0.01	0.00	0.01	0.00	0.00	0.00	0.02
NNE	0.00	0.01	0.00	0.00	0.00	0.00	0.01
NE	0.14	0.16	0.01	0.00	0.00	0.00	0.31
ENE	0.50	0.66	0.23	0.00	0.00	0.00	1.39
E	0.56	1.45	0.67	0.02	0.00	0.00	2.71
ESE	0.62	1.26	1.06	0.13	0.00	0.00	3.06
SE	0.43	1.15	1.05	0.42	0.07	0.00	3.14
SSE	0.45	1.11	1.79	1.34	0.08	0.01	4.77
S	0.33	0.96	1.96	1.26	0.14	0.01	4.66
SSW	0.33	0.91	0.82	0.76	0.14	0.01	2.98
SW	0.42	0.56	0.33	0.16	0.05	0.02	1.55
WSW	0.35	0.42	0.07	0.00	0.02	0.00	0.87
W	0.51	0.50	0.11	0.01	0.00	0.00	1.14
WNW	0.46	1.21	0.53	0.21	0.00	0.00	2.40
NW	0.48	3.34	1.94	0.30	0.00	0.00	6.06
NNW	0.13	1.97	1.77	0.24	0.00	0.00	4.11
Total	5.72	15.68	12.36	4.84	0.49	0.06	39.16

Percent of Calms 0.02  
Percent of Invalid Hours 0.00  
Percent of Valid Hours 39.18

Omaha Public Power District  
Fort Calhoun Nuclear Station  
JOINT FREQUENCY DISTRIBUTION BY PERCENT  
SLIGHTLY STABLE ( $-0.5 < \Delta T / \Delta z \leq 1.5$ )  
PERIOD OF RECORD: JAN 2001 - DEC 2001  
PASQUILL E  
WIND SPEED (mph) AT 10-m LEVEL

Wind	1.0- Direct	4.0- 7.9	8.0- 12.9	13.0- 18.9	19.0- 24.0	+24.0	Total
N	0.01	0.00	0.01	0.00	0.00	0.00	0.02
NNE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.03	0.05	0.00	0.00	0.00	0.00	0.08
ENE	0.27	0.07	0.00	0.00	0.00	0.00	0.34
E	0.53	0.29	0.03	0.00	0.00	0.00	0.84
ESE	0.79	0.96	0.09	0.00	0.00	0.00	1.84
SE	0.84	1.96	0.55	0.05	0.01	0.00	3.42
SSE	0.46	1.61	2.12	0.25	0.01	0.01	4.50
S	0.46	0.98	1.79	0.62	0.06	0.02	3.95
SSW	0.56	0.42	1.05	0.55	0.03	0.00	2.63
SW	0.50	0.31	0.24	0.29	0.02	0.00	1.38
WSW	0.72	0.21	0.16	0.01	0.00	0.00	1.11
W	1.19	0.47	0.03	0.00	0.00	0.00	1.71
WNW	1.35	0.99	0.07	0.00	0.00	0.00	2.41
NW	0.97	1.19	0.15	0.00	0.00	0.00	2.31
NNW	0.10	0.37	0.05	0.01	0.00	0.00	0.53
Total	8.78	9.86	6.35	1.77	0.14	0.03	26.93

Percent of Calms 0.14  
Percent of Invalid Hours 0.00  
Percent of Valid Hours 27.07

Omaha Public Power District  
Fort Calhoun Nuclear Station  
JOINT FREQUENCY DISTRIBUTION BY PERCENT  
MODERATELY STABLE ( $1.5 < \Delta T / \Delta z \leq 4.0$ )  
PERIOD OF RECORD: JAN 2001 - DEC 2001  
PASQUILL F  
WIND SPEED (mph) AT 10-m LEVEL

Wind	1.0-	4.0-	8.0-	13.0-	19.0-		Total
Direct	3.9	7.9	12.9	18.9	24.0	+24.0	
N	0.01	0.01	0.00	0.00	0.00	0.00	0.11
NNE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NE	0.01	0.00	0.00	0.00	0.00	0.00	0.01
ENE	0.01	0.00	0.00	0.00	0.00	0.00	0.01
E	0.32	0.01	0.00	0.00	0.00	0.00	0.33
ESE	0.56	0.35	0.01	0.00	0.00	0.00	0.92
SE	0.58	0.95	0.14	0.00	0.00	0.00	1.67
SSE	0.55	0.39	0.00	0.00	0.00	0.00	0.95
S	0.48	0.27	0.21	0.02	0.00	0.00	1.07
SSW	0.39	0.13	0.22	0.00	0.00	0.00	0.76
SW	0.50	0.07	0.09	0.00	0.00	0.00	0.75
WSW	0.56	0.02	0.01	0.00	0.00	0.00	0.71
W	0.88	0.01	0.00	0.00	0.00	0.00	0.97
WNW	0.95	0.09	0.02	0.00	0.00	0.00	1.11
NW	0.23	0.05	0.00	0.00	0.00	0.00	0.27
NNW	0.02	0.02	0.00	0.00	0.00	0.00	0.05
Total	6.05	2.37	0.70	0.02	0.00	0.00	9.14

Percent of Calms 0.56  
Percent of Invalid Hours 0.00  
Percent of Valid Hours 9.70

Omaha Public Power District  
Fort Calhoun Nuclear Station  
JOINT FREQUENCY DISTRIBUTION BY PERCENT  
EXTREMELY STABLE ( $\Delta T / \Delta z > 4.0$ )  
PERIOD OF RECORD: JAN 2001 - DEC 2001  
PASQUILL G  
WIND SPEED (mph) AT 10-m LEVEL

Wind	1.0-	4.0-	8.0-	13.0-	19.0-		
Direct	3.9	7.9	12.9	18.9	24.0	+24.0	Total
N	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NNE	0.01	0.00	0.00	0.00	0.00	0.00	0.01
NE	0.05	0.00	0.00	0.00	0.00	0.00	0.05
ENE	0.13	0.00	0.00	0.00	0.00	0.00	0.14
E	0.21	0.02	0.00	0.00	0.00	0.00	0.27
ESE	0.68	0.09	0.00	0.00	0.00	0.00	0.80
SE	0.84	0.10	0.01	0.00	0.00	0.00	0.98
SSE	0.67	0.08	0.00	0.00	0.00	0.00	0.81
S	0.53	0.03	0.02	0.00	0.00	0.00	0.71
SSW	0.39	0.14	0.01	0.00	0.00	0.00	0.62
SW	0.31	0.02	0.00	0.00	0.00	0.00	0.43
WSW	0.22	0.00	0.00	0.00	0.00	0.00	0.24
W	0.21	0.01	0.00	0.00	0.00	0.00	0.26
WNW	0.07	0.00	0.00	0.00	0.00	0.00	0.08
NW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NNW	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	4.30	0.50	0.05	0.00	0.00	0.00	4.85

Percent of Calms 0.55  
Percent of Invalid Hours 0.00  
Percent of Valid Hours 5.40  
Percent of Hours Accounted For: 100.00

**SECTION VII**

**ATTACHMENT 3**

**ANNUAL OCCUPATIONAL EXPOSURE REPORT**

**Technical Specification 5.9.1b**

**January 1, 2001 - December 31, 2001**

FORT CALHOUN STATION  
 OMAHA PUBLIC POWER DISTRICT  
 P. O. BOX 550  
 FT. CALHOUN, NE. 68023-0550

Date: 22-FEB-2002 09:42

LICENSE: DPR-40

Regulatory Guide 1.16 Information  
 End of Year Report 2001

Work and Job Function	Number of Personnel > 100 mrem			Total man-rem *		
	Station	Utility	Contractor	Station	Utility	Contractor
REACTOR OPERATIONS AND SURVEILLANCE						
MAINTENANCE AND CONSTRUCTION						
OPERATIONS	0.474	0.000	0.121	0.405	0.000	0.053
HEALTH PHYSICS	30.549	0.000	0.000	9.187	0.000	0.000
SUPERVISORY	9.193	0.000	19.519	5.271	0.000	8.008
ENGINEERING	4.506	0.000	0.003	1.206	0.000	0.001
	1.326	0.000	0.000	0.480	0.000	0.000
ROUTINE MAINTENANCE						
MAINTENANCE AND CONSTRUCTION						
OPERATIONS	32.123	14.721	58.509	15.843	7.173	17.105
HEALTH PHYSICS	0.592	0.000	0.000	0.163	0.000	0.000
SUPERVISORY	6.501	0.000	19.055	4.607	0.000	6.541
ENGINEERING	9.579	0.000	4.221	3.913	0.000	1.422
	5.625	0.000	9.916	1.352	0.000	2.387
INSERVICE INSPECTION						
MAINTENANCE AND CONSTRUCTION						
OPERATIONS	11.465	12.867	20.842	7.610	9.583	8.632
HEALTH PHYSICS	0.441	0.000	0.000	0.158	0.000	0.000
SUPERVISORY	0.667	0.000	6.279	0.541	0.000	2.802
ENGINEERING	3.027	0.000	11.587	1.376	0.000	3.806
	0.664	0.000	56.084	0.193	0.000	32.611
SPECIAL MAINTENANCE						
MAINTENANCE AND CONSTRUCTION						
OPERATIONS	1.710	1.794	9.995	1.351	1.147	5.269
HEALTH PHYSICS	0.243	0.000	0.000	0.059	0.000	0.000
SUPERVISORY	0.370	0.000	1.274	0.284	0.000	0.615
ENGINEERING	1.456	0.000	1.487	0.474	0.000	0.464
	0.968	0.000	0.000	0.180	0.000	0.000
WASTE PROCESSING						
MAINTENANCE AND CONSTRUCTION						
OPERATIONS	0.069	0.000	0.009	0.040	0.000	0.005
HEALTH PHYSICS	0.127	0.000	0.000	0.062	0.000	0.000
SUPERVISORY	3.219	0.000	1.969	2.105	0.000	0.301
ENGINEERING	0.078	0.000	0.000	0.043	0.000	0.000
	0.020	0.000	0.000	0.014	0.000	0.000

Regulatory Guide 1.16 Information  
End of Year Report 2001

Work and Job Function	Number of Personnel > 100 mrem			Total man-rem *		
	Station	Utility	Contractor	Station	Utility	Contractor
REFUELING						
MAINTENANCE AND CONSTRUCTION	16.187	21.589	48.526	8.969	13.750	24.684
OPERATIONS	1.033	0.000	0.000	0.244	0.000	0.000
HEALTH PHYSICS	1.949	0.000	7.904	1.505	0.000	4.341
SUPERVISORY	7.471	0.000	5.702	2.266	0.000	1.912
ENGINEERING	4.398	0.000	3.000	0.835	0.000	0.378
Totals						
MAINTENANCE AND CONSTRUCTION	62.029	50.971	138.000	34.218	31.653	55.748
OPERATIONS	32.984	0.000	0.000	9.873	0.000	0.000
HEALTH PHYSICS	21.898	0.000	56.000	14.313	0.000	22.608
SUPERVISORY	26.117	0.000	23.000	9.278	0.000	7.605
ENGINEERING	13.000	0.000	69.000	3.054	0.000	35.376
Grand Totals	156.029	50.971	286.000	70.736	31.653	121.337

\* The man-rem totals include dose only from individuals receiving more than 100 mrem throughout the year at the site.



Submitted by: LITTLE

Date: 23-FEB-2002 14:41

Sorted by: None Required

Page: 1

Year-to-Date 2001 TEDE Distribution Report  
All Monitored Personnel

Year-to-Date TEDE rem	No. of Persons	Percent	Cum. Percent	TEDE Total	Percent	Cum. Percent	Ave. TEDE	Ave. Age
No Measurable Exposure	456	37.19	37.19	0.000	0.00	0.00	0.000	46
0.001 - 0.100	271	22.10	59.30	11.114	4.92	4.92	0.041	44
0.100 - 0.250	161	13.13	72.43	27.233	12.06	16.98	0.169	45
0.250 - 0.500	164	13.38	85.81	59.341	26.27	43.25	0.362	44
0.500 - 0.750	108	8.81	94.62	66.603	29.48	72.73	0.617	43
0.750 - 1.000	48	3.92	98.53	41.667	18.45	91.18	0.868	42
1.000 - 2.000	18	1.47	100.00	19.933	8.82	100.00	1.107	42
2.000 - 3.000	0	0.00	100.00	0.000	0.00	100.00	0.000	0
3.000 - 4.000	0	0.00	100.00	0.000	0.00	100.00	0.000	0
4.000 - 5.000	0	0.00	100.00	0.000	0.00	100.00	0.000	0
5.000 - 6.000	0	0.00	100.00	0.000	0.00	100.00	0.000	0
6.000 - 7.000	0	0.00	100.00	0.000	0.00	100.00	0.000	0
7.000 - 8.000	0	0.00	100.00	0.000	0.00	100.00	0.000	0
8.000 - 9.000	0	0.00	100.00	0.000	0.00	100.00	0.000	0
9.000 - 10.000	0	0.00	100.00	0.000	0.00	100.00	0.000	0
> 10.000	0	0.00	100.00	0.000	0.00	100.00	0.000	0

Total Number of Monitored Personnel: 1,226 Persons  
Total Exposure: 225.891 rem  
Average Exposure: 0.184 rem / Person