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United States Nuclear Regulatory Commission  
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H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2  
DOCKET NO. 50-261/LICENSE NO. DPR-23

2001 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

Ladies and Gentlemen:

The purpose of this letter is to transmit the attached Annual Radioactive Effluent Release Report for the period of January 1, 2001, through December 31, 2001, for the H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2. This report is submitted in accordance with 10 CFR 50.36a(a)(2) and the HBRSEP, Unit No. 2, Technical Specifications, Section 5.6.3.

If you have any questions concerning this report, please contact Mr. C. T. Baucom.

Sincerely,

B. L. Fletcher III  
Manager - Regulatory Affairs

DJS/djs

Attachment

c: Mr. L. A. Reyes, NRC, Region II  
Mr. R. Subbaratnam, NRR, NRC (w/o enclosure)  
NRC Resident Inspector, HBRSEP

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

January 1, 2001 - December 31, 2001

CAROLINA POWER & LIGHT COMPANY

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2

FACILITY OPERATING LICENSE NO. DPR-23

DOCKET NO. 50-261

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## I. EXECUTIVE SUMMARY

### A. Discussion

#### 1. Protection Standards

The main objective in the control of radiation is to ensure that any exposure is kept not only within regulatory limits, but As Low As Reasonably Achievable (ALARA). The ALARA concept applies to reducing radiation exposure both to workers at H. B. Robinson Steam Electric Plant (HBRSEP), Unit No. 2 and to the general public. "Reasonably achievable" means that radiation exposure reduction is based on sound environmental practices, economic decisions, and operating practices. By practicing ALARA, HBRSEP and Carolina Power & Light (CP&L) Company minimizes health risk and environmental detriment, and ensures that exposures are maintained well below regulatory limits.

#### 2. Sources of Radioactivity Released

During normal operations of a nuclear power station, most of the fission products are retained within the fuel and fuel cladding. However, small quantities of radioactive fission and activation products are present in the reactor coolant water. The types of radioactive material released are noble gases, iodines and particulates, and tritium.

The noble gas fission products in the reactor coolant water are released as a gas when the coolant is depressurized. These gases are collected by a system designed for collection and storage for radioactive decay prior to release to the environment.

Small releases of radioactivity in liquids may occur from equipment associated with the reactor coolant system. These liquids are collected, processed for radioactivity removal, prior to and during release.

#### 3. Noble Gas

Some of the fission products released in airborne effluents are radioactive isotopes of noble gases, such as krypton, argon, and xenon. Noble gases are by nature inert and do not concentrate in humans or other organisms. Noble gases contribute to human radiation exposure as external exposure. The major isotopes released are Argon-41, Xenon-133, and Xenon-135 with half-lives of approximately two hours, five days, and nine hours, respectively. Half-life is defined as the time required for a radioactive isotope to lose 50 percent of its radioactivity by decay. Noble gases are readily dispersed in the atmosphere.

4. Iodines and Particulates

Annual releases of iodines, and those particulates with half-lives greater than eight days are small. Factors such as chemical reactivity and solubility in water, combined with high processing efficiencies, minimize their discharge. The main contribution of radioactive iodine to human exposure is to the thyroid gland, where the body concentrates iodine. The principal radioactive particulates are Cobalt-58 and Cobalt-60, which contribute to internal exposure of tissues such as the muscle, liver, and intestines. These particulates can also be a source of exposure if deposited on the ground.

5. Tritium

Tritium, a radioactive isotope of hydrogen, is the predominate radionuclide in liquid and gaseous effluents. Tritium is produced in the reactor coolant as a result of neutron interaction with deuterium (also a hydrogen isotope) and boron, both of which are present in the reactor coolant. Tritium is a weak beta particle emitter and contributes very little radiation exposure to the human body, and when tritium is inhaled or ingested it is dispersed throughout the body until eliminated.

6. Processing and Monitoring

Effluents are strictly controlled and monitored to ensure that radioactivity released to the environment is minimal and within regulatory limits. Effluent controls include the operation of radiation monitoring systems, in-plant and environmental sampling and analyses, quality assurance programs for both in-plant and environmental sampling and analyses, and procedures that address effluent and environmental monitoring.

The plant radiation monitoring system provides monitors that are designed to ensure that all releases are below regulatory limits. Each instrument provides indication of the amount of radioactivity present and is equipped with alarms and indicators in the control room. The alarm setpoints are set below the regulatory limits, i.e., typically at less than 50 percent of the regulatory limit, to ensure that the limits are not exceeded. If a monitor alarms, a release to the environment from a tank is automatically suspended. Additionally, releases are sampled and analyzed in the laboratory prior to discharge to the environment. The sampling and analysis done in the laboratory provides a more sensitive and precise method of determining pre-effluent composition than in-plant monitoring instruments.

The plant has a meteorological tower, which is linked to computers that record the meteorological data. The meteorological data and the release data are used to calculate dose to the public.

In addition to in-plant equipment the company maintains a Radiological Environmental Monitoring Program, which consists of devices used to sample the air and water in the environment. The samples collected from the surrounding environment are analyzed to determine the presence of radioactive material in the environment.

## 7. Exposure Pathways

Radiological exposure pathways are the methods by which people may become exposed to radioactive material. The major pathways of concern are those, which could cause the highest calculated radiation dose. The projected pathways are determined from the type and amount of radioactive material that may have been released, the environmental transport mechanism, and the use of the environment.

Environmental transport mechanisms include, but are not limited to, hydrological (i.e., water) and meteorological (i.e., weather) characteristics of the area. Information on water flow, wind speed and direction, dietary intake of residents, recreational use of the area and location of homes and farms in the area are some of the many factors used to calculate the potential exposure to offsite personnel.

The release of radioactive gaseous effluents includes pathways such as external whole body exposure, deposition on plants and soils, and human inhalation. The release of radioactive material in liquid effluents includes pathways such as drinking water, fish consumption, and direct exposure from the lake at the shoreline and while swimming.

Even though radionuclides can reach humans by many different pathways, some radionuclides result in more exposure than others. The critical pathway is the exposure which will provide, for a specific radionuclide, the greatest exposure to a population, or a specific group of the population, called the critical group. The critical group may vary depending on the radionuclides involved, the age and diet of the group, and other cultural factors. The exposure may be received by the whole body or to a specific organ, with the organ receiving the largest fraction of the exposure called the critical organ.

The exposures to the general public in the area surrounding HBRSEP, Unit No. 2 are calculated for gaseous and liquid releases. The exposure due to radioactive material released in gaseous effluents is calculated using factors such as the amount of radioactive material released, the concentration beyond the site boundary, weather conditions at the time of release, locations of exposure pathways, and usage factors. The exposures calculated due to radioactive materials released in liquid effluents are calculated using factors such as the total volume of liquid, the total volume of dilution water, field irrigation, and usage factors.

8. Results

The Radioactive Effluent Release Report is a detailed listing of the radioactivity released from the HBRSEP, Unit No. 2 during the period from January 1, 2001, through December 31, 2001.

During the period of January 1, 2001, through December 31, 2001, the estimated maximum individual offsite dose due to radioactivity released in effluents was:

Liquid Effluents:

- Total Body Dose 0.000704 millirem
- Critical Organ Dose 0.000831 millirem, gi-lli<sup>1</sup>

Gaseous Effluents:

- Beta Air Dose 0.00236 millirad
- Gamma Air Dose 0.00494 millirad
- Critical Organ Dose 0.15700 millirem, lung

B. Significant Variances

The following are explanations of significant variances in this Annual Report:

1. The 10 CFR 50, Appendix I, doses were calculated from the last posted release for the period indicated using the Canberra (Offsite Dose Calculation Manual (ODCM) meteorology) Effluent Management System (EMS). The ODCM (EMS<sup>2</sup> Software) provides day-by-day dose estimates that are conservative because all releases are assigned to the limiting receptor, using the continuous ground level dispersion factors calculated from 1978 meteorology.

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<sup>1</sup> gi-lli, gastrointestinal-lower level intestine

<sup>2</sup> EMS, Effluent Management Software, A product of Canberra Nuclear Industries used for determining curies and dose released from routine radioactive effluent releases



2. HBRSEP Unit No. 2 was removed from service on April 7, 2001 for a refueling outage. Power operations was resumed on May 12, 2001 and continued through the end of the year. Continued good fuel and reactor coolant system integrity kept gaseous and liquid effluent totals relatively low in 2001. Some of the gaseous and liquid release parameters for this reporting period are summarized below:

GASEOUS EFFLUENTS

	<u>Units</u>	<u>1st Qtr</u>	<u>2nd Qtr</u>	<u>3rd Qtr</u>	<u>4th Qtr</u>
Fission & Act. Gas	Ci	4.53E-02	1.19E-01	9.76E-02	1.16E-01
I-131	Ci	<LLD	8.66E-07	<LLD	<LLD
Part. >8 Day Half-Lives	Ci	2.53E-06	5.59E-06	5.94E-08	6.89E-08
Tritium	Ci	1.46E+00	4.44E+00	2.09E+00	3.42E+00

3. Virtually all parameters associated with liquid effluents were stable for the year except for the differences caused by the refueling outage in the second quarter. Also, the pond release in the fourth quarter made the liquid waste volume unusually high. Some of the liquid release parameters for this reporting period are shown below:

LIQUID EFFLUENTS

	<u>Units</u>	<u>1st Qtr</u>	<u>2nd Qtr</u>	<u>3rd Qtr</u>	<u>4th Qtr</u>
Fission & Act. Products	Ci	6.95E-03	5.67E-02	5.98E-03	1.42E-04
Tritium	Ci	1.55E+02	6.21E+01	5.51E+01	6.41E+01
Dilution Volume	Liters	2.77E+11	2.10E+11	2.91E+11	2.78E+11
Waste Volume	Liters	6.54E+05	8.26E+06	3.37E+05	5.22E+07

C. Regulatory Compliance

1. When projected on a day-by-day basis utilizing conservative meteorological conditions, the dose commitment from gaseous and liquid effluents is a small fraction of the 10 CFR 50, Appendix I limits. The direct radiation assessment to the most likely exposed member of the public is reported in the Annual Radiological Environmental Operating Report. During 2001 the results of the direct radiation assessment demonstrated no measurable effect above background for plant operations.
2. There were no changes to the waste solidification Process Control Program (PCP) during this reporting period.
3. There were no changes to the Radioactive Waste Systems (i.e., liquid, gaseous, or solid) during this reporting period.
4. There were no reportable instrumentation inoperability events during this reporting period.
5. There were no outside liquid holdup tanks that exceeded the 10 curie limit during this reporting period.
6. There were no Waste Gas Decay Tanks that exceeded the 1.9E+04 curie limit during this reporting period.
7. There was a revision to the ODCM during this reporting period. See page 39.

## II. SUPPLEMENTAL INFORMATION

### A. Regulatory Limits

1. Fission and Activation Gases:
  - 10 CFR 20 Limits (Instantaneous Release Rate)
    - Total Body Dose  $\leq 500$  mrem/yr
    - Skin Dose  $\leq 3000$  mrem/yr
  - 10 CFR 50, Appendix I
    - For Calendar Quarter
      - Gamma Dose  $\leq 5$  mrad
      - Beta Dose  $\leq 10$  mrad
    - For Calendar Year
      - Gamma Dose  $\leq 10$  mrad
      - Beta Dose  $\leq 20$  mrad
2. Iodine - 131 and 133, Tritium, and Particulates >8 day half-lives:
  - 10 CFR 20 Limits (Instantaneous Release Rate)
    - Dose from Inhalation (only) to a child to any organ  $\leq 1500$  mrem/yr
  - 10 CFR 50, Appendix I (Organ Doses)
    - For Calendar Quarter  $\leq 7.5$  mrem
    - For Calendar Year  $\leq 15$  mrem
3. Liquids:

Concentrations are specified in 10 CFR 20, Appendix B, Table 2, Column 2, for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to  $2.00E-04$   $\mu\text{Ci/ml}$  total activity.

  - 10 CFR 50, Appendix I
    - For Calendar Quarter
      - Total Body Dose  $\leq 1.5$  mrem
      - Any Organ Dose  $\leq 5$  mrem
    - For Calendar Year
      - Total Body Dose  $\leq 3$  mrem
      - Any Organ Dose  $\leq 10$  mrem

### B. Measurements and Approximations of Total Radioactivity

1. Continuous Gaseous Releases
  - a. Fission and Activation Gases - The total activity released is determined from the net count rate of the gaseous monitor, its calibration factor, and the total exhaust flow. The activity of radioactive gas is determined by the fraction of that radioactive gas in the isotopic analysis for that period.

- b. Iodines - The activity released as Iodine-131, 133, and 135 is based on isotopic analysis of the charcoal cartridge and particulate filter and the total vent flow.
- c. Particulates - The activity released via particulates with half-lives greater than eight days is determined by isotopic analysis of particulate filters and the total vent flow.
- d. Tritium - The activity released as tritium is based on weekly grab sample analysis and total vent flow.

2. Batch Gaseous Releases

- a. Fission and Activation Gases - The activity released is based on the volume released and the activity of the individual nuclides obtained from an isotopic analysis of the grab sample taken prior to the release.
- b. Iodines - The iodines from mixed mode batch releases are included in the iodine determination from the mixed mode continuous Reactor Auxiliary Building release.
- c. Particulates - The particulates from mixed mode batch releases are included in the particulate determination from the mixed mode continuous Reactor Auxiliary Building release. Ground level batch particulates are reported in the batch mode accountability.
- d. Tritium - The activity released as tritium is based on the grab sample analysis of each batch and the batch volume.

3. Liquid Releases

- a. Fission and Activation Products - The total release values (not including tritium, strontium, Iron-55, and alpha) are comprised of the sum of the individual radionuclide activities in each release to the discharge canal for the respective quarter. These values represent the activity known to be present in the liquid radwaste effluent.
- b. Tritium & Alpha - The measured tritium and alpha concentrations in a monthly composite sample are used to calculate the total release and average diluted concentration during each period.
- c. Strontium-89, 90, and Iron-55 - The total release values are measured quarterly from composite samples.

C. Estimated Total Errors

1. Estimated total errors for gaseous effluents are based on uncertainties in counting equipment calibration, counting statistics, vent flow rates, vent sample flow rates, non-steady release rates, chemical yield factors, and sample losses for such items as charcoal cartridges.
2. Estimated total errors for liquid effluents are based on uncertainties in counting equipment calibration, counting statistics, non-steady release flow rate, sampling and mixing losses, and volume determinations.
3. Estimated total errors for solid waste are based on uncertainties in equipment calibration, dose rate measurements, geometry, and volume determinations.

III. GASEOUS EFFLUENTS

A. Batch Releases

	Jan - June 2001	July - Dec 2001
Number of batch releases	5.40E+01	6.30E+01
Total time period for batch releases	4.05E+04 min	9.78E+04 min
Maximum time period for a batch release	1.39E+04 min	7.63E+04 min
Average time period for a batch release	7.50E+02 min	1.55E+03 min
Minimum time period for a batch release	2.00E+00 min	8.00E+00 min

B. Abnormal Releases

	Jan - June 2001	July - Dec 2001
Number of releases	0.00E+00	0.00E+00
Total activity released	0.00E+00 Ci	0.00E+00 Ci

C. Data Tables

The following tables provide the details of gaseous releases:

- Table III-A      Summation of all Releases
- Table III-B      Ground Level and Mixed Mode Releases
- Table III-C      Typical Lower Limits of Detection for Gaseous Effluents

TABLE III-A  
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT - 2001  
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

Unit	Quarter 1	Quarter 2	Est. Total Error %
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A. Fission and Activation Gases

1. Total release	Ci	4.53E-02	1.19E-01	3.63E+01
2. Average release rate for period	μCi/sec	5.83E-03	1.52E-02	

B. Iodines

1. Total Iodine-131	Ci	<LLD	8.66E-07	1.74E+01
2. Average release rate for period	μCi/sec	<LLD	1.10E-07	

C. Particulates

1. Particulates with half-lives >8 days	Ci	2.53E-06	5.59E-06	1.05E+01
2. Average release rate for period	μCi/sec	3.25E-07	7.11E-07	
3. Gross alpha radioactivity	Ci	<LLD	<LLD	

D. Tritium

1. Total release	Ci	1.46E+00	4.44E+00	2.31E+01
2. Average release rate for period	μCi/sec	1.88E-01	5.65E-01	

E. Percent of 10 CFR 50, Appendix I

1. Quarterly limit				
Gamma air	%	1.43E-02	2.30E-02	
Beta air	%	2.90E-03	5.85E-03	
Organ: Total Body	%	2.71E-01	-	
Organ: Liver	%	-	8.17E-01	
2. Annual limit				
Gamma air	%	7.13E-03*	1.86E-02*	
Beta air	%	1.45E-03*	4.38E-03*	
Organ: Total Body	%	1.35E-01*	-	
Organ: Liver	%	-	5.44E-01*	

\*Cumulative total for the year-to-date using the methodology in the ODCM.

TABLE III-A  
(Continued)  
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT - 2001  
GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

Unit	Quarter 3	Quarter 4	Est. Total Error %
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A. Fission and Activation Gases

1. Total release	Ci	9.76E-02	1.16E-01	3.63E+01
2. Average release rate for period	µCi/sec	1.23E-02	1.46E-02	

B. Iodines

1. Total Iodine-131	Ci	<LLD	<LLD	1.74E+01
2. Average release rate for period	µCi/sec	<LLD	<LLD	

C. Particulates

1. Particulates with half-lives >8 days	Ci	5.94E-08	6.89E-08	1.05E+01
2. Average release rate for period	µCi/sec	7.47E-09	8.67E-09	
3. Gross alpha radioactivity	Ci	<LLD	<LLD	

D. Tritium

1. Total release	Ci	2.09E+00	3.42E+00	2.31E+01
2. Average release rate for period	µCi/sec	2.63E-01	4.31E-01	

E. Percent of 10 CFR 50, Appendix I

1. Quarterly limit				
Gamma air	%	1.27E-02	4.88E-02	
Beta air	%	5.72E-03	9.16E-03	
Organ: Total Body	%	3.83E-01	6.28E-01	
2. Annual limit				
Gamma air	%	2.50E-02*	4.94E-02*	
Beta air	%	7.24E-03*	1.18E-02*	
Organ: Lung	%	7.35E-01*	1.05E+00*	

\*Cumulative total for the year-to-date using the methodology in the ODCM.



**TABLE III-B**  
**ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT - 2001**  
**GASEOUS EFFLUENTS - GROUND LEVEL AND MIXED MODE RELEASES**

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		Quarter 1	Quarter 2	Quarter 1	Quarter 2

## 1. Fission Gases

Ar-41	Ci	<LLD	<LLD	2.92E-02	4.53E-02
Kr-85m	Ci	<LLD	<LLD	<LLD	3.24E-06
Xe-131m	Ci	<LLD	<LLD	1.34E-04	4.90E-04
Xe-133	Ci	<LLD	1.05E-02	1.55E-02	6.12E-02
Xe-133m	Ci	<LLD	<LLD	1.05E-04	1.00E-03
Xe-135	Ci	<LLD	<LLD	3.50E-05	9.23E-04
Total for Period	Ci	<LLD	1.05E-02	4.53E-02	1.09E-01

2. Iodines<sup>1</sup>

I-131	Ci	<LLD	4.60E-07	<LLD	4.05E-07
I-133	Ci	<LLD	<LLD	<LLD	<LLD
Total for Period	Ci	<LLD	4.60E-07	<LLD	4.05E-07

3. Particulates<sup>1</sup>

Co-58	Ci	<LLD	9.33E-07	<LLD	1.59E-06
Co-60	Ci	<LLD	<LLD	2.53E-06	2.77E-07
Br-82	Ci	<LLD	3.42E-06	<LLD	<LLD
Sb-122	Ci	<LLD	1.75E-07	<LLD	<LLD
Te-123m	Ci	<LLD	1.93E-08	<LLD	2.01E-08
Cs-137	Ci	<LLD	<LLD	<LLD	2.76E-06
Total for Period	Ci	<LLD	4.54E-06	2.53E-06	4.64E-06

<sup>1</sup>Mixed mode continuous accountability includes mixed mode batch accountability (excludes tritium).

TABLE III-B  
(Continued)  
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT - 2001  
GASEOUS EFFLUENTS - GROUND LEVEL AND MIXED MODE RELEASES

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
1. Fission Gases					
Ar-41	Ci	<LLD	<LLD	2.63E-02	1.00E-01
Kr-85	Ci	<LLD	<LLD	6.91E-02	<LLD
Kr-85m	Ci	<LLD	<LLD	<LLD	3.94E-04
Kr-87	Ci	<LLD	<LLD	<LLD	9.18E-04
Xe-131m	Ci	<LLD	<LLD	<LLD	4.48E-05
Xe-133	Ci	<LLD	<LLD	2.10E-03	9.06E-03
Xe-133m	Ci	<LLD	<LLD	<LLD	4.06E-05
Xe-135	Ci	<LLD	<LLD	6.70E-06	3.33E-03
Xe-135m	Ci	<LLD	<LLD	<LLD	2.17E-03
Total for Period	Ci	<LLD	<LLD	9.75E-02	1.16E-01

2. Iodines<sup>1</sup>

I-131	Ci	<LLD	<LLD	<LLD	<LLD
I-133	Ci	<LLD	<LLD	1.67E-08	<LLD
Total for Period	Ci	<LLD	<LLD	1.67E-08	<LLD

3. Particulates<sup>1</sup>

Co-58	Ci	5.94E-08	<LLD	<LLD	<LLD
Br-82	Ci	<LLD	<LLD	2.92E-07	<LLD
Cs-137	Ci	<LLD	6.89E-08	<LLD	<LLD
Total for Period	Ci	5.94E-08	6.89E-08	2.92E-07	<LLD

<sup>1</sup>Mixed mode continuous accountability includes mixed mode batch accountability (excludes tritium).

**TABLE III-C**  
**TYPICAL LOWER LIMITS OF DETECTION FOR GASEOUS EFFLUENTS**

Nuclide	LLD ( $\mu\text{Ci/cc}$ )
H-3	1.00E-06
Ar-41	6.80E-09
Mn-54	1.00E-11
Co-58	1.00E-11
Fe-59	1.00E-11
Co-60	1.00E-11
Zn-65	1.00E-11
Br-82	1.21E-13
Kr-85	5.98E-06
Kr-85m	1.66E-08
Kr-87	1.00E-04
Kr-88	1.00E-04
Sr-89	1.00E-11
Sr-90	1.00E-11
Mo-99	1.00E-11
Sb-122	2.63E-14
Te-123m	7.92E-15
I-131	1.00E-12
Xe-131m	4.66E-07
I-133	1.00E-10
Xe-133	1.00E-04
Xe-133m	1.00E-04
Cs-134	1.00E-11
I-135	3.86E-10
Xe-135	1.00E-04
Xe-135m	4.38E-07
Cs-137	1.00E-11
Xe-138	1.00E-04
Ba-140	2.08E-14
La-140	9.40E-14
Ce-141	1.00E-11
Ce-144	1.00E-11
Gross Alpha	1.00E-11

IV. LIQUID EFFLUENTS

A. Batch Releases

	Jan - June 2001	July - Dec 2001
Number of batch releases	8.10E+01	1.70E+01
Total time period for batch releases	1.70E+04 min	3.29E+03 min
Maximum time period for a batch release	8.08E+02 min	2.60E+02 min
Average time period for a batch release	2.10E+02 min	1.94E+02 min
Minimum time period for a batch release	2.00E+00 min	1.05E+02 min
Average stream flow during release periods	4.94E+05 gpm	5.67E+05 gpm

B. Abnormal Releases

	Jan - June 2001	July - Dec 2001
Number of releases	0.00E+00	0.00E+00
Total activity released	0.00E+00 Ci	0.00E+00 Ci

C. Data Tables

The following tables provide the details of gaseous releases:

- Table IV-A      Summation of all Releases
- Table IV-B      Continuous and Batch Mode Releases
- Table IV-C      Typical Lower Limits of Detection for Liquid Effluents

TABLE IV-A  
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT - 2001  
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Quarter 1	Quarter 2	Est. Total Error %
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A. Fission and Activation Products

1. Total release (not including tritium, gases, alpha)	Ci	6.95E-03	5.67E-02	1.07E+01
2. Average diluted concentration during period	µCi/ml	2.51E-11	2.70E-10	

B. Tritium

1. Total release	Ci	1.55E+02	6.21E+01	9.20E+00
2. Average diluted concentration during period	µCi/ml	5.59E-07	2.96E-07	

C. Dissolved and entrained gases

1. Total release	Ci	1.40E-02	2.37E-03	9.60E+00
2. Average diluted concentration during period	µCi/ml	5.50E-11	1.13E-11	
3. Percent of applicable limit	%	2.75E-05	5.65E-06	

D. Gross alpha radioactivity

1. Total release	Ci	<LLD	<LLD	1.83E+01
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E. Volume of waste released prior to dilution	Liters	6.54E+05	8.26E+06	
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F. Volume of dilution water used during period	Liters	2.77E+11	2.10E+11	
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G. Percent of 10CFR50, Appendix I

1. Quarterly Limit				
Organ: Liver	%	4.94E-04	NA	
Organ: GI-LLI	%	NA	5.44E-03	
Total body	%	1.45E-03	6.37E-03	
2. Annual Limit				
Organ: Liver	%	2.47E-04*	NA	
Organ: GI-LLI	%	NA	2.94E-03*	
Total body	%	7.23E-04*	3.91E-03*	

\*Cumulative total for the year-to-date using the methodology in the ODCM.

TABLE IV-A  
(Continued)  
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT - 2001  
LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

	Unit	Quarter 3	Quarter 4	Est. Total Error %
<b>A. Fission and Activation Products</b>				
1. Total release (not including tritium, gases, alpha)	Ci	5.98E-03	1.42E-04	1.07E+01
2. Average diluted concentration during period	µCi/ml	2.05E-11	5.11E-13	
<b>B. Tritium</b>				
1. Total release	Ci	5.51E+01	6.41E+01	9.20E+00
2. Average diluted concentration during period	µCi/ml	1.89E-07	2.31E-07	
<b>C. Dissolved and entrained gases</b>				
1. Total release	Ci	8.33E-05	4.32E-06	9.60E+00
2. Average diluted concentration during period	µCi/ml	2.86E-13	1.56E-14	
3. Percent of applicable limit	%	1.43E-07	7.80E-09	
<b>D. Gross alpha radioactivity</b>				
1. Total release	Ci	<LLD	<LLD	1.83E+01
<b>E. Volume of waste released prior to dilution</b>				
	Liters	3.37E+05	5.22E+07	
<b>F. Volume of dilution water used during period</b>				
	Liters	2.91E+11	2.78E+11	
<b>G. Percent of 10CFR50, Appendix I</b>				
1. Quarterly Limit				
Organ: Liver	%	2.97E-03	9.40E-03	
Total body	%	8.44E-03	3.07E-02	
2. Annual Limit				
Organ: GI-LLI	%	3.88E-03*	8.31E-03*	
Total body	%	8.14E-03*	2.35E-02*	

\*Cumulative total for the year-to-date using the methodology in the ODCM.

**TABLE IV-B**  
**ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT - 2001**  
**LIQUID EFFLUENTS - CONTINUOUS MODE AND BATCH MODE RELEASES**

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		Quarter 1	Quarter 2	Quarter 1	Quarter 2
H-3	Ci	<LLD	<LLD	1.55E+02	6.21E+01
Cr-51	Ci	<LLD	<LLD	<LLD	4.45E-03
Mn-54	Ci	<LLD	<LLD	2.69E-05	6.13E-06
Fe-55	Ci	<LLD	<LLD	1.19E-04	8.96E-04
Co-57	Ci	<LLD	<LLD	2.59E-05	6.68E-05
Co-58	Ci	<LLD	1.15E-03	2.67E-04	2.13E-02
Fe-59	Ci	<LLD	<LLD	<LLD	2.21E-05
Co-60	Ci	<LLD	<LLD	5.74E-03	5.69E-03
Ag-110m	Ci	<LLD	<LLD	3.85E-04	2.33E-04
Sn-117m	Ci	<LLD	<LLD	<LLD	2.72E-04
Sb-122	Ci	<LLD	<LLD	<LLD	1.15E-03
Te-123m	Ci	<LLD	<LLD	4.10E-05	2.50E-03
Sb-124	Ci	<LLD	<LLD	3.05E-05	1.33E-02
Sb-125	Ci	<LLD	<LLD	2.60E-04	5.58E-03
Cs-137	Ci	<LLD	<LLD	5.68E-05	4.52E-06
Ce-141	Ci	<LLD	<LLD	<LLD	5.23E-06
Total for Period	Ci	<LLD	1.15E-03	6.95E-03	5.56E-02
Kr-85	Ci	<LLD	<LLD	<LLD	1.07E-04
Xe-131m	Ci	<LLD	<LLD	4.11E-05	<LLD
Xe-133	Ci	<LLD	<LLD	1.39E-02	2.26E-03
Xe-133m	Ci	<LLD	<LLD	8.48E-05	<LLD
Total for Period	Ci	<LLD	<LLD	1.40E-02	2.37E-03

TABLE IV-B  
(Continued)  
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT - 2001  
LIQUID EFFLUENTS - CONTINUOUS MODE AND BATCH MODE RELEASES

Nuclides Released	Unit	Continuous Mode		Batch Mode	
		Quarter 3	Quarter 4	Quarter 3	Quarter 4
H-3	Ci	3.24E-05	1.42E+00	5.51E+01	6.27E+01
Fe-55	Ci	<LLD	<LLD	6.02E-04	5.04E-05
Co-58	Ci	<LLD	<LLD	2.61E-04	5.34E-06
Co-60	Ci	<LLD	<LLD	2.76E-04	4.26E-06
Te-123m	Ci	<LLD	<LLD	6.43E-05	8.41E-06
Sb-124	Ci	<LLD	<LLD	3.06E-03	2.18E-05
Sb-125	Ci	<LLD	<LLD	1.70E-03	4.90E-05
Cs-137	Ci	<LLD	<LLD	1.72E-05	2.47E-06
Total for Period	Ci	<LLD	<LLD	5.97E-03	1.42E-04
Xe-133	Ci	<LLD	<LLD	8.33E-05	4.32E-06
Total for Period	Ci	<LLD	<LLD	8.33E-05	4.32E-06



**TABLE IV-C**  
**TYPICAL LOWER LIMITS OF DETECTION FOR LIQUID EFFLUENTS**

Nuclide	LLD ( $\mu\text{Ci/ml}$ )
H-3	1.00E-05
Cr-51	1.59E-07
Mn-54	5.00E-07
Fe-55	1.00E-06
Co-57	2.24E-08
Co-58	5.00E-07
Fe-59	5.00E-07
Co-60	5.00E-07
Zn-65	5.00E-07
Kr-85	1.00E-05
Sr-89	5.00E-08
Sr-90	5.00E-08
Nb-95	2.21E-08
Zr-95	5.55E-08
Mo-99	5.00E-07
Tc-99m	3.69E-08
Ag-110m	2.86E-08
Sn-117m	5.62E-07
Sb-122	2.79E-08
Te-123m	2.22E-08
Sb-124	7.34E-08
Sb-125	6.30E-08
I-131	1.00E-06
Xe-131m	1.00E-05
Xe-133	1.00E-05
Xe-133m	1.00E-05
Cs-134	5.00E-07
Xe-135	1.00E-05
Cs-137	5.00E-07
Ba-140	4.21E-08
La-140	5.13E-08
Ce-141	5.00E-07
Ce-144	5.00E-07
Gross Alpha	1.00E-07

V. SOLID WASTE AND IRRADIATED FUEL SHIPMENTS  
 Report Time Period January 1, 2001, Through December 31, 2001

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

Waste Class A

1. Type of Waste	Unit	Period Total	Est. Total Error (%)	Solid Agent	Cont. Type	Form	No. Ship.
a. Spent resins, filter sludges, evaporator bottoms, etc.	m <sup>3</sup> Ci	NA	NA	NA	NA	NA	NA
b. Dry compressible waste, contaminated equipment, etc.	m <sup>3</sup> Ci	3.98E+02 5.17E-01	1.00E+00 2.31E+01	None	STP	Compacted and Incinerable	6
c. Irradiated components, control rods, etc.	m <sup>3</sup> Ci	NA	NA	NA	NA	NA	NA
d. Other: Wax stripper sludge, mixed waste shipment of freon still bottoms, part washer sludge.	m <sup>3</sup> Ci	NA	NA	NA	NA	NA	NA

STP = Strong Tight Package

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

3. Solid Waste Disposition

Number of Shipments: 6  
Mode of Transportation: Exclusive use  
Destination: GTS Duratek, Envirocare

	%	Ci
a. NA	NA	NA
b. Nb-95	3.05E+01	1.58E-01
Zr-95	2.18E+01	1.13E-01
Co-58	1.54E+01	7.94E-02
Fe-55	1.31E+01	6.78E-02
Ni-63	6.55E+00	3.39E-02
Co-60	4.81E+00	2.49E-02
Cr-51	3.25E+00	1.68E-02
Sb-124	1.25E+00	6.49E-03
Sn-113	7.25E-01	3.75E-03
Mn-54	5.51E-01	2.85E-03
C-14	4.41E-01	2.28E-03
H-3	4.08E-01	2.11E-03
Pu-241	3.15E-01	1.63E-03
* Others	8.41E-01	4.35E-03
c. NA	NA	NA
d. NA	NA	NA

\* Others include: Co-57, Sr-90, Ag-110m, Te-123m, Cs-137, Ce-144, Hf-181, and Cm-242.

Total Curie Quantity and Principle Radionuclides were determined by Estimate.

V. SOLID WASTE AND IRRADIATED FUEL SHIPMENTS  
 Report Time Period January 1, 2001, Through December 31, 2001

B. SOLID WASTE SHIPPED OFFSITE FOR BURIAL OR DISPOSAL (not irradiated fuel)

Waste Class C

1. Type of Waste	Unit	Period Total	Est. Total Error (%)	Solid. Agent	Cont. Type	Form	No. Ship.
a. Spent resins, filter sludges, evaporator bottoms, etc.	m <sup>3</sup> Ci	1.54E+01 6.27E+01	1.00E+00 2.31E+01	None	DOT 7A Type A STP	Dewatered bead resin, dewatered filters	4
b. Dry compressible waste, contaminated equipment, etc.	m <sup>3</sup> Ci	NA	NA	NA	NA	NA	NA
c. Irradiated components, control rods, etc.	m <sup>3</sup> Ci	NA	NA	NA	NA	NA	NA
d. Other: Wax stripper sludge, mixed waste shipment of freon still bottoms, part washer sludge.	m <sup>3</sup> Ci	NA	NA	NA	NA	NA	NA

STP = Strong Tight Package

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

3. Solid Waste Disposition

Number of Shipments: 4  
Mode of Transportation: Exclusive use  
Destination: Barnwell

	%	Ci
a. Co-60	3.24E+01	2.03E+01
Ni-63	2.79E+01	1.75E+01
Fe-55	2.62E+01	1.64E+01
Sb-125	3.92E+00	2.46E+00
Mn-54	1.93E+00	1.21E+00
Cs-137	1.90E+00	1.19E+00
Cd-109	1.71E+00	1.07E+00
C-14	1.47E+00	9.21E-01
Co-58	5.65E-01	3.54E-01
Ag-110m	5.01E-01	3.14E-01
Sb-124	3.43E-01	2.15E-01
Cs-134	2.20E-01	1.38E-01
* Others	1.01E+00	6.34E-01

b. NA	NA	NA
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c. NA	NA	NA
-------	----	----

d. NA	NA	NA
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\* Others include: H-3, Cr-51, Co-57, Ni-59, Sr-89, Sr-90, Nb-95, Zr-95, Sn-113, Te-123m, Ce-144, Pu-238, Pu-239, Am-241, Pu-241, Cm-242, Am-243, Cm-243.

Total Curie Quantity and Principle Radionuclides were determined by Estimate.

VI. 40 CFR 190 DOSE CONFORMANCE

The direct radiation assessment to the most likely exposed member of the public is reported in the Annual Radiological Environmental Operating Report. The results of the assessment demonstrate no measurable affect above background from plant operations. Since no 10 CFR 50, Appendix I, limits have been exceeded and the evaluation of the Independent Spent Fuel Storage Installation indicates only a small fraction of the total dose to the environs, this demonstrates conformance with 40 CFR 190, "Environmental Radiation Protection Standards for Nuclear Power Operation."

VII. METEOROLOGICAL DATA

A. Continuous Release Diffusion Analysis

Table VII-A presents the number and frequency of wind direction occurrences by wind speed class as recorded at the onsite meteorological system during the period January 1, 2001, through December 31, 2001.

The frequencies are presented as a percent of total occurrences for each stability class as well as a summary for all classes for the lower (10 meter) sensor elevation.

Pertinent information available from the tables is as follows:

1. Stability

Percent occurrence Pasquill Stability categories based on lower level (10m) wind distribution:

A	B	C	D	E	F	G
2.9	5.0	6.5	39.3	28.3	8.6	9.4

2. Wind Speed 10 Meter

Average Speed (mph)	4.22
Percent Calm	11.97
Percent Less than 3.5 mph	48.00

3. Wind Direction 10 Meter

Prevailing	S
Percent Occurrence	11.90

TABLE VII-A JOINT OCCURRENCE FREQUENCIES FOR LOWNDDEG AND LOWNDSPD - CONTINUOUS RELEASES

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS A						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.34	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.56	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
3.35	0.000	0.000	0.000	0.149	0.138	0.057	0.218	0.046	0.057	0.195	0.241	0.218	0.298	0.092	0.000	0.000	1.708
5.59	0.000	0.000	0.000	0.000	0.011	0.011	0.000	0.034	0.138	0.195	0.218	0.138	0.092	0.080	0.046	0.000	0.963
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023	0.126	0.172
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.00	0.00	0.00	0.15	0.15	0.07	0.23	0.08	0.19	0.39	0.46	0.36	0.39	0.19	0.17	0.02	2.85

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS B						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.34	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.56	0.000	0.000	0.000	0.000	0.023	0.057	0.034	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.126
3.35	0.000	0.000	0.034	0.298	0.608	0.332	0.321	0.241	0.160	0.355	0.493	0.481	0.241	0.092	0.011	0.000	3.668
5.59	0.000	0.000	0.000	0.011	0.034	0.023	0.080	0.023	0.046	0.344	0.206	0.149	0.046	0.057	0.069	0.000	1.089
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.023	0.000	0.034
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.023	0.034
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.00	0.00	0.03	0.31	0.66	0.41	0.44	0.26	0.21	0.70	0.70	0.64	0.29	0.16	0.11	0.02	4.95

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS C						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.34	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.56	0.000	0.000	0.000	0.011	0.138	0.160	0.149	0.023	0.023	0.023	0.092	0.080	0.080	0.000	0.000	0.000	0.779
3.35	0.000	0.000	0.000	0.447	0.573	0.275	0.458	0.367	0.390	0.630	0.470	0.504	0.355	0.149	0.057	0.000	4.677
5.59	0.000	0.000	0.000	0.034	0.023	0.034	0.023	0.034	0.115	0.160	0.138	0.023	0.046	0.069	0.229	0.023	0.951
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.046	0.000	0.046
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.011
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.00	0.00	0.00	0.49	0.73	0.47	0.63	0.42	0.53	0.81	0.70	0.61	0.48	0.22	0.34	0.02	6.46

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS D						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.34	0.001	0.000	0.003	0.040	0.048	0.041	0.040	0.030	0.022	0.029	0.030	0.021	0.017	0.007	0.003	0.000	0.332
1.56	0.023	0.011	0.138	1.559	1.880	1.582	1.570	1.169	0.860	1.100	1.158	0.802	0.676	0.264	0.115	0.011	12.918
3.35	0.011	0.034	0.172	3.038	2.063	1.375	1.364	2.866	2.338	2.189	1.410	0.928	0.906	0.871	0.688	0.172	20.426
5.59	0.011	0.000	0.011	0.401	0.344	0.355	0.149	0.344	0.699	0.550	0.516	0.332	0.195	0.183	0.745	0.275	5.112
8.27	0.000	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.034	0.000	0.000	0.011	0.023	0.023	0.275	0.057	0.436
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.057	0.046	0.103
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.05	0.05	0.32	5.05	4.34	3.35	3.12	4.41	3.95	3.87	3.11	2.10	1.82	1.35	1.88	0.56	39.33

TABLE VII-A JOINT OCCURRENCE FREQUENCIES FOR LOWNDDEG AND LOWNDSPD - CONTINUOUS RELEASES

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS E						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.34	0.005	0.005	0.034	0.209	0.123	0.076	0.101	0.260	0.536	0.431	0.330	0.214	0.157	0.123	0.110	0.028	2.741
1.56	0.023	0.023	0.183	1.112	0.653	0.401	0.539	1.387	2.866	2.304	1.765	1.146	0.837	0.653	0.585	0.149	14.626
3.35	0.011	0.023	0.080	0.493	0.206	0.172	0.126	0.802	1.387	1.456	0.585	0.390	0.367	0.493	1.536	1.055	9.181
5.59	0.000	0.011	0.000	0.000	0.023	0.000	0.034	0.034	0.183	0.126	0.046	0.046	0.057	0.115	0.367	0.642	1.685
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023	0.046	0.023	0.092
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.011
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.04	0.06	0.30	1.81	1.01	0.65	0.80	2.48	4.97	4.32	2.73	1.80	1.42	1.41	2.64	1.91	28.34

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS F						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.34	0.024	0.000	0.016	0.031	0.039	0.031	0.047	0.384	0.557	0.424	0.314	0.298	0.228	0.204	0.322	0.141	3.060
1.56	0.034	0.000	0.023	0.046	0.057	0.046	0.069	0.562	0.814	0.619	0.458	0.436	0.332	0.298	0.470	0.206	4.470
3.35	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.023	0.034	0.011	0.011	0.011	0.011	0.023	0.436	0.493	1.055
5.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.023	0.034
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.06	0.00	0.04	0.08	0.10	0.08	0.12	0.97	1.41	1.05	0.78	0.75	0.57	0.52	1.24	0.86	8.62

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS G						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.34	0.000	0.000	0.000	0.000	0.044	0.022	0.044	0.581	0.409	0.323	0.258	0.323	0.172	0.539	2.346	0.775	5.835
1.56	0.000	0.000	0.000	0.000	0.023	0.011	0.023	0.309	0.218	0.172	0.138	0.172	0.092	0.287	1.249	0.413	3.106
3.35	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.172	0.321	0.504
5.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.00	0.00	0.00	0.00	0.07	0.03	0.07	0.89	0.63	0.50	0.40	0.50	0.26	0.84	3.77	1.51	9.45

TOTAL HOURS CONSIDERED ARE 8724.

WIND MEASURED AT 11.0 METERS.

OVERALL WIND DIRECTION FREQUENCY																	
WIND DIRECTION:	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
FREQUENCY:	0.1	0.1	0.7	7.9	7.1	5.1	5.4	9.5	11.9	11.6	8.9	6.7	5.2	4.7	10.2	4.9	100.0



VII. METEOROLOGICAL DATA

B. Mixed Mode Batch Release Diffusion Analysis

Table VII-B presents the number and frequency of wind direction occurrences by wind speed class as recorded at the onsite meteorological system during mixed mode batch releases for the period January 1, 2001, through December 31, 2001.

The frequencies are presented as a percent of total occurrences for each stability class as well as a summary for all classes for the lower (10 meter) sensor elevation.

TABLE VII-B JOINT OCCURRENCE FREQUENCIES FOR LOWNDDEG AND LOWNDSPD - MIXED MODE BATCH RELEASES

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS A						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.34	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.56	0.000	0.000	0.000	0.000	0.144	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.144
3.35	0.000	0.000	0.000	0.144	0.289	0.144	0.144	0.000	0.144	0.433	0.289	0.000	0.289	0.866	0.000	0.000	2.743
5.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.433	0.000	0.578	0.000	0.433	0.000	0.000	1.444
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.144	0.144
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.00	0.00	0.00	0.14	0.43	0.14	0.14	0.00	0.14	0.87	0.29	0.58	0.29	1.30	0.00	0.14	4.48

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS B						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.34	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.56	0.000	0.000	0.000	0.000	0.000	0.144	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.144
3.35	0.000	0.000	0.144	0.144	0.289	0.289	0.144	0.289	0.144	0.289	0.289	0.433	0.289	0.289	0.000	0.000	3.032
5.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.144	0.289	0.000	0.000	0.000	0.000	0.000	0.000	0.433
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.144	0.000	0.144
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.00	0.00	0.14	0.14	0.29	0.43	0.14	0.29	0.29	0.58	0.29	0.43	0.29	0.29	0.14	0.00	3.75

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS C						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.34	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.56	0.000	0.000	0.000	0.000	0.000	0.289	0.144	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.433
3.35	0.000	0.000	0.144	0.433	0.289	0.000	0.578	0.433	0.144	0.578	0.433	0.289	0.000	0.144	0.000	0.000	3.465
5.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.144	0.289	0.000	0.000	0.000	0.000	0.144	0.578
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.00	0.00	0.14	0.43	0.29	0.29	0.72	0.43	0.14	0.72	0.72	0.29	0.00	0.14	0.00	0.14	4.48

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS D						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.34	0.000	0.000	0.000	0.058	0.043	0.058	0.043	0.058	0.029	0.014	0.029	0.058	0.000	0.000	0.000	0.000	0.390
1.56	0.144	0.000	0.144	1.444	1.155	1.444	1.155	1.588	0.722	0.433	0.722	1.588	0.144	0.000	0.000	0.000	10.684
3.35	0.144	0.000	0.000	0.866	1.299	0.866	0.722	2.166	2.310	1.444	1.444	1.011	0.433	0.722	0.289	0.000	13.716
5.59	0.000	0.000	0.000	0.000	0.144	0.866	0.433	0.578	0.578	0.144	0.433	0.000	0.144	0.000	0.578	0.144	4.043
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.144	0.000	0.000	0.144	0.000	0.000	0.000	0.000	0.289
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.29	0.00	0.14	2.37	2.64	3.23	2.35	4.39	3.78	2.04	2.63	2.80	0.72	0.72	0.87	0.14	29.12

TABLE VII-B JOINT OCCURRENCE FREQUENCIES FOR LOWNDDEG AND LOWNDSPD - MIXED MODE BATCH RELEASES

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION												ATMOSPHERIC STABILITY CLASS E						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	
0.34	0.000	0.000	0.072	0.347	0.303	0.000	0.101	0.375	0.996	0.751	0.476	0.476	0.347	0.202	0.173	0.000	4.620	
1.56	0.000	0.000	0.289	1.444	1.299	0.000	0.433	1.588	4.187	3.176	2.021	2.021	1.444	0.866	0.722	0.000	19.492	
3.35	0.000	0.000	0.000	0.289	0.000	0.000	0.289	0.578	0.866	0.578	0.578	0.578	0.578	0.289	1.588	1.011	7.219	
5.59	0.000	0.000	0.000	0.000	0.000	0.000	0.144	0.289	0.000	0.000	0.000	0.000	0.144	0.289	0.433	0.578	1.877	
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
TOTAL	0.00	0.00	0.36	2.08	1.60	0.00	0.97	2.83	6.05	4.50	3.08	3.08	2.51	1.65	2.92	1.59	33.21	

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION												ATMOSPHERIC STABILITY CLASS F						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	
0.34	0.101	0.000	0.000	0.000	0.000	0.101	0.101	0.722	1.343	0.520	0.303	0.303	0.202	0.000	0.202	0.419	4.317	
1.56	0.144	0.000	0.000	0.000	0.000	0.144	0.144	1.011	1.877	0.722	0.433	0.433	0.289	0.000	0.289	0.578	6.064	
3.35	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.144	1.155	0.722	2.021	
5.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.144	0.144	
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
TOTAL	0.25	0.00	0.00	0.00	0.00	0.25	0.25	1.73	3.22	1.24	0.74	0.74	0.49	0.14	1.65	1.86	12.55	

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION												ATMOSPHERIC STABILITY CLASS G						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL	
0.34	0.000	0.000	0.000	0.000	0.000	0.000	0.260	1.040	0.000	1.040	0.780	0.260	0.260	0.520	2.339	1.299	7.797	
1.56	0.000	0.000	0.000	0.000	0.000	0.000	0.144	0.578	0.000	0.578	0.433	0.144	0.144	0.289	1.299	0.722	4.332	
3.35	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.144	0.144	0.289	
5.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
TOTAL	0.00	0.00	0.00	0.00	0.00	0.00	0.40	1.62	0.00	1.62	1.21	0.40	0.40	0.81	3.78	2.17	12.42	

TOTAL HOURS CONSIDERED ARE 693.

WIND MEASURED AT 11.0 METERS.

OVERALL WIND DIRECTION FREQUENCY																	
WIND DIRECTION:	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
FREQUENCY:	0.5	0.0	0.8	5.2	5.3	4.3	5.0	11.3	13.6	11.6	9.0	8.3	4.7	5.1	9.4	6.0	100.0

VII. METEOROLOGICAL DATA

C. Ground Level Batch Release Diffusion Analysis

Table VII-C presents the number and frequency of wind direction occurrences by wind speed class as recorded at the onsite meteorological system during ground level batch releases for the period January 1, 2001, through December 31, 2001.

The frequencies are presented as a percent of total occurrences for each stability class as well as a summary for all classes for the lower (10 meter) sensor elevation.

TABLE VII-C JOINT OCCURRENCE FREQUENCIES FOR LOWNDDEG AND LOWNDSPD - GROUND LEVEL BATCH RELEASES

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS A						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.34	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.56	0.000	0.000	0.000	0.000	0.000	0.000	0.059	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.059
3.35	0.000	0.000	0.000	0.294	0.000	0.059	0.118	0.059	0.177	0.059	0.294	0.177	0.235	0.177	0.000	0.000	1.648
5.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.235	0.235	0.294	0.177	0.059	0.118	0.059	0.000	1.177
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.00	0.00	0.00	0.29	0.00	0.06	0.18	0.06	0.41	0.29	0.59	0.35	0.29	0.29	0.06	0.00	2.88

  

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS B						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.34	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.56	0.000	0.000	0.000	0.000	0.000	0.000	0.059	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.059
3.35	0.000	0.000	0.000	0.177	0.177	0.353	0.177	0.118	0.294	0.294	0.589	0.294	0.412	0.118	0.000	0.000	3.002
5.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.059	0.353	0.530	0.059	0.000	0.000	0.000	0.000	1.001
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.00	0.00	0.00	0.18	0.18	0.35	0.24	0.12	0.35	0.65	1.12	0.35	0.41	0.12	0.00	0.00	4.06

  

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS C						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.34	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
1.56	0.000	0.000	0.000	0.000	0.118	0.177	0.059	0.000	0.000	0.059	0.000	0.000	0.059	0.000	0.000	0.000	0.471
3.35	0.000	0.000	0.000	0.471	0.648	0.235	0.530	0.412	0.648	1.060	0.706	0.294	0.177	0.118	0.000	0.000	5.298
5.59	0.000	0.000	0.000	0.000	0.000	0.000	0.059	0.000	0.412	0.177	0.294	0.059	0.000	0.059	0.589	0.000	1.648
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.00	0.00	0.00	0.47	0.77	0.41	0.65	0.41	1.06	1.30	1.00	0.35	0.24	0.18	0.59	0.00	7.42

  

JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS D						
UMAX (M/S)	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
0.34	0.000	0.000	0.000	0.018	0.029	0.035	0.029	0.012	0.006	0.006	0.018	0.012	0.006	0.000	0.000	0.000	0.171
1.56	0.000	0.059	0.118	1.177	1.648	2.002	1.884	0.648	0.412	0.530	1.060	0.765	0.294	0.118	0.118	0.000	10.832
3.35	0.000	0.000	0.059	1.825	1.825	2.060	1.884	3.414	2.531	2.472	1.472	1.060	1.001	0.706	0.412	0.177	20.898
5.59	0.000	0.000	0.000	0.000	0.118	0.412	0.177	0.765	1.884	0.942	0.589	0.235	0.059	0.000	0.589	0.353	6.122
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.177	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.177
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.00	0.06	0.18	3.02	3.62	4.51	3.97	4.84	5.01	3.95	3.14	2.07	1.36	0.82	1.12	0.53	38.20

TABLE VII-C JOINT OCCURRENCE FREQUENCIES FOR LOWNDDEG AND LOWNDSPD - GROUND LEVEL BATCH RELEASES

UMAX (M/S)	JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS E						TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW		
0.34	0.000	0.000	0.047	0.130	0.100	0.029	0.041	0.253	0.277	0.165	0.153	0.106	0.100	0.029	0.024	0.006	1.460	
1.56	0.000	0.000	0.353	1.001	0.765	0.235	0.294	1.943	2.119	1.236	1.177	0.824	0.765	0.235	0.177	0.059	11.185	
3.35	0.000	0.000	0.000	0.059	0.059	0.294	0.118	1.295	1.648	0.883	0.235	0.412	0.353	0.353	1.177	0.706	7.594	
5.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.059	0.177	0.000	0.000	0.000	0.059	0.059	0.059	0.059	0.471	
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
TOTAL	0.00	0.00	0.40	1.19	0.92	0.56	0.45	3.55	4.22	2.28	1.57	1.34	1.28	0.68	1.44	0.83	20.71	

UMAX (M/S)	JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS F						TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW		
0.34	0.053	0.000	0.000	0.024	0.000	0.024	0.100	0.330	0.406	0.383	0.230	0.283	0.077	0.130	0.177	0.024	2.237	
1.56	0.118	0.000	0.000	0.059	0.000	0.059	0.235	0.765	0.942	0.883	0.530	0.648	0.177	0.294	0.412	0.059	5.180	
3.35	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.118	0.118	0.000	0.000	0.000	0.000	0.000	0.706	0.883	1.825	
5.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.059	0.059	
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
TOTAL	0.17	0.00	0.00	0.08	0.00	0.08	0.34	1.21	1.47	1.27	0.76	0.93	0.25	0.42	1.30	1.02	9.30	

UMAX (M/S)	JOINT FREQUENCY DISTRIBUTION OF WIND SPEED AND DIRECTION											ATMOSPHERIC STABILITY CLASS G						TOTAL
	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW		
0.34	0.000	0.000	0.000	0.000	0.071	0.000	0.071	1.372	0.942	0.506	0.147	0.436	0.218	0.795	2.961	1.372	8.889	
1.56	0.000	0.000	0.000	0.000	0.059	0.000	0.059	1.119	0.765	0.412	0.118	0.353	0.177	0.648	2.414	1.119	7.241	
3.35	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.059	0.235	1.001	1.295	
5.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
8.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
11.18	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
24.59	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
TOTAL	0.00	0.00	0.00	0.00	0.13	0.00	0.13	2.49	1.71	0.92	0.26	0.79	0.39	1.50	5.61	3.49	17.43	

TOTAL HOURS CONSIDERED ARE 1699.

WIND MEASURED AT 11.0 METERS.

OVERALL WIND DIRECTION FREQUENCY																	
WIND DIRECTION:	N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	TOTAL
FREQUENCY:	0.2	0.1	0.6	5.2	5.6	6.0	6.0	12.7	14.2	10.7	8.4	6.2	4.2	4.0	10.1	5.9	100.0

CHANGES TO ODCM, PCP, AND  
RADIOACTIVE WASTE SYSTEMS

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I. CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL (ODCM)

There was a change to the ODCM during this reporting period. A summary of the change is shown below. A complete copy of the updated ODCM is being forwarded under separate letter.

ODCM REVISION 19  
DESCRIPTION OF CHANGE

The ODCM was revised to correct typographical errors and make format enhancements as well as to make several programmatic changes. The programmatic changes are listed below:

1. Section 9.0 has been changed to remove the requirements for using LADTAP and GASPAR computer codes for assessing integrated population dose and dose to each pathway. Instead, the Effluent Management System software will be used to evaluate the dose to the maximum exposed member of the public due to liquid and gaseous radioactive releases.
2. Section 2.0 has been changed, for simplicity and conservatism, to use the 10 CFR 20 limits for liquid releases. HBRSEP is allowed to make liquid discharges at a rate equal to ten times the values listed in 10 CFR 20.
3. R-37 has been added to Table 2.6-1 to require compensatory measures when the monitor is rendered inoperable.
4. R-22 and R-23 have been added to Tables 3.10-1 and 3.11-1 to specify compensatory measures for monitor inoperability and to specify required monitor surveillances.
5. Section 4.4 has been revised to require the Land Use Census to be performed once per 24 months instead of once per 12 months.
6. ESR 00-0001 removed the radiation measurement channels of R-23. Therefore, Section 3.0 has been changed to delete the methodology for R-23 setpoint calculations.
7. Section 10.0, Radioactive Releases – Monthly Summation, has been deleted. This section was mistakenly included when RETS was implemented.

II. CHANGES TO THE RADIOACTIVE WASTE SYSTEMS

There were no changes to the Radioactive Waste System during this reporting period.

III. CHANGES TO THE PROCESS CONTROL PROGRAM (PCP)

There was no change to the PCP during this reporting period.

IV. CHANGES TO THE LAND USE CENSUS

There were no changes to the environmental sampling program as a result of the Land Use Census performed in 2001.

V. INSTRUMENT INOPERABILITY

There were no reportable instrumentation inoperability events during this reporting period.

VI. LIQUID HOLDUP TANK CURIE LIMIT

There were no outside liquid holdup tanks that exceeded the ten curie limit during this reporting period.



VII. WASTE GAS DECAY TANK CURIE LIMIT

There were no waste gas decay tanks with a curie content that exceeded the  $1.90\text{E}+04$  curie limit during this reporting period.

VIII. UNANTICIPATED RELEASE

While analyzing monthly liquid release composites on December 4, 2001, it was discovered that the West Settling Pond effluent sample contained tritium. This release point normally contains no detectable activity. Subsequent investigation revealed a leaking valve on top of a primary system demineralizer to be the source of the tritium. This valve is used to load new resin into the demineralizer and is accessed from an emergency diesel generator muffler deck outside of the Reactor Auxiliary Building. When this primary system demineralizer is in use, the effected valve becomes a primary system boundary with any leakage going to the storm drain system, which in turn goes to the West Settling Pond.

This occurrence was entered into the station's Corrective Action Program via Action Request 52254. A temporary plug has been installed in the drain of the demineralizer valve access trench and an inspection frequency established to prevent release reoccurrence until the drain is permanently rerouted.

Accountability was performed on the liquid portion of the release by using the weekly sample results from the West Settling Pond effluent composite sampler, and readings from the pond discharge flow integrator. This accountability concluded that a release of  $1.2495\text{E}+07$  gallons of pond discharge containing a total of 1.415 curies of tritium occurred during the months of November and December 2001. No gamma activity was detectable at the pond effluent.

The 1.415 curies of tritium released by the pond discharge corresponded to a release of  $2.43\text{E}+06$  milliliters of reactor coolant. This information was used to generate a ground-level gaseous release permit for the gaseous activity contained in that volume of reactor coolant.

SUPPLEMENTS TO PREVIOUS  
REPORTS

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I. DISCUSSION

There are no corrections to previous reports.