Grand Gulf Nuclear Station

SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

July 1 - December 31, 1984

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I. INTRODUCTION

This Semiannual Radioactive Effluent Release Report for the period of July 1 through December 31, 1984, is submitted in accordance with Section 6.9.1.8 of Appendix A to Grand Gulf Nuclear Station (GGNS) License No. NPF-29. That portion of Appendix A which refers to the monitoring of radioactive effluents, Sections 3/4-11 and 3/4-12, will hereafter be referred to as the Radiological Effluent Technical Specification (RETS).

Airborne discharges at GGNS are ground level releases. All liquid and airborne discharges to the environment were analyzed in accordance with the RETS requirements. Also, all effluent releases were within the concentration and total release limits specified by the RETS.

There was one instance when Station Operations personnel were unable to restore operable status to radioactive effluent monitoring instrumentation. Additional discussion (Section II.K) has been provided to explain why this inoperability was not corrected within the time specified by GGNS Technical Specifications.

The calculations and terms utilized in this report are defined in the GGNS Offsite Dose Calculation Manual (ODCM).

II. DETAILED INFORMATION

A. Regulatory Limits

1. 10CFR20 Limits

a. Fission and Activation Gases - The release rate limit at any time for noble gases to areas at or beyond the site boundary shall be such that:

D_{tb} = average total body dose rate in the current year (mrem/yr)

$$= \overline{X/Q} \sum_i K_i \; Q'_i \leq 500 \text{ mrem/yr}$$

D_s = average skin dose rate in the current year (mrem/year)

$$= \overline{X/Q} \sum_i (L_i + 1.1 \, M_i) \; Q'_i \leq 3000 \text{ mrem/yr}$$

where the terms are defined in the GGNS ODCM.

b. Radioiodines and Particulates - The release rate limit for the sampling period for all radioiodines, tritium and radioactive materials in particulate form with half-lives greater than 8 days shall be such that:

D_o = average organ dose rate in current year (mrem/yr)

$$= \sum_i W \, P_i \, \overline{Q'_i} \leq 1500 \text{ mrem/yr}$$

where the terms are defined in the GGNS ODCM.

c. Liquid Effluents - The concentration of radioactive materials released in liquid effluents to unrestricted areas from the reactors at the site shall not exceed at any time the values specified in 10CFR20, Appendix B, Table II, Column 2. The concentration of dissolved or entrained noble gases, released in liquid effluents to unrestricted areas from all reactors at the site, shall be limited to 2×10^{-4} microcuries/ml total activity.

2. 10CFR50, Appendix I Limits

a. Fission and Activation Gases - The dose from noble gases in gaseous effluents to areas at or beyond the site boundary shall be such that:

D_γ = air dose due to gamma emissions from noble gases

$= 3.17 \times 10^{-8} \sum_i M_i \overline{X/Q'} Q_i \leq 5$ mRad /qtr

≤ 10 mRad /yr

= air dose due to beta emissions from noble gas

$= 3.17 \times 10^{8} \sum_i N_i \overline{X/Q'} Q_i \leq 10$ mRad /qtr

≤ 20 mRad /yr

b. Radioiodines and Particulates - The dose to an individual from tritium, I-131, I-133, and radioactive material in particulate form with half-lives greater than 8 days in gaseous effluents shall be such that:

Dp = dose to an individual from tritium, I-131, I-133, and radionuclides in particulate form with half-lives greater than 8 days (mrem)

$= 3.17 \times 10^{-8} \sum_i R_i W' Q_i \leq 7.5$ mrem/qtr Any Organ

≤ 15 mrem/yr Any Organ

Liquid Effluents - The dose from radioactive materials in liquid effluents shall be such that (where the terms are defined in the GGNS ODCM).

$D_{Tau} = \sum_i \left[A_i \, Tau \sum_{l=1}^{m} \Delta t_l \, C_{i_l} F_l \right] \leq 1.5$ mrem/qtr Total Body

≤ 5 mrem/qtr Any Organ

≤ 3 mrem/yr Total Body

≤ 10 mrem/yr Any Organ

3. 40CFR190 Limits

Doses are calculated for Fission and Activation Gases; Radioiodines and Particulates; and Liquid Effluents according to equations contained in Sections 2.(a), (b), and (c), respectively, with the exception that the limits applied are:

≤25 mRem/yr, Total Body and Any Organ except thyroid

≤75 mRem/yr, Thyroid

≤10 mRad γ/qtr or ≤20 mRad γ/yr, Fission and Activation Gases

≤20 mRad β/qtr or ≤40 mRad β/yr, Fission and Activation Gases

≤15 mRem/qtr or ≤30 mRem/yr, Any Organ, Iodine and particulates

≤ 3 mRem/qtr or ≤6 mRem/yr, Total Body, Liquid Effluents

≤ 5 mRem/qtr or ≤20 mRem/yr, Any Organ, Liquid Effluents

B. Maximum Permissible Concentrations

1. Airborne

The Maximum Permissible Concentration (MPC) of radioactive materials in gaseous effluents is limited by the dose rate restrictions of 10CFR20. In this case, the maximum permissible concentrations are actually determined by the dose factors in Table 2.1-1 of the GGNS ODCM.

2. Liquid

The MPC of radioactive materials in liquid effluents is limited by 10CFR20, Appendix B, Table II, Column 2. The MPC chosen is the most conservative value of either the soluble or insoluble MPC for each radioisotope.

C. Average Energy

Not Applicable for GGNS RETS.

D. Measurements and Approximations of Total Activity

The following discussion details the methods used to measure and approximate total activity for the following:

1. Fission and Activation Gases
2. Radioiodines
3. Particulates
4. Liquid Effluents

Tables 5 and 6 give sampling frequencies and minimum detectable sensitivity requirements for the analysis of liquid and gaseous effluent streams.

Values in the attached tables given as zero do not necessarily infer that the radionuclides were not present. A zero indicates that the radionuclide was not present at levels greater than the sensitivity requirements shown in Tables 5 and 6. For some radionuclides lower detection limits than required may be readily achievable; when a radionuclide is measured below its stated limits it is reported.

1. For Fission and Activation Gases

The following noble gases are considered in evaluating gaseous airborne discharges:

Ar-41	Xe-131m
Kr-85m	Xe-133
Kr-85	Xe-133m
Kr-87	Xe-135m
Kr-88	Xe-135
Kr-89	Xe-138.

Periodic grab samples from Station effluent streams are analyzed by a computerized pulse height analyzer system utilizing high resolution germanium detectors. (See Table 6 for sampling and analytical requirements.) Isotopic values thus obtained are used for dose release rate calculations as given in Section II.A.1. of this report. Only those radionuclides that are detected are used in this computation. During the period between grab samples, the amount of radioactivity released is based on the effluent monitor readings. Monitors are assigned a calibration factor based upon the last isotopic analysis using the following relationship:

$$C_i = U_i + m$$

where

C_i = isotopic calibration factor for isotope i

U_i = concentration of isotopic i in the grab sample, in Ci/ml.

m = net monitor reading associated with the effluent stream. (Determined at the time of grab sampling).

These calibration factors, along with the hourly effluent monitor values and flow rates, are entered into the laboratory computer where the release rates for individual radionuclides are calculated and stored. If no activity is detected in the grab sample, the calibration factor for Kr-85 and the dose factor for Kr-89 are entered into the laboratory computer.

2. For Particulates and Radioiodines

The radioiodines and radioactive materials in particulate form to be considered are:

Zn-65	I-133
Cr-51	Cs-134
Mn-54	Cs-136
Fe-59	Cs-137
Co-58	Ba-140
Co-60	Ce-141
Sr-89	Other Nuclides
Sr-90	with half-lives
Zr-95	greater than
Sb-124	8 days.
I-131	

3. For Continuous Releases

Continuous sampling is performed on the continuous release points (i.e, Radwaste Vent, Containment Purge, FHA Vent, Turbine Building Vent). Particulate material is collected by filtration. Radioiodines are collected by adsorption onto a charcoal filter. Periodically these filters are removed and analyzed on the pulse height analyzer to identify and quantify radioactive materials collected on the filters. Particulate filters are then analyzed for gross alpha and Strontium-89 and -90, as required. Gross alpha determinations are made using a 2-pi gas flow proportional counter. Strontium-89 and -90 values are obtained by chemical separation and subsequent analysis using 2-pi gas flow proportional counters. During major operational occurrences, the frequency of sampling is increased to satisfy the requirements of footnote "C" of Table 6, "Radioactive Gaseous Waste, Sampling and Analysis," (GGNS RETS, Table 4.11.2.1.2-1).

4. For Batch Releases: Gases

The processing of batch type releases (from Containment Purge) is analogous to that for continuous releases.

5. For Batch Releases: Liquid Effluents

The radionuclides listed below are considered when evaluating liquid effluents:

H-3	Mo-99
Co-58	Tc-99m
Co-60	I-131
Fe-55	I-132
Fe-59	I-133
Zn-65	I-135
Mn-54	Cs-134
Cr-51	Cs-140
Sr-89	Ba-140
Sr-90	La-140
Nb-95	Ce-141
Zr-95	Ce-144

Representative pre-release grab samples are obtained and analyzed as required by Table 5. Isotopic analyses are performed using the computerized pulse height analysis system previously described. Aliquots of each pre-released sample, proportional to the waste volume released, are composited in accordance with the requirements of Table 5. Strontium determinations are made by performing a chemical separation and counting the separated strontium using a 2-pi gas flow proportional counter. Gross alpha determinations are made using 2-pi gas flow proportional counters. Tritium and Iron-55 concentrations are determined by using liquid scintillation techniques. Dissolved gases are determined employing grab sampling techniques and then counting on the pulse height analyzer system.

E. Batch Releases

1. Liquid

3rd Quarter, 1984

a. Number of batch releases: 98
b. Total time period for batch releases: 33896 minutes
c. Maximum time period for a batch release: 1020 minutes
d. Average time period for batch releases: 346 minutes
e. Minimum time period for a batch releases: 130 minutes

4th Quarter, 1984

a. Number of batch releases: 112
b. Total time period for batch releases: 35571 minutes
c. Maximum time period for a batch release: 455 minutes
d. Average time period for batch releases: 318 minutes
e. Minimum time period for a batch release: 0 minutes

2. Gaseous

3rd and 4th Quarter, 1984

a. Number of batch releases: None
b. Total time period for batch releases: 0 hours
c. Maximum time period for a batch release: 0 hours
d. Average time period for a batch release: 0 hours
e. Minimum time period for a batch release: 0 hours

F. Abnormal Releases

1. Liquid

a. Number of releases: None
b. Total activity released: N/A

2. Gaseous

a. Number of releases: None
b. Total activity released: N/A

G. Estimate of Total Error

1. Liquid

The maximum errors associated with sampling, laboratory procedure and discharge volume are collectively estimated to be:

Fission and Activation Gases	Isotopic	H-3	Fe-55	Sr
29%	21%	26%	36%	29%

2. Gaseous

The maximum errors (not including sample line loss) associated with sample flow, vent flow, sample collection, monitor calibration and laboratory procedure are collectively estimated to be:

Fission and Activation Gases	Iodine	Particulate	Tritium
39%	43%	45%	31%

3. Counting Error

(1) Isotopic counting errors are computed by the equation:

$$\text{Error} = 1.96\sqrt{C_B + C_S}$$

Where: C_B = Background counts

C_S = Sample counts

The isotopic counting errors are estimated to be 68% due to the low sample activity.

(2) The gross counting errors associated with H-3, Sr-89, Sr-90, and Fe-55 are computed by the equation:

$$\text{Error} = 1.96\sqrt{C_B + C_S}$$

Where: C_B = Background counts

C_S = Sample counts

The estimated error for gross counting is estimated to be 68% due to the low sample activity.

4. Solid Radioactive Waste. (See Table 3 for error terms)

H. Solid Radioactive Waste Shipments.

(See Table 3 for shipment information)

I. Radiological Impact on Man

1. Water-Related Exposure Pathways

The values calculated in this section utilize information provided in Tables 2A, 2B and the ODCM.

Total Dose (mrem)

	3rd Quarter 1984	4th Quarter 1984
Whole-Body	4.99E-05	5.27E-04
Bone	8.17E-05	2.68E-04
Liver	9.67E-05	1.21E-03
Thyroid	4.36E-06	2.11E-04
Kidney	1.82E-05	3.97E-04
Lung	3.32E-05	2.02E-04
GI-LLI	5.49E-04	4.85E-03

2. Gas-Related Exposure Pathways

The values calculated in this section utilize information provided in Tables 1A, 1C and the ODCM.

	3rd Quarter 1984	4th Quarter 1984
Total Body	3.99E-02 mrem	1.09E-01 mrem
Skin	2.45E-02 mrem	4.94E-02 mrem

Particulate, Radioiodine and Tritium

	3rd Quarter 1984	4th Quarter 1984
Organ Dose	1.11E-03 mrem	5.23E-04 mrem

Lower Limit of Detection (LLD) Methodologies

If gaseous activity detected in the monthly isotopic analysis less than the LLDs, a Kr-85 calibration factor and a Kr-89 dose factor are inserted for the effluent monitors. The monitor net count rate is assumed to be zero whenever the monitor net count rate is less than two times the square root of the monitor background count rate.

J. Meteorological Data

(See Tables 4A and 4B).

K. Radioactive Effluent Monitoring Instrument Inoperability Reports

During the reporting period, there was one event pertaining to the RETS that necessitated entering into a limiting condition for operation where the time period as specified in the action statement was exceeded. The following explanation is provided as required by Technical Specifications 3.3.7.11.b.

1. LCO EVENT 83-0805

a. Recap

Date/Time Entered	Affected Channel	Duration	Closed Out Date/Time
11/14/83 1700 hrs	Liquid Radwaste Flow Interlock	292 days	9/1/84 1700 hrs

b. Description

On November 14, 1983 a temporary alteration was performed in order to defeat the flow interlocks on the liquid radwaste discharge canal monitor. This allows radwaste discharge using Plant Service Water for dilution when circulating water blowdown is not available, a condition that exists during circulating pump shutdown. Technical Specifications Position Statement 018 was approved by the Plant Safety Review Committee (PSRC) on December 13, 1983, to clarify that the inoperability of this channel for longer than 30 days is allowable when extended shutdown of circulating pumps is necessary.

On August 26, 1984, recirculation water was reestablished, however the discharge canal flow rate monitoring instrumentation was inoperable. Therefore, the LCO was left in place.

On August 31, 1984 Amendment 13 was incorporated in the GGNS Technical Specifications. This Amendment allows for monitoring of the flow rate in either the discharge canal or circulation water blowdown.

Based upon Technical Specification Amendment 13 and operability of circulation water blowdown flowrate monitoring instrumentation, LCO 83-0805 was closed on September 1, 1984.

III. 1984 RADIATION DOSE SUMMARY

Indicated below is the annual summary of offsite doses attributable to GGNS during 1984. Inspection of the quarterly and annual values indicate that GGNS releases were within the 10CFR50, Appendix I design objectives.

Since there are no other fuel cycle facilities within 8 km of GGNS, 40CFR190 limits have also been met during this period.

All parameters listed were calculated in accordance with the GGNS ODCM.

MAXIMUM* OFFSITE DOSES AND DOSE COMMITMENTS
TO MEMBERS OF THE PUBLIC

SOURCE	Dose (mrem)				
	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Total
Liquid Effluents	2.57E-5	5.32E-5	4.99E-5	5.27E-4	6.56E-4(1)
Airborne Effluents (Iodine & Particulates)	3.24E-4	2.14E-3	1.11E-3	5.23E-4	4.10E-3(2)
Noble Gases	3.30E-2	4.19E-2	3.99E-2	1.09E-1	2.23E-1(3)
Direct Radiation	0.00	0.00	0.00	0.00	0.00 (4)

* "Maximum" means the largest fraction of the corresponding Appendix I dose design objective.

(1) GI tract dose primarily by the fish pathway. This represents 6.56E-3% of the 10CFR50, Appendix I design objective.

(2) Organ dose primarily by the grass-cow-milk pathway. This represents 2.73E-2% of the 10CFR50, Appendix I design objective.

(3) mRad gamma dose to the whole-body.

(4) Based on thermoluminescent dosimeter (TLD) badges.

reduce the accuracy or reliability of dose calculations or setpoint determinations. Thus there are no significant hazards involved.

B. Process Control Program Revisions

N/A

TABLE 1A

GASEOUS EFFLUENTS-SUMMATION OF ALL RELEASES

Grand Gulf Nuclear Power Station UNIT I	Unit	Quarter 3	Quarter 4	Est. Total Error %
A. Fission & Activation Gases				
1. Total release	Ci	1.68E+01	7.01E+01	7.80E+01
2. Average release rate for period	uCi/sec	2.13E+00	8.73E+00	
3. % of Technical Specification limit	%	9.49E-01	2.60E+00	
B. Iodines				
1. Total Iodine-131	Ci	1.26E-07	2.84E-06	8.00E+01
2. Average release rate for period	uCi/sec	1.61E-08	3.54E-07	
3. % of Technical Specification limit	%	3.04E-04	6.10E-03	
C. Particulates				
1. Particulates with half-lives>8 days	Ci	3.92E-05	9.02E-06	8.10E+01
2. Average release rate for period	uCi/sec	4.98E-06	1.12E-06	
3. % of Technical Specification limit	%	1.46E-02	3.39E-03	
4. Gross alpha radioactivity	Ci	2.82E-07	1.53E-07	
D. Tritium				
1. Total release	Ci	0.00E+00	1.14E-01	7.50+01
2. Average release rate for period	uCi/sec	0.00E+00	1.42E-02	
3. % of Technical Specification limit	%	0.00E+00	7.33E-04	
E. Tritium, radioiodines and particulates				
1. % of Technical Specification limit	Ci	1.49E-02	1.02E-01	

TABLE 1B

Gaseous Effluents - Elevated Releases

(Not Applicable - GGNS Releases are considered ground level)

TABLE 1C

GASEOUS EFFLUENTS-GROUND-LEVEL RELEASE

Nuclides Released	Unit	CONTINUOUS MODE Quarter 3	CONTINUOUS MODE Quarter 4	BATCH MODE Quarter 3	BATCH MODE Quarter 4
1. Fission gases					
Xe-133	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-131M	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Kr-88	Ci	2.35E-03	0.00E+00	0.00E+00	0.00E+00
Xe-133M	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-135	Ci	1.33E-03	5.49E-03	0.00E+00	0.00E+00
Kr-85M	Ci	8.07E-04	0.00E+00	0.00E+00	0.00E+00
Kr-87	Ci	1.42E-03	0.00E+00	0.00E+00	0.00E+00
Xe-138	Ci	5.22E-03	0.00E+00	0.00E+00	0.00E+00
Xe-137	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Kr-85	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-135M	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Kr-89	Ci	1.67E+01	1.75E+01	0.00E+00	0.00E+00
Ar-41	Ci	8.74E-02	5.26E+01	0.00E+00	0.00E+00
Kr-90	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for period	Ci	1.68E+01	7.01E+01	0.00E+00	0.00E+00
2. Iodines					
I-131	Ci	1.26E-07	2.84E-06	0.00E+00	0.00E+00
I-133	Ci	2.30E-06	1.91E-05	0.00E+00	0.00E+00
I-132	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-134	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-135	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for period	Ci	2.42E-06	2.19E-05	0.00E+00	0.00E+00
3. Particulates					
Sr-89	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CE-141	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CR-51	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BA-140	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-134	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-137	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CE-144	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ZR-95	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NB-95	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-58	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MN-54	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-59	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CO-60	Ci	2.87E-07	0.00E+00	0.00E+00	0.00E+00
LA-140	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C-14	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
P-32	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FE-55	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NI-63	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 1C

GASEOUS EFFLUENTS-GROUND-LEVEL RELEASE

ZN-65	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Y-91	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU-103	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RU-106	Ci	3.89E-05	9.02E-06	0.00E+00	0.00E+00
AG-110M	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
CS-136	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PR-143	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for period	Ci	3.92E-05	9.02E-06	0.00E+00	0.00E+00

TABLE 2A

LIQUID EFFLUENTS-SUMMATION OF ALL RELEASES

		Unit	Quarter 3	Quarter 4	Est. Total Error %
A.	Fission & Activation Products				
	1. Total release (not including H3, gases, alpha)	Ci	3.92E-03	1.65E-02	8.15E+01
	2. Average diluted concentration during period	uCi/ml	2.27E-09	2.05E-08	
	3. Percent of applicable limit	%	5.69E-03	1.98E-02	
B.	Tritium				
	1. Total release	Ci	0.00E+00	7.21E-01	7.65E+01
	2. Average diluted concentration during period	uCi/ml	0.00E+00	8.93E-07	
	3. Percent of applicable limit	%	0.00E+00	2.98E-02	
C.	Dissolved and entrained gases				
	1. Total release	Ci	0.00E+00	1.74E-04	7.43E+01
	2. Average diluted concentration during period	uCi/ml	0.00E+00	2.15E-10	
	3. Percent of applicable limit	%	0.00E+00	1.05E-01	
D.	Gross alpha radioactivity				
	1. Total release	Ci	0.00E+00	0.00E+00	6.80E+01
E.	Volume of waste (prior to dilution)	liters	1.08E+07	1.23E+07	1.60E+01
F.	Volume of dilution water used	liters	1.72E+09	7.95E+08	1.60E+01

*Percentages based on 10CFR20, Appendix B, Table II, Column 2

TABLE 2B

Grand Gulf Nuclear Station

LIQUID EFFLUENTS - CONTINUOUS AND BATCH MODES

TABLE 3

Solid Radioactive Waste and Irradiated Fuel Shipments

A. Solid Waste Shipped Offsite for Burial or Disposal

1. Type of Waste	Unit	6-month Period	Estimate Total Error, %
a. Spent resins, filter sludges, evaporator bottoms, etc.	m^3	2.27E+02	
	Ci	4.35E+00	7.1E+01
b. Dry compressible waste, contaminated equipment, etc.	m^3	None	N/A
	Ci		
c. Irradiated components, control rods, etc.	m^3	None	N/A
	Ci		
d. Other	m^3	None	N/A
	Ci		

2. Estimate of major radionuclide composition (by type of waste as identified above).

a.	Cr-51	%	27.8
	Co-58	%	25.1
	Mn-65	%	2.1
	Fe-59	%	1.2
	Co-60	%	28.3
	Ni-63	%	2.1
	C-14	%	2.1
	H-3	%	2.1
	Nb-95	%	2.1
	Zn-65	%	2.1
	Zr-95	%	2.1
	Hg-203	%	2.1
	Co-57	%	2.1
	Ba-La-140	%	2.1
	I-131	%	2.1
	Nb-95	%	2.1
	Cs-136	%	2.1
b.	N/A	%	N/A
c.	N/A	%	N/A
d.	N/A	%	N/A

Waste is dewatered according to the requirements of the GGNS PCP and shipped in LSA containers.

TABLE 3

Solid Radioactive Waste and Irradiated Fuel Shipments (cont'd)

3. Solid Waste Disposition

Number of Shipments	Mode of Transportation	Destination
10	Truck	Barnwell, SC

B. Irradiated Fuel Shipments (Disposition)

Number of Shipments	Mode of Transportation	Destination
None	N/A	N/A

TABLE 4A
Joint Frequency Distribution
50 Meter Level

EXTREMELY UNSTABLE STABILITY CLASS A
PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	2.9	4.9	.0	.0	.0	.0	.0	7.8	.3
NNE	1.0	2.9	.0	.0	.0	.0	.0	3.9	.1
NE	4.9	3.9	.0	.0	.0	.0	.0	8.8	.3
ENE	5.9	3.9	.0	.0	.0	.0	.0	9.8	.3
E	4.9	2.9	.0	.0	.0	.0	.0	7.8	.2
ESE	2.0	1.0	.0	.0	.0	.0	.0	2.9	.1
SE	2.9	1.0	.0	.0	.0	.0	.0	3.9	.1
SSE	.0	2.0	.0	.0	.0	.0	.0	2.0	.1
S	1.0	.0	.0	.0	.0	.0	.0	1.0	.0
SSW	1.0	2.0	.0	.0	.0	.0	.0	2.9	.1
SW	7.8	8.8	.0	.0	.0	.0	.0	16.7	.5
WSW	2.0	6.9	.0	.0	.0	.0	.0	8.8	.3
W	3.9	.0	.0	.0	.0	.0	.0	3.9	.1
WNW	3.9	.0	.0	.0	.0	.0	.0	3.9	.1
NW	5.9	1.0	.0	.0	.0	.0	.0	6.9	.1
NNW	5.9	2.9	.0	.0	.0	.0	.0	8.8	.2
CALM	.0							.0	
TOTAL	55.9	44.1	.0	.0	.0	.0	.0	100.0	.2

1. HOURS OF BAD OR MISSING DATA OR 1.0 PERCENT FOR 103 HOURS

33Eay

TABLE 4A (cont'd)
Joint Frequency Distribution
50 Meter Level

MODERATELY UNSTABLE STABILITY CLASS B
PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	3.7	8.2	.0	.0	.0	.0	.0	11.9	.4
NNE	5.5	9.2	.0	.0	.0	.0	.0	14.7	.5
NE	2.7	1.8	.0	.0	.0	.0	.0	4.6	.1
ENE	2.7	1.8	.0	.0	.0	.0	.0	4.6	.1
E	1.8	3.7	.0	.0	.0	.0	.0	5.5	.2
ESE	1.8	3.7	.0	.0	.0	.0	.0	5.5	.2
SE	.9	2.7	.0	.0	.0	.0	.0	3.7	.1
SSE	.0	3.7	.0	.0	.0	.0	.0	3.7	.1
S	1.8	.9	.0	.0	.0	.0	.0	2.7	.0
SSW	2.7	.9	.0	.0	.0	.0	.0	3.7	.1
SW	7.3	1.8	.0	.0	.0	.0	.0	9.2	.2
WSW	1.8	2.7	.0	.0	.0	.0	.0	4.6	.1
W	6.4	.0	.0	.0	.0	.0	.0	6.4	.1
WNW	2.7	.0	.0	.0	.0	.0	.0	2.7	.0
NW	4.6	.0	.0	.0	.0	.0	.0	4.6	.1
NNW	9.2	2.7	.0	.0	.0	.0	.0	11.9	.3
CALM	.0							.0	
TOTAL	56.0	44.0	.0	.0	.0	.0	.0	100.0	.2

1. HOURS OF BAD OR MISSING DATA OR .9 PERCENT FOR 110 HOURS

33Eay

TABLE 4A (cont'd)
Joint Frequency Distribution
50 Meter Level

SLIGHTLY UNSTABLE STABILITY CLASS C
PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	2.7	10.1	.0	.0	.0	.0	.0	12.8	.5
NNE	2.7	4.7	.0	.0	.0	.0	.0	7.4	.2
NE	6.7	1.4	.0	.0	.0	.0	.0	8.1	.2
ENE	1.4	.0	.0	.0	.0	.0	.0	1.4	.0
E	3.4	.7	.0	.0	.0	.0	.0	4.0	.1
ESE	2.0	1.4	.0	.0	.0	.0	.0	3.4	.1
SE	1.4	3.4	.0	.0	.0	.0	.0	4.7	.1
SSE	1.4	2.7	.0	.0	.0	.0	.0	4.0	.1
S	2.7	2.0	.0	.0	.0	.0	.0	4.7	.1
SSW	3.4	.7	.0	.0	.0	.0	.0	4.0	.1
SW	8.1	2.7	.0	.0	.0	.0	.0	10.8	.3
WSW	8.1	.0	.0	.0	.0	.0	.0	8.1	.2
W	4.7	.0	.0	.0	.0	.0	.0	4.7	.1
WNW	4.7	.0	.0	.0	.0	.0	.0	4.7	.0
NW	4.7	1.4	.0	.0	.0	.0	.0	6.1	.1
NNW	9.4	1.4	.0	.0	.0	.0	.0	10.8	.3
CALM	.0							.0	
TOTAL	67.6	32.4	.0	.0	.0	.0	.0	100.0	.2

1. HOURS OF BAD OR MISSING DATA OR .7 PERCENT FOR 149 HOURS

33Eay

TABLE 4A (cont'd)
Joint Frequency Distribution
50 Meter Level

NEUTRAL STABILITY CLASS D
PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

WIND SPEED (m/sec)

DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	4.7	8.0	.0	.0	.0	.0	.0	12.7	.4
NNE	2.9	2.7	.0	.0	.0	.0	.0	5.7	.2
NE	2.1	.6	.0	.0	.0	.0	.2	2.9	.1
ENE	2.5	.6	.0	.0	.0	.0	.0	3.1	.1
E	1.8	.6	.0	.0	.0	.0	.0	2.3	.1
ESE	2.9	.8	.0	.0	.0	.0	.0	3.7	.1
SE	2.1	2.3	.0	.0	.0	.0	.0	4.5	.1
SSE	1.8	.6	.0	.0	.0	.0	.0	2.3	.1
S	3.3	.8	.0	.0	.0	.0	.0	4.1	.1
SSW	6.6	1.2	.0	.0	.0	.0	.0	7.8	.2
SW	10.6	3.3	.0	.0	.0	.0	.0	13.9	.3
WSW	6.4	1.2	.0	.0	.0	.0	.0	7.6	.2
W	6.6	.4	.0	.0	.0	.0	.0	7.0	.1
WNW	4.7	.2	.0	.0	.0	.0	.0	4.9	.1
NW	4.9	2.1	.0	.0	.0	.0	.0	7.0	.2
NNW	2.9	6.3	.2	.0	.0	.0	.0	9.4	.3
CALM	.8							.8	
TOTAL	67.9	31.7	.2	.0	.0	.0	.2	100.0	.2

12. HOURS OF BAD OR MISSING DATA OR 2.3 PERCENT FOR 523 HOURS

33Eay

TABLE 4A (cont'd)
Joint Frequency Distribution
50 Meter Level

SLIGHTLY STABLE STABILITY CLASS E
PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	3.2	4.4	.0	.0	.0	.0	.0	7.6	.3
NNE	2.6	3.7	.0	.0	.0	.0	.0	6.3	.2
NE	2.8	1.2	.0	.0	.0	.0	.0	4.0	.1
ENE	2.3	1.2	.0	.0	.0	.0	.0	3.5	.1
E	2.1	3.2	.0	.0	.0	.0	.0	5.3	.2
ESE	3.8	6.3	.0	.0	.0	.0	.0	10.1	.3
SE	5.7	5.7	.0	.0	.0	.0	.0	11.4	.3
SSE	6.6	1.9	.0	.0	.0	.0	.0	8.5	.2
S	6.9	4.1	.0	.0	.0	.0	.0	11.0	.3
SSW	6.6	3.1	.0	.0	.0	.0	.0	9.7	.3
SW	4.8	1.3	.0	.0	.0	.0	.0	6.2	.1
WSW	2.5	.7	.1	.0	.0	.0	.0	3.4	.1
W	2.8	.1	.0	.0	.0	.0	.0	2.9	.0
WNW	1.3	.1	.0	.0	.0	.0	.0	1.5	.0
NW	1.5	.1	.0	.0	.0	.0	.0	1.6	.0
NNW	2.9	3.7	.0	.0	.0	.0	.0	6.6	.2
CALM	.3							.3	
TOTAL	58.9	41.0	.1	.0	.0	.0	.0	100.0	.2

25. HOURS OF BAD OR MISSING DATA OR 3.5 PERCENT FOR 706 HOURS

33Eay

TABLE 4A (cont'd)
Joint Frequency Distribution
50 Meter Level

MODERATELY STABLE STABILITY CLASS F
PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	1.6	2.6	.0	.0	.0	.0	.0	4.2	.1
NNE	2.4	2.9	.0	.0	.0	.0	.0	5.3	.2
NE	4.8	3.4	.0	.0	.0	.0	.0	8.2	.2
ENE	4.5	2.9	.0	.0	.0	.0	.0	7.4	.2
E	4.8	6.1	.0	.0	.0	.0	.0	10.9	.3
ESE	2.9	5.3	.0	.0	.0	.0	.0	8.2	.3
SE	5.8	3.2	.0	.0	.0	.0	.0	9.0	.3
SSE	9.8	1.3	.0	.0	.0	.0	.0	11.1	.3
S	13.0	.3	.0	.0	.0	.0	.0	13.3	.3
SSW	7.4	.5	.0	.0	.0	.0	.0	7.9	.2
SW	6.4	.0	.0	.0	.0	.0	.0	6.4	.1
WSW	3.4	.0	.0	.0	.0	.0	.0	3.4	.0
W	.5	.8	.0	.0	.0	.0	.0	1.3	.0
WNW	.6	.0	.0	.0	.0	.0	.0	.8	.0
NW	.3	.0	.0	.0	.0	.0	.0	.3	.0
NNW	.3	.8	.0	.0	.0	.0	.0	1.1	.0
CALM	1.1							1.1	
TOTAL	69.8	30.2	.0	.0	.0	.0	.0	100.0	.2

2. HOURS OF BAD OR MISSING DATA OR .5 PERCENT FOR 379 HOURS

33Eay

TABLE 4A (cont'd)
Joint Frequency Distribution
50 Meter Level

EXTREMELY STABLE STABILITY CLASS G
PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	3.7	.9	.0	.0	.0	.0	.0	4.6	.1
NNE	5.5	3.7	.0	.0	.0	.0	.0	9.2	.2
NE	6.9	4.1	.0	.0	.0	.0	.0	11.0	.3
ENE	4.1	3.7	.0	.0	.0	.0	.0	7.8	.2
E	3.2	3.2	.0	.0	.0	.0	.0	6.4	.2
ESE	3.7	4.6	.0	.0	.0	.0	.0	8.3	.3
SE	7.8	3.2	.0	.0	.0	.0	.0	11.0	.3
SSE	6.4	.0	.0	.0	.0	.0	.0	6.4	.1
S	5.1	.5	.0	.0	.0	.0	.0	5.5	.1
SSW	4.1	.0	.0	.0	.0	.0	.0	4.1	.1
SW	6.9	.5	.0	.0	.0	.0	.0	7.4	.1
WSW	2.3	.0	.0	.0	.0	.0	.0	2.3	.0
W	1.8	.0	.0	.0	.0	.0	.0	1.8	.0
WNW	2.3	.0	.0	.0	.0	.0	.0	2.3	.0
NW	2.8	.0	.0	.0	.0	.0	.0	2.8	.0
NNW	4.1	.0	.0	.0	.0	.0	.0	4.1	.1
CALM	4.6							4.6	
TOTAL	75.6	24.4	.0	.0	.0	.0	.0	100.0	.1

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 217 HOURS

33Eay

TABLE 4A (cont'd)
Joint Frequency Distribution
10 Meter Level

EXTREMELY UNSTABLE STABILITY CLASS A
PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	9.7	.0	.0	.0	.0	.0	.0	9.7	.2
NNE	6.8	.0	.0	.0	.0	.0	.0	6.8	.1
NE	7.8	.0	.0	.0	.0	.0	.0	7.8	.2
ENE	5.8	1.0	1.0	.0	.0	.0	.0	7.8	.2
E	2.9	.0	.0	.0	.0	.0	.0	2.9	.0
ESE	1.9	.0	.0	.0	.0	.0	.0	1.9	.0
SE	1.0	.0	.0	.0	.0	.0	.0	1.0	.0
SSE	1.0	.0	.0	.0	.0	.0	.0	1.0	.0
S	4.8	.0	.0	.0	.0	.0	.0	4.8	.1
SSW	6.8	.0	.0	.0	.0	.0	.0	6.8	.1
SW	15.5	.0	.0	.0	.0	.0	.0	15.5	.3
WSW	8.7	.0	.0	.0	.0	.0	.0	8.7	.2
W	2.9	.0	.0	.0	.0	.0	.0	2.9	.0
WNW	2.9	.0	.0	.0	.0	.0	.0	2.9	.0
NW	10.7	.0	.0	.0	.0	.0	.0	10.7	.2
NNW	8.7	.0	.0	.0	.0	.0	.0	8.7	.2
CALM	.0							.0	
TOTAL	98.0	1.0	1.0	.0	.0	.0	.0	100.0	.1

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 103 HOURS

33Eay

TABLE 4A (cont'd)
Joint Frequency Distribution
10 Meter Level

MODERATELY UNSTABLE STABILITY CLASS B
PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	11.8	3.6	.0	.0	.0	.0	.0	15.4	.4
NNE	11.8	.0	.0	.0	.0	.0	.0	11.8	.3
NE	4.5	.0	.0	.0	.0	.0	.0	4.5	.1
ENE	4.5	.0	.0	.0	.0	.0	.0	4.5	.1
E	4.5	.0	.0	.0	.0	.0	.0	4.5	.1
ESE	1.8	.0	.0	.0	.0	.0	.0	1.8	.0
SE	1.8	.0	.0	.0	.0	.0	.0	1.8	.0
SSE	.9	.0	.0	.0	.0	.0	.0	.9	.0
S	6.4	.0	.0	.0	.0	.0	.0	6.4	.1
SSW	3.6	.0	.0	.0	.0	.0	.0	3.6	.1
SW	11.8	.0	.0	.0	.0	.0	.0	11.8	.2
WSW	3.6	.0	.0	.0	.0	.0	.0	3.6	.1
W	6.4	.0	.0	.0	.0	.0	.0	6.4	.1
WNW	2.7	.0	.0	.9	.0	.0	.0	3.6	.1
NW	6.4	.9	.0	.0	.0	.0	.0	7.3	.1
NNW	8.2	.0	.0	1.8	.0	.0	.0	10.0	.3
CALM	1.8							1.8	
TOTAL	92.7	4.5	.0	2.7	.0	.0	.0	100.0	.1

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 110 HOURS

33Eay

TABLE 4A (cont'd)
Joint Frequency Distribution
10 Meter Level

SLIGHTLY UNSTABLE STABILITY CLASS C
PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	8.7	5.4	.0	.0	.0	.0	.0	14.1	.3
NNE	7.4	.0	.0	.0	.0	.0	.0	7.4	.2
NE	7.4	.0	.0	.0	.0	.0	.0	7.4	.1
ENE	4.0	.0	.0	.0	.0	.0	.0	4.0	.1
E	2.7	.0	.0	.0	.0	.0	.0	2.7	.0
ESE	2.7	.0	.0	.0	.0	.0	.0	2.7	.0
SE	2.0	.0	.0	.0	.0	.0	.0	2.0	.0
SSE	2.0	.0	.0	.0	.0	.0	.0	2.0	.0
S	6.0	.0	.0	.0	.0	.0	.0	6.0	.1
SSW	5.4	.7	.0	.0	.0	.0	.0	6.0	.1
SW	13.4	.0	.0	.0	.0	.0	.0	13.4	.2
WSW	7.4	.0	.0	.0	.0	.0	.0	7.4	.1
W	5.4	.0	.0	.0	.0	.0	.0	5.4	.1
WNW	4.7	.0	.0	.0	.0	.0	.0	4.7	.1
NW	6.7	.0	.0	.0	.0	.0	.0	6.7	.1
NNW	8.0	.0	.0	.0	.0	.0	.0	8.0	.1
CALM	.0							.0	
TOTAL	93.9	6.0	.0	.0	.0	.0	.0	100.0	.1

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 149 HOURS

TABLE 4A (cont'd)
Joint Frequency Distribution
10 Meter Level

NEUTRAL STABILITY CLASS D
PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

WIND SPEED (m/sec)

DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	14.3	1.3	.0	.0	.0	.0	.0	15.7	.3
NNE	4.8	.4	.0	.0	.0	.0	.0	5.2	.1
NE	3.0	.2	.0	.0	.0	.2	.0	3.4	.1
ENE	2.9	.2	.0	.0	.0	.0	.0	3.0	.0
E	2.5	.0	.0	.0	.0	.0	.0	2.5	.0
ESE	2.1	.0	.0	.0	.0	.0	.0	2.1	.0
SE	2.3	.0	.0	.0	.0	.0	.0	2.3	.0
SSE	3.8	.0	.0	.0	.0	.0	.0	3.8	.0
S	3.6	.0	.2	.0	.0	.0	.0	3.8	.1
SSW	11.3	.2	.0	.0	.0	.0	.0	11.5	.2
SW	13.0	.0	.0	.0	.0	.0	.0	13.0	.2
WSW	6.1	.0	.0	.0	.0	.0	.0	6.1	.1
W	5.7	.0	.0	.0	.0	.0	.0	5.7	.1
WNW	3.6	.0	.0	.0	.0	.0	.0	3.6	.0
NW	4.2	.0	.0	.0	.0	.0	.0	4.2	.0
NNW	7.1	2.5	.0	.0	.0	.0	.0	9.6	.2
CALM	4.4							4.4	
TOTAL	94.8	4.8	.2	.0	.0	.2	.0	100.0	.1

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 523 HOURS

33Eay

TABLE 4A (cont'd)
Joint Frequency Distribution
10 Meter Level

SLIGHTLY STABLE STABILITY CLASS E
PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	10.5	.4	.0	.0	.0	.0	.0	10.9	.2
NNE	7.4	.0	.0	.0	.0	.0	.0	7.4	.1
NE	4.7	.0	.0	.0	.0	.0	.0	4.7	.0
ENE	4.0	.0	.0	.0	.0	.0	.0	4.0	.0
E	5.2	.0	.0	.0	.0	.0	.0	5.2	.0
ESE	5.7	.0	.0	.0	.0	.0	.0	5.7	.1
SE	4.5	.0	.0	.0	.0	.0	.0	4.5	.0
SSE	8.1	.0	.0	.0	.0	.0	.0	8.1	.1
S	11.0	.0	.0	.0	.0	.0	.0	11.0	.1
SSW	8.8	.0	.0	.0	.0	.0	.0	8.8	.1
SW	3.0	.1	.0	.0	.0	.0	.0	3.1	.0
WSW	2.1	.0	.0	.0	.0	.0	.0	2.1	.0
W	1.7	.0	.0	.0	.0	.0	.0	1.7	.0
WNW	1.1	.0	.0	.0	.0	.0	.0	1.1	.0
NW	.8	.0	.0	.0	.0	.0	.0	.8	.0
NNW	2.5	.0	.0	.0	.0	.0	.0	2.5	.0
CALM	18.3							18.3	
TOTAL	99.4	.6	.0	.0	.0	.0	.0	100.0	.1

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 706 HOURS

TABLE 4A (cont'd)
Joint Frequency Distribution
10 Meter Level

MODERATELY STABLE STABILITY CLASS F
PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	1.6	.0	.0	.0	.0	.0	.0	1.6	.0
NNE	6.3	.0	.0	.0	.0	.0	.0	6.3	.1
NE	8.7	.0	.0	.0	.0	.0	.0	8.7	.1
ENE	8.2	.0	.0	.0	.0	.0	.0	8.2	.1
E	6.6	.0	.0	.0	.0	.0	.0	6.6	.1
ESE	5.0	.0	.0	.0	.0	.0	.0	5.0	.0
SE	4.5	.0	.0	.0	.0	.0	.0	4.5	.0
SSE	4.7	.0	.0	.0	.0	.0	.0	4.7	.0
S	1.6	.0	.0	.0	.0	.0	.0	1.6	.0
SSW	.5	.0	.0	.0	.0	.0	.0	.5	.0
SW	.8	.0	.0	.0	.0	.0	.0	.8	.0
WSW	.3	.0	.0	.0	.0	.0	.0	.3	.0
W	.3	.3	.0	.0	.0	.0	.0	.5	.0
WNW	.0	.0	.0	.0	.0	.0	.0	.0	.0
NW	.3	.0	.0	.0	.0	.0	.0	.3	.0
NNW	.3	.0	.0	.0	.0	.0	.0	.3	.0
CALM	50.1							50.1	
TOTAL	99.7	.3	.0	.0	.0	.0	.0	100.0	.0

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 379 HOURS

33Eay

TABLE 4A (cont'd)
Joint Frequency Distribution
10 Meter Level

EXTREMELY STABLE STABILITY CLASS G
PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	.9	.0	.0	.0	.0	.0	.0	.9	.0
NNE	2.8	.0	.0	.0	.0	.0	.0	2.8	.0
NE	9.2	.0	.0	.0	.0	.0	.0	9.2	.1
ENE	10.6	.0	.0	.0	.0	.0	.0	10.6	.1
E	9.7	.0	.0	.0	.0	.0	.0	9.7	.1
ESE	5.5	.0	.0	.0	.0	.0	.0	5.5	.0
SE	.5	.0	.0	.0	.0	.0	.0	.5	.0
SSE	.0	.0	.0	.0	.0	.0	.0	.0	.0
S	.0	.0	.0	.0	.0	.0	.0	.0	.0
SSW	.0	.0	.0	.0	.0	.0	.0	.0	.0
SW	.5	.0	.0	.0	.0	.0	.0	.5	.0
WSW	.5	.0	.0	.0	.0	.0	.0	.5	.0
W	.0	.0	.0	.0	.0	.0	.0	.0	.0
WNW	.5	.0	.0	.0	.0	.0	.0	.5	.0
NW	.0	.0	.0	.0	.0	.0	.0	.0	.0
NNW	.5	.0	.0	.0	.0	.0	.0	.5	.0
CALM	59.0							59.0	
TOTAL	100.0	.0	.0	.0	.0	.0	.0	100.0	.1

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 217 HOURS

33Eay

TABLE 4A (cont'd)
Joint Frequency Distribution
50 Meter Level

STABILITY CLASS A - G
PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	3.3	5.2	.0	.0	.0	.0	.0	8.5	.3
NNE	3.0	3.6	.0	.0	.0	.0	.0	6.7	.2
NE	3.8	1.9	.0	.0	.0	.0	.0	5.7	.2
ENE	3.1	1.7	.0	.0	.0	.0	.0	4.7	.1
E	2.8	2.9	.0	.0	.0	.0	.0	5.7	.2
ESE	3.1	3.9	.0	.0	.0	.0	.0	7.0	.2
SE	4.4	3.7	.0	.0	.0	.0	.0	8.1	.2
SSE	5.0	1.4	.0	.0	.0	.0	.0	6.4	.2
S	6.1	1.8	.0	.0	.0	.0	.0	7.9	.2
SSW	5.8	1.5	.0	.0	.0	.0	.0	7.4	.2
SW	7.2	1.9	.0	.0	.0	.0	.0	9.1	.2
WSW	3.9	1.0	.0	.0	.0	.0	.0	4.9	.1
W	3.6	.3	.0	.0	.0	.0	.0	3.9	.1
WNW	2.6	.1	.0	.0	.0	.0	.0	2.6	.0
NW	2.8	.7	.0	.0	.0	.0	.0	3.5	.1
NNW	3.5	3.2	.0	.0	.0	.0	.0	6.7	.2
CALM	3.5							.9	
TOTAL	64.9	34.9	.1	.0	.0	.0	.0	100.0	.2

63. HOURS OF BAD OR MISSING DATA OR 2.9 PERCENT FOR 2208 HOURS

TABLE 4A (cont'd)
Joint Frequency Distribution
10 Meter Level

STABILITY CLASS A - G
PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	8.8	1.0	.0	.0	.0	.0	.0	9.8	.2
NNE	6.3	.1	.0	.0	.0	.0	.0	6.4	.1
NE	5.8	.0	.0	.0	.0	.0	.0	5.8	.1
ENE	5.2	.1	.0	.0	.0	.0	.0	5.3	.1
E	4.9	.0	.0	.0	.0	.0	.0	4.9	.0
ESE	4.1	.0	.0	.0	.0	.0	.0	4.1	.0
SE	3.1	.0	.0	.0	.0	.0	.0	3.1	.0
SSE	4.6	.0	.0	.0	.0	.0	.0	4.6	.0
S	5.7	.0	.0	.0	.0	.0	.0	5.7	.1
SSW	6.5	.1	.0	.0	.0	.0	.0	6.6	.1
SW	6.5	.0	.0	.0	.0	.0	.0	6.5	.1
WSW	3.3	.0	.0	.0	.0	.0	.0	3.3	.0
W	2.8	.0	.0	.0	.0	.0	.0	2.8	.0
WNW	1.9	.0	.0	.0	.0	.0	.0	1.9	.0
NW	2.6	.0	.0	.0	.0	.0	.0	2.6	.0
NNW	4.0	.6	.0	.1	.0	.0	.0	4.7	.1
CALM	4.0							21.6	
TOTAL	97.7	2.1	.1	.1	.0	.0	.0	100.0	.1

21. HOURS OF BAD OR MISSING DATA OR 1.0 PERCENT FOR 2208 HOURS

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TABLE 4A (cont'd)

PERCENT BAD DATA REPORT

PERIOD OF RECORD: 7/1/84 000 Hours 10/1/84 000 Hours

	HOURS	PERCENT
50M DIRECTION	42.	1.90
50M WIND SPEED	0.	.00
10M DIRECTION	0.	.00
10M WIND SPEED	0.	.00
TEMPERATURE	4.	.18
DEW POINT	72.	3.26
DELTA T	21.	.95
PRECIPITATION	2208.	100.00

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TABLE 4B
Joint Frequency Distribution
50 Meter Level

EXTREMELY UNSTABLE STABILITY CLASS A
PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	.0	17.0	.0	.0	.0	.0	.0	17.0	.6
NNE	7.5	3.8	.0	.0	.0	.0	.0	11.3	.3
NE	15.1	3.8	.0	.0	.0	.0	.0	18.9	.4
ENE	1.9	.0	.0	.0	.0	.0	.0	1.9	.0
E	5.7	1.9	.0	.0	.0	.0	.0	7.5	.2
ESE	.0	3.8	.0	.0	.0	.0	.0	3.8	.1
SE	1.9	.0	.0	.0	.0	.0	.0	1.9	.0
SSE	1.9	.0	.0	.0	.0	.0	.0	1.9	.0
S	.0	3.8	.0	.0	.0	.0	.0	3.8	.2
SSW	.0	3.8	.0	.0	.0	.0	.0	3.8	.1
SW	.0	3.8	.0	.0	.0	.0	.0	3.8	.2
WSW	.0	.0	.0	.0	.0	.0	.0	.0	.0
W	.0	.0	.0	.0	.0	.0	.0	.0	.0
WNW	.0	.0	.0	.0	.0	.0	.0	.0	.0
NW	3.8	1.9	1.9	.0	.0	.0	.0	7.5	.3
NNW	1.9	13.2	1.9	.0	.0	.0	.0	17.0	.8
CALM	.0							.0	
TOTAL	39.6	56.6	3.8	.0	.0	.0	.0	100.0	.3

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 53 HOURS

33Eay

TABLE 4B (cont'd)
Joint Frequency Distribution
50 Meter Level

MODERATELY UNSTABLE STABILITY CLASS B
PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	.0	13.0	.0	.0	.0	.0	.0	13.0	.5
NNE	2.6	1.3	.0	.0	.0	.0	.0	3.9	.1
NE	1.3	.0	1.3	.0	.0	.0	.0	2.6	.1
ENE	3.9	.0	.0	.0	.0	.0	.0	3.9	.1
E	3.9	1.3	.0	.0	.0	.0	.0	5.2	.1
ESE	1.3	11.7	.0	.0	.0	.0	.0	13.0	.5
SE	2.6	2.6	.0	.0	.0	.0	.0	5.2	.1
SSE	1.3	3.9	2.6	.0	.0	.0	.0	7.8	.3
S	.0	3.9	2.6	.0	.0	.0	.0	6.5	.3
SSW	1.3	1.3	.0	.0	.0	.0	.0	2.6	.1
SW	.0	6.5	.0	.0	.0	.0	.0	6.5	.3
WSW	1.3	2.6	.0	.0	.0	.0	.0	3.9	.1
W	.0	1.3	.0	.0	.0	.0	.0	1.3	.0
WNW	.0	.0	.0	.0	.0	.0	.0	.0	.0
NW	1.3	10.4	1.3	.0	.0	.0	.0	13.0	.6
NNW	.0	9.1	2.6	.0	.0	.0	.0	11.7	.5
CALM	.0							.0	
TOTAL	20.8	68.8	10.4	.0	.0	.0	.0	100.0	.3

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 77 HOURS

TABLE 4B (cont'd)
Joint Frequency Distribution
50 Meter Level

SLIGHTLY UNSTABLE STABILITY CLASS C
PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	2.1	5.2	.0	.0	.0	.0	.0	7.3	.3
NNE	.0	2.1	.0	.0	.0	.0	.0	2.1	.1
NE	1.0	3.1	2.1	.0	.0	.0	.0	6.3	.3
ENE	2.1	4.2	.0	.0	.0	.0	.0	6.3	.2
E	5.2	.0	.0	.0	.0	.0	.0	5.2	.1
ESE	4.2	6.3	.0	.0	.0	.0	.0	10.4	.3
SE	2.1	6.3	1.0	.0	.0	.0	.0	9.4	.4
SSE	3.1	6.3	2.1	.0	.0	.0	.0	11.4	.5
S	2.1	4.2	1.0	.0	.0	.0	.0	7.3	.3
SSW	3.1	2.1	1.0	.0	.0	.0	.0	6.3	.2
SW	.0	1.0	.0	.0	.0	.0	.0	1.0	.0
WSW	1.0	2.1	.0	.0	.0	.0	.0	3.1	.1
W	1.0	.0	.0	.0	.0	.0	.0	1.0	.0
WNW	4.2	3.1	.0	.0	.0	.0	.0	7.3	.2
NW	2.1	6.3	.0	.0	.0	.0	.0	8.3	.3
NNW	1.0	5.2	1.0	.0	.0	.0	.0	7.3	.3
CALM	.0							.0	
TOTAL	34.4	57.3	8.3	.0	.0	.0	.0	100.0	.2

2. HOURS OF BAD OR MISSING DATA OR 2.0 PERCENT FOR 98 HOURS

33Eay

TABLE 4B (cont'd)
Joint Frequency Distribution
50 Meter Level

NEUTRAL STABILITY CLASS D
PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	2.2	6.7	.0	.0	.0	.0	.0	8.9	.3
NNE	1.4	1.8	.0	.0	.0	.0	.0	3.2	.1
NE	2.2	2.4	.4	.0	.0	.0	.0	4.9	.2
ENE	2.2	.4	.0	.0	.0	.0	.0	2.5	.1
E	1.3	1.1	.2	.0	.0	.0	.0	2.5	.1
ESE	2.9	7.0	.0	.0	.0	.0	.0	9.9	.4
SE	3.4	5.4	4.0	.5	.0	.0	.0	13.4	.7
SSE	2.5	6.1	2.0	.0	.0	.0	.0	10.7	.5
S	2.7	4.9	.9	.0	.0	.0	.0	8.5	.3
SSW	2.5	2.9	1.4	.0	.0	.0	.0	6.9	.3
SW	2.2	2.2	.2	.0	.0	.0	.0	4.5	.1
WSW	3.6	.4	.2	.0	.0	.0	.0	4.1	.1
W	3.4	1.4	1.1	.0	.0	.0	.0	6.0	.2
WNW	2.9	1.6	.4	.0	.0	.0	.0	4.9	.1
NW	2.0	1.6	.5	.0	.0	.0	.0	4.1	.1
NNW	1.4	3.2	.2	.0	.0	.0	.0	4.9	.2
CALM	.0							.0	
TOTAL	38.9	49.2	11.4	.5	.0	.0	.0	100.0	.2

8. HOURS OF BAD OR MISSING DATA OR 1.4 PERCENT FOR 561 HOURS

33Eay

TABLE 4B (cont'd)
Joint Frequency Distribution
50 Meter Level

SLIGHTLY STABLE STABILITY CLASS E
PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	1.0	3.2	.0	.0	.0	.0	.0	4.3	.1
NNE	3.1	5.1	.0	.0	.0	.0	.0	8.2	.3
NE	4.3	4.8	.0	.0	.0	.0	.0	9.1	.3
ENE	2.1	1.5	.0	.0	.0	.0	.0	3.6	.1
E	1.3	1.7	.2	.0	.0	.0	.0	3.2	.1
ESE	3.7	10.9	.9	.0	.0	.0	.0	15.6	.6
SE	3.7	12.3	1.8	.0	.0	.0	.0	17.9	.8
SSE	2.1	9.6	.6	.0	.0	.0	.0	12.2	.5
S	2.0	5.5	.0	.0	.0	.0	.0	7.5	.3
SSW	2.5	2.1	.1	.0	.0	.0	.0	4.7	.1
SW	.9	1.3	.3	.0	.0	.0	.0	2.5	.1
WSW	.2	.1	.0	.0	.0	.0	.0	.3	.0
W	.9	.6	.0	.0	.0	.0	.0	1.5	.0
WNW	1.6	2.1	.0	.0	.0	.0	.0	3.7	.1
NW	.6	.7	.2	.0	.0	.0	.0	1.5	.0
NNW	1.1	2.9	.0	.0	.0	.0	.0	4.0	.1
CALM	.1							.1	
TOTAL	31.3	64.5	4.3	.0	.0	.0	.0	100.0	.2

1. HOURS OF BAD OR MISSING DATA OR .1 PERCENT FOR 868 HOURS

TABLE 4B (cont'd)
Joint Frequency Distribution
50 Meter Level

MODERATELY STABLE STABILITY CLASS F
PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	3.2	2.5	.7	.0	.0	.0	.0	6.3	.2
NNE	6.0	6.7	.0	.0	.0	.0	.0	12.7	.4
NE	2.5	4.6	.0	.0	.0	.0	.0	7.0	.2
ENE	3.2	2.1	.0	.0	.0	.0	.0	5.3	.1
E	2.1	4.9	.3	.0	.0	.0	.0	7.4	.3
ESE	3.5	13.0	.0	.0	.0	.0	.0	16.5	.6
SE	6.3	7.7	.0	.0	.0	.0	.0	14.1	.4
SSE	2.8	3.2	.3	.0	.0	.0	.0	6.3	.2
S	6.3	1.8	.7	.0	.0	.0	.0	8.8	.3
SSW	2.8	.3	.3	.0	.0	.0	.0	3.5	.1
SW	1.8	1.1	.0	.0	.0	.0	.0	2.8	.1
WSW	1.8	.3	.0	.0	.0	.0	.0	2.1	.0
W	.7	.7	.0	.0	.0	.0	.0	1.4	.0
WNW	.0	1.4	.3	.0	.0	.0	.0	1.8	.1
NW	1.1	.3	.0	.0	.0	.0	.0	1.4	.0
NNW	1.1	1.4	.0	.0	.0	.0	.0	2.5	.1
CALM	.0							.0	
TOTAL	45.1	52.1	2.8	.0	.0	.0	.0	100.0	.2

4. HOURS OF BAD OR MISSING DATA OR 1.4 PERCENT FOR 288 HOURS

33Eay

TABLE 4B (cont'd)
Joint Frequency Distribution
50 Meter Level

EXTREMELY STABLE STABILITY CLASS G
PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	4.7	.0	.0	.0	.0	.0	.0	4.7	.1
NNE	6.8	3.6	.0	.0	.0	.0	.0	10.4	.3
NE	8.3	4.7	.0	.0	.0	.0	.0	13.0	.3
ENE	4.2	4.2	.0	.0	.0	.0	.0	8.3	.2
E	1.6	6.3	.0	.0	.0	.0	.0	7.8	.3
ESE	3.1	9.9	.0	.0	.0	.0	.0	13.0	.5
SE	2.6	8.8	.0	.0	.0	.0	.0	11.4	.4
SSE	3.1	2.1	1.0	.0	.0	.0	.0	6.3	.2
S	3.1	1.6	1.0	.0	.0	.0	.0	5.7	.2
SSW	1.0	1.6	.0	.0	.0	.0	.0	2.6	.1
SW	.5	.0	.0	.0	.0	.0	.0	.5	.0
WSW	.0	.0	.5	.0	.0	.0	.0	.5	.0
W	.0	.5	.0	.0	.0	.0	.0	.5	.0
WNW	1.0	.5	.0	.0	.0	.0	.0	1.6	.0
NW	4.2	.0	.0	.0	.0	.0	.0	4.2	.1
NNW	6.3	.5	.0	.0	.0	.0	.0	6.8	.2
CALM	2.6							2.6	
TOTAL	53.1	44.3	2.6	.0	.0	.0	.0	100.0	.2

11. HOURS OF BAD OR MISSING DATA OR 5.4 PERCENT FOR 203 HOURS

33Eay

TABLE 4B (cont'd)
Joint Frequency Distribution
10 Meter Level

EXTREMELY UNSTABLE STABILITY CLASS A
PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	22.6	.0	.0	.0	.0	.0	.0	22.6	.5
NNE	11.3	.0	.0	.0	.0	.0	.0	11.3	.3
NE	7.5	.0	.0	.0	.0	.0	.0	7.5	.1
ENE	3.8	.0	.0	.0	.0	.0	.0	3.8	.1
E	9.4	.0	.0	.0	.0	.0	.0	9.4	.2
ESE	.0	.0	.0	.0	.0	.0	.0	.0	.0
SE	3.8	.0	.0	.0	.0	.0	.0	3.8	.1
SSE	1.9	.0	.0	.0	.0	.0	.0	1.9	.0
S	3.8	1.9	.0	.0	.0	.0	.0	5.7	.1
SSW	.0	.0	.0	.0	.0	.0	.0	.0	.0
SW	.0	.0	.0	.0	.0	.0	.0	.0	.0
WSW	1.9	3.8	.0	.0	.0	.0	.0	5.7	.1
W	.0	.0	.0	.0	.0	.0	.0	.0	.0
WNW	.0	.0	.0	.0	.0	.0	.0	.0	.0
NW	3.8	.0	.0	.0	.0	.0	.0	3.8	.1
NNW	18.9	5.7	.0	.0	.0	.0	.0	24.5	.7
CALM	.0							.0	
TOTAL	88.7	11.3	.0	.0	.0	.0	.0	100.0	.2

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 53 HOURS

33Eay

TABLE 4B (cont'd)
Joint Frequency Distribution
10 Meter Level

MODERATELY UNSTABLE STABILITY CLASS B
PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	9.1	6.5	.0	.0	.0	.0	.0	15.6	.4
NNE	2.6	.0	.0	.0	.0	.0	.0	2.6	.1
NE	2.6	.0	.0	.0	.0	.0	.0	2.6	.0
ENE	3.9	.0	.0	.0	.0	.0	.0	3.9	.1
E	3.9	.0	.0	.0	.0	.0	.0	3.9	.1
ESE	5.2	.0	.0	.0	.0	.0	.0	5.2	.1
SE	2.6	.0	.0	.0	.0	.0	.0	2.6	.0
SSE	6.5	1.3	.0	.0	.0	.0	.0	7.8	.2
S	5.2	7.8	.0	.0	.0	.0	.0	13.0	.4
SSW	5.2	.0	.0	.0	.0	.0	.0	5.2	.1
SW	6.5	2.6	.0	.0	.0	.0	.0	9.1	.2
WSW	3.9	.0	.0	.0	.0	.0	.0	3.9	.1
W	1.3	.0	.0	.0	.0	.0	.0	1.3	.0
WNW	.0	.0	.0	.0	.0	.0	.0	.0	.0
NW	3.9	1.3	.0	.0	.0	.0	.0	5.2	.1
NNW	9.1	9.1	.0	.0	.0	.0	.0	18.2	.6
CALM	.0							.0	
TOTAL	71.4	28.6	.0	.0	.0	.0	.0	100.0	.2

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 77 HOURS

TABLE 4B (cont'd)
Joint Frequency Distribution
10 Meter Level

SLIGHTLY UNSTABLE STABILITY CLASS C
PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

WIND SPEED (m/sec)

DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	4.1	1.0	.0	.0	.0	.0	.0	5.1	.1
NNE	2.0	1.0	.0	.0	.0	.0	.0	3.1	.1
NE	.0	.0	.0	.0	.0	.0	.0	.0	.0
ENE	1.0	.0	.0	.0	.0	.0	.0	1.0	.0
E	2.0	.0	.0	.0	.0	.0	.0	2.0	.0
ESE	2.0	.0	.0	.0	.0	.0	.0	2.0	.0
SE	3.1	3.1	.0	.0	.0	.0	.0	6.1	.2
SSE	11.2	7.1	.0	.0	.0	.0	.0	18.4	.5
S	3.1	11.2	.0	.0	.0	.0	.0	14.3	.5
SSW	11.2	2.0	.0	.0	.0	.0	.0	13.3	.3
SW	5.1	.0	.0	.0	.0	.0	.0	5.1	.1
WSW	4.1	.0	.0	.0	.0	.0	.0	4.1	.1
W	1.0	.0	.0	.0	.0	.0	.0	1.0	.0
WNW	5.1	.0	.0	.0	.0	.0	.0	5.1	.1
NW	7.1	.0	.0	.0	.0	.0	.0	7.1	.1
NNW	8.2	4.1	.0	.0	.0	.0	.0	12.2	.3
CALM	.0							.0	
TOTAL	70.4	29.6	.0	.0	.0	.0	.0	100.0	.2

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 98 HOURS

33Eay

TABLE 4B (cont'd)
Joint Frequency Distribution
10 Meter Level

NEUTRAL STABILITY CLASS D
PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	10.9	.9	.0	.0	.0	.0	.0	11.8	.3
NNE	2.3	.2	.0	.0	.0	.0	.0	2.5	.0
NE	2.5	.0	.0	.0	.0	.0	.0	2.5	.0
ENE	2.3	.0	.0	.0	.0	.0	.0	2.3	.0
E	2.1	.0	.0	.0	.0	.0	.0	2.1	.0
ESE	3.6	.5	.0	.0	.0	.0	.0	4.1	.1
SE	4.3	.5	.0	.0	.0	.0	.0	4.8	.1
SSE	9.3	6.2	.0	.0	.0	.0	.0	15.5	.4
S	8.0	5.7	.0	.0	.0	.0	.0	13.7	.4
SSW	4.3	3.0	.0	.0	.0	.0	.0	7.3	.2
SW	5.2	1.2	.0	.0	.0	.0	.0	6.4	.1
WSW	4.6	.3	.0	.0	.0	.0	.0	5.0	.1
W	5.0	.2	.0	.0	.0	.0	.0	5.2	.1
WNW	5.2	.5	.0	.0	.0	.0	.0	5.7	.1
NW	4.1	.2	.0	.0	.0	.0	.0	4.3	.1
NNW	5.5	.9	.0	.0	.0	.0	.0	6.4	.1
CALM	.3							.3	
TOTAL	79.5	20.5	.0	.0	.0	.0	.0	100.0	.1

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 561 HOURS

33Eay

TABLE 4B (cont'd)
Joint Frequency Distribution
10 Meter Level

SLIGHTLY STABLE STABILITY CLASS E
PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

WIND SPEED (m/sec)

DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	9.4	.2	.0	.0	.0	.0	.0	9.7	.1
NNE	7.7	.0	.0	.0	.0	.0	.0	7.7	.1
NE	6.7	.0	.0	.0	.0	.0	.0	6.7	.1
ENE	5.2	.0	.0	.0	.0	.0	.0	5.2	.1
E	3.9	.0	.0	.0	.0	.0	.0	3.9	.0
ESE	4.7	.0	.0	.0	.0	.0	.0	4.7	.0
SE	6.1	.3	.0	.0	.0	.0	.0	6.4	.1
SSE	12.3	1.7	.0	.0	.0	.0	.0	14.0	.3
S	8.6	2.9	.0	.0	.0	.0	.0	11.5	.3
SSW	4.7	.1	.0	.0	.0	.0	.0	4.8	.1
SW	3.1	.7	.0	.0	.0	.0	.0	3.8	.1
WSW	1.1	.0	.0	.0	.0	.0	.0	1.1	.0
W	1.3	.0	.0	.0	.0	.0	.0	1.3	.0
WNW	2.3	.1	.0	.0	.0	.0	.0	2.4	.0
NW	3.8	.2	.0	.0	.0	.0	.0	4.0	.1
NNW	3.1	.1	.0	.0	.0	.0	.0	3.2	.0
CALM	9.3							9.3	
TOTAL	93.5	6.4	.0	.0	.0	.0	.0	100.0	.1

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 868 HOURS

33Eay

TABLE 4B (cont'd)
Joint Frequency Distribution
10 Meter Level

MODERATELY STABLE STABILITY CLASS F
PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	2.4	1.0	.0	.0	.0	.0	.0	3.5	.1
NNE	8.0	.7	.0	.0	.0	.0	.0	8.7	.1
NE	8.0	.0	.0	.0	.0	.0	.0	8.0	.1
ENE	7.6	.0	.0	.0	.0	.0	.0	7.6	.1
E	10.4	.0	.0	.0	.0	.0	.0	10.4	.1
ESE	6.6	.0	.0	.0	.0	.0	.0	6.6	.1
SE	6.6	.0	.0	.0	.0	.0	.0	6.6	.1
SSE	3.8	.3	.0	.0	.0	.0	.0	4.2	.0
S	4.2	1.0	.0	.0	.0	.0	.0	5.2	.1
SSW	1.7	.7	.0	.0	.0	.0	.0	2.4	.0
SW	1.0	.0	.0	.0	.0	.0	.0	1.0	.0
WSW	1.7	.0	.0	.0	.0	.0	.0	1.7	.0
W	.7	.0	.0	.0	.0	.0	.0	.7	.0
WNW	1.4	.3	.0	.0	.0	.0	.0	1.7	.0
NW	1.4	.0	.0	.0	.0	.0	.0	1.4	.0
NNW	2.1	.3	.0	.0	.0	.0	.0	2.4	.0
CALM	27.8							27.8	
TOTAL	95.5	4.5	.0	.0	.0	.0	.0	100.0	.1

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 288 HOURS

33Eay

TABLE 4B (cont'd)
Joint Frequency Distribution
10 Meter Level

EXTREMELY STABLE STABILITY CLASS G
PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	.0	.0	.0	.0	.0	.0	.0	.0	.0
NNE	.5	.0	.0	.0	.0	.0	.0	.5	.0
NE	11.8	.0	.0	.0	.0	.0	.0	11.8	.1
ENE	19.7	.0	.0	.0	.0	.0	.0	19.7	.2
E	15.8	.0	.0	.0	.0	.0	.0	15.8	.2
ESE	2.0	.0	.0	.0	.0	.0	.0	2.0	.0
SE	2.0	.0	.0	.0	.0	.0	.0	2.0	.0
SSE	.5	.5	.0	.0	.0	.0	.0	1.0	.0
S	.5	1.5	.0	.0	.0	.0	.0	2.0	.1
SSW	.0	.0	.0	.0	.0	.0	.0	.0	.0
SW	.0	.0	.0	.0	.0	.0	.0	.0	.0
WSW	.5	.0	.0	.0	.0	.0	.0	.5	.0
W	.0	.0	.0	.0	.0	.0	.0	.0	.0
WNW	.0	.0	.0	.0	.0	.0	.0	.0	.0
NW	.5	.5	.0	.0	.0	.0	.0	1.0	.0
NNW	.5	.0	.0	.0	.0	.0	.0	.5	.0
CALM	43.3							43.3	
TOTAL	97.5	2.5	.0	.0	.0	.0	.0	100.0	.1

0. HOURS OF BAD OR MISSING DATA OR .0 PERCENT FOR 203 HOURS

33Eay

TABLE 4B (cont'd)
Joint Frequency Distribution
50 Meter Level

STABILITY CLASS A - G
PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	1.9	4.5	.1	.0	.0	.0	.0	6.5	.2
NNE	3.3	4.0	.0	.0	.0	.0	.0	7.3	.2
NE	3.9	3.9	.2	.0	.0	.0	.0	8.0	.3
ENE	2.5	1.6	.0	.0	.0	.0	.0	4.0	.1
E	1.8	2.3	.2	.0	.0	.0	.0	4.3	.1
ESE	3.2	9.7	.4	.0	.0	.0	.0	13.4	.5
SE	3.7	8.7	1.8	.1	.0	.0	.0	14.4	.6
SSE	2.4	6.5	1.1	.0	.0	.0	.0	10.0	.4
S	2.7	4.3	.6	.0	.0	.0	.0	7.6	.3
SSW	2.4	2.0	.5	.0	.0	.0	.0	4.9	.2
SW	1.2	1.6	.2	.0	.0	.0	.0	3.0	.1
WSW	1.4	.4	.1	.0	.0	.0	.0	1.8	.0
W	1.4	.8	.3	.0	.0	.0	.0	2.5	.1
WNW	1.7	1.6	.1	.0	.0	.0	.0	3.5	.1
NW	1.5	1.5	.3	.0	.0	.0	.0	3.3	.1
NNW	1.6	3.1	.2	.0	.0	.0	.0	5.0	.2
CALM	1.6							.3	
TOTAL	37.0	56.6	6.2	.1	.0	.0	.0	100.0	.2

86. HOURS OF BAD OR MISSING DATA OR 3.9 PERCENT FOR 2208 HOURS

33Eay

TABLE 4B (cont'd)
Joint Frequency Distribution
10 Meter Level

STABILITY CLASS A - G
PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

WIND SPEED (m/sec)

WIND DIRECTION	0-2	3-5	6-8	9-11	12-14	15-17	18 AND UP	TOTAL	AVG SPEED
N	8.0	.7	.0	.0	.0	.0	.0	8.8	.2
NNE	5.3	.2	.0	.0	.0	.0	.0	5.5	.1
NE	5.8	.0	.0	.0	.0	.0	.0	5.8	.1
ENE	5.9	.0	.0	.0	.0	.0	.0	5.9	.1
E	5.5	.0	.0	.0	.0	.0	.0	5.5	.1
ESE	4.2	.1	.0	.0	.0	.0	.0	4.3	.1
SE	5.0	.4	.0	.0	.0	.0	.0	5.4	.1
SSE	8.8	2.8	.0	.0	.0	.0	.0	11.5	.3
S	6.6	3.8	.0	.0	.0	.0	.0	10.4	.3
SSW	3.9	1.0	.0	.0	.0	.0	.0	5.0	.1
SW	3.2	.7	.0	.0	.0	.0	.0	3.9	.1
WSW	2.3	.2	.0	.0	.0	.0	.0	2.5	.0
W	2.0	.0	.0	.0	.0	.0	.0	2.0	.0
WNW	2.7	.2	.0	.0	.0	.0	.0	2.9	.0
NW	3.4	.2	.0	.0	.0	.0	.0	3.6	.1
NNW	4.2	1.0	.0	.0	.0	.0	.0	5.2	.1
CALM	4.2							11.7	
TOTAL	88.5	11.4	.0	.0	.0	.0	.0	100.0	.1

60. HOURS OF BAD OR MISSING DATA OR 2.7 PERCENT FOR 2208 HOURS

33Eay

TABLE 4B (cont'd)

PERCENT BAD DATA REPORT

PERIOD OF RECORD: 10/1/84 000 Hours 1/1/85 000 Hours

	HOURS	PERCENT
50M DIRECTION	28.	1.27
50M WIND SPEED	2.	.09
10M DIRECTION	2.	.09
10M WIND SPEED	2.	.09
TEMPERATURE	2.	.09
DEW POINT	583.	26.40
DELTA T	60.	2.72
PRECIPITATION	2208.	100.00

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Table 4C

CLASSIFICATION OF ATMOSPHERIC STABILITY

Stability Classification	Pasquill Categories	$\sigma\theta$[a] (degrees)	Temperature Change with Height (C/100m)
Extremely Unstable	A	25.0	<-1.9
Moderately Unstable	B	20.0	-1.9 to -1.7
Slightly Unstable	C	15.0	-1.7 to -1.5
Neutral	D	10.0	-1.5 to -0.5
Slightly Stable	E	5.0	-0.5 to -1.5
Moderately Stable	F	2.5	1.5 to 4.0
Extremely Stable	G	1.7	>4.0

[a] Standard deviation of horizontal wind direction fluctuation over a period of 15 minutes to 1 hour. The values shown are average for each stability classification.

TABLE 5

RADIOACTIVE LIQUID WASTE SAMPLING AND ANALYSIS PROGRAM

Liquid Release Type	Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) (μCi/ml)[a]
A. Batch Waste Release Tanks[c]	P Each batch	P Each Batch	Principal Gamma Emitters[d]	5×10^{-7}
			I-131	1×10^{-6}
	P One Batch/M	M	Dissolved and Entrained Gases (Gamma emitters)	1×10^{-5}
	P Each Batch	M Composite[b]	H-3	1×10^{-5}
			Gross Alpha	1×10^{-7}
	P Each Batch	Q Composite[b]	Sr-89, Sr-90	5×10^{-8}
			Fe-55	1×10^{-6}
B. SSW Basin (prior to blowdown)	Each Blowdown	Each Batch	Principal Gamma Emitters[d]	5×10^{-7}
			I-131	1×10^{-6}

TABLE 6

RADIOACTIVE GASEOUS WASTE SAMPLING AND ANALYSIS PROGRAM

Gaseous Release Type		Sampling Frequency	Minimum Analysis Frequency	Type of Activity Analysis	Lower Limit of Detection (LLD) (μCi/ml)[a]
A. (1)	Radwaste Building Ventilation Exhaust	M Grab Sample	M	Principal Gamma Emitters[b,e]	$1x10^{-4}$
				H-3	$1x10^{-6}$
(2)	Fuel Handling Area Ventilation Exhaust	Continuous[d]	W[c] Charcoal Sample	I-131	$1x10^{-12}$
				I-133	$1x10^{-10}$
(3)	Containment Ventilation Exhaust	Continuous[d]	W[c] Particulate Sample	Principal Gamma Emitters[e] (I-131, Others)	$1x10^{-11}$
(4)	Turbine Building Ventilation Exhaust	Continuous[d]	M Composite Particulate Sample	Gross Alpha	$1x10^{-11}$
		Continuous[d]	Q Composite Particulate Sample	Sr-89, Sr-90	$1x10^{-11}$
		Continuous	Noble Gas Monitor	Noble Gases Gross Beta or Gamma	$1x10^{-6}$
B. (1)	Offgas Post Treatment Exhaust, whenever there is flow	M Grab Sample	M	Principal Gamma Emitters[e]	$1x10^{-4}$
(2)	Standby Gas Treatment A Exhaust, whenever there is flow.				
(3)	Standby Gas Treatment B Exhaust, whenever there is flow.				

Note: Footnotes indicated are listed in GGNS Technical Specifications, Table 4.11.2.1.2-1.

1.2 Dose Calculation for Liquid Effluents

1.2.1 The dose contribution to the maximum exposed individual from all radionuclides identified in waste tank liquid effluents released to unrestricted areas is calculated for the purpose of implementing RETS Specifications 3.11.1.2, 4.11.1.2 and 4.11.1.3.1 using the following expression: 6.9.1.9 | 1

$$D_{Tau} = \sum_i \left[A_{iTau} \sum_{1=1}^{m} \Delta t_1 \, C_{i1} \, F_1 \right] \quad \text{(millirem)} \quad (8) \qquad (1)$$

where:

A_{iTau} = Site-related ingestion dose commitment factor for radionuclide i in millirem/hr per uCi/ml.

= $K_o \; U_F \; BF_i \; DF_i$

Δt_1 = length of the 1 th time period over which C_{i1} and F_1 are averaged for all waste tank liquid releases, in hours.

C_{i1} = average concentration of radionuclide i observed in the undiluted waste tank liquid effluent during time period Δt_1 from any liquid release from the waste tank, in uCi/ml. Concentrations are determined primarily from a gamma isotopic analysis of the waste tank liquid effluent sample. For Sr-89, Sr-90, H-3, the last measured value from the most recent monthly and quarterly composite samples will be used in the dose calculation. Note: LLD values are not used in dose calculations.

F_1 = near field average dilution factor for C_i during any liquid effluent release. Defined as the ratio of the average undiluted liquid waste flow during release to the product of the average flow from the site discharge structure to unrestricted receiving waters times the applicable factor of 2 [2].

= $\frac{\text{average undiluted liquid waste flow}}{\text{average flow from site discharge} \times 2}$ [5]

K_o = units conversion factor 1.14×10^5

= $\left(10^6 \frac{\text{pCi}}{\text{uCi}} \times 10^3 \frac{\text{ml}}{\text{Kg}} \div 8766 \frac{\text{hr}}{\text{yr}}\right)$

U_F = adult fish consumption (21 kg/yr) [3].

BF_i = Bioaccumulation factor for each nuclide, i, in fish, in pCi/kg per pCi/l from Table 1.2-1 (taken from Reference 3, Table A-1).

DF_i = Dose conversion factor for each nuclide, i, for adults in preselected organ, Tau, in mrem/pCi, from Table 1.2-2 (taken from Reference 3, Table E-11).

Calculated values of A_{iTau} for radionuclides which might be observed in liquid effluents is given in Table 1.2-3.

2.0 GASEOUS EFFLUENTS

2.1 Gaseous Effluent Monitor Setpoints

2.1.1 For the purpose of implementation of Specification 3.3.7.12 of the RETS, the alarm setpoint level for continuous ventilation noble gas monitors will be calculated as follows:

S_V = Count rate of vent noble gas monitor at alarm setpoint level

$$= \text{the lesser of} \begin{cases} 0.25 \times R_t \times D_{TB} \\ \text{or} \\ 0.25 \times R_s \times D_{ss} \end{cases} \quad (1)$$

Where,

0.25 = safety factor allowing for cumulative uncertainties of measurements

D_{TB} = Dose rate limit to the total body of an individual at the Site Boundary (or at UNRESTRICTED AREAS inside the SITE BOUNDARY) required to limit dose to 500 mrem in one year.

$$= \overline{(X/Q)} \sum_i K_i \overline{Q_i} \quad \left(\leq 500 \text{ mrem} \right)$$

D_{ss} = Dose rate limit to the skin of the body of an individual at the Site Boundary required to limit dose to 3000 mrem in one year.

$$= \overline{(X/Q)} \sum_i (L_i + 1.1\, M_i)\, \overline{Q_i} \quad \left(\leq 3000 \text{ mrem} \right)$$

R_t = count rate per mrem/yr to the total body

$$= C \div \left[\overline{X/Q} \sum_i K_i \overline{Q_i} \right]$$

Where,

C = count rate of the vent monitor corresponding to grab sample radionuclide concentrations

$\overline{X/Q}$ = highest sector annual average atmospheric dispersion at the Site Boundary or at UNRESTRICTED AREAS inside the SITE BOUNDARY

= ~~5.176×10^{-6}~~ 4.537×10^{-6}* sec/m^3 in the ~~WSW~~ WNW sector.

K_i = total body dose factor due to gamma emissions from each noble gas radionuclide i (mrem/yr per uCi/m^3) from Table 2.1-1.

Q_i = rate of release of noble gas radionuclide i (uCi/sec) from the release point | 3

R_s = count rate per mrem/yr to the skin

$$= C \div \overline{X/Q} \left[\sum_i (L_i + 1.1\, M_i)\, Q_i \right] \quad | 3$$

L_i = skin dose factor due to beta emissions from isotope i (mrem/yr per uCi/m^3) from Table 2.1-1

1.1 = mrem skin dose per mrad air dose

M_i = air dose factor due to gamma emissions from isotope i (mrad/yr per uCi/m^3) from Table 2.1-1

~~* Value taken from Reference 4, Table 6.1.26.~~

* The highest ANNUAL average X/Q for the GGNS SITE BOUNDARY or UNRESTRICTED AREAS inside the SITE BOUNDARY is Hamilton Lake (WNW, 0.75 miles). This value is taken from the GGNS Final Environmental Report, Table 6.1.2a.

IV. OFFSITE DOSE CALCULATION MANUAL/PROCESS CONTROL PROGRAM REVISIONS

A. Offsite Dose Calculation Manual (ODCM) Revision 5

Revision 5 to the ODCM was reviewed and approved by the Plant Safety Review Committee on January 8, 1985. The changes within this revision can be characterized as:

- Administrative revisions
- Revisions in methodology as a result of the new GGNS Technical Specification requirements.

The revisions do not reduce the accuracy nor the reliability of the dose calculations or setpoint determinations.

A markup copy of Revision 4 is included as Attachment I. Revision 5 has been included as Attachment II and a detailed outline of Revision 5 has been provided below:

SUBJECT: Grand Gulf Nuclear Station Offsite Dose Calculation Manual (ODCM), Revision 5, January 8, 1985.

- Page 1.0-7

  *Affected Lines: 6, 8, 10 and 11

  Revision: Line 6 incorporates Technical Specification 6.9.1.9, Line 8 places a subscript for Δt_1, and Lines 10 and 11 insert the words "for radionuclide i".

  Justification: These changes were administrative in nature. Line 6 was changed to incorporate the new reporting requirements for the ODCM. Line 8 corrected an earlier typographical error and Line 10 was changed to clarify that the variable A_{itau} was specific for radionuclide i.

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* Line numbers reflect revision location in Revision 5 of the ODCM.

- Page 1.0-8

  Affected Lines: 6 and 7

  Revision: The dilution flow factor was changed from 5 to 2.

  Justification: This change corrects a typographical error in the original ODCM in which the correct dilution factor (2^5) was transposed with the subscript. As corrected it now coincides with the GGNS Final Safety Analysis Report Section 11.2.3.2.

- Page 2.0-1

  Affected Lines: 16-19, 21-24 and 26

  Revision: Lines 16-19 were revised to incorporate the following: "or at UNRESTRICTED AREAS inside the SITE BOUNDARY..."

  The equations for D_{tb} and D_{ss} were deleted from lines 19-24 and substituted with the dose rate limits of $\leq$500 mrem/yr and $\leq$3000 mrem/yr respectively.

  The release rate factor in Line 26 has been changed from $\overline{Qi}$ to Q_i'.

  Justification: GGNS Technical Specification were revised to require that doses to MEMBERS OF THE PUBLIC inside the SITE BOUNDARY be evaluated. Therefore, D_{TB} and D_{ss} were revised to incorporate this requirement.

  Since the dose rate limits for D_{TB} and DSS are set at $\leq$ the limits identified above these values have been substituted for the equations.

  The release rate variable was revised (Q_i') to more accurately reflect that it is a single release and not an average as was indicated in the previous variable. ($\overline{Qi}$).

- Page 2.0-2

  Affected Lines: 4-7, 11, 14 and 20-23

Revision: Lines 4-7 were changed to reflect UNRESTRICTED AREAS inside the SITE BOUNDARY. The X/Q factor for this location 4.537×10^{-6} in the WNW Sector was also included in this change.

Lines 20-23 were added as a footnote to identify the location of the UNRESTRICTED AREAS inside the SITE BOUNDARY and the reference document for the X/Q values.

Lines 11 and 14 were changed to reflect the new variable (Qi) for the noble gas release rate.

Justification: The UNRESTRICTED AREA was included for reasons previously identified for page 2.0-1. The X/Q factor for this location was incorporated since it represents the most conservative X/Q for the SITE BOUNDARY or UNRESTRICTED AREAS. This is not immediately apparent when you compare the new X/Q value for the WNW Sector (4.537×10^{-6}) to the previous value for the SITE BOUNDARY in the WNW Sector (5.176×10^{-6}). However examination of the previous value used for the WNW Sector indicated that the original factor was in error and should have been 3.662×10^{-6}. Therefore since the value for the UNRESTRICTED AREAS inside the SITE BOUNDARY is more restrictive than the correct value for the most conservative SITE BOUNDARY location it is now used in calculating total body and skin dose setpoints.

The variable for the release rate of noble gas was changed for reasons identified above for page 2.0-1.

- Page 2.0-4

Affected Lines: 1, 8, 9, 11, 12 and 29

Revision: Line 1 was revised to insert the word NOTES.

Lines 8 and 9 were revised to include the words "utilizing the calculations provided in Section 2.1.1 and the terms listed below".

Lines 11 and 12 were revised to include $\leq$ values for D_{TB} and DSS.

Line 29 was revised to delete the words "the most restrictive isotope".

Justification: Change to lines 1, 8, 9, 11 and 12 were administrative in nature and have no impact on the setpoint calculation in this section.

Line 29 was changed because for skin dose, Kr-89 is not the most restrictive isotope identified in Table 2.1-1. However it is the most restrictive for total body dose. Therefore to be consistent this isotope is utilized for calculation of skin doses as well.

- Page 2.0-5

Affected Lines: Line 1

Revision: The words most restrictive isotope were deleted.

Justification: The justification is the same as outlined above for page 2.0-4.

- Page 2.0-7

Affected Lines: 3, 4, 8 and 11

Revision: Lines 3 and 4 were changed to include UNRESTRICTED AREAS inside the SITE BOUNDARY.

The release rate variant for D_{tb} and D_s was revised to Q'_i.

Justification: The justification for these changes are the same as those outlined for page 2.0-1 above.

- Page 2.0-8

Affected Lines: 2, 3, 5, 6, 7, 9-12, 14, 18, 19, 23 and 24-28

Revision: Lines 2 and 3 were revised to include UNRESTRICTED AREAS inside the SITE BOUNDARY.

Lines 5 and 6 incorporated the $\overline{X/Q}$ factor (4.537×10^{-6}) for the UNRESTRICTED AREAS inside the SITE BOUNDARY.

The subscript for lines 7 and 28 were changed from a single asterisk to a double asterisk.

Lines 9-12 were modified to include the following: "The total dose parameter ... for food and ground plane pathways ...".

Line 14 was modified to include tritium, I-131, I-133.

Lines 18-19 were modified to include UNRESTRICTED AREAS inside the SITE BOUNDARY.

The release rate variable for line 23 was revised to Q_i.

Lines 24-27 were added to include a footnote describing the UNRESTRICTED AREAS inside the SITE BOUNDARY.

Justification: The justification for lines 2, 3, 5, 6, 18-19 and 24-28 are the same as that identfied for pages 2.0-1 and 2.0-2 respectively.

The changes to lines 7 and 28 were administrative in nature and have no effect on the dose calculations.

The changes to lines 9-12 were made so as to clarify the fact that Pi represents the total dose for all pathways.

The addition of tritium, I-131 and I-133 in line 14 clarifies the variable and makes it consistent with GGNS Technical Specifications.

The revision of the release rate variable is administrative in nature and has no effect on the dose calculations.

- Page 2.0-9

  Affected Lines: 2-4, 8-10, 21-23 and 24-27

  Revision: The revisions to lines 2-4, 21-23 and 24-27 are identical to those identified for page 2.0-8 above.

  Lines 8-10 were revised as follows "Qi = cumulative release. . . tritium, I-131, I-133 or material in particulate form...".

  Justification: The justification for revisions to lines 2-4, 21-23 and 24-27 are the same as identified for page 2.0-1 and 2.0-2 above.

  The revision to lines 8-10 were made so as to utilize a consistent variable Qi for Section 2.2.2a, b and c.

- Page 2.0-10

  Affected Lines: 1-3, 13,17-20, 21-24 and 25-28

  Revision: Lines 1-3 were changed as identified above for page 2.0-9.

  The release rate variable in line 13 was changed to Qi.

  Lines 17-20 were revised to incorporate the X/Q factor, (4.057×10^{-6}) for the S Sector and D/Q factor (1.408×10^{-8}) for the S Sector.

  Lines 21-24 were modified as follows: "Ri = the total dose... and m^2 · mrem/yr per uCi/sec for food and ground plane pathways...".

Lines 25-28 were added a follows:
"*This conservative approach utilizes values for the onsite MP&L gardens (Tables 2.2-3 and 2.3-1). As an alternative MP&L may use the most conservative offsite controlling locations identified in the above referenced tables."

Justification: The justification for revisions to lines 1-3 and 13 are the same as identified for page 2.0-9 above.

Lines 17-29 and 25-28 were revised, or incorporated to include those X/Q and D/Q values for the onsite MP&L gardens which are utilized to comply with Technical Specification 3.12.1. In order to provide the most conservative dose calculation for controlling locations these gardens and their applicable dispersion and deposition factors may be used. However, an alternative approach allows the use of the most conservative offsite controlling location as well. The alternative methodology will be utilized in situations where power levels are restricted by the more conservative approach. Overall this methodology is more conservative than that outlined in previous revisions to the ODCM.

Lines 21-24 were revised to clarify that Ri represents a total dose factor for all pathways.

- Page 2.0-10a

Affected Lines: 1-3 and 8 and 9

Revision: Lines 1-3 were revised as identified above for page 2.0-9.

Lines 8 and 9 were revised as follows: "meteorological parameters (most limiting, parameters will be used)...".

Justification: The justification for revisions to lines 1-3 are the same as identified for page 2.0-9 above.

Lines 8-9 were revised to indicate that the most limiting meteorological parameters will be used in implementing Specification 6.9.1 of the Radiological Effluent Technical Specification. This is consistent with the present dose calculation methodology which utilizes average meteorological parameters.

- Page 2.0-23

  Affected Lines: 5-15, 20, 21 and 22

  Revisions and Justification: Table 2.2-3 was revised as indicated in the markup to reflect the results of the 1984 Land Use Census and the location of the onsite MP&L gardens.

- Page 2.0-26

  Affected Lines: 5, 7, 9-13, 15, 20 and 22

  Revision and Justification: Table 2.3-1 was revised as identified in the markup to reflect the 1984 Land Use Census results.

- Page 2.0-28

  Affected Lines: 20, 22, 23, 25-27

  Revision and Justification: The release rate variables were consolidated and revised as identified above for pages 2.0-8, 2.0-9 and 2.0-10. This revision reduces the number of variables utilized in the setpoint and dose calculations making the equations easier to follow and therefore easier to use.

- Page 2.0-36

  Affected Lines: The entire page

Revision and Justification: This revision incorporates the methodology utilized to calculate direct radiation from the reactor units and radwaste storage tanks as required by Specification 3.11.4. This methodology will be used under the circumstances identified in 3.11.4 and also utilized to calculate direct radiation for Section III of the Semiannual Radiological Effluent Release Report.

- Page 3.0-1

  Affected Lines: 5-7

  Revision: Lines 5-7 were added as follows: "The types of vegetation and fish which are normally available for sampling are identified in Tables 3.0-4 and 3.0-5 respectively".

  Justification: This charge identifies the vegetation and species of fish which will normally be collected to meet the requirements of Technical Specification 3.12.1.

- Pages 3.0-2 - 3.0-6C

  Affected Lines: 31-32

  Revision: The footnote "from Grand Gulf Nuclear Station's Annual Radiological Environmental Operating Report was deleted.

  Justification: The footnote for these tables is no longer applicable and was therefore deleted.

- Page 3.0-3

  Affected Lines: 28, 29-36

  Revision: The TRIMWELL sample was deleted from lines 28 and 29.

  Justification: The TRIMWELL is no longer in use and was deleted from this table.

- Page 3.0-3a

  Affected Lines: 15-28

  Revision: Lines 15-28 were revised to reflect that this is now the old training center and to update the mileage for the affected sample locations.

  Justification: This information more accurately depicts these sampling locations.

- Page 3.0-4, 3.0-6a, 3.0-6b and 3.0-6c

  Revision: The mileage for various TLDs and those which are utilized to meet the technical specification requirements were updated as identified in the markup.

  Justification: This information more accurately reflects these sampling locations and the GGNS Technical Specifications.

- Pages 3.0-10 and 3.0-11

  Affected Lines: Entire pages

  Revisions and Justifications: These tables were included to outline those vegetation and fish samples which are utilized in meeting the requirements of Specification 3.12.1.

Significant Hazards Category

Revision 5 to the ODCM involves no changes to the safety-related equipment at GGNS. It does not introduce a significant reduction in the margin of safety and does not involve a significant increase in the probability or consequences of an accident previously evaluated. It does not create the possibility of a new or different kind of accident from any accident previously evaluated nor does it

NOTES For Section 2.1.1

1) The calculated setpoint values will be regarded as upper bounds for the actual setpoint adjustments. That is, setpoint adjustments are not required to be performed if the existing setpoint level corresponds to a lower count rate than the calculated value.

2) A more conservative setpoint may be calculated to minimize requirements for adjustment of the monitor ~~as follows~~ utilizing the calculations provided in Section 2.1.1 and the terms listed below:

D_{TB} = $\leq$ 500 mrem/yr 3

D_{ss} = $\leq$ 3000 mrem/yr

R_t'' = conservative count rate per mrem/yr to the total body (Xe-133 detection, Kr-89 dose)

= $C' \div (\overline{X/Q} \times K \times \overline{Q''_i})$ 3

Where,

$\overline{Q''_i}$ = Assigned release rate value of, for example, 1.0 uCi/sec, Xe-133. (See definition of C' below.) 3

C' = count rate of vent monitor for an effluent concentration of Xe-133 corresponding to a 1.0 uCi/sec release rate of Xe-133, (Note: Calculate the related concentration based on dilution flow.)

K = total body dose factor for Kr-89, the most restrictive isotope, from Table 2.1-1.

R_s'' = conservative count rate per mrem/yr to the skin

= $C' \div \left[\overline{X/Q} \times (L + 1.1M) \times \overline{Q''_i} \right]$ 3

Where

L = skin dose factor for Kr-89, ~~the most restrictive isotope,~~ from Table 2.1-1,

M = air dose factor for Kr-89 ~~the most restrictive isotope,~~ from Table 2.1-1.

3

2.2 Gaseous Effluent Dose Calculations

2.2.1.a For the purpose of implementation of Specification 3.11.2.1.a, the dose at the Site Boundary (or at UNRESTRICTED AREAS outside the SITE BOUNDARY) due to noble gases shall be calculated as follows: | 2

D_{tb} = average total body dose rate in current year (mrem/yr)

$$= \overline{X/Q} \sum K_i \overline{Q}_i'$$

D_s = average skin dose rate in current year (mrem/yr)

$$= \overline{X/Q} \sum (L_i + 1.1\, M_i)\, \overline{Q}_i'$$

2.2.1.b Organ doses due to tritium, I-131, I-133 and all radioactive materials in particulate form, with half-lives greater than eight days will be calculated for the purpose of implementation of Specification 3.11.2.1.b. as follows:

D_o = average organ dose rate in current year (mrem/yr)

$$= \sum_i W\, P_i\, \overline{Q}'_i \qquad \text{where}$$

W = controlling sector annual average atmospheric dispersion at the Site Boundary (or UNRESTRICTED AREAS outside the SITE BOUNDARY) for the appropriate pathway. | 2

$$= \begin{cases} \overline{X/Q} = \text{4.537 } (\text{5.176}) \times 10^{-6*} \text{ sec/m}^3 \text{ for inhalation in the WNW sector.} \\ \overline{D/Q} = 1.301 \times 10^{-8**} \text{ m}^{-2} \text{ for other pathways in the SSE sector} \end{cases}$$

| 2

* See footnote page 2.0-2

** Value taken from Reference 4, Table 6.1.26.

P_i = dose parameter for radionuclide i, (mrem/yr per uCi/m³) for inhalation and (m² · mrem/yr per uCi/sec) for ~~food~~ ground plane ~~other~~ pathways, from Table 2.2-1.a-b.

$\overline{Q'}_i$ = average release rate of isotope i of ~~radioiodine~~ Tritium, I-131, I-133 or other radionuclide in particulate form, with half-life greater than eight (8) days in the current year (uCi/sec).

2.2.2.a For the purpose of implementation of Specification 3.11.2.2, the air dose at the Site Boundary or at UNRESTRICTED AREAS within the SITE BOUNDARY shall be determined as follows:

D_γ = air dose due to gamma emissions from noble gas radionuclide i (mrad)

$$= 3.17 \times 10^{-8} \sum_i M_i \overline{X/Q'} Q_i$$

Where,

$\overline{X/Q'}$ = relative concentration for the Site Boundary or UNRESTRICTED AREAS within the SITE BOUNDARY

$= 4.537 \times 10^{-6}$* sec/m³, in the WNW sector

M_i = air dose factor due to gamma emissions from noble gas radionuclide i (mrad/yr per uCi/m³) from Table 2.1-1

Q_i = cumulative release of noble gas radionuclide i, tritium, I-131, I-133, or material in particulate form over the period of interest (uCi)

Note: 3.17×10^{-8} is the inverse of the number of seconds per year, and

D_β = air dose due to beta emissions from noble gas radionuclide i (mrad)

$$= 3.17 \times 10^{-8} \sum_i N_i \overline{X/Q'} Q_i$$

See Footnote page 2.0-2.

* ~~Value taken from Reference 4, Table 6.1.26.~~

Where,

N_i = air dose factor due to beta emissions from noble gas radionuclide i (mrad/yr per uCi/m^3) from Table 2.1-1

$\overline{X/Q'}$ = relative concentration for the Site Boundary or UNRESTRICTED AREAS inside the SITE BOUNDARY

= ~~5.176~~ 4.537 x 10^{-6}* sec/m^3, in the ~~WSW~~ WNW sector

Q_i = cumulative release of noble gas radionuclide i over the period of interest (uCi). tritium, I-131, I133 or material in particulate form

2.2.2.b Dose to an individual from tritium, I-131, I-133 and radioactive materials in particulate form, with half-lives greater than eight (8) days will be calculated for the purpose of implementation of Specification 3.11.2.3 as follows:

D_p = dose to an individual from radioiodines and radionuclides in particulate form, with half-life greater than eight days (mrem)

$$= 3.17 \times 10^{-8} \sum_i R_i \quad W' \, Q_i$$

Where,

W' = relative concentration at a controlling location for an individual

$$= \begin{cases} \overline{X/Q'} = \dfrac{\text{~~3.001 x } 10^{-6}~~ 4.057}{\text{sector}} \text{ sec/m}^3 \text{ for inhalation in the ~~SW~~ S} \\ \overline{D/Q'} = \dfrac{\text{~~4.440 x } 10^{-8}~~ 1.408}{\text{~~SW~~ S Sector}} \text{ m}^{-2} \text{ for other pathways in the} \end{cases}$$

* This conservative approach utilizes values for the onsite MP&L gardens (Tables 2.2-3 and 2.3-1). As an alternative MP&L may use the most conservative offsite controlling locations identified in the above referenced tables.

~~** Value taken from reference 4 Table 6.1.26~~

~~** Values taken from Tables 2.2-3 and 2.3-1~~

R_i = the total dose factor for radionuclide i, (mrem/yr per uCi/m^3) and ~~or~~ (m^2 . mrem/yr per uCi/sec) for food and ground plane pathways from Tables 2.2-2a - d.

$\tilde{Q}'_i$ = cumulative release of radionuclide i of noble gas, tritium, I-131, ~~iodine or~~ I-133 or material in particulate form over the period of interest (uCi)

2.2.2.c For the purpose of implementing Specification 6.9.1, of the RETS, dose calculations will be performed using the above equations with the substitution of average meteorological parameters which prevailed for the period of the report. (most limiting parameter will be used) 2

TABLE 2.2-3

CONTROLLING RECEPTORS, LOCATIONS, AND PATHWAYS

Sector	Distance (Meters)	Miles	Pathway	Age Group	Origin (for info only)
N	~~1207~~ 2100	~~0.75~~ 1.00	Vegetation	Infant	- garden
NNE	1207	0.75	Inhal/Gnd Plane	Infant	- residence
NE	~~2414~~ 1100	~~1.50~~ 0.50	~~Inhal/Gnd Plane~~ Vegetation	~~Infant~~ child	- residence
ENE	~~4023~~ 4400	2.50	Vegetation	Child	- garden
E	~~4023~~ 982	~~2.50~~ 0.61	~~Vegetation~~ Inhal/Gnd Plane	~~Infant~~ Adult	- ~~garden~~ resident
ESE	~~1207~~ 7000	~~0.75~~ 4.00	~~Inhal/Gnd Plane~~ Vegetation	~~Teenager~~ Adult	- ~~residence~~ garden
SE	~~2414~~ 3400	~~1.50~~ 2.00	Vegetation	~~Child~~ Adult	- ~~garden~~ residence
SSE	~~2414~~ 1800	~~1.50~~ 1.00	~~Vegetation~~ Inhal/Gnd Plane	Adult	- ~~garden~~ residence
S	~~4023~~ 805	~~2.50~~ 0.50	~~Inhal/Gnd Plane~~ Vegetation	Child	- ~~residence~~ hypothetical*
SSW	3218	2.00	Inhal/Gnd Plane	Infant	- hypothetical
SW	1432	0.90	~~Vegetation~~ Inhal/Gnd Plane	Child	- ~~garden~~ residence
WSW	8047	5.00	Cow/Milk	Infant	- hypothetical
W	8047	5.00	Cow/Milk	Infant	- hypothetical
WNW	7242	4.50	Inhal/Gnd Plane	Infant	- residence
NW	8047	5.00	Cow/Milk	Infant	- hypothetical
NNW	~~2414~~ 1207	~~1.50~~ 0.75	~~Inhal/Gnd Plane~~ Vegetation	Child	- ~~residence~~ hypothetical*

2

Table based on 1983 4 Land Use Census

* These locations represent MP&L gardens located inside the site boundary

TABLE 2.3-1

ATMOSPHERIC DISPERSION PARAMETERS* FOR TECHNICAL SPECIFICATIONS 4.11.2.2, 4.11.2.3, 4.11.2.5.1

SECTOR	MILES	X/Q	D/Q
N	~~0.75~~ 1.00	~~1.868 x 10^{-6}~~ 1.164	~~7.751 x 10^{-9}~~ 4.759
NNE	0.75	1.129 x 10^{-6}	5.298 x 10^{-9}
NE	~~1.50~~ 0.50	~~2.391~~ x 10^{-7} 1.520 x 10^{-6}	~~1.437~~ x 10^{-9} 9.144
ENE	2.50	7.358 x 10^{-8}	4.341 x 10^{-10}
E	~~2.50~~ 0.61	~~8.434~~ x 10^{-8} 8.618 x 10^{-7}	~~4.581~~ x 10^{-10} 5.130 x 10^{-9}
ESE	~~0.75~~ 4.00	5.134 x 10^{-7} 3.206 x 10^{-8}	~~3.348~~ x 10^{-9} 1.824 x 10^{-10}
SE	~~1.50~~ 2.00	~~2.628~~ x 10^{-7} 1.636 x 10^{-7}	~~1.471~~ x 10^{-9} 8.941 x 10^{-10}
SSE	~~1.50~~ 1.00	~~3.760~~ x 10^{-7} 7.347 x 10^{-7}	~~1.288~~ x 10^{-9} 3.587 x 10^{-9}
S	~~2.50~~ 0.50	~~3.038~~ x 10^{-7} 4.057 x 10^{-6}	~~9.074~~ x 10^{-10} 1.408 x 10^{-8}
SSW	2.00	5.063 x 10^{-7}	1.068 x 10^{-9}
SW	~~3.001~~ x 10^{-6} 0.90	2.653 x 10^{-6}	~~4.440~~ x 10^{-9} 4.463 x 10^{-9}
WSW	5.00	3.931 x 10^{-7}	3.177 x 10^{-10}
W	5.00	4.259 x 10^{-7}	3.746 x 10^{-10}
WNW	4.50	3.164 x 10^{-7}	3.739 x 10^{-10}
NW	5.00	1.584 x 10^{-7}	2.733 x 10^{-10}
NNW	~~1.50~~ 0.75	~~7.237~~ x 10^{-7} 2.199 x 10^{-6}	~~2.342~~ x 10^{-9} 7.650 x 10^{-9}

* Reference: Grand Gulf Nuclear Station, Environmental Report, Table 6.1.26 6.1.28, 6.1.29 and ODCM Table 2.2-3.

2.4 Definitions of Gaseous Effluents Parameters (Continued)

D_{TB} = limiting dose rate to the total body based on the limit of 500 mrem in one year. (2.1.1)

D_{ss} = limiting dose rate to the skin based on the limit of 3000 mrem in one year. (2.1.1) | 3

L = skin dose factor for Kr-89, the most restrictive isotope (mrem/yr per uCi/m³) from Table 2.1-1 (2.1.2)

L_i = skin dose factor due to beta emissions from isotope i (mrem/yr per uCi/m³) from Table 2.1-1 (2.1.1)

M = air dose factor for Kr-89, the most restrictive isotope (mrad/yr per uCi/m³), from Table 2.1-1 (2.1.2)

M_i = air dose factor due to gamma emissions from isotope i (mrad/yr per uCi/m³) from Table 2.1-1 (2.1.1)

N_i = air dose factor due to beta emissions from noble gas radionuclide i (mrad/yr per uCi/m³) from Table 2.1-1 (2.2.2.a)

P_i = dose parameter for radionuclide i, (mrem/yr per uCi/m³) for inhalation from (m² mrem/yr per uCi/sec) for other pathways, from Table 2.2-1 (2.2.1.b) | 3

$\dot{Q}_i$ = rate of release of noble gas radionuclide i (uCi/sec) (2.1.1) | 3

For the current year (uCi/sec) tritium, I-131, I-133

$\overline{Q'_i}$ = average release rate of isotope i of ~~radioiodine~~ or other radionuclide in particulate form, with half-life greater than eight (8) days ~~in the current year (uCi/sec)~~ (2.2.1.b)

$\bar{Q}_i$ = ~~cumulative release of noble gas radionuclide i over the period of interest (uCi)~~ (2.2.2.a)

Noble gases, tritium, I-131, I-133

$\bar{Q}'_i$ = cumulative release of radionuclide i of iodine or material in particulate form over the period of interest $(uCi)_\Lambda$ (2.2.2.b)

(2.2.2.a)

3.0 RADIOLOGICAL ENVIRONMENTAL MONITORING

Sampling locations as required in section 3/4.12.1 of the Radiological Effluent Technical Specification are described in Table 3.0-1 through 3.0-3 and shown on maps in Figures 3.0-1 through 3.0-4. The types of vegetation and fish which are normally available for sampling are identified in Tables 3.0-4 and 3.0-5 respectively

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TABLE 3.0-1

AIR SAMPLER COLLECTION SITES

AIR SAMPLERS

NUMBER	FIGURE	LOCATION	
* AS-1 PG	3.0-3	Southeast of GGNS at the Port Gibson City Barn. (Sector G Radius 5.5 miles)	
AS-2 61N	3.0-2	North Northeast of GGNS, on Hwy 61 South across from the Yokena Church. (Sector B Radius 13 miles)	
* AS-3 61 VA	3.0-2	North Northeast of GGNS on Hwy 61 south at the Vicksburg Airport. (Sector B Radius 18 miles)	
AS-4 GJOE	3.0-1	Southwest of GGNS. Glodjo property on Waterloo Road. (Sector L Radius .9 miles)	| 4
AS-5 TC	3.0-1	South of GGNS behind MP&L training center building. (Sector J Radius .4 miles)	
* AS-6 RS	3.0-1	Northeast of GGNS, South of Grand Gulf Road. (Sector C Radius .8 miles)	| 4
* AS-7 MT	3.0-1	North of GGNS, located next to the Meteorological Tower. (Sector A Radius .8 miles)	
* AS-8 WR	3.0-1	East of GGNS, located at Maggie Jackson's trailer on Waterloo Road near the Eastern Site Boundary. (Sector E Radius .5 miles)	| 4
AS-9 GGMP	3.0-1	North of GGNS, located in Grand Gulf Military Park. (Sector A Radius 1.5 miles)	| 4
AS-10 NLT	3.0-3	West Northwest of GGNS, located at Newellton, Louisiana. (Sector P Radius 12.5 miles)	
AS-11 STJ	3.0-3	West Southwest of GGNS, located at St. Joseph, Louisiana. (Sector M Radius 13.0 miles)	

* Technical Specification requirements

~~From Grand Gulf Nuclear Station's Annual Radiological Environmental Operating Report.~~

TABLE 3.0-2

MISCELLANEOUS COLLECTION SITES

	Figure	
MILK SAMPLES (CONTROL LOCATION)		
Alcorn State University*	3.0-3	Located Southwest of GGNS. (Sector K Radius 10.5 miles)
Rosco Johnson farm	3.0-3	Located Southeast of GGNS. (Sector G Radius 9 miles)
Hazetta Warren farm	3.0-3	Located in Louisiana West Northwest of GGNS. (Sector N Radius 8.5 miles)
CISTERN WATER		
1. Trimble Cistern*	3.0-4	Located east of GGNS at the Trimble Tenant House. (Sector E Radius .5 miles)
2. Willis Cistern*	3.0-3	Located at the C.E. Willis house East Northeast of GGNS across from the Shiloh Baptist Church. (Sector D Radius 6 miles)
GROUND WATER		
1. PGWELL*	3.0-4	PORT GIBSON WELL - Taken at Port Gibson City Water lift Station. (Sector G Radius 5.0 miles)
2. GGMPWELL*	3.0-4	GRAND GULF MILITARY PARK - Taken from faucet at the Grand Gulf Military Park. (Sector A Radius 1.5 miles) | 3
~~3. TRIMWELL~~	~~3.0-4~~	~~TRIMBLE house faucet. (Sector E Radius 0.7 miles)~~ | 3
3~~4~~. LAKE BRUIN	3.0-3	Taken from faucet at the bath house in Lake Bruin State Park, Louisiana. (Sector M Radius 9.5 miles) | 3

* Technical Specification requirements

~~From Grand Gulf Nuclear Station's Annual Radiological Environmental Operating Report.~~ \| 3

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TABLE 3.0-2 (CONTINUED)

	Figure		
SURFACE WATER			
Upstream *	3.0-4	4500 ft. upstream of the GGNS outfall to allow adequate mixing of the Mississippi and Big Black Rivers. (Sector Q)	
Downstream *	3.0-4	5000 ft. downstream of GGNS outfall, near the most southern radial well. (Sector N)	
Discharge Basin *	3.0-4	West of GGNS, 0.5 miles, Sector P	
VEGETATION			
Broad Leaf Vegetation*	3.0-4	South of GGNS near the old training center (Sector J, 0.5 miles) and North Northwest of GGNS near the Meteorological Tower (Sector R, 0.75 miles)	4
		Alcorn State University Southwest of GGNS (Sector K, 10.5 miles)	4
FISH SAMPLES			
Commercially or recreationally important species *	3.0-4	Downstream of the discharge point in the Mississippi River	4
	3.0-4	Upstream of Discharge Point uninfluenced by Plant Operations.	

Note

The above locations are gardens maintained by MP&L inside the SITE BOUNDARY in order to provide a more conservative calculation of dose due to the potential ingestion of contaminated vegetation. These two sampling sites exceed the requirements of Technical Specification 3.12.1

* Technical Specification requirements
From Grand Gulf Nuclear Station's Annual Radiological Environmental Operating Report.

SEDIMENT SAMPLES *	Figure 3.0-4	Collected semiannually during the low water periods of the Tidal Basin - samples taken downstream of the outfall in the vicinity of the boat landing near Hamilitaon Lake outlet and in the Barge Slip. (Sector N and Q, 2 miles)
SEDCONT		Collected upstream from barge slip at Upper Grand Gulf Landing (Sector R, 2.2 miles) 3

* Technical Specification requirements
~~From Grand Gulf Nuclear Station's Annual Radiological Environmental Operating Report.~~ 3

ODCM
TABLE 3.0-3
TLD LOCATIONS
Page 1 of 6

TLD NO.	LOCATION	FIGURE	SECTOR	MILE	
* M-00	Maintained in lead shield during the exposure period	-	-	-	3
* M-01	REA Pole-East of Entry Gate at Lake Claiborne	3.0-3	E	3.5	
M-02	REA Pole Left of Entry Gate Windsor Ruins	3.0-3	L	7.0	
M-03	REA Pole-East Side Hwy 61 P.G. Country Club entrance	3.0-3	H	7.0	
M-04	MP&L Pole-Hwy 547 North Side Between Twin Power Poles		G	6.5	3
M-05	50 yards North of Hwy 18 Approximately 5 miles East of U.S. 61	3.0-3	F	9.0	
M-06	REA Pole-East of Willows Beyond MMB Church MS Hwy 462		E	~~8.0~~ 10.0	
* M-07	Port Gibson City Barn AS-1	3.0-3	G	5.5	
M-08	West Side Big Black River South Entrance	3.0-3	C	8.5	
M-09	Oak Tree Hanger-South Warner Tully Camp	3.0-3	D	3.5	
* M-10	Entrance Gate Grand Gulf Military Park	3.0-1	R	1.5	
M-11	Hwy 61 3 miles North of Big Black River at Twin Tower	3.0-3	C	10.5	
M-12	Hwy 61 at AS-2-61 North Yokena	3.0-2	B	13.0	
M-13	Hwy 61 LeTourneau Hill West Side of Road	3.0-2	B	15.0	

* Technical Specification requirements

~~From Grand Gulf Nuclear Station's Annual Radiological Environmental Operating Report.~~ 3

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TABLE 3.0-3 (CONTINUED)

TLD LOCATIONS

TLD NO.	LOCATION	FIGURE	SECTOR	MILE	
* M-14 (CONTROL)	Hwy 61 AS-3-61VA at Casket Company	3.0-2	B	18.0	
M-15	Barge Slip (South edge)	3.0-1	P	1.5	
* M-16	AS-7 MET Tower	3.0-1	A	0.8	3
M-17	AS-6-RS Grand Gulf Road	3.0-1	C	0.5	
* M-18	Railroad Crossing Eastern Site Boundary	3.0-1	F	0.5	
M-19	Behind Burn Pit on Fence at Eastern Site Boundary	3.0-1	E	0.5	
M-20	Eastern site boundary behind hazardous waste storage area	3.0-1	F	0.5	3
M-21	AS-5-TC Training Center	3.0-1	J	0.4	3
M-22	100 yards south of RR Entrance Crossing on West Side	3.0-1	G	0.5	3
M-23	County Road/Heavy Haul Road 50 Yards North on Power Pole	3.0-1	Q	0.5	
M-24	Upper Grand Gulf Landing	3.0-1	R	2.2	3
* M-25	Hamilton Lake Boat Launch	3.0-1	N	1.0	
M-26	Hamilton Lake Outfall	3.0-1	N	1.5	3
* M-27	South Point Site Boundary 200 Yards along Property Line	3.0-1	M	1.5	
* M-28	AS-4-Glodjo Residence Glodjo	3.0-1	L	0.9	
M-29	In sharp curve of Waterloo Road to Waterloo Plantation	3.0-1	K	1.5	
* M-30	Arnold Acres Trailer Park Entrance	3.0-1	J	1.1	3

* Technical Specification requirements

~~From Grand Gulf Nuclear Station's Annual Radiological Environmental Operating Report.~~ 3

TLD NO.	LOCATION	FIGURE	SECTOR	MILE	
M-31	Duplicate TLD Installed at designated Site Number	-	-	-	
M-32	Duplicate TLD Installed at designated Site Number	-	-	-	
* M-33	Newellton, Louisiana Water Tower	3.0-3	P	12.5	3
* M-34	Primary Levee at End of County Road at Point Pleasant, Louisiana	3.0-3	R	8.0	3
* M-35	Mor Landing - Lake Yucatan	3.0-3	Q	8.0	
* M-36	Curve on 608 Point Nearest GGNS, at Power Pole	3.0-3	P	5.0	
M-37	Winter Quarters Home	3.0-3	N	8.0	
* M-38	Lake Bruin State Park Second Pole	3.0-3	M	9.5	3
* M-39	St. Joseph, Louisiana, Aux. Water Tank	3.0-3	M	13.0	3
* M-40	International Paper Road, Approximately 5 miles from Site	3.0-3	M	5.0	
* M-41	Heavy Haul Road - J Pipe on Concrete Block	3.0-1	P	1.0	
* M-42	Heavy Haul Road North Iron Gate	3.0-1	Q	1.0	
* M-43	Gin Lake Entrance	3.0-1	R	1.2	
* M-44	Truck Bypass on Grand Gulf Road	3.0-1	C	0.5	
* M-45	Visitor Center Gate East Side	3.0-1	D	0.5	

* Technical Specification requirements

~~From Grand Gulf Nuclear Station's Annual Radiological Environmental Operating Report.~~ 3

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TABLE 3.0-3 (CONTINUED)

TLD LOCATIONS

TLD NO.	LOCATION	FIGURE	SECTOR	MILE	
* M-46	Power Pole Across from Grand Gulf/Waterloo roads intersection	3.0-1	E	1.0	
* M-47	Bridge 0.6 miles past Rodney Road/Greenwood Road intersection North Side	3.0-3	L	5.2	3
* M-48	Property Line Fence 0.4 miles on Greenwood Road on West Side	3.0-3	K	4.8	
* M-49	Fork in Weathers Road	3.0-3	H	4.5	
* M-50	Panola Hunting Club Entrance		B	5.5	3
* M-51	Power Pole 0.5 miles on Gravel Road to Big Black on West Side	3.0-3	C	4.8	
* M-52	Power Pole-Waterloo Road Marked with White Paint	3.0-1	K	1.0	
* M-53	Arnold Acres Property Fence Past Trailer Park	3.0-1	H	1.1	3
* M-54	Bottom of curve past Arnold's house	3.0-1	G	1.0	3
* M-55	Behind Bonner's Beauty Shop at MSBH Air Sample	3.0-3	D	5.0	
* M-56	Hwy 61 South at "All Creatures Veterinary Hospital"	3.0-3	G	5.0	
* M-57	Hwy 61 North Behind the Welcome to Port Gibson sign	3.0-3	F	4.5	
* M-58	Big Bayou Pierre Bridge Southwest End	3.0-3	E	5.0	
* M-59	Off Levee at Winter Quarters Hunting Camp	3.0-3	N	5.1	

* Technical Specification requirements

~~From Grand Gulf Nuclear Station's Annual Radiological Environmental~~ Operating Report. | 3

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TABLE 3.0-3 (CONTINUED)
TLD LOCATIONS

TLD NO.	LOCATION	FIGURE	SECTOR	MILE	
M-60	Duplicate TLD	-	-	-	
M-61	Protected area fence by the vehicle entrance gate	Not Shown	P	Onsite	
M-62	Protected area fence Northeast corner MP&L parking lot	"	N ~~parking lot~~	"	
M-63	Protected area fence middle MP&L parking lot	"	N	"	
M-64	Protected area fence Southeast corner MP&L parking lot	"	M	"	3
M-65	South protected area fence behind MP&L warehouse	"	L	"	
M-66	South protected area fence across from cooling tower	"	K	"	
M-67	South protected area fence east end	"	J	"	3
M-68	East protected area fence across from chlorination tank	"	H	"	
M-69	East protected area fence near electric bus	"	G	"	
M-70	North fence behind turbine bldg.	"	F	"	
M-71	133' railway bay	"	C	"	3
M-72	133' railway bay	"	B	"	
M-73	Corner of fence outside control bldg.	"	P	"	

* Technical Specification requirements
~~From Grand Gulf Nuclear Station's Annual Radiological Environmental Operating Report.~~ 3

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TABLE 3.0-3 (CONTINUED)

TLD LOCATIONS

TLD NO.	LOCATION	FIGURE	SECTOR	MILE	
M-74	Midway of North fence	Not Shown	P	Onsite	
M-75	Corner in fence in front of Maintenance Shop	"	A	"	
M-76	Southeast corner SSW Basins	"	A	"	
M-77	Protected area fence beside maintenance shop	"	R	"	
M-78	Outside vault in Admin. Bldg.	"	Q	"	
M-79	Wall in Central Records (middle)	"	Q	"	3
M-80	Wall in Central Records old library location	"	Q	"	
M-81	Inside Admin. Bldg., 2nd floor, northeast wall	"	Q	"	
M-82	Tech Support Area	"	Q	"	
M-83	Tech Support Secretary's office	"	Q	"	3
M-84	Security Island	"	P	"	
M-85	Rotating duplicate	-	-	-	
* M-86	Bechtel Gate North Site Boundary	3.0-1	B	0.5	
* M-87	Intersection of Rodney Road & transmission line	3.0-3	J	3.5	
* M-88	River mile marker 409.5	3.0-1	A	4.2	3
* M-89	Middle Ground Island	3.0-1	R	4.4	
* M-90	Across from Middle Ground Island	3.0-1	Q	3.5	
M-91	Transmission line by pond	3.0-1	J	4.5	

* Technical Specification requirements

~~From Grand Gulf Nuclear Station's Annual Radiological Environmental Operating Report.~~ 3

ATTACHMENT II

OFFSITE DOSE CALCULATION MANUAL

GRAND GULF NUCLEAR STATION

ODCM
LIST OF EFFECTIVE PAGES

PAGE NO.	REV. NO.	PAGE NO.	REV. NO.
i	5	2.0-22	1
ii	2	2.0-23	5
iii	2	2.0-24	2
iv	2	2.0-25	0
v	1	2.0-26	5
vi	2	2.0-27	3
vii	5	2.0-28	5
		2.0-29	3
1.0-1	0	2.0-30	3
1.0-2	2	2.0-31	0
1.0-3	2	2.0-32	0
1.0-4	1	2.0-33	0
1.0-5	0	2.0-34	0
1.0-6	1	2.0-35	4
1.0-7	5	2.0-36	5
1.0-8	5	3.0-1	5
1.0-9	2	3.0-2	5
1.0-10	0	3.0-3	5
1.0-11	0	3.0-3a	5
1.0-12	0	3.0-3b	5
1.0-13	2	3.0-4	5
1.0-14	1	3.0-5	5
1.0-15	4	3.0-6	5
		3.0-6a	5
2.0-1	5	3.0-6b	5
2.0-2	5	3.0-6c	5
2.0-3	2	3.0-7	3
2.0-4	5	3.0-8	1
2.0-5	5	3.0-9	3
2.0-6	0	3.0-10	5
2.0-7	5	3.0-11	5
2.0-8	5		
2.0-9	5		
2.0-10	5		
2.0-10a	5		
2.0-11	1		
2.0-12	1		
2.0-13	2		
2.0-14	1		
2.0-15	2		
2.0-16	2		
2.0-17	1		
2.0-18	2		
2.0-19	1		
2.0-20	1		
2.0-21	2		

1.2 Dose Calculation for Liquid Effluents

1.2.1 The dose contribution to the maximum exposed individual from all radionuclides identified in waste tank liquid effluents released to unrestricted areas is calculated for the purpose of implementing RETS Specifications 3.11.1.2, 4.11.1.2, 4.11.1.3.1, and 6.9.1.9 using the following expression: | 5

$$D_{Tau} = \sum_{i} \left[A_{iTau} \sum_{1=1}^{m} \Delta t_1 \; C_{i1} \; F_1 \right] \quad \text{(millirem)} \quad \begin{matrix} (1) \\ (8) \end{matrix} \quad | \; 5$$

where:

A_{iTau} = Site-related ingestion dose commitment factor for radionuclide i, in millirem/hr per uCi/ml. | 5

= $K_o \; U_F \; BF_i \; DF_i$

Δt_1 = length of the time period over which C_{i1} and F_1 are averaged for all waste tank liquid releases, in hours.

C_{i1} = average concentration of radionuclide i observed in the undiluted waste tank liquid effluent during time period Δt_1 from any liquid release from the waste tank, in uCi/ml. Concentrations are determined primarily from a gamma isotopic analysis of the waste tank liquid effluent sample. For Sr-89, Sr-90, H-3, the last measured value from the most recent monthly and quarterly composite samples will be used in the dose calculation. Note: LLD values are not used in dose calculations.

F_1 = near field average dilution factor for C_i during any liquid effluent release. Defined as the ratio of the average undiluted liquid waste flow during release to the product of the average flow from the site discharge structure to unrestricted receiving waters times the applicable factor of 2[5]. 5

= $\frac{\text{average undiluted liquid waste flow}}{\text{average flow from site discharge} \times 2}$ 5

K_o = units conversion factor 1.14×10^5

$= \left(10^6 \ \frac{pCi}{uCi} \times 10^3 \ \frac{ml}{Kg} \div 8766 \ \frac{hr}{yr} \right)$

U_F = adult fish consumption (21 kg/yr) [3].

BF_i = Bioaccumulation factor for each nuclide, i, in fish, in pCi/kg per pCi/l from Table 1.2-1 (taken from Reference 3, Table A-1).

DF_i = Dose conversion factor for each nuclide, i, for adults in preselected organ, Tau, in mrem/pCi, from Table 1.2-2 (taken from Reference 3, Table E-11).

Calculated values of A_{iTau} for radionuclides which might be observed in liquid effluents is given in Table 1.2-3.

2.0 GASEOUS EFFLUENTS

2.1 Gaseous Effluent Monitor Setpoints

2.1.1 For the purpose of implementation of Specification 3.3.7.12 of the RETS, the alarm setpoint level for continuous ventilation noble gas monitors will be calculated as follows:

S_V = Count rate of vent noble gas monitor at alarm setpoint level

$$= \text{the lesser of} \begin{cases} 0.25 \times R_t \times D_{TB} \\ \text{or} \\ 0.25 \times R_s \times D_{ss} \end{cases} \quad (1)$$

Where,

0.25 = safety factor allowing for cumulative uncertainties of measurements

D_{TB} = Dose rate limit to the total body of an individual at the SITE BOUNDARY or at UNRESTRICTED AREAS inside the SITE BOUNDARY required to limit dose to 500 mrem in one year. 5

$= \leq$ 500 mrem/yr.

D_{ss} = Dose rate limit to the skin of the body of an individual at the SITE BOUNDARY or at UNRESTRICTED AREAS inside the SITE BOUNDARY required to limit dose to 3000 mrem in one year. 5

$= \leq$ 3000 mrem/yr 5

R_t = count rate per mrem/yr to the total body

$$= C \div \left[\overline{X/Q} \sum_i K_i Q'_i \right] \quad 5$$

Where,

C = count rate of the vent monitor corresponding to grab sample radionuclide concentrations

$\overline{X/Q}$ = highest sector annual average atmospheric dispersion at the SITE BOUNDARY or at UNRESTRICTED AREAS inside the SITE BOUNDARY | 5

= $\underline{4.537 \times 10^{-6}}$* sec/$m^3$ in the $\underline{WNW}$ sector.

K_i = total body dose factor due to gamma emissions from each noble gas radionuclide i (mrem/yr per uCi/m^3) from Table 2.1-1.

Q_i' = rate of release of noble gas radionuclide i (uCi/sec) from the release point | 5

R_s = count rate per mrem/yr to the skin

$= C \div \overline{X/Q} \left[\sum_i (L_i + 1.1\, M_i)\, Q_i' \right]$ | 5

L_i = skin dose factor due to beta emissions from isotope i (mrem/yr per uCi/m^3) from Table 2.1-1

1.1 = mrem skin dose per mrad air dose

M_i = air dose factor due to gamma emissions from isotope i (mrad/yr per uCi/m^3) from Table 2.1-1

* The highest annual average X/Q for the GGNS SITE BOUNDARY or UNRESTRICTED AREAS inside the SITE BOUNDARY is Hamilton Lake (WNW, 0.75 miles). This value is taken from the Grand Gulf Nuclear Station Final Environmental Report, Table 6.1.28. | 5

NOTES For Section 2.1.1

1) The calculated setpoint values will be regarded as upper bounds for the actual setpoint adjustments. That is, setpoint adjustments are not required to be performed if the existing setpoint level corresponds to a lower count rate than the calculated value.

2) A more conservative setpoint may be calculated to minimize requirements for adjustment of the monitor utilizing the calculations provided in section 2.1.1 and the terms listed below:

D_{TB} = $\leq$ 500 mrem/yr

D_{ss} = $\leq$ 3000 mrem/yr

R_t" = conservative count rate per mrem/yr to the total body (Xe-133 detection, Kr-89 dose)

$$= C' \div (\overline{X/Q} \times K \times \overline{Q}"_i)$$

Where,

$\overline{Q}$" = Assigned release rate value of, for example, 1.0 uCi/sec, Xe-133. Flow rate utilized is the maximum designed flow. (See definition of C' below.)

C' = count rate of vent monitor for an effluent concentration of Xe-133 corresponding to a 1.0 uCi/sec release rate of Xe-133, (Note: Calculate the related concentration based on dilution flow.)

K = total body dose factor for Kr-89, the most restrictive isotope, from Table 2.1-1.

R_s" = conservative count rate per mrem/yr to the skin

$$= C' \div \left[\overline{X/Q} \times [L + 1.1M) \times \overline{Q}"_i \right]$$

Where

L = skin dose factor for Kr-89, from Table 2.1-1,

M = air dose factor for Kr-89, from Table 2.1-1. | 5

2.2 Gaseous Effluent Dose Calculations

2.2.1.a For the purpose of implementation of Specification 3.11.2.1.a, the dose at the SITE BOUNDARY or at UNRESTRICTED AREAS within the SITE BOUNDARY due to noble gases shall be calculated as follows: | 5

D_{tb} = average total body dose rate in current year (mrem/yr)

$$= \overline{X/Q} \sum K_i Q_i' \quad | 5$$

D_s = average skin dose rate in current year (mrem/yr)

$$= \overline{X/Q} \sum (L_i + 1.1 M_i) Q_i' \quad | 5$$

2.2.1.b Organ doses due to tritium, I-131, I-133 and all radioactive materials in particulate form, with half-lives greater than eight days will be calculated for the purpose of implementation of Specification 3.11.2.1.b. as follows:

D_o = average organ dose rate in current year (mrem/yr)

$$= \sum_i W \; P_i \overline{Q'}_i \qquad \text{where}$$

W = controlling sector annual average atmospheric dispersion at the SITE BOUNDARY or UNRESTRICTED AREAS inside the SITE BOUNDARY for the appropriate pathway. 5

$$= \begin{cases} \overline{X/Q} = 4.537 \times 10^{-6*} \text{ sec/m}^3 \text{ for inhalation in the WNW sector.} & 5 \\ \overline{D/Q} = 1.301 \times 10^{-8**} \text{ m}^{-2} \text{ for other pathways in the SSE sector} & 5 \end{cases}$$

P_i = the total dose parameter for radionuclide i, (mrem/yr per uCi/m³) for inhalation and (m² · mrem/yr per uCi/sec) for food and ground plane pathways, from Table 2.2-1.a-b. 5

$\overline{Q'}_i$ = average release rate of isotope i of tritium, I-131, I-133 or other radionuclide in particulate form, with half-lives greater than eight (8) days in the current year (uCi/sec). 5

2.2.2.a For the purpose of implementation of Specification 3.11.2.2, the air dose at the SITE BOUNDARY or at UNRESTRICTED AREAS inside the SITE BOUNDARY shall be determined as follows: 5

D_γ = air dose due to gamma emissions from noble gas radionuclide i (mrad)

$$= 3.17 \times 10^{-8} \sum_i M_i \ \overline{X/Q'} \ Q_i \qquad 5$$

* The highest annual average X/Q for the GGNS SITE BOUNDARY or UNRESTRICTED AREAS inside the SITE BOUNDARY is Hamilton Lake (WNW, 0.75 miles). This value is taken from the Grand Gulf Nuclear Station Final Environmental Report, Table 6.1.28. 5

** Value taken from Reference 4, Table 6.1.26

Where,

$\overline{X/Q'}$ = relative concentration for the SITE BOUNDARY or UNRESTRICTED AREAS inside the SITE BOUNDARY. 5

= $4.537 \times 10^{-6*}$ sec/m^3, in the WNW sector

M_i = air dose factor due to gamma emissions from noble gas radionuclide i (mrad/yr per uCi/m^3) from Table 2.1-1

Q_i = cumulative release of radionuclide i of noble gas, tritium, I-131, I-133, or material in particulate form over the period of interest (uCi) 5

Note: 3.17×10^{-8} is the inverse of the number of seconds per year, and

D_B = air dose due to beta emissions from noble gas radionuclide i (mrad)

= $3.17 \times 10^{-8} \sum_i N_i \overline{X/Q'} Q_i$

Where,

N_i = air dose factor due to beta emissions from noble gas radionuclide i (mrad/yr per uCi/m^3) from Table 2.1-1

$\overline{X/Q'}$ = relative concentration for the SITE BOUNDARY or UNRESTRICTED AREAS inside the SITE BOUNDARY 5

= $4.537 \times 10^{-6*}$ sec/m^3, in the WNW sector

* The highest annual average X/Q for the GGNS SITE BOUNDARY or UNRESTRICTED AREAS inside the SITE BOUNDARY is Hamilton Lake (WNW, 0.75 miles). This value is taken from the Grand Gulf Nuclear Station Final Environmental Report, Table 6.1.28. 5

Q_i = cumulative release of radionuclide i of noble gas, tritium, I-131, I-133, or material in particulate form over the period of interest (uCi). | 5

2.2.2.b Dose to an individual from tritium, I-131, I-133 and radioactive materials in particulate form, with half-lives greater than eight (8) days will be calculated for the purpose of implementation of Specification 3.11.2.3 as follows:

D_p = dose to an individual from tritium, I-131, I-133 and radionuclides in particulate form, with half-life greater than eight days (mrem)

$$= 3.17 \times 10^{-8} \sum_i R_i \quad W' \; Q_i$$ | 5

Where,

W' = relative concentration at a controlling location for an individual

$$= \begin{cases} \overline{X/Q'} = \underline{4.057 \times 10^{-6*}} \text{ sec/m}^3 \text{ for inhalation in the S sector} & | \; 5 \\ \overline{D/Q'} = \underline{1.408 \times 10^{-8*}} \text{ m}^{-2} \text{ for other pathways in the } \underline{S} \text{ Sector} & | \; 5 \end{cases}$$

R_i = the total dose factor for radionuclide i, (mrem/yr per uCi/m^3) and (m^2 . mrem/yr per uCi/sec) for food and ground plane pathways from Tables 2.2-2a - d | 5

* This conservative approach utilizes values for the onsite MP&L gardens (Tables 2.2-3 and 2.3-1). As an alternative MP&L may use the most conservative offsite controlling locations identified in the above referenced tables. | 5

Q_i = cumulative release of radionuclide i of noble gas, tritium, I-131, I-133, or material in particulate form over the period of interest (uCi) | 5

2.2.2.c For the purpose of implementing Specification 6.9.1, of the RETS, dose calculations will be performed using the above equations or with the substitution of average meteorological parameters (most limiting parameters will be used) which prevailed for the period of the report. | 5

TABLE 2.2-3

CONTROLLING RECEPTORS, LOCATIONS, AND PATHWAYS

Sector	Distance (Meters)	Miles	Pathway	Age Group	Origin (for info only)
N	2100	1.00	Vegetation	Infant	- garden
NNE	1207	0.75	Inhal/Gnd Plane	Infant	- residence
NE	1100	0.50	Vegetation	Child	- residence
ENE	4400	2.50	Vegetation	Child	- garden
E	982	0.61	Inhal/Gnd Plant	Adult	- residence
ESE	7000	4.00	Vegetation	Adult	- garden
SE	3400	2.00	Vegetation	Adult	- residence
SSE	1800	1.00	Inhal/Gnd Plant	Adult	- residence
S	805	0.50	Vegetation	Child	- hypothetical*
SSW	3218	2.00	Inhal/Gnd Plane	Infant	- hypothetical
SW	1432	0.90	Inhal/Gnd Plane	Child	- residence
WSW	8047	5.00	Cow/Milk	Infant	- hypothetical
W	8047	5.00	Cow/Milk	Infant	- hypothetical
WNW	7242	4.50	Inhal/Gnd Plane	Infant	- residence
NW	8047	5.00	Cow/Milk	Infant	- hypothetical
NNW	1207	0.75	Vegetation	Child	- hypothetical*

5

5

Table based on 1984 Land Use Census

* These locations represent MP&L gardens located inside the site boundary.

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TABLE 2.3-1

ATMOSPHERIC DISPERSION PARAMETERS* FOR TECHNICAL SPECIFICATIONS 4.11.2.2, 4.11.2.3, 4.11.2.5.1

SECTOR	MILES	X/Q	D/Q	
N	1.00	1.164×10^{-6}	4.759×10^{-9}	5
NNE	0.75	1.129×10^{-6}	5.298×10^{-9}	
NE	0.50	1.520×10^{-6}	9.144×10^{-9}	5
ENE	2.50	7.358×10^{-8}	4.341×10^{-10}	
E	0.61	8.618×10^{-7}	5.135×10^{-9}	
ESE	4.00	3.206×10^{-8}	1.824×10^{-10}	
SE	2.00	1.636×10^{-7}	8.941×10^{-10}	5
SSE	1.00	7.347×10^{-7}	3.587×10^{-9}	
S	0.50	4.057×10^{-6}	1.408×10^{-8}	
SSW	2.00	5.063×10^{-7}	1.068×10^{-9}	
SW	0.90	2.653×10^{-6}	4.463×10^{-9}	5
WSW	5.00	3.931×10^{-7}	3.177×10^{-10}	
W	5.00	4.259×10^{-7}	3.746×10^{-10}	
WNW	4.50	3.164×10^{-7}	3.739×10^{-10}	
NW	5.00	1.584×10^{-7}	2.733×10^{-10}	
NNW	0.75	2.199×10^{-6}	7.650×10^{-9}	5

* Reference: Grand Gulf Nuclear Station, Environmental Report, Table 6.1.26, 6.1.28, 6.1.29 and ODCM Table 2.2-3. 5

2.4 Definitions of Gaseous Effluents Parameters (Continued)

D_{TB} = limiting dose rate to the total body based on the limit of 500 mrem in one year. (2.1.1)

D_{ss} = limiting dose rate to the skin based on the limit of 3000 mrem in one year. (2.1.1)

L = skin dose factor for Kr-89, the most restrictive isotope (mrem/yr per uCi/m^3) from Table 2.1-1 (2.1.2)

L_i = skin dose factor due to beta emissions from isotope i (mrem/yr per uCi/m^3) from Table 2.1-1 (2.1.1)

M = air dose factor for Kr-89, the most restrictive isotope (mrad/yr per uCi/m^3), from Table 2.1-1 (2.1.2)

M_i = air dose factor due to gamma emissions from isotope i (mrad/yr per uCi/m^3) from Table 2.1-1 (2.1.1)

N_i = air dose factor due to beta emissions from noble gas radionuclide i (mrad/yr per uCi/m^3) from Table 2.1-1 (2.2.2.a)

P_i = dose parameter for radionuclide i, (mrem/yr per uCi/m^3) for inhalation from (m^2 mrem/yr per uCi/sec) for other pathways, from Table 2.2-1 (2.2.1.b)

Q_i' = rate of release of noble gas radionuclide i (uCi/sec) (2.1.1) | 5

$\overline{Q'_i}$ = average release rate for the current year (uCi/sec) of isotope i of tritium, I-131, I-133 or other radionuclide in particulate form, with half-life greater than eight (8) days (2.2.1.b). | 5

Q_i = cumulative release of radionuclide i of noble gas, tritium, I-131, I-133, or material in particulate form over the period of interest (uCi) (2.2.2.a) (2.2.2.b) | 5

2.6 Direct Radiation Dose Measurement

Technical Specification 3.11.4 requires the determination of cumulative dose contributions to a MEMBER OF THE PUBLIC from direct radiation from the reactor units and from radwaste storage tanks. This requirement is applicable only under conditions set forth in Specification 3.11.4 Action a. This determination is made by the utilization of direct radiation measurements from thermoluminescent dosimeters (TLDs) M-61 through M-84 located at equidistant intervals on the Unit I protected area fence. Exact locations are defined in Table 3.0-3. Measurements from these TLDs represent the direct radiation generated by the facility plus normal background radiation. 5

Control TLD's are also utilized to differentiate between background radiation and direct radiation from the facility. The following seven TLDs are designated as controls based on the criterion that they are located ten miles or greater from the facility. Exact locations are identified in Table 3.0-3.

M-06	M-12	M-14	M-39
M-11	M-13	M-33	

The difference between the averaged quarterly radiation measurements of the protected area TLDs and the control TLDs represents the direct radiation dose to a MEMBER OF THE PUBLIC from the operating facility.

3.0 RADIOLOGICAL ENVIRONMENTAL MONITORING

Sampling locations as required in section 3/4.12.1 of the Radiological Effluent Technical Specification are described in Table 3.0-1 through 3.0-3 and shown on maps in Figures 3.0-1 through 3.0-4. The types of vegetation and fish which are normally available for sampling are identified in Tables 3.0-4 and 3.0-5 respectively. 5

ODCM
TABLE 3.0-1
AIR SAMPLER COLLECTION SITES

AIR SAMPLERS

NUMBER	FIGURE	LOCATION
* AS-1 PG	3.0-3	Southeast of GGNS at the Port Gibson City Barn. (Sector G Radius 5.5 miles)
AS-2 61N	3.0-2	North Northeast of GGNS, on Hwy 61 South across from the Yokena Church. (Sector B Radius 13 miles)
* AS-3 61 VA	3.0-2	North Northeast of GGNS on Hwy 61 south at the Vicksburg Airport. (Sector B Radius 18 miles)
AS-4 GJOE	3.0-1	Southwest of GGNS. Glodjo property on Waterloo Road. (Sector L Radius .9 miles)
AS-5 TC	3.0-1	South of GGNS behind MP&L training center building. (Sector J Radius .4 miles)
* AS-6 RS	3.0-1	Northeast of GGNS, South of Grand Gulf Road. (Sector C Radius .8 miles)
* AS-7 MT	3.0-1	North of GGNS, located next to the Meteorological Tower. (Sector A Radius .8 miles)
* AS-8 WR	3.0-1	East of GGNS, located at Maggie Jackson's trailer on Waterloo Road near the Eastern SITE BOUNDARY. (Sector E Radius .5 miles)
AS-9 GGMP	3.0-1	North of GGNS, located in Grand Gulf Military Park. (Sector A Radius 1.5 miles)
AS-10 NLT	3.0-3	West Northwest of GGNS, located at Newellton, Louisiana. (Sector P Radius 12.5 miles)
AS-11 STJ	3.0-3	West Southwest of GGNS, located at St. Joseph, Louisiana. (Sector M Radius 13.0 miles)

* Technical Specification requirements

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TABLE 3.0-2
MISCELLANEOUS COLLECTION SITES

	Figure	
MILK SAMPLES (CONTROL LOCATION)		
Alcorn State University*	3.0-3	Located Southwest of GGNS. (Sector K Radius 10.5 miles)
Rosco Johnson farm	3.0-3	Located Southeast of GGNS. (Sector G Radius 9 miles)
Hazetta Warren farm	3.0-3	Located in Louisiana West Northwest of GGNS. (Sector N Radius 8.5 miles)
CISTERN WATER		
1. Trimble Cistern*	3.0-4	Located east of GGNS at the Trimble Tenant House. (Sector E Radius .5 miles)
2. Willis Cistern*	3.0-3	Located at the C.E. Willis house East Northeast of GGNS across from the Shiloh Baptist Church. (Sector D Radius 6 miles)
GROUND WATER		
1. PGWELL*	3.0-4	PORT GIBSON WELL - Taken at Port Gibson City Water lift Station. (Sector G Radius 5.0 miles)
2. GGMPWELL*	3.0-4	GRAND GULF MILITARY PARK - Taken from faucet at the Grand Gulf Military Park. (Sector A Radius 1.5 miles)
3. LAKE BRUIN	3.0-3	Taken from faucet at the bath house in Lake Bruin State Park, Louisiana. (Sector M Radius 9.5 miles)

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* Technical Specification requirements

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	Figure		
SURFACE WATER			
Upstream *	3.0-4	4500 ft. upstream of the GGNS outfall to allow adequate mixing of the Mississippi and Big Black Rivers. (Sector Q)	
Downstream *	3.0-4	5000 ft. downstream of GGNS outfall, near the most southern radial well. (Sector N)	
Discharge Basin *	3.0-4	West of GGNS, 0.5 miles, Sector P	
VEGETATION			
Broad Leaf Vegetation*	3.0-4	South of GGNS near the old training center (Sector J, 0.5 miles) and North Northwest of GGNS near the Meteorological Tower (Sector R, 0.75 miles)	5
		NOTE The above locations are gardens maintained by MP&L inside the SITE BOUNDARY in order to provide a more conservative calculation of doses due to the potential ingestion of contaminated vegetation. These two sampling sites exceed the requirements of Technical Specification 3.12.1.	5
		Alcorn State University Southwest of GGNS (Sector K, 10.5 miles)	
FISH SAMPLES			
Commercially or recreationally important species *	3.0-4	Downstream of the discharge point in the Mississippi River	
	3.0-4	Upstream of Discharge Point uninfluenced by Plant Operations.	

* Technical Specification requirements 5

ODCM
TABLE 3.0-2 (CONTINUED)
Page 3 of 3

SEDIMENT SAMPLES *	Figure 3.0-4	Collected semiannually during the low water periods of the Tidal Basin - samples taken downstream of the outfall in the vicinity of the boat landing near Hamilton Lake outlet and in the Barge Slip. (Sector N and Q, 2 miles)
SEDCONT		Collected upstream from barge slip at Upper Grand Gulf Landing (Sector R, 2.2 miles)

* Technical Specification requirements

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ODCM
TABLE 3.0-3
TLD LOCATIONS
Page 1 of 6

TLD NO.	LOCATION	FIGURE	SECTOR	MILE	
M-00	Maintained in lead shield during the exposure period	-	-	-	
* M-01	REA Pole-East of Entry Gate at Lake Claiborne	3.0-3	E	3.5	
M-02	REA Pole Left of Entry Gate Windsor Ruins	3.0-3	L	7.0	
M-03	REA Pole-East Side Hwy 61 P.G. Country Club entrance	3.0-3	H	7.0	
M-04	MP&L Pole-Hwy 547 North Side Between Twin Power Poles		G	6.5	
M-05	50 yards North of Hwy 18 Approximately 5 miles East of U.S. 61	3.0-3	F	9.0	
M-06	REA Pole-East of Willows Beyond MMB Church MS Hwy 462		E	10.0	5
* M-07	Port Gibson City Barn AS-1	3.0-3	G	5.5	
M-08	West Side Big Black River South Entrance	3.0-3	C	8.5	
* M-09	Oak Tree Hanger-South Warner Tully Camp	3.0-3	D	3.5	
* M-10	Entrance Gate Grand Gulf Military Park	3.0-1	R	1.5	
M-11	Hwy 61 3 miles North of Big Black River at Twin Tower	3.0-3	C	10.5	
M-12	Hwy 61 at AS-2-61 North Yokena	3.0-2	B	13.0	
M-13	Hwy 61 Letourneau Hill West Side of Road	3.0-2	B	15.0	5

* Technical Specification requirements

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ODCM
TABLE 3.0-3 (CONTINUED)
TLD LOCATIONS
Page 2 of 6

TLD NO.	LOCATION	FIGURE	SECTOR	MILE
* M-14 (CONTROL)	Hwy 61 AS-3-61VA at Casket Company	3.0-2	B	18.0
M-15	Barge Slip (South edge)	3.0-1	P	1.5
* M-16	AS-7 MET Tower	3.0-1	A	0.8
M-17	AS-6-RS Grand Gulf Road	3.0-1	C	0.5
* M-18	Railroad Crossing Eastern SITE BOUNDARY	3.0-1	F	0.5
M-19	Behind Burn Pit on Fence at Eastern SITE BOUNDARY	3.0-1	E	0.5
M-20	Eastern site boundary behind hazardous waste storage area	3.0-1	F	0.5
M-21	AS-5-TC Training Center	3.0-1	J	0.4
M-22	100 yards south of RR Entrance Crossing on West Side	3.0-1	G	0.5
M-23	County Road/Heavy Haul Road 50 Yards North on Power Pole	3.0-1	Q	0.5
M-24	Upper Grand Gulf Landing	3.0-1	R	2.2
* M-25	Hamilton Lake Boat Launch	3.0-1	N	1.0
M-26	Hamilton Lake Outfall	3.0-1	N	1.5
* M-27	South Point SITE BOUNDARY 200 Yards along Property Line	3.0-1	M	1.5
* M-28	AS-4-Glodjo Residence Glodjo	3.0-1	L	0.9
M-29	In sharp curve of Waterloo Road to Waterloo Plantation	3.0-1	K	1.5
* M-30	Arnold Acres Trailer Park Entrance	3.0-1	J	1.1

* Technical Specification requirements

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ODCM
TABLE 3.0-3 (CONTINUED)
TLD LOCATIONS
Page 3 of 6

TLD NO.	LOCATION	FIGURE	SECTOR	MILE
M-31	Duplicate TLD Installed at designated Site Number	-	-	-
M-32	Duplicate TLD Installed at designated Site Number	-	-	-
* M-33	Newellton, Louisiana Water Tower	3.0-3	P	12.5
M-34	Primary Levee at End of County Road at Point Pleasant, Louisiana	3.0-3	R	8.0
M-35	Mor Landing - Lake Yucatan	3.0-3	Q	8.0
* M-36	Curve on 608 Point Nearest GGNS, at Power Pole	3.0-3	P	5.0
M-37	Winter Quarters Home	3.0-3	N	8.0
* M-38	Lake Bruin State Park Second Pole	3.0-3	M	9.5
* M-39	St. Joseph, Louisiana, Aux. Water Tank	3.0-3	M	13.0
* M-40	International Paper Road, Approximately 5 miles from Site	3.0-3	M	5.0
* M-41	Heavy Haul Road - J Pipe on Concrete Block	3.0-1	P	1.0
* M-42	Heavy Haul Road North Iron Gate	3.0-1	Q	1.0
* M-43	Gin Lake Entrance	3.0-1	R	1.2
* M-44	Truck Bypass on Grand Gulf Road	3.0-1	C	0.5
* M-45	Visitor Center Gate East Side	3.0-1	D	0.5

* Technical Specification requirements

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ODCM
TABLE 3.0-3 (CONTINUED)
TLD LOCATIONS
Page 4 of 6

TLD NO.	LOCATION	FIGURE	SECTOR	MILE
* M-46	Power Pole Across from Grand Gulf/Waterloo roads intersection	3.0-1	E	1.0
* M-47	Bridge 0.6 miles past Rodney Road/Greenwood Road intersection North Side	3.0-3	L	5.2
* M-48	Property Line Fence 0.4 miles on Greenwood Road on West Side	3.0-3	K	4.8
* M-49	Fork in Weathers Road	3.0-3	H	4.5
* M-50	Panola Hunting Club Entrance		B	5.5
* M-51	Power Pole 0.5 miles on Gravel Road to Big Black on West Side	3.0-3	C	4.8
* M-52	Power Pole-Waterloo Road Marked with White Paint	3.0-1	K	1.0
* M-53	Arnold Acres Property Fence Past Trailer Park	3.0-1	H	1.1
* M-54	Bottom of curve past Arnold's house	3.0-1	G	1.0
* M-55	Behind Bonner's Beauty Shop at MSBH Air Sample	3.0-3	D	5.0
* M-56	Hwy 61 South at "All Creatures Veterinary Hospital"	3.0-3	G	5.0
* M-57	Hwy 61 North Behind the Welcome to Port Gibson sign	3.0-3	F	4.5
* M-58	Big Bayou Pierre Bridge Southeast End	3.0-3	E	5.0
* M-59	Off Levee at Winter Quarters Hunting Camp	3.0-3	N	5.1

* Technical Specification requirements

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ODCM
TABLE 3.0-3 (CONTINUED)
TLD LOCATIONS

TLD NO.	LOCATION	FIGURE	SECTOR	MILE
M-60	Duplicate TLD	-	-	-
M-61	Protected area fence by the vehicle entrance gate	Not Shown	P	Onsite
M-62	Protected area fence Northeast corner MP&L parking lot	"	N	"
M-63	Protected area fence middle MP&L parking lot	"	N	"
M-64	Protected area fence Southeast corner MP&L parking lot	"	M	"
M-65	South protected area fence behind MP&L warehouse	"	L	"
M-66	South protected area fence across from cooling tower	"	K	"
M-67	South protected area fence east end	"	J	"
M-68	East protected area fence across from chlorination tank	"	H	"
M-69	East protected area fence near electric bus	"	G	"
M-70	North fence behind turbine bldg.	"	F	"
M-71	133' railway bay	"	C	"
M-72	133' railway bay	"	B	"
M-73	Corner of fence outside control bldg.	"	P	"

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* Technical Specification requirements

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TABLE 3.0-3 (CONTINUED)
TLD LOCATIONS
Page 6 of 6

TLD NO.	LOCATION	FIGURE	SECTOR	MILE
M-74	Midway of North fence	Not Shown	P	Onsite
M-75	Corner in fence in front of Maintenance Shop	"	A	"
M-76	Southeast corner SSW Basins	"	A	"
M-77	Protected area fence beside maintenance shop	"	R	"
M-78	Outside vault in Admin. Bldg.	"	Q	"
M-79	Wall in Central Records (middle)	"	Q	"
M-80	Wall in Central Records old library location	"	Q	"
M-81	Inside Admin. Bldg., 2nd floor, northeast wall	"	Q	"
M-82	Tech Support Area	"	Q	"
M-83	Tech Support Secretary's office	"	Q	"
M-84	Security Island	"	P	"
M-85	Rotating duplicate	-	-	-
* M-86	Bechtel Gate North Site Boundary	3.0-1	B	0.5
M-87	Intersection of Rodney Road & transmission line	3.0-3	J	3.5
* M-88	River mile marker 409.5	3.0-1	A	4.2
* M-89	Middle Ground Island	3.0-1	R	4.4
* M-90	Across from Middle Ground Island	3.0-1	Q	3.5
* M-91	Transmission line by pond	3.0-1	J	4.5

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* Technical Specification requirements

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TABLE 3.0-4

VEGETATION SAMPLE SOURCES

This table identifies the common names of vegetation sources which are normally available for broadleaf vegetation sampling as required by Technical Specification 3.12.1; however, this list is not considered all inclusive.

Beets
Box elder
Broccoli
Cabbage
Cauliflower
Clover (red and white)
Collards
Corn
Cottonwood
Cucumbers
Elephant ears
Honeysuckle
Johnson grass
Kale
Kudzu
Lettuce
Magnolia
Mayapple
Mustard greens
Oak
Pear
Peas
Pecans
Poplar
Potato
Radishes
Rape
Rhubarb
Skunk cabbage
Soy beans
Spinach
Squash
Turnip greens
Vetch
Watermelon

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TABLE 3.0-5

FISH SAMPLE SOURCES

This table identifies the common names of fish sources which are normally available for sampling as required by Technical Specification 3.12.1; however, the list is not considered all inclusive. 5

Black bass	Gar
Bream	Sturgeon
Buffalo	White bass
Catfish	White perch

DMB

MISSISSIPPI POWER & LIGHT COMPANY
Helping Build Mississippi
P. O. BOX 1640, JACKSON, MISSISSIPPI 39205

35 MAR 4 A8:42

February 28, 1985

NUCLEAR LICENSING & SAFETY DEPARTMENT

U. S. Nuclear Regulatory Commission
Region II
101 Marietta Street, N. W., Suite 2900
Atlanta, Georgia 30323

Attention: Dr. J. Nelson Grace
Regional Administrator

Dear Dr. Grace:

SUBJECT: Grand Gulf Nuclear Station
Unit 1
License No. NPF-29
Docket No. 50-416
File: 0292/15319
Semiannual Radioactive
Effluent Release Report
AECM-85/0054

Attached is Mississippi Power & Light (MP&L) Company's Semiannual Radioactive Effluent Release Report for Grand Gulf Nuclear Station for the period July 1, 1984 through December 31, 1984.

Questions concerning this report should be referred to Mr. G. O. Smith at (601) 969-2672.

Yours truly,

L. F. Dale
Director

CLT/GOS:ay

Attachment

cc: Mr. J. B. Richard (w/a)
Mr. R. B. McGehee (w/a)
Mr. N. S. Reynolds (w/a)
Mr. G. B. Taylor (w/o)

Mr. James M. Taylor (w/a)
Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

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