Entergy

Entergy Operations, Inc.
1340 Echelon Parkway
Jackson, MS 39213

William K. Hughey
Director, Licensing – New Plant
(601) 368-5327
whughey@entergy.com

G3NO-2008-00011

November 5, 2008

U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001
Attention: Document Control Desk

DOCKET: No. 52-024

SUBJECT: Responses to NRC Requests for Additional Information, Letter No. 09 (GG3 COLA)

REFERENCES:

1. NRC Letter to Entergy Nuclear, *Request for Additional Information Letter No. 09 Related to the SRP Section 12.02 for the Grand Gulf Combined License Application*, dated October 6, 2008 (ADAMS Accession No. ML082800261)

2. Entergy Operations, Inc. Letter to NRC, *Responses to NRC Requests for Additional Information, Letter No. 2 (GG3 COLA)*, dated October 13, 2008

Dear Sir or Madam:

In Reference #1, the NRC requested additional information on four items to support review of certain portions of the Grand Gulf Unit 3 Combined License Application (GG3 COLA). The responses to the following Requests for Additional Information (RAIs) in the reference letter are provided in Attachments 1, 2, 3 and 4 to this letter as follows:

1. RAI Question No. 12.02-1, Cost Benefit Analysis, NEI Template 07-11

2. RAI Question No. 12.02-2, External Radiation – Hydrogen Water Chemistry Effects

3. RAI Question No. 12.02-3, Gaseous Effluent Releases

4. RAI Question No. 12.02-4, Liquid Effluent Discharge Flow, Design Capacity Factor

Included with the response to RAI Question No. 12.02-3 in Attachment 3 are draft revisions to the FSAR and Part 7 of the COLA reflecting changes in DCD Revision 5 related to the topics of normal effluent gaseous releases and dose addressed in the RAI question.

Also, note that in Reference #2, Entergy committed to provide updated long-term dispersion coefficients and associated airborne release results. This updated information is provided in Attachment 2.

D088
NRO

Should you have any questions, please contact me or Mr. Tom Williamson of my staff. Mr. Williamson may be reached as follows:

Telephone: (601-368-5786)

Mailing Address: 1340 Echelon Parkway
Mail Stop M-ECH-21
Jackson, MS 39213

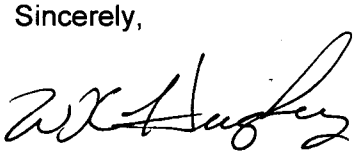
E-Mail Address: twilli2@entergy.com

This letter contains commitments as identified in Attachment 5.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on November 5, 2008.

Sincerely,



WKH/ghd

Attachment:
1. Response to RAI Question No. 12.02-1
2. Response to RAI Question No. 12.02-2
3. Response to RAI Question No. 12.02-3
4. Response to RAI Question No. 12.02-4
5. Regulatory Commitments

cc (email unless otherwise specified):
Mr. T. A. Burke (ECH)
Mr. S. P. Frantz (Morgan, Lewis & Bockius)
Mr. B. R. Johnson (GE-Hitachi)
Ms. M. Kray (NuStart)
Mr. P. D. Hinnenkamp (ECH)

NRC Project Manager – GGNS COLA
NRC Director – Division of Construction Projects (Region II)
NRC Regional Administrator - Region IV
NRC Resident Inspectors' Office: GGNS

ATTACHMENT 1

G3NO-2008-00011

RESPONSE TO NRC RAI LETTER NO. 09

RAI QUESTION NO. 12.02-1

RAI QUESTION NO.12.02-1

NRC RAI 12.02-1

FSAR Subsections 12.2.2.2.2 and 12.2.2.4.2, Grand Gulf Nuclear Station (GGNS) COL 12.2-2A and 12.2-3-A, includes by reference, the draft NEI Template 07-11. The NEI template was expected to present a bounding envelope of the population doses associated with the gaseous and liquid effluent releases, which if met, would demonstrate compliance with ALARA cost benefit requirement of Section II.D of Appendix I to 10 CFR Part 50. However, this template has been withdrawn, and it is not any longer a relevant reference. Accordingly, provide an updated cost-benefit analysis in the applicable FSAR sections.

Entergy Response

A site-specific cost-benefit analysis has been performed, based on Regulatory Guide 1.110, "Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors," in response to NRC Request for Additional Information Letter 08. FSAR Subsection 12.2.2.2.2 and 12.2.2.4.2 will be revised to remove the reference to NEI 07-11.

Proposed COLA Revision

FSAR Section 12.2.2.4.2 will be revised to delete the reference to NEI 07-11 as indicated in the attached draft markup.

FSAR Sections 12.2.2.2.2 and 12.2.5 will be revised to delete the reference to NEI 07-11 (Section 12.2.2.2.2), and to delete the reference for NEI 07-11 (Section 12.2.5), as indicated in the draft markup included with the response to RAI Question 12.02-3 in Attachment 3 to this letter.

Markup of Grand Gulf COLA

The following markup represents Entergy's good faith effort to show how the COLA will be revised in a future COLA submittal in response to the subject RAI. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be somewhat different than as presented herein.

CFR Part 50. In addition, the maximally exposed individual dose calculated was compared to and meets the 40 CFR 190 criteria (Table 12.2-204) for liquid effluents.

12.2.2.4.2 Compliance with 10 CFR 50, Appendix I, Section II.D

~~Dose rates determined for the normal liquid effluent releases are bounded by the results presented in NEI 07-11, Generic Template Guidance for Cost Benefit Analysis for Radwaste Systems for Light Water Cooled Nuclear Power Reactors (Reference 12.2-201). See Section 11.2.1 for more details.~~ A site-specific cost benefit analysis of the liquid radwaste system augments suggested in Regulatory Guide 1.110 is presented in Section 11.2.1. The results of this evaluation indicate that there are no cost beneficial liquid radwaste system augments. Therefore, Unit 3 complies with 10 CFR 50, Appendix I, Section II.D.

12.2.2.4.3 Compliance with 10 CFR 20 Appendix B, Table 2, Column 2

Compliance with 10 CFR 20 Appendix B, Table 2, Column 2 is demonstrated in DCD Table 12.2-19b.

12.2.2.4.4 Compliance with 10 CFR 20.1301

See Section 12.2.2.2.4.

12.2.2.4.5 Compliance with 10 CFR 20.1302

See Section 12.2.2.2.5.

12.2.4 COL INFORMATION

12.2-2-A Airborne Effluents and Doses

GGNS COL 12.2-2-A This COL item is addressed in Sections 11.3.2, 12.2.2.1 and 12.2.2.2.

12.2-3-A Liquid Effluents and Doses

GGNS COL 12.2-3-A This COL item is addressed in Section 12.2.2.4.

12.2-4-A Other Contained Sources

GGNS COL 12.2-4-A This COL Item is addressed in Section 12.2.1.5.

ATTACHMENT 2

G3NO-2008-00011

RESPONSE TO NRC RAI LETTER NO. 09

RAI QUESTION NO. 12.02-2

RAI QUESTION NO. 12.02-2

NRC RAI 12.02-2

FSAR Subsection 12.2.2.2.3, "Compliance with 10 CFR Part 20.1301," presents the analysis of doses to the maximally exposed individual and compares dose results against the EPA environmental dose standards of 40 CFR Part 190, as implemented under Part 20.1301(e). The discussion is presented in FSAR pages 12-4 and 12-5. Although the discussion points out that the dose calculated in the Early Site Permit (SSAR Table 3.2-3B and 3.2-5) from direct external radiation has been considered in the evaluation, it is not clear if the FSAR analysis did consider increased external radiation levels at the nearest residence associated with the operation of hydrogen water chemistry system. DCD Tier 2, Revision 4, Section 12.2.1.3 of DCD acknowledges increased external radiation levels whenever hydrogen water chemistry is used, and it presents the results of a generic analysis (Table 12.2-21) using arbitrary site conditions and distances. Accordingly, update the Grand Gulf Unit 3 plant and site specific analysis to demonstrate that, when the N-16 dose is added to the dose contribution from all other direct sources of external radiation to the nearest residence, the sum of direct sources of radiation will not exceed the dose standards of 40 CFR Part 190 and 10 CFR Part 20.1301(e).

Entergy Response

Revision 0 of FSAR Section 12.2.2.2.4 states, "Direct radiation as a result of plant operation has been shown to be negligible." DCD Table 12.2-21 provides an annual dose of 5.93E-06 mSv/yr (5.93E-04 mrem/yr) at 800 m (0.50 mi) from direct radiation for the ESBWR, and 1.66E-06 mSv/yr (1.66E-04 mrem/yr) at 1000 m (0.62 mi). DCD Section 12.2.1.3, in the paragraph under the heading, "N-16 Skyshine Offsite Dose Contribution," explains that the Turbine Building source term for the ESBWR design takes into account hydrogen water chemistry and noble metal injection. The values for skyshine contribution to offsite dose, considering these two effects, are provided in DCD Table 12.2-21. DCD Section 12.2.1.3 and Table 12.2-21 are incorporated by reference into FSAR Chapter 12. For clarity, FSAR Table 12.2-205 (Note 3) will be revised to reference DCD Table 12.2-21 as the source for direct radiation from Unit 3.

The Unit 3 exclusion area boundary (EAB) is 841 m (0.52 mi) from the defined power block area (see SSAR Figure 2.1-2). The dose contribution from direct radiation at this location would be slightly less than the already small dose indicated in DCD Table 12.2-21 at 800 m (5.93E-04 mrem/yr). As indicated in the FSAR Section 12.2.2.2.4 draft markup provided in the response to RAI Question 12.02-3 (included in Attachment 3 to this letter), the total effective dose equivalent (TEDE) for routine gaseous release is 4.04 mrem/yr and the liquid pathway TEDE is estimated at 0.44 mrem/yr, giving a combined annual TEDE dose of 4.48 mrem. Therefore, as noted in the draft markup of FSAR Table 12.2-205 provided in the response to RAI Question 12.02-3 included in Attachment 3 to this letter, the contribution of the direct radiation dose from Unit 3 in DCD Table 12.2-21 to this combined gaseous and liquid pathway dose, considering hydrogen water chemistry and noble metal injections and the additional distance to the location of the maximally exposed individual, is negligible.

FSAR Section 12.2.2.2.4 and Table 12.2-203 will be revised to correct the maximum exposed individual (MEI) dose (TEDE and whole body, respectively) from the liquid pathway; the corrected TEDE dose value is indicated above, and the corrected MEI whole body dose is in the revised table.

Proposed COLA Revision

FSAR Section 12.2.2.2.4, FSAR Table 12.2-203, and FSAR Table 12.2-205 will be revised as indicated in the draft markup included with the response to RAI Question 12.02-3 in Attachment 3 to this letter.

ATTACHMENT 3

G3NO-2008-00011

RESPONSE TO NRC RAI LETTER NO. 09

RAI QUESTION NO. 12.02-3

RAI QUESTION NO. 12.02-3

NRC RAI 12.02-3

FSAR Subsection 12.2.2.2.3 presents compliance with 10CFR20 Appendix B for gaseous effluent concentrations at the site boundary.

a. A review of gaseous effluent releases indicates inconsistencies in the assigned release values for several radionuclides. The ESBWR DCD, Rev. 5 Table 11.1-5b provides the expected normal operational non-volatile fission product concentrations in the reactor coolant, indicating several nuclide pairs in secular equilibrium. These include: Sr-90/Y-90, Zr-95/Nb-95, Mo-99/Tc-99m, Ru-103/Rh-103m, Ru-106/Rh-106, Ba-140/La-140, and Ce-144/Pr-144. Gaseous released quantities for these nuclides should be of the same magnitude. Review of the gaseous effluents in the FSAR Table 12.2-206 indicates large differences in release values for these pairs except for the Ce-144/Pr-144 releases. Accordingly, update the released quantities for the affected nuclides to be consistent with their parent values, and revise Table 12.2-206, as necessary.

b. In demonstrating compliance with the unity rule of Table 2 (Column 1) of Appendix B to 10 CFR Part 20, add a column to FSAR Table 12.2-206 showing the ratio of each radionuclide and the sum-of-the-ratios for all radionuclides. Currently, the tabulation does not present the sum-of-the-ratios. Accordingly, provide an updated Table 12.2-206 showing the nuclide concentration ratios over values of Table 2 of Appendix B to 10CFR20, and compliance with the unity rule.

c. Please correct the site boundary value to 8.8E-06 (i.e., it is incorrectly listed as 8.8E 06).

d. Table 12.206 indicates a composite tritium release of 2.81E+08 MBq/yr (or 76000 Ci/yr), whereas the corresponding value in Table D-7 of Grand Gulf ESP-02, which is the source for the composite value, is 7,060 Ci/yr (or 2.61E+08 MBq/yr). Correct the cited value in Table 12.206 to 2.61E+08.

Entergy Response

Changes in ESBWR standard plant design in DCD Revision 5 deleted the single plant stack for routine gaseous effluent releases and replaced it with ventilation stacks for the Reactor/Fuel Building, Turbine Building, and Radwaste Building. Revision 5 to the DCD also changed the gaseous effluent release source term (DCD Table 12.2-16 and Table 12.2-17) resulting in the ESP gaseous release source term not being bounding for all isotopes (ESP source in ESP-002 Appendix D, "Values of Plant Parameters Considered in the Environmental Review of the Application," Tables D1 and D7; and in SSAR, Tables 1.3-1 and 1.3-2). DCD Revision 5, Table 2.0-1 also included revised site parameters for the long-term atmospheric dispersion coefficients. The COLA will be revised to provide new site characteristic long-term dispersion coefficients considering the revised release locations in the DCD. Estimates of dose from routine gaseous releases will be revised using the DCD gaseous normal release source term (DCD Table 12.2-16 and Table 12.2-17) and the revised site-specific long-term dispersion coefficients.

The responses to the questions concerning compliance with the 10 CFR 20 Appendix B gaseous effluent concentrations, considering the COLA changes described above, are as follows:

a. Based on the COLA changes discussed above, the annual airborne radionuclide releases presented in the revision to FSAR Table 12.2-206, included in the draft markups of this attachment, are the same as the airborne releases presented in DCD Table 12.2-17. The methodology used by General Electric-Hitachi (GEH) to calculate these releases is presented in DCD Appendix 12B. The airborne releases in the DCD are calculated using this methodology and the data and parameters specified in DCD Table 12.2-15. Because the release values for each nuclide presented in the revision to FSAR Table 12.2-206 included in the draft markups of this attachment are the DCD values, no other changes to Table 12.2-206 are required.

b. Table 12.2-206 will be revised to be consistent with DCD Table 12.2-17, Revision 5, and will include the summation of the ratios to demonstrate compliance with the unity rule, as indicated in the draft markup attached.

c. The site boundary X/Q value is correctly listed as 8.8E-06 sec/m^3 in FSAR Table 2.0-201, Table 12.2-206, and in Section 12.2.2.2. In Section 12.2.2.2.3, as noted, the negative sign (-) was inadvertently left out. This site boundary X/Q value will be changed as indicated in the attached draft markups to use the revised Unit 3 site boundary X/Q value.

d. The composite releases given in Table D7 of Grand Gulf ESP-002, and in SSAR Tables 3.2-1 and 3.2-2, are no longer being used as discussed above. Instead, the airborne releases will be taken from DCD Table 12.2-17 and included in a revised Table 12.2-206 as indicated in the draft markup attached.

Proposed COLA Revision

As a result of the DCD Revision 5 changes eliminating the single plant stack release point, changes in DCD long term dispersion coefficient site parameters, and because of use of the DCD Revision 5 source term for determination of routine gaseous release dose estimates, the following sections and parts of the COLA will be revised as indicated in the attached draft markups.

- FSAR Table 1.1-202, to reflect that SSAR Sections 2.3.5.2 and 2.3.5.3 and 3.2 are superseded
- FSAR Table 1.8-202, to add two additional ESP/SSAR variance requests to the list
- FSAR Section 1.12.2, to remove reference to the main plant stack
- FSAR Table 2.0-201 and Table 2.0-202, to reflect new long-term atmospheric dispersion coefficients
- FSAR Section 2.3.2, to reflect elimination of the main plant (off-gas) stack

- FSAR Section 2.3.5, to reflect recalculation of long-term dispersion coefficients based on the ESBWR design change from a single point plant stack release to multi-point ventilation stack releases, and to supersede SSAR Section 2.3.5.2 and 2.3.5.3
- FSAR Section 2.3.6, to add new references
- New FSAR Tables 2.3-212 through 2.3-217, to provide the results of the calculation of long-term dispersion coefficients, and to supersede information provided in SSAR Tables 2.3-143 through 2.3-146
- FSAR Section 11.3.2, to remove the reference to the plant stack
- FSAR Sections 12.2, to reflect that SSAR Section 3.2 and its tables are superseded
- FSAR Sections 12.2.2.1 and 12.2.2.2, to reflect recalculation of routine gaseous release doses, to supersede information in SSAR Section 3.2, and to revise regulatory compliance discussions
- FSAR Sections 12.2.5, to delete reference 12.2-201, NEI 07-11
- FSAR Table 12.2-205, to reflect new gaseous routine release doses and to correct the Unit 1 doses
- FSAR Table 12.2-206, to reflect use of the DCD Revision 5 gaseous release source term instead of the ESP source term, and to demonstrate consistency with the unity rule
- New FSAR Tables 12.2-207 through 12.2-214, to provide inputs to and the results of the recalculation of routine gaseous release doses, and to supersede SSAR Tables 3.2-1 through 3.2-9
- Various FSAR figures (Figures 1.1-201, 2.1-202, 2.4.1-201 Sheets 1 and 2, and 2.4.2-204), to reflect removal of the main plant (off-gas) stack from the site plan
- Part 7, to add two additional variance requests from the ESP and SSAR related to use of the DCD Revision 5 gaseous release source term and development of new site-specific long-term dispersion coefficients

Markup of Grand Gulf COLA

The following markup represents Entergy's good faith effort to show how the COLA will be revised in a future COLA submittal in response to the subject RAI. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be somewhat different than as presented herein.

LIST OF TABLES (CONTINUED)

LIST OF TABLES (CONTINUED)

TABLE 1.1-202 (Sheet 2 of 5)
CROSS REFERENCE OF SSAR SECTIONS INCORPORATED BY REFERENCE INTO FSAR SECTIONS

GGNS SUP 1.1-4

SSAR Section	SSAR Section Title	FSAR Section Incorporating SSAR Section By Reference / Comments
1.4	Conformance With Regulatory Requirements and Guidance	This section of the SSAR is incorporated by reference into the FSAR. FSAR Table 1.9-202 includes the Regulatory Guides listed in SSAR Table 1.4-1 applicable six months prior to submittal of the COL application.
2.1	Geography and Demography	Section 2.1, Geography and Demography
2.2	Nearby Industrial, Military and Transportation Facilities and Routes	Section 2.2, Nearby Industrial, Military, and Transportation Facilities and Routes
2.3	Meteorology	Section 2.3, Meteorology. SSAR Sections 2.3.5.2 and 2.3.5.3 are superseded by FSAR Sections 2.3.5.2 and 2.3.5.3, respectively.
2.4.1	Hydrologic Description	Section 2.4.1, Hydrologic Description
2.4.2	Floods	Section 2.4.2, Floods
2.4.3	Probable Maximum Flood (PMF) on Streams and Rivers	Section 2.4.3, Probable Maximum Flood on Streams and Rivers
2.4.4	Potential Dam Failures, Seismically Induced	Section 2.4.4, Potential Dam Failures
2.4.5	Probable Maximum Surge and Seiche Flooding	Section 2.4.5, Probable Maximum Surge and Seiche Flooding
2.4.6	Probable Maximum Tsunami Flooding	Section 2.4.6, Probable Maximum Tsunami Hazards
2.4.7	Ice Effects	Section 2.4.7, Ice Effects
2.4.8	Cooling Water Canals and Reservoirs	Section 2.4.8, Cooling Water Canals and Reservoirs

TABLE 1.1-202 (Sheet 4 of 5)
CROSS REFERENCE OF SSAR SECTIONS INCORPORATED BY REFERENCE INTO FSAR SECTIONS

GGNS SUP 1.1-4

SSAR Section	SSAR Section Title	FSAR Section Incorporating SSAR Section By Reference / Comments
3.1.4.1	Meteorology	Section 2.3, Meteorology
3.1.4.2	Geology	Section 2.5, Geology, Seismology, and Geotechnical Engineering
3.1.4.3	Seismology	Section 2.5, Geology, Seismology, and Geotechnical Engineering
3.1.4.4	Hydrology	Section 2.4, Hydrologic Engineering
3.1.5	Potential Off-site Hazards	Section 2.2, Nearby Industrial, Military, and Transportation Facilities and Routes
3.1.6	Site Characteristics – Security Plan	Information in SSAR Section 3.1.6 is incorporated by reference into this Table. Complete Security Plans are provided as safeguards information in Part 8, Safeguards/ Security Plans, of the COL application.
3.1.7	Site Characteristics - Emergency Plans	Information in SSAR Section 3.1.7 is incorporated by reference into this Table. The complete Emergency Plan is provided in Part 5, Emergency Plan, of the COL application.
3.1.8	Population Density	Section 2.1, Geography and Demography
3.2	Gaseous Effluent Release Dose Consequences from Normal Operations	SSAR Section 3.2 is superseded by FSAR Section 12.2.2.1 and Section 12.2.2.2~~, Airborne Dose Evaluation Off-site~~

GGNS SUP 1.8-4

TABLE 1.8-202
VARIANCES FROM THE ESP AND ESPA SSAR

Number	Subject	FSAR Section
GGNS ESP VAR 2.0-1	Design response spectra	2.5.4, Table 2.0-202
GGNS ESP VAR 2.0-2	Minimum shear wave velocity of soil at the proposed plant foundation level	2.5.4, Table 2.0-202
GGNS ESP VAR 2.0-3	Accident Analyses.	Table 2.0-203
GGNS ESP VAR 2.0-4	Long Term (Routine Release) Atmospheric Dispersion	Table 2.0-202, 2.3.5
GGNS ESP VAR 2.3-1	Determination of Roof Loads Due to Extreme Winter Precipitation	2.3.1.2.6
GGNS ESP VAR 2.4.1-1	Distance to closest surface water	2.4.1.2 Table 2.0-202
GGNS ESP VAR 2.4.12-1	Highest ground water elevation	2.4.12.2.3 Table 2.0-202
GGNS ESP VAR 2.5-1	Geology, Seismology, and Geotechnical Engineering	2.5.1, 2.5.3
GGNS ESP VAR 2.5-2	Stability of Subsurface Materials and Foundations	2.5.1, 2.5.4
GGNS ESP VAR 12.2-1	Normal Operations Gaseous Release Source Terms	12.2.2.1, 12.2.2.2

1.12 IMPACT OF CONSTRUCTION ACTIVITIES ON UNIT 1

GGNS SUP 1.12-1

1.12.1 INTRODUCTION

Paragraph 10 CFR 52.79(a)(31) requires that the FSAR include the following information:

> For nuclear power plants to be operated on multi-unit sites, an evaluation of the potential hazards to the structures, systems and components (SSCs) important to safety of operating units resulting from construction activities, as well as a description of the managerial and administrative controls to be used to provide assurance that the limiting conditions for operation (LCO) are not exceeded as a result of construction activities at the multi-unit sites.

Accordingly, the evaluation of the potential impact of the construction of Unit 3 on Unit 1 SSCs important to safety is summarized below, along with a description of the managerial and administrative controls used to provide assurance that Unit 1 LCO are not exceeded as a result of Unit 3 construction activities. This evaluation involves several sequential steps:

- Identification of potential construction activity hazards
- Identification of SSCs important to safety
- Identification of LCOs
- Identification of Impacted SSCs and LCOs
- Identification of applicable managerial and administrative controls

1.12.2 POTENTIAL CONSTRUCTION ACTIVITY HAZARDS

Unit 3 is located on the existing GGNS site on a parcel of land adjacent to and generally west of the operating unit, Unit 1, as shown in Figure 2.1-201.

Based on experience from similar construction projects, the scope of work necessary to construct Unit 3 is well understood. In general, it includes, but not necessarily limited to, activities such as site exploration, grading, clearing and installation of drainage and erosion control measures; boring, drilling, dredging, demolition and excavating; storage and warehousing of equipment, and construction, erection and fabrication of new facilities. These activities involve major ESBWR standard plant structures such as the Reactor Building, Control Building, Fuel Building, Turbine Building, Radwaste Building, Electrical Building, and ~~plant stack~~Ancillary Diesel Generator Building; as well as related support facilities such as transformers, switchyard(s), transmission lines, cooling water

GGNS COL
2.0-1-A

TABLE 2.0-201 (Sheet 25 of 31)
COMPARISON OF ESBWR DCD SITE PARAMETERS (1) WITH UNIT 3 SITE CHARACTERISTICS

Parameter	ESBWR Site Parameter	Unit 3 Site Characteristic	Bounding Yes/No	Comments
Technical Support Center χ/Q: Turbine Building release				
0-2 hours:	2.00E-03 s/m^3	1.60E-03 s/m^3	Yes	FSAR Table 2.3-208 provides TSC χ/Q values for a Turbine Building release less than those in the DCD. Therefore, the Unit 3 site characteristic values for TSC χ/Q for Turbine Building release fall within the values established by the ESBWR site parameters.
2-8 hours:	1.50E-03 s/m^3	9.99E-04 s/m^3	Yes	
8-24 hours:	8.00E-04 s/m^3	5.46E-04 s/m^3	Yes	
1-4 days:	6.00E-04 s/m^3	3.75E-04 s/m^3	Yes	
4-30 days:	5.00E-04 s/m^3	2.61E-04 s/m^3	Yes	
Technical Support Center χ/Q: Passive Containment Cooling System / Reactor Building Roof release				
0-2 hours:	2.00E-03 s/m^3	4.22E-04 s/m^3	Yes	FSAR Table 2.3-208 provides TSC χ/Q values for PCCS/ Reactor Building Roof release less than those in the DCD. Therefore, the Unit 3 site characteristic values for TSC χ/Q for PCCS/Reactor Building Roof release fall within the values established by the ESBWR site parameters.
2-8 hours:	1.10E-03 s/m^3	3.11E-04 s/m^3	Yes	
8-24 hours:	5.00E-04 s/m^3	1.35E-04 s/m^3	Yes	
1-4 days:	4.00E-04 s/m^3	1.06E-04 s/m^3	Yes	
4-30 days:	3.00E-04 s/m^3	7.30E-05 s/m^3	Yes	
Long Term Dispersion Estimates(15,16,17):				
χ/Q:	~~2.0E-06~~2.0E-07 s/m3	~~4.7E-8~~1.0E-07 sec/m^3 (Undepleted / No Decay χ/Q Value at Nearest Milk Cow, ~~1~~02.38 miles)	Yes	χ/Q Bounding - Yes. FSAR Table 2.3-212 provides a long term dispersion estimate χ/Q less than or equal to those in the DCD. Therefore, the Unit 3 site characteristic value for long term dispersion estimate χ/Q falls within the values established by the ESBWR Site Parameters.

GGNS COL
2.0-1-A

TABLE 2.0-201 (Sheet 26 of 31)
COMPARISON OF ESBWR DCD SITE PARAMETERS (1) WITH UNIT 3 SITE CHARACTERISTICS

Parameter	ESBWR Site Parameter	Unit 3 Site Characteristic	Bounding Yes/No	Comments
χ/Q:	~~2.0E-06~~2.0E-07 s/m^3	~~4.7~~8.4 E-8 sec/ m^3 (Depleted / No Decay χ/Q Value at Nearest Milk Cow, ~~10~~2.38 miles)	Yes	~~SSAR Table 2.3-143 provides long term dispersion estimate χ/Q values less than or equal to those in the DCD. Therefore, the Unit 3 site characteristic values for long term dispersion estimate χ/Q fall within the values established by the ESBWR site parameters.~~
		~~8.8~~5.0 E-6 sec/ m^3 (Undepleted / No Decay χ/Q Value at Site Boundary, ~~0.85~~0.91 mile)	No	~~SSAR Table 2.3-143 provides~~ χ/Q Bounding - No. The long term dispersion estimate χ/Q values ~~that~~ are greater than the DCD ESBWR site parameter value. Per Note (12) of DCD Table 2.0-1, if a selected site has a χ/Q value that exceeds the ESBWR reference site value, the release concentrations in DCD Table 12.2-17 would be adjusted proportionate to the change in χ/Q, using the stack release information in DCD Table 12.2-16, to show the 10 CFR 20 limits are met. Table 12.2-206 provides the Unit 3 (adjusted) release concentrations based on the maximum (most conservative) site boudary χ/Q (5.0E-06) and demonstrates 10 CFR 20 limits are met. In addition, for a site selected that exceeds the bounding χ/Q values, the resulting annual average doses must be addressed to demonstrate that the doses continue to meet the dose reference values provided in 10 CFR 50 Appendix I, using site-specific χ/Q values. Per DCD COL Item 12.2-2-A, Section 12.2.2.2 demonstrates that site-specific doses and gaseous effluent isotopic concentrations and off-site doses are well within allowable limits using the higher χ/Q site characteristic and the ~~bounding ESP~~ composite ESBWR gaseous release source term.
		~~7.8~~4.4 E-6 sec/ m^3 (Depleted / No Decay χ/Q Value at Site Boundary, ~~0.85~~0.91 mile)	No	
		~~2.2~~4.3 E-6 sec/ m^3 (Undepleted / No Decay χ/Q Value at Nearest ~~Home~~Occupied House, ~~0.81~~0.88 mile)	No	

GGNS COL
2.0-1-A

TABLE 2.0-201 (Sheet 27 of 31)
COMPARISON OF ESBWR DCD SITE PARAMETERS (1) WITH UNIT 3 SITE CHARACTERISTICS

Parameter	ESBWR Site Parameter	Unit 3 Site Characteristic	Bounding Yes/No	Comments
χ/Q:	~~2.0E-06~~2.0E-07 s/m^3	~~1.9~~3.8 E-6 sec/m^3 (Depleted / No Decay χ/Q Value at Nearest ~~Home~~Occupied House, ~~0.81~~0.88 miles)	~~Yes~~No	~~SSAR Table 2.3-143 provides long term dispersion estimate χ/Q values less than or equal to those in the DCD. Therefore, the Unit 3 site characteristic values for long term dispersion estimate χ/Q fall within the values established by the ESBWR site parameters.~~
		~~2.0~~4.3 E-6 sec/m^3 (Undepleted / No Decay χ/Q Value at Nearest Garden, ~~1.05~~0.88 miles)	~~Yes~~No	
		~~1.7 E-6~~3.8E-06 sec/m^3 (Depleted / No Decay χ/Q Value at Nearest Garden, ~~1.05~~0.88 miles)	~~Yes~~No	
		~~1.1 E-7~~4.3E-06 sec/m^3 (Undepleted / No Decay χ/Q Value at Nearest Meat Cow, ~~4~~0.88 miles)	~~Yes~~No	
		~~1.1 E-7~~3.8E-06 sec/m^3 (Depleted / No Decay χ/Q Value at Nearest Meat Cow, ~~4~~0.88 miles)	~~Yes~~No	

TABLE 2.0-201 (Sheet 28 of 31)
COMPARISON OF ESBWR DCD SITE PARAMETERS (1) WITH UNIT 3 SITE CHARACTERISTICS

GGNS COL 2.0-1-A

Parameter	ESBWR Site Parameter	Unit 3 Site Characteristic	Bounding Yes/No	Comments
D/Q:	~~4.0~~6.0E-09 m^{-2}	~~1.2 E-8~~6.0E-09 m^{-2} (Site Boundary, ~~0.58~~0.91 miles)	~~No~~Yes	~~SSAR Table 2.3-143~~D/Q - Bounding - Yes. FSAR Table 2.3-212 provides Site Boundary and nearest milk cow ~~provides~~ long term dispersion estimate D/Q values ~~greater~~less than or equal to the DCD ESBWR site parameter value. The site boundary D/Q value was calculated at the location resulting in the highest χ/Q value. Therefore, these Unit 3 site characteristic values fall within the ESBWR site parameter value. ~~SSAR Table 2.3-143 provides long term dispersion estimate D/Q values less than those in the DCD. Therefore, the Unit 3 site characteristic values for long term dispersion estimate D/Q fall within the values established by the ESBWR site parameters.~~
		~~8.7 E-11~~3.8E-10 m^{-2} (Nearest Milk Cow, ~~10~~2.38 miles)	Yes	
GGNS COL 12.2-2-A		~~7.0~~8.1 E-09 m^{-2} (Nearest ~~Home~~Occupied House, ~~0.64~~0.88 mile)	No	D/Q Bounding - No. FSAR Table 2.3-212 provides long term dispersion estimate D/Q values (nearest occupied house, nearest garden and nearest meat cow) greater than the DCD ESBWR site parameter value. Per Note (12) of DCD Table 2.0-1, if a selected site has a D/Q value that exceeds the ESBWR reference site value, the release concentrations in DCD Table 12.2-17 would be adjusted proportionate to the change in D/Q to show the 10 CFR 20 limits are met. As noted above, Table 12.2-206 demonstrates that 10 CFR 20 concentration limits are met, based on the ESBWR release and Unit 3 meteorology. In addition, for a site selected that exceeds the bounding D/Q values, the resulting annual average doses must be addressed to demonstrate that the doses continue to meet the dose reference values provided in 10 CFR 50 Appendix I, using site-specific D/Q values. Per DCD COL Item 12.2-2-A, Section 12.2.2.2 demonstrates that site-specific doses are well within allowable limits using the higher D/Q site characteristic and the ~~bounding ESP~~ composite ESBWR gaseous release source term.
		~~5.4~~8.1 E-09 m^{-2} (Nearest Garden, ~~0.63~~0.88 mile)	No	
		~~4.0~~8.1E-09 E-10 m^{-2} (Nearest Meat Cow, ~~4~~0.88 miles)	~~Yes~~No	

GGNS COL
2.0-1-A

TABLE 2.0-201 (Sheet 31 of 31)
COMPARISON OF ESBWR DCD SITE PARAMETERS (1) WITH UNIT 3 SITE CHARACTERISTICS

Parameter	ESBWR Site Parameter	Unit 3 Site Characteristic	Bounding Yes/No	Comments

(10) Values reported here are actually design criteria rather than site design parameters. They are included here because they do not appear elsewhere in the DCD.

(11) Unit 3 χ/Q values fall within the ESBWR reference site values. Therefore, the radiological consequences associated with the controlling DBA meet the dose reference values provided in 10 CFR 50.34(a) and control room operator dose limits provided in General Design Criterion 19.

(12) Value was selected to comply with expected requirements of southeastern coastal locations.

(13) Localized liquefaction potential under other than Seismic Category I structures is addressed per SRP 2.5.4 in Table 2.0-2R.

(14) Settlement values are long-term (post-construction) values except for differential settlement within the foundation mat. The design of the foundation mat accommodates immediate and long-term (post-construction) differential settlements after the installation of the basemat.

(15) For the Unit 3 analysis the nearest milk cow is assumed to be at an occupied residence 2.38 miles in the ESE direction; this is based on occasional milk usage at the location, not commercial production. Other pathways are evaluated at the nearest occupied house/garden location at 0.88 miles, or the site boundary at 0.91 miles.

(16) DCD Table 2.0-1 provides individual χ/Q and D/Q values for each of three ventilation stacks:

Ventilation Stack	χ/Q (s/m^3)	D/Q (m^{-2})
Reactor/Fuel Building	3.0E-07	1.0E-08
Turbine Building	2.0E-07	6.0E-09
Radwaste Building	2.0E-05	3.0E-08

The smallest of the χ/Q and D/Q values, for the Turbine Building ventilation stack, are used as the ESBWR Site Parameter for comparison to the Unit 3 site characteristics.

(17) Distances to receptors are from the circumference of a circle with a radius of 420 ft that conservatively encompasses all three ventilation stack release locations.

GGNS
ESP PC 3.A

TABLE 2.0-202 (Sheet 6 of 18)
COMPARISON OF UNIT 3 SITE CHARACTERISTICS TO THE GRAND GULF ESP SITE CHARACTERISTICS

Site Characteristic	ESP-002 Site Characteristic	Unit 3 Site Characteristic	Unit 3 Site Characteristic Reference	Bounded Yes/No
Short-Term (Accident Release) Atmospheric Dispersion				
0–2-H χ/Q Value @ EAB	5.95×10^{-4} s/m^3	5.95×10^{-4} s/m^3	SSAR 2.3.4.2	Yes
0–8-H χ/Q Value @ LPZ	8.83×10^{-5} s/m^3	8.83×10^{-5} s/m^3	SSAR 2.3.4.2	The short-term (accident release) atmospheric dispersion site characteristics are identical to the ESP site characteristics. Therefore, the Unit 3 site characteristics fall within the ESP site characteristics.
8–24-H χ/Q Value @ LPZ	6.16×10^{-5} s/m^3	6.16×10^{-5} s/m^3	SSAR 2.3.4.2	
1–4-Day χ/Q Value @ LPZ	2.82×10^{-5} s/m^3	2.82×10^{-5} s/m^3	SSAR 2.3.4.2	
4–30-Day χ/Q Value @ LPZ	9.15×10^{-6} s/m^3	9.15×10^{-6} s/m^3	SSAR 2.3.4.2	
Long-Term (Routine Release) Atmospheric Dispersion				
Annual Average Undepleted/No Decay χ/Q Value @ Site Boundary	8.8×10^{-6} s/m^3	~~8.8~~5.0$\times10^{-6}$ s/m^3	~~SSAR Table 2.3-143~~FSAR Table 2.3-212	Yes. The Unit 3 site characteristic is less than ~~The long-term (routine release) atmospheric dispersion site characteristics are identical to~~ the ESP site characteristic~~s~~. Therefore, the Unit 3 site characteristic~~s~~ fall~~s~~ within the ESP site characteristic~~s~~.
Annual Average Depleted/ No Decay χ/Q Value @ Site Boundary	7.8×10^{-6} s/m^3	~~7.8~~4.4$\times10^{-6}$ s/m^3	~~SSAR Table 2.3-143~~FSAR Table 2.3-212	Yes. The Unit 3 site characteristic is less than the ESP site characteristic. Therefore, the Unit 3 site characteristic falls within the ESP site characteristic.

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TABLE 2.0-202 (Sheet 7 of 18)
COMPARISON OF UNIT 3 SITE CHARACTERISTICS TO THE GRAND GULF ESP SITE CHARACTERISTICS

	Site Characteristic	ESP-002 Site Characteristic	Unit 3 Site Characteristic	Unit 3 Site Characteristic Reference	Bounded Yes/No
	Annual Average D/Q Value @ Site Boundary	1.2×10^{-8} 1/m^2	~~1.2×10^{-8}~~6.0×10^{-9} 1/m^2	~~SSAR Table 2.3-143~~FSAR Table 2.3-212	Yes. The Unit 3 site characteristic is less than the ESP site characteristic. Therefore, the Unit 3 site characteristic falls within the ESP site characteristic. The D/Q value was calculated at the location on the site boundary resulting in the highest χ/Q value.
GGNS ESP VAR 2.0-4	Annual Average Undepleted/No Decay χ/Q Value @ Nearest Home	2.2×10^{-6} s/m^3	~~2.2~~4.3$\times10^{-6}$ s/m^3	~~SSAR Table 2.3-143~~FSAR Table 2.3-212	No. See GGNS ESP VAR 2.0-4. See Table 2.0-201 Note 15.
GGNS ESP VAR 2.0-4	Annual Average Depleted/ No Decay χ/Q Value @ Nearest Home	1.9×10^{-6} s/m^3	~~1.9~~3.8$\times10^{-6}$ s/m^3	~~SSAR Table 2.3-143~~FSAR Table 2.3-212	No. See GGNS ESP VAR 2.0-4. See Table 2.0-201 Note 15.
GGNS ESP VAR 2.0-4	Annual Average D/Q Value @ Nearest Home	7.0×10^{-9} 1/m^2	~~7.0~~8.1$\times10^{-9}$ 1/m^2	~~SSAR Table 2.3-143~~FSAR Table 2.3-212	No. See GGNS ESP VAR 2.0-4. See Table 2.0-201 Note 15.

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ESP PC 3.A

TABLE 2.0-202 (Sheet 8 of 18)
COMPARISON OF UNIT 3 SITE CHARACTERISTICS TO THE GRAND GULF ESP SITE CHARACTERISTICS

	Site Characteristic	ESP-002 Site Characteristic	Unit 3 Site Characteristic	Unit 3 Site Characteristic Reference	Bounded Yes/No
	Long-Term (Routine Release) Atmospheric Dispersion (cont.)				
GGNS ESP VAR 2.0-4	Annual Average Undepleted/No Decay χ/Q Value @ Nearest Garden	2.0×10^{-6} s/m^3	~~2.0~~4.3$\times10^{-6}$ s/m^3	~~SSAR Table 2.3-143~~FSAR Table 2.3-212	~~Yes~~ ~~The long-term (routine-release) atmospheric dispersion site characteristics are identical to the ESP site characteristics. Therefore, the Unit 3 site characteristics fall within the ESP site characteristics.~~No. See GGNS ESP VAR 2.0-4. See Table 2.0-201 Note 15.
GGNS ESP VAR 2.0-4	Annual Average Depleted/ No Decay χ/Q Value @ Nearest Garden	1.7×10^{-6} s/m^3	~~1.7~~3.8$\times10^{-6}$ s/m^3	~~SSAR Table 2.3-143~~FSAR Table 2.3-212	No. See GGNS ESP VAR 2.0-4. See Table 2.0-201 Note 15.
GGNS ESP VAR 2.0-4	Annual Average D/Q Value @ Nearest Garden	5.4×10^{-9} 1/m^2	~~5.4~~8.1$\times10^{-9}$ 1/m^2	~~SSAR Table 2.3-143~~FSAR Table 2.3-212	No. See GGNS ESP VAR 2.0-4. See Table 2.0-201 Note 15.
GGNS ESP VAR 2.0-4	Annual Average Undepleted/No Decay χ/Q Value @ Nearest Milk Cow	7.0×10^{-8} s/m^3	~~7.0×10^{-8}~~1.0x10^{-7} s/m^3	~~SSAR Table 2.3-143~~FSAR Table 2.3-212	No. See GGNS ESP VAR 2.0-4. See Table 2.0-201 Note 15.
GGNS ESP VAR 2.0-4	Annual Average Depleted/ No Decay χ/Q Value @ Nearest Milk Cow	4.7×10^{-8} s/m^3	~~4.7~~8.4$\times10^{-8}$ s/m^3	~~SSAR Table 2.3-143~~FSAR Table 2.3-212	No. See GGNS ESP VAR 2.0-4. See Table 2.0-201 Note 15.

GGNS
ESP PC 3.A

TABLE 2.0-202 (Sheet 9 of 18)
COMPARISON OF UNIT 3 SITE CHARACTERISTICS TO THE GRAND GULF ESP SITE CHARACTERISTICS

	Site Characteristic	ESP-002 Site Characteristic	Unit 3 Site Characteristic	Unit 3 Site Characteristic Reference	Bounded Yes/No
	Long-Term (Routine Release) Atmospheric Dispersion (cont.)				
GGNS ESP VAR 2.0-4	Annual Average D/Q Value @ Nearest Milk Cow	8.7×10^{-11} 1/m^2	~~8.7×10^{-11}~~ 3.8×10^{-10} 1/m^2	~~SSAR Table 2.3-143~~ FSAR Table 2.3-212	No. See GGNS ESP VAR 2.0-4. See Table 2.0-201 Note 15.
GGNS ESP VAR 2.0-4	Annual Average Undepleted/No Decay χ/Q Value @ Nearest Meat Cow	1.4×10^{-7} s/m^3	~~1.4×10^{-7}~~ 4.3×10^{-6} s/m^3	~~SSAR Table 2.3-143~~ FSAR Table 2.3-212	No. See GGNS ESP VAR 2.0-4. See Table 2.0-201 Note 15.
GGNS ESP VAR 2.0-4	Annual Average Depleted/ No Decay χ/Q Value @ Nearest Meat Cow	1.1×10^{-7} s/m^3	~~1.1×10^{-7}~~ 3.8×10^{-6} s/m^3	~~SSAR Table 2.3-143~~ FSAR Table 2.3-212	~~Yes~~ ~~The long-term (routine release) atmospheric dispersion site characteristics are identical to the ESP site characteristics. Therefore, the Unit 3 site characteristics fall within the ESP site characteristics.~~ No. See GGNS ESP VAR 2.0-4. See Table 2.0-201 Note 15.
GGNS ESP VAR 2.0-4	Annual Average D/Q Value @ Nearest Meat Cow	4.0×10^{-10} 1/m^2	~~4.0×10^{-10}~~ 8.1×10^{-9} 1/m^2	~~SSAR Table 2.3-143~~ FSAR Table 2.3-212	No. See GGNS ESP VAR 2.0-4. See Table 2.0-201 Note 15.

the roof to no more than an average depth of 100 mm (4 in.) during PMWP conditions.

Based on the roof drainage system design capability to limit rainfall accumulation to an average depth of 4 inches water, the equivalent average pressure loading from the PMWP event is 20.8 lbf/ft^2. The maximum ground snow load is 6.1 lbf/ft^2 as reported in SSAR Section 2.3.1.2.4. The roof design live load from antecedent snowpack represents a 100-year return ground snow load that on the roof of each safety-related building is taken as 60% of that value, based on exposure and thermal conditions, per the ASCE 7 Commentary in DCD Reference 2.0-2. Therefore, the roof snow load from the antecedent snowpack is no more than 3.7 lbf/ft^2 for any Unit 3 safety-related building. Because precipitation during a PMWP event is liquid at the Grand Gulf site, the total roof loading includes an additional rain-on-snow surcharge to account for liquid flowing through the 100-year snowpack. Per Section 7.10 of ASCE 7, 5 lbf/ft^2 accounts for the rain-on-snow surcharge. Therefore, the maximum total load (snowpack plus rain) to be used for the extreme winter precipitation load for roof structural design purposes on a Unit 3 safety-related building is: (3.7 + 20.8 + 5) or 29.5 lbf/ft^2, less than half of the ESBWR standard plant design roof load of 60 lbf/ft^2 (DCD Table 2.0-1).

2.3.2 LOCAL METEOROLOGY

GGNS ESP COL 2.3-1

GGNS COL 2.0-8-A

ESP COL Action Item 2.3-1 states that a COL or CP applicant should evaluate interaction between the existing meteorological tower and the proposed facility's cooling towers. The following supplements to Section 2.3.2.2 provide the results of this COL Action Item 2.3-1 evaluation.

Add the following subheading after Section 2.3.2.2 heading:

General

Add the following subheading after the second and before the third paragraph:

Facility Construction and Structure Influences

Add the following text after the third paragraph:

The main 50 meter meteorological tower base is approximately 156 ft. msl as indicated in SSAR Section 2.3.3.2. The major Unit 3 structures in the vicinity of the meteorological tower are the Unit 3 turbine building, ~~and~~ the reactor ~~buildings~~building, ~~the offgas stack~~ and the natural draft cooling tower (NDCT). The 550 ft. tall NDCT is located approximately 2600 ft. south of the meteorological tower with its base at elevation 157 ft. msl (Figure 2.4.1-201). The Unit 3 turbine

and reactor buildings ~~and the plant stack~~ are sited on a grade of 133.5 ft. msl south-southeast of the meteorological tower at a distance of approximately 3200 ft. from the meteorological tower (Figure 2.4.1-201).

RG 1.23, Revision 1, indicates that a meteorological tower located at 10-building-heights horizontal distance downwind will not have adverse building wake effects exerted by the structure. The height of the turbine building is approximately 162 ft. above grade (DCD Figure 1.2-19) and the reactor building is approximately 157 ft. above grade (DCD Figure 1.2-11). Site grade at the location of these structures is 133.5 ft. msl. Therefore, the zone of turbulent flow created by the turbine building will be limited to approximately 1620 ft. (10 building heights) downwind. Thus, the Unit 3 turbine building or reactor building will not adversely affect the measurements taken at the primary tower. ~~The plant stack is a narrow cylindrical structure located also approximately 3200 ft. from the meteorological tower; its height is approximately 164 ft. above grade. Therefore, it will not adversely affect the meteorological tower instrument measurements.~~

The 10-building-height distance of separation guidance is usually applied to square- or rectangular-shaped structures or objects. A round structure will produce a downwind wake zone that is shorter than a square or rectangular structure or object. The downwind region of adverse influence of a hyperbolically-shaped, natural-draft cooling tower is estimated to be approximately five times the width of the tower at the top of the structure (Reference 2.3-201).

The NDCT is approximately 550 ft. high, with a diameter of 262 ft. at the top. Based on the EPA guidance for this type of structure and the diameter at its top, the outermost boundary of influence that will be exerted by the NDCT is estimated to be approximately 1315 ft. This distance is much shorter than the physical separation of the cooling tower from the meteorological tower (i.e., approximately 2600 ft.). Therefore, the natural-draft cooling towers will not adversely affect measurements made at the primary meteorological tower. Similarly, other structures in the vicinity of the primary meteorological tower have been evaluated as having no adverse effect on the measurements taken at the tower.

Winds blow predominantly from the north-northeast at the site; winds at the 33 ft. elevation blow from the south an average of approximately 7.6 percent of the time, from the south-southeast an average of approximately 7.4 percent of the time, and from the south-southwest approximately 5.1 percent of the time (see SSAR Tables 2.3-32 through 2.3-43). Wake effects from the cooling tower and powerblock structures will have some influence on the local air flow immediately downwind of the structures. However, considering the frequency of winds blowing toward the meteorological tower, the distance of the plant structures from the meteorological tower and the shape of the plant structures, the effect on the meteorological measurements would be minimal and the data taken at the meteorological tower will be representative of the site.

Finally, the ARCON96 code default values are used for the "hours in averages" and "minimum number of hours" parameters in accordance with RG 1.194, Table A-2. The ARCON96 parameters are summarized in Tables 2.3-202 and 2.3-203.

2.3.4.3.3 Results

The χ/Q values for each source-receptor pair are shown in Tables 2.3-204 through 2.3-207. The site-specific χ/Qs are less than the corresponding DCD values (see Table 2.0-201).

Dispersion factors are required so that the doses from a Unit 1 accident on Unit 3 operators may be calculated. The cross-unit χ/Q values are conservatively based on a simple point source model. A distance of 350 m between Unit 1 and Unit 3 is conservatively assumed (actual distance is approximately 400 m). The release height and receptor height are both assumed to be 10 m. The results are presented in Table 2.3-208. The calculated results, as well as the results with a "safety factor" of 1.5, are presented. The "safety factor" is used to account for any variations in release locations.

2.3.4.4 INGRESS/EGRESS DIFFUSION ESTIMATES

For the purposes of evaluating dose to personnel for control room ingress and egress, the atmospheric dispersion coefficients calculated at the unfiltered CB louver intake are used.

2.3.5 LONG TERM DIFFUSION ESTIMATES

GGNS ESP COL 2.3-3

GGNS ESP VAR 2.0-4

ESP COL Action Item 2.3-3 states that a COL or CP applicant should confirm specific release point characteristics and locations of potential receptors for routine release dose computations. This action item requires verification that the specific release point characteristics (e.g., release height and building wake dimensions) and specific locations of receptors of interest (e.g., distance and direction to nearest home, garden, meat animal, and milk animal) used to generate the SSAR long-term (routine release) atmospheric dispersion site characteristics bound the actual values provided at the COL or CP stage. ~~The following information added to~~ SSAR Sections 2.3.5.2 and 2.3.5.3 and SSAR Tables 2.3-143 through 2.3-146 are superseded by the following to ~~addresses~~address the ESP COL action item and the ESBWR plant design attributes.

~~Because the SSAR χ/Q calculations utilized ground level releases and did not consider building wake effects, the release point characteristics used in the SSAR analyses supporting this section are bounding for Unit 3. The specific locations of receptors of interest (e.g., distance and direction to nearest home, garden, meat~~

~~animal, and milk animal) used to generate the SSAR long term (routine release) atmospheric dispersion site characteristics were compared with values from the latest Unit 1 land use census data (Reference 2.3-203). In all cases, the distances to the limiting locations used in the ESP SSAR analyses are smaller than the distances given in the current land use census. Therefore, the χ/Qs provided in the SSAR remain valid for Unit 3.~~

2.3.5.2 Calculation Methodology and Assumptions

The XOQDOQ Computer Program (NUREG/CR-2919) which implements the assumptions outlined in Regulatory Guide 1.111, "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Release from Light-Water-Cooled Reactors" developed by the USNRC, is used to generate the annual average relative concentration, χ/Q, and annual average relative deposition, D/Q. Values of χ/Q and D/Q are determined at points of potential maximum concentration, outside the site boundary, at points of maximum individual exposure and at points within a radial grid of sixteen 22 1/2 degree sectors and extending to a distance of 50 miles. Radioactive decay and dry deposition are considered.

Meteorological data for the period from 2002 through 2003 is used, and conservative receptor locations are determined from the locations given in the GGNS land use census (References 2.3-203 and 2.3-204). Hourly meteorological data is used in the development of joint frequency distributions, in hours, of wind direction and wind speed by atmospheric stability class. The wind speed categories used are consistent with the short-term (accident) diffusion χ/Q calculation. Calms are distributed as the first wind speed class.

Joint frequency distribution tables are developed from the hourly meteorological data with the assumption that if data required as input to the XOQDOQ program (i.e., lower level wind direction and wind speed, and temperature differential as opposed to upper level wind direction and wind speed) is missing from the hourly data record, all data for that hour is discarded. This assumption maximizes the data being included in the calculation of the χ/Q and D/Q values.

The analysis assumes a release boundary as the circumference of a circle with a radius of 420 ft (128 m) which conservatively encompasses all potential release locations for GGNS Unit 3. This release boundary is used to determine the distances to the site boundary and the offsite receptors. At ground level locations beyond several miles from the plant, the annual average concentration of effluents are essentially independent of release mode; however, for ground level concentrations within a few miles, the release mode is very important. Gaseous effluents released from tall stacks generally produce peak ground-level air concentrations near or beyond the site boundary. Near ground level releases usually produce concentrations that decrease from the release point to all locations downwind. Guidance for selection of the release mode is provided in Regulatory Guide 1.111. In general, in order for an elevated release to be assumed, either the release height must be at least twice the height of adjacent

buildings or detailed information must be known about the wind speed at the height of the release. For this analysis, routine releases from Unit 3 are conservatively modeled as ground level releases.

Building cross-sectional area and building height are used in calculation of building wake effects. Regulatory Guide 1.111 identifies the tallest adjacent building, in many cases the reactor building, as appropriate for use. A conservative building cross-section area of 2000 m^2 and a building height of 48-m are used in the analysis.

Consistent with Regulatory Guide 1.111 regarding radiological impact evaluations, radioactive decay and deposition are considered. For conservative estimates of radioactive decay, an overall half-life of 2.26 days is acceptable for short-lived noble gases and a half-life of 8 days for all iodines released to the atmosphere is used. At sites where there is not a well defined rainy season associated with a local grazing season, wet deposition does not have a significant impact. In addition, the dry deposition rate of noble gases is so slow that the depletion is negligible within 50 miles. Therefore, in this analysis only the effects of dry deposition of iodines are considered. The calculation results with and without consideration of dry deposition are identified in Tables 2.3-212 through 2.3-216 as "depleted" and "undepleted," respectively.

No terrain recirculation factor is applied. This is consistent with the GGNS position on Regulatory Guide 1.111 as stated in the UFSAR (Section 3A) (Reference 2.3-205). This regulatory position states that since the meteorological data does not show any conclusive or systematic up and down or cross valley flow it would be inappropriate to apply recirculation factors as indicated in Regulatory Guide 1.111.

Receptor locations for the Grand Gulf site are evaluated as specified in NUREG-1555 which states: "χ/Q and/or D/Q at points of potential maximum concentration outside the site boundary, at points of maximum individual exposure, and at points within a radial grid of sixteen 22 1/2 degree sectors (centered on true north, north-northeast, northeast, etc.) and extending to a distance of 80 km (50 mi) from the station. A set of data points should be located within each sector at increments of 0.4 km (0.25 mi) to a distance of 1.6 km (1 mi) from the plant, at increments of 0.8 km (0.5 mi) from a distance of 1.6 km (1 mi) to 8 km (5 mi), at increments of 4 km (2.5 mi) from a distance of 8 km (5 mi) to 16 km(10 mi), and at increments of 8 km (5 mi) thereafter to a distance of 80 km (50 mi). Estimates of χ/Q (undecayed and undepleted; depleted for radioiodines) and D/Q radioiodines and particulates should be provided at each of these grid points." This is consistent with the guidance of NUREG-0800 (Section 2.3.5.2) and Regulatory Guide 1.206 (Section 2.3.5.2).

2.3.5.3 Results

Results of the analysis, based upon 2 years of data collected on site, are presented in Tables 2.3-212 through 2.3-217.

2.3.6 REFERENCES

2.3-201 Guideline for Determination of Good Engineering Practice Stack Height, Technical Support Document for the Stack Height Regulations, U.S. Environmental Protection Agency (EPA), EPA-450/4-80-023, July 1981.

2.3-202 SACTI User's Manual: Cooling-Tower-Plume Prediction Code, EPRI CS-3403-CCM, April 1984.

2.3-203 Entergy Operations Inc., Annual Radiological Environmental Operating Report, April 30, 2007, ADAMS Accession No. ML071200209.

2.3-204 Entergy Operations Inc., Annual Radiological Environmental Operating Report, April 24, 2007, ADAMS Accession No. ML021200537.

2.3-205 Grand Gulf Nuclear Station, Updated Final Safety Analysis Report, Chapter 3, Appendix 3A.

GGNS ESP COL 2.3-3

TABLE 2.3-212 (Sheet 1 of 5)
ANNUAL AVERAGE χ/Q AND D/Q
(DATA PERIOD 2002 - 2003)

Receptor Location[1]	Sector	Distance (miles)	Distance (meters)	χ/Q No Decay Undepleted (sec/m^3)	χ/Q No Decay Depleted (sec/m^3)	χ/Q 2.26 Day Decay Undepleted (sec/m^3)	χ/Q 8.00 Day Decay Depleted (sec/m^3)	D/Q (m^{-2})
Site Boundary	S	0.72	1159	1.7E-06	1.5E-06	1.7E-06	1.5E-06	7.9E-09
Site Boundary	SSW	1.51	2430	9.2E-07	7.8E-07	9.1E-07	7.8E-07	2.3E-09
Site Boundary	SW	1.17	1883	2.8E-06	2.4E-06	2.8E-06	2.4E-06	5.0E-09
Site Boundary	WSW	0.91	1465	5.0E-06	4.4E-06	5.0E-06	4.4E-06	6.0E-09
Site Boundary	W	1.17	1883	3.4E-06	2.9E-06	3.3E-06	2.9E-06	3.7E-09
Site Boundary	WNW	1.08	1738	2.5E-06	2.2E-06	2.5E-06	2.1E-06	3.8E-09
Site Boundary	NW	1.23	1979	1.4E-06	1.2E-06	1.4E-06	1.2E-06	3.6E-09
Site Boundary	NNW	1.76	2832	5.9E-07	4.9E-07	5.8E-07	4.9E-07	1.7E-09
Site Boundary	N	0.74	1191	2.0E-06	1.8E-06	2.0E-06	1.8E-06	7.8E-09
Site Boundary	NNE	0.63	1014	1.7E-06	1.5E-06	1.6E-06	1.5E-06	7.1E-09
Site Boundary	NE	0.57	917	1.3E-06	1.1E-06	1.3E-06	1.1E-06	6.3E-09

Grand Gulf Nuclear Station, Unit 3
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GGNS ESP COL 2.3-3

TABLE 2.3-212 (Sheet 2 of 5)
ANNUAL AVERAGE χ/Q AND D/Q
(DATA PERIOD 2002 - 2003)

Receptor Location[1]	Sector	Distance (miles)	Distance (meters)	χ/Q No Decay Undepleted (sec/m^3)	χ/Q No Decay Depleted (sec/m^3)	χ/Q 2.26 Day Decay Undepleted (sec/m^3)	χ/Q 8.00 Day Decay Depleted (sec/m^3)	D/Q (m^{-2})
Site Boundary	ENE	0.61	982	1.4E-06	1.2E-06	1.3E-06	1.2E-06	5.8E-09
Site Boundary	E	0.72	1159	7.8E-07	6.9E-07	7.7E-07	6.9E-07	3.7E-09
Site Boundary	ESE	0.68	1094	7.1E-07	6.3E-07	7.0E-07	6.3E-07	3.3E-09
Site Boundary	SE	0.69	1110	7.7E-07	6.9E-07	7.6E-07	6.8E-07	3.1E-09
Site Boundary	SSE	0.72	1159	1.2E-06	1.0E-06	1.2E-06	1.0E-06	6.3E-09
GARDEN	S	3.29	5295	1.8E-07	1.4E-07	1.7E-07	1.4E-07	5.7E-10
GARDEN	SSW	2.29	3685	5.1E-07	4.2E-07	5.0E-07	4.2E-07	1.1E-09
GARDEN	SW	0.88	1416	4.3E-06	3.8E-06	4.3E-06	3.8E-06	8.1E-09
GARDEN	NNW	1.16	1867	1.1E-06	9.3E-07	1.1E-06	9.2E-07	3.4E-09
GARDEN	N	1.5	2414	6.9E-07	5.9E-07	6.9E-07	5.9E-07	2.3E-09
GARDEN	NNE	1.35	2173	5.3E-07	4.6E-07	5.3E-07	4.6E-07	2.0E-09
GARDEN	NE	0.62	998	1.1E-06	9.9E-07	1.1E-06	9.9E-07	5.5E-09

Grand Gulf Nuclear Station, Unit 3
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GGNS ESP COL 2.3-3

TABLE 2.3-212 (Sheet 3 of 5)
ANNUAL AVERAGE χ/Q AND D/Q
(DATA PERIOD 2002 - 2003)

Receptor Location[1]	Sector	Distance (miles)	Distance (meters)	χ/Q No Decay Undepleted (sec/m^3)	χ/Q No Decay Depleted (sec/m^3)	χ/Q 2.26 Day Decay Undepleted (sec/m^3)	χ/Q 8.00 Day Decay Depleted (sec/m^3)	D/Q (m^{-2})
GARDEN	ENE	2.69	4329	1.5E-07	1.2E-07	1.5E-07	1.2E-07	4.5E-10
GARDEN	E	0.99	1593	4.7E-07	4.2E-07	4.7E-07	4.1E-07	2.2E-09
GARDEN	ESE	2.38	3830	1.0E-07	8.4E-08	1.0E-07	8.4E-08	3.8E-10
GARDEN	SE	3.98	6405	5.5E-08	4.2E-08	5.4E-08	4.2E-08	1.5E-10
GARDEN	SSE	1.24	1996	5.0E-07	4.3E-07	5.0E-07	4.3E-07	2.5E-09
OCCUPIED HOUSE	S	3.29	5295	1.8E-07	1.4E-07	1.7E-07	1.4E-07	5.7E-10
OCCUPIED HOUSE	SSW	2.29	3685	5.1E-07	4.2E-07	5.0E-07	4.2E-07	1.1E-09
OCCUPIED HOUSE	SW	0.88	1416	4.3E-06	3.8E-06	4.3E-06	3.8E-06	8.1E-09
OCCUPIED HOUSE	NNW	0.82	1320	1.8E-06	1.6E-06	1.8E-06	1.6E-06	6.2E-09
OCCUPIED HOUSE	N	0.73	1175	2.0E-06	1.8E-06	2.0E-06	1.8E-06	7.9E-09
OCCUPIED HOUSE	NNE	0.65	1046	1.6E-06	1.4E-06	1.6E-06	1.4E-06	6.8E-09
OCCUPIED HOUSE	NE	0.62	998	1.1E-06	9.9E-07	1.1E-06	9.9E-07	5.5E-09

Grand Gulf Nuclear Station, Unit 3
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GGNS ESP COL 2.3-3

TABLE 2.3-212 (Sheet 4 of 5)
ANNUAL AVERAGE χ/Q AND D/Q
(DATA PERIOD 2002 - 2003)

Receptor Location[1]	Sector	Distance (miles)	Distance (meters)	χ/Q No Decay Undepleted (sec/m^3)	χ/Q No Decay Depleted (sec/m^3)	χ/Q 2.26 Day Decay Undepleted (sec/m^3)	χ/Q 8.00 Day Decay Depleted (sec/m^3)	D/Q (m^{-2})
OCCUPIED HOUSE	ENE	2.56	4120	1.6E-07	1.3E-07	1.6E-07	1.3E-07	4.9E-10
OCCUPIED HOUSE	E	0.99	1593	4.7E-07	4.2E-07	4.7E-07	4.1E-07	2.2E-09
OCCUPIED HOUSE	ESE	2.38	3830	1.0E-07	8.4E-08	1.0E-07	8.4E-08	3.8E-10
OCCUPIED HOUSE	SE	2.27	3653	1.3E-07	1.0E-07	1.2E-07	1.0E-07	4.0E-10
OCCUPIED HOUSE	SSE	1.28	2060	4.8E-07	4.1E-07	4.8E-07	4.1E-07	2.4E-09
UNOCCUPIED HOUSE	W	1.37	2205	2.7E-06	2.3E-06	2.7E-06	2.3E-06	2.8E-09
UNOCCUPIED HOUSE	WNW	4.52	7274	3.8E-07	2.8E-07	3.6E-07	2.8E-07	3.1E-10
UNOCCUPIED HOUSE	NW	3.17	5102	3.8E-07	3.0E-07	3.8E-07	3.0E-07	6.9E-10
UNOCCUPIED HOUSE	N	0.69	1110	2.2E-06	2.0E-06	2.2E-06	2.0E-06	8.7E-09

Grand Gulf Nuclear Station, Unit 3
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GGNS ESP COL 2.3-3

TABLE 2.3-212 (Sheet 5 of 5)
ANNUAL AVERAGE χ/Q AND D/Q
(DATA PERIOD 2002 - 2003)

Receptor Location[1]	Sector	Distance (miles)	Distance (meters)	χ/Q No Decay Undepleted (sec/m^3)	χ/Q No Decay Depleted (sec/m^3)	χ/Q 2.26 Day Decay Undepleted (sec/m^3)	χ/Q 8.00 Day Decay Depleted (sec/m^3)	D/Q (m^{-2})
UNOCCUPIED HOUSE	E	0.94	1513	5.1E-07	4.5E-07	5.1E-07	4.5E-07	2.4E-09
UNOCCUPIED HOUSE	SE	2.11	3396	1.4E-07	1.2E-07	1.4E-07	1.2E-07	4.5E-10
UNOCCUPIED HOUSE	SSE	1.28	2060	4.8E-07	4.1E-07	4.8E-07	4.1E-07	2.4E-09

NOTE:

1. For the Unit 3 analysis the nearest milk cow is assumed to be at an occupied residence 2.38 miles in the ESE direction; this is based on occasional milk usage at the location, not commercial production. Other pathways are evaluated at the nearest occupied house/garden location at 0.88 miles, or the site boundary at 0.91 miles.

GGNS ESP COL 2.3-3

TABLE 2.3-213 (Sheet 1 of 3)
ANNUAL AVERAGE RELATIVE CONCENTRATION, χ/Q
(NO DECAY, UNDEPLETED)

RADWASTE BUILDING VENT[1] NO DECAY, UNDEPLETED

ANNUAL AVERAGE CHI/Q (SEC/METER-CUBED) DISTANCE IN MILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	8.703E-06	2.975E-06	1.590E-06	1.025E-06	5.589E-07	3.649E-07	2.626E-07	2.010E-07	1.605E-07	1.322E-07	1.114E-07
SSW	1.435E-05	4.744E-06	2.551E-06	1.664E-06	9.291E-07	6.175E-07	4.504E-07	3.485E-07	2.808E-07	2.331E-07	1.979E-07
SW	3.465E-05	1.070E-05	5.508E-06	3.546E-06	2.031E-06	1.385E-06	1.030E-06	8.097E-07	6.610E-07	5.548E-07	4.756E-07
WSW	4.503E-05	1.353E-05	6.812E-06	4.354E-06	2.526E-06	1.743E-06	1.308E-06	1.035E-06	8.502E-07	7.170E-07	6.172E-07
W	4.315E-05	1.299E-05	6.567E-06	4.208E-06	2.439E-06	1.681E-06	1.261E-06	9.971E-07	8.182E-07	6.896E-07	5.934E-07
WNW	2.751E-05	8.429E-06	4.316E-06	2.776E-06	1.596E-06	1.092E-06	8.141E-07	6.410E-07	5.241E-07	4.405E-07	3.780E-07
NW	1.720E-05	5.579E-06	2.978E-06	1.942E-06	1.090E-06	7.278E-07	5.329E-07	4.136E-07	3.341E-07	2.779E-07	2.364E-07
NNW	1.118E-05	3.739E-06	2.029E-06	1.327E-06	7.373E-07	4.874E-07	3.541E-07	2.730E-07	2.194E-07	1.817E-07	1.539E-07
N	1.030E-05	3.543E-06	1.934E-06	1.258E-06	6.924E-07	4.546E-07	3.286E-07	2.524E-07	2.021E-07	1.669E-07	1.410E-07
NNE	6.801E-06	2.336E-06	1.277E-06	8.333E-07	4.575E-07	2.995E-07	2.159E-07	1.655E-07	1.323E-07	1.090E-07	9.199E-08
NE	4.555E-06	1.541E-06	8.268E-07	5.337E-07	2.900E-07	1.885E-07	1.352E-07	1.032E-07	8.226E-08	6.762E-08	5.692E-08
ENE	5.581E-06	1.853E-06	9.864E-07	6.372E-07	3.485E-07	2.280E-07	1.643E-07	1.259E-07	1.006E-07	8.297E-08	7.002E-08
E	4.168E-06	1.384E-06	7.292E-07	4.666E-07	2.532E-07	1.648E-07	1.183E-07	9.043E-08	7.212E-08	5.934E-08	4.999E-08
ESE	3.383E-06	1.142E-06	6.069E-07	3.894E-07	2.093E-07	1.350E-07	9.623E-08	7.309E-08	5.799E-08	4.749E-08	3.985E-08
SE	3.755E-06	1.270E-06	6.721E-07	4.304E-07	2.334E-07	1.519E-07	1.090E-07	8.328E-08	6.639E-08	5.460E-08	4.598E-08
SSE	6.013E-06	2.051E-06	1.092E-06	6.996E-07	3.764E-07	2.431E-07	1.735E-07	1.319E-07	1.047E-07	8.579E-08	7.201E-08

Grand Gulf Nuclear Station, Unit 3
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GGNS ESP COL 2.3-3

TABLE 2.3-213 (Sheet 2 of 3)
ANNUAL AVERAGE RELATIVE CONCENTRATION, χ/Q
(NO DECAY, UNDEPLETED)

RADWASTE BUILDING VENT[1] NO DECAY, UNDEPLETED

ANNUAL AVERAGE CHI/Q (SEC/METER-CUBED) DISTANCE IN MILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	9.571E-08	5.361E-08	3.569E-08	2.025E-08	1.362E-08	1.004E-08	7.832E-09	6.357E-09	5.310E-09	4.532E-09	3.936E-09
SSW	1.710E-07	9.793E-08	6.619E-08	3.833E-08	2.613E-08	1.945E-08	1.530E-08	1.250E-08	1.050E-08	9.005E-09	7.853E-09
SW	4.146E-07	2.453E-07	1.696E-07	1.013E-07	7.055E-08	5.337E-08	4.254E-08	3.514E-08	2.980E-08	2.578E-08	2.265E-08
WSW	5.399E-07	3.237E-07	2.258E-07	1.365E-07	9.576E-08	7.287E-08	5.835E-08	4.839E-08	4.116E-08	3.571E-08	3.145E-08
W	5.189E-07	3.106E-07	2.164E-07	1.306E-07	9.157E-08	6.962E-08	5.572E-08	4.618E-08	3.927E-08	3.405E-08	2.998E-08
WNW	3.298E-07	1.958E-07	1.357E-07	8.133E-08	5.675E-08	4.300E-08	3.431E-08	2.838E-08	2.408E-08	2.085E-08	1.833E-08
NW	2.047E-07	1.181E-07	8.022E-08	4.679E-08	3.205E-08	2.394E-08	1.889E-08	1.547E-08	1.303E-08	1.120E-08	9.781E-09
NNW	1.327E-07	7.548E-08	5.077E-08	2.919E-08	1.979E-08	1.467E-08	1.150E-08	9.373E-09	7.853E-09	6.722E-09	5.850E-09
N	1.213E-07	6.842E-08	4.575E-08	2.609E-08	1.759E-08	1.299E-08	1.014E-08	8.240E-09	6.886E-09	5.880E-09	5.107E-09
NNE	7.907E-08	4.437E-08	2.956E-08	1.676E-08	1.126E-08	8.284E-09	6.455E-09	5.231E-09	4.363E-09	3.719E-09	3.225E-09
NE	4.884E-08	2.725E-08	1.809E-08	1.022E-08	6.860E-09	5.046E-09	3.931E-09	3.186E-09	2.658E-09	2.267E-09	1.966E-09
ENE	6.021E-08	3.389E-08	2.264E-08	1.291E-08	8.720E-09	6.446E-09	5.043E-09	4.102E-09	3.432E-09	2.935E-09	2.552E-09
E	4.293E-08	2.405E-08	1.601E-08	9.103E-09	6.143E-09	4.540E-09	3.551E-09	2.888E-09	2.417E-09	2.067E-09	1.798E-09
ESE	3.410E-08	1.882E-08	1.240E-08	6.952E-09	4.652E-09	3.414E-09	2.656E-09	2.150E-09	1.792E-09	1.526E-09	1.323E-09
SE	3.947E-08	2.206E-08	1.467E-08	8.316E-09	5.597E-09	4.127E-09	3.223E-09	2.618E-09	2.188E-09	1.869E-09	1.624E-09
SSE	6.164E-08	3.408E-08	2.248E-08	1.260E-08	8.427E-09	6.180E-09	4.805E-09	3.887E-09	3.238E-09	2.758E-09	2.390E-09

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TABLE 2.3-213 (Sheet 3 of 3)
ANNUAL AVERAGE RELATIVE CONCENTRATION, χ/Q
(NO DECAY, UNDEPLETED)

RADWASTE BUILDING VENT[1] NO DECAY, UNDEPLETED

CHI/Q (SEC/METER-CUBED) FOR EACH SEGMENT — SEGMENT BOUNDARIES IN MILES FROM THE SITE

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	1.647E-06	5.762E-07	2.653E-07	1.613E-07	1.117E-07	5.500E-08	2.073E-08	1.011E-08	6.379E-09	4.542E-09
SSW	2.644E-06	9.540E-07	4.542E-07	2.820E-07	1.984E-07	1.001E-07	3.910E-08	1.957E-08	1.254E-08	9.020E-09
SW	5.791E-06	2.081E-06	1.037E-06	6.630E-07	4.765E-07	2.493E-07	1.028E-07	5.362E-08	3.522E-08	2.581E-08
WSW	7.212E-06	2.584E-06	1.315E-06	8.524E-07	6.182E-07	3.282E-07	1.382E-07	7.317E-08	4.848E-08	3.575E-08
W	6.946E-06	2.495E-06	1.267E-06	8.203E-07	5.943E-07	3.150E-07	1.323E-07	6.991E-08	4.627E-08	3.409E-08
WNW	4.546E-06	1.634E-06	8.190E-07	5.257E-07	3.787E-07	1.989E-07	8.249E-08	4.319E-08	2.844E-08	2.087E-08
NW	3.095E-06	1.118E-06	5.371E-07	3.354E-07	2.370E-07	1.205E-07	4.767E-08	2.408E-08	1.552E-08	1.121E-08
NNW	2.097E-06	7.573E-07	3.572E-07	2.203E-07	1.543E-07	7.722E-08	2.981E-08	1.477E-08	9.403E-09	6.734E-09
N	1.991E-06	7.125E-07	3.317E-07	2.030E-07	1.414E-07	7.011E-08	2.668E-08	1.308E-08	8.268E-09	5.892E-09
NNE	1.315E-06	4.708E-07	2.180E-07	1.329E-07	9.225E-08	4.550E-08	1.716E-08	8.346E-09	5.250E-09	3.727E-09
NE	8.553E-07	2.991E-07	1.367E-07	8.268E-08	5.709E-08	2.797E-08	1.048E-08	5.084E-09	3.198E-09	2.272E-09
ENE	1.024E-06	3.591E-07	1.659E-07	1.011E-07	7.022E-08	3.474E-08	1.321E-08	6.491E-09	4.116E-09	2.941E-09
E	7.580E-07	2.613E-07	1.196E-07	7.248E-08	5.015E-08	2.467E-08	9.323E-09	4.572E-09	2.898E-09	2.071E-09
ESE	6.290E-07	2.163E-07	9.731E-08	5.830E-08	3.998E-08	1.936E-08	7.141E-09	3.441E-09	2.158E-09	1.530E-09
SE	6.976E-07	2.410E-07	1.102E-07	6.673E-08	4.613E-08	2.265E-08	8.519E-09	4.158E-09	2.627E-09	1.872E-09
SSE	1.131E-06	3.890E-07	1.754E-07	1.053E-07	7.225E-08	3.505E-08	1.294E-08	6.229E-09	3.902E-09	2.764E-09

1. The ESBWR has three ventilation stacks, which are comprised of building stacks for the Reactor Building/Fuel Building, Radwaste Building, and Turbine Building (DCD Appendix 2A). For conservatism, the height of the lowest ventilation stack, which is located at the Radwaste Building, is used in the analysis. The analysis assumes a circular boundary of 420 ft radius, that encompasses all three release locations, for routine releases.

GGNS ESP COL 2.3-3

TABLE 2.3-214 (Sheet 1 of 3)
ANNUAL AVERAGE RELATIVE CONCENTRATION, χ/Q
(NO DECAY, DEPLETED)

RADWASTE BUILDING VENT[1] NO DECAY, DEPLETED

ANNUAL AVERAGE CHI/Q (SEC/METER-CUBED) DISTANCE IN MILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	8.099E-06	2.706E-06	1.417E-06	8.971E-07	4.747E-07	3.022E-07	2.127E-07	1.597E-07	1.252E-07	1.014E-07	8.424E-08
SSW	1.335E-05	4.315E-06	2.273E-06	1.457E-06	7.891E-07	5.113E-07	3.649E-07	2.768E-07	2.191E-07	1.789E-07	1.496E-07
SW	3.224E-05	9.736E-06	4.908E-06	3.104E-06	1.725E-06	1.147E-06	8.345E-07	6.431E-07	5.158E-07	4.259E-07	3.596E-07
WSW	4.191E-05	1.230E-05	6.070E-06	3.811E-06	2.145E-06	1.443E-06	1.060E-06	8.225E-07	6.634E-07	5.504E-07	4.667E-07
W	4.015E-05	1.182E-05	5.852E-06	3.683E-06	2.071E-06	1.392E-06	1.021E-06	7.920E-07	6.384E-07	5.294E-07	4.487E-07
WNW	2.560E-05	7.666E-06	3.846E-06	2.430E-06	1.356E-06	9.042E-07	6.595E-07	5.092E-07	4.090E-07	3.381E-07	2.858E-07
NW	1.600E-05	5.074E-06	2.654E-06	1.700E-06	9.255E-07	6.026E-07	4.316E-07	3.285E-07	2.607E-07	2.134E-07	1.788E-07
NNW	1.041E-05	3.400E-06	1.808E-06	1.162E-06	6.261E-07	4.036E-07	2.868E-07	2.169E-07	1.712E-07	1.394E-07	1.163E-07
N	9.588E-06	3.223E-06	1.724E-06	1.101E-06	5.880E-07	3.765E-07	2.662E-07	2.005E-07	1.577E-07	1.281E-07	1.066E-07
NNE	6.329E-06	2.125E-06	1.138E-06	7.294E-07	3.885E-07	2.480E-07	1.749E-07	1.314E-07	1.032E-07	8.370E-08	6.955E-08
NE	4.239E-06	1.402E-06	7.368E-07	4.672E-07	2.463E-07	1.561E-07	1.096E-07	8.201E-08	6.419E-08	5.191E-08	4.303E-08
ENE	5.194E-06	1.686E-06	8.790E-07	5.577E-07	2.960E-07	1.888E-07	1.331E-07	1.000E-07	7.854E-08	6.369E-08	5.294E-08
E	3.879E-06	1.259E-06	6.498E-07	4.085E-07	2.150E-07	1.365E-07	9.586E-08	7.183E-08	5.628E-08	4.555E-08	3.780E-08
ESE	3.148E-06	1.038E-06	5.408E-07	3.409E-07	1.778E-07	1.118E-07	7.795E-08	5.806E-08	4.525E-08	3.646E-08	3.013E-08
SE	3.494E-06	1.155E-06	5.989E-07	3.768E-07	1.982E-07	1.258E-07	8.832E-08	6.615E-08	5.181E-08	4.191E-08	3.477E-08
SSE	5.596E-06	1.866E-06	9.727E-07	6.124E-07	3.197E-07	2.013E-07	1.405E-07	1.047E-07	8.169E-08	6.586E-08	5.445E-08

Grand Gulf Nuclear Station, Unit 3
COL Application
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GGNS ESP COL 2.3-3

TABLE 2.3-214 (Sheet 2 of 3)
ANNUAL AVERAGE RELATIVE CONCENTRATION, χ/Q
(NO DECAY, DEPLETED)

RADWASTE BUILDING VENT[1] NO DECAY, DEPLETED

ANNUAL AVERAGE CHI/Q (SEC/METER-CUBED) DISTANCE IN MILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	7.135E-08	3.780E-08	2.398E-08	1.259E-08	7.954E-09	5.554E-09	4.131E-09	3.210E-09	2.575E-09	2.117E-09	1.774E-09
SSW	1.275E-07	6.903E-08	4.447E-08	2.384E-08	1.526E-08	1.076E-08	8.068E-09	6.310E-09	5.091E-09	4.205E-09	3.539E-09
SW	3.090E-07	1.729E-07	1.139E-07	6.300E-08	4.120E-08	2.953E-08	2.244E-08	1.774E-08	1.445E-08	1.204E-08	1.021E-08
WSW	4.025E-07	2.282E-07	1.517E-07	8.487E-08	5.593E-08	4.032E-08	3.078E-08	2.443E-08	1.996E-08	1.667E-08	1.417E-08
W	3.868E-07	2.190E-07	1.454E-07	8.122E-08	5.348E-08	3.853E-08	2.939E-08	2.332E-08	1.904E-08	1.590E-08	1.351E-08
WNW	2.459E-07	1.380E-07	9.118E-08	5.057E-08	3.314E-08	2.379E-08	1.810E-08	1.433E-08	1.168E-08	9.735E-09	8.260E-09
NW	1.526E-07	8.324E-08	5.390E-08	2.910E-08	1.872E-08	1.325E-08	9.964E-09	7.813E-09	6.317E-09	5.228E-09	4.408E-09
NNW	9.894E-08	5.321E-08	3.411E-08	1.815E-08	1.156E-08	8.120E-09	6.068E-09	4.732E-09	3.808E-09	3.139E-09	2.636E-09
N	9.045E-08	4.824E-08	3.073E-08	1.622E-08	1.028E-08	7.186E-09	5.351E-09	4.160E-09	3.339E-09	2.746E-09	2.302E-09
NNE	5.894E-08	3.128E-08	1.986E-08	1.042E-08	6.576E-09	4.584E-09	3.404E-09	2.641E-09	2.116E-09	1.737E-09	1.454E-09
NE	3.640E-08	1.921E-08	1.215E-08	6.356E-09	4.006E-09	2.792E-09	2.073E-09	1.609E-09	1.289E-09	1.059E-09	8.862E-10
ENE	4.488E-08	2.389E-08	1.521E-08	8.029E-09	5.093E-09	3.567E-09	2.660E-09	2.071E-09	1.665E-09	1.371E-09	1.150E-09
E	3.200E-08	1.695E-08	1.076E-08	5.661E-09	3.588E-09	2.512E-09	1.873E-09	1.458E-09	1.172E-09	9.653E-10	8.103E-10
ESE	2.542E-08	1.327E-08	8.334E-09	4.323E-09	2.717E-09	1.889E-09	1.401E-09	1.085E-09	8.688E-10	7.128E-10	5.963E-10
SE	2.942E-08	1.555E-08	9.855E-09	5.171E-09	3.269E-09	2.284E-09	1.700E-09	1.322E-09	1.061E-09	8.726E-10	7.317E-10
SSE	4.595E-08	2.403E-08	1.510E-08	7.838E-09	4.921E-09	3.420E-09	2.534E-09	1.963E-09	1.570E-09	1.288E-09	1.077E-09

Grand Gulf Nuclear Station, Unit 3
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GGNS ESP COL 2.3-3

TABLE 2.3-214 (Sheet 3 of 3)
ANNUAL AVERAGE RELATIVE CONCENTRATION, χ/Q
(NO DECAY, DEPLETED)

RADWASTE BUILDING VENT[1] NO DECAY, DEPLETED

CHI/Q (SEC/METER-CUBED) FOR EACH SEGMENT — SEGMENT BOUNDARIES IN MILES FROM THE SITE

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	1.472E-06	4.919E-07	2.154E-07	1.260E-07	8.456E-08	3.911E-08	1.306E-08	5.625E-09	3.231E-09	2.125E-09
SSW	2.364E-06	8.140E-07	3.687E-07	2.203E-07	1.501E-07	7.110E-08	2.461E-08	1.088E-08	6.348E-09	4.221E-09
SW	5.179E-06	1.775E-06	8.412E-07	5.179E-07	3.605E-07	1.769E-07	6.463E-08	2.981E-08	1.783E-08	1.208E-08
WSW	6.451E-06	2.203E-06	1.067E-06	6.658E-07	4.677E-07	2.329E-07	8.686E-08	4.067E-08	2.454E-08	1.672E-08
W	6.213E-06	2.128E-06	1.028E-06	6.408E-07	4.497E-07	2.236E-07	8.315E-08	3.886E-08	2.342E-08	1.595E-08
WNW	4.066E-06	1.394E-06	6.646E-07	4.106E-07	2.865E-07	1.412E-07	5.185E-08	2.401E-08	1.440E-08	9.765E-09
NW	2.768E-06	9.540E-07	4.360E-07	2.620E-07	1.793E-07	8.561E-08	2.999E-08	1.339E-08	7.858E-09	5.247E-09
NNW	1.875E-06	6.463E-07	2.900E-07	1.722E-07	1.167E-07	5.488E-08	1.877E-08	8.217E-09	4.762E-09	3.151E-09
N	1.780E-06	6.081E-07	2.693E-07	1.586E-07	1.070E-07	4.984E-08	1.680E-08	7.275E-09	4.188E-09	2.757E-09
NNE	1.176E-06	4.018E-07	1.770E-07	1.038E-07	6.981E-08	3.235E-08	1.081E-08	4.643E-09	2.659E-09	1.744E-09
NE	7.647E-07	2.553E-07	1.110E-07	6.460E-08	4.321E-08	1.989E-08	6.600E-09	2.828E-09	1.620E-09	1.063E-09
ENE	9.155E-07	3.065E-07	1.347E-07	7.902E-08	5.314E-08	2.470E-08	8.320E-09	3.611E-09	2.084E-09	1.376E-09
E	6.778E-07	2.231E-07	9.707E-08	5.664E-08	3.795E-08	1.754E-08	5.872E-09	2.543E-09	1.468E-09	9.692E-10
ESE	5.625E-07	1.847E-07	7.901E-08	4.556E-08	3.026E-08	1.377E-08	4.500E-09	1.915E-09	1.093E-09	7.159E-10
SE	6.239E-07	2.057E-07	8.944E-08	5.214E-08	3.491E-08	1.610E-08	5.366E-09	2.313E-09	1.330E-09	8.762E-10
SSE	1.011E-06	3.321E-07	1.424E-07	8.225E-08	5.468E-08	2.493E-08	8.156E-09	3.466E-09	1.976E-09	1.293E-09

1. The ESBWR has three ventilation stacks, which are comprised of building stacks for the Reactor Building/Fuel Building, Radwaste Building, and Turbine Building (DCD Appendix 2A). For conservatism, the height of the lowest ventilation stacks, which is located at the Radwaste Building, is used in the analysis. The analysis assumes a circular boundary of 420 ft radius, that encompasses all three release locations, for routine releases.

GGNS ESP COL 2.3-3

TABLE 2.3-215 (Sheet 1 of 3)
ANNUAL AVERAGE RELATIVE CONCENTRATION, χ/Q
(2.26 DAY DECAY, UNDEPLETED)

RADWASTE BUILDING VENT[1] 2.260 DAY DECAY, UNDEPLETED

ANNUAL AVERAGE CHI/Q (SEC/METER-CUBED) DISTANCE IN MILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	8.691E-06	2.967E-06	1.584E-06	1.019E-06	5.544E-07	3.609E-07	2.590E-07	1.976E-07	1.573E-07	1.292E-07	1.086E-07
SSW	1.433E-05	4.730E-06	2.539E-06	1.654E-06	9.208E-07	6.100E-07	4.436E-07	3.422E-07	2.748E-07	2.274E-07	1.924E-07
SW	3.459E-05	1.067E-05	5.480E-06	3.522E-06	2.010E-06	1.366E-06	1.012E-06	7.927E-07	6.448E-07	5.393E-07	4.606E-07
WSW	4.492E-05	1.346E-05	6.766E-06	4.315E-06	2.491E-06	1.712E-06	1.279E-06	1.007E-06	8.233E-07	6.912E-07	5.922E-07
W	4.305E-05	1.293E-05	6.523E-06	4.170E-06	2.406E-06	1.651E-06	1.232E-06	9.700E-07	7.922E-07	6.647E-07	5.693E-07
WNW	2.745E-05	8.398E-06	4.292E-06	2.756E-06	1.579E-06	1.076E-06	7.992E-07	6.270E-07	5.107E-07	4.276E-07	3.656E-07
NW	1.717E-05	5.562E-06	2.965E-06	1.930E-06	1.080E-06	7.190E-07	5.248E-07	4.060E-07	3.270E-07	2.711E-07	2.299E-07
NNW	1.117E-05	3.728E-06	2.020E-06	1.320E-06	7.308E-07	4.816E-07	3.488E-07	2.681E-07	2.148E-07	1.773E-07	1.497E-07
N	1.029E-05	3.533E-06	1.926E-06	1.251E-06	6.867E-07	4.495E-07	3.240E-07	2.481E-07	1.981E-07	1.630E-07	1.373E-07
NNE	6.791E-06	2.329E-06	1.272E-06	8.285E-07	4.535E-07	2.959E-07	2.127E-07	1.625E-07	1.295E-07	1.064E-07	8.953E-08
NE	4.549E-06	1.537E-06	8.235E-07	5.308E-07	2.876E-07	1.864E-07	1.333E-07	1.015E-07	8.063E-08	6.608E-08	5.546E-08
ENE	5.572E-06	1.847E-06	9.818E-07	6.332E-07	3.452E-07	2.250E-07	1.616E-07	1.234E-07	9.834E-08	8.078E-08	6.794E-08
E	4.162E-06	1.380E-06	7.260E-07	4.639E-07	2.509E-07	1.628E-07	1.165E-07	8.875E-08	7.054E-08	5.785E-08	4.857E-08
ESE	3.378E-06	1.139E-06	6.045E-07	3.873E-07	2.076E-07	1.335E-07	9.489E-08	7.186E-08	5.684E-08	4.642E-08	3.883E-08
SE	3.749E-06	1.266E-06	6.690E-07	4.278E-07	2.312E-07	1.500E-07	1.073E-07	8.167E-08	6.488E-08	5.317E-08	4.462E-08
SSE	6.006E-06	2.046E-06	1.087E-06	6.960E-07	3.735E-07	2.406E-07	1.712E-07	1.298E-07	1.028E-07	8.399E-08	7.032E-08

Grand Gulf Nuclear Station, Unit 3
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GGNS ESP COL 2.3-3

TABLE 2.3-215 (Sheet 2 of 3)
ANNUAL AVERAGE RELATIVE CONCENTRATION, χ/Q
(2.26 DAY DECAY, UNDEPLETED)

RADWASTE BUILDING VENT[1] 2.260 DAY DECAY, UNDEPLETED

ANNUAL AVERAGE CHI/Q (SEC/METER-CUBED) DISTANCE IN MILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	9.298E-08	5.128E-08	3.361E-08	1.848E-08	1.205E-08	8.603E-09	6.508E-09	5.122E-09	4.149E-09	3.436E-09	2.895E-09
SSW	1.658E-07	9.342E-08	6.214E-08	3.485E-08	2.301E-08	1.659E-08	1.265E-08	1.002E-08	8.157E-09	6.785E-09	5.739E-09
SW	4.001E-07	2.324E-07	1.578E-07	9.093E-08	6.107E-08	4.458E-08	3.429E-08	2.734E-08	2.238E-08	1.869E-08	1.586E-08
WSW	5.157E-07	3.021E-07	2.059E-07	1.189E-07	7.968E-08	5.794E-08	4.435E-08	3.517E-08	2.862E-08	2.376E-08	2.003E-08
W	4.955E-07	2.898E-07	1.973E-07	1.137E-07	7.618E-08	5.537E-08	4.237E-08	3.359E-08	2.733E-08	2.269E-08	1.913E-08
WNW	3.178E-07	1.852E-07	1.260E-07	7.281E-08	4.899E-08	3.581E-08	2.758E-08	2.202E-08	1.805E-08	1.509E-08	1.282E-08
NW	1.984E-07	1.126E-07	7.531E-08	4.254E-08	2.823E-08	2.043E-08	1.562E-08	1.241E-08	1.013E-08	8.444E-09	7.157E-09
NNW	1.287E-07	7.204E-08	4.769E-08	2.656E-08	1.745E-08	1.254E-08	9.534E-09	7.534E-09	6.124E-09	5.087E-09	4.299E-09
N	1.178E-07	6.545E-08	4.310E-08	2.384E-08	1.560E-08	1.117E-08	8.470E-09	6.680E-09	5.422E-09	4.499E-09	3.798E-09
NNE	7.672E-08	4.238E-08	2.780E-08	1.529E-08	9.962E-09	7.112E-09	5.379E-09	4.233E-09	3.429E-09	2.841E-09	2.395E-09
NE	4.744E-08	2.608E-08	1.705E-08	9.356E-09	6.097E-09	4.357E-09	3.298E-09	2.599E-09	2.108E-09	1.749E-09	1.477E-09
ENE	5.822E-08	3.220E-08	2.114E-08	1.164E-08	7.595E-09	5.425E-09	4.103E-09	3.227E-09	2.612E-09	2.162E-09	1.820E-09
E	4.157E-08	2.289E-08	1.499E-08	8.235E-09	5.373E-09	3.839E-09	2.905E-09	2.287E-09	1.852E-09	1.534E-09	1.293E-09
ESE	3.313E-08	1.802E-08	1.170E-08	6.366E-09	4.137E-09	2.950E-09	2.229E-09	1.754E-09	1.421E-09	1.177E-09	9.928E-10
SE	3.817E-08	2.096E-08	1.369E-08	7.488E-09	4.864E-09	3.462E-09	2.610E-09	2.047E-09	1.653E-09	1.365E-09	1.146E-09
SSE	6.003E-08	3.274E-08	2.131E-08	1.163E-08	7.575E-09	5.413E-09	4.101E-09	3.235E-09	2.628E-09	2.183E-09	1.846E-09

Grand Gulf Nuclear Station, Unit 3
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GGNS ESP COL 2.3-3

TABLE 2.3-215 (Sheet 3 of 3)
ANNUAL AVERAGE RELATIVE CONCENTRATION, χ/Q
(2.26 DAY DECAY, UNDEPLETED)

RADWASTE BUILDING VENT[1] 2.260 DAY DECAY, UNDEPLETED

CHI/Q (SEC/METER-CUBED) FOR EACH SEGMENT — SEGMENT BOUNDARIES IN MILES FROM THE SITE

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	1.640E-06	5.718E-07	2.616E-07	1.581E-07	1.089E-07	5.269E-08	1.898E-08	8.683E-09	5.147E-09	3.447E-09
SSW	2.633E-06	9.457E-07	4.474E-07	2.760E-07	1.929E-07	9.560E-08	3.566E-08	1.673E-08	1.006E-08	6.804E-09
SW	5.762E-06	2.060E-06	1.019E-06	6.469E-07	4.615E-07	2.365E-07	9.253E-08	4.486E-08	2.743E-08	1.874E-08
WSW	7.165E-06	2.550E-06	1.286E-06	8.256E-07	5.932E-07	3.068E-07	1.208E-07	5.830E-08	3.530E-08	2.382E-08
W	6.901E-06	2.462E-06	1.239E-06	7.944E-07	5.702E-07	2.944E-07	1.156E-07	5.572E-08	3.372E-08	2.275E-08
WNW	4.522E-06	1.617E-06	8.041E-07	5.123E-07	3.663E-07	1.884E-07	7.405E-08	3.604E-08	2.210E-08	1.513E-08
NW	3.082E-06	1.108E-06	5.291E-07	3.283E-07	2.305E-07	1.151E-07	4.346E-08	2.059E-08	1.246E-08	8.466E-09
NNW	2.088E-06	7.509E-07	3.519E-07	2.157E-07	1.501E-07	7.381E-08	2.721E-08	1.265E-08	7.568E-09	5.103E-09
N	1.983E-06	7.068E-07	3.271E-07	1.990E-07	1.377E-07	6.716E-08	2.445E-08	1.127E-08	6.712E-09	4.513E-09
NNE	1.310E-06	4.668E-07	2.148E-07	1.302E-07	8.979E-08	4.353E-08	1.570E-08	7.179E-09	4.254E-09	2.850E-09
NE	8.520E-07	2.967E-07	1.348E-07	8.105E-08	5.563E-08	2.681E-08	9.618E-09	4.398E-09	2.612E-09	1.755E-09
ENE	1.019E-06	3.558E-07	1.633E-07	9.882E-08	6.815E-08	3.307E-08	1.195E-08	5.475E-09	3.243E-09	2.169E-09
E	7.548E-07	2.591E-07	1.177E-07	7.091E-08	4.873E-08	2.353E-08	8.464E-09	3.874E-09	2.298E-09	1.539E-09
ESE	6.266E-07	2.146E-07	9.597E-08	5.716E-08	3.897E-08	1.857E-08	6.561E-09	2.978E-09	1.763E-09	1.181E-09
SE	6.946E-07	2.388E-07	1.084E-07	6.522E-08	4.477E-08	2.155E-08	7.700E-09	3.495E-09	2.058E-09	1.369E-09
SSE	1.127E-06	3.861E-07	1.732E-07	1.033E-07	7.056E-08	3.372E-08	1.198E-08	5.465E-09	3.251E-09	2.190E-09

1. The ESBWR has three ventilation stacks, which are comprised of building stacks for the Reactor Building/Fuel Building, Radwaste Building, and Turbine Building (DCD Appendix 2A). For conservatism, the height of the lowest ventilation stack, which is located at the Radwaste Building, is used in the analysis. The analysis assumes a circular boundary of 420 ft radius, that encompasses all three release locations, for routine releases.

GGNS ESP COL 2.3-3

TABLE 2.3-216 (Sheet 1 of 3)
ANNUAL AVERAGE RELATIVE CONCENTRATION, χ/Q
(8.00 DAY DECAY, DEPLETED)

RADWASTE BUILDING VENT[1] 8.000 DAY DECAY, DEPLETED

ANNUAL AVERAGE CHI/Q (SEC/METER-CUBED) DISTANCE IN MILES FROM THE SITE

SECTOR	0.250	0.500	0.750	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500
S	8.096E-06	2.704E-06	1.416E-06	8.958E-07	4.736E-07	3.012E-07	2.119E-07	1.589E-07	1.245E-07	1.008E-07	8.362E-08
SSW	1.335E-05	4.311E-06	2.270E-06	1.454E-06	7.871E-07	5.095E-07	3.633E-07	2.754E-07	2.178E-07	1.777E-07	1.484E-07
SW	3.223E-05	9.726E-06	4.901E-06	3.098E-06	1.720E-06	1.142E-06	8.304E-07	6.393E-07	5.122E-07	4.225E-07	3.563E-07
WSW	4.188E-05	1.229E-05	6.059E-06	3.802E-06	2.137E-06	1.436E-06	1.053E-06	8.161E-07	6.574E-07	5.447E-07	4.612E-07
W	4.013E-05	1.180E-05	5.841E-06	3.674E-06	2.063E-06	1.385E-06	1.015E-06	7.858E-07	6.326E-07	5.239E-07	4.434E-07
WNW	2.558E-05	7.658E-06	3.840E-06	2.425E-06	1.351E-06	9.004E-07	6.560E-07	5.060E-07	4.060E-07	3.353E-07	2.831E-07
NW	1.600E-05	5.070E-06	2.651E-06	1.697E-06	9.232E-07	6.006E-07	4.298E-07	3.268E-07	2.591E-07	2.119E-07	1.773E-07
NNW	1.040E-05	3.398E-06	1.806E-06	1.160E-06	6.246E-07	4.022E-07	2.856E-07	2.158E-07	1.702E-07	1.385E-07	1.154E-07
N	9.584E-06	3.220E-06	1.722E-06	1.100E-06	5.866E-07	3.753E-07	2.651E-07	1.995E-07	1.568E-07	1.272E-07	1.058E-07
NNE	6.327E-06	2.123E-06	1.137E-06	7.282E-07	3.876E-07	2.471E-07	1.742E-07	1.308E-07	1.026E-07	8.312E-08	6.902E-08
NE	4.237E-06	1.401E-06	7.360E-07	4.665E-07	2.457E-07	1.556E-07	1.091E-07	8.161E-08	6.382E-08	5.157E-08	4.272E-08
ENE	5.191E-06	1.684E-06	8.779E-07	5.567E-07	2.952E-07	1.881E-07	1.325E-07	9.945E-08	7.802E-08	6.321E-08	5.249E-08
E	3.878E-06	1.258E-06	6.490E-07	4.078E-07	2.145E-07	1.360E-07	9.544E-08	7.145E-08	5.593E-08	4.522E-08	3.749E-08
ESE	3.147E-06	1.038E-06	5.402E-07	3.403E-07	1.773E-07	1.114E-07	7.764E-08	5.778E-08	4.499E-08	3.622E-08	2.991E-08
SE	3.493E-06	1.154E-06	5.981E-07	3.761E-07	1.977E-07	1.253E-07	8.791E-08	6.578E-08	5.147E-08	4.160E-08	3.447E-08
SSE	5.594E-06	1.864E-06	9.717E-07	6.115E-07	3.190E-07	2.007E-07	1.400E-07	1.043E-07	8.126E-08	6.546E-08	5.408E-08

Grand Gulf Nuclear Station, Unit 3
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GGNS ESP COL 2.3-3

TABLE 2.3-216 (Sheet 2 of 3)
ANNUAL AVERAGE RELATIVE CONCENTRATION, χ/Q
(8.00 DAY DECAY, DEPLETED)

RADWASTE BUILDING VENT[1] 8.000 DAY DECAY, DEPLETED

ANNUAL AVERAGE CHI/Q (SEC/METER-CUBED) DISTANCE IN MILES FROM THE SITE

SECTOR	5.000	7.500	10.000	15.000	20.000	25.000	30.000	35.000	40.000	45.000	50.000
S	7.076E-08	3.732E-08	2.357E-08	1.226E-08	7.675E-09	5.309E-09	3.912E-09	3.011E-09	2.392E-09	1.948E-09	1.617E-09
SSW	1.263E-07	6.811E-08	4.368E-08	2.319E-08	1.471E-08	1.028E-08	7.633E-09	5.914E-09	4.727E-09	3.868E-09	3.225E-09
SW	3.059E-07	1.703E-07	1.116E-07	6.109E-08	3.953E-08	2.804E-08	2.108E-08	1.650E-08	1.330E-08	1.096E-08	9.200E-09
WSW	3.973E-07	2.238E-07	1.478E-07	8.157E-08	5.305E-08	3.775E-08	2.843E-08	2.227E-08	1.796E-08	1.481E-08	1.242E-08
W	3.818E-07	2.147E-07	1.416E-07	7.807E-08	5.072E-08	3.606E-08	2.715E-08	2.126E-08	1.713E-08	1.412E-08	1.184E-08
WNW	2.433E-07	1.359E-07	8.927E-08	4.899E-08	3.177E-08	2.257E-08	1.699E-08	1.331E-08	1.073E-08	8.856E-09	7.436E-09
NW	1.512E-07	8.213E-08	5.293E-08	2.831E-08	1.804E-08	1.265E-08	9.427E-09	7.324E-09	5.866E-09	4.810E-09	4.018E-09
NNW	9.808E-08	5.251E-08	3.350E-08	1.766E-08	1.115E-08	7.756E-09	5.742E-09	4.437E-09	3.537E-09	2.888E-09	2.404E-09
N	8.970E-08	4.763E-08	3.021E-08	1.581E-08	9.921E-09	6.875E-09	5.073E-09	3.909E-09	3.109E-09	2.533E-09	2.104E-09
NNE	5.844E-08	3.087E-08	1.951E-08	1.015E-08	6.346E-09	4.384E-09	3.227E-09	2.481E-09	1.970E-09	1.602E-09	1.329E-09
NE	3.610E-08	1.897E-08	1.195E-08	6.196E-09	3.872E-09	2.675E-09	1.969E-09	1.515E-09	1.203E-09	9.796E-10	8.131E-10
ENE	4.446E-08	2.355E-08	1.491E-08	7.793E-09	4.893E-09	3.392E-09	2.503E-09	1.929E-09	1.535E-09	1.251E-09	1.039E-09
E	3.171E-08	1.672E-08	1.056E-08	5.499E-09	3.451E-09	2.392E-09	1.766E-09	1.361E-09	1.083E-09	8.829E-10	7.337E-10
ESE	2.521E-08	1.311E-08	8.196E-09	4.215E-09	2.626E-09	1.811E-09	1.331E-09	1.023E-09	8.117E-10	6.603E-10	5.477E-10
SE	2.914E-08	1.533E-08	9.662E-09	5.017E-09	3.138E-09	2.169E-09	1.598E-09	1.229E-09	9.760E-10	7.943E-10	6.589E-10
SSE	4.560E-08	2.375E-08	1.487E-08	7.658E-09	4.771E-09	3.290E-09	2.419E-09	1.859E-09	1.476E-09	1.201E-09	9.970E-10

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GGNS ESP COL 2.3-3

TABLE 2.3-216 (Sheet 3 of 3)
ANNUAL AVERAGE RELATIVE CONCENTRATION, χ/Q
(8.00 DAY DECAY, DEPLETED)

RADWASTE BUILDING VENT[1] 8.000 DAY DECAY, DEPLETED

CHI/Q (SEC/METER-CUBED) FOR EACH SEGMENT — SEGMENT BOUNDARIES IN MILES FROM THE SITE

DIRECTION FROM SITE	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	1.471E-06	4.908E-07	2.145E-07	1.253E-07	8.394E-08	3.864E-08	1.274E-08	5.381E-09	3.033E-09	1.957E-09
SSW	2.361E-06	8.120E-07	3.671E-07	2.190E-07	1.489E-07	7.019E-08	2.398E-08	1.040E-08	5.953E-09	3.884E-09
SW	5.172E-06	1.769E-06	8.371E-07	5.143E-07	3.573E-07	1.744E-07	6.274E-08	2.832E-08	1.659E-08	1.100E-08
WSW	6.440E-06	2.195E-06	1.060E-06	6.598E-07	4.623E-07	2.285E-07	8.361E-08	3.810E-08	2.239E-08	1.486E-08
W	6.202E-06	2.120E-06	1.022E-06	6.350E-07	4.444E-07	2.193E-07	8.003E-08	3.640E-08	2.137E-08	1.417E-08
WNW	4.060E-06	1.390E-06	6.612E-07	4.076E-07	2.838E-07	1.390E-07	5.029E-08	2.279E-08	1.338E-08	8.886E-09
NW	2.764E-06	9.517E-07	4.341E-07	2.605E-07	1.779E-07	8.451E-08	2.922E-08	1.280E-08	7.370E-09	4.830E-09
NNW	1.872E-06	6.447E-07	2.888E-07	1.711E-07	1.158E-07	5.419E-08	1.829E-08	7.854E-09	4.467E-09	2.901E-09
N	1.778E-06	6.067E-07	2.682E-07	1.577E-07	1.062E-07	4.924E-08	1.639E-08	6.966E-09	3.937E-09	2.545E-09
NNE	1.174E-06	4.008E-07	1.763E-07	1.032E-07	6.928E-08	3.195E-08	1.054E-08	4.444E-09	2.499E-09	1.610E-09
NE	7.639E-07	2.547E-07	1.105E-07	6.424E-08	4.289E-08	1.966E-08	6.441E-09	2.712E-09	1.526E-09	9.842E-10
ENE	9.143E-07	3.057E-07	1.341E-07	7.850E-08	5.269E-08	2.436E-08	8.086E-09	3.437E-09	1.943E-09	1.257E-09
E	6.770E-07	2.225E-07	9.665E-08	5.628E-08	3.764E-08	1.731E-08	5.713E-09	2.424E-09	1.371E-09	8.869E-10
ESE	5.619E-07	1.843E-07	7.870E-08	4.530E-08	3.004E-08	1.361E-08	4.394E-09	1.837E-09	1.030E-09	6.634E-10
SE	6.231E-07	2.052E-07	8.903E-08	5.180E-08	3.461E-08	1.588E-08	5.214E-09	2.199E-09	1.238E-09	7.980E-10
SSE	1.010E-06	3.314E-07	1.419E-07	8.182E-08	5.431E-08	2.466E-08	7.978E-09	3.337E-09	1.873E-09	1.207E-09

1. The ESBWR has three ventilation stacks, which are comprised of building stacks for the Reactor Building/Fuel Building, Radwaste Building, and Turbine Building (DCD Appendix 2A). For conservatism, the height of the lowest ventilation stack, which is located at the Radwaste Building, is used in the analysis. The analysis assumes a circular boundary of 420 ft radius, that encompasses all three release locations, for routine releases.

GGNS ESP COL 2.3-3

TABLE 2.3-217 (Sheet 1 of 3)
ANNUAL AVERAGE RELATIVE DEPOSITION, D/Q

RADWASTE BUILDING VENT[1]

RELATIVE DEPOSITION PER UNIT AREA (M**-2) AT FIXED POINTS BY DOWNWIND SECTORS

DIRECTION FROM SITE	DISTANCE IN MILES										
	0.25	0.50	0.75	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50
S	4.242E-08	1.435E-08	7.366E-09	4.523E-09	2.255E-09	1.368E-09	9.247E-10	6.700E-10	5.095E-10	4.014E-10	3.249E-10
SSW	4.441E-08	1.502E-08	7.710E-09	4.734E-09	2.360E-09	1.431E-09	9.678E-10	7.013E-10	5.333E-10	4.201E-10	3.401E-10
SW	6.138E-08	2.076E-08	1.066E-08	6.544E-09	3.262E-09	1.979E-09	1.338E-09	9.694E-10	7.371E-10	5.807E-10	4.701E-10
WSW	4.797E-08	1.622E-08	8.329E-09	5.114E-09	2.550E-09	1.546E-09	1.046E-09	7.577E-10	5.761E-10	4.539E-10	3.674E-10
W	4.581E-08	1.549E-08	7.954E-09	4.884E-09	2.435E-09	1.477E-09	9.985E-10	7.235E-10	5.502E-10	4.334E-10	3.509E-10
WNW	4.061E-08	1.373E-08	7.051E-09	4.330E-09	2.159E-09	1.309E-09	8.851E-10	6.414E-10	4.877E-10	3.842E-10	3.111E-10
NW	4.826E-08	1.632E-08	8.380E-09	5.146E-09	2.565E-09	1.556E-09	1.052E-09	7.623E-10	5.796E-10	4.566E-10	3.697E-10
NNW	4.151E-08	1.404E-08	7.207E-09	4.425E-09	2.206E-09	1.338E-09	9.047E-10	6.556E-10	4.985E-10	3.927E-10	3.179E-10
N	4.367E-08	1.477E-08	7.582E-09	4.656E-09	2.321E-09	1.408E-09	9.518E-10	6.897E-10	5.245E-10	4.132E-10	3.345E-10
NNE	3.062E-08	1.036E-08	5.317E-09	3.265E-09	1.628E-09	9.872E-10	6.674E-10	4.836E-10	3.678E-10	2.897E-10	2.346E-10
NE	2.321E-08	7.850E-09	4.030E-09	2.475E-09	1.234E-09	7.483E-10	5.059E-10	3.666E-10	2.788E-10	2.196E-10	1.778E-10
ENE	2.361E-08	7.983E-09	4.099E-09	2.517E-09	1.255E-09	7.610E-10	5.145E-10	3.728E-10	2.835E-10	2.233E-10	1.808E-10
E	1.993E-08	6.741E-09	3.461E-09	2.125E-09	1.060E-09	6.426E-10	4.345E-10	3.148E-10	2.394E-10	1.886E-10	1.527E-10
ESE	1.606E-08	5.432E-09	2.789E-09	1.713E-09	8.539E-10	5.179E-10	3.501E-10	2.537E-10	1.929E-10	1.520E-10	1.230E-10
SE	1.548E-08	5.233E-09	2.687E-09	1.650E-09	8.225E-10	4.989E-10	3.373E-10	2.444E-10	1.858E-10	1.464E-10	1.185E-10
SSE	3.404E-08	1.151E-08	5.911E-09	3.629E-09	1.809E-09	1.097E-09	7.420E-10	5.377E-10	4.088E-10	3.221E-10	2.607E-10

Grand Gulf Nuclear Station, Unit 3
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GGNS ESP COL 2.3-3

TABLE 2.3-217 (Sheet 2 of 3)
ANNUAL AVERAGE RELATIVE DEPOSITION, D/Q

RADWASTE BUILDING VENT[1]

DIRECTION FROM SITE	DISTANCE IN MILES										
	5.00	7.50	10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00
S	2.688E-10	1.317E-10	8.265E-11	4.178E-11	2.528E-11	1.695E-11	1.215E-11	9.121E-12	7.092E-12	5.665E-12	4.624E-12
SSW	2.813E-10	1.379E-10	8.651E-11	4.373E-11	2.647E-11	1.774E-11	1.271E-11	9.547E-12	7.423E-12	5.930E-12	4.840E-12
SW	3.889E-10	1.906E-10	1.196E-10	6.044E-11	3.658E-11	2.453E-11	1.757E-11	1.320E-11	1.026E-11	8.196E-12	6.690E-12
WSW	3.039E-10	1.489E-10	9.346E-11	4.724E-11	2.859E-11	1.917E-11	1.374E-11	1.031E-11	8.020E-12	6.406E-12	5.229E-12
W	2.903E-10	1.422E-10	8.925E-11	4.511E-11	2.730E-11	1.831E-11	1.312E-11	9.850E-12	7.658E-12	6.118E-12	4.993E-12
WNW	2.573E-10	1.261E-10	7.912E-11	3.999E-11	2.420E-11	1.623E-11	1.163E-11	8.732E-12	6.789E-12	5.423E-12	4.427E-12
NW	3.058E-10	1.499E-10	9.402E-11	4.752E-11	2.876E-11	1.929E-11	1.382E-11	1.038E-11	8.068E-12	6.445E-12	5.260E-12
NNW	2.630E-10	1.289E-10	8.087E-11	4.087E-11	2.474E-11	1.659E-11	1.189E-11	8.925E-12	6.939E-12	5.543E-12	4.524E-12
N	2.767E-10	1.356E-10	8.508E-11	4.300E-11	2.603E-11	1.745E-11	1.250E-11	9.389E-12	7.301E-12	5.832E-12	4.760E-12
NNE	1.940E-10	9.508E-11	5.966E-11	3.015E-11	1.825E-11	1.224E-11	8.768E-12	6.584E-12	5.119E-12	4.089E-12	3.338E-12
NE	1.471E-10	7.207E-11	4.522E-11	2.286E-11	1.383E-11	9.276E-12	6.646E-12	4.991E-12	3.880E-12	3.100E-12	2.530E-12
ENE	1.496E-10	7.330E-11	4.599E-11	2.325E-11	1.407E-11	9.433E-12	6.759E-12	5.076E-12	3.946E-12	3.152E-12	2.573E-12
E	1.263E-10	6.189E-11	3.883E-11	1.963E-11	1.188E-11	7.965E-12	5.708E-12	4.286E-12	3.332E-12	2.662E-12	2.173E-12
ESE	1.018E-10	4.988E-11	3.130E-11	1.582E-11	9.574E-12	6.419E-12	4.600E-12	3.454E-12	2.686E-12	2.145E-12	1.751E-12
SE	9.805E-11	4.805E-11	3.015E-11	1.524E-11	9.223E-12	6.184E-12	4.431E-12	3.327E-12	2.587E-12	2.067E-12	1.687E-12
SSE	2.157E-10	1.057E-10	6.632E-11	3.352E-11	2.029E-11	1.360E-11	9.747E-12	7.319E-12	5.691E-12	4.546E-12	3.711E-12

Grand Gulf Nuclear Station, Unit 3
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Part 2, FSAR

GGNS ESP COL 2.3-3

TABLE 2.3-217 (Sheet 3 of 3)
ANNUAL AVERAGE RELATIVE DEPOSITION, D/Q

RADWASTE BUILDING VENT[1]

RELATIVE DEPOSITION PER UNIT AREA (M**-2) BY DOWNWIND SECTORS

DIRECTION FROM SITE	SEGMENT BOUNDARIES IN MILES									
	.5-1	1-2	2-3	3-4	4-5	5-10	10-20	20-30	30-40	40-50
S	7.654E-09	2.365E-09	9.409E-10	5.142E-10	3.268E-10	1.404E-10	4.353E-11	1.725E-11	9.213E-12	5.702E-12
SSW	8.011E-09	2.475E-09	9.849E-10	5.382E-10	3.421E-10	1.469E-10	4.556E-11	1.806E-11	9.643E-12	5.969E-12
SW	1.107E-08	3.421E-09	1.361E-09	7.439E-10	4.728E-10	2.031E-10	6.298E-11	2.496E-11	1.333E-11	8.250E-12
WSW	8.654E-09	2.674E-09	1.064E-09	5.814E-10	3.695E-10	1.587E-10	4.922E-11	1.951E-11	1.042E-11	6.448E-12
W	8.265E-09	2.553E-09	1.016E-09	5.552E-10	3.529E-10	1.516E-10	4.701E-11	1.863E-11	9.949E-12	6.158E-12
WNW	7.327E-09	2.264E-09	9.007E-10	4.922E-10	3.128E-10	1.344E-10	4.167E-11	1.652E-11	8.819E-12	5.459E-12
NW	8.707E-09	2.690E-09	1.070E-09	5.849E-10	3.718E-10	1.597E-10	4.952E-11	1.963E-11	1.048E-11	6.487E-12
NNW	7.488E-09	2.314E-09	9.206E-10	5.031E-10	3.197E-10	1.373E-10	4.259E-11	1.688E-11	9.014E-12	5.579E-12
N	7.878E-09	2.434E-09	9.686E-10	5.293E-10	3.364E-10	1.445E-10	4.481E-11	1.776E-11	9.484E-12	5.870E-12
NNE	5.525E-09	1.707E-09	6.792E-10	3.711E-10	2.359E-10	1.013E-10	3.142E-11	1.245E-11	6.650E-12	4.116E-12
NE	4.188E-09	1.294E-09	5.148E-10	2.813E-10	1.788E-10	7.681E-11	2.382E-11	9.440E-12	5.041E-12	3.120E-12
ENE	4.259E-09	1.316E-09	5.236E-10	2.861E-10	1.818E-10	7.811E-11	2.422E-11	9.600E-12	5.126E-12	3.173E-12
E	3.596E-09	1.111E-09	4.421E-10	2.416E-10	1.536E-10	6.596E-11	2.045E-11	8.106E-12	4.329E-12	2.679E-12
ESE	2.898E-09	8.954E-10	3.563E-10	1.947E-10	1.237E-10	5.315E-11	1.648E-11	6.533E-12	3.489E-12	2.159E-12
SE	2.792E-09	8.625E-10	3.432E-10	1.876E-10	1.192E-10	5.120E-11	1.588E-11	6.293E-12	3.361E-12	2.080E-12
SSE	6.142E-09	1.897E-09	7.550E-10	4.126E-10	2.622E-10	1.126E-10	3.493E-11	1.384E-11	7.393E-12	4.576E-12

1. The ESBWR has three ventilation stacks, which are comprised of building stacks for the Reactor Building/Fuel Building, Radwaste Building, and Turbine Building (DCD Appendix 2A). For conservatism, the height of the lowest ventilation stack, which is located at the Radwaste Building, is used in the analysis. The analysis assumes a circular boundary of 420 ft radius, that encompasses all three release locations, for routine releases.

11.3 GASEOUS WASTE MANAGEMENT SYSTEM

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

11.3.1 DESIGN BASIS

Add the following paragraph at the end of this section.

GGNS SUP 11.3-1

The cost-benefit analysis for the gaseous radwaste system is addressed in NEI 07-11, Generic FSAR Template Guidance for Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors (Reference 11.3-201) which is currently under review by the NRC staff, and in Section 12.2. The NEI 07-11 template is incorporated by reference into Section 11.2.

~~11.3.2 OFFGAS SYSTEM DESCRIPTION~~

11.3.2.4 Releases

GGNS COL 12.2-2-A

Replace the last sentence of the 1st paragraph of ~~the Releases portion of~~ this section with the following.

As indicated in Section 12.2.2.2 and Table 12.2-206, airborne releases from ~~the plant stack or vent~~ Unit 3 do not exceed the maximum permissable concentration to the environment.

11.3.9 REFERENCES

11.3-201 NEI 07-11, Generic FSAR Template Guidance for Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Reactors

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12.2 PLANT SOURCES

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Section 3.2 of the referenced ESP safety analysis report (including SSAR Tables 3.2-1 through 3.2-9) is ~~incorporated by reference with no variances or supplements~~superseded by FSAR Sections 12.2.2.1 and 12.2.2.2, and associated tables.

12.2.1.5 OTHER CONTAINED SOURCES

Replace this section with the following.

STD COL 12.2-4-A In addition to the contained sources identified above, additional contained sources which contain byproduct, source, or special nuclear materials may be maintained on site. These contained sources are typically used as calibration or radiography sources. These sources are not part of the permanent plant design, and their control and use are governed by plant procedures. The procedures consider the guidance provided in RG 8.8 to ensure that occupational doses from the control and use of the sources are as low as is reasonably achievable (ALARA).

Various types and quantities of radioactive sources are employed to calibrate the process and effluent radiation monitors, the area radiation monitors, and portable and laboratory radiation detectors. Check sources that are integral to the area, process, and effluent monitors consist of small quantities of by-product material and do not require special handling, storage, or use procedures for radiation protection purposes. The same consideration applies to solid and liquid radionuclide sources of exempt quantities or concentrations which are used to calibrate or check the portable and laboratory radiation measurement instruments.

Instrument calibrators are normally used for calibrating gamma dose rate instrumentation. These may be self-contained, heavily shielded, multiple source calibrators. Beta and alpha radiation sources are also available for instrument calibration. Calibration sources are traceable to the National Institute of Standards and Technology, or equivalent.

Radiography sources are surveyed upon entry to the site. Radiation protection personnel maintain copies of the most recent leak test records for owner-controlled sources. Contractor radiography personnel provide copies of the most recent leak test records upon radiation protection personnel request. Radiography is conducted in accordance with approved procedures.

12.2.2.1 AIRBORNE ~~RELEASE~~RELEASES OFFSITE

GGNS COL 12.2-2-A Replace this section with the following.

GGNS ESP VAR 12.2-1 Airborne sources are calculated using the source terms given in DCD Section 11.1.

The annual airborne release source term is provided in DCD Table 12.2-16.

The ESBWR standard design employs three ventilation stacks (airborne release points). Individual stacks service the ventilation flows from the Reactor/Fuel Buildings (RB/FB), the Turbine Building (TB) and the Radwaste Building (RWB). The offsite airborne release analysis of the ESBWR ventilation stack design employs separate long term atmospheric dispersion (χ/Q) and deposition (D/Q) parameter values for each release location, and the results are reported in DCD Table 12.2-18b. Calculation of Unit 3 long term atmospheric dispersion (χ/Q) and deposition (D/Q) site-specific parameters is described in Section 2.3.5.

The site-specific χ/Q and D/Q values in Table 2.3-212, along with the normal operating source term in DCD Table 12.2-16, are used in the calculation of the gaseous effluent normal operation doses in Table 12.2-209. Calculation of site-specific doses is discussed in Section 12.2.2.2.

~~Add the following at the beginning of this section, and add the sentence below under "*Annual Releases.*"~~

~~The discussion in this section, and the associated DCD Tables 12.2-15, 12.2-16, 12.2-17, 12.2-18a, are applicable to the ESBWR standard plant design and the associated airborne release concentrations and dose analyses for a generic site, and for which representative off-site doses were calculated and reported in DCD Table 12.2-18b. As discussed in Section 12.2.2.2 below, the Unit 3 off-site dose analysis was performed using a site-specific atmospheric dispersion coefficient and relative deposition factor, and the ESP 002 "composite" source term that is bounding of the DCD source term. (See SSAR Section 3.2.) Therefore, data in DCD Tables 12.2-15, 12.2-16, 12.2-17, 12.2-18a specifically related to the DCD offsite dose calculations and the DCD dose results presented in 12.2-18b are not applicable for Unit 3.~~

~~*Annual releases*~~

~~Unit 3 site-specific normal operating source terms, as defined in ESP 002 Appendix D, Table D7, are given in Table 12.2-206, and a comparison to 10 CFR 20 criteria is given in Table 12.2-206.~~

12.2.2.2 AIRBORNE DOSE EVALUATION OFFSITE

Replace this section with the following.

GGNS COL 12.2-2-A
GGNS ESP COL 11.1-1

Airborne doses were calculated to demonstrate compliance with 10 CFR 50, Appendix I. Doses were calculated using methodologies and dose conversion factors consistent with Regulatory Guides 1.109 and 1.111. The Unit 3 airborne offsite dose calculation bases are provided in Table 12.2-207. Default parameters of Regulatory Guide 1.109 were used in determining the offsite dose, with the exception of the explicitly stated values in Table 12.2-213; other site-specific inputs are determined using the methodology defined in Regulatory Guide 1.109. The results of the maximally exposed individual dose analysis are given in Table 12.2-209, and population dose from the gaseous pathway is given in Table 12.2-211.

~~Replace the last two sentences of this section with the following.~~

~~A comparison of the gaseous effluent releases in DCD Table 12.2-17 with the bounding gaseous effluent releases in ESP-002 Appendix D, Table D7, is provided in Table 12.2-206. Unit 3 composite airborne concentrations reported in Table 12.2-206 are developed using the ESP-002 Appendix D, Table D7 composite releases and the ESP site characteristic (i.e., site specific) χ/Q values. Table 12.2-206 shows that the resulting ESP gaseous effluent release concentrations bound the ESBWR DCD gaseous effluent release concentrations for every radioisotope in the ESBWR release. Therefore, the Grand Gulf ESP gaseous effluent releases result in conservative estimates of the offsite doses due to normal gaseous effluent releases for Unit 3.~~

~~The site-specific long-term atmospheric dispersion coefficient (χ/Q) at the site boundary given in Table 2.0-201 (8.8E-06 s/m^3) is higher than the value given in DCD Table 12.2-15 (2.0E-06 s/m^3), as noted in Table 2.0-201. This site-specific χ/Q value is utilized in the calculation of site-specific offsite doses reported in SSAR Section 3.2. The site-specific relative deposition factor (D/Q) at the site boundary in Table 2.0-201 (1.2E-08 m^{-2}) is also not bounded by the equivalent DCD site parameter (4.0E-09 m^{-2}). This higher site specific D/Q value is also utilized in the site-specific dose analysis in SSAR Section 3.2. However, as indicated in SSAR Section 3.2, calculated doses using the higher site-specific parameters for χ/Q, D/Q and the composite ESP-002 release are within regulatory limits.~~

12.2.2.2.1 Compliance with 10 CFR 50, Appendix I, Sections II.B and II.C

The ~~ESP~~ estimated whole-body and critical organ annual doses to the maximally exposed individual (MEI) due to release of radioactive materials in airborne effluents meet the guidelines of Appendix I to 10 CFR Part 50 (~~SSAR~~ Table 12.2-210~~3.2-3B~~). The off-site doses calculated using the ~~ESP-002~~DCD Table 12.2-16 gaseous effluent releases and site-specific input parameters meet the guidelines of Appendix I to 10 CFR Part 50, ~~Appendix I,~~ Sections II.B and II.C. ~~The released activity, atmospheric dispersion coefficients, and ground deposition values used in the ESP dose analysis all bound the corresponding DCD parameters.~~

12.2.2.2.2 Compliance with 10 CFR 50, Appendix I, Section II.D

~~The population doses determined for the gaseous effluent releases from Unit 3 given in SSAR Table 3.2-4 are bounded by the results presented in NEI 07-11, Generic Template Guidance for Cost Benefit Analysis for Radwaste Systems for Light Water Cooled Nuclear Power Reactors (Reference 12.2-201). See Section 11.3.1 for more details.~~ A site-specific cost benefit analysis of the gaseous radwaste system augments suggested in Regulatory Guide 1.110 is presented in Section 11.3.1. The results of this evaluation indicate that there are no cost beneficial gaseous radwaste system augments. Therefore, Unit 3 complies with 10 CFR 50, Appendix I, Section II.D.

12.2.2.2.3 Compliance with 10 CFR 20 Appendix B, Table 2, Column 1

DCD Table 12.2-16 ~~12.2-206~~ shows the ~~site-specific~~Unit 3 gaseous effluent releases (composite release in DCD Table 12.2-17) used to determine ~~bounding~~ offsite doses reported in ~~SSAR~~ Table 12.2-210~~-3.2-3B~~. The Unit 3 maximum annual average χ/Q value at the site boundary is ~~8.8E-06~~5.0E-06 s/m^3~~, as identified in ESP-002 Appendix A (page A-5)~~. Site-specific gaseous effluent concentrations reported in Table 12.2-206 are derived by ~~taking~~multiplying the annual ~~ESP~~DCD Table 12.2-17 airborne release activities~~, and multiplying~~ by the site-specific annual average χ/Q. The site-specific gaseous effluent concentrations in Table 12.2-206 are less than (bounded by) the 10 CFR 20 Appendix B, Table 2, Column 1 concentration limits. Additionally, Table 12.2-206 demonstrates compliance with the Unity Rule.

~~Additionally, the gaseous effluent concentrations of DCD Table 12.2-17 when adjusted by the ratio of the site-specific χ/Q and the DCD χ/Q are also shown to be less than (bounded by) the 10 CFR 20 Appendix B, Table 2, Column 1 concentration limits.~~

12.2.2.2.4 Compliance with 10 CFR 20.1301

10 CFR 20.1301(a)(1) indicates that operations shall be conducted such that the total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem (1 mSv) in a year, and additionally, the dose in any unrestricted area from external sources, does not exceed 0.002 rem (0.02 millisievert) in any one hour. For the gaseous pathway~~, the annual whole body dose~~the total effective dose equivalent for the MEI ~~located at the EAB~~ is ~~1.62~~4.04 mrem/year TEDE (~~SSAR~~ Table 12.2-214~~3.2-3B~~). The MEI ~~annual whole body dose~~total effective dose equivalent from the liquid pathway is ~~0.62 mrem~~0.44 mrem/yr ~~TEDE~~ (Table 12.2-203). Direct radiation as a result of plant operation has been shown to be negligible. Therefore, combined annual dose to the MEI is ~~2.3~~4.48 mrem (~~0.023~~0.0448 mSv) TEDE. This is well below the limit given in 10 CFR 20.1301. ~~The MEI dose rate also meets the limit of 2 mrem/hr~~By dividing the annual TEDE by 8760 hours, an hourly dose of 5.12E-04 mrem/hr is calculated. Because the dose is due only to normal gaseous and liquid releases, the dose rate should not fluctuate significantly, because the releases are relatively

constant. Therefore, with the calculated hourly dose being such a small fraction of the limit, it is reasonable to conclude that the limit of 2 mrem/hr given in 10 CFR 20.1301(a)(2) is met.

Table 12.2-205 shows that the total site doses from all pathways resulting from the normal operation of Unit 1 and Unit 3 are well within the regulatory limits of 40 CFR 190.

12.2.2.2.5 Compliance with 10 CFR 20.1302

Surveys of radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas are conducted to demonstrate compliance with the dose limits given in 10 CFR 20.1302 for individual members of the public. These surveys are conducted in accordance with the Off-site Dose Calculation Manual (ODCM) required by the Technical Specifications.

Compliance with the annual dose limit in 10 CFR 20.1301 is demonstrated in Section 12.2.2.2.4 by showing that the calculated total effective dose equivalent to the individual likely to receive the highest dose does not exceed the annual dose limit.

12.2.2.4 LIQUID DOSES OFF-SITE

GGNS COL 12.2-3-A Delete DCD Tables 12.2-20a and 12.2-20b and replace this section with the following.

GGNS ESP COL 11.1-1

Exposure Pathways

The release of small amounts of radioactive liquid effluents is permitted as long as releases comply with the requirements specified in 10 CFR 20. The important exposure pathways for liquid effluents include:

- Internal exposure from ingestion of water or contaminated food chain components;
- External exposure from the surface of contaminated water or from shoreline sediment; and,
- External exposure from immersion in contaminated water.

Irrigation has not been found necessary or observed in the area around the Grand Gulf site, therefore, this pathway has not been considered. Similarly, the dose due to drinking water intake has not been considered; there is no downstream user of

12.2.2.4.1 Compliance with 10 CFR 50, Appendix I, Section II.A

The maximum exposed individual annual doses from the discharge of radioactive materials in liquid effluents meet the guidelines of Appendix I, Section II.A, to 10 CFR Part 50. In addition, the maximally exposed individual dose calculated was compared to and meets the 40 CFR 190 criteria (Table 12.2-204) for liquid effluents.

12.2.2.4.2 Compliance with 10 CFR 50, Appendix I, Section II.D

~~Dose rates determined for the normal liquid effluent releases are bounded by the results presented in NEI 07-11, Generic Template Guidance for Cost-Benefit Analysis for Radwaste Systems for Light Water Cooled Nuclear Power Reactors (Reference 12.2-201). See Section 11.2.1 for more details.~~ A site-specific cost benefit analysis of the liquid radwaste system augments suggested in Regulatory Guide 1.110 is presented in Section 11.2.1. The results of this evaluation indicate that there are no cost beneficial liquid radwaste system augments. Therefore, Unit 3 complies with 10 CFR 50, Appendix I, Section II.D.

12.2.2.4.3 Compliance with 10 CFR 20 Appendix B, Table 2, Column 2

Compliance with 10 CFR 20 Appendix B, Table 2, Column 2 is demonstrated in Table 12.2-215.

12.2.2.4.4 Compliance with 10 CFR 20.1301

See Section 12.2.2.2.4.

12.2.2.4.5 Compliance with 10 CFR 20.1302

See Section 12.2.2.2.5.

12.2.4 COL INFORMATION

12.2-2-A Airborne Effluents and Doses

GGNS COL 12.2-2-A This COL item is addressed in Sections ~~11.3.2~~11.3.2.4, 12.2.2.1 and 12.2.2.2.

12.2-3-A Liquid Effluents and Doses

GGNS COL 12.2-3-A This COL item is addressed in Section 12.2.2.4.

12.2-4-A Other Contained Sources

STD COL 12.2-4-A This COL Item is addressed in Section 12.2.1.5.

12.2.5 REFERENCES

Delete DCD Reference 12.2-4.

~~12.2-201 NEI 07-11, Generic Template Guidance for Cost Benefit Analysis for Radwaste Systems for Light Water Cooled Nuclear Power Reactors.~~

GGNS COL 12.2-3-A

GGNS ESP COL 11.1-1

TABLE 12.2-203
LIQUID PATHWAY COMPARISON OF MAXIMUM INDIVIDUAL DOSE TO APPENDIX 10 CFR 50, APPENDIX I CRITERIA

Pathway	Annual Dose Total Body[2] mrem/yr (mSv/yr) (Per Unit)	Maximum Organ (bone)[3] mrem/yr (mSv/yr) (Per Unit)	Thyroid Dose[2] mrem/yr (mSv/yr) (Per Unit)	Dose Limit[1] (mrem/yr)
Aquatic Foods	~~6.24~~.33E-01 (~~6.24~~.33E-03)	9.0 (9.0E-02)	1.43E-01 (1.43E-03)	
Shoreline Use	~~5.66~~.6E-04 (~~5.66~~.6E-06)	6.6E-04 (6.6E-06)	6.58E-04 (6.58E-06)	Total Body: 3 Any organ: 10
Total	~~6.24~~.33E-01 (~~6.24~~.33E-03)	9.0 (9.0E-02)	1.43E-01 (1.43E-03)	

NOTES:

1. 10 CFR 50 Appendix I limits.
2. ~~An adult was found to receive the maximum~~Maximum individual ~~total body~~ dose for child.
3. A child was found to receive the maximum individual organ dose.
4. 1 mrem = 0.01 mSv.

GGNS COL 12.2-3-A

GGNS ESP COL 11.1-1

TABLE 12.2-205
COMPARISON OF MAXIMUM INDIVIDUAL DOSE FOR THE SITE TO 40 CFR 190 CRITERIA

Type of Dose (Annual)	Unit 3 Dose [3] mrem (mSv)	Unit 1 Dose [2] mrem (mSv)	Total Site Dose [1] mrem (mSv)	Design Objective [4] mrem (mSv)
Whole Body Dose Equivalent	4.10 (4.10E-02)~~2.24 (2.24E-02)~~	1.74 (1.74E-02)~~1.33 (1.33E-02)~~	5.84 (5.84E-02)~~3.57 (3.57E-02)~~	25 (0.25)
Thyroid Dose	12.7 (1.27E-01)~~3.35 (3.35E-02)~~	12.5 (1.25E-01)~~9.65 (9.65E-02)~~	25.2 (2.52E-01)~~13.00 (0.13)~~	75 (0.75)
Dose to Another Organ	19.0 (1.90E-01)~~10.39 (1.039E-01)~~ (bone)	4.63 (4.63E-02)~~9.65~~[5] ~~(9.65E-02)~~ (~~thyroid~~bone)	23.6 (2.36E-01)~~20.04 (2.004E-01)~~	25 (0.25)
	~~4.42 (4.42E-02) (skin)~~	~~2.16 (2.16E-02) (skin)~~	~~6.58 (6.58E-02) (skin)~~	

NOTES:

1. Includes all pathways for all effluents and direct radiation sources for all units at the site. Direct radiation has been shown to be negligible.

2. Includes all pathways for all effluents and direct radiation sources. Direct radiation has been shown to be negligible. ~~Source for Unit 1 data is Unit 1 UFSAR Tables 11.2-11 and 11.3-12.~~

3. Includes all pathways for all effluents and direct radiation sources. Direct radiation has been shown to be negligible for Unit 3 (see DCD Table 12.2-21).

4. Source: 40 CFR 190.

~~5. Doses to other organs are less than the dose to the thyroid.~~

5. 1 mrem = 0.01 mSv.

GGNS COL 12.2-2-A

GGNS ESP COL 11.1-1

TABLE 12.2-206 (Sheet 1 of 4)
COMPARISON OF SITE-SPECIFIC AIRBORNE CONCENTRATIONS WITH 10 CFR 20 TABLE 2 COLUMN 1 CONCENTRATIONS

Nuclide	DCD Table 12.2-17 Airborne Release (MBq/yr)	DCD Table 12.2-17 Airborne Concentration (Bq/m^3)	Adjusted DCD Table 12.2-17 Concentration[3] (Bq/m^3)	Unit 3 Composite Normal Airborne Release[4] (MBq/yr)	Unit 3 Composite Airborne Concentration[4] (Bq/m^3)	10 CFR 20 Appendix B, Table 2, Column 1 (Bq/m^3)	Concentration Ratio (10CFR20 / Unit 3)	Concentration Ratio (Unit 3 / DCD)	Concentration Ratio (10CFR20 / Adjusted DCD)
Kr-83m	3.73E+01	2.36E-06	1.04E-05	6.22E+01	1.73E-05	2.00E+06	1.2E+11	7.33E+00	1.9E+11
Kr-85m	6.50E+05	4.12E-02	1.81E-01	2.66E+06	7.43E-01	4.00E+03	5.4E+03	1.80E+01	2.2E+04
Kr-85	4.29E+06	2.72E-01	1.20E+00	3.03E+08	8.46E+01	3.00E+04	3.5E+02	3.11E+02	2.5E+04
Kr-87	1.45E+06	9.17E-02	4.03E-01	1.86E+06	5.19E-01	7.00E+02	1.3E+03	5.66E+00	1.7E+03
Kr-88	2.18E+06	1.38E-01	6.07E-01	3.40E+06	9.49E-01	3.00E+02	3.2E+02	6.88E+00	4.9E+02
Kr-89	1.40E+07	8.90E-01	3.92E+00	1.78E+07	4.96E+00	4.00E+01	8.1E+00	5.58E+00	1.0E+01
Kr-90	1.25E+01	7.94E-07	3.49E-06	2.40E+01	6.70E-06	4.00E+01	6.0E+06	8.43E+00	1.1E+07
Xe-131m	1.10E+05	6.97E-03	3.07E-02	1.33E+08	3.71E+01	7.00E+04	1.9E+03	5.33E+03	2.3E+06
Xe-133m	8.59E+01	5.44E-06	2.39E-05	6.44E+06	1.80E+00	2.00E+04	1.1E+04	3.30E+05	8.4E+08
Xe-133	3.11E+07	1.97E+00	8.67E+00	3.40E+08	9.49E+01	2.00E+04	2.1E+02	4.82E+01	2.3E+03
Xe-135m	2.27E+07	1.44E+00	6.34E+00	3.00E+07	8.37E+00	1.00E+03	1.2E+02	5.81E+00	1.6E+02
Xe-135	2.43E+07	1.54E+00	6.78E+00	3.40E+07	9.48E+00	3.00E+03	3.2E+02	6.16E+00	4.4E+02
Xe-137	2.90E+07	1.84E+00	8.10E+00	3.81E+07	1.06E+01	4.00E+01	3.8E+00	5.78E+00	4.9E+00
Xe-138	2.32E+07	1.47E+00	6.47E+00	3.20E+07	8.92E+00	7.00E+02	7.8E+01	6.07E+00	1.1E+02
Xe-139	1.57E+01	9.93E-07	4.37E-06	3.00E+01	8.37E-06	4.00E+01	4.8E+06	8.43E+00	9.2E+06
I-131	1.51E+04	9.57E-04	4.21E-03	1.92E+04	5.35E-03	7.00E+00	1.3E+03	5.60E+00	1.7E+03
I-132	5.89E+04	3.74E-03	1.65E-02	1.62E+05	4.52E-02	7.00E+02	1.5E+04	1.21E+01	4.3E+04
I-133	4.88E+04	3.09E-03	1.36E-02	1.26E+05	3.52E-02	4.00E+01	1.1E+03	1.14E+01	2.9E+03
I-134	1.06E+05	6.72E-03	2.96E-02	2.80E+05	7.81E-02	2.00E+03	2.6E+04	1.16E+01	6.8E+04

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GGNS COL 12.2-2-A

GGNS ESP COL 11.1-1

TABLE 12.2-206 (Sheet 2 of 4)
COMPARISON OF SITE-SPECIFIC AIRBORNE CONCENTRATIONS WITH 10 CFR 20 TABLE 2 COLUMN 1 CONCENTRATIONS

Nuclide	DCD Table 12.2-17 Airborne Release (MBq/yr)	DCD Table 12.2-17 Airborne Concentration (Bq/m^3)	Adjusted DCD Table 12.2-17 Concentration[3] (Bq/m^3)	Unit 3 Composite Normal Airborne Release[4] (MBq/yr)	Unit 3 Composite Airborne Concentration[4] (Bq/m^3)	10 CFR 20 Appendix B, Table 2, Column 1 (Bq/m^3)	Concentration Ratio (10CFR20 / Unit 3)	Concentration Ratio (Unit 3 / DCD)	Concentration Ratio (10CFR20 / Adjusted DCD)
I-135	6.14E+04	3.89E-03	1.71E-02	1.78E+05	4.96E-02	2.00E+02	4.0E+03	1.28E+01	1.2E+04
C-14	3.54E+05	2.24E-02	9.86E-02	8.10E+05	2.26E-01	1.00E+02	4.4E+02	1.01E+01	1.0E+03
Na-24	5.42E-01	3.44E-08	1.51E-07	3.00E+02	8.37E-05	3.00E+02	3.6E+06	2.43E+03	2.0E+09
P-32	1.34E-01	8.50E-09	3.74E-08	6.81E+01	1.90E-05	2.00E+01	1.1E+06	2.23E+03	5.3E+08
Ar-41	2.85E+02	1.81E-05	7.96E-05	3.77E+06	1.05E+00	4.00E+02	3.8E+02	5.81E+04	5.0E+06
Cr-51	7.73E+01	4.90E-06	2.16E-05	2.60E+03	7.25E-04	1.00E+03	1.4E+06	1.48E+02	4.6E+07
Mn-54	1.47E+02	9.29E-06	4.09E-05	4.00E+02	1.11E-04	4.00E+01	3.6E+05	1.20E+01	9.8E+05
Mn-56	1.07E+00	6.80E-08	2.99E-07	2.60E+02	7.25E-05	7.00E+02	9.7E+06	1.07E+03	2.3E+09
Fe-55	4.72E+00	2.99E-07	1.32E-06	4.81E+02	1.34E-04	1.00E+02	7.5E+05	4.49E+02	7.6E+07
Co-57	N/A	N/A	N/A	9.10E-01	2.54E-07	3.33E+01	1.3E+08	N/A	N/A
Co-58	3.70E+01	2.35E-06	1.03E-05	2.55E+03	7.12E-04	4.00E+01	5.6E+04	3.03E+02	3.9E+06
Fe-59	1.94E+01	1.23E-06	5.41E-06	5.09E+01	1.67E-05	2.00E+01	1.2E+06	1.36E+01	3.7E+06
Co-60	3.18E+02	2.02E-05	8.89E-05	9.66E+02	2.69E-04	2.00E+00	7.4E+03	1.33E+01	2.3E+04
Ni-63	4.74E-03	3.01E-10	1.32E-09	4.81E-01	1.34E-07	4.00E+01	3.0E+08	4.46E+02	3.0E+10
Cu-64	6.93E-01	4.39E-08	1.93E-07	7.40E+02	2.06E-04	1.00E+03	4.8E+06	4.70E+03	5.2E+09
Zn-65	2.80E+02	1.78E-05	7.83E-05	8.21E+02	2.29E-04	1.00E+01	4.4E+04	1.29E+01	1.3E+05
Rb-89	2.01E-02	1.27E-09	5.59E-09	3.20E+00	8.92E-07	7.00E+03	7.8E+09	7.03E+02	1.3E+12
Sr-89	1.48E+02	9.38E-06	4.13E-05	4.22E+02	1.18E-04	7.00E+00	6.0E+04	1.25E+01	1.7E+05
Sr-90	7.65E-01	4.85E-08	2.13E-07	1.33E+02	3.71E-05	2.00E-01	5.4E+03	7.66E+02	9.4E+05
Y-90	3.27E-02	2.07E-09	9.11E-09	3.40E+00	9.48E-07	3.00E+01	3.2E+07	4.58E+02	3.3E+09

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TABLE 12.2-206 (Sheet 3 of 4)
COMPARISON OF SITE-SPECIFIC AIRBORNE CONCENTRATIONS WITH 10 CFR 20 TABLE 2 COLUMN 1 CONCENTRATIONS

Nuclide	DCD Table 12.2-17 Airborne Release (MBq/yr)	DCD Table 12.2-17 Airborne Concentration (Bq/m^3)	Adjusted DCD Table 12.2-17 Concentration[3] (Bq/m^3)	Unit 3 Composite Normal Airborne Release[4] (MBq/yr)	Unit 3 Composite Airborne Concentration[4] (Bq/m^3)	10 CFR 20 Appendix B, Table 2, Column 1 (Bq/m^3)	Concentration Ratio (10CFR20 / Unit 3)	Concentration Ratio (Unit 3 / DCD)	Concentration Ratio (10CFR20 / Adjusted DCD)
Sr-91	6.72E-01	4.26E-08	1.87E-07	7.40E+01	2.06E-05	2.00E+02	9.7E+06	4.84E+02	1.1E+09
Sr-92	4.63E-01	2.93E-08	1.29E-07	5.81E+01	1.62E-05	3.00E+02	1.9E+07	5.53E+02	2.3E+09
Y-91	1.74E-01	1.10E-08	4.84E-08	1.78E+01	4.96E-06	7.00E+00	1.4E+06	4.51E+02	1.4E+08
Y-92	3.68E-01	2.33E-08	1.03E-07	4.59E+01	1.28E-05	4.00E+02	3.1E+07	5.49E+02	3.9E+09
Y-93	7.23E-01	4.58E-08	2.02E-07	8.21E+01	2.29E-05	1.00E+02	4.4E+06	5.00E+02	5.0E+08
Zr-95	4.49E+01	2.85E-06	1.25E-05	1.18E+02	3.29E-05	1.00E+01	3.0E+05	1.15E+01	8.0E+05
Nb-95	2.44E+02	1.55E-05	6.82E-05	6.22E+02	1.73E-04	7.00E+01	4.0E+05	1.12E+01	1.0E+06
Mo-99	1.66E+03	1.05E-04	4.62E-04	4.40E+03	1.23E-03	7.00E+01	5.7E+04	1.17E+01	1.5E+05
Tc-99m	2.23E-01	1.41E-08	6.20E-08	2.20E+01	6.14E-06	7.00E+03	1.1E+09	4.35E+02	1.1E+11
Ru-103	1.04E+02	6.58E-06	2.90E-05	2.60E+02	7.25E-05	3.00E+01	4.1E+05	1.10E+01	1.0E+06
Rh-103m	8.24E-02	5.22E-09	2.30E-08	8.21E+00	2.29E-06	7.00E+04	3.1E+10	4.39E+02	3.0E+12
Ru-106	1.35E-02	8.56E-10	3.77E-09	8.66E+00	2.41E-06	7.00E-01	2.9E+05	2.82E+03	1.9E+08
Rh-106	1.35E-02	8.56E-10	3.77E-09	1.40E+00	3.90E-07	4.00E+01	1.0E+08	4.56E+02	1.1E+10
Ag-110m	5.86E-02	3.71E-09	1.63E-08	1.48E-01	4.13E-08	4.00E+00	9.7E+07	1.11E+01	2.5E+08
Sb-124	5.37E+00	3.40E-07	1.50E-06	1.34E+01	3.73E-06	1.00E+01	2.7E+06	1.10E+01	6.7E+06
Sb-125	NA	N/A	N/A	6.77E+00	1.89E-06	2.50E+01	1.4E+07	N/A	N/A
Te-129m	1.63E-01	1.03E-08	4.53E-08	1.62E+01	4.52E-06	1.00E+01	2.2E+06	4.39E+02	2.2E+08
Te-131m	5.50E-02	3.49E-09	1.54E-08	5.59E+00	1.56E-06	4.00E+01	2.6E+07	4.46E+02	2.6E+09
Te-132	1.41E-02	8.91E-10	3.92E-09	1.40E+00	3.90E-07	3.00E+01	7.7E+07	4.38E+02	7.7E+09
Cs-134	1.78E+02	1.13E-05	4.97E-05	4.59E+02	1.28E-04	7.00E+00	5.5E+04	1.13E+01	1.4E+05

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TABLE 12.2-206 (Sheet 4 of 4)
COMPARISON OF SITE-SPECIFIC AIRBORNE CONCENTRATIONS WITH 10 CFR 20 TABLE 2 COLUMN 1 CONCENTRATIONS

Nuclide	DCD Table 12.2-17 Airborne Release (MBq/yr)	DCD Table 12.2-17 Airborne Concentration (Bq/m^3)	Adjusted DCD Table 12.2-17 Concentration[2] (Bq/m^3)	Unit 3 Composite Normal Airborne Release[1] (MBq/yr)	Unit 3 Composite Airborne Concentration[1] (Bq/m^3)	10 CFR 20 Appendix B, Table 2, Column 1 (Bq/m^3)	Concentration Ratio (10CFR20 / Unit 3)	Concentration Ratio (Unit 3 / DCD)	Concentration Ratio (10CFR20 / Adjusted DCD)
Cs-136	1.47E+01	9.31E-07	4.10E-06	4.40E+01	1.23E-05	3.00E+01	2.4E+06	1.32E+01	7.3E+06
Cs-137	2.69E+02	1.70E-05	7.48E-05	6.99E+02	1.95E-04	7.00E+00	3.6E+04	1.15E+01	9.4E+04
Cs-138	8.50E-02	5.39E-09	2.37E-08	1.26E+01	3.52E-06	3.00E+03	8.5E+08	6.53E+02	1.3E+11
Ba-140	7.82E+02	4.96E-05	2.18E-04	2.00E+03	5.58E-04	7.00E+01	1.3E+05	1.13E+01	3.2E+05
La-140	1.29E+00	8.19E-08	3.60E-07	1.34E+02	3.73E-05	7.00E+01	1.9E+06	4.56E+02	1.9E+08
Ce-141	2.66E+02	1.69E-05	7.44E-05	6.81E+02	1.90E-04	3.00E+01	1.6E+05	1.12E+01	4.0E+05
Ce-144	1.35E-02	8.53E-10	3.75E-09	1.40E+00	3.90E-07	7.00E-01	1.8E+06	4.57E+02	1.9E+08
Pr-144	1.35E-02	8.53E-10	3.75E-09	1.40E+00	3.90E-07	7.00E+00	1.8E+07	4.57E+02	1.9E+09
W-187	1.29E-01	8.21E-09	3.61E-08	1.40E+01	3.90E-06	4.00E+02	1.0E+08	4.75E+02	1.1E+10
Np-239	8.28E+00	5.25E-07	2.31E-06	8.81E+02	2.46E-04	1.00E+02	4.1E+05	4.68E+02	4.3E+07
H-3	2.80E+06	1.78E-01	7.83E-01	2.81E+08	7.84E+01	4.00E+03	5.1E+01	4.41E+02	5.1E+03

NOTES:

1. Composite Release from ESP-002 Appendix D, Table D7.

2. Adjusted based on ratio of site specific o/Q and DCD o/Q: (8.8E-06 / 2.0E-06 = 4.4)

REPLACE ABOVE WITH TABLE ON NEXT PAGE

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TABLE 12.2-206 (Sheet 1 of 4)
COMPARISON OF SITE-SPECIFIC AIRBORNE CONCENTRATIONS WITH 10 CFR 20 TABLE 2 COLUMN 1 CONCENTRATIONS

Nuclide	DCD Table 12.2-17 Airborne Release (MBq/yr)	Unit 3 Normal Airborne Release Concentration[1] (Bq/m^3)	10 CFR 20 Appendix B, Table 2, Column 1 Limit (Bq/m^3)	Concentration Ratio (GGNS/10CFR20)
Kr-83m	8.50E+01	1.35E-05	2.00E+06	6.73E-12
Kr-85m	6.60E+05	1.05E-01	4.00E+03	2.61E-05
Kr-85	5.20E+06	8.24E-01	3.00E+04	2.75E-05
Kr-87	1.40E+06	2.22E-01	7.00E+02	3.17E-04
Kr-88	2.10E+06	3.33E-01	3.00E+02	1.11E-03
Kr-89	1.40E+07	2.22E+00	4.00E+01	5.55E-02
Xe-131m	1.50E+05	2.38E-02	7.00E+04	3.40E-07
Xe-133m	1.90E+02	3.01E-05	2.00E+04	1.51E-09
Xe-133	4.10E+07	6.50E+00	2.00E+04	3.25E-04
Xe-135m	2.20E+07	3.49E+00	1.00E+03	3.49E-03
Xe-135	2.80E+07	4.44E+00	3.00E+03	1.48E-03
Xe-137	2.80E+07	4.44E+00	4.00E+01	1.11E-01
Xe-138	2.30E+07	3.64E+00	7.00E+02	5.21E-03
I-131	8.40E+03	1.33E-03	7.00E+00	1.90E-04
I-132	5.80E+04	9.19E-03	7.00E+02	1.31E-05
I-133	4.20E+04	6.65E-03	4.00E+01	1.66E-04
I-134	1.10E+05	1.74E-02	2.00E+03	8.71E-06
I-135	5.90E+04	9.35E-03	2.00E+02	4.67E-05
H-3	2.80E+-6	4.44E-01	4.00E+03	1.11E-04
C-14	5.30E+05	8.40E-02	1.00E+02	8.40E-04

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TABLE 12.2-206 (Sheet 2 of 4)
COMPARISON OF SITE-SPECIFIC AIRBORNE CONCENTRATIONS WITH 10 CFR 20 TABLE 2 COLUMN 1 CONCENTRATIONS

Nuclide	DCD Table 12.2-17 Airborne Release (MBq/yr)	Unit 3 Normal Airborne Release Concentration[1] (Bq/m^3)	10 CFR 20 Appendix B, Table 2, Column 1 Limit (Bq/m^3)	Concentration Ratio (GGNS/10CFR20)
Na-24	5.40E+00	8.56E-07	3.00E+02	2.85E-09
P-32	1.30E+00	2.06E-07	2.00E+01	1.03E-08
Ar-41	1.40E+-3	2.22E-04	4.00E+02	5.55E-07
Cr-51	1.80E+02	2.85E-05	1.00E+03	2.85E-08
Mn-54	1.50E+02	2.38E-05	4.00E+01	5.94E-07
Mn-56	1.10E+01	1.74E-06	7.00E+02	2.49E-09
Fe-55	4.70E+01	7.45E-06	1.00E+02	7.45E-08
Fe-59	2.00E+01	3.17E-06	2.00E+01	1.58E-07
Co-58	4.00E+01	6.34E-06	4.00E+01	1.58E-07
Co-60	3.20E+02	5.07E-05	2.00E+00	2.54E-05
Ni-63	4.07E-02	7.45E-09	4.00E+01	1.86E-10
Cu-64	6.90E+00	1.09E-06	1.00E+03	1.09E-09
Zn-65	3.20E+02	5.07E-05	1.00E+01	5.07E-06
Rb-89	2.00E-01	3.17E-08	7.00E+03	4.53E-12
Sr-89	1.50E+02	2.38E-05	7.00E+00	3.40E-06
Sr-90	1.00E+00	1.58E-07	2.00E-01	7.92E-07
Y-90	8.10E-02	1.28E-08	3.00E+01	4.28E-10
Sr-91	6.70E+00	1.06E-06	2.00E+02	5.31E-09
Sr-92	4.60E+00	7.29E-07	3.00E+02	2.43E-09
Y-91	1.70E+00	2.69E-07	7.00E+00	3.85E-08
Y-92	3.70E+00	5.86E-07	4.00E+02	1.47E-09

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TABLE 12.2-206 (Sheet 3 of 4)
COMPARISON OF SITE-SPECIFIC AIRBORNE CONCENTRATIONS WITH 10 CFR 20 TABLE 2 COLUMN 1 CONCENTRATIONS

Nuclide	DCD Table 12.2-17 Airborne Release (MBq/yr)	Unit 3 Normal Airborne Release Concentration[1] (Bq/m^3)	10 CFR 20 Appendix B, Table 2, Column 1 Limit (Bq/m^3)	Concentration Ratio (GGNS/10CFR20)
Y-93	7.20E+00	1.14E-06	1.00E+02	1.14E-08
Zr-95	4.40E+01	6.97E-06	1.00E+01	6.97E-07
Nb-95	2.40E+02	3.80E-05	7.00E+01	5.43E-07
Mo-99	1.70E+03	2.69E-04	7.00E+01	3.85E-06
Tc-99m	2.20E+00	3.49E-07	7.00E+03	4.98E-11
Ru-103	1.00E+02	1.58E-05	3.00E+01	5.28E-07
Rh-103m	3.50E-03	5.55E-10	7.00E+04	7.92E-15
Ru-106	1.40E-01	2.22E-08	7.00E-01	3.17E-08
Rh-106	4.50E-06	7.13E-13	4.00E+01	1.78E-14
Ag-110m	1.00E-01	1.58E-08	4.00E+00	3.96E-09
Sb-124	5.30E+00	8.40E-07	1.00E+01	8.40E-08
Te-129m	1.60E+00	2.54E-07	1.00E+01	2.54E-08
Te-131m	5.50E-01	8.71E-08	4.00E+01	2.18E-09
Te-132	1.40E-01	2.22E-08	3.00E+01	7.39E-10
Cs-134	1.80E+02	2.85E-05	7.00E+00	4.07E-06
Cs-136	1.50E+01	2.38E-06	3.00E+01	7.92E-08
Cs-137	2.70E+02	4.28E-05	7.00E+00	6.11E-06
Cs-138	8.50E-01	1.35E-07	3.00E+03	4.49E-11
Ba-140	7.80E+02	1.24E-04	7.00E+01	1.77E-06
La-140	1.30E+01	2.06E-06	7.00E+01	2.94E-08
Ce-141	2.60E+02	4.12E-05	3.00E+01	1.37E-06

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TABLE 12.2-206 (Sheet 4 of 4)
COMPARISON OF SITE-SPECIFIC AIRBORNE CONCENTRATIONS WITH 10 CFR 20 TABLE 2 COLUMN 1 CONCENTRATIONS

Nuclide	DCD Table 12.2-17 Airborne Release (MBq/yr)	Unit 3 Normal Airborne Release Concentration[1] (Bq/m^3)	10 CFR 20 Appendix B, Table 2, Column 1 Limit (Bq/m^3)	Concentration Ratio (GGNS/10CFR20)
Ce-144	1.30E-01	2.06E-08	7.00E-01	2.94E-08
Pr-144	1.60E-04	2.54E-11	7.00E+00	3.62E-12
W-187	1.30E+00	2.06E-07	4.00E+02	5.15E-10
Np-239	8.30E+01	1.32E-05	1.00E+02	1.32E-07
				Sum = 1.80E-01

NOTES:

1. Unit 3 Airborne release concentration at the Site Boundary based on an atmospheric dispersion factor of 5.0E-06 sec/m^3 (Table 2.0-201).

GGNS COL 12.2-2-A

TABLE 12.2-207
GASEOUS PATHWAY PARAMETERS

Input Description	Location of Data
Source Terms	DCD Table 12.2-16
Population Data	Tables 2.5-1 and 2.5-6 of Part 3 of the ESP Application
Meteorological Data	Section 2.3
Consumption Factors	Table 12.2-208
Milk Production	Table 12.2-213
Meat Production	Table 12.2-213
Vegetable Production	Table 12.2-213

GGNS COL 12.2-2-A

TABLE 12.2-208
GASEOUS PATHWAY CONSUMPTION FACTORS

Maximum Individual Consumption Factors[1]

Maximum Individual	Vegetables (kg/yr)	Leafy Vegetables (kg/yr)	Milk (L/yr)	Meat (kg/yr)
Adult	520	64	310	110
Teen	630	42	400	65
Child	520	26	330	41
Infant	0	0	330	0

NOTES:

1. Consumption Factors from USNRC Regulatory Guide 1.109, Table E-5.

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TABLE 12.2-209 (Sheet 1 of 2)
ANNUAL DOSE TO A MAXIMALLY EXPOSED INDIVIDUAL FROM GASEOUS EFFLUENTS (UNIT 3)

Location	Pathway	Dose Rate (mrem/yr) Total Body	Skin	Thyroid
Nearest Site Boundary[1] (W-SW, 0.91 miles)	Plume Exposure	1.94E+00	5.24E+00	1.94E+00
Nearest Residence/ Garden[1] (SW, 0.88 miles)	Ground Exposure	8.96E-02	1.05E-01	8.96E-02
Nearest Residence/ Garden[1] (SW, 0.88 miles)	Vegetable Consumption			
	Adult	3.73E-01	3.44E-01	3.14E+00
	Teen	5.96E-01	5.67E-01	4.27E+00
	Child	1.40E+00	1.37E+00	8.44E+00
Nearest Residence/ Garden[1] (SW, 0.88 miles)	Meat Consumption			
	Adult	1.36E-01	1.33E-01	2.41E-01
	Teen	1.14E-01	1.12E-01	1.90E-01
	Child	2.12E-01	2.09E-01	3.28E-01
Nearest Milk Cow[1,2] (E-SE, 2.38 miles)	Cow Milk			
	Adult	4.66E-03	3.42E-03	1.48E-01
	Teen	7.75E-03	6.26E-03	2.36E-01
	Child	1.72E-02	1.53E-02	4.73E-01
	Infant	3.46E-02	3.18E-02	1.14E+00

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TABLE 12.2-209 (Sheet 2 of 2)
ANNUAL DOSE TO A MAXIMALLY EXPOSED INDIVIDUAL FROM GASEOUS EFFLUENTS (UNIT 3)

Location	Pathway	Dose Rate (mrem/yr) Total Body	Skin	Thyroid
Nearest Residence/ Garden[1] (SW, 0.88 miles)	Inhalation			
	Adult	1.02E-02	7.04E-03	7.97E-01
	Teen	1.08E-02	7.10E-03	1.04E+00
	Child	1.02E-02	6.27E-03	1.27E+00
	Infant	6.22E-03	3.61E-03	1.15E+00

NOTES:

1. "Nearest" refers to the location at which the highest radiation dose to an individual from the applicable pathways has been estimated.

2. The dose to the maximally exposed individual due to ingestion of contaminated milk is conservatively calculated at an occupied house 2.38 miles east-southeast of Unit 3. However, according to the GGNS Unit 1 2006 Annual Radiological Environmental Operating Report (AREOR) this milk source is not for commercial dairy production.

GGNS COL 12.2-2-A

TABLE 12.2-210
COMPARISON OF MAXIMUM INDIVIDUAL DOSE TO 10 CFR 50 APPENDIX I CRITERIA - GASEOUS PATHWAY (UNIT 3)

Type of Dose	Design Objective[1]	Point of Evaluation	Estimated Dose
	Gaseous Effluents		
Gamma Dose	10 mrad	Site Boundary	2.91E+00 mrad
Beta Dose	20 mrad	Site Boundary	3.36E+00 mrad
Total Body Dose	5 mrem	Site Boundary	1.94E+00 mrem
Skin Dose	15 mrem	Site Boundary	5.24E+00 mrem
Max to Any Organ[3]	15 mrem	Nearest House/ Garden[2]	1.06E+01 mrem

NOTES:

1. 10 CFR 50, Appendix I.

2. The cow milk ingestion pathway occurs at an occupied house, 2.38 miles east-southeast of Unit 3 (see Table 12.2-209, Note 2), while all other pathways occur at the nearest occupied house/garden.

3. The provided maximum dose to any organ is due to radioiodines and particulates, while all other doses are due to noble gases only. The estimated dose is the thyroid dose for a child.

GGNS COL 12.2-2-A

TABLE 12.2-211
ANNUAL POPULATION DOSES - GASEOUS PATHWAY

	Estimated Doses (Person-rem)	
Pathway	Whole Body	Thyroid
Plume	6.94E-02	6.94E-02
Ground	3.73E-02	3.73E-02
Inhalation	9.83E-03	6.09E-01
Vegetable Ingestion	6.17E-01	6.37E-01
Cow Milk Ingestion	1.44E-01	1.06E+00
Meat Ingestion	1.49E-01	1.99E-01
Total	1.03E+00	2.61E+00

GGNS COL 12.2-2-A

TABLE 12.2-212
COMPARISON OF MAXIMUM INDIVIDUAL DOSE TO 40 CFR 190 CRITERIA - GASEOUS PATHWAY (BOTH UNITS)

Type of Dose (Annual)	Design Objective[1]	Estimated Dose
Whole body dose equivalent	25 mrem	3.79E+00 mrem
Dose to thyroid	75 mrem	1.67E+01 mrem
Max Dose to Any Other Organ[2]	25 mrem	1.03E+01 mrem

NOTES:

1. Source 40 CFR 190.

2. Maximum dose to any organ other than the thryroid is the dose to the bone of a child.

GGNS COL 12.2-2-A

TABLE 12.2-213
FOOD PRODUCTION BETWEEN 0 AND 50 MILES

Food Pathway	Total Production[1]
Cow Milk	26,618,101 L/yr
Meat	667,989,422 kg/yr
Vegetable	15,711,816 kr/yr

NOTES:

1. United States Department of Agriculture, National Agricultural Statistics Service (available online at http://www.nass.usda.gov).

GGNS COL 12.2-2-A

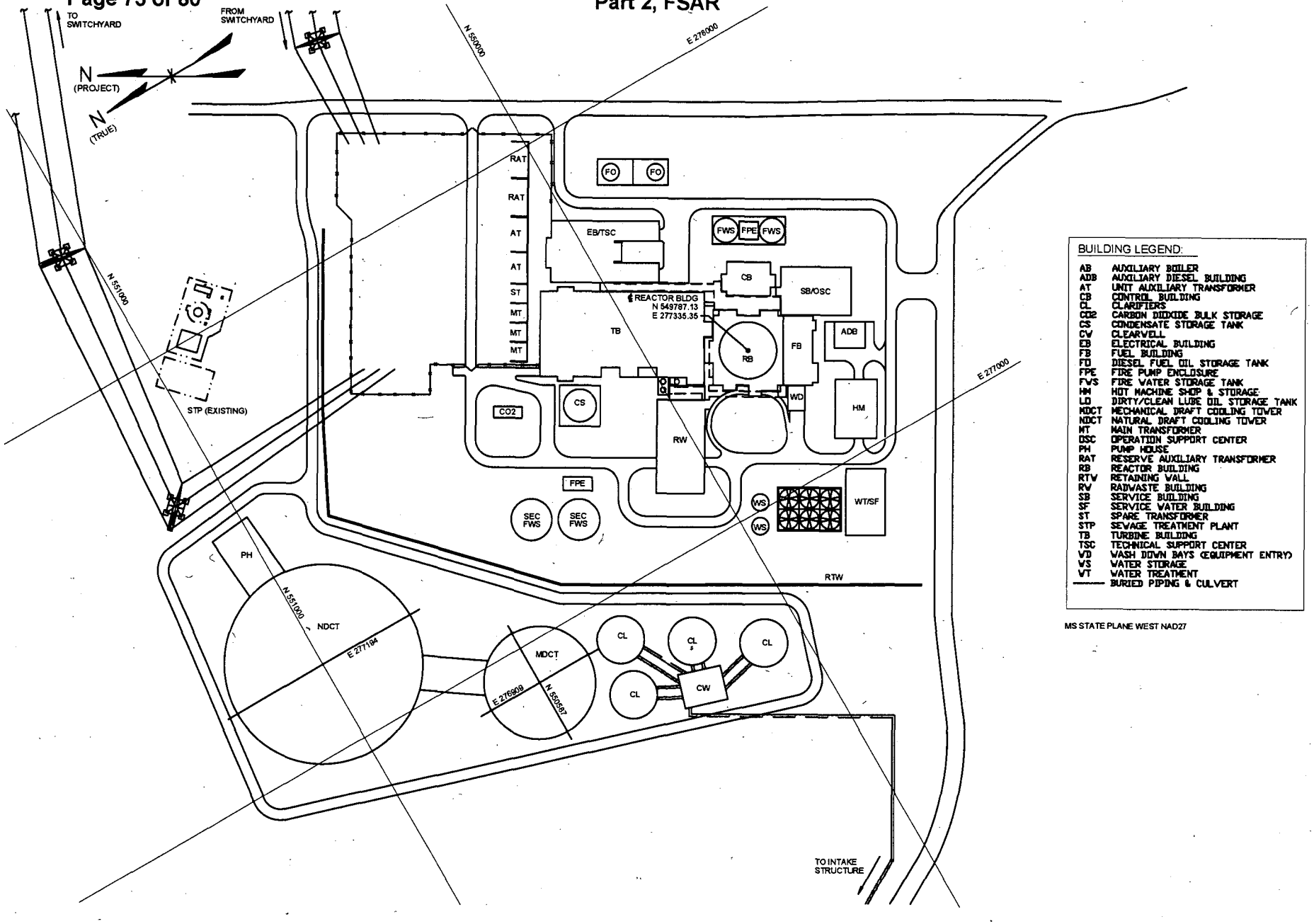
TABLE 12.2-214
COMPARISON OF MAXIMUM INDIVIDUAL DOSE TO 10 CFR 20.1301 CRITERIA (UNIT 3)

Type of Dose	Design Objective[1]	Estimated Dose
Liquid TEDE	—	0.44 mrem
Gaseous TEDE	—	4.04 mrem
Total TEDE	100 mrem	4.48 mrem
Maximum Dose per Hour[2]	2 mrem/hr	5.12E-04 mrem/hr

NOTES:

1. 10 CFR 20.1301.

2. The hourly dose was calculated by dividing the annual TEDE by 8760 hours. Because direct radiation is shown to be negligible, the normal dose is due to gaseous and liquid effluents only. This value is provided to demonstrate that even a large fluctuation in the normal releases should not result in doses exceeding the hourly limit.



BUILDING LEGEND:

AB	AUXILIARY BOILER
ADB	AUXILIARY DIESEL BUILDING
AT	UNIT AUXILIARY TRANSFORMER
CB	CONTROL BUILDING
CL	CLARIFIERS
CO2	CARBON DIOXIDE BULK STORAGE
CS	CONDENSATE STORAGE TANK
CW	CLEARWELL
EB	ELECTRICAL BUILDING
FB	FUEL BUILDING
FO	DIESEL FUEL OIL STORAGE TANK
FPE	FIRE PUMP ENCLOSURE
FWS	FIRE WATER STORAGE TANK
HM	HOT MACHINE SHOP & STORAGE
LD	DIRTY/CLEAN LUBE OIL STORAGE TANK
MDCT	MECHANICAL DRAFT COOLING TOWER
NDCT	NATURAL DRAFT COOLING TOWER
MT	MAIN TRANSFORMER
OSC	OPERATION SUPPORT CENTER
PH	PUMP HOUSE
RAT	RESERVE AUXILIARY TRANSFORMER
RB	REACTOR BUILDING
RTW	RETAINING WALL
RW	RADWASTE BUILDING
SB	SERVICE BUILDING
SF	SERVICE WATER BUILDING
ST	SPARE TRANSFORMER
STP	SEWAGE TREATMENT PLANT
TB	TURBINE BUILDING
TSC	TECHNICAL SUPPORT CENTER
WD	WASH DOWN BAYS (EQUIPMENT ENTRY)
WS	WATER STORAGE
WT	WATER TREATMENT
———	BURIED PIPING & CULVERT

MS STATE PLANE WEST NAD27

Figure 1.1-201. Unit 3 Site Plot Plan

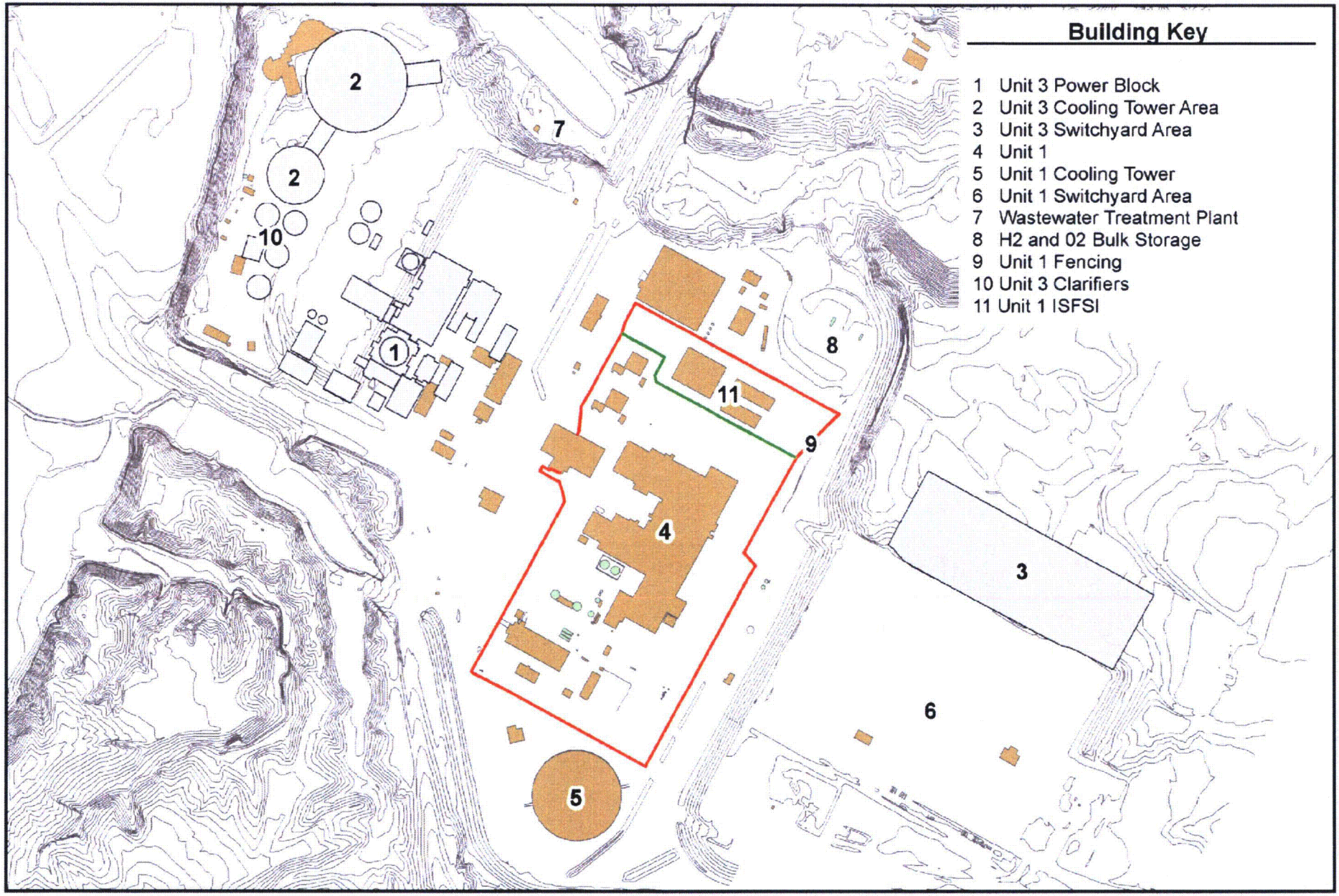
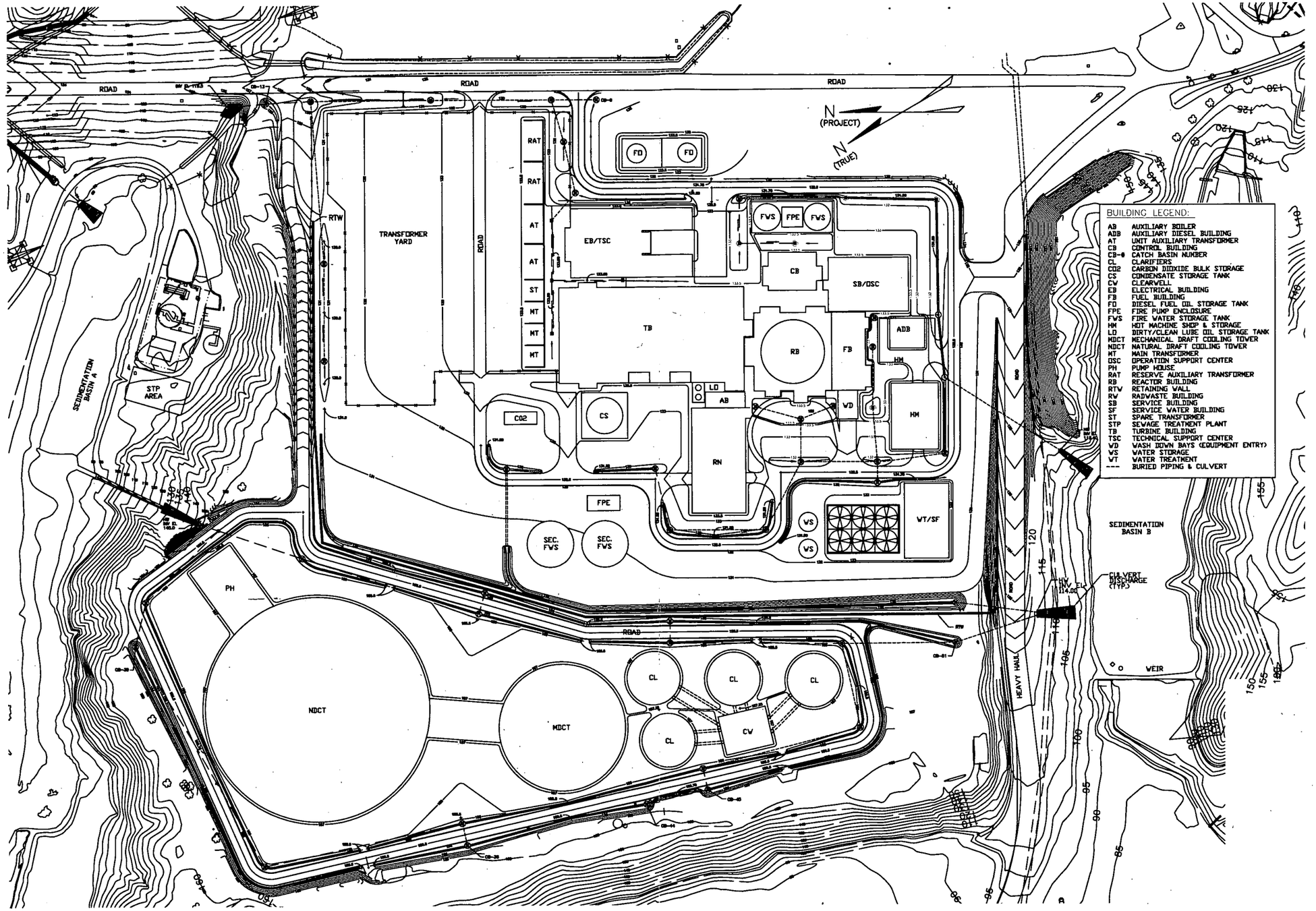
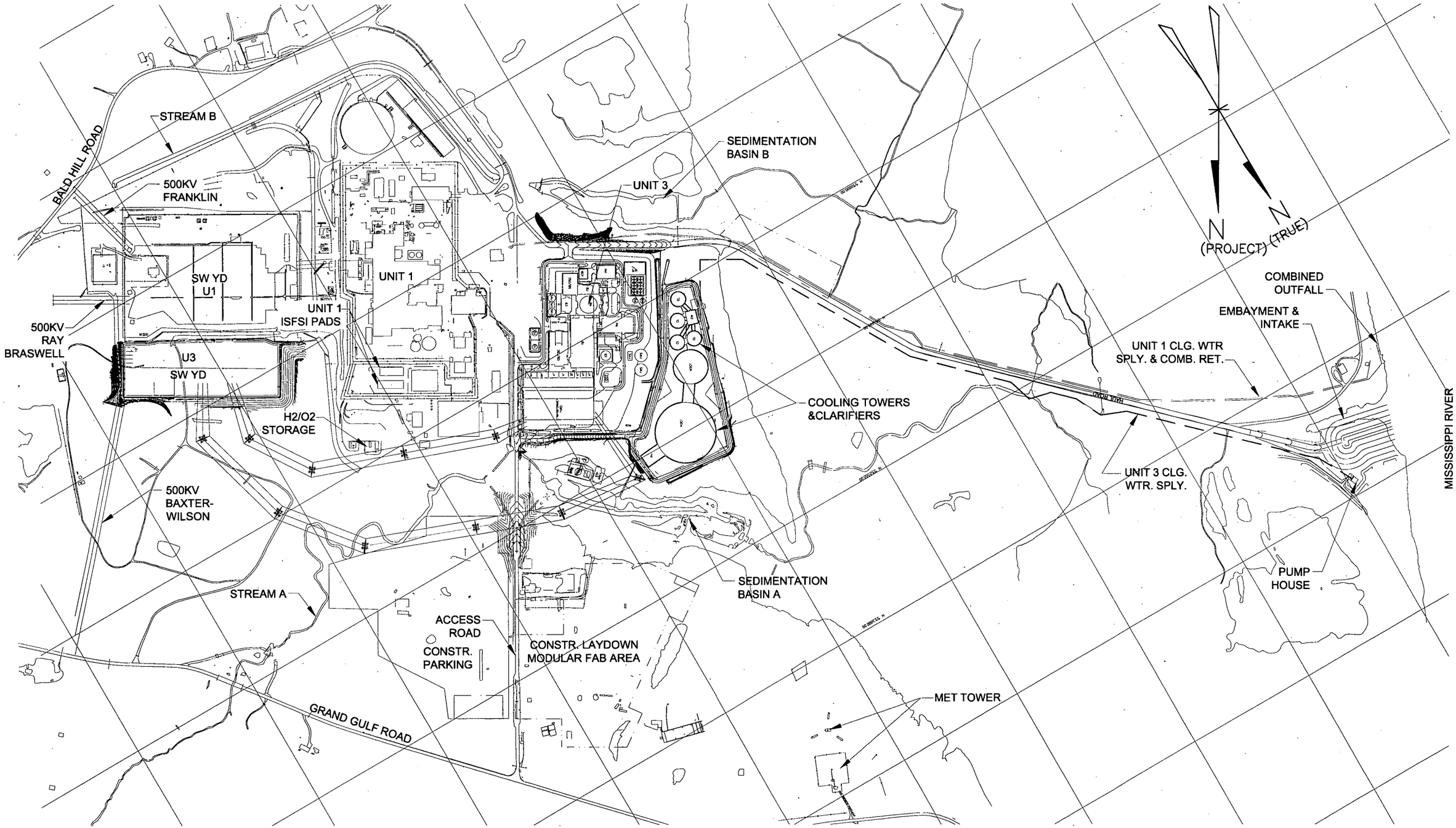
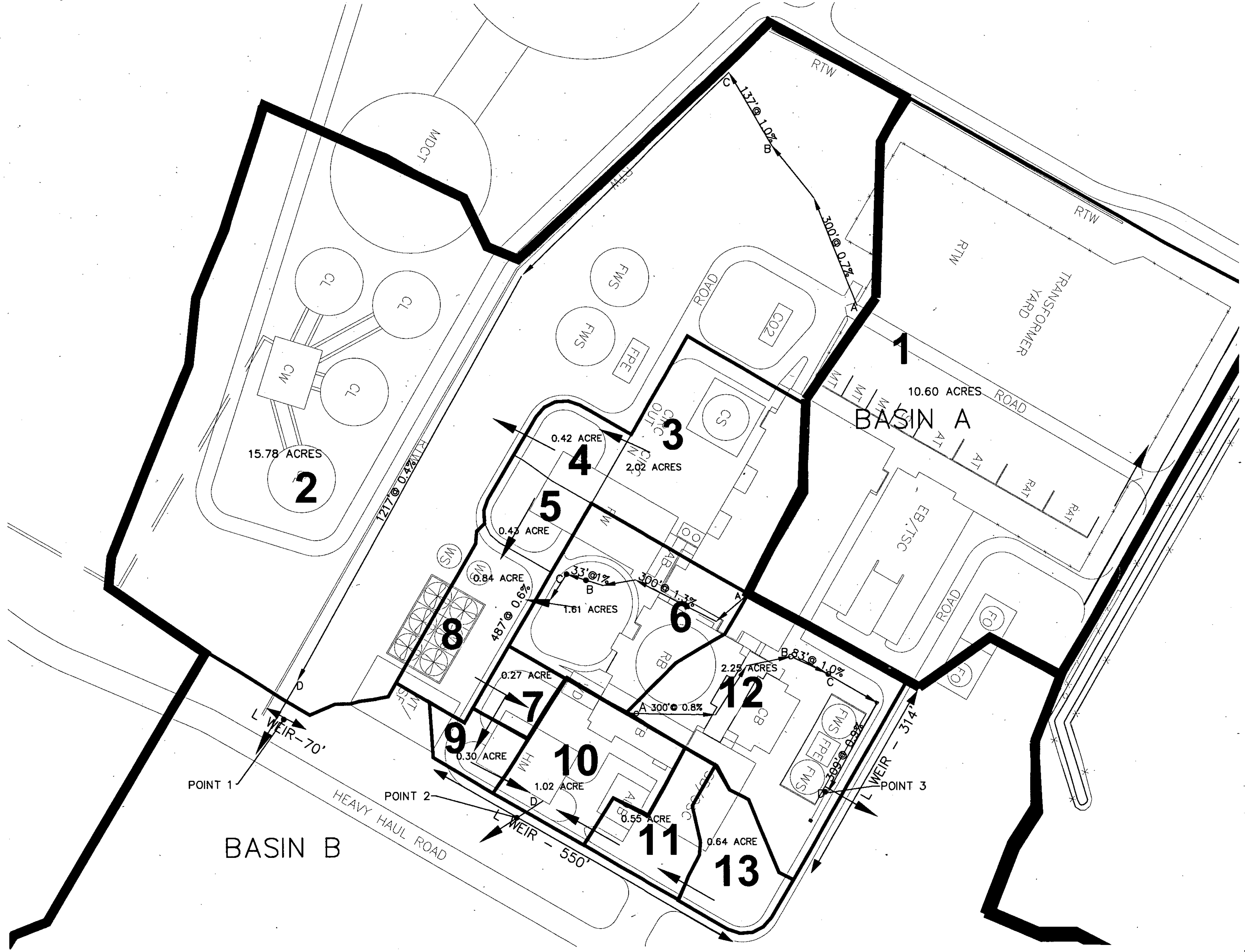


Figure 2.1-202 Detailed Site Plan and Location of Existing Structures


ROAD
ROAD
ROAD
N (PROJECT)
N (TRUE)
RAT
RAT
AT
AT
ST
MT
MT
MT
FD
FD
FWS
FPE
FWS
EB/TSC
CB
SB/DSC
TB
RB
FB
ADB
HM
WD
HM
LD
AB
CO2
CS
RN
FPE
SEC. FWS
SEC. FWS
VS
VS
WT/SF
RTW
TRANSFORMER YARD
ROAD
SEDIMENTATION BASIN A
STP AREA
PH
NDCT
MDCT
CL
CL
CL
CL
CW
ROAD
RTW
HEAVY HAUL ROAD
SEDIMENTATION BASIN B
CULVERT DISCHARGE (TYP.)
WEIR
BUILDING LEGEND:
AB AUXILIARY BOILER
ADB AUXILIARY DIESEL BUILDING
AT UNIT AUXILIARY TRANSFORMER
CB CONTROL BUILDING
CB-# CATCH BASIN NUMBER
CL CLARIFIERS
CO2 CARBON DIOXIDE BULK STORAGE
CS CONDENSATE STORAGE TANK
CW CLEARWELL
EB ELECTRICAL BUILDING
FB FUEL BUILDING
FD DIESEL FUEL OIL STORAGE TANK
FPE FIRE PUMP ENCLOSURE
FWS FIRE WATER STORAGE TANK
HM HOT MACHINE SHOP & STORAGE
LD DIRTY/CLEAN LUBE OIL STORAGE TANK
MDCT MECHANICAL DRAFT COOLING TOWER
NDCT NATURAL DRAFT COOLING TOWER
MT MAIN TRANSFORMER
OSC OPERATION SUPPORT CENTER
PH PUMP HOUSE
RAT RESERVE AUXILIARY TRANSFORMER
RB REACTOR BUILDING
RTW RETAINING WALL
RW RADWASTE BUILDING
SB SERVICE BUILDING
SF SERVICE WATER BUILDING
ST SPARE TRANSFORMER
STP SEWAGE TREATMENT PLANT
TB TURBINE BUILDING
TSC TECHNICAL SUPPORT CENTER
VD WASH DOWN BAYS (EQUIPMENT ENTRY)
VS WATER STORAGE
WT WATER TREATMENT
--- BURIED PIPING & CULVERT


STREAM B
BALD HILL ROAD
500KV
FRANKLIN
SW YD
U1
UNIT 1
UNIT 1
ISFSI PADS
500KV
RAY
BRASWELL
U3
SW YD
H2/O2
STORAGE
500KV
BAXTER-
WILSON
STREAM A
ACCESS
ROAD
CONSTR.
PARKING
GRAND GULF ROAD
SEDIMENTATION
BASIN B
UNIT 3
COOLING TOWERS
&CLARIFIERS
SEDIMENTATION
BASIN A
CONSTR. LAYDOWN
MODULAR FAB AREA
MET TOWER
N
(PROJECT)
N
(TRUE)
COMBINED
OUTFALL
EMBAYMENT &
INTAKE
UNIT 1 CLG. WTR
SPLY. & COMB. RET.
UNIT 3 CLG.
WTR. SPLY.
PUMP
HOUSE
MISSISSIPPI RIVER


BASIN A
BASIN B
1
10.60 ACRES
2
15.78 ACRES
3
2.02 ACRES
4
0.42 ACRE
5
0.43 ACRE
6
1.61 ACRES
7
0.27 ACRE
8
0.84 ACRE
9
0.30 ACRE
10
1.02 ACRE
11
0.55 ACRE
12
2.25 ACRES
13
0.64 ACRE
MDCT
CL
CW
FWS
FPE
CO2
CS
RTW
TRANSFORMER YARD
ROAD
EB/TSC
FO
RB
CB
HEAVY HAUL ROAD
137'@ 1.0%
300'@ 0.7%
1217'@ 0.4%
487'@ 0.6%
33'@1%
300'@ 1.3%
300'@ 0.8%
83'@ 1.0%
309'@ 0.8%
WEIR-70'
WEIR - 550'
WEIR - 314'
POINT 1
POINT 2
POINT 3

2.0 VARIANCES

A *variance* is a plant-specific deviation from one or more of the site characteristics, design parameters, or terms and conditions of an ESP or from the site safety analysis report (SSAR).

The following sections provide requests for variances from the proposed site characteristics for the Grand Gulf ESP. The requests comply with the requirements of 10 CFR 52.39 and 10 CFR 52.93. To support a decision whether to grant a variance, each variance request provides the technical justification and supporting cross-references to the Unit 3 FSAR information that meet the technically relevant regulatory acceptance criteria.

In accordance with 10 CFR 52.79(b)(2) and 10 CFR 52.39(d), where the Unit 3 FSAR references the Grand Gulf ESP and does not demonstrate that the design of Unit 3 falls within the ESP site characteristics, or where the Unit 3 FSAR does not incorporate the ESP SSAR information by reference without the need for certain changes, this COLA includes the following requests for variances[1]:

GGNS ESP VAR 2.0-1:	Design Response Spectra
GGNS ESP VAR 2.0-2:	Minimum Shear Wave Velocity of Soil at the Proposed Plant Foundation Level
GGNS ESP VAR 2.0-3:	Accident Analyses
GGNS ESP VAR 2.0-4:	Long Term (Routine Release) Atmospheric Dispersion
GGNS ESP VAR 2.3-1:	Determination of Roof Loads Due to Extreme Winter Precipitation
GGNS ESP VAR 2.4.1-1:	Distance to Closest Surface Water
GGNS ESP VAR 2.4.12-1:	Highest Ground Water Elevation
GGNS ESP VAR 2.5-1:	Geology, Seismology, and Geotechnical Engineering
GGNS ESP VAR 2.5-2:	Stability of Subsurface Materials and Foundations
GGNS ESP VAR 12.2-1:	Normal Operations Gaseous Release Source Term

[1] **NOTE**: Only new requests for variance, GGNS ESP VAR 2.0-4 and 12.2-1 are included in this submittal. Other requests for variances provided in Revision 0 of Part 7 and in Entergy letter CNRO-2008-00019, dated June 13, 2008, are not impacted by these changes and are not included here.

Variance: GGNS ESP VAR 2.0-4 – Long Term (Routine Release) Atmospheric Dispersion

Request

A variance is requested from the use of site characteristics of ESP-002 Appendix A, Characteristics of the Grand Gulf ESP Site, Section 2.3 Meteorology, Long-Term (Routine Release) Atmospheric Dispersion, and as provided in SSAR Tables 2.3-143 through 2.3-146. ESBWR DCD Revision 5 changed the design such that routine release of gaseous effluents is now from three discrete ventilation system stacks, rather than from a single main plant stack; the main plant stack has been removed from the ESBWR standard design. DCD Table 2.0-1, Revision 5, provides revised long term atmospheric dispersion coefficients based on the revised design. Therefore, new site-specific characteristic atmospheric dispersion coefficients have been calculated.

Justification

This variance from the site characteristics in the permit is acceptable because the revised site-specific atmospheric dispersion coefficients are based on the design of Unit 3 provided in the ESBWR DCD Revision 5, and are reflective of the revised gaseous release locations. Site-specific atmospheric dispersion coefficients are determined using a defined release boundary that encompasses the ESBWR ventilation release stack locations provided in Revision 5 of the DCD, as discussed in FSAR Section 2.3.5.2. Revised gaseous pathway doses have been determined to be within the regulatory limits of 10 CFR 20 and 10 CFR 50, Appendix I, using the revised site-specific atmospheric dispersion coefficients. See also request for variance, GGNS ESP VAR 12.2-1.

Variance: GGNS ESP VAR 12.2-1 – Normal Operations Gaseous Release Source Term

Request

A variance is requested from the use of the normal gaseous effluent release source term given in the SSAR, Tables 1.3-1 and 1.3-2. The ESP source term is also listed in Appendix D, Values of Plant Parameters Considered in the Environmental Review of the Application, Tables D1 and D7, invoked as a condition of the permit by Section 3.D. Revision 5 of the the ESBWR DCD revised the gaseous effluent routine release source term, resulting in the SSAR source term not bounding all isotopes of the DCD source term. Therefore, the Revision 5 DCD gaseous source term for routine release will be utilized in calculation of site-specific dose from the gaseous pathway.

Justification

The ESP application determined site suitability based on a plant parameter envelope approach, using a composite source term developed from gaseous release data provided by several reactor technologies in order to bound any reactor technology selected for installation at the GGNS ESP site. As described above, the composite source term is no longer bounding for all isotopes of the ESBWR gaseous release source term. Use of the Revision 5 ESBWR DCD source term for determination of offsite dose from the gaseous effluent pathway, in combination with site-specific atmospheric dispersion coefficients, is acceptable because this provides bounding doses

that are based on the Unit 3 (ESBWR) design-specific release parameters, and the GGNS site-specific meteorological parameters.

ATTACHMENT 4

G3NO-2008-00011

RESPONSE TO NRC RAI LETTER NO. 09

RAI QUESTION NO. 12.02-4

RAI QUESTION NO. 12.02-4

NRC RAI 12.02-4

A review of FSAR Section 12.2.2.4 indicates inconsistencies and lack of details in the presentation of supporting data as compared with the ESBWR DCD, Tier 2 Rev. 5. Specifically, please address and resolve the following items in the Grand Gulf Unit 3 FSAR:

a. The FSAR uses a different liquid discharge flow rate as compared to that used in the ESBWR DCD, Rev. 4, even though it refers back to the ESBWR DCD Table 12.2-19b for source term and concentration. The DCD uses an outfall (dilution) flow rate of 20,000 liters per minute, whereas the FSAR Table 12.2-201 indicates a dilution flow rate of 7,000 gpm, or about 26,500 liters per minute. In demonstrating consistency with the unity rule of Table 2 (Column 2) of Appendix B to 10 CFR Part 20, please update the FSAR by listing in a tabular format, the liquid discharge nuclide concentrations, along with comparisons to the corresponding values in Table 2 of 10 CFR part 20 Appendix B, for consistency with the unity rule.

b. A review of the ESBWR DCD, Rev. 5 Table 12.2-19b indicates that the source term (MBq/yr) is based on a plant capacity factor of 0.8 while the ESBWR design capacity factor is 0.92 (DCD Table 12.2-15). A higher capacity factor would result in an increased reactor coolant system radiological inventory and thereby the potential for higher released quantities. Therefore, the radiological release values (i.e., source term) are expected to be higher by a factor of 1.15 (0.92/0.8). The use of the increased capacity factor would lead to a proportionally higher liquid dose offsite. Since applicant has used the liquid source term given in the ESBWR DCD, Rev. 4 Tier 2, Table 12.2-19b, the use of these values in the FSAR requires a note stating that the source term is based on the capacity factor of 0.80. The inclusion of such note in the FSAR would make the presentation of this information consistent with the corresponding offsite dose values presented in Table 12.2-203. Accordingly, please add a footnote to the tabular information requested as part of item "a" above, indicating that the source term is based on a capacity factor of 0.80.

c. FSAR Table 12.2-201 indicates an effluent discharge flow rate of 35 gpm. The same flow rate is also provided on Page D-3 of ESP-002 which is referenced in the FSAR. However, the effluent discharge flow rate presented in the water balance figure (i.e., Figure 3.3-201 of "Grand Gulf Nuclear Station Unit 3, Combined License Application, Environmental Report, Revision 0 February 2008") indicates a liquid radwaste wastewater (stream No. 16) flow rate of 98 gpm. A stream with 35 gpm (stream No. 7) is labeled as sanitary wastewater system on the same figure. Please confirm that the cited flow rate for the liquid effluent discharge rate is correct. Otherwise, please list the correct value in an updated the FSAR Table 12.2-201.

Entergy Response

The inconsistencies and lack of detail identified in RAI 12.02-4 are addressed as follows:

a. ESBWR DCD Table 12.2-19b demonstrates that the ESBWR liquid release concentrations fall within (are less than) those of Table 2 (Column 2) of Appendix B to 10 CFR Part 20; however, the concentrations provided are based on a discharge canal flow rate of 20,000 liters/min. FSAR Table 12.2-201 indicates a dilution flow rate of 7,000 gpm, or about 26,500 liters per minute for Grand Gulf Unit 3. Therefore, a new FSAR Table is necessary to provide site-specific concentrations. New FSAR Table 12.2-215, included in the attached draft FSAR markup, shows the Grand Gulf Unit 3 liquid discharge nuclide concentrations in a tabular format. Comparisons to the corresponding values in Table 2 of 10 CFR Part 20 Appendix B, are provided. Demonstration of consistency with the unity rule is included in new Table 12.2-215 by summation of the ratio of the GG Unit 3 concentrations to the 10 CFR 20 concentrations for all nuclides in the release. The summation of the ratios of the GG Unit 3 concentrations to the 10 CFR 20 concentrations is shown to be less than one. FSAR Section 12.2.2.4.3 will be revised, as indicated in the attached draft markup, to refer to the new Table 12.2-215 also included in the attached draft markup.

b. As indicated in FSAR Table 12.2-201, the source term given in DCD Table 12.2-19b is used in the liquid effluent pathway off-site dose calculation. The bases for the DCD average annual liquid releases offsite are given in the ESBWR DCD. ESBWR DCD Tier 2, Subsection 12.2.2.3 and Table 12.2-19a discuss the release of processed radioactive liquid effluents and the input parameters to the GALE 86 code which are used in determining the Table 12.2-19b annual liquid release values, respectively. As explained in the GEH response to DCD RAI Number 12.2-15S02 (Reference: GEH letter MFN 06-305 Supplement 2, dated May 16, 2008), plant capacity factor is not specifically addressed as an input; a capacity factor of 0.8 is an internal default value of the GALE 86 code that applies only to tritium discharges in the liquid effluent. In the GEH response, it is stated that the liquid effluent doses due to the annual activity releases in Table 12.2-19b would not be appreciably affected by changing the default capacity factor of 0.8 in NUREG-0016 to the ESBWR design rating of 0.92. Given the small change in the tritium release, as indicated in MFN-06-305 Supplement 2, and the small contribution of tritium to the total body and organ doses, no changes to the GGNS FSAR will be made in response to this RAI.

c. FSAR Table 12.2-201, "Liquid Pathway Parameters," provides parameters used in the LADTAP II computer code to perform the liquid effluent dose analysis. FSAR Table 12.2-201, indicates an effluent discharge flow rate of 35 gpm. The same flow rate is also provided on Page D-3 of ESP-002. Using this effluent flow rate of 35 gpm results in higher radionuclide concentrations than if 98 gpm effluent flow as given in Figure 3.3-201 of the Grand Gulf Environmental Report were used. The flow rate of 35 gpm is the correct flow rate, and is the flow rate used in the liquid effluent dose analysis for Grand Gulf Unit 3, as indicated in FSAR Table 12.2-201.

Proposed COLA Revision

FSAR Section 12.2.2.4.3 will be revised, as indicated in the attached draft markup, to refer to the new Table 12.2-215, also included in the attached draft markup.

Markup of Grand Gulf COLA

The following markup represents Entergy's good faith effort to show how the COLA will be revised in a future COLA submittal in response to the subject RAI. However, the same COLA content may be impacted by revisions to the ESBWR DCD, responses to other COLA RAIs, other COLA changes, plant design changes, editorial or typographical corrections, etc. As a result, the final COLA content that appears in a future submittal may be somewhat different than as presented herein.

of this evaluation indicate that there are no cost beneficial liquid radwaste system augments. Therefore, Unit 3 complies with 10 CFR 50, Appendix I, Section II.D.

12.2.2.4.3 Compliance with 10 CFR 20 Appendix B, Table 2, Column 2

Compliance with 10 CFR 20 Appendix B, Table 2, Column 2 is demonstrated in ~~DCD~~ Table 12.2-~~19b~~215.

12.2.2.4.4 Compliance with 10 CFR 20.1301

See Section 12.2.2.2.4.

12.2.2.4.5 Compliance with 10 CFR 20.1302

See Section 12.2.2.2.5.

12.2.4 COL INFORMATION

12.2-2-A Airborne Effluents and Doses

GGNS COL 12.2-2-A This COL item is addressed in Sections 11.3.2, 12.2.2.1 and 12.2.2.2.

12.2-3-A Liquid Effluents and Doses

GGNS COL 12.2-3-A This COL item is addressed in Section 12.2.2.4.

12.2-4-A Other Contained Sources

STD COL 12.2-4-A This COL Item is addressed in Section 12.2.1.5.

GGNS COL 12.2-3-A

Table 12.2-215 (Sheet 1 of 2)
AVERAGE ANNUAL LIQUID RELEASE

Nuclide	Annual Release MBq/yr	Concentration Bq/ml	10CFR20 MPC Bq/ml	Concentration Ratio (GGNS/10 CFR 20)
I-131	1.55E+02	1.11E-05	3.70E-02	3.01E-04
I-132	3.03E+01	2.17E-06	3.70E+00	5.88E-07
I-133	7.77E+02	5.58E-05	2.59E-01	2.15E-04
I-134	1.48E+00	1.06E-07	1.48E+01	7.18E-09
I-135	2.00E+02	1.44E-05	1.11E+00	1.29E-05
H-3	5.18E+05	3.72E-02	3.70E+01	1.00E-03
Na-24	1.89E+02	1.36E-05	1.85E+00	7.33E-06
P-32	1.55E+01	1.11E-06	3.33E-01	3.34E-06
Cr-51	4.81E+02	3.45E-05	1.85E+01	1.87E-06
Mn-54	5.92E+00	4.25E-07	1.11E+00	3.83E-07
Mn-56	4.81E+01	3.45E-06	2.59E+00	1.33E-06
Fe-55	8.51E+01	6.11E-06	3.70E+00	1.65E-06
Fe-59	2.59E+00	1.86E-07	3.70E-01	5.02E-07
Co-58	1.63E+01	1.17E-06	7.40E-01	1.58E-06
Co-60	3.33E+01	2.39E-06	1.11E-01	2.15E-05
Cu-64	4.81E+02	3.45E-05	7.40E+00	4.66E-06
Zn-65	1.67E+01	1.20E-06	1.85E-01	6.48E-06
Zn-69m	3.40E+01	2.44E-06	2.22E+00	1.10E-06
Br-83	3.33E+00	2.39E-07	3.33E+01	7.18E-09
Sr-89	8.14E+00	5.84E-07	2.96E-01	1.97E-06
Sr-90	7.40E-01	5.31E-08	1.85E-02	2.87E-06
Sr-91	4.44E+01	3.19E-06	7.40E-01	4.31E-06
Y-91	5.18E+00	3.72E-07	2.96E-01	1.26E-06
Sr-92	1.07E+01	7.68E-07	1.48E+00	5.19E-07
Y-92	4.07E+01	2.92E-06	1.48E+00	1.97E-06
Y-93	4.44E+01	3.19E-06	7.40E-01	4.31E-06
Zr-95	7.40E-01	5.31E-08	7.40E-01	7.18E-08
Nb-95	7.40E-01	5.31E-08	1.11E+00	4.78E-08
Mo-99	1.11E+02	7.96E-06	7.40E-01	1.08E-05
Tc-99m	2.04E+02	1.46E-05	3.70E+01	3.96E-07
Ru-103	1.48E+00	1.06E-07	1.11E+00	9.57E-08
Ru-105	6.29E+00	4.51E-07	2.59E+00	1.74E-07
Te-129m	3.33E+00	2.39E-07	2.59E-01	9.23E-07
Te-131m	3.70E+00	2.65E-07	2.96E-01	8.97E-07
Te-132	7.40E-01	5.31E-08	3.33E-01	1.59E-07
Cs-134	2.52E+01	1.81E-06	3.33E-02	5.43E-05
Cs-136	1.52E+01	1.09E-06	2.22E-01	4.91E-06
Cs-137	6.66E+01	4.78E-06	3.70E-02	1.29E-04
Ba-139	1.48E+00	1.06E-07	7.40E+00	1.44E-08

**Grand Gulf Nuclear Station, Unit
COL Application
Part 2, FSAR**

GGNS COL 12.2-3-A

Table 12.2-215 (Sheet 2 of 2)
AVERAGE ANNUAL LIQUID RELEASE

Nuclide	Annual Release MBq/yr	Concentration Bq/ml	10CFR20 MPC Bq/ml	Concentration Ratio (GGNS/10 CFR 20)
Ba-140	3.03E+01	2.17E-06	2.96E-01	7.34E-06
Ce-141	2.59E+00	1.86E-07	1.11E+00	1.67E-07
La-142	1.11E+00	7.96E-08	3.70E+00	2.15E-08
Ce-143	1.11E+00	7.96E-08	7.40E-01	1.08E-07
Pr-143	3.33E+00	2.39E-07	7.40E-01	3.23E-07
W-187	8.88E+00	6.37E-07	1.11E+00	5.74E-07
Np-239	4.07E+02	2.92E-05	7.40E-01	3.95E-05
			Sum	1.85E-03

ATTACHMENT 5

G3NO-2008-00011

REGULATORY COMMITMENTS

REGULATORY COMMITMENTS

The following table identifies those actions committed to by Entergy in this document. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

COMMITMENT	TYPE (Check one)		SCHEDULED COMPLETION DATE (If Required)
	ONE-TIME ACTION	CONTINUING COMPLIANCE	
Entergy will revise the COLA as discussed in the attachments to this letter, in Revision 1 of Part 2 and Part 7 of the COL application. Revised COLA information will include: • FSAR Section 12.2.2.4.2 as indicated in Attachment 1. • FSAR Sections 1.12.2, 2.3.2, 2.3.5, 2.3.6, 11.3.2, 12.2, 12.2.2.1, 12.2.2.2 and 12.2.5, FSAR Tables 1.1-202, 1.8-202, 2.0-201, 2.0-202, (new Tables) 2.3-212 through 2.3-217, 12.2-203, 12.2-205, 12.2-206, (new Tables) 12.2-207 through 12.2-214, and FSAR Figures 1.1-201, 2.1-202, 2.4.1-201 Sheets 1 and 2, and 2.4.2-204, as indicated in Attachment 3. • Part 7, as indicated in Attachment 3. • FSAR Section 12.2.2.4.3 and new Table 12.2-215 as indicated in Attachment 4.	✓		Future COLA submittal.