Chapter 12 Radiation Protection

12.1 Ensuring That Occupational Radiation Exposures Are ALARA

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

Add the following at the beginning of this section.

STD SUP 12.1-1

The ALARA program is addressed in Appendix 12AA and Appendix 12BB.

12.1.1.3.1 **Compliance with Regulatory Guide 8.8**

Replace the first paragraph of this section with the following.

STD COL 12.1-4-A

Compliance with Regulatory Guide 8.8 is addressed in Appendix 12BB.

12.1.1.3.2 **Compliance with Regulatory Guide 8.10**

Replace this section with the following.

STD COL 12.1-1-A

Compliance with Regulatory Guide 8.10 is addressed in Appendix 12BB.

12.1.1.3.3 **Compliance with Regulatory Guide 1.8**

Replace this section with the following.

STD COL 12.1-2-A

Compliance with Regulatory Guide 1.8 is addressed in Appendix 12BB.

12.1.3 **Operational Considerations**

Replace this section with the following

STD COL 12.1-3-A

The ALARA program implementation is addressed in Appendix 12BB.

12.1.4 **COL Information**

12.1-1-A **Regulatory Guide 8.10**

STD COL 12.1-1-A This COL item is addressed in Subsection 12.1.1.3.2 and Appendix 12BB.

12.1-2-A **Regulatory Guide 1.8**

STD COL 12.1-2-A This COL item is addressed in Subsection 12.1.1.3.3 and Appendix 12BB.

12.1-3-A **Operational Considerations**

STD COL 12.1-3-A This COL item is addressed in Subsection 12.1.3 and Appendix 12BB.

12.1-4-A **Regulatory Guide 8.8**

STD COL 12.1-4-A This COL item is addressed in Subsection 12.1.1.3.1 and Appendix 12BB.

12.2 Plant Sources

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

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 by-product, source, or special nuclear materials may be maintained onsite. These contained sources are used as calibration, check, 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 Releases Offsite

Replace this section with the following.

EF3 COL 12.2-2-A

Airborne sources are calculated using the source terms given in Section 11.1.

The bases for these calculations are shown in Table 12.2-15R.

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 (X/Q) and deposition (D/Q) parameter values for each release location. Fermi site-specific values for these parameters are shown in Table 12.2-15R.

The subject X/Q and D/Q values in Table 12.2-15R are used in the calculation of the gaseous effluent normal operation doses in . Calculation of site-specific doses is discussed in Subsection 12.2.2.2.

Table 12.2-15R contains values used in calculating the annual airborne release source term. These source terms are provided in DCD Table 12.2-16. Design basis noble gas, iodine, and other fission product concentrations are taken from the tables in DCD Chapter 11. Specific details and information on the derivation of the airborne source terms are provided in DCD Appendix 12B.

Annual Releases

Based upon the above criteria, the normal operating source terms are given in DCD Table 12.2-16 and a comparison to 10 CFR 20 criteria is given in Table 12.2-17R. For determining the maximum activity concentration at the site boundary, the site specific X/Q values from each vent stack are conservatively assumed to be 800 meters (0.5 mile) from the site boundary. This table also shows the maximum activity concentration for each nuclide at the site boundary from combined operation of Fermi 2 and Fermi 3, and the corresponding concentration limit from 10 CFR 20, Appendix B, Table 2, Column 1.

12.2.2.2 Airborne Dose Evaluation Offsite

Replace this section with the following.

EF3 COL 12.2-2-A

The bases for the calculation of Fermi 3-specific airborne offsite doses are provided in Table 12.2-18aR. The annual gaseous pathway doses are provided in . The methodology in RG 1.109 was used in determining the annual airborne dose values. The bases include values that are default parameters in RG 1.109 and other values that are Fermi 3 site-specific inputs. As part of the analysis, several sensitivities were performed to account for potentially limiting combinations of atmospheric dispersion, deposition and ingestion pathways. The SSE direction provides the limiting plume dose. The WNW direction at the site boundary provides the limiting dose for non-milk iodine and particulate sources. This is conservative relative to the doses at the actual residences, vegetable gardens and meat cows. The WNW direction at the actual locations provides the dose contribution due to milk consumption. In this case the cow and goat milk are both included for conservatism. The total dose is the sum of these individual pathways. The results of the Fermi 3 gaseous pathway dose analysis are given in.

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

Table 12.2-201 demonstrates that offsite doses due to Fermi 3 radioactive airborne effluents comply with the regulatory dose limits in 10 CFR 50, Appendix I, Sections II.B and II.C.

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

Population dose is determined for the gaseous effluent releases from Fermi 3 for both whole body dose and thyroid dose. The whole body dose is 4.5 person-rem/yr as shown in Table 12.2-204. The thyroid dose is 24.1 person-rem/yr. The cost-benefit analysis performed to consider gaseous radwaste augments to reduce doses due to gaseous effluents is presented in Section 11.3. Based on the results from the cost-benefit analyses, no augments are cost-beneficial. Therefore, Fermi 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

Table 12.2-17R provides the gaseous effluent concentrations in comparison to the 10 CFR 20, Appendix B, Table 2, Column 1 limits. The Fermi 3 gaseous effluent concentrations comply with 10 CFR 20, Appendix B, Table 2, Column 1.

12.2.2.2.4 Compliance with 10 CFR 20.1301 and 20.1302

Compliance with 10 CFR 20.1301 and 20.1302 is demonstrated in Subsection 12.2.2.4.4 and 12.2.2.4.5, respectively.

12.2.2.4 Liquid Doses Offsite

Replace this section with the following.

EF3 COL 12.2-3-A

The ESBWR LWMS is designed with the capability to recycle 100 percent of the liquid radwaste (zero liquid release). The analysis of dose via liquid effluents is presented in order to provide a conservative representation of unit operation. Detroit Edison intends to operate Fermi 3 with zero liquid effluents.

Liquid pathway doses were calculated based on the criteria specified in DCD Section 12.2.2.3 for compliance with 10 CFR 50, Appendix I. Dose conversion factors and methodologies consistent with RGs 1.109 and

1.113 were used as described in DCD References 12.2-7 and 12.2-4, respectively.

The liquid effluent pathway offsite dose calculation bases are provided in Table 12.2-20aR. The bases include values that are default parameters in RG 1.109 and other values that are Fermi 3 site-specific inputs.

Based on the annual liquid release offsite values in DCD Table 12.2-19b, the Fermi 3 annual liquid release concentrations were calculated based upon the criteria specified in DCD Section 12.2.2.3 and the Fermi 3 specific input values shown in Table 12.2-20aR.

The LADTAP II code is used to perform the liquid effluent dose analysis (DCD Reference 12.2-3). The results of the dose calculation are given in Table 12.2-20bR.

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

Table 12.2-202 demonstrates that offsite dose due to Fermi 3 radioactive liquid effluents comply with the regulatory dose limits in 10 CFR 50, Appendix I, Section II.A.

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

Population dose is determined for the liquid effluent releases from Fermi 3 for both whole body dose and thyroid dose. The whole body dose is 14.9 person-rem/yr as shown in Table 12.2-204. The thyroid dose is 30.1 person-rem/yr. The cost-benefit analysis performed to consider liquid radwaste augments to reduce dose due to liquid effluents is presented in Section 11.2. Based on the above liquid effluent dose estimate values and the threshold value from the cost-benefit analysis, no augments are cost-beneficial.Therefore, Fermi 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 12.2-19bR.

12.2.2.4.4 Compliance with 10 CFR 20.1301 and 20.1302

This section demonstrates that offsite doses due to Fermi 3, combined with offsite doses due to Fermi 2 comply with the regulatory limits in 10 CFR 20.1301 for doses to members of the public.

Using the Fermi 3-specific gaseous effluent release activities identified in Table 12.2-17R and the liquid effluent release activities identified in Table 12.2-19bR, the total annual doses to the MEI and the population resulting from Fermi 3 liquid and gaseous effluents are calculated and presented in Table 12.2-203 and Table 12.2-204, respectively.

The direct radiation contribution from operation of Fermi 3 is negligible. The direct dose contribution from Fermi 3 at two distances is provided in DCD Table 12.2-21. The annual dose of 5.93E-04 mrem/yr at 800 m (0.5 mi) is negligible. The distance to the site boundary from Fermi 3 is at least 890 m (0.56 mi) and the increase in distance further reduces the low dose rate.

The total annual doses to the MEI and the population resulting from Fermi 2 liquid and gaseous effluents are provided in Table 12.2-203 and Table 12.2-204, respectively. The values shown are representative based on review of Fermi 2 annual radiological environmental reports (Reference 12.2-201).

The direct radiation contribution from operation of Fermi 2 is negligible. An evaluation of operating plants by the NRC states that:

> "…because the primary coolant of an LWR is contained in a heavily shielded area, dose rates in the vicinity of light water reactors are generally undetectable and are less than 1 mrem/year at the site boundary."

The NRC concludes that the direct radiation from normal operation results in "small contributions at site boundaries" (Reference 12.2-202, Section 4.6.1.2).

Table 12.2-203 shows that the total Fermi site doses resulting from the normal operation of Fermi 2 and Fermi 3 are well within the regulatory limits of 40 CFR 190.

Table 12.2-204 shows the whole body doses from liquid and gaseous effluents doses attributable to Fermi 3 for the population within 80 km (50 mi) from the Fermi site.

12.2.2.4.5 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.

Compliance with the annual dose limit in 10 CFR 20.1302 is demonstrated 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.

12.2.4 COL Information

12.2-2-A Airborne Effluents and Doses

EF3 COL 12.2-2-A This COL item is addressed in Subsection 12.2.2.1 and Subsection 12.2.2.2, and Table 2.0-201.

12.2-3-A Liquid Effluents and Doses

EF3 COL 12.2-3-A This COL item is addressed in Subsection 12.2.2.4.

12.2-4-A Other Contained Sources

STD COL 12.2-4-A This COL item is addressed in Subsection 12.2.1.5.

12.2.5 References

12.2-201 Detroit Edison, “Fermi 2 – 2006 Annual Radioactive Effluent Release and Radiological Environmental Operating Report for the period of January 1, 2006 through December 31, 2006.”

12.2-202 U.S. Nuclear Regulatory Commission, “Generic Environmental Impact Statement for License Renewal of Nuclear Plants,” NUREG-1437, May 1996.

Table 12.2-15R Airborne Sources Calculation [EF3 COL 12.2-2-A]

	Calculation Bases	
	Methodology	DCD Appendix 12B
	Noble Gas Source at t=30 min	740 MBq/sec (20,000 µCi/sec)
	I-131 Release Rate	3.7 MBq/sec (100 µCi/sec)
EF3 COL 12.2-2-A	Meteorology Boundary	Table 2.3-305 and Table 2.3-306 (Residences, Vegetable Gardens and Meat Cows conservatively assumed to be located at site boundary)
EF3 COL 12.2-2-A	Meteorology X/Qs	
	RWB Ventilation Stack	Table 2.3-328 through Table 2.3-330
	RB/FB Ventilation Stack	Table 2.3-332 through Table 2.3-334
	TB Ventilation Stack	Table 2.3-336 through Table 2.3-338
EF3 COL 12.2-2-A	Meteorology D/Qs	
	RWB Ventilation Stack	Table 2.3-331
	RB/FB Ventilation Stack	Table 2.3-335
	TB Ventilation Stack	Table 2.3-339
	Plant Availability Factor	0.92
	Offgas System:	
	Offgas stream temperature	100°F
	Flow rate	54 m^3/hr
	K_d (Kr)	18.5 cm^3/g
	K_d (Xe)	330 cm^3/g
	K_d (Ar)	6.4 cm^3/g
	Guard tank charcoal mass	7,500 kg (single tank)
	Adsorber tank charcoal mass	27,750 kg (each)
	Adsorber tank arrangement	2 parallel trains of 4 tanks each
	Turbine Gland Sealing System Exhaust:	
	I-131 release	0.81 Ci/yr per µCi/g of I-131 in coolant
	I-133 release	0.22 Ci/yr per µCi/g of I-133 in coolant

Table 12.2-17R Comparison of Airborne Release Concentrations with 10 CFR 20 Limit (Sheet 1 of 5) [EF3 COL 12.2-2.A]

	Fermi 3 Annual Release		Fermi 3 Concentration		Fermi 2 + 3 Concentration	10 CFR 20 Concentration Limit	Fermi 2 + 3 Fraction of 10 CFR 20 Limit
Nuclide	**MBq/yr**	**Ci/yr**	**Bq/m^3**	**µCi/ml**	**µCi/ml**	**µCi/ml**	
Kr-83m	8.5E+01	2.3E-03	1.7E-06	4.6E-17	3.6E-12	5.0E-05	7.2E-08
Kr-85m	6.6E+05	1.8E+01	1.4E-02	3.9E-13	1.4E-10	1.0E-07	1.4E-03
Kr-85	5.2E+06	1.4E+02	1.1E-01	3.1E-12	2.2E-11	7.0E-07	3.2E-05
Kr-87	1.4E+06	3.9E+01	3.2E-02	8.6E-13	3.2E-12	2.0E-08	1.6E-04
Kr-88	2.1E+06	5.6E+01	4.6E-02	1.2E-12	5.4E-11	9.0E-09	6.0E-03
Kr-89	1.4E+07	3.7E+02	7.0E-01	1.9E-11	9.8E-11	1.0E-09	9.8E-02
Xe-131m	1.5E+05	4.1E+00	3.3E-03	8.9E-14	5.8E-12	2.0E-06	2.9E-06
Xe-133m	1.9E+02	5.2E-03	3.8E-06	1.0E-16	2.4E-12	6.0E-07	4.0E-06
Xe-133	4.1E+07	1.1E+03	4.0E+00	1.1E-10	1.1E-09	5.0E-07	2.1E-03
Xe-135m	2.2E+07	6.0E+02	7.8E+00	2.1E-10	2.1E-10	4.0E-08	5.3E-03
Xe-135	2.8E+07	7.5E+02	4.5E+00	1.2E-10	1.4E-10	7.0E-08	2.1E-03
Xe-137	2.8E+07	7.6E+02	1.8E+00	4.8E-11	7.1E-11	1.0E-09	7.1E-02
Xe-138	2.3E+07	6.3E+02	5.4E-01	1.5E-11	1.1E-10	2.0E-08	5.7E-03
I-131	8.7E+03	2.3E-01	4.0E-04	1.1E-14	2.2E-14	2.0E-10	1.1E-04
I-132	5.8E+04	1.6E+00	3.1E-03	8.3E-14	1.8E-13	2.0E-08	9.2E-06
I-133	4.3E+04	1.2E+00	2.3E-03	6.1E-14	1.4E-13	1.0E-09	1.4E-04

Table 12.2-17R Comparison of Airborne Release Concentrations with 10 CFR 20 Limit (Sheet 2 of 5) [EF3 COL 12.2-2.A]

	Fermi 3 Annual Release		Fermi 3 Concentration		Fermi 2 + 3 Concentration	10 CFR 20 Concentration Limit	Fermi 2 + 3 Fraction of 10 CFR 20 Limit
Nuclide	**MBq/yr**	**Ci/yr**	**Bq/m^3**	**µCi/ml**	**µCi/ml**	**µCi/ml**	
I-134	1.1E+05	3.0E+00	5.6E-03	1.5E-13	3.4E-13	6.0E-08	5.7E-06
I-135	5.9E+04	1.6E+00	3.2E-03	8.6E-14	2.0E-13	6.0E-09	3.3E-05
H-3	2.8E+06	7.6E+01	5.5E-02	1.5E-12	1.6E-12	1.0E-07	1.6E-05
C-14	5.3E+05	1.4E+01	1.2E-02	3.2E-13	3.2E-13	3.0E-09	1.1E-04
Na-24	5.4E+00	1.5E-04	1.1E-07	2.9E-18	2.9E-18	7.0E-09	4.1E-10
P-32	1.3E+00	3.5E-05	2.6E-08	7.0E-19	7.0E-19	5.0E-10	1.4E-09
Ar-41	1.4E+03	3.8E-02	3.1E-05	8.3E-16	8.3E-16	1.0E-08	8.3E-08
Cr-51	1.8E+02	4.7E-03	1.4E-05	3.8E-16	3.8E-16	3.0E-08	1.3E-08
Mn-54	1.5E+02	4.1E-03	6.2E-05	1.7E-15	1.7E-15	1.0E-09	1.7E-06
Mn-56	1.1E+01	3.0E-04	2.2E-07	5.9E-18	5.9E-18	2.0E-08	2.9E-10
Fe-55	4.7E+01	1.3E-03	9.3E-07	2.5E-17	2.5E-17	3.0E-09	8.4E-09
Fe-59	2.0E+01	5.4E-04	4.8E-06	1.3E-16	1.3E-16	5.0E-10	2.6E-07
Co-58	4.0E+01	1.1E-03	3.8E-06	1.0E-16	1.0E-16	1.0E-09	1.0E-07
Co-60	3.2E+02	8.7E-03	1.1E-04	3.0E-15	3.0E-15	5.0E-11	6.0E-05
Ni-63	4.7E+02	1.3E-06	9.3E-10	2.5E-20	2.5E-20	1.0E-09	2.5E-11
Cu-64	6.9E+00	1.9E-04	1.4E-07	3.7E-18	3.7E-18	3.0E-08	1.2E-10

Table 12.2-17R Comparison of Airborne Release Concentrations with 10 CFR 20 Limit (Sheet 3 of 5) [EF3 COL 12.2-2.A]

	Fermi 3 Annual Release		Fermi 3 Concentration		Fermi 2 + 3 Concentration	10 CFR 20 Concentration Limit	Fermi 2 + 3 Fraction of 10 CFR 20 Limit
Nuclide	**MBq/yr**	**Ci/yr**	**Bq/m^3**	**µCi/ml**	**µCi/ml**	**µCi/ml**	
Zn-65	3.2E+02	8.6E-03	1.1E-05	3.0E-16	3.0E-16	4.0E-10	7.4E-07
Rb-89	2.0E-01	5.4E-06	4.0E-09	1.1E-19	1.1E-19	2.0E-07	5.4E-13
Sr-89	1.5E+02	3.9E-03	3.2E-06	8.6E-17	7.4E-16	2.0E-10	3.7E-06
Sr-90	1.0E+00	2.7E-05	2.2E-08	5.9E-19	5.0E-17	6.0E-12	8.3E-06
Y-90	8.1E-02	2.2E-06	1.6E-09	4.3E-20	4.3E-20	9.0E-10	4.8E-11
Sr-91	6.7E+00	1.8E-04	1.3E-07	3.6E-18	1.4E-14	5.0E-09	2.8E-06
Sr-92	4.6E+00	1.2E-04	9.1E-08	2.5E-18	2.2E-14	9.0E-09	2.4E-06
Y-91	1.7E+00	4.6E-05	3.4E-08	9.1E-19	9.1E-19	2.0E-10	4.6E-09
Y-92	3.7E+00	1.0E-04	7.3E-08	2.0E-18	2.0E-18	1.0E-08	2.0E-10
Y-93	7.2E+00	1.9E-04	1.4E-07	3.9E-18	3.9E-18	3.0E-09	1.3E-09
Zr-95	4.4E+01	1.2E-03	1.3E-05	3.4E-16	3.5E-16	4.0E-10	8.7E-07
Nb-95	2.4E+02	6.5E-03	4.8E-06	1.3E-16	1.3E-16	2.0E-09	6.5E-08
Mo-99	1.7E+03	4.5E-02	3.3E-05	9.0E-16	5.5E-15	2.0E-09	2.8E-06
Tc-99m	2.2E+00	5.9E-05	4.4E-08	1.2E-18	5.7E-14	2.0E-07	2.9E-07
Ru-103	1.0E+02	2.8E-03	2.0E-06	5.5E-17	5.9E-17	9.0E-10	6.5E-08
Rh-103m	3.5E-03	9.5E-08	6.9E-11	1.9E-21	1.9E-21	2.0E-06	9.4E-16
Ru-106	1.4E-01	3.8E-06	2.8E-09	7.5E-20	7.5E-20	2.0E-11	3.8E-09

Table 12.2-17R Comparison of Airborne Release Concentrations with 10 CFR 20 Limit (Sheet 4 of 5) [EF3 COL 12.2-2.A]

	Fermi 3 Annual Release		Fermi 3 Concentration		Fermi 2 + 3 Concentration	10 CFR 20 Concentration Limit	Fermi 2 + 3 Fraction of 10 CFR 20 Limit
Nuclide	**MBq/yr**	**Ci/yr**	**Bq/m^3**	**µCi/ml**	**µCi/ml**	**µCi/ml**	
Rh-106	4.5E-06	1.2E-10	8.9E-14	2.4E-24	2.4E-24	1.0E-09	2.4E-15
Ag-110m	1.0E-01	2.8E-06	2.0E-09	5.5E-20	5.5E-20	1.0E-10	5.5E-10
Sb-124	5.3E+00	1.4E-04	1.2E-06	3.1E-17	3.1E-17	3.0E-10	1.0E-07
Te-129m	1.6E+00	4.3E-05	3.2E-08	8.6E-19	8.6E-19	3.0E-10	2.9E-09
Te-131m	5.5E-01	1.5E-05	1.1E-08	2.9E-19	2.9E-19	1.0E-09	2.9E-10
Te-132	1.4E-01	3.8E-06	2.8E-09	7.5E-20	1.0E-15	9.0E-10	1.1E-06
Cs-134	1.8E+02	4.9E-03	3.8E-05	1.0E-15	1.1E-15	2.0E-10	5.4E-06
Cs-136	1.5E+01	4.0E-04	3.0E-07	8.2E-18	3.1E-17	9.0E-10	3.5E-08
Cs-137	2.7E+02	7.3E-03	6.4E-05	1.7E-15	1.8E-15	2.0E-10	8.9E-06
Cs-138	8.5E-01	2.3E-05	1.7E-08	4.6E-19	3.1E-14	8.0E-08	3.9E-07
Ba-140	7.8E+02	2.1E-02	1.6E-05	4.4E-16	2.3E-15	2.0E-09	1.2E-06
La-140	1.3E+01	3.5E-04	2.6E-07	7.0E-18	7.0E-18	2.0E-09	3.5E-09
Ce-141	2.6E+02	7.1E-03	5.8E-06	1.6E-16	1.7E-16	8.0E-10	2.1E-07
Ce-144	1.3E-01	3.5E-06	2.6E-09	7.0E-20	7.3E-18	2.0E-11	3.6E-07
Pr-144	1.6E-04	4.3E-09	3.2E-12	8.6E-23	8.6E-23	2.0E-07	4.3E-16
W-187	1.3E+00	3.5E-05	2.6E-08	7.0E-19	7.0E-19	1.0E-08	7.0E-11

Table 12.2-17R Comparison of Airborne Release Concentrations with 10 CFR 20 Limit (Sheet 5 of 5) [EF3 COL 12.2-2.A]

	Fermi 3 Annual Release		Fermi 3 Concentration		Fermi 2 + 3 Concentration	10 CFR 20 Concentration Limit	Fermi 2 + 3 Fraction of 10 CFR 20 Limit
Nuclide	**MBq/yr**	**Ci/yr**	**Bq/m^3**	**µCi/ml**	**µCi/ml**	**µCi/ml**	
Np-239	8.3E+01	2.2E-03	1.6E-06	4.5E-17	4.9E-14	3.0E-09	1.6E-05
Total (w/ H-3)	1.7E+08	4.6E+03	2.0E+01	5.3E-10	1.9E-09		1.9E-01
Total (w/o H-3)	1.7E+08	4.5E+03	2.0E+01	5.3E-10	1.9E-09		1.9E-01

Table 12.2-18aR Offsite Dose Calculation Bases [EF3 COL 12.2-2-A]

	Calculation Bases	
EF3 COL 12.2-2-A	Meteorology χ/Qs	Table 12.2-15R
EF3 COL 12.2-2-A	Meteorology D/Qs	Table 12.2-15R
	Airborne Release Source Term	DCD Table 12.2-16
	Calculation Methodology	RG 1.109
	Computer Code Utilized	GASPAR II (NUREG/CR-4653)
	Individual Consumption Rates	Table E-5 of RG 1.109
	Misc. Calculation Inputs (other than RG 1.109 default values):	
EF3 COL 12.2-2-A	Midpoint of plant operating life	20 years
EF3 COL 12.2-2-A	Fraction of year that leafy vegetables are grown	0.33
EF3 COL 12.2-2-A	Fraction of year that animals graze on pasture	0.58 for milk cows 0.67 for goats
EF3 COL 12.2-2-A	Fraction of daily feed that is pasture grass when the animal grazes on pasture	1 for cows 1 for goats
	Animal milk considered for milk pathway	Cow and Goat
EF3 COL 12.2-2-A	Annual Average Doses from Airborne Releases	

Table 12.2-18bR Gaseous Pathway Doses to the MEI [EF3 COL 12.2-2-A]

		Fermi 3		
		Whole Body	Thyroid	Skin
Location	**Pathway**	**Annual Dose (mrem/year)**		
Site Boundary (1131 m [0.7 mi] SSE)	Plume	1.0E-01	1.05E-01	2.53E-01
Site Boundary (SB) (919 m [0.57 mi] WNW)	Ground (SB)	2.57E-01	2.57E-01	3.01E-01
	Vegetable (SB)			
	Adult	1.08E-01	4.50E+00	4.18E-02
	Teen	1.37E-01	6.24E+00	7.02E-02
	Child	2.44E-01	1.21E+01	1.71E-01
	Meat Cow (SB)			
	Adult	2.39E-02	1.66E-01	1.69E-02
	Teen	1.82E-02	1.22E-01	1.42E-02
	Child	3.07E-02	1.89E-01	2.66-02
	Inhalation (SB)			
	Adult	1.73E-03	1.47E-01	8.61E-04
	Teen	1.76E-03	1.91E-01	8.69E-04
	Child	1.54E-03	2.34E-01	7.67E-04
	Infant	9.28E-04	2.13E-01	4.41E-04
In direction of Residence, GArden, Meat Cow, Goat Milk, and Cow Milk (WNW)	Goat Milk (3704 m [2.3 mi])			
	Adult	8.44E-03	3.25E-01	1.85E-03
	Teen	1.01E-02	5.15E-01	3.35E-03
	Child	1.43E-02	1.03E+00	8.15E-03
	Infant	2.43E-02	2.49E+00	1.70E-02
	Cow Milk (3513 m [2.18 mi])			
	Adult	4.81E-03	2.63E-01	1.97E-03
	Teen	6.89E-03	4.17E-01	3.60E-03
	Child	1.28E-02	8.31E-01	8.80E-03
	Infant	2.38E-02	2.02E+00	1.83E-02
	Total (Includes Plume)			

Table 12.2-18bR Gaseous Pathway Doses to the MEI [EF3 COL 12.2-2-A]

			Fermi 3		
			Whole Body	Thyroid	Skin
Location	Pathway		Annual Dose (mrem/year)		
		Adult	5.09E-01	5.76E+00	6.17E-01
		Teen	5.36E-01	7.85E+00	6.46E-01
		Child	6.66E-01	1.47E+01	7.69E-01
		Infant	4.11E-01	5.08E+00	5.90E-01

Notes:

1. There are no infant doses for the vegetables and meat cow pathways because infants do not consume these foods.
2. I mrem = 0.01 mSv.

Table 12.2-19bR Comparison of Annual Liquid Release Concentrations with 10 CFR 20 Limit (Sheet 1 of 3) [EF3 COL 12.2-3-A]

	Fermi 3 Annual Release		Fermi 3 Concentration		Fermi 2 + 3 Concentration	10 CFR 20 Concentration Limit	Fermi 2 + 3 Fraction of 10 CFR 20 Limit
Nuclide	**MBq/yr**	**Ci/yr**	**Bq/ml**	**µCi/ml**	**µCi/ml**	**µCi/ml**	
1-131	1.55E+02	4.19E-03	6.4E-06	1.73E-10	2.09E-10	1.00E-06	2.09E-04
1-132	3.03E+01	8.18E-04	1.25E-06	3.38E-11	2.19E-10	1.00E-04	2.19E-06
1-133	7.77E+02	2.10E-02	3.21E-05	8.68E-10	1.29E-09	7.00E-06	1.84E-04
1-134	1.48E+00	4.00E-05	6.12E-08	1.65E-12	1.20E-10	4.00E-04	3.00E-07
1-135	2.00E+02	5.40E-03	8.27E-06	2.23E-10	5.30E-10	3.00E-05	1.77E-05
H-3	5.18E+05	1.40E+01	2.14E-02	5.78E-07	1.01E-06	1.00E-03	1.01E-03
Na-24	1.89E+02	5.10E-03	7.82E-06	2.11E-10	2.85E-10	5.00E-05	5.70E-06
P-32	1.55E+01	4.19E-04	6.41E-07	1.73E-11	1.91E-11	9.00E-06	2.12E-06
Cr-51	4.81E+02	1.30E-02	1.99E-05	5.37E-10	5.93E-10	5.00E-04	1.19E-06
Mn-54	5.92E+00	1.60E-04	2.45E-07	6.61E-12	7.25E-12	3.00E-05	2.42E-07
Mn-56	4.81E+01	1.30E-03	1.99E-06	5.37E-11	2.16E-10	7.00E-05	3.08E-06
Fe-55	8.51E+01	2.30E-03	3.52E-06	9.50E-11	1.04E-10	1.00E-04	1.04E-06
Fe-59	2.59E+00	6.99E-05	1.07E-07	2.89E-12	3.21E-12	1.00E-05	3.21E-07
Co-58	1.63E+01	4.40E-04	6.74E-07	1.82E-11	2.00E-11	2.00E-05	9.99E-07
Co-60	3.33E+01	8.99E-04	1.38E-06	3.72E-11	4.09E-11	3.00E-06	1.36E-05
Cu-64	4.81E+02	1.30E-02	1.99E-05	5.37E-10	7.51E-10	2.00E-04	3.76E-06
Zn-65	1.67E+01	4.51E-04	6.91E-07	1.86E-11	2.04E-11	5.00E-06	4.08E-06
Zn-69m	3.40E+01	9.18E-04	1.41E-06	3.80E-11	5.26E-11	6.00E-05	8.77E-07

Table 12.2-19bR Comparison of Annual Liquid Release Concentrations with 10 CFR 20 Limit (Sheet 2 of 3) [EF3 COL 12.2-3-A]

	Fermi 3 Annual Release		Fermi 3 Concentration		Fermi 2 + 3 Concentration	10 CFR 20 Concentration Limit	Fermi 2 + 3 Fraction of 10 CFR 20 Limit
Nuclide	MBq/yr	Ci/yr	Bq/ml	µCi/ml	µCi/ml	µCi/ml	
Br-83	3.33E+00	8.99E-05	1.38E-07	3.72E-12	2.30E-11	9.00E-04	2.56E-08
Sr-89	8.14E+00	2.20E-04	3.37E-07	9.09E-12	1.01E-11	8.00E-06	1.26E-06
Sr-90	7.40E-01	2.00E-05	3.06E-08	8.26E-13	8.26E-13	5.00E-07	1.65E-06
Sr-91	4.44E+01	1.20E-03	1.84E-06	4.96E-11	7.58E-11	2.00E-05	3.79E-06
Y-91	5.18E+00	1.40E-04	2.14E-07	5.78E-12	6.11E-12	8.00E-06	7.63E-07
Sr-92	1.07E+01	2.89E-04	4.43E-07	1.19E-11	4.56E-11	4.00E-05	1.14E-06
Y-92	4.07E+01	1.10E-03	1.68E-06	4.55E-11	9.02E-11	4.00E-05	2.25E-06
Y-93	4.44E+01	1.20E-03	1.84E-06	4.96E-11	7.64E-11	2.00E-05	3.82E-06
Zr-95	7.40E-01	2.00E-05	3.06E-08	8.26E-13	8.26E-13	2.00E-05	4.13E-08
Nb-95	7.40E-01	2.00E-05	3.06E-08	8.26E-13	8.26E-13	3.00E-05	2.75E-08
Mo-99	1.11E+02	3.00E-03	4.59E-06	1.24E-10	1.41E-10	2.00E-05	7.07E-06
Tc-99m	2.04E+02	5.51E-03	8.44E-06	2.28E-10	3.43E-10	1.00E-03	3.43E-07
Ru-103	1.48E+00	4.00E-05	6.12E-08	1.65E-12	1.81E-12	3.00E-05	6.05E-08
Ru-105	6.29E+00	1.70E-04	2.60E-07	7.02E-12	1.64E-11	7.00E-05	2.34E-07
Te-129m	3.33E+00	8.99E-05	1.38E-07	3.72E-12	4.04E-12	7.00E-06	5.77E-07
Te-131m	3.70E+00	9.99E-05	1.53E-07	4.13E-12	4.94E-12	8.00E-06	6.17E-07
Te-132	7.40E-01	2.00E-05	3.06E-08	8.26E-13	8.26E-13	9.00E-06	9.18E-08
Cs-134	2.52E+01	6.80E-04	1.04E-06	2.81E-11	3.10E-11	9.00E-07	3.45E-05

Table 12.2-19bR Comparison of Annual Liquid Release Concentrations with 10 CFR 20 Limit (Sheet 3 of 3) [EF3 COL 12.2-3-A]

	Fermi 3 Annual Release		Fermi 3 Concentration		Fermi 2 + 3 Concentration	10 CFR 20 Concentration Limit	Fermi 2 + 3 Fraction of 10 CFR 20 Limit
Nuclide	**MBq/yr**	**Ci/yr**	**Bq/ml**	**µCi/ml**	**µCi/ml**	**µCi/ml**	
Cs-136	1.52E+01	4.10E-04	6.29E-07	1.70E-11	2.44E-11	6.00E-06	4.06E-06
Cs-137	6.66E+01	1.80E-03	2.75E-06	7.44E-11	7.61E-11	1.00E-06	7.61E-05
Ba-139	1.48E+00	4.00E-05	6.12E-08	1.65E-12	2.00E-11	2.00E-04	9.99E-08
Ba-140	3.03E+01	8.18E-04	1.25E-06	3.38E-11	3.75E-11	8.00E-06	4.69E-06
Ce-141	2.59E+00	6.99E-05	1.07E-07	2.89E-12	3.21E-12	3.00E-05	1.07E-07
La-142	1.11E+00	3.00E-05	4.59E-08	1.24E-12	1.28E-11	1.00E-04	1.28E-07
Ce-143	1.11E+00	3.00E-05	4.59E-08	1.24E-12	1.40E-12	2.00E-05	7.00E-08
Pr-143	3.33E+00	8.99E-05	1.38E-07	3.72E-12	4.04E-12	2.00E-05	2.02E-07
W-187	8.88E+00	2.40E-04	3.67E-07	9.92E-12	1.23E-11	3.00E-05	4.11E-07
Np-239	4.07E+02	1.10E-02	1.68E-05	4.55E-10	5.16E-10	2.00E-05	2.58E-05
Total (wi/H-3)	5.22E+05	1.41E+01	2.16E-02	5.83E-07	1.02E-06		1.63E-03
Total (w/oH-3}	3.62E+03	9.79E-02	1.50E-04	4.05E-09	6.06E-09		6.21E-04

Table 12.2-20aR Liquid Pathway Offsite Dose Calculation Bases [EF3 COL 12.2-3-A]

	Calculation Bases	
	Calculation Methodology	RG 1.109
	Computer Code Utilized	LADTAP II (NUREG/CR-4013)
	Individual Consumption/Exposure Rates	Table E-5 of RG 1.109
	Site Water Type	Freshwater
EF3 COL 12.2-3-A	Liquid Effluent Discharge Rate	400 liters/min (0.234 ft^3/sec)
EF3 COL 12.2-3-A	Shore-Width Factor	0.3
EF3 COL 12.2-3-A	Dilution Factor	115 – Minimum to discharge location (1) Additional dilution factors after discharge: 45 – Nearest Shoreline Northeast (1770 m [1.1 mi]) 67 – Nearest Shoreline South (1530 m [0.95 mi]) 77 – 3200 m (1.99 mi) South 100 – Distances greater than 3200 m (1.99 mi)
EF3 COL 12.2-3-A	Transit times from discharge to the receiving water body to exposure location	Drinking Water – 22.6 hours Fishing – 24 hours Aquatic Recreation – 10.6 hours
EF3 COL 12.2-3-A	Irrigation rate	None – lake water is not used for irrigation
EF3 COL 12.2-3-A	Fraction of year that leafy vegetables are grown	Not used in liquid pathway dose calculation
EF3 COL 12.2-3-A	Fraction of year that animals graze on pasture	Not used in liquid pathway dose calculation
EF3 COL 12.2-3-A	Fraction of daily feed that is pasture grass when the animal grazes on pasture	Not used in liquid pathway dose calculation
EF3 COL 12.2-3-A	Animal milk considered for milk pathway	Not used in liquid pathway dose calculation
EF3 COL 12.2-3-A	Liquid Pathway Offsite Annual Doses	Table 12.2-20bR

Notes:

1. Blowdown flowrate divided by discharge flow rate

Table 12.2-20bR Liquid Pathway Doses from Fermi 3 for MEI at Lake Erie

[EF3 COL 12.2-3-A]

	Fermi 3 Dose (mrem/yr)		
Pathway	**Whole Body**	**Thyroid**	**Bone**
Fish	5.41E-03	2.19E-03	8.27E-02
Invertebrate	5.71E-04	1.88E-04	4.49E-03
Drinking	6.05E-04	2.63E-02	5.92E-04
Shoreline (includes water recreation)	1.01E-04	1.01E-04	1.01E-04
Total	6.48E-03	2.63E-02	8.77E-02
Age group receiving maximum dose	Adult	Infant	Child

Notes:

1. Bone of the child is the organ receiving the maximum dose.
2. There are no infant doses for the fish and invertebrate pathways because infants do not consume these foods.
3. 1 mrem = 0.01 mSv

Table 12.2-201 Comparison of Annual Doses to the MEI from Gaseous Effluents

[EF3 COL 12.2-2-A]

Type of Dose	Location	Fermi 3	10 CFR 50 Limit
Gamma Air (mrad/yr)	Site Boundary (1131 m [0.70 mi] SSE)	1.62E-01	10
Beta Air (mrad/yr)	Site Boundary (1131 m [0.70 mi] SSE)	2.00E-01	20
Whole Body (mrem/yr)	Site Boundary (1131 m [0.70 mi] SSE)	6.66E-01	5
Skin (mrem/yr)	Site Boundary (1131 m [0.70 mi] SSE)	7.69E-01	15
Iodines and Particulates – Max Organ Thyroid (mrem/yr)	WNW Direction, Site Boundary (919 m [0.57 mi]) for Residence, Garden and Meat Cow 3704 m [2.3 mi} for Goat Milk 3513 m [2.18 mi]) for Cow Milk	1.47E+01	15

1 mrad = 0.01 mGy
1 mrem = 0.01 mSv

Table 12.2-202 Comparison of Annual Doses to MEI from Liquid Effluents

[EF3 COL 12.2-3-A]

Type of Dose	Location	Fermi 3	10 CFR 50 Limit
Whole Body (mrem/yr)	Lake Erie	6.48E-03	3
Thyroid (mrem/yr)	Lake Erie	2.63E-02	10
Bone (mrem/yr)	Lake Erie	8.77E-02	10

1 mrem = 0.01 mSv

Table 12.2-203 Comparison of Site Doses to the MEI

[EF3 COL 12.2-2-A] [EF3 COL 12.2-3-A]

Type of Dose	Fermi 3 (ESBWR)			Fermi 2	Site Total(1)	40 CFR 190 Limit
	Liquid	Gaseous	Total			
Whole Body (mrem/yr)	0.006	0.67	0.68	4.68	5.36	25
Thyroid (mrem/yr)	0.026	14.7	14.7	2.66	17.39	75
Bone (mrem/yr)	0.088	1.81	1.90	0.052	1.95	25

Notes:

1. This site total dose includes the Fermi 3 total dose and the dose from Fermi 2.
2. 1 mrem = 0.01 mSv

Table 12.2-204 Collective Total Body (Population) Doses Within 50 Miles [EF3 COL 12.2-2-A] [EF3 COL 12.2-3-A]

Units in person-rem/yr

	Fermi 3
Total Body (Liquid)	14.9
Bone (Liquid)	104.2
Thyroid (Liquid)	30.1
Total Body (Gaseous)	4.5
Max Organ – Thyroid (Gaseous)	24.1

1 rem = 0.01 Sv

12.3 Radiation Protection

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

12.3.1.5 **Minimization of Contamination and Radioactive Waste Generation**

STD COL 12.3-4-A

Replace the second sentence in the second paragraph with the following.

Subsection 12.3.1.5.2 describes operational procedures and program concepts associated with the Regulatory Position.

12.3.1.5.2 **Operational/Programmatic Considerations**

Replace this section with the following.

STD COL 12.3-4-A

Operational programs and procedures that address the requirements of 10 CFR 20.1406 are necessary adjuncts to the design features. The operational and post-construction objectives in Regulatory Guide 4.21 Positions C.1 through C.4 are addressed as follows:

- Operational practices are periodically reviewed to ensure operating procedures reflect the installation of new or modified equipment, personnel qualification and training are kept current, and facility personnel are following the operating procedures.
- Future decommissioning is facilitated by maintenance of records relating to facility design and construction, facility design changes, site conditions before and after construction, onsite waste disposal and contamination and results of radiological surveys.
- A conceptual site model (based on site characterization and facility design and construction) that aids in the understanding of the interface with environmental systems and the features that control the movement of contamination in the environment is maintained.
- The final site configuration will be evaluated after construction to assist in preventing the migration of radionuclides offsite via unmonitored pathways.
- An onsite contamination monitoring program is implemented along the potential pathways from the release sources to the receptor points. Measures are implemented in operating procedures to minimize

contamination. Appendix 12BB establishes contamination control measures to ensure compliance with 10 CFR 20.1406. Practical measures to prevent the spread of contamination are employed, including:

- Engineering controls, such as portable ventilation or filtration units to reduce concentrations of radioactivity in air or fluids, are used where practical.
- Criteria for selecting tools, material, and equipment for use in contaminated areas include minimizing the use of porous or other materials that are difficult to decontaminate.
- Leaks and spills are contained promptly and repaired or cleaned up as soon as practical.
- Containments, caches, and enclosures are used during maintenance, repairs, and testing, when practical, to contain spills or releases.
- Contaminated tools and equipment are segregated from clean tools and equipment .
- Potentially contaminated systems, equipment, and components are surveyed for the presence of contamination when opened or prior to removal.
- Procedures ensure that equipment performs and is operated in accordance with the design requirements.
- Temporary and permanent design modifications require compensatory measures be taken to prevent and limit the spread of contamination.

12.3.4 Area Radiation and Airborne Radioactivity Monitoring Instrumentation

Replace the last bullet with the following.

STD COL 12.3-2-A

The radiation instrumentation that monitors airborne radioactivity is classified as nonsafety-related. Airborne radiation monitoring operational considerations, such as the procedures for operation and calibration of the monitors, as well as the placement of the portable monitors, are discussed in Section 12.5.

12.3.7 COL Information

12.3-2-A Operational Considerations

STD COL 12.3-2-A This COL item is addressed in Subsection 12.3.4.

12.3-4-A Compliance with 10 CFR 20.1406

STD COL 12.3-4-A This COL item is addressed in Subsection 12.3.1.5.2.

Table 12.3-4R Area Radiation Monitors for Radwaste Building [EF3 DEP 11.4-1]

ARM No.	Description & Location	Figure No.	Monitoring Range1
1	RW Electrical Equipment Room (6170), EL -9350	12.3-39R	H
2	RW Control Room (6270), EL -2350	12.3-40R	H
3	RW High Activity Decant Pump Room (6188), EL -9350	12.3-39R	H
4	RW High Activity Transfer Pump Room (6283), EL-2350	12.3-40R	H
5	RW Trailer Access Area (6383), EL 4650	12.3-41R	H
6[2]	RW Liquid Radioactive Waste Treatment Processing Systems Area (6381), EL 4650	12.3-41R	H
7[2]	RW Wet Solid Radioactive Waste Treatment Processing Area (6394/6395), EL 4650	12.3-41R	H
8[2]	RW Dry Solid Waste Treatment Area (Sorting Room 6393), EL 4650	12.3-41R	H
9[2]	RW Packaged Waste Storage Area (6390/6391/6392), EL 4650	12.3-41R	H

[1] The monitoring ranges corresponding to these alphabetical designations are provided in DCD Table 12.3-7.

[2] ARMs located in accessible areas where abnormal plant evolutions or anticipated operational occurrences can potentially result in dose rate increases of 1mSv/hr (100 mrem/hr) or more.

Table 12.3-8R Shielding Geometry (Nominal) (Sheet 1 of 3) [EF3 DEP 11.4-1]

Elev.	Room	Room Name	North	East	South	West	Floor	Ceiling
Nuclear Island			**cm (in)**					
-11500	1151	RWCU/SDC Heat Exchanger Room A	75 (30)	110 (43)	100 (39)	100/75 (39/30)	Ground	70 (28)
-11500	1152	RWCU/SDC Pump Room A	60 (24)	55 (22)	55 (22)	60/40 (24/16)	Ground	90 (35)
-11500	1161	RWCU/SDC Heat Exchanger Room B	75 (30)	100 (39)	100/75 (39/30)	110 (43)	Ground	70 (28)
-11500	1162	RWCU/SDC Pump Room B	60 (24)	60 (24)	70 (28)	35 (14)	Ground	70 (28)
-11500	2102	FAPC Backwash Tank Room	70 (28)	80 (31)	90 (35)	110 (43)	Ground	90 (35)
-11500	2150	FAPC Pump/Heat Exchanger Room A	35 (14)	70 (28)	60 (24)	30 (12)	Ground	70 (28)
-11500	2151	Backwash Transfer Pump Room A	90 (35)	105 (41)	70 (28)	95 (37)	Ground	70 (28)
-11500	2160	FAPC Pump/Heat Exchanger Room B	35 (14)	30 (12)	60 (24)	35 (14)	Ground	70 (28)
-11500	2161	Backwash Transfer Pump Room B	70 (28)	105 (41)	70 (28)	95 (37)	Ground	70 (28)
-6400	1250	RWCU/SDC Heat Exchanger Room A	110(43)	110 (43)	100 (39)	100 (39)	70 (28)	70 (28)
-6400	1251	RWCU/SDC Filter/Demineralizer Vault A1	135 (53)	150 (59)	40 (16)	135 (53)	110 (43)	90 (35)
-6400	1252	RWCU/SDC Filter/Demineralizer Vault A2	40 (16)	150 (59)	40 (16)	135 (53)	110 (43)	90 (35)
-6400	1260	RWCU/SDC Heat Exchanger Room B	110(43)	100 (39)	100 (39)	100 (39)	70 (28)	70 (28)
-6400	1261	RWCU/SDC Filter/Demineralizer Vault B1	135(53)	40 (16)	150 (59)	40 (16)	110 (43)	90 (35)
-6400	1262	RWCU/SDC Filter/Demineralizer Vault B2	135(53)	40 (16)	150 (59)	70 (28)	110 (43)	90 (35)
-6400	2251	FAPC Filter/Demineralizer Vault 1	90 (35)	70 (28)	30 (12)	90 (35)	70 (28)	70 (28)
-6400	2261	FAPC Filter/Demineralizer Vault 2	30 (12)	70 (28)	115 (45)	90 (35)	70 (28)	70 (28)
Radwaste Building			**cm (in)**					
-9350	6103	Equipment Drain Collection Tank Room A	120 (47)	90 (35)	80 (31)	60 (24)	Ground	91 (36)
-9350	6104	Equipment Drain Collection Tank Room B	120 (47)	60 (24)	80 (31)	60 (24)	Ground	91 (36)
-9350	6105	Equipment Drain Collection Tank Room C	120 (47)	60 (24)	80 (31)	60 (24)	Ground	91 (36)
-9350	6106	Low Activity Resin Holdup Tank Room	60 (24)	60 (24)	130 (51)	60 (24)	Ground	91 (36)
-9350	6107	Condensate Resin Holdup Tank Room	60 (24)	90 (35)	130 (51)	60 (24)	Ground	91 (36)
-9350	6108	High Activity Resin Holdup Tank Room	110 (43)	100 (39)	130 (51)	100 (39) 110 (43)	Ground	91 (36)

Table 12.3-8R Shielding Geometry (Nominal) (Sheet 2 of 3) [EF3 DEP 11.4-1]

Elev.	Room	Room Name	North	East	South	West	Floor	Ceiling
Radwaste Building (continued)			**cm (in)**					
-9350	6109	Concentrated Waste Tank Room	60 (24)	60 (24)	130 (51)	90 (35)	Ground	91 (36)
-9350	6150	Floor Drain Collection Tank Room A	120 (47)	60 (24)	80 (31)	60 (24)	Ground	91 (36)
-9350	6160	Floor Drain Collection Tank Room B	120 (47)	60 (24)	80 (31)	60 (24)	Ground	91 (36)
-9350	6161	Low Activity Phase Separator Room	60 (24)	70 (28)	130 (51)	60 (24)	Ground	91 (36)
-9350	6171	Floor & Equipment Drain Sample Tank Room	120 (47)	60 (24)	60 (24)	120 (47)	Ground	91 (36)
-2350	6103	Equipment Drain Collection Tank Room A	120 (47)	90 (35)	80 (31)	60 (24)	N/A	91 (36)
-2350	6104	Equipment Drain Collection Tank Room B	120 (47)	60 (24)	80 (31)	80 (31) 60 (24)	N/A	91 (36)
-2350	6105	Equipment Drain Collection Tank Room C	120 (47)	60 (24)	80 (31)	60 (24)	N/A	91 (36)
-2350	6106	Low Activity Resin Holdup Tank Room	60 (24)	60 (24)	130 (51)	60 (24)	N/A	91 (36)
-2350	6107	Condensate Resin Holdup Tank Room	60 (24)	90 (35)	130 (51)	60 (24)	N/A	91 (36)
-2350	6108	High Activity Resin Holdup Tank Room	110 (43)	100 (39)	130 (51)	110 (43)	N/A	91 (36)
-2350	6109	Concentrated Waste Tank Room	60 (24)	60 (24)	130 (51)	90 (35)	N/A	91 (36)
-2350	6150	Floor Drain Collection Tank Room A	120 (47)	60 (24)	80 (31)	60 (24)	N/A	91 (36)
-2350	6251	High Activity Phase Separator Room	90 (35)	90 (35)	90 (35)	90 (35)	50 (20)	91 (36)
-2350	6160	Floor Drain Collection Tank Room B	120 (47)	60 (24)	80 (31)	60 (24)	N/A	91 (36)
-2350	6161	Low Activity Phase Separator Room	60 (24)	70 (39)	130 (51)	60 (24)	N/A	91 (36)
-2350	6171	Floor & Equipment Drain Sample Tank Room	120 (47)	60 (24)	60 (24)	120 (47)	N/A	91 (36)
Turbine Building			**cm (in)**					
-1400	4196	Off-Gas Charcoal Absorber Vessel Vault	110 (43)	110 (43)	110 (43)	110 (43)	Ground	-
-1400	4197	Main Condenser Vault	110 (43)	110 (43)	60 (24)	110 (43)	Ground	
(Deleted)								
-1400	4182A	Condensate Pleated Filter Vault A	50 (20)	60 (24)	35 (14)	110 (43)	Ground	100 (39)
-1400	4182B-E	Condensate Pleated Filter Vault B-E	35 (14)	60 (24)	35 (14)	110 (43)	Ground	100 (39)
-1400	4182F	Condensate Pleated Filter Vault F	50 (20)	60 (24)	55 (22)	110 (43)	Ground	100 (39)
-1400	4183	Condensate Filter Backwash Receiving Tank Vault	45 (18)	65 (26)	85 (33)	95 (37)	Ground	100 (39)
(Deleted)								

Table 12.3-8R Shielding Geometry (Nominal) (Sheet 3 of 3) [EF3 DEP 11.4-1]

Elev.	Room	Room Name	North	East	South	West	Floor	Ceiling
Turbine Building (continued)			cm (in)					
-1400	4180	Condensate Demin. Resin Receiving Tank Vault	75 (30)	70 (28)	70 (28)	90 (35)	Ground	100 (39)
(Deleted)								
4650	4206B	Condensate Drain Tank and Steam Jet Air Ejector/H2 Recombiner & Cooler Room B	150 (59)	150 (59)	120 (47)	150 (59)	100 (39)	120 (47)
4650	4206A	Steam Jet Air Ejector/H2 Recombiner & Cooler Room A	115 (45)	150 (59)	120 (47)	150 (59)	70 (28)	30 (12)
(Deleted)								
(Deleted)								
4650	4281A	Condensate Deep Bed Demineralizer Vault A	35 (14)	90 (35)	35 (14)	55 (22)	100 (39)	100 (39)
4650	4281B-G	Condensate Deep Bed Demineralizer Vault B-G	35 (14)	90 (35)	35 (14)	55 (22)	100 (39)	100 (39)
4650	4281H	Condensate Deep Bed Demineralizer Vault H	35 (14)	90 (35)	90 (35)	55 (22)	100 (39)	100 (39)
12000	4301A	Feedwater Heater 5A and 6A Room	100 (39)	100 (39)	100 (39)	100 (39)	100 (39)	100 (39)
12000	4301B	Feedwater Heater 5B and 6B Room	100 (39)	100 (39)	100 (39)	100 (39)	100 (39)	100 (39)
(Deleted)								
(Deleted)								
(Deleted)								
12000	4391	Turbine Building Steam Tunnel	150 (59)	150 (59)	150 (59)	150 (59)	-	
(Deleted)								
(Deleted)								
20000	4402A	Feedwater Heater 7A Room	100 (39)	100 (39)	100 (39)	100 (39)	100 (39)	100 (39)
20000	4402B	Feedwater Heater 7B Room	100 (39)	100 (39)	100 (39)	100 (39)	100 (39)	100 (39)
28000	4504	Feedwater Heater 4 and Feedwater Storage Tank Room	150 (59)	150 (59)	150 (59)	110 (43)	115 (45)	115 (45)
(Deleted)								
28000	4505	Moisture Separator and Reheater/HP and LP Turbine Room	150 (59)	110 (43)	150 (59)	150 (59)	100 (39)	150 (59)
(Deleted)								

Figure 12.3-19R **RADWASTE BUILDING RADIATION ZONES EL –9350**
{{{Security-Related Information – Withheld Under 10 CFR 2.390}}}
See Fermi 3 COLA Part 9 [EF3 DEP 11.4-1]

Figure 12.3-20R **RADWASTE BUILDING RADIATION ZONES EL –2350**
{{{Security-Related Information – Withheld Under 10 CFR 2.390}}}
See Fermi 3 COLA Part 9 [EF3 DEP 11.4-1]

Figure 12.3-21R **RADWASTE BUILDING RADIATION ZONES EL 4650**
{{{Security-Related Information – Withheld Under 10 CFR 2.390}}}
See Fermi 3 COLA Part 9 [EF3 DEP 11.4-1]

Figure 12.3-22R **RADWASTE BUILDING RADIATION ZONES EL 10650**
{{{Security-Related Information – Withheld Under 10 CFR 2.390}}}
See Fermi 3 COLA Part 9 [EF3 DEP 11.4-1]

Figure 12.3-39R **RADWASTE BUILDING AREA RADIATION MONITORS EL -9350 {{{Security-Related Information – Withheld Under 10 CFR 2.390}}} See Fermi 3 COLA Part 9** [EF3 DEP 11.4-1]

Figure 12.3-40R **RADWASTE BUILDING AREA RADIATION MONITORS EL -2350 {{{Security-Related Information – Withheld Under 10 CFR 2.390}}} See Fermi 3 COLA Part 9** [EF3 DEP 11.4-1]

Figure 12.3-41R **RADWASTE BUILDING AREA RADIATION MONITORS EL 4650 {{{Security-Related Information – Withheld Under 10 CFR 2.390}}} See Fermi 3 COLA Part 9** [EF3 DEP 11.4-1]

Figure 12.3-42R **RADWASTE BUILDING AREA RADIATION MONITORS EL 10650 {{{Security-Related Information – Withheld Under 10 CFR 2.390}}} See Fermi 3 COLA Part 9** [EF3 DEP 11.4-1]

Figure 12.3-61R **RADWASTE BUILDING ACCESS AND EGRESS ROUTES EL –9350**
{{{Security-Related Information – Withheld Under 10 CFR 2.390}}}
See Fermi 3 COLA Part 9 [EF3 DEP 11.4-1]

Figure 12.3-62R **RADWASTE BUILDING ACCESS AND EGRESS ROUTES EL –2350**
{{{Security-Related Information – Withheld Under 10 CFR 2.390}}}
See Fermi 3 COLA Part 9 [EF3 DEP 11.4-1]

Figure 12.3-63R **RADWASTE BUILDING ACCESS AND EGRESS ROUTES EL 4650 {{{Security-Related Information – Withheld Under 10 CFR 2.390}}} See Fermi 3 COLA Part 9** [EF3 DEP 11.4-1]

Figure 12.3-64R **RADWASTE BUILDING ACCESS AND EGRESS ROUTES EL 10650**
{{{Security-Related Information – Withheld Under 10 CFR 2.390}}}
See Fermi 3 COLA Part 9 [EF3 DEP 11.4-1]

12.4 Dose Assessment

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

12.4.7.1 Annual Doses to Construction Workers

EF3 SUP 12.4-1

Doses to construction workers are addressed in Section 4.5 of the Environmental Report (ER) contained in COLA Part 3 and associated impacts are determined to be SMALL. As described in Section 4.5 of the ER, the dose estimates are determined based on the following.

- The dose to the construction worker includes dose due to operation of Fermi 2 and estimated dose from the planned Fermi Independent Spent Fuel Storage Installation (ISFSI).
- External dose estimates are determined based on TLD readings that are located closest to the Fermi 3 power block construction area relative to Fermi 2. Conservative TLD readings used are based on several years of data.
- Effluent release data for Fermi 2 used for dose calculations is based on several years of data as reported in the Fermi 2 Annual Radioactive Effluent Release Reports. Conservative values are used based on several years of data.
- The estimated peak number of construction workers is 2900.

The resultant projected maximum dose estimate for an individual construction worker is less than the limits for public dose specified in 10 CFR 20.1301.

There are also some contributions to dose for Fermi 3 construction workers from the decommissioned Fermi 1 site. To meet the limits established in 10 CFR 20.1402, the maximum dose to a construction worker from the decommissioned Fermi 1 must not exceed 25 mrem per year. Conservatively including this additional dose with the dose estimated in ER Section 4.5 still results in estimated construction worker dose that is well within the limits for the members of the public.

12.5 Operational Radiation Protection Program

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

12.5.3 Operational Considerations

Replace this section with the following.

STD COL 12.5-1-A
STD COL 12.5-2-A
STD COL 12.5-3-A

The operational program for radiation protection is addressed in Appendix 12BB.

12.5.4 COL Information

12.5-1-A Equipment, Instrumentation, and Facilities

STD COL 12.5-1-A This COL item is addressed in Appendix 12BB.

12.5-2-A Compliance with 10 CFR 50.34(f)(2)(xxvii) and NUREG-0737 Item III.D.3.3

STD COL 12.5-2-A This COL item is addressed in Appendix 12BB.

12.5-3-A Radiation Protection Program

STD COL 12.5-3-A This COL item is addressed in Appendix 12BB.

Appendix 12A Calculation of Airborne Radionuclides

This section of the referenced DCD is incorporated by reference with no departures or supplements.

Appendix 12B Calculation of Airborne Releases

This section of the referenced DCD is incorporated by reference with no departures or supplements.

STD SUP 12.1-1

Appendix 12AA ALARA Program

NEI 07-08, Generic FSAR Template Guidance for Ensuring that Occupational Radiation Exposures Are As Low As Is Reasonably Achievable (ALARA), which is currently under review by the NRC staff, is incorporated by reference. (Reference 12AA-201)

12AA.1 References

12AA-201 Nuclear Energy Institute (NEI), Generic FSAR Template Guidance for Ensuring that Occupational Radiation Exposures Are As Low As Is Reasonably Achievable (ALARA), NEI 07-08.

STD COL 12.1-1-A
STD COL 12.1-2-A
STD COL 12.1-3-A
STD COL 12.1-4-A
STD COL 12.5-1-A
STD COL 12.5-2-A
STD COL 12.5-3-A

Appendix 12BB Radiation Protection

NEI 07-03, Generic FSAR Template Guidance for Radiation Protection Program Description, which is currently under review by the NRC staff, is incorporated by reference with the following supplemental information. (Reference 12BB-201)

12.5.2.4 Radiation Protection Technicians

Delete the third paragraph.

12.5.3.1 Facilities

Delete the first and second paragraphs.

12.5.3.2 Monitoring Instrumentation and Equipment

Delete the third paragraph.

12.5.3.3 Personal Protective Clothing and Equipment

Delete the last sentence in the first paragraph.

12.5.4.2 Methods to Maintain Exposures ALARA

Delete the second paragraph.

12.5.4.4 Access Control

Isometric drawings of the Very High Radiation Areas (VHRA) are included in DCD Section 12.3.

Physical access controls for permanent and temporary areas include postings, barricades, physical barriers, and the use of locks that are keyed so only keys designated as VHRA can open the locks. Additionally, entry into a VHRA is allowed only with a specific (Special) radiation work permit.

12.5.4.12 Quality Assurance

Replace the bracketed text in the first paragraph with Section 17.5.

12BB.1 References

12BB-201 Nuclear Energy Institute (NEI), Generic FSAR Template Guidance for Radiation Protection Program Description, NEI 07-03.