September 30, 1983

SUBJECT: Offsite Dose Calculation Manual - Revision 2

The General Office Radwaste Engineering staff is transmitting to you this date, Revision 2 of the Offsite Dose Calculation Manual. Please update your copy No. 1, and discard affected pages.

REMOVE THESE PAGES	INSERT THESE PAGES	
Page B-6	Page B-6	Revision 2
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Table B4.0-1	Table B4.0-1	Revision 2
Table B4.0-2	Table B4.0-2	Revision 2

NOTE: As this letter contains "LOEP" information, please insert this letter in front of the April 15, 1983 letter.

Approval Date: 9/21/83

Effective Date: 10/07/83

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Approval Date: 9/29/83

Effective Date: 10/07/83

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$$\sum_i (L_i + 1.1\ M_i)\ [(\overline{\chi/Q})\tilde{Q}_i] < 3000 \text{ mrem/yr}$$

where the terms are defined below.

B2.2.2 Radioiodines, Particulates, and Others

$$\sum_i P_i\ [W\ \tilde{Q}_i] < 1500 \text{ mrem/yr}$$

where:

K_i = The total body dose factor due to gamma emissions for each identified noble gas radionuclide, in mrem/yr per $\mu Ci/m^3$ from Table 1.2-1.

L_i = The skin dose factor due to beta emissions for each identified noble gas radionuclide, in mrem/yr per $\mu Ci/m^3$ from Table 1.2-1.

M_i = The air dose factor due to gamma emissions for each identified noble gas radionuclide, in mrad/yr per $\mu Ci/m^3$ from Table 1.2-1 (unit conversion constant of 1.1 mrem/mrad converts air dose to skin dose).

P_i = The dose parameter for radionuclides other than noble gases for the inhalation pathway, in mrem/yr per $\mu Ci/m^3$ and for the food and ground plane pathways in $m^2 \cdot$(mrem/yr) per μCi/sec from Table 1.2-2. The dose factors are based on the critical individual organ and most restrictive age group (child or infant).

$\tilde{Q}_i$ = The release rate of radionuclides, i, in gaseous effluent from all release points at the site, in μCi/sec.

$\overline{\chi/Q}$ = 7.2E-5 sec/m^3. The highest calculated annual average relative concentration for any area at or beyond the unrestricted area boundary.

W = The highest calculated annual average dispersion parameter for estimating the dose to an individual at the controlling location:

W = 1.2E-5 sec/m^3, for the inhalation pathway. The location is the unrestricted area in the ESE sector (nearest residence).

W = 3.0E-8 $meter^{-2}$, for the food and ground plane pathways. The location is the unrestricted area boundary in the E sector (nearest vegetable garden).

$\tilde{Q}_i = k_1 C_i f \div k_2 = 4.72E{+}2 C_i f$

where:

C_i = the concentration of radionuclide, i, in undiluted gaseous effluent, in μCi/ml.

B3.2 GAS MONITORS

The following equation shall be used to calculate noble gas radiation monitor setpoints based on Xe-133:

$K(\overline{X/Q})\tilde{Q}_i < 500$ (See section B2.2.1)

$\tilde{Q}_i = 4.72E+2\ C_i f$ (See Section B2.2.2)

$C_i < 5.00E+01/f$

where:

C_i = the gross activity in undiluted effluent, in μCi/ml

f = the flow from the tank or building and varies for various release sources, in cfm

K = from Table 1.2-1 for Xe-133, 2.94E+2 mrem/yr per $\mu Ci/m^3$

$\overline{X/Q}$ = 7.2E-5 sec/m^3, as defined in Section B2.2.2.

As stated in Section B2.2, the unit vent is the release point for the containment purge ventilation system, the containment air release and addition system, the condenser air ejector, and auxiliary building ventilation. Since all of these releases are through the unit vent, the radiation monitor on the unit vent may be used to assure that station release limits are not exceeded.

For release from the containment purge ventilation system, a typical radiation monitor setpoint may be calculated as follows:

$C_i < 5.00E+01/f = 6.10E-04$ μCi/ml

where:

f = 54,000 cfm (auxiliary building ventilation) + 28,000 cfm (containment purge)
= 82,000 cfm

For release from the continament air release and addition system, the waste gas decay tanks, the condenser air ejectors, and the auxiliary building ventilation system, a typical radiation monitor setpoint may be calculated as follows:

$C_i < 5.00E+01/f = 9.26E-04$ μCi/ml

where:

f = 54,000 cfm (auxiliary building ventilation)

C_{Cs-137} = the average concentration of Cs-137 in undiluted effluent, in μCi/ml, during the time period considered.

0.59 = The ratio of the adult total body ingestion dose factors for Cs-134 and Cs-137 or 7.14E-05 ÷ 1.21E-04 = 0.59

B4.3.2 Gaseous Effluents

Meteorological data is provided in Tables B4.0-1 and B4.0-2.

B4.3.2.1 Noble Gases

For dose estimates, simplified dose estimates using the assumptions in B4.2.2.1 and source terms in the FSAR are presented below. Once operational source term data is available, this information shall be used to revise these calculations, if necessary. These calculations further assume that the annual average dispersion parameter is used and that Xenon-133 contributes 45% of the dose.

$$D_\gamma = 8.06E\text{-}10\ [\tilde{Q}]_{Xe-133}\ (2.22)$$

$$D_\beta = 2.40E\text{-}09\ [\tilde{Q}]_{Xe-133}\ (2.22)$$

where:

$\overline{X/Q}$ = 7.2E-05 sec/m^3, as defined in Section B2.2.2

8.06E-10 = (3.17E-8)(353) ($\overline{X/Q}$), derived from equation presented in Section 3.1.2.1.

2.40E-09 = (3.17E-08) (1050) ($\overline{X/Q}$), derived from equation presented in Section 3.1.2.1.

$[\tilde{Q}]_{Xe-133}$ = the total Xenon-133 activity released in μCi

2.22 = factor derived from the assumption that 45% of the dose is contributed by Xe-133.

B4.3.2.2 Radioiodines, Particulates, and Other Radionuclides with T 1/2 > 8 days

For dose estimates, simplified dose estimates using the assumptions in B4.2.2.2 and source terms in the FSAR are presented below. Once operational source term data is available, this information shall be used to revise these calculations, if necessary. These calculations further assume that the annual average dispersion/deposition parameter is used and that 95% of the dose is from Iodine-131 concentrated in goat's milk. The simplified dose estimate to the thyroid of an infant is:

$$D = 2.00E\text{+}04\ w\ (\tilde{Q})_{I-131}\ (1.05)$$

where:

w = 2.3E-09 = $\overline{D/Q}$ for food and ground plane pathway, in m^{-2} from Table B4.0-2 for the location of the nearest real goat (SSE sector at 1.5 miles).

TABLE B4.0-1

MCGUIRE NUCLEAR STATION

DISPERSION PARAMETER ($\overline{X/Q}$) FOR LONG TERM RELEASES > 500 HR/YR OR > 125 HR/QTR

Sector	Distance to the control location, in miles									
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
S	1.3 E-5	3.4 E-6	1.4 E-6	7.4 E-7	4.7 E-7	3.3 E-7	2.4 E-7	1.9 E-7	1.5 E-7	1.3 E-7
SSW	1.6 E-5	4.2 E-6	1.7 E-6	9.0 E-7	5.7 E-7	4.0 E-7	3.0 E-7	2.3 E-7	1.9 E-7	1.5 E-7
SW	1.6 E-5	4.2 E-6	1.6 E-6	8.8 E-7	5.6 E-7	3.9 E-7	2.9 E-7	2.2 E-7	1.8 E-7	1.5 E-7
WSW	1.0 E-5	2.8 E-6	1.1 E-6	6.0 E-7	3.7 E-7	2.6 E-7	1.9 E-7	1.5 E-7	1.2 E-7	9.9 E-8
W	4.5 E-6	1.2 E-6	4.7 E-7	2.6 E-7	1.6 E-7	1.1 E-7	8.5 E-8	6.7 E-8	5.4 E-8	4.5 E-8
WNW	4.0 E-6	1.1 E-6	4.2 E-7	2.3 E-7	1.4 E-7	1.0 E-7	7.4 E-8	5.8 E-8	4.6 E-8	3.8 E-8
NW	9.0 E-6	2.4 E-6	9.7 E-7	5.3 E-7	3.3 E-7	2.3 E-7	1.7 E-7	1.4 E-7	1.1 E-7	9.2 E-8
NNW	1.4 E-5	3.6 E-6	1.5 E-6	8.1 E-7	5.2 E-7	3.7 E-7	2.8 E-7	2.2 E-7	1.8 E-7	1.5 E-7
N	5.8 E-5	1.5 E-5	6.1 E-6	3.4 E-6	2.2 E-6	1.6 E-6	1.2 E-6	9.6 E-7	7.8 E-7	6.6 E-7
NNE	7.2 E-5	1.8 E-5	7.5 E-6	4.2 E-6	2.8 E-6	2.0 E-6	1.5 E-6	1.2 E-6	9.7 E-7	8.1 E-7
NE	4.0 E-5	1.0 E-5	4.2 E-6	2.3 E-6	1.5 E-6	1.1 E-6	8.2 E-7	6.5 E-7	5.3 E-7	4.5 E-7
ENE	2.3 E-5	5.9 E-6	2.5 E-6	1.4 E-6	9.0 E-7	6.4 E-7	4.8 E-7	3.8 E-7	3.1 E-7	2.6 E-7
E	1.8 E-5	4.6 E-6	1.9 E-6	1.1 E-6	6.9 E-7	4.9 E-7	3.7 E-7	2.9 E-7	2.4 E-7	2.0 E-7
ESE	1.2 E-5	3.2 E-6	1.3 E-6	7.4 E-7	4.8 E-7	3.4 E-7	2.5 E-7	2.0 E-7	1.6 E-7	1.4 E-7
SE	1.1 E-5	2.9 E-6	1.2 E-6	6.6 E-7	4.2 E-7	3.0 E-7	2.2 E-7	1.8 E-7	1.4 E-7	1.2 E-7
SSE	7.7 E-6	2.1 E-6	8.5 E-7	4.6 E-7	3.0 E-7	2.1 E-7	1.5 E-7	1.2 E-7	9.9 E-8	8.2 E-8

TABLE B4.0-2

MCGUIRE NUCLEAR STATION

DEPOSITION PARAMETER ($\overline{D/Q}$) FOR LONG TERM RELEASES > 500 HR/YR OR > 125 HR/QTR

	Distance to the control location, in miles									
Sector	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
S	4.9 E-8	1.2 E-8	4.3 E-9	2.1 E-9	1.3 E-9	8.2 E-10	5.8 E-10	4.3 E-10	3.3 E-10	2.6 E-10
SSW	7.1 E-8	1.7 E-8	6.2 E-9	3.1 E-9	1.8 E-9	1.2 E-9	8.3 E-10	6.2 E-10	4.8 E-10	3.8 E-10
SW	9.4 E-8	2.3 E-8	8.2 E-9	4.1 E-9	2.4 E-9	1.6 E-9	1.1 E-9	8.2 E-10	6.3 E-10	5.0 E-10
WSW	5.3 E-8	1.3 E-8	4.7 E-9	2.3 E-9	1.4 E-9	8.9 E-10	6.3 E-10	4.7 E-10	3.6 E-10	2.9 E-10
W	1.3 E-8	3.1 E-9	1.1 E-9	5.6 E-10	3.3 E-10	2.1 E-10	1.5 E-10	1.1 E-10	8.6 E-11	6.9 E-11
WNW	1.1 E-8	2.7 E-9	9.8 E-10	4.9 E-10	2.9 E-10	1.9 E-10	1.3 E-10	9.8 E-11	7.6 E-11	6.0 E-11
NW	1.9 E-8	4.7 E-9	1.7 E-9	8.4 E-10	5.0 E-10	3.2 E-10	2.3 E-10	1.7 E-10	1.3 E-10	1.0 E-10
NNW	2.3 E-8	5.7 E-9	2.1 E-9	1.0 E-9	6.0 E-10	3.9 E-10	2.8 E-10	2.0 E-10	1.6 E-10	1.3 E-10
N	9.3 E-8	2.3 E-8	8.1 E-9	4.0 E-9	2.4 E-9	1.6 E-9	1.1 E-9	8.1 E-10	6.3 E-10	5.0 E-10
NNE	1.3 E-7	3.2 E-8	1.1 E-8	5.7 E-9	3.3 E-9	2.2 E-9	1.5 E-9	1.1 E-9	8.8 E-10	7.0 E-10
NE	7.1 E-8	1.7 E-8	6.2 E-9	3.1 E-9	1.8 E-9	1.2 E-9	8.3 E-10	6.2 E-10	4.8 E-10	3.8 E-10
ENE	3.8 E-8	9.3 E-9	3.3 E-9	1.7 E-9	9.8 E-10	6.4 E-10	4.5 E-10	3.3 E-10	2.6 E-10	2.0 E-10
E	3.0 E-8	7.3 E-9	2.6 E-9	1.3 E-9	7.6 E-10	5.0 E-10	3.5 E-10	2.6 E-10	2.0 E-10	1.6 E-10
ESE	3.0 E-8	7.4 E-9	2.7 E-9	1.3 E-9	7.8 E-10	5.1 E-10	3.6 E-10	2.6 E-10	2.0 E-10	1.6 E-10
SE	3.1 E-8	7.6 E-9	2.7 E-9	1.3 E-9	7.9 E-10	5.2 E-10	3.7 E-10	2.7 E-10	2.1 E-10	1.7 E-10
SSE	2.7 E-8	6.5 E-9	2.3 E-9	1.2 E-9	6.8 E-10	4.5 E-10	3.1 E-10	2.3 E-10	1.8 E-10	1.4 E-10