BYRON SECTIONS 7.2 and 8.0

REVISION 11

JUNE 1984

OFFSITE DOSE CALCULATION MANUAL

COMMONWEALTH EDISON COMPANY

ODCM LIST OF TABLES FOR BYRON SECTION 7.2

ODCM LIST OF FIGURES FOR BYRON SECTION 7.2

TABLE 7.2-1

AQUATIC ENVIRONMENTAL DOSE PARAMETERS

PARAMETER	BYRON	BASIS*
U^w, water usage, liters/hr	0.042	A
U^f, fish consumption, kg/hr	2.4×10^{-3}	B
$1/M^w$, $1/M^f$	1	C
F^w, cfs	5.2×10^4	D
F^f, cfs	4.7×10^3	E
t^f, hr	24	F
t^w, hr	115	G

B_i - Regulatory Guide 1.109, Revision 1, October 1977, Table A-1, Column 2 for freshwater fish. See Table 7.1-12.

F^t, cfs
F^w_o, cfs
$1/M^w_o$
t^w_o, hr
V^t, gal
t_o, hr

Not Applicable. No outdoor tanks without overflow pipes connected to other storage tanks.

*Basis codes:

A: Reference 6.2, Page 138.

B: Reference 6.5, Table E-5.

C: Conservative assumption (implies no additional dilution).

D: The receiving body of water is taken as the Mississippi River, whose confluence is approximately 115 miles downstream of the plant. F^w is taken as the sum of the following average flow rates:

Rock River at Como, Illinois (45 miles downstream of plant)	5.0×10^3 cfs per Byron Station Environmental Report, Subsection 2.4.1.2
Mississippi River near DeWitt, Iowa (approximately 35 miles upstream of confluence with Rock River)	4.7×10^4 cfs per Quad-Cities Station Units 1 and 2 Safety Analysis Report, Section 2.4

E: The near-field receiving body of water is the Rock River. F^f is taken as the average flow of the Rock River at the site, 4.7×10^3 cfs per Byron Station Environmental Report, Subsection 2.4.1.2.

F: Assumption.

G: There are no potable water intakes on the Rock River downstream of the plant (per Byron Station Environmental Report, Subsection 2.1.3.2.1). For 10 CFR 50 compliance evaluation purposes, t^w is taken as 115 hr, the estimated time of flow to the Mississippi River. The confluence of the Rock River with the Mississippi River is approximately 115 miles downstream of the plant (per Byron Station Environmental Report, Sub-section 2.1.3.2.1). The flow rate is estimated as 1 mph based on the data in Table 2.2-5 of the Byron Station Environmental Report.

TABLE 7.2-2

ANNUAL DESIGN OBJECTIVES SET BY 10 CFR 50,

APPENDIX I, FOR EACH REACTOR

TYPE OF DOSE	ANNUAL DESIGN OBJECTIVES
Airborne Releases	
Gamma Air Dose	10 mrad
Beta Air Dose	20 mrad
Whole Body Dose	5 mrem
Skin Dose	15 mrem
Infant Thyroid Dose	15 mrem
Liquid Releases	
Whole Body Dose	3 mrem
Thyroid Dose	10 mrem
Bone Dose	10 mrem
Skin Dose	10 mrem

TABLE 7.2-3

STATION CHARACTERISTICS

STATION: Byron

LOCATION: 3.7 miles SSW of Byron, Illinois

CHARACTERISTICS OF ELEVATED RELEASE POINT

1) Release Height = _____ m 2) Diameter = _____ m

3) Exit Speed = _____ ms^{-1} 4) Heat Content = _____ KCal s^{-1}

CHARACTERISTICS OF VENT STACK RELEASE POINTS*

1) Release Height = 60.96 m 2) Effective Diameter = 2.80 m

3) Exit Speed = 15.34 ms^{-1}

*The station has two adjacent rectangular vent stack release points of the same height and cross section. Their centers are 15.01 m apart.

CHARACTERISTICS OF GROUND LEVEL RELEASE

1) Release Height = 0 m

2) Building Factor (D) = 60.6 m

METEOROLOGICAL DATA

A 250 ft. Tower is located 1036 m SW of vent stack release point

Tower Data Used in Calculations

Release Point	Wind Speed and Direction	Differential Temperature
Elevated	(NA)	(NA)
Vent	250 ft	250 - 30 ft
Ground	30 ft	250 - 30 ft

TABLE 7.2-4

CRITICAL RANGES

DIRECTION	RESTRICTED AREA BOUNDARY* (m)	NEAREST** RESIDENT (m)	NEAREST DAIRY FARM RANGE** (m)
N	1875	2300	---- †
NNE	1829	2900	---- †
NE	1585	1900	3400
ENE	1234	2100	---- †
E	1227	1900	---- †
ESE	991	2600	5100
SE	1006	2100	5300
SSE	800	1300	---- †
S	945	1100	3200
SSW	975	1000	---- †
SW	1067	1300	---- †
WSW	1212	2700	---- †
W	1189	3100	3100
WNW	1227	3400	5300
NW	1300	1300	5100
NNW	1044	1900	---- †

*Approximate distance from midpoint between gaseous effluent release points. (See FSAR Table 2.1-1a (Amendment 39, September 1982) and ER Table 2.1-1 (Amendment 1, July 1981).)

**Approximate distance from center of plant per 1983 annual survey by Teledyne Isotopes Midwest Laboratories.

†No dairy farm found within 5 miles (8000 m) of station.

TABLE 7.2-5

TERRAIN CORRECTION FACTORS (n_t)*

(h_t = 0 to Stated Range, Then h_t = Given Value)

DIRECTION	RANGE (miles)	h_t (meters)
N	—	0.0
NNE	—	0.0
NE	—	0.0
ENE	—	0.0
E	9.0	3.0
ESE	—	0.0
SE	5.0	11.0
SSE	4.2	9.0
S	4.4	9.0
SSW	—	0.0
SW	5.0	9.0
WSW	6.5	12.0
W	7.6	14.0
WNW	—	0.0
NW	7.3	9.0
NNW	9.7	6.0

*Within 10 miles

TABLE 7.2-6

X/Q AND D/Q MAXIMA AT OR BEYOND THE UNRESTRICTED AREA BOUNDARY

DOWNWIND DIRECTION	ELEVATED(STACK) RELEASE[a]				MIXED MODE(VENT) RELEASE			GROUND LEVEL RELEASE[a]		
	RADIUS[b] (METERS)	X/Q (SEC/M**3)	RADIUS[b] (METERS)	D/Q (1/M**2)	RADIUS[b] (METERS)	X/Q (SEC/M**3)	D/Q (1/M**2)	RADIUS[b] (METERS)	X/Q (SEC/M**3)	D/Q (1/M**2)
N	1875.	9.557-08	1875.	9.680-10	1875.	2.102-07	1.666-09	1875.	1.007-06	4.937-09
NNE	1829.	1.083-07	1829.	1.048-09	1829.	1.683-07	1.582-09	1829.	8.936-07	4.682-09
NE	1585.	9.628-08	1585.	1.062-09	1585.	1.648-07	1.562-09	1585.	9.067-07	4.912-09
ENE	1609.	9.103-08	1234.	1.305-09	1234.	1.741-07	1.768-09	1234.	1.130-06	6.280-09
E	1400.	1.067-07	1227.	1.787-09	1227.	2.204-07	2.143-09	1227.	1.436-06	7.005-09
ESE	1400.	1.066-07	991.	2.199-09	991.	2.591-07	2.748-09	991.	1.706-06	9.462-09
SE	1500.	9.378-08	1006.	1.846-09	1006.	3.791-07	2.589-09	1006.	2.623-06	1.030-08
SSE	1500.	7.869-08	800.	1.558-09	800.	3.376-07	2.176-09	800.	2.622-06	1.146-08
S	1800.	6.347-08	945.	7.539-10	945.	1.775-07	1.377-09	945.	1.390-06	7.506-09
SSW	1609.	5.441-08	975.	8.453-10	975.	1.310-07	1.191-09	975.	9.962-07	5.632-09
SW	1609.	6.179-08	1067.	9.762-10	1067.	1.257-07	1.467-09	1067.	8.619-07	5.159-09
WSW	1609.	5.528-08	1212.	7.907-10	1212.	1.244-07	1.310-09	1212.	7.873-07	4.685-09
W	1609.	5.338-08	1189.	7.180-10	1189.	1.310-07	1.173-09	1189.	8.107-07	4.424-09
WNW	1400.	5.222-08	1227.	8.600-10	1227.	1.162-07	1.183-09	1227.	7.074-07	3.598-09
NW	1400.	5.652-08	1128.	1.028-09	1128.	1.380-07	1.405-09	1128.	8.763-07	4.804-09
NNW	1400.	8.117-08	1044.	1.591-09	1044.	2.769-07	2.540-09	1044.	1.492-06	8.173-09

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

[a] The elevated (stack) and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode (vent) release data.

[b] Approximate distance from midpoint between gaseous effluent release points to location of highest X/Q or D/Q at or beyond the unrestricted area boundary.

TABLE 7.2-6 (Cont'd)

BYRON 1&2

AVERAGE WIND SPEEDS FOR EACH RELEASE MODE

DOWNWIND DIRECTION	AVERAGE WIND SPEED (m/sec)[a]		
	ELEVATED[b]	MIXED MODE	GROUND LEVEL[b]
N	7.6	6.6	4.5
NNE	7.4	6.6	4.7
NE	6.8	6.2	4.6
ENE	6.5	5.8	4.5
E	6.5	5.9	4.5
ESE	6.3	5.7	4.4
SE	6.0	5.4	4.0
SSE	6.0	5.2	3.9
S	5.9	5.2	4.1
SSW	6.0	5.4	4.0
SW	6.6	6.0	4.6
WSW	6.8	6.2	4.8
W	6.7	5.8	4.1
WNW	7.0	6.1	4.2
NW	7.0	6.0	3.9
NNW	7.2	6.2	4.2

[a]Based on Byron Site Meteorological Data, January 1974 through December 1976.

[b]The elevated and ground level values are provided for reference purposes only. Routine dose calculations are performed using the mixed mode values.

TABLE 7.2-7

D/Q AT THE NEAREST MILK COW AND MEAT ANIMAL LOCATIONS WITHIN 5 MILES

DOWNWIND DIRECTION	NEAREST MILK COW D/Q(1/M**2) RADIUS (METERS)[a]	ELEVATED RELEASE[b]	MIXED RELEASE	GROUND RELEASE[b]	NEAREST MEAT ANIMAL D/Q(1/M**2) RADIUS (METERS)[c]	ELEVATED RELEASE[b]	MIXED RELEASE	GROUND RELEASE[b]
N	8000.	1.096-10	1.654-10	3.889-10	1900.	9.553-10	1.637-09	4.827-09
NNE	8000.	1.154-10	1.559-10	3.534-10	2600.	6.727-10	9.430-10	2.536-09
NE	3400.	3.974-10	5.217-10	1.306-09	1800	9.298-10	1.320-09	3.956-09
ENE	8000.	9.768-11	1.153-10	2.425-10	2400.	6.303-10	7.382-10	2.003-09
E	8000.	1.320-10	1.396-10	2.679-10	1900.	1.142-09	1.234-09	3.325-09
ESE	5100.	2.606-10	2.858-10	5.593-10	2400.	8.078-10	8.659-10	2.079-09
SE	5300.	2.142-10	2.497-10	5.825-10	2600.	6.320-10	7.250-10	2.016-09
SSE	8000.	8.492-11	8.853-11	2.167-10	2400.	5.458-10	5.505-10	1.789-09
S	3200.	2.047-10	2.643-10	9.242-10	1300.	5.683-10	8.863-10	4.387-09
SSW	8000.	5.310-11	5.919-11	1.460-10	2600.	3.063-10	3.337-10	1.048-09
SW	8000.	6.287-11	7.647-11	1.555-10	1400.	7.322-10	1.005-09	3.247-09
WSW	8000.	6.026-11	8.062-11	1.754-10	1400.	6.850-10	1.072-09	3.664-09
W	3100.	2.384-10	3.076-10	8.458-10	3200.	2.269-10	2.929-10	8.006-10
WNW	5300.	1.211-10	1.420-10	2.853-10	2600.	3.586-10	4.207-10	9.875-10
NW	5100.	1.403-10	1.609-10	3.538-10	2300.	4.608-10	5.327-10	1.417-09
NNW	8000.	9.475-11	1.167-10	2.374-10	2400.	6.155-10	7.804-10	1.961-09

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

[a] Approximate distance from center of plant as determined by annual census.

[b] The elevated and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode release data.

[c] Approximate distance from center of plant per ER Table Q470.2-1 (Amendment 2, September 1981).

TABLE 7.2-8

BYRON 1&2

MAXIMUM OFFSITE FINITE PLUME GAMMA DOSE FACTORS FOR KR 83M

DOWNWIND DIRECTION	RESTRICTED AREA BOUND (METERS)	ELEVATED(STACK) RELEASE* RADIUS** (METERS)	S (MRAD/YR)/(UCI/SEC)	SBAR	MIXED MODE(VENT) RELEASE RADIUS** (METERS)	V (MRAD/YR)/(UCI/SEC)	VBAR	GROUND LEVEL RELEASE* RADIUS** (METERS)	G (MRAD/YR)/(UCI/SEC)	GBAR
N	1875.	1875.	1.068-05	9.648-07	1875.	2.360-05	2.131-06	1875.	1.079-04	9.740-06
NNE	1829.	1829.	1.192-05	1.076-06	1829.	1.901-05	1.716-06	1829.	9.390-05	8.479-06
NE	1585.	1585.	1.074-05	9.697-07	1585.	1.846-05	1.667-06	1585.	9.516-05	8.593-06
ENE	1234.	1234.	1.132-05	1.022-06	1234.	2.034-05	1.836-06	1234.	1.229-04	1.110-05
E	1227.	1227.	1.281-05	1.157-06	1227.	2.482-05	2.241-06	1227.	1.536-04	1.387-05
ESE	991.	991.	1.432-05	1.293-06	991.	3.026-05	2.733-06	991.	1.894-04	1.710-05
SE	1006.	1006.	1.251-05	1.130-06	1006.	4.172-05	3.767-06	1006.	2.811-04	2.539-05
SSE	800.	800.	1.120-05	1.011-06	800.	3.735-05	3.372-06	800.	2.846-04	2.570-05
S	945.	945.	8.389-06	7.575-07	945.	2.134-05	1.927-06	945.	1.568-04	1.416-05
SSW	975.	975.	7.085-06	6.397-07	975.	1.572-05	1.420-06	975.	1.124-04	1.015-05
SW	1067.	1067.	8.135-06	7.346-07	1067.	1.503-05	1.357-06	1067.	9.529-05	8.605-06
WSW	1212.	1212.	6.862-06	6.196-07	1212.	1.470-05	1.327-06	1212.	8.648-05	7.809-06
W	1189.	1189.	6.732-06	6.079-07	1189.	1.549-05	1.399-06	1189.	9.002-05	8.129-06
WNW	1227.	1227.	6.640-06	5.996-07	1227.	1.360-05	1.228-06	1227.	7.786-05	7.031-06
NW	1128.	1128.	7.413-06	6.694-07	1128.	1.635-05	1.476-06	1128.	9.772-05	8.824-06
NNW	1044.	1044.	1.074-05	9.694-07	1044.	3.265-05	2.948-06	1044.	1.696-04	1.531-05

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

*The elevated (stack) and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode (vent) release data.

**Approximate distance from midpoint between gaseous effluent release points.

TABLE 7.2-8 (Cont'd)

BYRON 1&2

MAXIMUM OFFSITE FINITE PLUME GAMMA DOSE FACTORS FOR KR 85M

DOWNWIND DIRECTION	RESTRICTED AREA BOUND (METERS)	ELEVATED(STACK) RELEASE* RADIUS** (METERS)	S (MRAD/YR)/(UCI/SEC)	SBAR	MIXED MODE(VENT) RELEASE RADIUS** (METERS)	V (MRAD/YR)/(UCI/SEC)	VBAR	GROUND LEVEL RELEASE* RADIUS** (METERS)	G (MRAD/YR)/(UCI/SEC)	GBAR
N	1875.	1875.	1.731-04	9.137-05	1875.	2.312-04	1.209-04	1875.	6.971-04	3.601-04
NNE	1829.	1829.	1.929-04	1.018-04	1829.	2.179-04	1.143-04	1829.	6.266-04	3.240-04
NE	1585.	1585.	1.809-04	9.554-05	1585.	2.117-04	1.111-04	1585.	6.368-04	3.293-04
ENE	1234.	1234.	2.207-04	1.168-04	1234.	2.398-04	1.259-04	1234.	7.650-04	3.948-04
E	1227.	1227.	2.297-04	1.214-04	1227.	2.644-04	1.385-04	1227.	9.340-04	4.814-04
ESE	991.	991.	2.964-04	1.569-04	991.	3.331-04	1.747-04	991.	1.103-03	5.681-04
SE	1006.	1006.	2.697-04	1.428-04	1006.	3.675-04	1.917-04	1006.	1.569-03	8.060-04
SSE	800.	800.	2.787-04	1.478-04	800.	3.457-04	1.806-04	800.	1.498-03	7.684-04
S	945.	945.	2.116-04	1.122-04	945.	2.348-04	1.232-04	945.	8.918-04	4.589-04
SSW	975.	975.	1.668-04	8.844-05	975.	1.800-04	9.449-05	975.	6.584-04	3.392-04
SW	1067.	1067.	1.795-04	9.508-05	1067.	1.803-04	9.473-05	1067.	5.698-04	2.937-04
WSW	1212.	1212.	1.345-04	7.119-05	1212.	1.579-04	8.276-05	1212.	5.225-04	2.694-04
W	1189.	1189.	1.363-04	7.215-05	1189.	1.653-04	8.663-05	1189.	5.437-04	2.803-04
WNW	1227.	1227.	1.280-04	6.773-05	1227.	1.442-04	7.557-05	1227.	4.705-04	2.426-04
NW	1128.	1128.	1.468-04	7.767-05	1128.	1.693-04	8.868-05	1128.	5.778-04	2.977-04
NNW	1044.	1044.	2.172-04	1.149-04	1044.	2.891-04	1.509-04	1044.	9.390-04	4.827-04

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

*The elevated (stack) and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode (vent) release data.

**Approximate distance from midpoint between gaseous effluent release points.

TABLE 7.2-8 (Cont'd)

BYRON 1&2

MAXIMUM OFFSITE FINITE PLUME GAMMA DOSE FACTORS FOR KR 85

DOWNWIND DIRECTION	RESTRICTED AREA BOUND (METERS)	ELEVATED(STACK) RELEASE* RADIUS** (METERS)	S (MRAD/YR)/(UCI/SEC)	SBAR	MIXED MODE(VENT) RELEASE RADIUS** (METERS)	V (MRAD/YR)/(UCI/SEC)	VBAR	GROUND LEVEL RELEASE* RADIUS** (METERS)	G (MRAD/YR)/(UCI/SEC)	GBAR
N	1875.	1875.	2.036-06	1.260-06	1875.	2.723-06	1.686-06	1875.	7.846-06	4.857-06
NNE	1829.	1829.	2.270-06	1.405-06	1829.	2.598-06	1.608-06	1829.	7.093-06	4.390-06
NE	1585.	1585.	2.140-06	1.325-06	1585.	2.532-06	1.568-06	1585.	7.221-06	4.470-06
ENE	1234.	1234.	2.612-06	1.617-06	1234.	2.865-06	1.773-06	1234.	8.564-06	5.301-06
E	1227.	1227.	2.712-06	1.678-06	1227.	3.151-06	1.951-06	1227.	1.050-05	6.502-06
ESE	991.	991.	3.523-06	2.181-06	991.	3.971-06	2.458-06	991.	1.222-05	7.566-06
SE	1006.	1006.	3.204-06	1.983-06	1006.	4.330-06	2.680-06	1006.	1.749-05	1.082-05
SSE	800.	800.	3.322-06	2.057-06	800.	4.080-06	2.526-06	800.	1.654-05	1.024-05
S	945.	945.	2.530-06	1.566-06	945.	2.796-06	1.730-06	945.	9.827-06	6.083-06
SSW	975.	975.	1.989-06	1.231-06	975.	2.145-06	1.328-06	975.	7.266-06	4.498-06
SW	1067.	1067.	2.130-06	1.318-06	1067.	2.148-06	1.329-06	1067.	6.312-06	3.907-06
WSW	1212.	1212.	1.585-06	9.814-07	1212.	1.860-06	1.151-06	1212.	5.812-06	3.597-06
W	1189.	1189.	1.619-06	1.002-06	1189.	1.960-06	1.213-06	1189.	6.043-06	3.741-06
WNW	1227.	1227.	1.513-06	9.366-07	1227.	1.708-06	1.057-06	1227.	5.251-06	3.250-06
NW	1128.	1128.	1.733-06	1.073-06	1128.	1.999-06	1.238-06	1128.	6.410-06	3.968-06
NNW	1044.	1044.	2.568-06	1.590-06	1044.	3.374-06	2.089-06	1044.	1.032-05	6.390-06

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

*The elevated (stack) and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode (vent) release data.

**Approximate distance from midpoint between gaseous effluent release points.

TABLE 7.2-8 (Cont'd)

BYRON 1&2

MAXIMUM OFFSITE FINITE PLUME GAMMA DOSE FACTORS FOR KR 87

DOWNWIND DIRECTION	RESTRICTED AREA BOUND (METERS)	ELEVATED(STACK) RELEASE* RADIUS** (METERS)	S (MRAD/YR)/(UCI/SEC)	SBAR (MRAD/YR)/(UCI/SEC)	MIXED MODE(VENT) RELEASE RADIUS** (METERS)	V (MRAD/YR)/(UCI/SEC)	VBAR (MRAD/YR)/(UCI/SEC)	GROUND LEVEL RELEASE* RADIUS** (METERS)	G (MRAD/YR)/(UCI/SEC)	GBAR (MRAD/YR)/(UCI/SEC)
N	1875.	1875.	5.961-04	4.327-04	1875.	7.713-04	5.596-04	1875.	2.020-03	1.459-03
NNE	1829.	1829.	6.620-04	4.806-04	1829.	7.460-04	5.417-04	1829.	1.807-03	1.305-03
NE	1585.	1585.	6.270-04	4.551-04	1585.	7.268-04	5.278-04	1585.	1.848-03	1.335-03
ENE	1234.	1234.	7.768-04	5.640-04	1234.	8.465-04	6.151-04	1234.	2.256-03	1.629-03
E	1227.	1227.	8.045-04	5.841-04	1227.	9.119-04	6.623-04	1227.	2.713-03	1.958-03
ESE	991.	991.	1.053-03	7.646-04	991.	1.178-03	8.562-04	991.	3.265-03	2.357-03
SE	1006.	1006.	9.613-04	6.980-04	1006.	1.248-03	9.055-04	1006.	4.539-03	3.277-03
SSE	800.	800.	1.005-03	7.299-04	800.	1.214-03	8.819-04	800.	4.446-03	3.209-03
S	945.	945.	7.550-04	5.482-04	945.	8.365-04	6.079-04	945.	2.654-03	1.916-03
SSW	975.	975.	5.964-04	4.330-04	975.	6.421-04	4.666-04	975.	1.964-03	1.418-03
SW	1067.	1067.	6.390-04	4.639-04	1067.	6.471-04	4.703-04	1067.	1.696-03	1.225-03
WSW	1212.	1212.	4.785-04	3.474-04	1212.	5.538-04	4.021-04	1212.	1.555-03	1.123-03
W	1189.	1189.	4.779-04	3.469-04	1189.	5.759-04	4.182-04	1189.	1.620-03	1.170-03
WNW	1227.	1227.	4.526-04	3.286-04	1227.	5.040-04	3.660-04	1227.	1.388-03	1.002-03
NW	1128.	1128.	5.203-04	3.778-04	1128.	5.944-04	4.316-04	1128.	1.723-03	1.244-03
NNW	1044.	1044.	7.732-04	5.614-04	1044.	9.980-04	7.242-04	1044.	2.811-03	2.029-03

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

*The elevated (stack) and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode (vent) release data.

**Approximate distance from midpoint between gaseous effluent release points.

TABLE 7.2-8 (Cont'd)

BYRON 1&2

MAXIMUM OFFSITE FINITE PLUME GAMMA DOSE FACTORS FOR KR 88

DOWNWIND DIRECTION	RESTRICTED AREA BOUND (METERS)	ELEVATED(STACK) RELEASE* RADIUS** (METERS)	S (MRAD/YR)/(UCI/SEC)	SBAR	MIXED MODE(VENT) RELEASE RADIUS** (METERS)	V (MRAD/YR)/(UCI/SEC)	VBAR	GROUND LEVEL RELEASE* RADIUS** (METERS)	G (MRAD/YR)/(UCI/SEC)	GBAR
N	1875.	1875.	1.463-03	1.122-03	1875.	1.915-03	1.466-03	1875.	5.038-03	3.836-03
NNE	1829.	1829.	1.629-03	1.249-03	1829.	1.856-03	1.423-03	1829.	4.538-03	3.456-03
NE	1585.	1585.	1.537-03	1.179-03	1585.	1.809-03	1.387-03	1585.	4.623-03	3.521-03
ENE	1234.	1234.	1.893-03	1.453-03	1234.	2.091-03	1.604-03	1234.	5.545-03	4.221-03
E	1227.	1227.	1.965-03	1.508-03	1227.	2.266-03	1.737-03	1227.	6.740-03	5.130-03
ESE	991.	991.	2.561-03	1.966-03	991.	2.906-03	2.228-03	991.	7.965-03	6.059-03
SE	1006.	1006.	2.334-03	1.792-03	1006.	3.087-03	2.364-03	1006.	1.123-02	8.540-03
SSE	800.	800.	2.426-03	1.863-03	800.	2.975-03	2.279-03	800.	1.078-02	8.193-03
S	945.	945.	1.835-03	1.410-03	945.	2.055-03	1.576-03	945.	6.429-03	4.890-03
SSW	975.	975.	1.448-03	1.112-03	975.	1.578-03	1.211-03	975.	4.760-03	3.621-03
SW	1067.	1067.	1.550-03	1.190-03	1067.	1.586-03	1.217-03	1067.	4.122-03	3.137-03
WSW	1212.	1212.	1.156-03	8.876-04	1212.	1.352-03	1.036-03	1212.	3.787-03	2.882-03
W	1189.	1189.	1.170-03	8.978-04	1189.	1.420-03	1.088-03	1189.	3.944-03	3.002-03
WNW	1227.	1227.	1.100-03	8.444-04	1227.	1.238-03	9.487-04	1227.	3.404-03	2.591-03
NW	1128.	1128.	1.263-03	9.695-04	1128.	1.455-03	1.115-03	1128.	4.196-03	3.193-03
NNW	1044.	1044.	1.874-03	1.439-03	1044.	2.432-03	1.862-03	1044.	6.779-03	5.155-03

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

*The elevated (stack) and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode (vent) release data.

**Approximate distance from midpoint between gaseous effluent release points.

TABLE 7.2-8 (Cont'd)

BYRON 1&2

MAXIMUM OFFSITE FINITE PLUME GAMMA DOSE FACTORS FOR KR 89

DOWNWIND DIRECTION	RESTRICTED AREA BOUND (METERS)	ELEVATED(STACK) RELEASE* RADIUS** (METERS)	S (MRAD/YR)/(UCI/SEC)	SBAR	MIXED MODE(VENT) RELEASE RADIUS** (METERS)	V (MRAD/YR)/(UCI/SEC)	VBAR	GROUND LEVEL RELEASE* RADIUS** (METERS)	G (MRAD/YR)/(UCI/SEC)	GBAR
N	1875.	1875.	4.111-04	3.010-04	1875.	4.062-04	2.974-04	1875.	5.990-04	4.364-04
NNE	1829.	1829.	4.422-04	3.237-04	1829.	4.105-04	3.007-04	1829.	5.406-04	3.939-04
NE	1585.	1585.	4.341-04	3.178-04	1585.	4.221-04	3.093-04	1585.	6.219-04	4.532-04
ENE	1234.	1234.	6.185-04	4.529-04	1234.	5.854-04	4.292-04	1234.	9.721-04	7.080-04
E	1227.	1227.	6.462-04	4.731-04	1227.	5.883-04	4.313-04	1227.	1.008-03	7.343-04
ESE	991.	991.	9.327-04	6.830-04	991.	8.838-04	6.482-04	991.	1.599-03	1.165-03
SE	1006.	1006.	8.489-04	6.216-04	1006.	8.077-04	5.923-04	1006.	1.616-03	1.177-03
SSE	800.	800.	9.994-04	7.319-04	800.	9.545-04	7.001-04	800.	2.238-03	1.630-03
S	945.	945.	6.409-04	4.693-04	945.	6.336-04	4.646-04	945.	1.433-03	1.043-03
SSW	975.	975.	5.305-04	3.885-04	975.	4.929-04	3.622-04	975.	1.049-03	7.640-04
SW	1067.	1067.	5.759-04	4.217-04	1067.	5.305-04	3.889-04	1067.	8.888-04	6.473-04
WSW	1212.	1212.	4.259-04	3.118-04	1212.	4.363-04	3.196-04	1212.	7.908-04	5.759-04
W	1189.	1189.	3.744-04	2.742-04	1189.	3.891-04	2.851-04	1189.	7.491-04	5.455-04
WNW	1227.	1227.	3.884-04	2.844-04	1227.	3.632-04	2.662-04	1227.	5.733-04	4.176-04
NW	1128.	1128.	4.680-04	3.427-04	1128.	4.492-04	3.292-04	1128.	8.016-04	5.839-04
NNW	1044.	1044.	7.275-04	5.327-04	1044.	7.938-04	5.812-04	1044.	1.573-03	1.145-03

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

*The elevated (stack) and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode (vent) release data.

**Approximate distance from midpoint between gaseous effluent release points.

TABLE 7.2-8 (Cont'd)

BYRON 1&2

MAXIMUM OFFSITE FINITE PLUME GAMMA DOSE FACTORS FOR KR 90

DOWNWIND DIRECTION	RESTRICTED AREA BOUND (METERS)	ELEVATED(STACK) RELEASE* RADIUS** (METERS)	S (MRAD/YR)/(UCI/SEC)	SBAR	MIXED MODE(VENT) RELEASE RADIUS** (METERS)	V (MRAD/YR)/(UCI/SEC)	VBAR	GROUND LEVEL RELEASE* RADIUS** (METERS)	G (MRAD/YR)/(UCI/SEC)	GBAR
N	1875.	1875.	1.125-05	7.998-06	1875.	7.471-06	5.312-06	1875.	4.324-06	3.054-06
NNE	1829.	1829.	1.194-05	8.481-06	1829.	8.361-06	5.945-06	1829.	5.383-06	3.802-06
NE	1585.	1585.	1.460-05	1.038-05	1585.	1.163-05	8.268-06	1585.	9.069-06	6.405-06
ENE	1234.	1234.	3.604-05	2.562-05	1234.	2.752-05	1.957-05	1234.	2.745-05	1.938-05
E	1227.	1227.	4.020-05	2.857-05	1227.	3.081-05	2.190-05	1227.	3.305-05	2.334-05
ESE	991.	991.	8.655-05	6.154-05	991.	6.939-05	4.938-05	991.	7.290-05	5.146-05
SE	1006.	1006.	6.896-05	4.903-05	1006.	5.360-05	3.814-05	1006.	6.719-05	4.743-05
SSE	800.	800.	1.246-04	8.864-05	800.	9.173-05	6.532-05	800.	1.368-04	9.654-05
S	945.	945.	5.623-05	3.999-05	945.	4.379-05	3.117-05	945.	6.024-05	4.250-05
SSW	975.	975.	4.486-05	3.190-05	975.	3.367-05	2.396-05	975.	3.851-05	2.717-05
SW	1067.	1067.	4.947-05	3.517-05	1067.	3.940-05	2.800-05	1067.	3.895-05	2.749-05
WSW	1212.	1212.	2.878-05	2.046-05	1212.	2.504-05	1.779-05	1212.	2.607-05	1.840-05
W	1189.	1189.	2.728-05	1.939-05	1189.	2.031-05	1.445-05	1189.	1.678-05	1.184-05
WNW	1227.	1227.	2.812-05	1.999-05	1227.	1.958-05	1.393-05	1227.	1.374-05	9.700-06
NW	1128.	1128.	3.999-05	2.844-05	1128.	2.696-05	1.919-05	1128.	1.820-05	1.285-05
NNW	1044.	1044.	7.876-05	5.601-05	1044.	5.964-05	4.241-05	1044.	4.889-05	3.450-05

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

*The elevated (stack) and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode (vent) release data.

**Approximate distance from midpoint between gaseous effluent release points.

TABLE 7.2-8 (Cont'd)

BYRON 1&2

MAXIMUM OFFSITE FINITE PLUME GAMMA DOSE FACTORS FOR XE131M

DOWNWIND DIRECTION	RESTRICTED AREA BOUND (METERS)	ELEVATED(STACK) RELEASE* RADIUS** (METERS)	S (MRAD/YR)/(UCI/SEC)	SBAR	MIXED MODE(VENT) RELEASE RADIUS** (METERS)	V (MRAD/YR)/(UCI/SEC)	VBAR	GROUND LEVEL RELEASE* RADIUS** (METERS)	G (MRAD/YR)/(UCI/SEC)	GBAR
N	1875.	1875.	1.246-05	2.765-06	1875.	2.486-05	4.428-06	1875.	1.076-04	1.628-05
NNE	1829.	1829.	1.390-05	3.085-06	1829.	2.061-05	3.925-06	1829.	9.491-05	1.450-05
NE	1585.	1585.	1.266-05	2.858-06	1585.	2.015-05	3.825-06	1585.	9.587-05	1.467-05
ENE	1234.	1234.	1.386-05	3.340-06	1234.	2.206-05	4.252-06	1234.	1.200-04	1.798-05
E	1227.	1227.	1.529-05	3.554-06	1227.	2.669-05	4.907-06	1227.	1.516-04	2.245-05
ESE	991.	991.	1.790-05	4.420-06	991.	3.223-05	6.040-06	991.	1.817-04	2.663-05
SE	1006.	1006.	1.581-05	3.977-06	1006.	4.314-05	7.345-06	1006.	2.728-04	3.924-05
SSE	800.	800.	1.488-05	3.975-06	800.	3.820-05	6.675-06	800.	2.676-04	3.794-05
S	945.	945.	1.130-05	3.026-06	945.	2.253-05	4.237-06	945.	1.485-04	2.164-05
SSW	975.	975.	9.262-06	2.415-06	975.	1.677-05	3.205-06	975.	1.069-04	1.573-05
SW	1067.	1067.	1.036-05	2.632-06	1067.	1.612-05	3.147-06	1067.	9.124-05	1.352-05
WSW	1212.	1212.	8.352-06	2.022-06	1212.	1.541-05	2.870-06	1212.	8.326-05	1.237-05
W	1189.	1189.	8.405-06	2.053-06	1189.	1.626-05	3.022-06	1189.	8.633-05	1.284-05
WNW	1227.	1227.	8.095-06	1.941-06	1227.	1.428-05	2.642-06	1227.	7.531-05	1.118-05
NW	1128.	1128.	9.101-06	2.208-06	1128.	1.697-05	3.117-06	1128.	9.340-05	1.379-05
NNW	1044.	1044.	1.327-05	3.248-06	1044.	3.270-05	5.644-06	1044.	1.590-04	2.299-05

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

*The elevated (stack) and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode (vent) release data.

**Approximate distance from midpoint between gaseous effluent release points.

TABLE 7.2-8 (Cont'd)

BYRON 1&2

MAXIMUM OFFSITE FINITE PLUME GAMMA DOSE FACTORS FOR XE133M

DOWNWIND DIRECTION	RESTRICTED AREA BOUND (METERS)	ELEVATED(STACK) RELEASE* RADIUS** (METERS)	S	SBAR	MIXED MODE(VENT) RELEASE RADIUS** (METERS)	V	VBAR	GROUND LEVEL RELEASE* RADIUS** (METERS)	G	GBAR
			(MRAD/YR)/(UCI/SEC)			(MRAD/YR)/(UCI/SEC)			(MRAD/YR)/(UCI/SEC)	
N	1875.	1875.	3.363-05	1.394-05	1875.	5.333-05	1.932-05	1875.	1.943-04	6.113-05
NNE	1829.	1829.	3.752-05	1.556-05	1829.	4.741-05	1.800-05	1829.	1.731-04	5.498-05
NE	1585.	1585.	3.478-05	1.454-05	1585.	4.620-05	1.750-05	1585.	1.752-04	5.574-05
ENE	1234.	1234.	4.075-05	1.757-05	1234.	5.142-05	1.967-05	1234.	2.145-04	6.680-05
E	1227.	1227.	4.331-05	1.836-05	1227.	5.919-05	2.194-05	1227.	2.676-04	8.228-05
ESE	991.	991.	5.398-05	2.352-05	991.	7.295-05	2.740-05	991.	3.175-04	9.660-05
SE	1006.	1006.	4.861-05	2.135-05	1006.	8.827-05	3.089-05	1006.	4.672-04	1.392-04
SSE	800.	800.	4.869-05	2.190-05	800.	8.037-05	2.871-05	800.	4.516-04	1.323-04
S	945.	945.	3.706-05	1.669-05	945.	5.119-05	1.927-05	945.	2.580-04	7.798-05
SSW	975.	975.	2.955-05	1.317-05	975.	3.875-05	1.474-05	975.	1.877-04	5.737-05
SW	1067.	1067.	3.218-05	1.419-05	1067.	3.809-05	1.469-05	1067.	1.613-04	4.964-05
WSW	1212.	1212.	2.468-05	1.066-05	1212.	3.466-05	1.296-05	1212.	1.476-04	4.555-05
W	1189.	1189.	2.505-05	1.086-05	1189.	3.649-05	1.362-05	1189.	1.532-04	4.735-05
WNW	1227.	1227.	2.368-05	1.018-05	1227.	3.190-05	1.188-05	1227.	1.334-04	4.114-05
NW	1128.	1128.	2.695-05	1.165-05	1128.	3.763-05	1.394-05	1128.	1.645-04	5.042-05
NNW	1044.	1044.	3.966-05	1.722-05	1044.	6.793-05	2.403-05	1044.	2.741-04	8.213-05

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

*The elevated (stack) and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode (vent) release data.

**Approximate distance from midpoint between gaseous effluent release points.

TABLE 7.2-8 (Cont'd)

BYRON 1&2

MAXIMUM OFFSITE FINITE PLUME GAMMA DOSE FACTORS FOR XE133

DOWNWIND DIRECTION	RESTRICTED AREA BOUND (METERS)	ELEVATED(STACK) RELEASE* RADIUS** (METERS)	S (MRAD/YR)/(UCI/SEC)	SBAR (MRAD/YR)/(UCI/SEC)	MIXED MODE(VENT) RELEASE RADIUS** (METERS)	V (MRAD/YR)/(UCI/SEC)	VBAR (MRAD/YR)/(UCI/SEC)	GROUND LEVEL RELEASE* RADIUS** (METERS)	G (MRAD/YR)/(UCI/SEC)	GBAR (MRAD/YR)/(UCI/SEC)
N	1875.	1875.	3.840-05	1.340-05	1875.	5.939-05	1.898-05	1875.	2.194-04	6.492-05
NNE	1829.	1829.	4.286-05	1.496-05	1829.	5.269-05	1.731-05	1829.	1.959-04	5.833-05
NE	1585.	1585.	3.998-05	1.400-05	1585.	5.143-05	1.689-05	1585.	1.984-04	5.917-05
ENE	1234.	1234.	4.709-05	1.686-05	1234.	5.671-05	1.869-05	1234.	2.420-04	7.119-05
E	1227.	1227.	4.980-05	1.764-05	1227.	6.529-05	2.111-05	1227.	3.006-04	8.769-05
ESE	991.	991.	6.263-05	2.259-05	991.	8.019-05	2.611-05	991.	3.550-04	1.028-04
SE	1006.	1006.	5.653-05	2.049-05	1006.	9.677-05	3.015-05	1006.	5.192-04	1.482-04
SSE	800.	800.	5.700-05	2.099-05	800.	8.759-05	2.759-05	800.	4.987-04	1.406-04
S	945.	945.	4.348-05	1.603-05	945.	5.614-05	1.829-05	945.	2.878-04	8.294-05
SSW	975.	975.	3.458-05	1.266-05	975.	4.257-05	1.397-05	975.	2.102-04	6.104-05
SW	1067.	1067.	3.747-05	1.362-05	1067.	4.193-05	1.389-05	1067.	1.812-04	5.290-05
WSW	1212.	1212.	2.855-05	1.024-05	1212.	3.836-05	1.248-05	1212.	1.660-04	4.857-05
W	1189.	1189.	2.899-05	1.042-05	1189.	4.030-05	1.309-05	1189.	1.724-04	5.046-05
WNW	1227.	1227.	2.729-05	9.752-06	1227.	3.529-05	1.145-05	1227.	1.500-04	4.385-05
NW	1128.	1128.	3.111-05	1.116-05	1128.	4.149-05	1.341-05	1128.	1.843-04	5.362-05
NNW	1044.	1044.	4.589-05	1.650-05	1044.	7.478-05	2.349-05	1044.	3.053-04	8.751-05

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

*The elevated (stack) and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode (vent) release data.

**Approximate distance from midpoint between gaseous effluent release points.

TABLE 7.2-8 (Cont'd)

BYRON 1&2

MAXIMUM OFFSITE FINITE PLUME GAMMA DOSE FACTORS FOR XE135M

DOWNWIND DIRECTION	RESTRICTED AREA BOUND (METERS)	ELEVATED(STACK) RELEASE* RADIUS** (METERS)	S (MRAD/YR)/(UCI/SEC)	SBAR	MIXED MODE(VENT) RELEASE RADIUS** (METERS)	V (MRAD/YR)/(UCI/SEC)	VBAR	GROUND LEVEL RELEASE* RADIUS** (METERS)	G (MRAD/YR)/(UCI/SEC)	GBAR
N	1875.	1875.	2.796-04	1.722-04	1875.	3.384-04	2.079-04	1875.	8.143-04	4.977-04
NNE	1829.	1829.	3.068-04	1.890-04	1829.	3.264-04	2.007-04	1829.	7.058-04	4.315-04
NE	1585.	1585.	2.939-04	1.811-04	1585.	3.169-04	1.949-04	1585.	7.313-04	4.472-04
ENE	1234.	1234.	3.759-04	2.318-04	1234.	3.860-04	2.375-04	1234.	9.739-04	5.951-04
E	1227.	1227.	3.865-04	2.382-04	1227.	4.000-04	2.460-04	1227.	1.093-03	6.676-04
ESE	991.	991.	5.161-04	3.183-04	991.	5.411-04	3.329-04	991.	1.468-03	8.960-04
SE	1006.	1006.	4.750-04	2.930-04	1006.	5.507-04	3.383-04	1006.	1.848-03	1.127-03
SSE	800.	800.	5.132-04	3.167-04	800.	5.734-04	3.523-04	800.	2.056-03	1.254-03
S	945.	945.	3.686-04	2.275-04	945.	3.920-04	2.411-04	945.	1.245-03	7.597-04
SSW	975.	975.	2.949-04	1.820-04	975.	3.006-04	1.849-04	975.	9.205-04	5.619-04
SW	1067.	1067.	3.176-04	1.959-04	1067.	3.096-04	1.905-04	1067.	7.812-04	4.771-04
WSW	1212.	1212.	2.419-04	1.492-04	1212.	2.676-04	1.645-04	1212.	7.102-04	4.338-04
W	1189.	1189.	2.263-04	1.396-04	1189.	2.643-04	1.625-04	1189.	7.371-04	4.502-04
WNW	1227.	1227.	2.227-04	1.373-04	1227.	2.357-04	1.449-04	1227.	6.060-04	3.700-04
NW	1128.	1128.	2.585-04	1.594-04	1128.	2.829-04	1.739-04	1128.	7.847-04	4.791-04
NNW	1044.	1044.	3.874-04	2.390-04	1044.	4.860-04	2.984-04	1044.	1.358-03	8.285-04

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

*The elevated (stack) and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode (vent) release data.

**Approximate distance from midpoint between gaseous effluent release points.

TABLE 7.2-8 (Cont'd)

BYRON 1&2

MAXIMUM OFFSITE FINITE PLUME GAMMA DOSE FACTORS FOR XE135

DOWNWIND DIRECTION	RESTRICTED AREA BOUND (METERS)	ELEVATED(STACK) RELEASE* RADIUS** (METERS)	S (MRAD/YR)/(UCI/SEC)	SBAR	MIXED MODE(VENT) RELEASE RADIUS** (METERS)	V (MRAD/YR)/(UCI/SEC)	VBAR	GROUND LEVEL RELEASE* RADIUS** (METERS)	G (MRAD/YR)/(UCI/SEC)	GBAR
N	1875.	1875.	2.405-04	1.297-04	1875.	3.197-04	1.721-04	1875.	9.558-04	5.129-04
NNE	1829.	1829.	2.681-04	1.446-04	1829.	3.023-04	1.628-04	1829.	8.615-04	4.624-04
NE	1585.	1585.	2.515-04	1.356-04	1585.	2.937-04	1.582-04	1585.	8.750-04	4.697-04
ENE	1234.	1234.	3.067-04	1.655-04	1234.	3.321-04	1.789-04	1234.	1.044-03	5.601-04
E	1227.	1227.	3.190-04	1.721-04	1227.	3.661-04	1.972-04	1227.	1.277-03	6.849-04
ESE	991.	991.	4.121-04	2.224-04	991.	4.604-04	2.480-04	991.	1.499-03	8.037-04
SE	1006.	1006.	3.749-04	2.024-04	1006.	5.064-04	2.724-04	1006.	2.135-03	1.144-03
SSE	800.	800.	3.875-04	2.092-04	800.	4.754-04	2.559-04	800.	2.025-03	1.085-03
S	945.	945.	2.948-04	1.591-04	945.	3.243-04	1.747-04	945.	1.208-03	6.479-04
SSW	975.	975.	2.322-04	1.253-04	975.	2.488-04	1.340-04	975.	8.930-04	4.789-04
SW	1067.	1067.	2.495-04	1.347-04	1067.	2.492-04	1.343-04	1067.	7.741-04	4.152-04
WSW	1212.	1212.	1.866-04	1.007-04	1212.	2.176-04	1.172-04	1212.	7.108-04	3.813-04
W	1189.	1189.	1.898-04	1.024-04	1189.	2.283-04	1.230-04	1189.	7.393-04	3.966-04
WNW	1227.	1227.	1.778-04	9.593-05	1227.	1.991-04	1.072-04	1227.	6.410-04	3.439-04
NW	1128.	1128.	2.038-04	1.100-04	1128.	2.333-04	1.257-04	1128.	7.849-04	4.210-04
NNW	1044.	1044.	3.015-04	1.627-04	1044.	3.966-04	2.134-04	1044.	1.270-03	6.806-04

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

*The elevated (stack) and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode (vent) release data.

**Approximate distance from midpoint between gaseous effluent release points.

TABLE 7.2-8 (Cont'd)

BYRON 1&2

MAXIMUM OFFSITE FINITE PLUME GAMMA DOSE FACTORS FOR XE137

DOWNWIND DIRECTION	RESTRICTED AREA BOUND (METERS)	ELEVATED(STACK) RELEASE* RADIUS** (METERS)	S (MRAD/YR)/(UCI/SEC)	SBAR	MIXED MODE(VENT) RELEASE RADIUS** (METERS)	V (MRAD/YR)/(UCI/SEC)	VBAR	GROUND LEVEL RELEASE* RADIUS** (METERS)	G (MRAD/YR)/(UCI/SEC)	GBAR
N	1875.	1875.	6.446-05	4.157-05	1875.	6.532-05	4.251-05	1875.	1.103-04	7.093-05
NNE	1829.	1829.	6.951-05	4.483-05	1829.	6.574-05	4.241-05	1829.	9.777-05	6.288-05
NE	1585.	1585.	6.795-05	4.382-05	1585.	6.656-05	4.294-05	1585.	1.097-04	7.055-05
ENE	1234.	1234.	9.459-05	6.101-05	1234.	8.954-05	5.779-05	1234.	1.663-04	1.069-04
E	1227.	1227.	9.821-05	6.335-05	1227.	8.967-05	5.787-05	1227.	1.718-04	1.105-04
ESE	991.	991.	1.392-04	8.980-05	991.	1.318-04	8.509-05	991.	2.672-04	1.718-04
SE	1006.	1006.	1.274-04	8.220-05	1006.	1.210-04	7.874-05	1006.	2.747-04	1.766-04
SSE	800.	800.	1.477-04	9.525-05	800.	1.416-04	9.140-05	800.	3.742-04	2.405-04
S	945.	945.	9.657-05	6.229-05	945.	9.542-05	6.158-05	945.	2.396-04	1.540-04
SSW	975.	975.	7.956-05	5.152-05	975.	7.406-05	4.780-05	975.	1.762-04	1.133-04
SW	1067.	1067.	8.635-05	5.570-05	1067.	7.944-05	5.126-05	1067.	1.488-04	9.566-05
WSW	1212.	1212.	6.460-05	4.167-05	1212.	6.650-05	4.290-05	1212.	1.335-04	8.585-05
W	1189.	1189.	5.686-05	3.667-05	1189.	6.009-05	3.876-05	1189.	1.295-04	8.323-05
WNW	1227.	1227.	5.870-05	3.786-05	1227.	5.565-05	3.591-05	1227.	9.980-05	6.416-05
NW	1128.	1128.	7.014-05	4.524-05	1128.	6.848-05	4.418-05	1128.	1.380-04	8.876-05
NNW	1044.	1044.	1.081-04	6.974-05	1044.	1.210-04	7.804-05	1044.	2.661-04	1.711-04

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

*The elevated (stack) and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode (vent) release data.

**Approximate distance from midpoint between gaseous effluent release points.

TABLE 7.2-8 (Cont'd)

BYRON 1&2

MAXIMUM OFFSITE FINITE PLUME GAMMA DOSE FACTORS FOR XE138

DOWNWIND DIRECTION	RESTRICTED AREA BOUND (METERS)	ELEVATED(STACK) RELEASE* RADIUS** (METERS)	S (MRAD/YR)/(UCI/SEC)	SBAR	MIXED MODE(VENT) RELEASE RADIUS** (METERS)	V (MRAD/YR)/(UCI/SEC)	VBAR	GROUND LEVEL RELEASE* RADIUS** (METERS)	G (MRAD/YR)/(UCI/SEC)	GBAR
N	1875.	1875.	6.240-04	4.500-04	1875.	7.439-04	5.360-04	1875.	1.674-03	1.198-03
NNE	1829.	1829.	6.841-04	4.933-04	1829.	7.254-04	5.233-04	1829.	1.453-03	1.040-03
NE	1585.	1585.	6.543-04	4.719-04	1585.	7.055-04	5.091-04	1585.	1.503-03	1.076-03
ENE	1234.	1234.	8.415-04	6.071-04	1234.	8.693-04	6.278-04	1234.	2.004-03	1.434-03
E	1227.	1227.	8.652-04	6.242-04	1227.	8.955-04	6.465-04	1227.	2.238-03	1.601-03
ESE	991.	991.	1.159-03	8.362-04	991.	1.220-03	8.809-04	991.	3.025-03	2.163-03
SE	1006.	1006.	1.067-03	7.703-04	1006.	1.224-03	8.832-04	1006.	3.766-03	2.693-03
SSE	800.	800.	1.155-03	8.336-04	800.	1.288-03	9.298-04	800.	4.217-03	3.014-03
S	945.	945.	8.264-04	5.965-04	945.	8.839-04	6.382-04	945.	2.567-03	1.835-03
SSW	975.	975.	6.624-04	4.782-04	975.	6.789-04	4.903-04	975.	1.901-03	1.359-03
SW	1067.	1067.	7.136-04	5.150-04	1067.	7.000-04	5.055-04	1067.	1.613-03	1.154-03
WSW	1212.	1212.	5.430-04	3.917-04	1212.	5.991-04	4.322-04	1212.	1.466-03	1.048-03
W	1189.	1189.	5.063-04	3.653-04	1189.	5.893-04	4.251-04	1189.	1.520-03	1.087-03
WNW	1227.	1227.	4.997-04	3.605-04	1227.	5.270-04	3.802-04	1227.	1.246-03	8.911-04
NW	1128.	1128.	5.810-04	4.192-04	1128.	6.331-04	4.568-04	1128.	1.622-03	1.160-03
NNW	1044.	1044.	8.715-04	6.290-04	1044.	1.077-03	7.764-04	1044.	2.807-03	2.007-03

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

*The elevated (stack) and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode (vent) release data.

**Approximate distance from midpoint between gaseous effluent release points.

TABLE 7.2-8 (Cont'd)

BYRON 1&2

MAXIMUM OFFSITE FINITE PLUME GAMMA DOSE FACTORS FOR AR 41

DOWNWIND DIRECTION	RESTRICTED AREA BOUND (METERS)	ELEVATED(STACK) RELEASE* RADIUS** (METERS)	S (MRAD/YR)/(UCI/SEC)	SBAR	MIXED MODE(VENT) RELEASE RADIUS** (METERS)	V (MRAD/YR)/(UCI/SEC)	VBAR	GROUND LEVEL RELEASE* RADIUS ** (METERS)	G (MRAD/YR)/(UCI/SEC)	GBAR
N	1875.	1875.	9.166-04	6.462-04	1875.	1.194-03	8.420-04	1875.	3.209-03	2.262-03
NNE	1829.	1829.	1.019-03	7.187-04	1829.	1.151-03	8.116-04	1829.	2.878-03	2.029-03
NE	1585.	1585.	9.617-04	6.780-04	1585	1.121-03	7.903-04	1585.	2.936-03	2.070-03
ENE	1234.	1234.	1.186-03	8.362-04	1234.	1.299-03	9.155-04	1234.	3.564-03	2.512-03
E	1227.	1227.	1.232-03	8.687-04	1227.	1.406-03	9.914-04	1227.	4.311-03	3.039-03
ESE	991.	991.	1.602-03	1.130-03	991.	1.808-03	1.274-03	991.	5.133-03	3.619-03
SE	1006.	1006.	1.460-03	1.029-03	1006.	1.929-03	1.360-03	1006.	7.203-03	5.078-03
SSE	800.	800.	1.517-03	1.069-03	800.	1.863-03	1.313-03	800.	6.975-03	4.917-03
S	945.	945.	1.145-03	8.072-04	945.	1.281-03	9.034-04	945.	4.157-03	2.930-03
SSW	975.	975.	9.040-04	6.373-04	975.	9.832-04	6.931-04	975.	3.076-03	2.168-03
SW	1067.	1067.	9.698-04	6.837-04	1067.	9.888-04	6.971-04	1067.	2.663-03	1.877-03
WSW	1212.	1212.	7.269-04	5.125-04	1212.	8.472-04	5.973-04	1212.	2.445-03	1.724-03
W	1189.	1189.	7.302-04	5.148-04	1189.	8.847-04	6.237-04	1189.	2.547-03	1.795-03
WNW	1227.	1227.	6.903-04	4.867-04	1227.	7.726-04	5.447-04	1227.	2.190-03	1.544-03
NW	1128.	1128.	7.918-04	5.582-04	1128.	9.099-04	6.415-04	1128.	2.705-03	1.907-03
NNW	1044.	1044.	1.175-03	8.284-04	1044.	1.530-03	1.078-03	1044.	4.395-03	3.099-03

BYRON SITE METEOROLOGICAL DATA 1/74 - 12/76

*The elevated (stack) and ground level release data are provided for reference purposes only. Routine dose calculations are performed using mixed mode (vent) release data.

**Approximate distance from midpoint between gaseous effluent release points.

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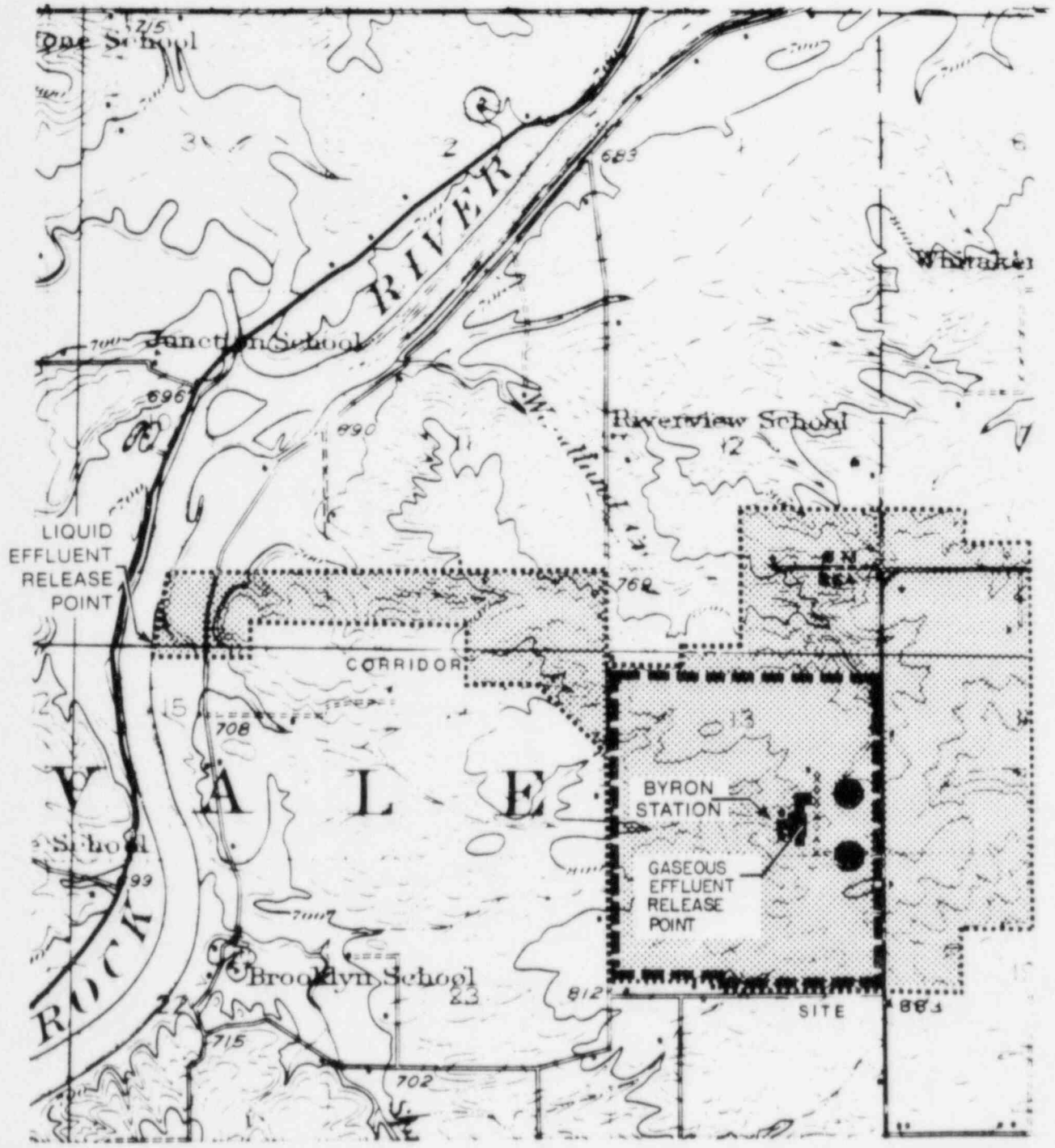

BYRON STATION

FIGURE 7.2-1

RESTRICTED AREA BOUNDARY

ODCM TABLE OF CONTENTS FOR BYRON SECTION 8.0

ODCM LIST OF TABLES FOR BYRON SECTION 8.0

ODCM LIST OF FIGURES FOR BYRON SECTION 8.0

8.0 RADIOACTIVE EFFLUENT TREATMENT SYSTEMS, MODELS FOR SETTING GASEOUS AND LIQUID EFFLUENT MONITOR ALARM AND TRIP SETPOINTS, AND ENVIRONMENTAL RADIOLOGICAL MONITORING

8.1 GASEOUS RELEASES

8.1.1 System Design

8.1.1.1 Gaseous Radwaste Treatment System

A gaseous radwaste treatment system shall be any system designed and installed to reduce radioactive gaseous effluents by collecting primary coolant system off-gases from the primary system and providing for delay or holdup for the purpose of reducing the total radioactivity prior to release to the environment. Refer to Figure 8.1-1 for a simplified system flowpath diagram.

8.1.1.2 Ventilation Exhaust Treatment System

A ventilation exhaust treatment system shall be any system designed and installed to reduce gaseous radioiodine or radioactive material in particulate form in effluents by passing ventilation or vent exhaust gases through charcoal adsorbers and/or HEPA filters for the purpose of removing iodines or particulates from the gaseous exhaust stream prior to the release to the environment (such a system is not considered to have any effect on noble gas effluents). Engineered Safety Feature (ESF) atmospheric cleanup systems are not considered to be ventilation exhaust treatment system components.

8.1.2 Alarm and Trip Setpoints

Alarm and trip setpoints of gaseous effluent monitors at the principal points of release of ventilation exhaust air

containing radioactivity are established to ensure that the release limits of 10 CFR 20 are not exceeded. The set-points are found by solving Equations 2.6* and 2.7** for each class of releases.

For this equation, the radioactivity mixture in the exhaust air is assumed to have the composition of gases listed in Table 3.5-7 of the Environmental Report Operating License Stage. According to Subsection 3.5.3.4 of the report, releases of radionuclides in gaseous effluents were calculated using the PWR-GALE computer program and the parameters listed in Table 3.5-5.

Equation 2.6* is rewritten using the fractional composition of each nuclide, f_i, and a total release rate, Q_t, for station vent stack releases (the principal point of release of ventilation exhaust air containing radioactivity):

$$1.11 \sum_i \left[Q_{tv} (\bar{V}_i \times f_i) \right] < 500 \text{ mrem/yr} \qquad (8.1)$$

f_i Fractional Radionuclide Composition

The release rate of radionuclide i divided by the total release of all radionuclides.

Q_{tv} Total Release Rate, Vent Release (μCi/sec)

The release rate for all radionuclides due to a station vent stack release.

$$Q_{iv} = Q_{tv} f_i \qquad (8.2)$$

Equation 8.1 can be solved for Q_{tv} for release limit determinations. Similarly, Equation 2.7** can be rewritten:

$$\sum_i \left[\bar{L}_i \, (\chi/Q)_v \, Q_{tv} \, f_i \exp (- \lambda_i \, R/3600 \, u_v) + 1.11 \, V_i \, Q_{tv} \, f_i \right] < 3000 \text{ mrem/yr} \qquad (8.3)$$

* Equation 2.9 of Revision 2.

** Equation 2.10 of Revision 2.

Equation 8.3 can be solved for Q_{tv} and a corresponding release limit can be determined. The most conservative release limit from Equations 8.1 and 8.3 will be used in selecting the appropriate alarm and trip setpoints for a vent release.

The exact settings will be selected to ensure that 10 CFR 20 limits are not exceeded.

Surveillance frequencies for gaseous effluent monitors will be as stated in Table 4.3-9 of the Technical Specifications. Calibration methods will be consistent with the definitions found in Section 1.0 of the Technical Specifications.

8.1.3 Station Vent Stack Monitors

Detectors 1RE-PR028A, B, C, D, and E (particulate, low gas, iodine, high gas, and background subtraction channels, respectively) and 2RE-PR028A, B, C, D, and E monitor station vent stack effluent from the auxiliary building vent stacks.

The particulate detector utilizes a beta scintillator and has a range of 10^{-11} to 10^{-5} µCi/cc. The low and high gas detectors utilize beta scintillators and have ranges of 10^{-6} to 10^{-2} µCi/cc and 10^{-2} to 10^{2} µCi/cc, respectively. The iodine detector utilizes a NaI(Tl) scintillator and has a range of 10^{-11} to 10^{-5} µCi/cc.

Both vent stack effluent monitors feature automatic isokinetic sampling, automatic gaseous composite grab sampling, and tritium sampling.

The monitor skids with associated pumps, detectors, and local controls are located in the auxiliary building on the 477-foot elevation.

Each monitor has a microprocessor (RM-80) which utilizes digital processing techniques to analyze data and control monitor functions. Monitor data, including current radiation levels, high radiation alarms, and monitor operational status, are displayed on a CRT display (RM-11) in the main control room.

A power supply unit furnishes the positive and negative voltages for the circuits, relays, and alarm lights and provides the high voltage for the detectors. The power supply unit is located on the monitor skids. The monitors are powered by local 120-Vac instrumentation buses.

Alarm setpoint determination is addressed in Subsection 8.1.2. The release limits (μCi/sec) obtained from Equations 8.1 and 8.3 are divided by the normal auxiliary building vent stack flow rates (cc/sec) to obtain the μCi/cc alarm setpoint values. Readouts for the vent stack monitors are in μCi/cc. The cpm to μCi/cc conversion is accomplished by use of conversion factors in the radiation monitoring system software.

8.1.4 Containment Purge Effluent Monitors

Detectors 1RE-PR001A, B, and C (particulate, gas, and iodine channels, respectively) and 2RE-PR001A, B, and C monitor containment purge effluent discharge to the auxiliary building vent stacks for Units 1 and 2, respectively.

The particulate detector utilizes a beta scintillator and has a range of 10^{-11} to 10^{-5} μCi/cc. The gas detector utilizes a beta scintillator and has a range of 10^{-6} to 10^{-2} μCi/cc. The iodine detector utilizes a NaI(Tl) scintillator and has a range of 10^{-11} to 10^{-5} μCi/cc.

The monitor skids with associated pumps, detectors, and local controls are located in the auxiliary building on the 475-foot elevation.

Each monitor has a microprocessor (RM-80) which utilizes digital processing techniques to analyze data and control monitor functions. Monitor data, including current radiation levels, high radiation alarms, and monitor operational status, are displayed on a CRT display (RM-11) in the main control room.

A power supply unit furnishes the positive and negative voltages for the circuits, relays, and alarm lights and provides the high voltage for the detectors. The power supply unit is located on the monitor skids. The monitors are powered by local 120-Vac instrumentation buses.

A containment atmosphere sample is obtained and analyzed prior to each containment purge release. The isotopic analysis results of this sample are used to determine the maximum allowed containment purge flow rate and as a basis for determining the containment purge effluent monitor setpoints.

8.1.5 Gas Decay Tank Monitors

Detectors 0RE-PR002A and B (low range gas and high range gas, respectively) monitor the radiation level of the gas decay tank discharge to the auxiliary building vent stacks. Detectors 0RE-PR002A and B are interlocked with valve 0GWRCV014. Automatically, on a high radiation and/or instrument failure signal from the detectors, vent valve 0GWRCV014 closes to isolate the gas decay tank discharge line.

Both the low range and high range gas detectors utilize beta scintillators and have ranges of 10^{-6} to 10^{-2} µCi/cc and 10^{-2} to 10^{2} µCi/cc, respectively.

The monitor skid with associated pump, detectors, and local controls is located in the auxiliary building on the 346-foot elevation.

The monitor has a microprocessor (RM-80) which utilizes digital processing techniques to analyze data and control monitor functions. Monitor data, including current radiation levels, high radiation alarms, and monitor operational status, are displayed on a CRT display (RM-11) in the main control room.

A power supply unit furnishes the positive and negative voltages for the circuits, relays, and alarm lights and provides the high voltage for the detectors. The power supply unit is located on the monitor skid. The monitor is powered by local 120-Vac instrumentation buses.

A grab sample from the gas decay tank to be released is obtained and analyzed prior to each gas decay tank discharge. The isotopic analysis results of this sample are used to determine the maximum allowed gas decay tank discharge line flow rate and as a basis for determining the gas decay tank monitor interlock and high alarm setpoints.

8.1.6 Allocation of Effluents from Common Release Points

Radioactive gaseous effluents released from the auxiliary building, miscellaneous ventilation system, and the gas decay tanks are comprised of contributions from both units. Under normal operating conditions, it is difficult to apportion the radioactivity between the units. Consequently, allocation will normally be made evenly between units.

8.1.7 Symbols Used in Section 8.1

SYMBOLS	NAME	UNIT
Q_{tv}	Total Release Rate, Vent Release	(μCi/sec)
$\overline{V}_i$	Gamma Whole Body Dose Constant, Vent Release	(mrad/yr per μCi/sec)
f_i	Fractional Radionuclide Composition	
$\overline{L}_i$	Beta Skin Dose Constant	(mrem/yr per $\mu Ci/m^3$)
$(\chi/Q)_v$	Relative Effluent Concentration, Vent Release	(sec/m^3)
λ_i	Radiological Decay Constant	(hr^{-1})
R	Downwind Range	(m)
u_v	Average Wind Speed, Vent Release	(m/sec)
Q_{iv}	Release Rate, Vent Release	(μCi/sec)
V_i	Gamma Dose Constant, Vent Release	(mrad/yr per μCi/sec)

8.1.8 Constants Used in Section 8.1

NUMERICAL VALUE	NAME	UNIT
1.11	Conversion Constant	(mrem/mrad)
3600	Conversion Constant	(sec/hr)

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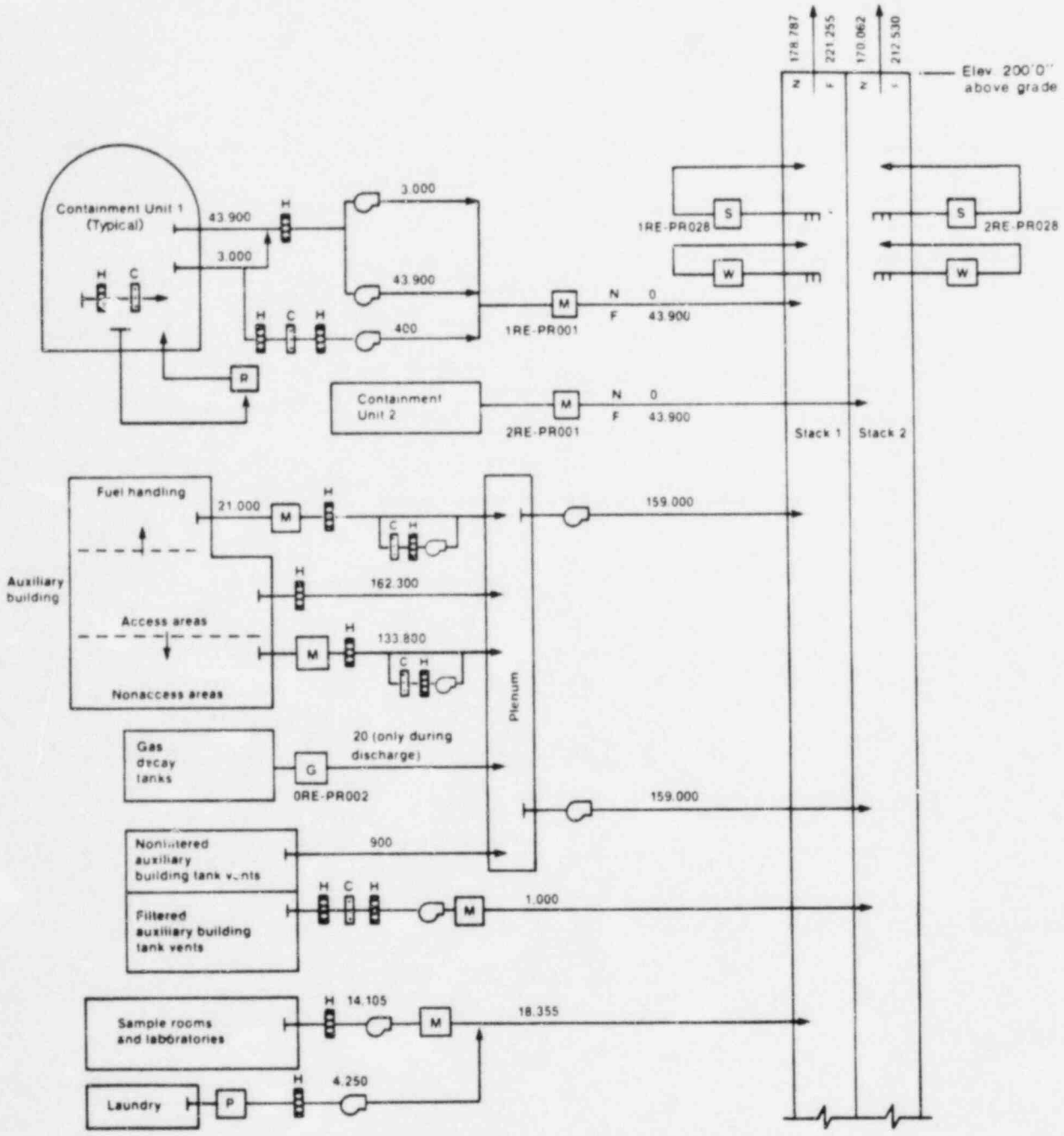
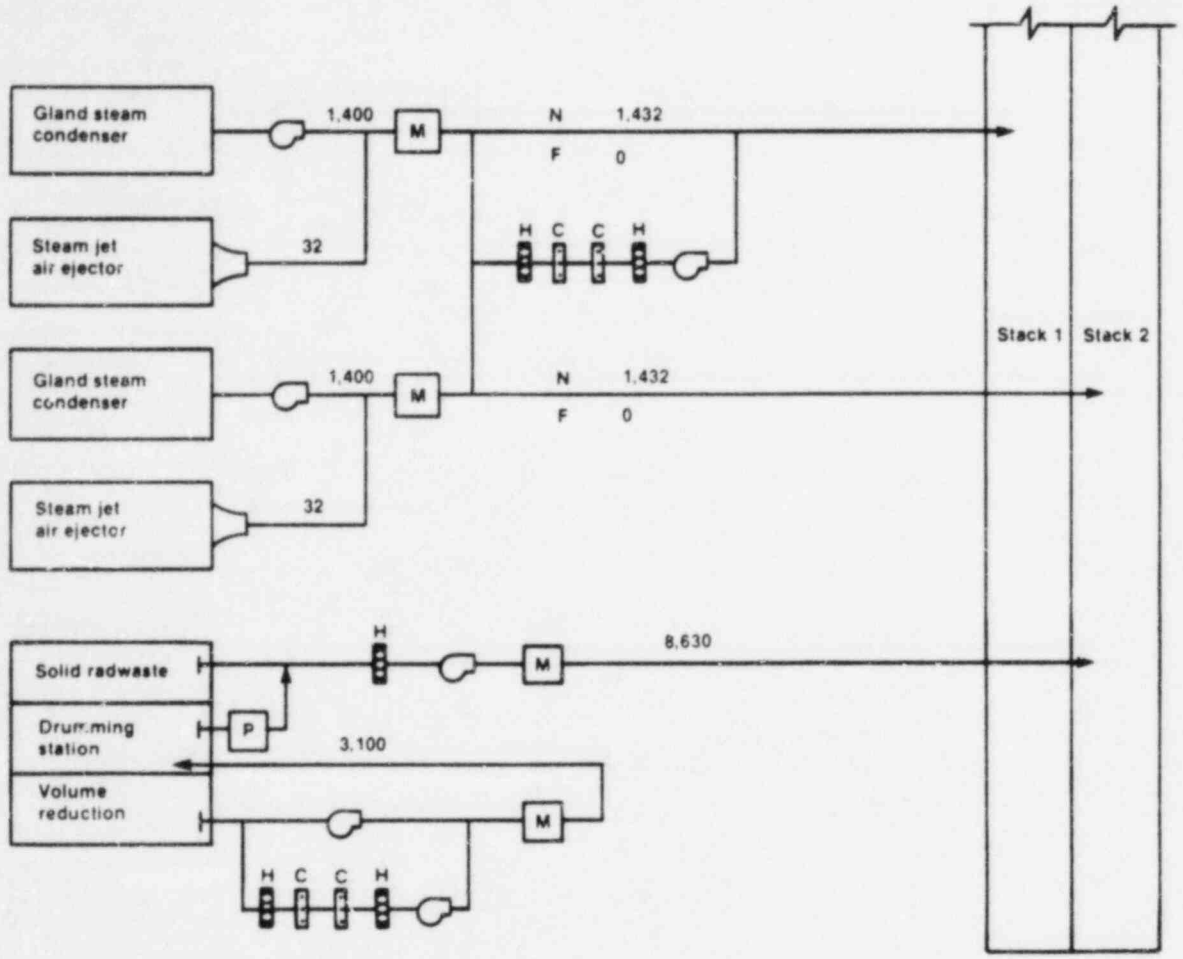


BYRON STATION

FIGURE 8.1-1

SIMPLIFIED HVAC AND GASEOUS EFFLUENT FLOW DIAGRAM

(SHEET 1 OF 2)



C Charcoal filter
F Refueling
G Noble gas radiation monitor (offline)
H HEPA filter
M Three-channel radiation monitor for particulate, iodine, and noble gas (offline)
N Normal operation
P Particulate monitor (offline)
R Hydrogen recombiner
S Normal range stack radiation monitor (particulate, iodine, and noble gas)
W Wide-range stack noble gas radiation monitor

All flow rates are cubic feet per minute

BYRON STATION

FIGURE 8.1-1

SIMPLIFIED HVAC AND GASEOUS EFFLUENT FLOW DIAGRAM

(SHEET 2 OF 2)

8.2 LIQUID RELEASES

8.2.1 System Design

A liquid radwaste treatment system shall be a system designed and installed to reduce radioactive liquid effluents by collecting the liquids, providing for retention or holdup, and providing for treatment by demineralizer or a concentrator for the purpose of reducing the total radioactivity prior to release to the environment. Refer to Figure 8.2-1 for a simplified system flowpath diagram.

8.2.2 Alarm Setpoints

Alarm setpoints of liquid effluent monitors at the principal release points are established to ensure that the limits of 10 CFR 20 are not exceeded in the unrestricted area. Prior to each batch release, a grab sample from the release tank is obtained and analyzed. Equation 8.4 is evaluated for each radionuclide identified in the grab sample isotopic analysis results to determine the maximum allowable flow rate in the liquid radwaste discharge line.

$$F^r_{max} = \left[\frac{MPC_i \times F^d_{act}}{C_i} \right] \div K \qquad (8.4)$$

F^r_{max} Maximum Permissible Flow Rate, Radwaste Discharge (gpm)

The maximum flow rate permitted in the liquid radwaste discharge line that meets 10 CFR 20 limits.

F^d_{act} Actual Flow Rate, Initial Dilution Stream (gpm)

The actual flow rate of the initial dilution stream which carries the radionuclides to the unrestricted area boundary.

MPC_i Maximum Permissible Concentration of Radionuclide i in the Unrestricted Area (10 CFR 20, Appendix B, Table II, Column 2) (μCi/ml)

C_i Concentration of Radionuclide i in the Release Tank (μCi/ml)

K Conservatism Constant Determined by Station Procedures for Liquid Releases; $K \geq 1.0$. Division by K allows station management to provide a margin of conservatism for liquid batch releases.

After determining F^r_{max} from Equation 8.4, 10 CFR 20 compliance is verified using Equations 8.5 and 8.6.

$$C^a_i = C_i \left[\frac{F^r_{max}}{F^r_{max} + F^d_{act}} \right] \quad (8.5)$$

C^a_i = Concentration of Radionuclide i in the Unrestricted Area. (μCi/ml)

$$\sum_i \frac{C^a_i}{MPC_i} \leq 1 \quad (8.6)$$

The alarm setpoints for the liquid radwaste effluent monitor (0RE-PR001) are determined prior to each release and are based on the isotopic analysis results of the release tank grab sample. The alarm setpoints are set so that any deviations from the isotopic analysis results will result in the automatic termination of the release. Readouts for the liquid effluent monitor are in μCi/ml. The cpm to μCi/ml conversion is accomplished by use of conversion factors in the radiation monitoring system software.

8.2.3 Liquid Radwaste Effluent Monitor

Radiation monitor 0RE-PR001 monitors liquid radwaste effluent and is interlocked with release tank discharge valve 0WX353.

On high radiation in the liquid radwaste effluent, the release tank discharge valve is closed automatically.

The release tank (0WX01T) holds 30,000 gallons and is located in the turbine building on the 401-foot elevation.

The monitor utilizes a NaI(Tl) detector with a range for gamma radiation of 10^{-8} μCi/ml to 10^{-2} μCi/ml. The monitor skid and associated features are located in the turbine building on the 401-foot elevation.

The monitor has a microprocessor (RM-80) which utilizes digital processing techniques to analyze data and control monitor functions. Monitor data, including current radiation levels, high radiation alarms, and monitor operational status, are displayed on a CRT display (RM-11) in the main control room.

A power supply unit furnishes the positive and negative voltages for the circuits, relays, and alarm lights and provides the high voltage for the detector. The power supply is located on the monitor skid. The monitor is powered from local 120-Vac instrumentation buses.

A discussion of alarm setpoints for 0RE-PR001 is included in Subsection 8.2.2.

8.2.4 Station Blowdown Monitor

Radiation monitor 0RE-PR010 continuously monitors the circulating water blowdown for radioactivity. The monitor utilizes a NaI(Tl) detector with a range for gamma radiation of 10^{-8} µCi/ml to 10^{-2} µCi/ml. The monitor skid and associated features are located in the turbine building on the 364-foot elevation.

The monitor has a microprocessor (RM-80) which utilizes digital processing techniques to analyze data and control monitor functions. Monitor data, including current radiation levels, high radiation alarms, and monitor operational status, are displayed on a CRT display (RM-11) in the main control room.

A power supply unit furnishes the positive and negative voltages for the circuits, relays, and alarm lights and provides high voltage for the detector. The power supply is located on the monitor skid. The monitor is powered from local 120-Vac instrumentation buses.

The alarm setpoints for the station blowdown monitor are determined prior to each release and are based on the isotopic analysis results of the release tank grab sample and the actual dilution flow rates. The alarm setpoints are set so

that any deviations from the isotopic analysis results or from the specified dilution flow rate will result in an alarm from the monitor. Between batch releases, the station blowdown monitor alarm setpoints are set based upon the I-131 MPC and the average dilution flow rate.

8.2.5 Reactor Containment Fan Cooler (RCFC) and Essential Service Water Outlet Line Monitors

Radiation monitors 1RE-PR002, 2RE-PR002, 1RE-PR003, and 2RE-PR003 monitor the RCFC and essential service water outlet lines for radioactivity. The monitor utilizes a NaI(Tl) detector with a range for gamma radiation of 10^{-8} µCi/ml to 10^{-2} µCi/ml. The monitor skid and associated features are located in the auxiliary building on the 401-foot elevation.

The monitor has a microprocessor (RM-80) which utilizes digital processing techniques to analyze data and control monitor functions. Monitor data, including current radiation levels, high radiation alarms, and monitor operational status, are displayed on a CRT display (RM-11) in the main control room.

A power supply unit furnishes the positive and negative voltages for the circuits, relays, and alarm lights and provides high voltage for the detector. The power supply is located on the monitor skid. The monitor is powered from local 120-Vac instrumentation buses.

During initial unit startup, alarms are set at twice background.

8.2.6 Administrative and Procedural Controls for Radwaste Discharges

Administrative and procedural controls have been designed to ensure proper control of radioactive liquid radwaste discharge in order to preclude a release in excess of 10 CFR 20 limits. The discharge rate for each batch is calculated by radiation chemistry personnel (Equation 8.4) and then provided to operating staff personnel. All liquid radwaste discharges will be from the release tank 0WX01T. On high radiation in the liquid radwaste effluent, the release tank discharge valve 0WX353 is closed automatically.

The proper valve lineup is performed by the operator prior to each batch discharge, per station procedures. The actual discharge is authorized by the shift engineer.

The system is equipped with a radiation trip point which alarms and initiates automatic valve closure on the radwaste discharge line to prevent the violation of 10 CFR 20 limits.

8.2.7 Determination of Initial Dilution Stream Flow Rates

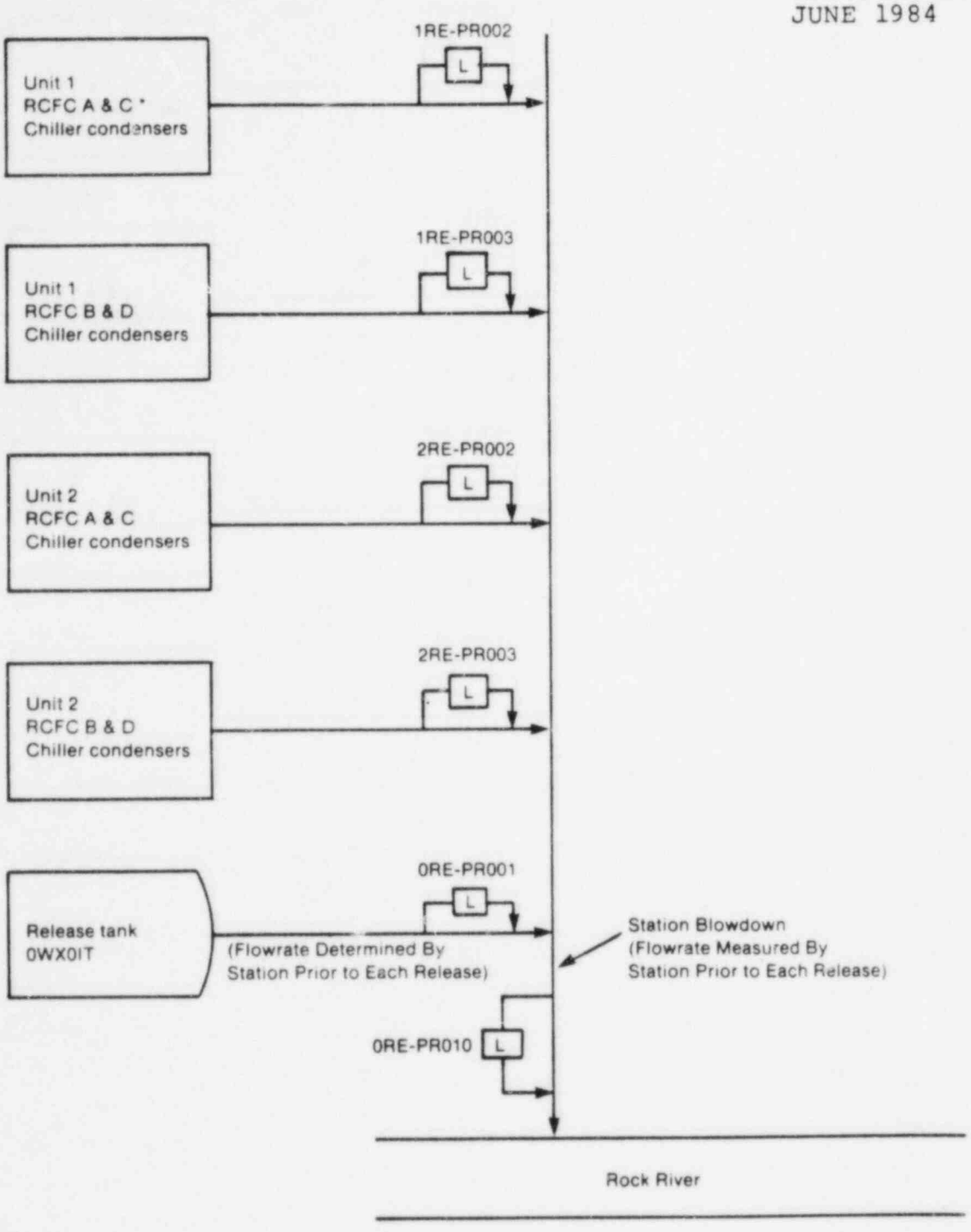
For those release paths which have installed flow monitoring instrumentation, that instrumentation will be used to determine the flow rate of the initial dilution stream. This instrumentation will be operated and maintained as prescribed by the Technical Specifications. For those release paths which do not have installed flow monitoring instrumentation, flow rates will be determined by use of appropriate engineering data such as pump curves, differential pressures, or valve position indication.

8.2.8 Allocation of Effluents from Common Release Points

Radioactive liquid effluents released from the release tank (0WX01T) are comprised of contributions from both units. Under normal operating conditions, it is difficult to apportion the radioactivity between the units. Consequently, allocation will normally be made evenly between units.

8.2.9 Symbols Used In Section 8.2

SYMBOL	NAME	UNIT
C_i^a	Concentration of Radionuclide i in the Unrestricted Area	(μCi/ml)
C_i	Concentration of Radionuclide i in the Release Tank	(μCi/ml)
MPC_i	Maximum Permissible Concentration of Radionuclide i in the Unrestricted Area	(μCi/ml)
F_{max}^r	Maximum Permissible Flow Rate, Radwaste Discharge	(gpm)
F_{act}^d	Actual Flow Rate, Initial Dilution Stream	(gpm)
K	Conservatism Constant Determined by Station Procedures for Liquid Releases; $K \geq 1.0$	



L = Liquid Process Radiation Monitor
RCFC = Reactor Containment Fan Cooler

*In each unit, only the A & C or B & D chiller condensers are operating at one time.

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FIGURE 8.2-1

LIQUID RELEASE FLOWPATH

8.3 SOLIDIFICATION OF WASTE/PROCESS CONTROL PROGRAM

The process control program (PCP) shall contain the sampling, analysis, and formulation determination by which solidification of radioactive wastes from liquid systems is ensured.

8.4 ENVIRONMENTAL RADIOLOGICAL MONITORING

The environmental radiological monitoring program for the environs around Byron Station is given in Table 8.4-1. Reporting levels and lower limits of detection for this program are given in Tables 8.4-2 and 8.4-3, respectively.

Figures 8.4-1, 8.4-2, and 8.4-3 show sampling and monitoring locations.

TABLE 8.4-1

ENVIRONMENTAL RADIOLOGICAL MONITORING PROGRAM[a]

EXPOSURE PATHWAY AND/OR SAMPLE	SAMPLING OR MONITORING LOCATIONS	SAMPLING OR COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
1. Direct Radiation	Indicators a. Inner Ring 101-1, 1.2 mi NNE 101-2, 1.2 mi NNE 102-1, 1.0 mi NNE 102-2, 1.0 mi NNE 103-1, 1.7 mi NE 103-2, 1.6 mi NE 104-1, 1.4 mi ENE 104-2, 1.4 mi ENE 105-1, 1.3 mi E 105-2, 1.3 mi E 106-1, 1.4 mi ESE 106-2, 1.4 mi ESE 107-1, 1.4 mi SE 107-2, 1.4 mi SE 108-1, 0.6 mi SSE 108-2, 0.6 mi SSE 109-1, 0.6 mi S 109-2, 0.6 mi S 110-1, 0.6 mi SSW 110-2, 0.6 mi SSW 111-1, 0.9 mi SW 111-2, 0.8 mi SW 112-1, 0.8 mi WSW 112-2, 0.7 mi WSW 113-1, 0.7 mi W 113-2, 0.7 mi W 114-1, 0.8 mi WNW 114-2, 0.8 mi WNW 115-1, 1.0 mi NW 115-2, 1.0 mi NW 116-1, 1.4 mi NNW 116-2, 1.4 mi NNW b. Outer Ring 201-1, 4.8 mi N 201-2, 5.2 mi N 202-1, 4.5 mi NNE 202-2, 5.2 mi NNE 203-1, 5.1 mi NE 203-2, 5.1 mi NE 204-1, 4.2 mi ENE 204-2, 4.1 mi ENE 205-1, 3.9 mi E 205-2, 4.1 mi E	Quarterly	Gamma dose quarterly

TABLE 8.4-1 (Cont'd)

EXPOSURE PATHWAY AND/OR SAMPLE	SAMPLING OR MONITORING LOCATIONS	SAMPLING OR COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
1. Direct Radiation (Cont'd)	Indicators (Cont'd) b. Outer Ring (Cont'd) 206-1, 4.2 mi ESE 206-2, 4.3 mi SE 207-1, 4.2 mi SE 207-2, 3.7 mi SE 208-1, 4.1 mi SSE 208-2, 3.8 mi SSE 209-1, 3.8 mi S 209-2, 3.9 mi SSW 210-1, 3.6 mi SSW 210-2, 3.6 mi SW 211-1, 5.2 mi SW 211-2, 4.8 mi WSW 212-1, 4.9 mi WSW 212-2, 5.1 mi W 213-1, 5.0 mi W 213-2, 5.2 mi WNW 214-1, 4.8 mi WNW 214-2, 5.2 mi NW 215-1, 5.4 mi NW 215-2, 5.2 mi NW 216-1, 4.8 mi NNW 216-2, 5.1 mi NNW c. Special Interest At each of the airborne pathway indicator locations specified in Part 2 of this table. Controls At each of the airborne pathway control locations specified in Part 2 of this table.		
2. Airborne Radioiodine and Particulates	Indicators a. Near Site Boundary BY-21, North Parking Lot, 0.27 mi N BY-22, CECo Real Estate Office, 0.30 mi E BY-23, South of Plant on Deerpath Road, 0.59 mi S BY-24, Met Tower, 0.66 mi SW b. Near Community with Highest Calculated Annual Average Ground Level D/Q BY-1, Byron, 3.5 mi NNE	Continuous sampler operation with sample collection weekly, or more frequently if required by dust loading.	Radioiodine Canister: I-131 analysis biweekly. Particulate Sampler: a. Gross beta radioactivity analysis following filter change.[b] b. Gamma isotopic analysis of composite (by location) quarterly.[c]

TABLE 8.4-1 (Cont'd)

EXPOSURE PATHWAY AND/OR SAMPLE	SAMPLING OR MONITORING LOCATIONS	SAMPLING OR COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
2. Airborne (Cont'd)	Indicators (Cont'd) c. Other BY-2, Stillman Valley, 6.2 mi NE BY-3, Nearsite - East, 3.8 mi E BY-4, Paynes Pt., 4.5 mi SE BY-5, Nearsite - South, 3.6 mi S BY-6, Oregon, 4.6 mi SSW Controls BY-7, Mt. Morris, 7.8 mi WSW BY-8, Leaf River, 7.0 mi NW		
3. Waterborne			
a. Surface	Indicators BY-9, Woodland Creek, 2.3 mi W BY-11, Byron Discharge Pipe/River, at Station BY-12, Oregon Pool of Rock River, Downstream of Discharge, 4.5 mi SSW Controls BY-10, Byron Intake Pipe/River, at Station BY-13, Oregon Pool of Rock River, Upstream of Intake, 4.3 mi SSW	Weekly collection composited monthly.	Gamma isotopic analysis[c] monthly. Composite for tritium analysis quarterly.
b. Ground	Indicators BY-18, Onsite Well, at Station Controls BY-14, CECo Real Estate Office, 0.3 mi E	Quarterly	Gamma isotopic[c] and tritium analysis quarterly.
c. Sediment from Shoreline	Indicators BY-12, Oregon Pool of Rock River, Downstream of Discharge, 4.5 mi SSW Controls BY-13, Oregon Pool of Rock River, Upstream of Intake, 4.3 mi SSW	Semiannually	Gamma isotopic analysis[c] semiannually.
4. Ingestion			
a. Milk	Indicators BY-15, Groenhagen/Oltmann Farm, 2.0 mi S BY-16, Ashelford Farm, 2.7 mi W BY-20, Meyers Farm, 5.0 mi SE Controls BY-17, Bosecker/Lingel Farm, 7.0 mi NE	Semimonthly when animals are on pasture, monthly at other times.	Gamma isotopic[c] and I-131 analysis semimonthly when animals are on pasture, monthly at other times.

TABLE 8.4-1 (Cont'd)

EXPOSURE PATHWAY AND/OR SAMPLE	SAMPLING OR MONITORING LOCATIONS	SAMPLING OR COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
4. Ingestion (Cont'd)			
b. Fish and Invertebrates Representative samples of commercially and recreationally important species.	Indicators BY-12, Oregon Pool of Rock River, Downstream of Discharge, 4.5 mi SSW Controls BY-13, Oregon Pool of Rock River, Upstream of Intake, 4.3 mi SSW	Three times per year (spring, summer, and fall).	Gamma isotopic analysis[c] on edible portions.
c. Food Products			
Representative samples of the principal classes of food products.	Indicators From any area within 10 miles of the plant that is irrigated by water in which plant wastes have been discharged.	At time of harvest.[d]	Gamma isotopic analysis[c] on edible portions.
Samples of three different kinds of broadleaf vegetation.	From nearest each of two different offsite locations of highest predicted annual average ground level D/Q (see Table 7.2-6).	Monthly when available and required; required only if milk sampling is not performed.	Gamma isotopic[c] and I-131 analysis.
One sample each of broadleaf vegetation similar to that collected for the above requirement.	Controls From a location 9.3 to 18.6 miles from the station in direction of lowest predicted annual average ground level D/Q (see Table 7.2-6).	Monthly when available and required; required only if milk sampling is not performed.	Gamma isotopic[c] and I-131 analysis.

[a] Deviations are permitted from the required sampling schedule if specimens are unobtainable due to hazardous conditions, seasonal unavailability, malfunction of automatic sampling equipment and other legitimate reasons. If specimens are unobtainable due to sampling equipment malfunction, every effort shall be made to complete corrective action prior to the end of the next sampling period. All deviations from the sampling schedule shall be documented in the Annual Radiological Environmental Operating Report. It is recognized that, at times, it may not be possible or practicable to continue to obtain samples of the media of choice at the most desired location or time. In these instances suitable alternative media and locations may be chosen for the particular pathway in question and appropriate substitutions made within 30 days in the radiological environmental monitoring program. The cause of the unavailability of samples for that pathway and the new location(s) for obtaining replacement samples shall be identified in a Special Report to the Nuclear Regulatory Commission within 30 days. The report shall also include a revised figure(s) and table for the ODCM reflecting the new location(s).

[b] Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than ten times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.

[c] Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.

[d] If harvest occurs more than once a year, sampling shall be performed during each discrete harvest. If harvest occurs continuously, sampling shall be monthly. Attention shall be paid to including samples of tuberous and root food products.

TABLE 8.4-2

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

ANALYSIS	REPORTING LEVELS				
	WATER (pCi/ℓ)	AIRBORNE PARTICULATE OR GASES (pCi/m^3)	FISH (pCi/kg, wet)	MILK (pCi/ℓ)	FOOD PRODUCTS (pCi/kg, wet)
H-3	20,000*				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		10,000		
Zn-65	300		20,000		
Zr-Nb-95	400				
I-131	2	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200			300	

*For drinking water samples. This is 40 CFR Part 141 value. If no drinking water pathway exists, a value of 30,000 pCi/ℓ may be used.

TABLE 8.4-3

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS[a]

LOWER LIMIT OF DETECTION (LLD)[b,c]

ANALYSIS	WATER (pCi/ℓ)	AIRBORNE PARTICULATE OR GAS (pCi/m^3)	FISH (pCi/kg, wet)	MILK (pCi/ℓ)	FOOD PRODUCTS (pCi/kg, wet)	SEDIMENT (pCi/kg, dry)
Gross Beta	4	0.01				
H-3	2000*					
Mn-54	15		130			
Fe-59	30		260			
Co-58,60	15		130			
Zn-65	30		260			
Zr-Nb-95	15					
I-131	1[d]	0.10		1	60	
Cs-134	15	0.05	130	15	60	150
CS-137	18	0.06	150	18	80	180
Ba-La-140	15			15		

*If no drinking water pathway exists, a value of 3000 pCi/ℓ may be used.

TABLE 8.4-3 (Cont'd)

[a] This list does not mean that only these nuclides are to be considered. Other peaks that are identifiable, together with those of the above nuclides, shall also be analyzed and reported in the Annual Radiological Environmental Operating Report.

[b] Required detection capabilities for thermoluminescent dosimeters used for environmental measurements are given in Regulatory Guide 4.13.

[c] The LLD is defined, for purposes of these specifications, as the smallest concentration of radioactive material in a sample that will yield a net count, above system background, that will be detected with 95 percent probability with only 5 percent probability of falsely concluding that a blank observation represents a "real" signal.

For a particular measurement system, which may include radiochemical separation:

$$LLD = \frac{4.66\ s_b}{E \cdot V \cdot 2.22 \cdot Y \cdot \exp(-\lambda \Delta t)}$$

where:

LLD = the "a priori" lower limit of detection (picoCuries per unit mass or volume),

s_b = the standard deviation of the background counting rate or of the counting rate of a blank sample as appropriate (counts per minute),

E = the counting efficiency (counts per disintegration),

V = the sample size (units of mass or volume),

2.22 = the number of disintegrations per minute per picoCurie,

Y = the fractional radiochemical yield, when applicable,

λ = the radioactive decay constant for the particular radionuclide, (sec^{-1}), and

Δt = the elapsed time between sample collection, or end of the sample collection period, and time of counting (sec).

Typical values of E, V, Y, and Δt should be used in the calculation.

It should be recognized that the LLD is defined as an a priori (before the fact) limit representing the capability of a measurement system and not as an a posteriori (after the fact) limit for a particular measurement. Analyses shall be performed in such a manner that the stated LLDs will be achieved under routine conditions. Occasionally

TABLE 8.4-3 (Cont'd)

background fluctuations, unavoidable small sample sizes, the presence of interfering nuclides, or other uncontrollable circumstances may render these LLDs unachievable. In such cases, the contributing factors shall be identified and described in the Annual Radiological Environmental Operating Report.

[d] LLD for drinking water samples. If no drinking water pathway exists, an LLD of 60 pCi/ℓ may be used.

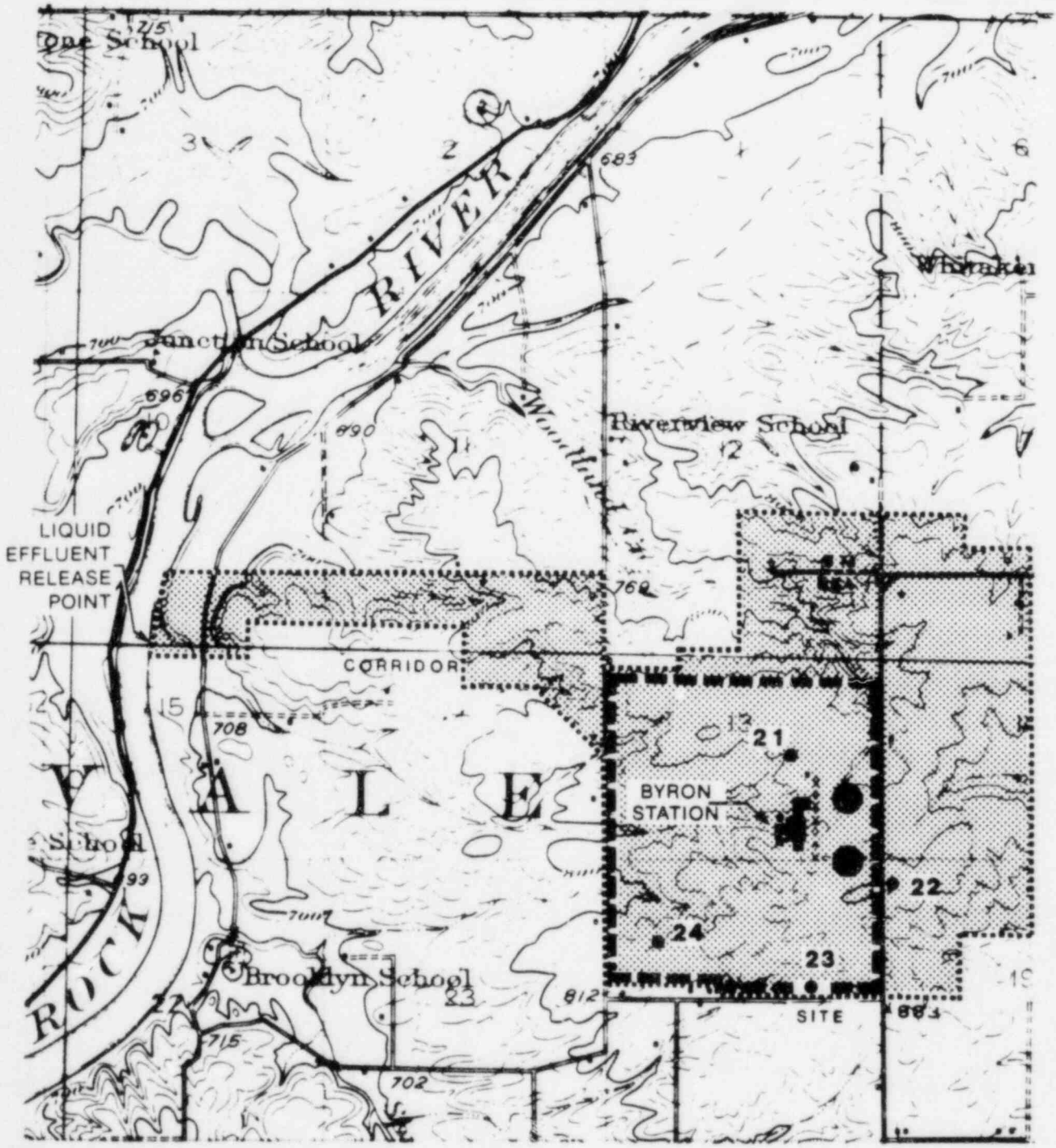

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FIGURE 8.4-1

ONSITE AIR SAMPLING LOCATIONS

REVISION 11
JUNE 1984

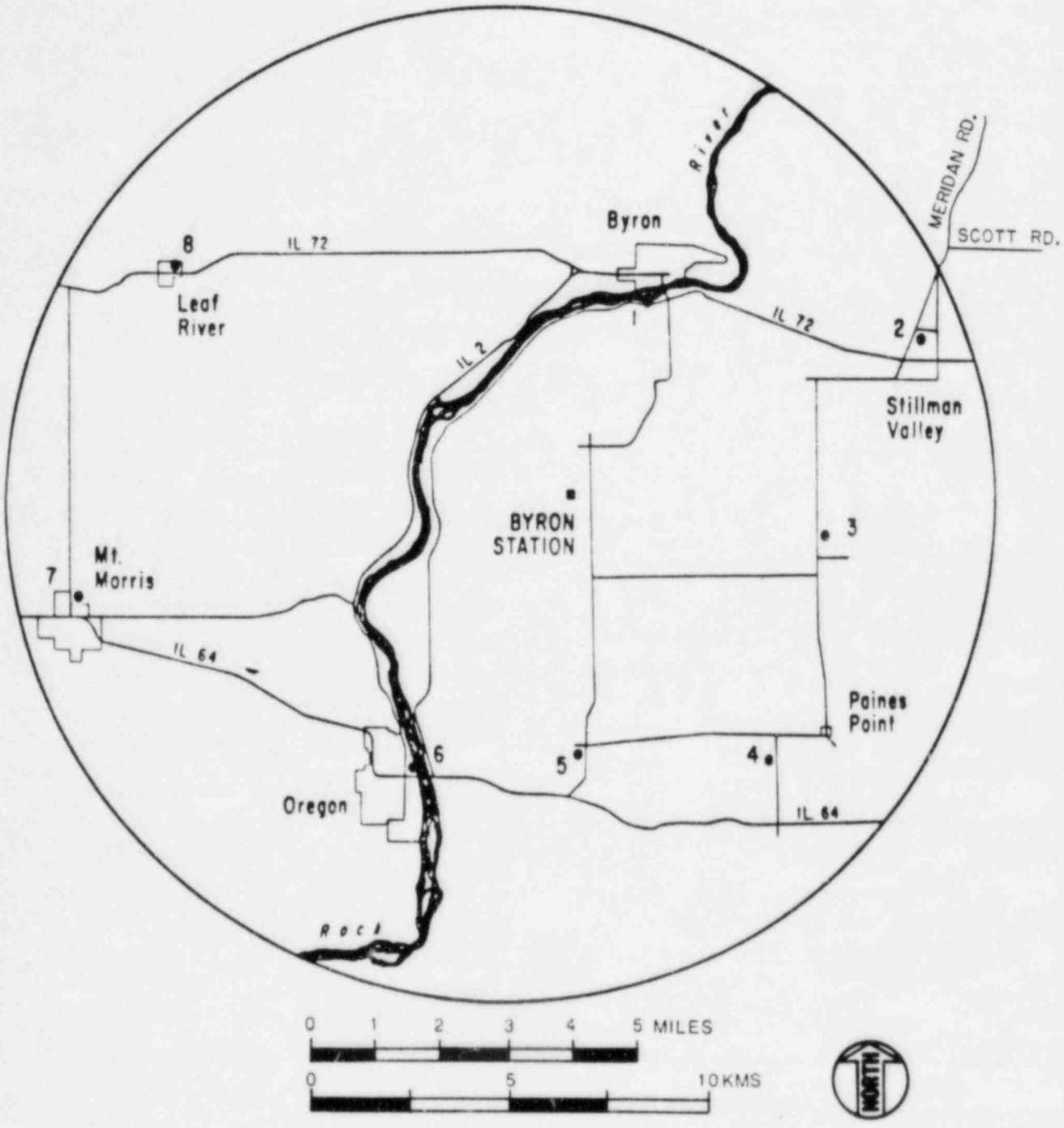

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FIGURE 8.4-2

OFFSITE AIR SAMPLING LOCATIONS

REVISION 11
JUNE 1984

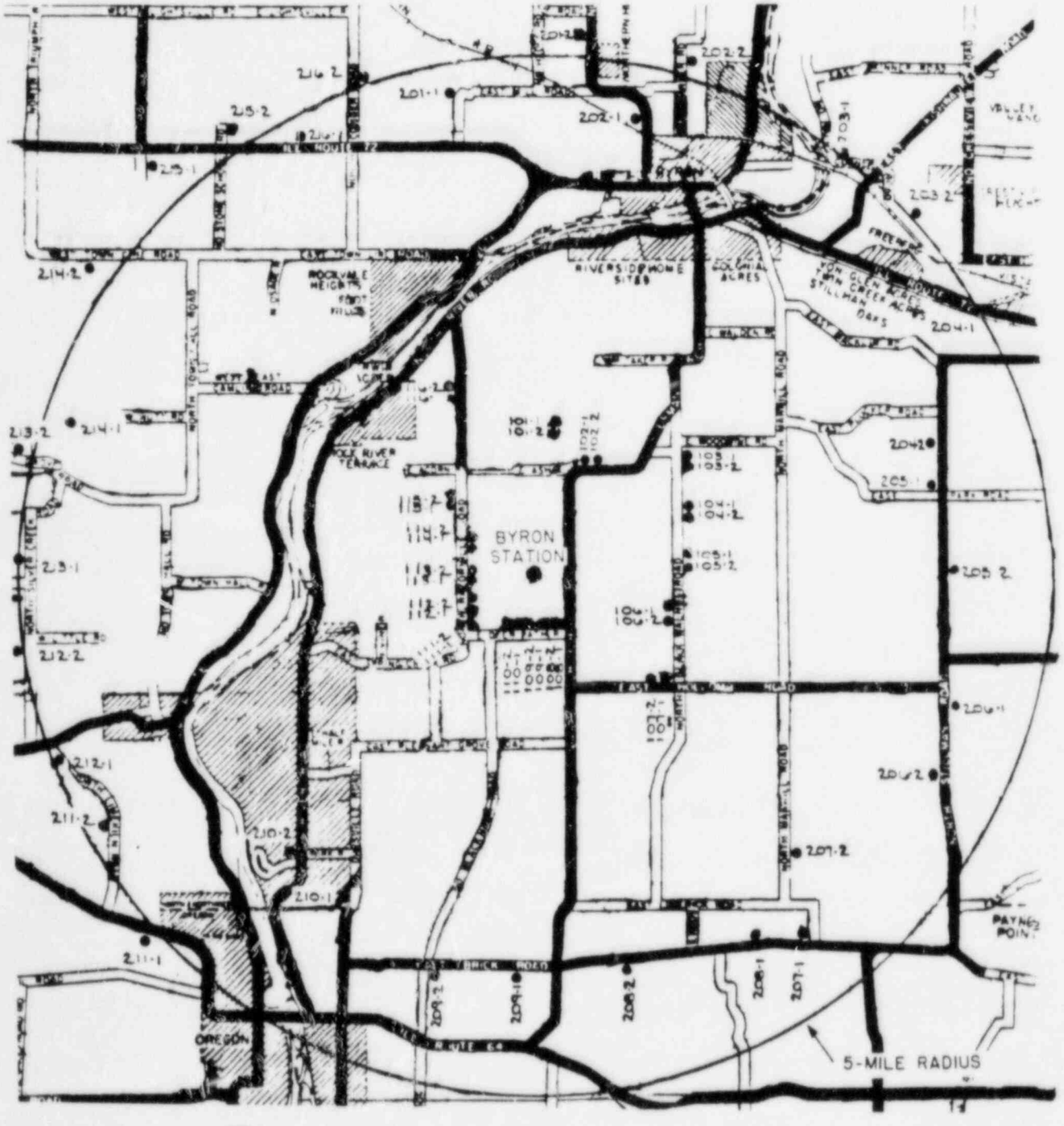

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FIGURE 8.4-3

INNER RING AND OUTER RING TLD LOCATIONS