FNP-0-M-011
May 21, 1985
Revision 1

ALABAMA POWER COMPANY

JOSEPH M. FARLEY NUCLEAR PLANT

UNITS 1 AND 2

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OFFSITE DOSE CALCULATION MANUAL

Approved:

Technical Superintendent

Date Issued: 6/25/85

List of Effective Page

Page	Rev.
i,ii	0
1-38	0
39-52	1

CHP/ODCM

4.12.1 Radiological Environmental Monitoring Locations

Table 3.12-1 and Figures 3.12-1, 3.12-2, 3.12-3, and 3.12-4 provid the Radiological Environmental Monitoring point locations.

TABLE 3.12-1

RADIOLOGICAL ENVIRONMENTAL MONITORING LOCATIONS

EXPOSURE PATHWAY AND/OR SAMPLE	SAMPLE LOCATIONS	SAMPLE IDENTIFICATION
1. AIRBORNE		
a. Particulate	Indicator Stations:	
	River Intake Structure (ESE-0.8)	PI - 0501
	South Perimeter (SSE-1.0)	PI - 0701
	Plant Entrance (WSW-0.9)	PI - 1101
	North Perimeter (N-0.8)	PI - 1601
	Control Stations:	
	Blakely, Ga. (NE-15)	PB - 0215
	Dothan, Ala. (W-18)	PB - 1218
	[1]Neals Landing, Fl. (SSE-18)	PB - 0718
	Community Stations:	
	Great Southern Paper Co. (SSE-3)	PC - 0703
	Ashford, AL. (WSW-8)	PC - 1108
	Columbia, AL. (N-5)	PC - 1605
b. Radioiodine	Indicator Stations:	
	River Intake Structure (ESE-0.8)	II - 0501
	South Perimeter (SSE-1.0)	II - 0701
	Plant Entrance (WSW-0.9)	II - 1101
	North Perimeter (N-0.8)	II - 1601
	Control Stations:	
	Blakely, Ga. (NE-15)	IB - 0215
	Dothan, Ala. (W-18)	IB - 1218
	[1]Neals Landing, Fl. (SSE-18)	IB - 0718
	Community Stations:	
	[2]Great Southern Paper Co. (SSE-3)	IC - 0703

[1]Not required by Tech Specs. Used as a spare station.
[2]Not required by Tech Specs. Used for comparison purposes with state of Ga. EPD.

TABLE 3.12-1 (con't)

EXPOSURE PATHWAY AND/OR SAMPLE	SAMPLE LOCATIONS	SAMPLE IDENTIFICATION
2. Direct Radiation	Indicator Stations:	
	Plant Perimeter	
	(NNE-0.9)	RI - 0101
	(NE-1.0)	RI - 0201
	(ENE-0.9)	RI - 0301
	(E-0.8)	RI - 0401
	(ESE-0.8)	RI - 0501
	(SE-1.1)	RI - 0601
	(SSE-1.0)	RI - 0701
	(S-1.0)	RI - 0801
	(SSW-1.0)	RI - 0901
	(SW-0.9)	RI - 1001
	(WSW-0.9)	RI - 1101
	(W-0.8)	RI - 1201
	(WNW-0.8)	RI - 1301
	(NW-1.1)	RI - 1401
	(NNW-0.9)	RI - 1501
	(N-0.8)	RI - 1601
	Control Stations:	
	Blakely, Ga. (NE-15)	RB - 0215
	Neals Landing, Fla. (SSE-18)	RB - 0718
	Dothan, Ala. (W-15)	RB - 1215
	Dothan, Ala. (W-18)	RB - 1218
	Community Stations:	
	(NNE-4)	RC - 0104
	(NE-4)	RC - 0204
	(ENE-4)	RC - 0304
	(E-5)	RC - 0405
	(ESE-5)	RC - 0505
	(SE-5)	RC - 0605
	(SSE-3)	RC - 0703

TABLE 3.12-1 (con't)

EXPOSURE PATHWAY AND/OR SAMPLE	SAMPLE LOCATIONS	SAMPLE IDENTIFICATION
2. Direct Radiation (Con't)	Community Stations (Cont):	
	(S-5)	RC - 0805
	(SSW-4)	RC - 0904
	(SW-1.2)	RC - 1001
	(SW-5)	RC - 1005
	(WSW-4)	RC - 1104
	(WSW-8)	RC - 1108
	(W-4)	RC - 1204
	(WNW-4)	RC - 1304
	(NW-4)	RC - 1404
	(NNW-4)	RC - 1504
	(N-5)	RC - 1605
3. WATERBORNE		
a. Surface	Indicator Station: Great Southern Paper Intake Structure (River Mile-40)	WRI
	Control Station: Andrews Lock & Dam Upper Pier (River Mile-47)	WRB
b. Ground	Indicator Station: Great Southern Paper Co. Well (SSE-4)	WGI - 07
	Control Station: Mr. Whatley (SW-1.2)	WGB - 10
c. Sediment	Indicator Station: Smith's Bend (River Mile-41)	RSI
	Control Station: Andrews Lock & Dam Reservoir (River Mile-47)	RSB

TABLE 3.12-1 (con't)

EXPOSURE PATHWAY AND/OR SAMPLE	SAMPLE LOCATIONS	SAMPLE IDENTIFICATION
4. INGESTION		
A. Milk	Indicator Station: None	
	Control Station: Brooks-Silcox Dairy, Ashford, Ala. (WSW-10)	MB - 1110
b. Fish	Indicator Station: Smith Bend (River Mile-41)	
	Game Fish	FGI
	Bottom Feeding Fish	FBI
	Control Station: Andrews Lock & Dam Reservoir (River Mile-47)	
	Game Fish	FGB
	Bottom Feeding Fish	FBB
c. Forage	Indicator Stations:	
	South Perimeter (SSE-1.0)	FI - 0701
	North Perimeter (N-0.8)	FI - 1601
	Control Station: Dothan, Alabama (W-18)	FB - 1218

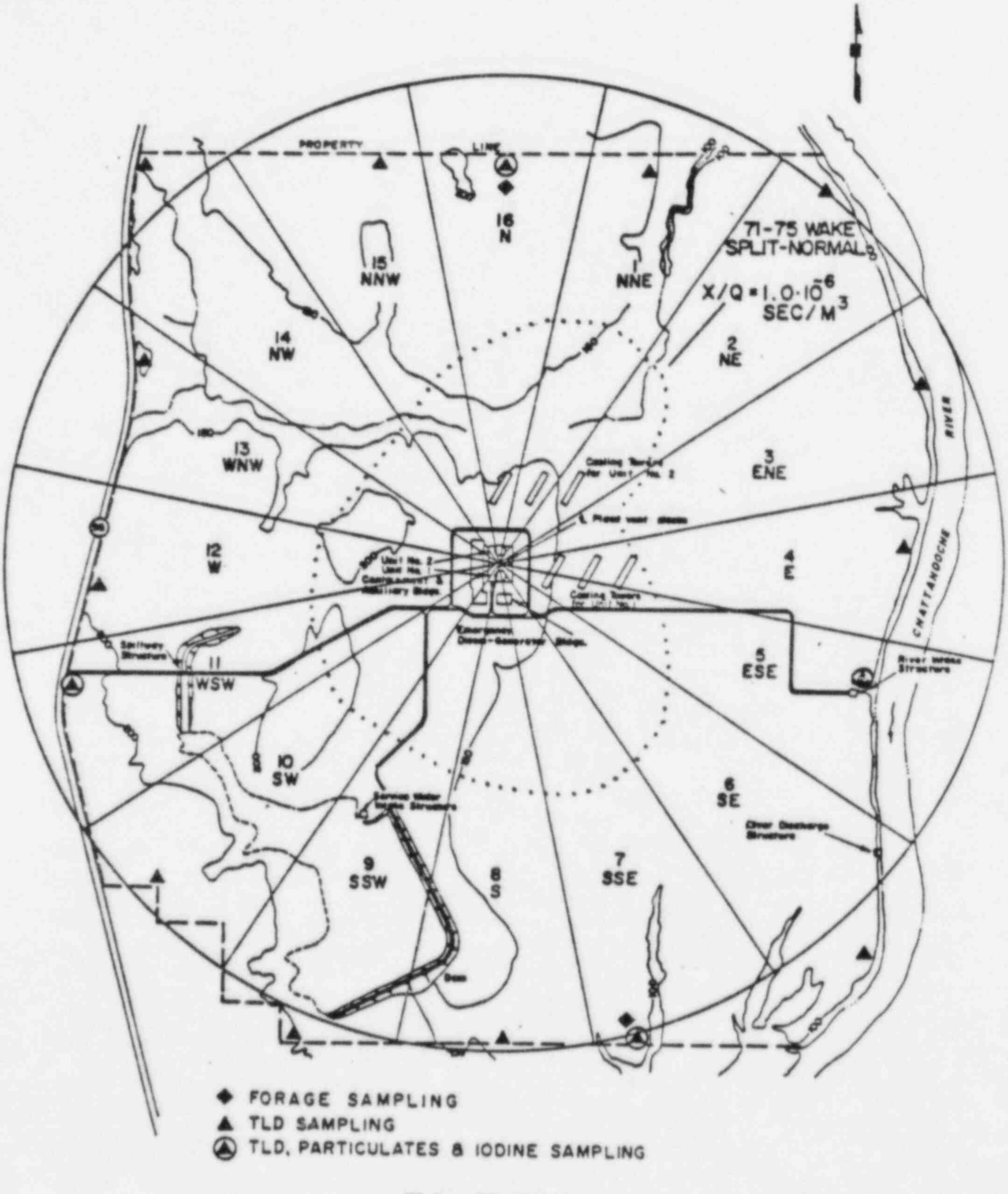


FIGURE 3.12-1 INDICATOR SAMPLING LOCATIONS FOR AIRBORNE ENVIRONMENTAL RADIOACTIVITY AT THE FARLEY NUCLEAR PLANT.

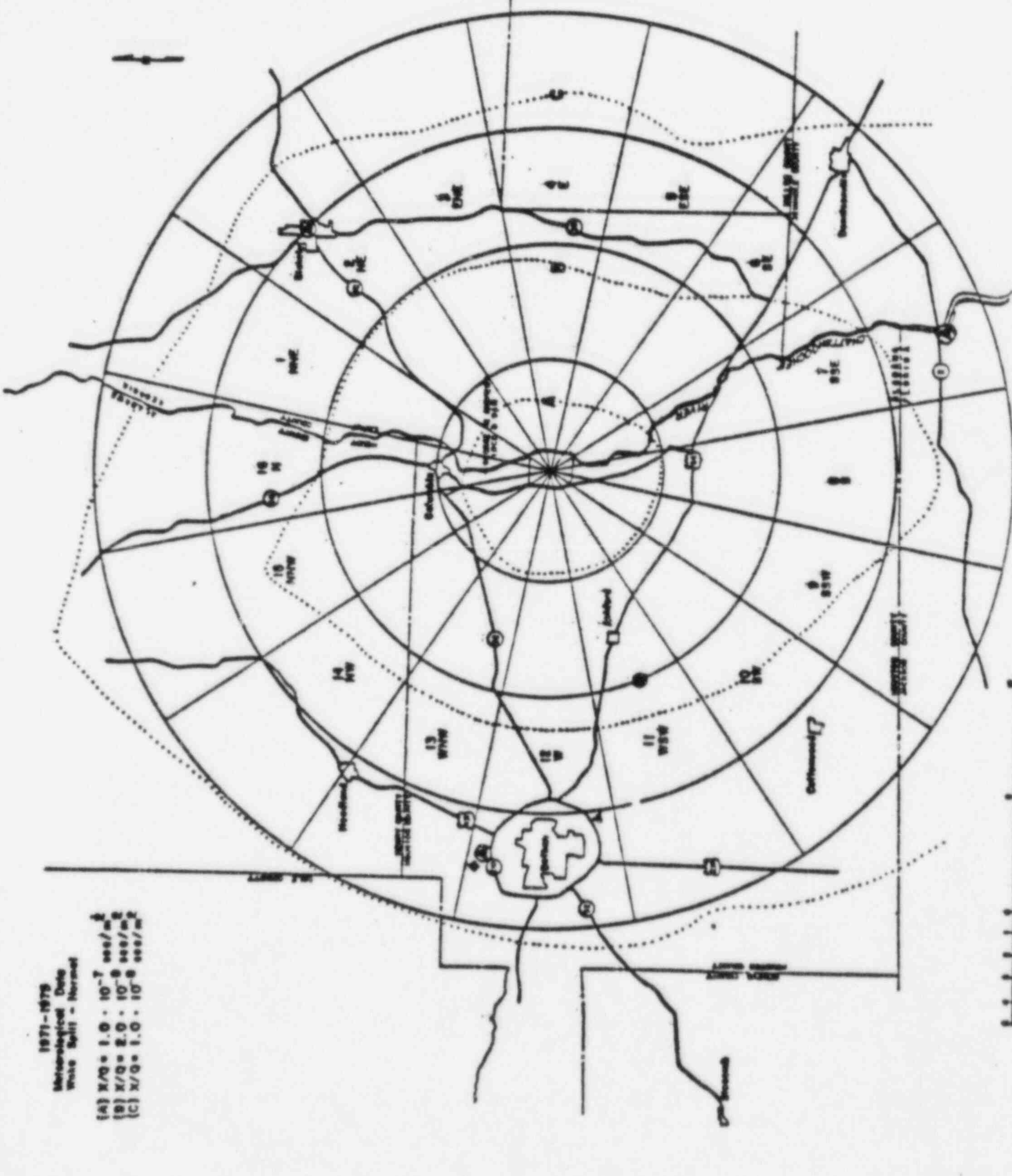
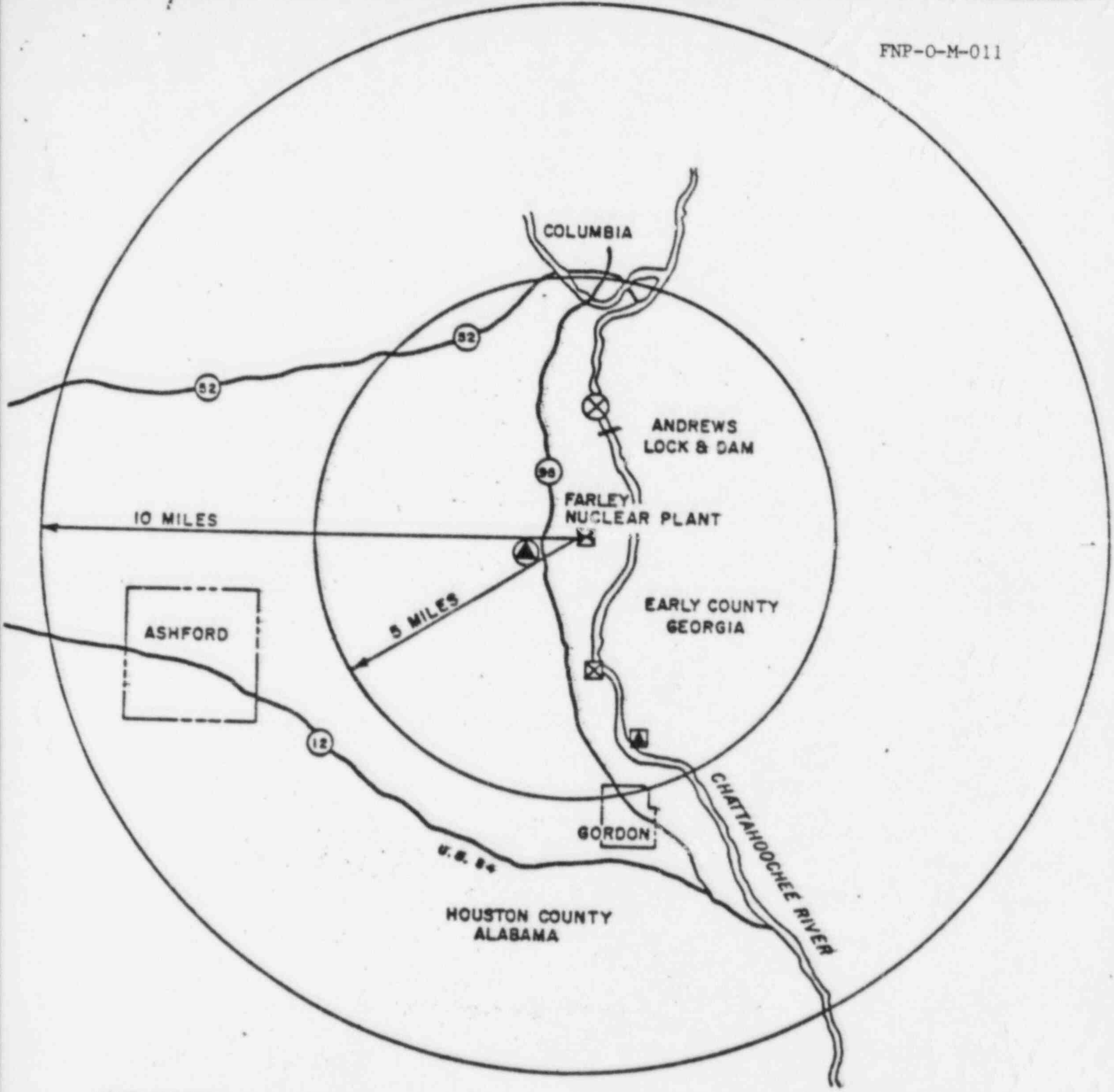


FIGURE 3.12-2 CONTROL SAMPLING LOCATIONS FOR AIRBORNE ENVIRONMENTAL RADIOACTIVITY

◆ FORAGE SAMPLING
▲ TLD SAMPLING
TLD, PARTICULATES AND



INDICATOR STATIONS

- SURFACE AND GROUND WATER
- FISH AND SEDIMENT

CONTROL STATIONS

- SURFACE WATER, Fish and Sediment
- GROUND WATER

FIGURE 3.12-3 INDICATOR AND CONTROL SAMPLING LOCATIONS FOR WATERBORNE ENVIRONMENTAL RADIOACTIVITY IN THE FARLEY NUCLEAR PLANT AREA.

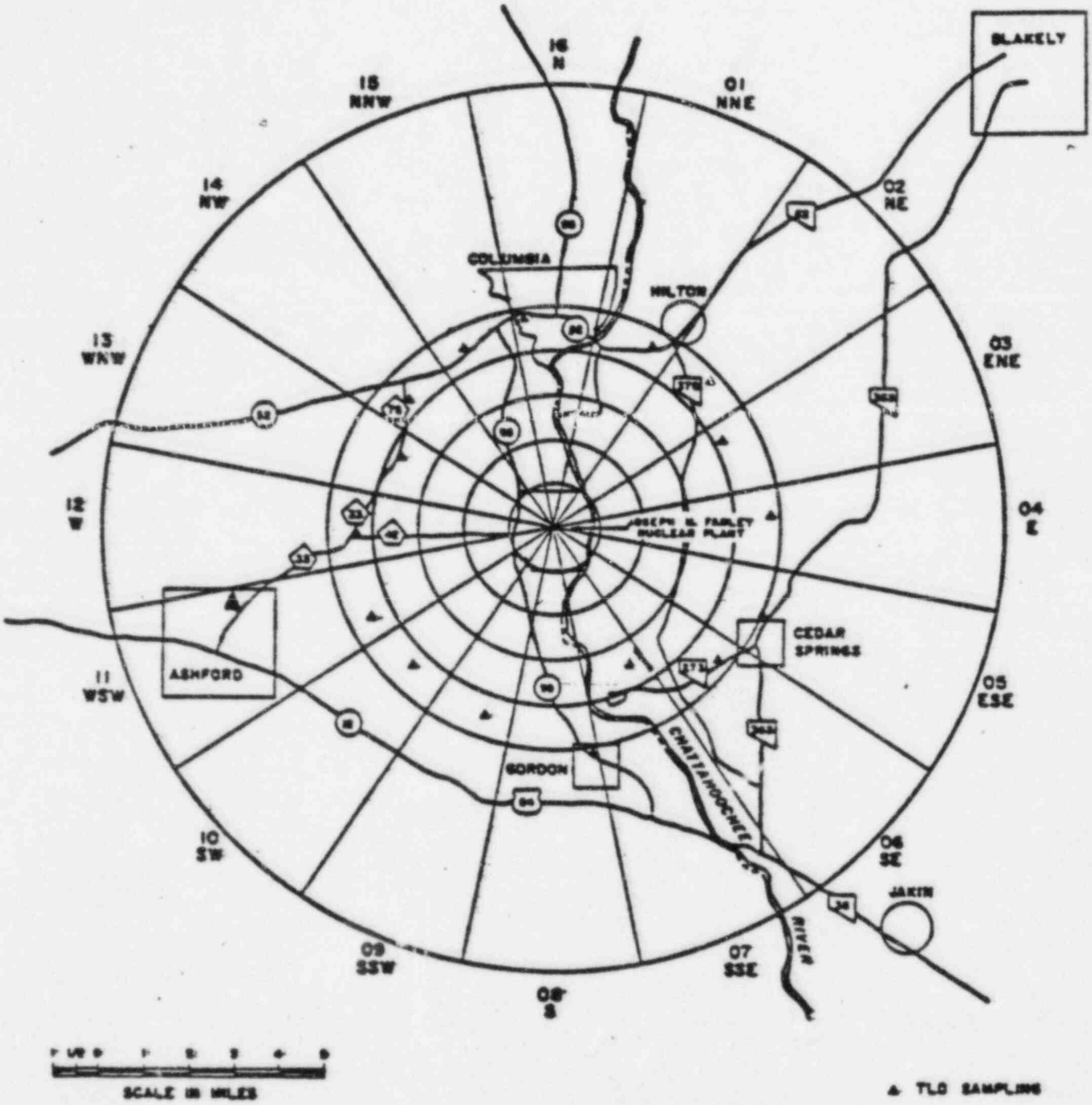


FIGURE 1.12-4. COMMUNITY (INDICATOR II) SAMPLING LOCATIONS FOR AIRBORNE RADIOACTIVITY IN THE FARLEY NUCLEAR PLANT AREA.

3.3.3.10 Determination of Alarm/Trip Setpoints for Liquid Monitors

R-18 Trip setpoint will be calculated based on manufacturers single isotope activity response curves for the detector being used according to the following expression;

$$M_T = K \frac{(F_W + F_D)}{F_W}$$

where:

K = monitor meter response (cpm) corresponding to the source activity (μCi/ml) calculated as measured monitor meter response taken from the calibration curve given by the manufacturer.

F_W = liquid radwaste tank resease flow rate (gpm)

F_D = dilution water flow rate (gpm)

R-23A and R-23B Trip setpoints will be determined from;

1. During initial startup the trip setpoint will be taken from the manufacturers single isotope activity response curves for the detector being used. Setpoints will be less than or equal to the count rate (cpm) corresponding to 1×10^{-5} μCi/ml in the effluent stream.

2. After sufficient data is accumulated to permit a calibration against actual representative effluent these monitor trip setpoints may be calculated from the following expression;

$$M_T = h(x) + K \text{ (cpm)}$$

where:

K = The zero intercept on the manufacturers curve obtained by taking the difference between the (cpm) actual response of the detector to the measured μCi/ml.

$h(x)$ = the function which generates the manufacturers curve such that M_T = (cpm) count rate corresponding to 1 X 10^{-5} µCi/ml as measured in the effluent stream.

The blowdown discharges into the service water dilution stream which has a minimum flow of 10,000 gpm. The maximum blowdown flow rate per generator is 50 gpm which yields 150 gpm total. The effective dilution ratio is 66.67 which when applied to the maximum activity allowed by the setpoint (1 x 10^{-5} µCi/ml), gives an activity approximately 2 x 10^{-7} µCi/ml which is well below all mpc values set by 10 CFR 20. The blowdown is automatically routed back to the condenser if there is no dilution flow.

3.3.3.11 Determination of Alarm/Trip Setpoints for Gaseous Monitors

R-15 and R-22 alarm setpoints and R-14 trip setpoint will be calculated based on the most restrictive of the following release-dose rates:

a) $$\sum_{i=1}^{14} K_i Q_{iv} < \frac{500 \text{ mrem/yr } F_v}{(\overline{X/Q})_v \; 10^6 \text{ pci}/\mu\text{Ci} * F}$$

where,

i = subscript numbering noble gases in consideration

K_i = the total body dose factor due to gamma emissions for identified noble gas isotope i (mrem/yr per pCi/m^3) from Table 3.

Q_{iv} = average release rate of isotope i from release point v (μCi/sec)

v = subscript indicating release point in consideration (turbine building vent or plant stack)

F_v = release fraction allotted to release point in consideration

$(\overline{X/Q})_v$ = highest value of annual average atmospheric dispersion factor at site boundary for all sectors (sec/m^3)

$(\overline{X/Q})_S$ = 7.5x10^{-7} sec/m^3

$(\overline{X/Q})_T$ 1.2x10^{-5} sec/m^3

F = safety factor to account for possible sampling and monitoring error and allow advance warning of approaching limit = 2

b) $$\sum_{i=1}^{14} (L_i + 1.1\, M_i)\, Q_{iv} < \frac{3000 \text{ mrem/hr } F_v}{(\overline{X/Q})_v \; 10^6 \text{ pci}/\mu\text{Ci} * F}$$

Li = skin dose factor due to beta emmissions for identified noble gas isotope i (mrem/yr per pci/m^3) from Table 3

M_i = air dose factor due to gamma emissions for identified noble gas isotope i (mrad/yr per pci/m^3) from Table 3

The actual monitor setpoints will be adjusted for a lower (thus more conservative) count rate based on the worst isotope release-dose rate Q_w as follows and need not be changed, except based on reaportioning of allotted release fraction from operating experience as mentioned above. From Table 3, Kr-89 would be the most restrictive isotope in either the total body or skin dose restrictions. Assuming that the total release consists of Kr-89, the skin dose equation is more restrictive than the whole body dose equation, and the release-dose rate limit would be calculated as:

$$Q_w = \frac{3000 \text{ mrem/yr } F_v}{(X/Q)_v \; 10^6 \text{ pci}/\mu\text{Ci} * F * (L_w + 1.1 M_w)}, \text{ and}$$

$$Q_{sw} = 6.9 \times 10^4 \ \mu\text{Ci/sec } (F_s)$$

$$Q_{TW} = 4.3 \times 10^3 \ \mu\text{Ci/sec } (F_T)$$

Based on maximum flow rate and conservative detector efficiency, the monitor setpoints S_w (cpm) may be calculated as follows:

$$S_w = \frac{Q_w}{(c)(f_w)} + b, \text{ where}$$

b = monitor background count rate (cpm

c = gross monitor calibration factor (μCi/ml per net cpm)

= u÷ m, where

u = isotope concentration (μCi/ml) in the monitor at time of grab sample calibration (Noble gas release rate calculations)

f_w = maximum effluent flow rate (ml/sec)

m = net monitor reading (cpm) at time of grab sample calibration (release rate calculations)

Setpoint calculations will be made for R-14, R-15, and R-22 in similar form. The limiting release rate Q_L (μCi/sec) will be the lesser of the values satisfactory relationships 6.7.1.a and 6.7.1.b. From section 6.1, the setpoint $M=S_L$ (cpm) corresponding to this release rate may be described as:

$$S_L = \frac{Q_L}{f_w \sum_i^{14} c_i} + b, \text{ where}$$

f_w = maximum release flow rate (ml/sec)