ODCM REVISION
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Section	Revision and Reason
01.01 page 2 paragraph 1	Changed 10CFR50.361 to 10CFR50.36a , corrected typo.
02.01 page 2 section 1.0	Changed table reference from 2.1-2 to 2.1-1, corrected reference.
05.01 page 2 sections 1.0, 2.0, 3.0	Changed word "waste" to "effluent" in section 1.0, changed 1st sentence in section 2.0 to exact wording in T.S., added section 3.0 to reference section 1.0 word change to LAR 39.
13.05 page 2	Changed sample collection site resulting from annual land-use census.

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REVIEW AND APPROVALS				
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I/cjs

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This Off-Site Dose Calculational Manual (ODCM) provides the information and methodologies to be used by Monticello Nuclear Generating Plant (MNGP) to assure compliance with MNGP's operating technical specifications related to liquid and gaseous radiological effluents. They are intended to show compliance with 10CFR 20, 10CFR 50.36a, 10CFR 50, Appendix A (GDC 60 & 64) and Appendix I, and 40 CFR 190.

This ODCM is based on "Radiological Effluent Technical Specifications for BWRs (NUREG-0473, Draft)," "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants (NUREG-0133)," and other inputs from the Nuclear Regulatory Commission (USNRC). Specific plant procedures for implementation of this manual are provided elsewhere. These procedures will be utilized by the operating staff of MNGP to assure compliance with the technical specifications.

Also included in this manual is information related to the Radiological Environmental Monitoring Program (REMP) in the form of Figures 5.1-1, 5.1-2, 5.1-3, and Table 5.1-1. These figures and table designate specific sample types and locations currently used to satisfy the technical specification requirements for the REMP. They are subject to change based on the results of the periodic land use census.

Calculations described in this manual may be performed using computer programs designed to implement these algorithms. In addition, the current meteorological data and χ/Q data may be generated by the MIDAS programs. MIDAS programs implement the regulatory guidance found in Regulatory Guide 1.109, 1.23 and 1.111.

MIDAS is a set of programs designed to collect and process meteorological data, radiological release data and other data to permit prompt reporting of off-site radiological consequences during emergency release conditions. MIDAS algorithms may be used when appropriate to perform dose calculations from routine airborne releases, for computation of doses from liquid releases, and to identify critical receptors.

Regulatory Guide 1.21 defines abnormal releases as "unplanned or uncontrolled release of radioactive material from the site boundary."

MNGP further defines abnormal gaseous releases as any gaseous release where the effluent release rate significantly exceeds an established normal release rate.

Abnormal releases as stated above will typically be due to personnel error, procedure inadequacy, training deficiency, or equipment malfunction.

This ODCM has been prepared as generically as possible in order to minimize the need for future revisions. Some changes to the ODCM will be needed in the future. Any such changes will be properly reviewed and approved as indicated in the Administrative Control Section of the MNGP Technical Specifications.

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It is MNGP's policy to make no routine liquid releases, however, in the event of a release this section is used to:

A. Determine alarm setpoints for liquid monitors;

B. Determine that liquid concentrations in effluents are below the allowable concentrations given in 10 CFR 20;

C. Calculate dose commitments to individuals; and

D. Project doses for the next month due to liquid radioactive effluents.

1.0 MONITOR ALARM SETPOINT DETERMINATION

Monitor alarm setpoints are determined to assure compliance with Tech Specs. The setpoints indicate if the concentration of radionuclides in the liquid effluent at the site boundary exceeds the concentrations specified in (10 CFR 20, Appendix B, to Section 20.1 - 20.601) Table II, Column 2[1] for radionuclides other than dissolved or entrained noble gases. The setpoints will also assure that a concentration of 2×10^{-4} μCi/ml for dissolved or entrained noble gases is not exceeded.

Monitor alarm setpoints are calculated monthly. The calculation is performed by the LIQDOS computer program. The calculation is based on radionuclides detected in effluent from the release point during the previous month in the following manner:

A. If there were no detectable radionuclides during the previous month, the BWR GALE Code source terms (Table 2.1-1)[2] will be used as the basis for the monthly release rate.

B. If the calculated setpoint is less than the existing monitor setpoint, the setpoint will be reduced to the new lower value.

C. If the calculated setpoint is greater than the existing monitor setpoint, the setpoint may remain at the lower value or be increased to the new value.

1.1 Radwaste Discharge Line Monitor

The following method applies to liquid releases from the plant via the discharge canal when determining the high-high alarm setpoint for the Liquid Radwaste Effluent Monitor during all operational conditions. The radwaste discharge flowrate is assumed to be maintained relatively constant at or near the maximum design flowrate.

1.1.1 Determine the "mix" (radionuclides and composition) of the liquid effluent.

A. Determine the liquid source terms that are representative of the "mix" of the liquid effluent. Liquid source terms are the total curies of each isotope released during the previous month. Table 2.1-1 source terms may be used if there have been no liquid releases.

B. Determine S_i (the fraction of the total radioactivity in the liquid effluent comprised by radionuclide i) for each individual radionuclide in the liquid effluent.

$$S_i = \frac{A_i}{\sum_i A_i} \qquad 2.1\text{-}1$$

where

A_i = The radioactivity of radionuclide i in the liquid effluent from Table 2.1.1.

1.1.2 Determine C_t, the maximum acceptable total radioactivity concentration of all radionuclides in the liquid effluent prior to dilution (μCi/ml).

$$C_t = \frac{F}{f \sum_i \frac{S_i}{MPC_i}} \qquad 2.1\text{-}2$$

where

F = Dilution water flowrate (GPM):

= 240,000 GPM from two circulating water pumps;

f = The maximum acceptable discharge flowrate prior to dilution (GPM);

= 50 GPM from the Liquid Radwaste Pump (3);

and

MPC_i = The liquid effluent radioactivity concentration limit for radionuclide i (μCi/ml) from Table 5.1.

1.1.3 Determine C_m, the maximum acceptable total radioactivity concentration of the radionuclides (minus tritium) in the liquid discharge prior to dilution(μCi/ml).

$$C_m = C_t - (C_t S_H) \qquad 2.1\text{-}3$$

where

S_H = The fraction of the total radioactivity in the liquid effluent comprised of tritium and other radionuclides that do not emit gamma or x ray radiation.

1.1.4 Determine C.R., the calculated monitor count rate above background attributed to the radionuclides (ncps).

$$C.R. = \frac{C_m}{E} \qquad 2.1\text{-}4$$

where

E = The detection efficiency of the monitor (μCi/CC/CPS) from Plant Chemistry Surveillance procedures.

1.1.5 The monitor high-high alarm setpoint above background (ncps) should be set at the C.R. value. Since only one tank can be released at a time, adjustment of this value is not necessary to compensate for releases from more than one source.

1.2 Discharge Canal Monitor

The following method determines the high-high alarm setpoint for the Discharge Canal Monitor during all operational conditions.

1.2.1 Determine the "mix" (radionuclides and composition) of all liquids released into the discharge canal.

A. Determine the liquid source terms that are representative of the "mix" of all liquid released into discharge canal. Liquid source terms are the total curies of each isotope released during the previous month. Table 2.1-1 source terms may be used if there have been no liquid releases.

B. Determine S_i (the fraction of the total radioactivity of all liquids released into the discharge canal comprised by radionuclide i) for each individual radionuclide released into the discharge canal.

$$S_i = \frac{A_i}{\Sigma A_i} \qquad 2.1\text{-}5$$

where

A_i = The radioactivity of radionuclide i released into the discharge canal.

1.2.2 Determine C_d, the maximum acceptable total radioactivity concentration of all radionuclides released into the discharge canal (μCi/ml).

$$C_d = \frac{1}{\sum_i \frac{S_i}{MPC_i}} \qquad 2.1\text{-}6$$

where

MPC_i = The liquid effluent radioactivity concentration limit for radionuclide i (μCi/ml) from Table 2.1.1.

1.2.3 Determine C_m the maximum acceptable total radioactivity concentration of the radionuclides (minus tritium) released into the discharge canal (μCi/ml).

$$C_m = C_d - (C_d S_H) \qquad 2.1\text{-}7$$

where

S_H = The fraction of the total radioactivity released into the discharge canal comprised of tritium and other radionuclides that do not emit gamma or x-ray radiation.

1.2.4 Determine C.R., the calculated monitor count rate above background attributed to the radionuclides (ncps).

$$C.R. = \frac{C_m}{E} \qquad 2.1\text{-}8$$

where

E = The detection efficiency of the monitor (μCi/CC/CPS) from Plant Chemistry Surveillance procedures.

1.2.5 The monitor high-high alarm setpoint above background (ncps) should be set at the C.R. value.

1.3 Service Water Discharge Pipe Monitor

The following method determines the high-high alarm set-point for the Service Water Discharge Pipe Monitor during all operational conditions.

1.3.1 Determine the "mix" (radionuclides and composition) of the service water effluent.

A. Determine the liquid source terms that are representative of the "mix" of the service water effluent. Liquid source terms are the total curies of each isotope released during the previous month. Table 2.1-I source terms may be used if there have been no liquid releases.

B. Determine S_i the fraction of the total radioactivity in the service water effluent comprised by radionuclide i, for each individual radionuclide in the liquid effluent.

$$S_i = \frac{A_i}{\sum_i A_i} \qquad 2.1\text{-}9$$

where

A_i = The radioactivity of radionuclide i in the service water effluent.

1.3.2 Determine C_t, (the maximum acceptable total radioactivity concentration of all radionuclides in the service water effluent prior to dilution ($\mu Ci/ml$)).

$$C_t = \frac{F}{f \sum_i \frac{S_i}{MPC_i}} \qquad 2.1\text{-}10$$

where

F = Dilution water flowrate (GPM);

= 240,000 GPM from two circulating water pumps;

f = The maximum acceptable discharge flowrate prior to dilution (GPM);

= 10,000 GPM;

and

MPC_i = The liquid effluent radioactivity concentration limit for radionuclide i ($\mu Ci/ml$) from Table 2.1-1.

1.3.3 Determine C_m, (the maximum acceptable total radioactivity concentration of the radionuclides (minus tritium)) in the service water prior to dilution ($\mu Ci/ml$).

$$C_m = C_t - (C_t S_H) \qquad 2.1\text{-}10$$

where

S_H = The fraction of the total radioactivity in the service water effluent comprised of tritium and other radionuclides that do not emit gamma or x-ray radiation.

1.3.4 Determine C.R. (the calculated monitor count rate above background attributed to the radionuclides (ncps))

$$C.R. = \frac{C_m}{E} \qquad 2.1\text{-}12$$

where

E = The detection efficiency of the monitor (μCi/CC/CPS) from Plant Chemistry Surveillance procedures.

1.3.5 The monitor high-high alarm setpoint above background (ncps) should be set at the C.R. value.

1.4 Turbine Building Normal Drain Sump Monitor

The following method determines the high-high alarm set-point for the Turbine Building Normal Drain Sump Monitor during all operational conditions.

1.4.1 Determine the "mix" (radionuclides and composition) of the TBNDS effluent.

A. Determine the liquid source terms that are representative of the "mix" of the TBNDS effluent. Liquid source terms are the total curies of each isotope released during the previous month. Table2.1-I source terms may be used if there have been no liquid releases.

B. Determine S_i, the fraction of the total radioactivity in the TBNDS effluent comprised by radionuclide i, for each individual radionuclide in the liquid effluent.

$$S_i = \frac{A_i}{\sum_i A_i} \qquad 2.1\text{-}13$$

where

A_i = The radioactivity of radionuclide i in the TBNDS effluent.

1.4.2 Determine C_t (the maximum acceptable total radioactivity concentration of all radionuclides in the TBNDS effluent prior to dilution (μCi/ml)).

$$C_t = \frac{F}{f \sum_i \frac{S_i}{MPC_i}} \qquad 3.1\text{-}14$$

where

F = Dilution water flowrate (GPM);

= 240,000 GPM from two circulating water pumps;

f = The maximum acceptable TBNDS discharge flowrate prior to dilution (GPM);

= 128 GPM from TBNDS pump 52A.

= 110 GPM from TBNDS pump 52B.

MPC_i = The liquid effluent radioactivity concentration limit for radionuclide i (μCi/ml) from Table 2.1-1.

1.4.3 Determine C_m (the maximum acceptable total radioactivity concentration of the radionuclides (minus tritium) in the TBNDS prior to dilution (μCi/ml).

$$C_m = C_t - (C_t S_H) \qquad 2.1\text{-}10$$

where

S_H = The fraction of the total radioactivity in the TBNDS effluent comprised of tritium and other radionuclides that do not emit gamma or x-ray radiation.

1.4.4 Determine C.R. (the calculated monitor count rate above background attributed to the radionuclides (ncps)).

$$C.R. = \frac{C_m}{E} \qquad 2.1\text{-}16$$

where

E = The detection efficiency of the monitor (μCi/CC/CPS) from Plant Chemistry Surveillance procedures.

1.4.5 The monitor high-high alarm setpoint above background (ncps) should be set at the C.R. value.

1.5 Multiple Release Points

The discharge canal monitor, service water discharge and TBNDS line monitor are provided to detect unplanned or accidental releases. All normal releases are monitored by the radwaste discharge line monitor. There are, therefore, no multiple release points and monitor settings do not have to be reduced to account for multiple releases.

2.0 LIQUID EFFLUENT CONCENTRATION - COMPLIANCE WITH TECH SPECs (TS)

In order to show compliance with Tech Specs the concentrations of radionuclides in liquid effluents are determined and compared with the maximum permissible concentrations (MPC) as defined in Appendix B, to section 20.1 - 20.601, Table II of 10CFR 20. The concentration of radioactivity in effluents prior to dilution is determined. The concentration in diluted effluent is calculated by the LIQDOS computer program in conjunction with Surveillance Test Numbers 0377, 0238, 0239, 0240 and 0242, using these results before each batch release, and following each batch release.

2.1 Batch Releases

2.1.1 Prerelease

The radioactivity content of each batch release is determined prior to release. MNGP will show compliance with Tech Specs (TS). in the following manner:

The concentration of the various radionuclides in the batch release prior to dilution flow to obtain the concentration at the unrestricted area. This calculation is shown in the following equation:

$$Conc_i = \frac{C_i R}{MDF} \qquad 2.2\text{-}1$$

where

$Conc_i$ = concentration of radionuclide i at the unrestricted area, (µCi/ml);

C_i = concentration of radionuclide i in the potential batch release, (µCi/ml);

R = release rate of the batch, (GPM);

MDF = minimum dilution flow, (GPM).

The projected concentration in the unrestricted area is compared to the concentrations in Appendix B, (to Section 20.1 - 20.601) Table II of 10CFR 20. These concentrations are given in Table 5.1. Before a release may occur, Equation 2.2-2 must be met for all nuclides. For the MNGP the MDF is 240,000 GPM. The maximum release rate is 50 GPM.

$$\sum_i \frac{Conc_i}{MPC_i} \leq 1 \qquad 4.2\text{-}2$$

where

MPC_i = maximum concentration of radionuclide i from Reference 2, (µCi/ml).

3.0 LIQUID EFFLUENT DOSES - COMPLIANCE WITH 10 CFR 50

Doses resulting from liquid effluents are calculated monthly to show compliance with 10 CFR 50. These calculations are performed by the LIQDOS computer program in conjunction with Surveillance Test 0374. A cumulative summation of total body and organ doses for each calendar quarter and calendar year is maintained as well as projected doses for the next month.

3.1 Determination of Liquid Effluent Dilution

To determine doses from liquid effluents the near field average dilution factor for the period of release must be calculated. This dilution factor must be calculated for each batch release. The dilution factor is determined by:

$$F_k = \frac{R_k}{X \, ADF_k} \qquad 2.3\text{-}1$$

where

R_k = release rate of the batch during time period k, (GPM);

and

ADF_k = actual dilution flow during the time period of release k, (GPM).

The value of X is the site specific value for the mixing effect of the MNGP discharge structure. This value is 1.0 for MNGP while operating in the once-through cooling mode. Although not expected to occur, if radioactive material is discharged while operating in the recycle mode, this value may be 1.86. [4]

3.2 Dose Calculations

The dose contribution from the release of liquid effluents is calculated monthly. The dose contribution is calculated using the following equation:

$$D_j = \sum_k \sum_i A_{ij} t_k C_{ik} F_k \qquad 4.3\text{-}2$$

where

D_j = the dose commitment to the total body or any organ, from the liquid effluents for the 31 day period, (mrem);

C_{ik} = the average concentration of radionuclide, i, in undiluted liquid effluent for release k, (μCi/ml);

A_{ij} = the site related ingestion dose commitment factor to the total body or any organ j for each identified principal gamma and beta emitter, (mrem/hr per μCi/ml);

F_k = the near field average dilution factor for C_{ik} during liquid effluent release k, as defined in Equation 4.3-1, and

t_k = the length of time for release k, (hours).

The dose factor A_{ij} was calculated for an adult for each isotope using the following equation:

$$A_{ij} = 1.14 \times 10^5 \,(730/D_w + 21BF_i)\, DF_{ij} \qquad 2.3\text{-}3$$

where

$$1.14 \times 10^5 = \frac{10^6 pCi}{\mu Ci} \quad \frac{10^3 ml}{liter} \quad \frac{1\ yr}{8760\ hr}$$

730 = adult water consumption rate, (liters/yr);

D_w = dilution factor from the near field area to the potable water intake for adult water consumption;

21 = adult fish consumption, (kg/yr);

BF_i = bioaccumulation factor for radionuclide i in fish from Table A-1 of Regulatory Guide 1.109 Rev. 1, [(5)] (pCi/Kg per pCi/liter);

DF_{ij} = dose conversion factor for radionuclide i for adults for particular organ j from Table E-11 of Regulatory Guide 1.109 Rev. 1, (mrem/pCi).

The A_{ij} values for an adult at the MNGP are given in Table 4.2. The far field dilution factor, D_w for the MNGP is 7:1 for the nearest downstream water supply in St. Paul. This value was determined by assuming that effluents are completely mixed in 50% of the Mississippi River flow (7431 cfs at Anoka, MN). [(6)]

3.3 Cumulation of Doses

Doses calculated monthly are summed for comparison with quarterly and annual limits. The monthly results should be added to the doses cumulated from the other months in the quarter of interest and in the year of interest. This summation is performed by the LIQDOS computer program.

For the quarter,

$D \leq 1.5$ mRem total body 2.3-4

$D \leq 5$ mRem any organ 2.3-5

For the Calendar Year,

$D \leq 3$ mRem total body 2.3-6

$D \leq 10$ mRem any organ 2/3-7

The quarterly limits given above represent one half of the annual design objective.(7) If these quarterly or annual limits are exceeded, a special report should be submitted stating the reason and corrective action to be taken. This report will include results of analyses of Mississippi River water and an analysis of possible impacts through the drinking water pathway. If twice these limits are exceeded, a special report will be submitted showing compliance with 40CFR 190.(8)

3.4 Projection of Doses

Anticipated doses resulting from the release of liquid effluents are projected monthly. If the projected doses for the month exceeds two percent of Equation 2.3-6 or 2.3-7, additional components of the liquid radwaste treatment system will be used to process waste. The projected doses are calculated using Equation 2.3-2. This calculation is performed by the LIQDOS computer program in conjunction with Surveillance Test 0375. The dilution factor, F_k, is calculated by replacing the term ADF_k in Equation 2.3-1 with the term MDF from Equation 2.2-1.

The total source term utilized for the most recent dose calculation should be used for the projections unless information exists indicating that actual releases could differ significantly in the next month. In this case, the source term would be adjusted to reflect this information and the justification for the adjustment noted. This adjustment should account for any radwaste equipment which was operated during the previous month that could be out of service in the coming month.

REFERENCES

1. USNRC, Title 10, Code of Federal Regulation, Part 20, "Standards for Protection Against Radiation", Appendix B, Table II, Column 2.

2. NSP - Monticello Nuclear Generating Plant, Appendix I Analysis - Supplement No. 1 - Docket No. 50-263, Table 2.1-2.

3. NSP - Monticello Nuclear Generating Plant, Appendix I Analysis - Supplement No. 1 - Docket No. 50-263, Table 2.1-1.

4. Boegli, J.S., et. al. Eds, Section 4.3 in "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants, NUREG-0133, 1978, NTIS, Springfield Va.

5. USNRC, Regulatory Guide 1.109. "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I", Rev. 1, Oct. 1977, USNRC, Washington D.C.

6. NSP - Monticello Nuclear Generating Plant, Final Draft Safety Analysis Report - Amendment 4, Question 3.3, and Amendment 8 in entirety.

7. USNRC, Title 10, Code of Federal Regulation, Part 50, "Domestic Licensing of Production and Utilization Facilities", Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion As Low as is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents"

8. EPA, Title 40, Code of Federal Regulations, Part 190 "Environmental Radiation Protection Standards for Nuclear Power Operations"

MONTICELLO NUCLEAR GENERATING PLANT		
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1.0 SAMPLING

Table 5.1-1 and Figure 5.1-1 specify the current sampling locations for the radiation environmental monitoring program. These sampling locations are based on the latest land use census.

If it is learned from an annual census that milk animals or gardens are present at the location which yields a calculated thyroid dose greater than those locations previously sampled, the new milk animal or garden locations resulting in the higher calculated doses ***SHALL*** be added to the surveillance program as soon as practicable. Sample locations (except the control) having lower calculated doses may be dropped from the program at the end of the grazing or growing season (October 31) to keep the total number of sample locations constant.

If the plant begins routine discharges of liquid radioactive effluent into the Mississippi River, a land use survey will be conducted to determine whether any crops are irrigated with water taken from the Mississippi River between the plant discharge canal and a point 5 miles downstream. If edible crops are being irrigated from Mississippi River water, appropriate samples will be collected and analyzed per Technical Specifications Table 4.16.1.

2.0 INTERLABORATORY COMPARISON PROGRAM

Analyses ***SHALL*** be performed on radioactive materials supplied as part of an NRC approved interlaboratory comparison program. This program involves the analyses of samples provided by a control laboratory and comparison of results with those of the control laboratory as well as with other laboratories which receive portions of the same samples. Media used in this program (air, milk, water, etc.) ***SHALL*** be limited to those found in the radiation environmental monitoring program. The results of analyses performed as a part of the crosscheck program ***SHALL*** be included in the Annual Radiation Environmental Monitoring Report.

3.0 BASES

Section 1.0, paragraph 3, is worded to conform to LAR-39 and its associated NRC Safety Evaluation (SER).

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Table 5.1-1 Monticello Nuclear Generating Plant Radiation Environmental Monitoring Program Sampling Locations

Type of Sample	Code	Collection Site	Location: Distance Miles	Location: Compass Heading	Location: Sector
River water	M-8^c	Upstream of plant	w/in 1000 ft upstream of plant intake		
River water	M-9	Downstream of plant	w/in 1000 ft downstream of plant discharge		
Drinking water	M-14	City of Minneapolis	36.	128	SE
Well water	M-10^c	Goenner Farm	12.5	321	NW
Well water	M-11	City of Monticello	3.2	128	SE
Well water	M-12	Plant Well No. 1	0.2	267	W
Well water	M-27	Wise Residence	0.7	200	SSW
Sediment-River	M-8^c	Upstream of plant	w/in 1000 ft upstream of plant intake		
Sediment-River	M-9	Downstream of plant	w/in 1000 ft downstream of plant discharge		
Sediment-Shoreline	M-15	Montissippi Park	1.6	117	ESE
Periphyton or Macroinvertebrates	M-8^c	Upstream of plant	w/in 1000 ft upstream of plant intake		
	M-9	Downstream of plant	w/in 1000 ft downstream of plant discharge		
Fish	M-8^c	Upstream of plant	w/in 1000 ft upstream of plant intake		
Fish	M-9	Downstream of plant	w/in 1000 ft downstream of plant discharge		
Milk	M-10^c	Goenner Farm	12.5	321	NW
Milk	M-24	Weinand Farm	4.8	180	S
Milk	M-28	Hoglund Farm	3.7	300	WNW

Table 5.1-1 Monticello Nuclear Generating Plant Radiation Environmental Monitoring Program Sampling Locations (Cont'd)

			Location		
Type of Sample	Code	Collection Site	Distance Miles	Compass Heading	Sector
Cultivated crops (leafy green vegetables)					
	M-10[c]	a. Available Producer	>10.0	a.	a.
	M-27	Highest D/Q Garden	0.7	200	SSW
(corn)*					
(potatoes)*					
Particulates and Radioiodine					
(air)	M-1[c]	Air Station M-1	11.1	306	NW
(air)	M-2	Air Station M-2	0.8	140	SE
(air)	M-3	Air Station M-3	0.6	104	ESE
(air)	M-4	Air Station M-4	0.9	150	SSE
(air)	M-5	Air Station M-5	2.7	136	SE
Direct Radiation - (general area of the site boundary)					
(TLD)	M01A	North Boundary Rd.	0.7	353	N
(TLD)	M02A	North Boundary Rd.	0.8	23	NNE
(TLD)	M03A	North Boundary Rd.	0.1	43	NE
(TLD)	M04A	Biology Station Rd.	0.7	92	E
(TLD)	M05A	Biology Station Rd.	0.6	112	ESE
(TLD)	M06A	Biology Station Rd.	0.6	133	SE
(TLD)	M07A	County Road 75	0.5	158	SSE
(TLD)	M08A	County Road 75	0.5	183	S
(TLD)	M09A	County Road 75	0.4	203	SSW
(TLD)	M10A	County Road 75	0.3	225	SW
(TLD)	M11A	County Road 75	0.4	250	WSW

* Collected only if plant discharges radioactive effluent into the river, then only from river irrigated fields. (See Sec. 5.1)

(TLD)	M12A	County Road 75	0.7	273	W
(TLD)	M13A	North Boundary Rd.	1.1	317	NW

l/mab

Table 5.1-1 Monticello Nuclear Generating Plant Radiation Environmental Monitoring Program Sampling Locations (Cont'd)

Type of Sample	Code	Collection Site	Location: Distance Miles	Compass Heading	Sector
(TLD)	M14A	North Boudnary Rd.	0.8	338	NNW
Direct Radiation - (about 4 to 5 miles distant from the plant)					
(TLD)	M01B	Sherco No. 1 Air Sta.	4.6	2	N
(TLD)	M02B	County Road 11	4.4	17	NNE
(TLD)	M03B	County Rd. 73 & 81	4.5	49	NE
(TLD)	M04B	Sherco No. 6 Air Sta.	4.2	67	ENE
(TLD)	M05B	City of Big Lake	4.4	87	E
(TLD)	M06B	County Rd 14 & 196 St	4.3	116	ESE
(TLD)	M07B	Monte Industrial Dr.	4.4	135	SE
(TLD)	M08B	Dale Larson Res.	4.6	162	SSE
(TLD)	M09B	Norbert Weinand Farm	4.7	180	S
(TLD)	M10B	John Reisewitz Farm	4.4	206	SSW
(TLD)	M11B	Clifford Vanlith Farm	4.2	225	SW
(TLD)	M12B	Lake Maria St. Park	4.4	253	WSW
(TLD)	M13B	Bridgewater Sta.	4.1	271	W
(TLD)	M14B	Richard Anderson Res.	4.5	288	WNW
(TLD)	M15B	Gary Williamson Res.	4.5	308	NW
(TLD)	M16B	Sand Plain Research Farm	4.3	338	NNW
Direct Radiation - (special interest locations)					
(TLD)	M01S	Osowski Farm Market	0.7	130	SW
(TLD)	M02S	Edgar Klucas Res.	0.7	142	SE
(TLD)	M03S	Big Oaks Park	1.3	89	E
(TLD)	M04S	Pinewood School	2.3	132	SE
(TLD)	M05S	Rivercrest Christian Academy	2.6	112	ESE
(TLD)	M06S	Monte Public Works	2.7	136	SE
(TLD)	M01C	Kirchenbauer Farm	11.5	323	NW

Notes on Table 5.1-1:

"c" denotes control locations. All other locations are indicator locations.
a. Control "leafy green" vegetable will be taken in locations as available outside 10 mi. EPZ.

The letters after TLD code numbers have the following meanings:

A Locations in the general area of the site boundary;
B Locations about 4 to 5 miles distant from the plant;
S Special interest locations.