NIAGARA MOHAWK

NINE MILE POINT NUCLEAR STATION UNIT 1

OFFSITE DOSE CALCULATION MANUAL

NIAGARA MOHAWK POWER CORPORATION

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ODCM - NINE MILE POINT

1.0 INTRODUCTION

The Offsite Dose Calculation Manual (ODCM) provides the methodology to be used for demonstrating compliance with the Radiological Effluent Technical Specifications (RETS), 10 CFR 20, 10 CFR 50, and 40 CFR 190. The contents of the ODCM are based on Draft NUREG-0472, Revision 3, "Standard Radiological Effluent Technical Specifications for Pressurized Water Reactors," September 1982; Draft NUREG-0473, Revision 2, "Radiological Effluent Technical Specifications for BWR's," July 1979; NUREG 0133, "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," October 1978; the several Regulatory Guides referenced in these documents; and, communication with the NRC staff.

Notwithstanding the above, rather than redefine the basis for an offsite dose limit or release limit, the limits listed in the Environmntal Technical Specifications for Nine Mile Point Nuclear Station Unit 1 dated March 1, 1979, have been utilized whenever possible. In this manner a minimum number of changes to the current implementing procedures are needed. One of the major differences between the RETS and ODCM and the Environmental Technical Specification is that release limits and offsite dose limits in the latter are based on <u>site</u> releases while they are based on <u>unit</u> releases in the former. This difference is compensated for in the ODCM by setting the releases from other units at the site eaual to zero.

Section 5 contains a detailed description of the Radiological Environmental Monitoring (REM) sampling locations. These locations are subject to change based on the results of the annual Land Use Census.

Should it be necessary to revise the ODCM, these revisions will be made in accordance with Technical Specifications.

2.0 LIQUID EFFLUENTS

2.1 Setpoint Determinations

2.1.1 Basis

Monitor setpoints will be established such that the concentration of radionuclides in the liquid effluent releases in the discharge canal will not exceed those concentrations as specified in 10 CFR 20, Appendix B, Table II, Column 2. Setpoints for the Service Water System Effluent Line will be calculated based on the radionuclides identified during the previous year's releases from the liquid radwaste system or the isotopes identified in the most recent radwaste release. Setpoints for the Liquid Radwaste Effluent Line will be based on the radionuclides identified in each batch of liquid waste prior to its release.

After release, Liquid Radwaste the monitor setpoint may remain as set, or revert back to a setpoint based on a previous Semi-Annual Radioactive Effluent Release Report.

2.1.2 Service Water System Effluent Line Alarm Setpoint

The detailed methods for establishing setpoints for the Service Water System Effluent Line Monitor shall be contained in the Nine Mile Point Station Procedures. These methods shall be in accordance with the following:

$$\text{Setpoint (Hi-Hi alarm)} \leq 0.9 \left(C_i\right)\left(\frac{TDF}{F_{SW}}\right) \Bigg/ \left(\frac{CF}{\sum \frac{C_i}{MPC_i}}\right) + \text{background}$$

where C_i = concentration of isotope i in the sample (units = uCi/ml)

TDF = Total Dilution Flow (units = gallons/min)

F_{SW} = Service Water Flow (units = gallons/min)

CF = monitor calibration factor (units = net cps/uCi/ml)

MPC_i = liquid effluent radioactivity concentration limit for radionuclide i as specified in 10 CFR 20, Appendix B, Table II, Column 2, for those nuclides present in the previous batch release from the liquid radwaste effluent system <u>or</u> for those nuclides present in the last Semi-annual Radioactive Effluent Release Report (units = uCi/ml) or for those nuclides present in the service water system.**

0.9 = factor to account for the presence of β emitters

$\sum \frac{C_i}{MPC_i}$ = Required Dilution Factor

$\frac{TDF}{F_{SW}}$ = Actual Dilution Factor

** For periods with known reactor water to RCLC system leakage, RCLC maximum permissible concentration may be prudently substituted for the above.

Setpoint (Hi alarm) $\leq$ 0.7 Setpoint (Hi-Hi alarm)

2.1.3 Liquid Radwaste Effluent Line Alarm Setpoint

The detailed methods for establishing setpoints for the Liquid Radwaste Effluent Line Monitor shall be contained in the Nine Mile Point Station Procedures. These methods shall be in accordance with the following:

$$\text{Setpoint (Hi-Hi alarm)} \leq 0.9 \left(\sum C_i\right) \left(\frac{TDF}{F_{re}}\right) \left(\frac{CF}{\sum \frac{C_i}{MPC_i}}\right) + \text{background}$$

where C_i = activity of isotope i in the sample (units = uCi/ml)

TDF = Total Dilution Flow (units = gallons/min)

F_{re} = Radwaste Effluent Flow (units = gallons/min)

CF = monitor calibration factor (units = net cps/uCi/ml)

MPC_i = liquid effluent radioactivity concentration limit for radionuclide i as specified in 10 CFR 20, Appendix B, Table II, Column 2, for those nuclides detected by spectral analysis of the contents of the radwaste tanks to be released (units = uCi/ml)

0.9 = factor to account for emitters

$\sum \frac{C_i}{MPC_i}$ = Required Dilution Factor

Setpoint (Hi alarm) $\leq$ 0.7 Setpoint (Hi-Hi Alarm)

Note: If $\frac{TDF}{F_{re}} = \frac{C_i}{MPC_i}$ the discharge could not be made, since the monitor would be continuously in alarm. To avoid this situation, F_{re} will be reduced (normally by a factor of 2) to allow setting the alarm point at a concentration higher than tank concentration. This will also result in discharge canal concentration at approximately 50% maximum permissible concentration.

After the batch release has been made from the liquid radwaste effluent system, the setpoint may remain the same or be returned to a level based on the previous Semi-Annual Radioactive Effluent Release Report where an actual release was made.

2.2 Dose Determination

2.2.1 Maximum Dose Equivalent Pathway

A dose assessment report was prepared for the Nine Mile Point Unit 1 facility by Charles T. Main, Inc., of Boston, MA. This report presented the calculated dose equivalent rates to individuals as well as the population within a 50-mile radius of the facility based on the radionuclides released in liquid and gaseous effluents during the time periods of 1 July 1980 through 31 December 1980 and from 1 January 1981 through 31 December 1981. Utilizing the effluent data contained in the

Semi-Annual Radioactive Effluent Release Reports as source terms, dose equivalent rates were determined using the environmental pathway models specified in Regulatory Guides 1.109 and 1.111 as incorporated in the NRC computer codes LADTAP for liquid pathways, and XOQDOQ and GASPAR for gaseous effluent pathways. Dose equivalent rates were calculated for the total body as well as seven organs and/or tissues for adults, teenagers, children, and infants. From the standpoint of liquid effluents the pathways evaluated included fish ingestion, drinking water, and external exposure to water and sediment.

Based on the findings of the above referenced report, the maximum total body dose from all liquid pathways is received by an adult. Similarly, the maximum total dose to any organ is received by the teen liver. In both of these cases (i.e., adult whole body dose and teen liver dose), 99% and 98% respectively of these doses were received via the fish ingestion pathway.

In order to determine the dose contribution from the release of liquid effluents, the annual dose to an adult whole body and a teen liver will be calculated for each of the significant nuclides (see Table 2-1) identified in the liquid waste based on the fish ingestion pathway utilizing the following formula:

$$R_{apji} = \frac{1100 U_{ap} M_p}{F} \sum Q_i B_{ip} D_{aipj} \exp\left(-\lambda_i t_p\right)$$

Where R_{apji} = total annual dose to organ "j" of individuals of age group "a" from all of the nuclides "i" in pathway "p" (units = mrem/year - Ci)

U_{ap} = usage factor specifying the exposure time or intake rate for an individual of an age group "a" associated with pathway "p" (units = kg/year)

M_p = mixing rates (reciprocal of dilution factor) at the point of exposure or point of harvest (units = dimensionless)

F = flow rate of the liquid effluent (units = ft^3/sec)

Q_i = release rate of radionuclide "i" (units = Ci/year)

B_{ip} = equilibrium bioaccumulation factor for nuclide "i" in pathway "p" (units = liters/kg)

D_{aipj} = the dose factor, specific to a specific age group "a", radionuclide "i", pathway "p", and organ "j", which can be utilized to calculate the radiation dose from an intake of a radionuclide (units = mrem/pCi)

i = radioactive decay constant of nuclide "i" (units = hours $^{-1}$)

t_p = the average transit time required for nuclides to reach the point of exposure. For internal dose, t_p is the total time elapsed between the release of the nuclides and the ingestion of the food and/or water (units = hours)

1100 = factor to convert from (Ci/year)/(ft^3/sec) to pCi/liter

Values for R_{apji} are contained in Table 2-1. All of these values of R_{apji} are on a per Curie basis for <u>each</u> of the nuclides released. Table 2-2 indicates those parameters used for selected factors of the formula.

Prior to each radioactive liquid discharge, each liquid waste tank to be discharged will be analyzed for isotope content utilizing a GeLi detector. On the basis of this analysis, projected doses to an adult whole body and a teen liver will be calculated using the following relationships:

$$PD_{WB} = 1.05 \sum R_{apji(WB)} C_i$$

$$PD_L = 1.05 \sum R_{apji(L)} C_i$$

Where PD_{WB} = Projected dose expected to the whole body of an adult due to the release of the identified concentration of nuclide "i". (Units = mrem/year)

PD_L = Projected dose expected to the liver of a teenager due to the release of the identified concentration of nuclide "i" (units = mrem/year)

$R_{apji(WB)}$ = total annual dose to the whole body of an adult caused by the ingestion of nuclide "i" per Curie of nuclide "i" released (units = mrem/year/Curie)

$R_{apji(L)}$ = total annual dose to the liver of a teenager caused by the ingestion of nuclide "i" per Curie of nuclide "i" released (units = mrem/year/Curie)

C_i = quantity of nuclide "i" identified as present in the release (units = Curies)

1.05 = correction factor to account for 100% of dose assuming that 95% of dose received is delivered via the fish ingestion pathway.

The basis for the derivation of the above parameters is contained in the preceding pages 6, 7 and 8 and on page 10. As stated, it has been determined that greater than 95% of the projected organ and whole body dose from the liquid pathway comes from ingestion of fish. The value of 1.05 is used in the equation as a conservative factor to increase the projected dose from an anticpated release to 100%.

All projected doses calculated in this manner for each batch of liquid effluent will be summed for comparison with quarterly and annual limits, added to the doses accumulated from other releases in the quarter and year of interest. In all cases, the following relationships will hold:

For a calendar quarter:

$D_t \leq$ 1.5 mrem total body

$D_t \leq$ 5 mrem for any organ

For the calendar year:

$D_t \leq$ 3.0 mrem total body

$D_t \leq$ 10 mrem for any organ

where D_t = total dose received due to liquid effluent releases

If these limits are exceeded, a special report will be submitted to the NRC identifying the cause and proposed corrective actions. In addition, if these limits are exceeded by a factor of two, calculations shall be made to determine if the dose limits contained in 40 CFR 190 have been exceeded. Dose limits, as contained in 40 CFR 190 are total body and organ doses of 25 mrem per year and a thyroid dose of 75 mrem per year. These calculations will include doses as a result of liquid and gaseous pathways as well as doses from direct radiation. Liquid, gaseous and direct radiation pathway doses will consider the James A. FitzPatrick facility as well as Nine Mile Point Nuclear Station.

In the event the calculations demonstrate that the 40 CFR 190 dose limits, as defined above, have been exceeded, then a report shall be prepared and submitted to the Commission within 30 days as specified in Section 3.6.15.d of the Technical Specifications.

Section 4.0 of the ODCM contains more information concerning calculations for an evaluation of whether 40 CFR 190 limits have been exceeded.

3.0 GASEOUS EFFLUENTS

3.1 Setpoint Determinations

3.1.1 Basis

The monitor setpoints will be established such that the instantaneous release rate of radioactive materials in gaseous effluents does not exceed the 10 CFR 20 limits for annual release. The setpoints will be activated if the annual dose at or beyond the site boundary would exceed 500 mrem to the whole body or 3000 mrem to the skin from the continuous release of radioactive noble gas in the gaseous effluent. The Stack Gas Monitor setpoints will be determined once per month and will be based on the isotopic composition of the release. If the calculated setpoint is less conservative than the existing setpoint it is not mandatory that the setpoint be changed. During outages, the last operating setpoint shall be used. Following an outage of greater than 30 days the setpoints at the time of shutdown shall be utilized until such time as the current isotopic composition of the effluent has been determined; this period may not exceed one month.

3.1.2 Stack Monitor Setpoint

The detailed methods for establishing setpoints shall be contained in the station procedures. These methods shall be in accordance with the following:

(1) The release rate limit for noble gases from Nine Mile Point Unit 1 is:

$$\sum[Q_i\,(1.6E_{i\gamma} + 0.3\,E_{i\beta})] \leq 1$$

where: i = an individual nuclide

Q_i = release rate from Nine Mile Point Unit 1 main stack in Ci/sec for isotope i

E = the average gamma energy per disintegration

E_B = the average beta energy per disintegration

Refer to Table 3-1 for E_γ and E_β values.

(2) Utilizing the isotopic composition of noble gas releases, determine f_i (the fraction of each noble gas isotope in the effluent)

$$f_i = \frac{C\cdot}{\sum C_i}$$

C_i = the concentration in uCi/cc of isotope i in the gaseous effluent.

(3) Determine the maximum acceptable release rate Qmax (Ci/sec) for the isotopic mixture of noble gases.

$$Qmax = \frac{1}{\sum[f_i\,(1.6\,E_{i\gamma} + 0.3\,E_{i\beta})]}$$

(4) Determine the Hi Hi alarm point value

Hi Hi Alarm Point = [(Qmax)(CF)]

CF = Calibration Factor (net cps/Ci/sec)

(5) The Hi alarm point value is 1/2 the Hi Hi alarm point value.

3.1.3 Recombiner Discharge Monitor

The release rate at the Recombiner Discharge Monitor is limited to 500,000 uCi/sec (1 Ci/sec for up to 60 days).

(1) The Hi Hi alarm point value is determined as follows:

$$\text{Hi Hi alarm point} = \frac{3/4^{*} \times 500{,}000 \text{ uCi/sec}}{31.5 \text{ uCi/sec/mr/hr}^{**}} = 11{,}900 \text{ mr/hr}$$

(2) and, the Hi alarm point value is

$$\text{Hi alarm point} = \frac{1/4^{*} \times 500{,}000 \text{ uCi/sec}}{31.5 \text{ uCi/sec/mr/hr}} = 3{,}960 \text{ mr/hr}$$

*3/4 and 1/4 represent factors of conservatism which may be set less conservative if isotopic analysis frequency is increased from monthly to weekly.

** Typical value, as determined by isotopic analysis.

3.2 Dose Determination

3.2.1 Dose Rate

3.2.1.1 Noble Gases

In accordance with the provisions of 10 CFR 20 the dose rates from noble gas release to unrestricted areas are to be limited to 500 mrem/yr to the total

body and 3,000 mrem/yr to the skin. The monitor alarm setpoint determinations in Section 3.1 are based on this limit and setting the alarm setpoints in the manner specified will assure that these limits are not exceeded.

3.2.1.2 Tritium, Iodines and Particulates

The dose rate in unrestricted areas from the release of tritium, iodine-131, iodine-133 and all radionuclides in particulate form with half lives greater than 8 days is limited to 1500 mrem/year to any organ. In order to assure that this limit is not exceeded the average annual release rate of tritium, I-131, I-133 and particulates with half lives greater than 8 days shall be:

$$1.2 \times 10^4 \; Q_p \leq 1$$

where: Q_p = release rate from Unit 1 stack in Ci/sec or the maximum release rate (Qpmax) shall not exceed:

$$Q_{pmax} = \frac{1}{1.2 \times 10^4} = 8.3 \times 10^{-5} \text{ Ci/sec.} = 83 \text{ uCi/sec}$$

3.2.2 Dose

Calculations will be performed monthly to demonstrate that doses resulting from the release of noble gases, tritium, I-131, I-133 and particulates with half lives greater than 8 days are within the limits specified in 10 CFR 50, Appendix I. These limits are:

Noble Gas

5 mr gamma/calendar quarter

10 mrad beta/calendar quarter

10 mr gamma/calendar year

20 mrad beta/calendar year

Radioiodines, Tritium & Particulates

7.5 mrem to any organ/calendar quarter

15 mrem to any organ/calendar year

3.2.2.1 Noble Gas

The air dose at the critical receptor due to noble gas releases is determined as follows:

For gamma radiation

$$D = 3.17 \times 10^{-8} \sum M_i \; X/Q \;\; Q_i$$

For beta radiation

$$D_B = 3.17 \times 10^{-8} \sum N_i \; X/Q \;\; Q_i$$

where

M_i = air gamma dose factor in (mr/year per uCi/m^3) for each isotope i (Table 3-3)

N_i = air beta dose factor (mrad/year per uCi/m^3) for each isotope i (Table 3-3)

X/Q = the highest calculated 5 year annual average relative concentration for areas at or beyond the site boundary (sec/m^3) (Table 3-2)

Q_i = the total quantity of isotope i released during the period, (uCi)

3.17×10^{-8} = the inverse of the number of seconds in a year

3.2.2.2 Radioiodine, Tritium & Particulates

The doses to an individual from I-131, I-133, tritium, and particulates with half lives greater than 8 days will be calculated monthly as follows:

$$\text{Dose} = 3.17 \times 10^{-8} \sum_j \sum_i R_{ijak} W_j Q_i$$

Where

W_j = dispersion parameter either X/Q or D/Q depending on pathway

Q_i = the total quantity of isotope i released during the period, (uCi)

R_{ijak} = the dose factor for each isotope i, pathway j, age group a, and organ k (Table 3-4, A through S)

3.17×10^{-8} = the inverse of the number of seconds in a year

The R values contained in Table 3-4 were calculated using the methodology defined in NUREG-0133 and Regulatory Guide 1.109, Revision 1.

3.2.2.3 Accumulating Doses

Doses will be calculated monthly for the identified critical organ, age group, and pathway, and the results will be summed for each calendar quarter and year. It has been historically demonstrated that the critical pathway is usually the grass-cow-milk pathway and the critical organ is the infant's thyroid. The critical doses are based on the following pathways.

- noble gas plume dose
- ground plane dose (deposition)
- inhalation dose
- cow's milk dose
- goat's milk dose
- meat consumption dose
- vegetation (food crops) dose

Critical receptor locations have been identified for the purposes of evaluating each pathway. These receptor locations are contained in Table 3-2. For the noble gas plume dose and inhalation dose the critical X/Q residence is applicable. For the milk, meat and vegetation dose, the critical receptor locations are the critical D/Q milk cow location, milk goat location, meat animal location and critical D/Q garden location.

The quarterly and annual results shall be compared to the limits listed in paragraph 3.2.2. If the limits are exceeded, special reports as required by Section 6.9.3 of the Technical Specification must be submitted.

3.3 Critical Receptors

In accordance with the provisions of 10 CFR 20 and 10 CFR 50, Appendix I, the critical receptors will be identified. For noble gases, only the external noble gas plume dose pathway will be considered and the location of concern will be the greatest X/Q residence as determined in specification 3.6.22 of the Technical Specifications. For I-133, I-131, tritium and particulate radionuclides with a half life of greater than eight days, the critical pathways are milk (cow and goat), meat, vegetation, inhalation and direct radiation (ground plane) as a result of ground deposition.

The cow milk and goat milk pathway will be based on the greatest D/Q milk cow and milk goat location as determined in specification 3.6.22. The inhalation dose pathway will be based on the greatest X/Q residence as determined in specification 3.6.22 since this location would have the greatest potential residence time. This critical receptor location is the same as the location used for the noble gas plume dose pathway. The ground plane dose pathway will be calculated as the greatest D/Q residence because of the greatest potential residence time. For the meat consumption dose pathway, the critical receptor is the greatest D/Q meat animal location. This location is determined in conjunction with the land use census (specification 3.6.22). The vegetation (food crop) dose is based on the greatest D/Q garden location. This location, as the critical meat animal location, will be determined in conjunction with the land use census.

4.0 40 CFR 190 REQUIREMENTS

The "Uranium Fuel Cycle" is defined in 40 CFR Part 190.02 (b) as follows:

> "Uranium fuel cycle means the operations of milling of uranium ore, chemical conversion of uranium, isotopic enrichment of uranium, fabrication of uranium fuel, generation of electricity by a light-water-cooled nuclear power plant using uranium fuel, and reprocessing of spent uranium fuel, to the extent that these directly support the production of electrical power for public use utilizing nuclear energy, but excludes mining operations, operations at waste disposal sites, transportation of any radioactive material in support of these operations, and the reuse of recovered non-uranium special nuclear and by-product materials from the cycle."

Section 3.6.15.d of the Technical Specifications requires than when the calculated doses associated with the effluent releases exceed twice the specified limits of sections 3.6.15.a.(2)(b), 3.6.15.b.(2)(b) and 3.6.15.b.(3)(b), then calculations shall be made including direct radiation contributions from the reactor units and outside storage tanks (as applicable) to determine whether the above 40 CFR 190 does limits have been exceeded. If such is the case, Niagara Mohawk shall submit a Special Report to the NRC and limit subsequent releases such that the dose commitment to a real individual from all uranium fuel cycle sources is limited to $\leq$ 25 mrem to the total body or any organ (except the thyroid, which is limited to $\leq$ 75 mrem) over the calendar year. This report is to demonstrate that radiation exposures to all real individuals from all uranium fuel cycle sources (including all liquid and gaseous effluent pathways and direct radiation) are less than the limits in 40 CFR Part 190. If releases that

result in doses exceeding the 40 CFR 190 limits have occurred, then a variance from the NRC to permit such releases will be requested and if possible, action will be taken to reduce subsequent releases.
The report to the NRC shall contain:

1) Identification of all uranium fuel cycle facilities or operations within 5 miles of the nuclear power reactor units at the site, that contribute to the annual dose of the maximum exposed member of the public.
2) Identification of the maximum exposed member of the public and a determination of the total annual dose to this person from all existing pathways and sources of radioactive effluents and direct radiation.

The total body and organ doses resulting from radioactive material in liquid effluents from Nine Mile Point Unit 1 will be summed with the doses resulting from the releases of noble gases, radioiodines, and particulates for preceeding 3 quarters and from the quarter in which twice the limit was exceeded. The direct dose components will also be determined by either calculation or actual measurement. The doses from Nine Mile Point Unit 1 will be added to the doses to the maximum exposed individual that are contributed from other uranium fuel cycle operations.

For the purpose of calculating doses, the results of the Radiological Environmental Monitoring Program may be included for providing more refined estimates of doses to a real maximum exposed individual. Estimated doses, as calculated from station effluents, may be replaced by doses calculated from actual environmental sample results.

4.1 Evaluation of Doses From Liquid Effluents

For the evaluation of doses to real members of the public from liquid effluents, the fish consumption and shoreline sediment ground dose will be considered. The dose associated with fish consumption may be calculated using the ODCM methodology or by calculating a dose to man based on actual fish sample analysis data. The dose associated with shoreline sediment is based on the assumption that the shoreline would be utilized as a recreational area. This dose may be derived from liquid effluent data or from actual shoreline sediment sample analysis data.

Doses to members of the public from the fish consumption and shoreline sediment pathways will be calculated using Regulatory Guide 1.109 methodology or ODCM methodology.

4.2 Evaluation of Doses From Gaseous Effluents

For the evaluation of doses to real members of the public from gaseous effluents, the pathways contained in section 3.2.2.3 of the ODCM will be considered. However, any updated field data may be utilized that concerns locations of real individuals, real time meteorological data, location of critical receptors, etc. Data from the most recent census and sample location surveys should be utilized. Doses may also be calculated from actual environmental sample media, as available. Environmental sample media data such as TLD, air sample, milk sample and vegetable (food crop) sample data may be utilized in lieu of effluent calculational data.

Doses to members of the public from the pathways contained in ODCM section 3.2.2.3 as a result of gaseous effluents will be calculated using the dose factors of Regulatory Guide 1.109 or the methodology of the ODCM, as applicable.

4.3 Evaluation of Doses From Direct Radiation

Section 3.6.15.d of the Technical Specifications reauires that the dose contribution as a result of direct radiation be considered when evaluating whether the dose limitations of 40 CFR 190 have been exceeded. Direct radiation doses as a result of the reactor, turbine and radwaste buildings and outside radioactive storage tanks (as applicable) may be evaluated by engineering calculations or by evaluating environmental TLD results at critical receptor locations, site boundary or other special interest locations.

5.0 ENVIRONMENTAL MONITORING PROGRAM

5.1 Sampling Stations

The current sampling locations are specified in Table 5-1 and Figures 5.1-1, 5.1-2. The Environmental Monitoring Program is a joint effort between the Niagara Mohawk Power Corporation and the New York Power Authority, the owners and operators of the Nine Mile Point Unit 1 and the James A. FitzPatrick Nuclear Power Plant, respectively. Sampling locations are chosen on the basis of historical average dispersion or deposition parameters from both units.

The average dispersion and deposition parameters for the two units have been calculated for a 5 year period, 1978 through 1982. These dispersion calculations are attached as Appendix C. The calculated dispersion or deposition parameters will be compared to the results of the annual land use census. If it is determined that a milk sampling location exist at a location that yields a significantly higher (e.g. 50%) calculated D/Q rate, the new milk sampling location will be added to the monitoring program within 30 days. If a new location is added, the old location that yields the lowest calculated D/Q may be dropped from the program after October 31 of that year.

5.2 Interlaboratory Comparison Program

Analyses shall be performed on samples containing known quantities of radioactive materials that are supplied as part of a Commission approved or sponsored Interlaboratory Comparison Program, such as the

EPA Crosscheck Program. Participation shall be only for those media, e.g., air, milk, water, etc., that are included in the Nine Mile Point environmental monitoring program and for which cross check samples are available. The site identification symbol or the actual Quality Control sample results shall be reported in the Annual Radiological Environmental Operating Report so that the Commission staff may evaluate the results.

5.3 Capabilities for Thermoluminescent Dosimeters Used for Environmental Measurements

Required detection capabilities for thermoluminescent dosimeters used for environmental measurements required by Table 4.6.20-1, footnote b of the Technical Specifications are based on ANSI Standard N545, section 4.3. Required detection capabilities are as follows. TLDs are defined as phosphors packaged for field use.

In regard to the detection capabilities for thermoluminescent dosimeters, only one determination is required to evaluate the above capabilities per type of TLD. Furthermore, the above capabilities may be determined by the vendor who supplies the TLDs.

5.3.1 Uniformity shall be determined by giving TLDs from the same batch an exposure equal to that resulting from an exposure rate of 10 uR/hr during the field cycle. The responses obtained shall have a relative standard deviation of less than 7.5%. A total of at least 5 TLDs shall be evaluated.

5.3.2 Reproducibility shall be determined by giving TLDs repeated exposures equal to that resulting from an exposure rate of 10 uR/hr during the field cycle. The average of the relative standard deviations of the responses shall be less than 3.0%. A total of at least 4 TLDs shall be evaluated.

5.3.3 Dependence of exposure interpretation on the length of a field cycle shall be examined by placing TLDs for a period equal to at least a field cycle and a period equal to half the same field cycle in an area where the exposure rate is known to be constant. This test shall be conducted under approximate average winter temperatures and approximate average summer temperatures. For these tests, the ratio of the response obtained in the field cycle to twice that obtained for half the field cycle shall not be less than 0.85. At least 6 TLDs shall be evaluated.

5.3.4 Energy dependence shall be evaluated by the response of TLDs to photons for several energies between approximately 30 keV and 3 MeV. The response shall not differ from that obtained with the calibration source by more than 25% for photons with energies greater than 80 keV and shall not be enhanced by more than a factor of two for photons with energies less than 80 keV. A total of at least 8 TLDs shall be evaluated.

5.3.5 The directional dependence of the TLD response shall be determined by comparing the response of the TLD exposed in the routine orientation with respect to the calibration source with the response obtained for different orientations. To accomplish this, the TLD shall be rotated through at least two perpendicular planes. The response averaged over all directions shall not differ from the response obtained in the standard calibration position by more than 10%. A total of at least 4 TLDs shall be evaluated.

5.3.6 Light dependence shall be determined by placing TLDs in the field for a period equal to the field cycle under the four conditions found in ANSI N545, section 4.3.6. The results obtained for the unwrapped TLDs shall not differ from those obtained for the TLDs wrapped in aluminum foil by more than 10%. A total of at least 4 TLDs shall be evaluated for each of the four conditions.

5.3.7 Moisture dependence shall be determined by placing TLDs (that is, the phosphors packaged for field use) for a period equal to the field cycle in an area where the exposure rate is known to be constant. The TLDs shall be exposed under two conditions: (1) packaged in a thin, sealed plastic bag, and (2) packaged in a thin, sealed plastic bag with sufficient water to yield observable moisture throughout the field cycle. The TLD or phosphor, as appropriate, shall be dried before readout. The

response of the TLD exposed in the plastic bag containing water shall not differ from that exposed in the regular plastic bag by more than 10%. A total of at least 4 TLDs shall be evaluated for each condition.

5.3.8 Self irradiation shall be determined by placing TLDs for a period equal to the field cycle in an area where the exposure rate is less than 10 uR/hr and the exposure during the field cycle is known. If necessary, corrections shall be applied for the dependence of exposure interpretation on the length of the field cycle (ANSI N545, section 4.3.3). The average exposure inferred from the responses of the TLDs shall not differ from the known exposure by more than an exposure equal to that resulting from an exposure rate of 10 uR/hr during the field cycle. A total of at least 3 TLDs shall be evaluated.

TABLE 2-1

R_{apji} VALUES FOR THE NINE MILE POINT UNIT 1 FACILITY

NUCLIDE	ADULT - TOTAL BODY R_{apji} (MREM/YR-Ci)	TEEN - LIVER R_{apji} (MREM/YR-Ci)
^{89}Sr	2.05 E - 3	N/A
^{90}Sr	4.37 E - 1	N/A
^{134}Cs	1.89 E + 0	2.35 E + 0
^{137}Cs	1.12 E + 0	1.78 E + 0
^{58}Co	6.47 E - 4	2.87 E - 4
^{60}Co	1.85 E - 3	8.38 E - 4
^{54}Mn	2.72 E - 3	1.19 E - 2

TABLE 2-2

PARAMETERS FOR THE LIQUID EFFLUENT PATHWAY

PARAMETER	VALUE	REFERENCE (REG. GUIDE 1.109)
U_{ap}	Adult = 21.0 Kg/gr Teen = 16.0 Kg/gr	Table E-5
M_p	0.2	Site Specific
F	590 ft.^{3}/second	Site Specific
B_{ip}	Each element	Table A-1
D_{aipi}	Each radionuclide	Tables E-11 to E-14
tp	26.9 hours	Site Specific

TABLE 3-1

Average Energy Per Disintegration

ISOTOPE	$\bar{E}_\gamma$ mev/dis	(Ref)	$\bar{E}_\beta$ mev/dis(3)	(Ref)
Kr-83m	0.00248	(1)	0.0371	(1)
Kr-85	0.0022	(1)	0.250	(1)
Kr-85m	0.159	(1)	0.253	(1)
Kr-87	0.793	(1)	1.32	(1)
Kr-88	1.95	(1)	0.377	(1)
Kr-89	2.22	(2)	1.37	(2)
Kr-90	2.10	(2)	1.01	(2)
Xe-131M	0.0201	(1)	0.143	(1)
Xe-133	0.0454	(1)	0.135	(1)
Xe-133m	0.042	(1)	0.19	(1)
Xe-135	0.247	(1)	0.317	(1)
Xe-135m	0.432	(1)	0.095	(1)
Xe-137	0.194	(1)	1.64	(1)
Xe-138	1.18	(1)	0.611	(1)

(1) ORNL-4923, Radioactive Atoms - Supplement I, M.S. Martin, November 1973.

(2) NEDO-12037, "Summary of Gamma and Beta Emitters and Intensity Data"; M.E. Meek, R.S. Gilbert, January 1970. (The average energy was computed from the maximum energy using the ICRP II equation, not the 1/3 value assumption used in this reference).

(3) The average energy includes conversion electrons.

TABLE 3-2
Critical Receptor Dispersion Parameters

LOCATION	DIR	MILES	X/Q $\left(\frac{sec}{m^3}\right)$	D/Q $\left(\frac{1}{m^2}\right)$
Residences	E	1.2	1.00E-07*	6.00E-09*
Dairy Cows	ESE	1.6	5.00E-08**	2.00E-09**
Milk Goats	SW	2.9	1.25E-08**	2.00E-10**
Meat Animals	ESE	1.6	5.00E-08**	2.00E-09**
Gardens	E	1.6	8.00E-08**	2.50E-09**

* Estimated value (conservative) based on 5 year annual meteorological data

** Estimated value (conservative) based on 5 year average grazing season meteorological data

TABLE 3-3
DOSE FACTORS FOR NOBLE GASES

Radionuclides	Gamma Air Dose Factor M_i $\frac{mr\text{-}m^3}{uC_i\text{-}yr}$	Beta Air Dose Factor N_i $\frac{mrad\text{-}m^3}{uC_i\text{-}yr}$
Kr-83m	1.93E+01	2.88E+02
Kr-85m	1.23E+03	1.97E+03
Kr-85	1.72E+01	1.95E+03
Kr-87	6.17E+03	1.03E+04
Kr-88	1.51E+04	2.93E+03
Kr-89	1.73E+04	1.-6E+04
Kr-90	1.63E+04	7.83E+03
Xe-131m	1.56E+02	1.11E+03
Xe-133m	3.27E+02	1.48E+03
Xe-133	3.53E+02	1.05E+03
Xe-135m	3.36E+03	7.39E+02
Xe-135	1.92E+03	2.46E+03
Xe-137	1.51E+03	1.27E+04
Xe-138	9.21E+03	4.75E+03
Xe-139	5.28E+03	6.52E+04
Ar-41	9.30E+03	3.28E+03

* 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 Part 50, Appendix I," dated October 1977, page 1.109-21.

TABLE 3-4A
R VALUES - COW'S MILK - INFANT
m²-mrem/yr
uCi/sec

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3*	2.40E 03	2.40E 03		2.40E 03	2.40E 03	2.40E 03	2.40E 03
CR 51	7.46E 04	2.17E 06			1.06E 04	4.87E 04	4.47E 04
MN 54	4.54E 06	7.36E 06		2.00E 07	4.44E 06		
FE 59	7.21E 07	8.74E 07	1.05E 08	1.83E 08			5.41E 07
CO 58	2.88E 07	2.88E 07		1.15E 07			
CO 60	1.11E 08	1.12E 08		4.71E 07			
ZN 65	5.26E 09	9.63E 09	3.32E 09	1.14E 10	5.53E 09		
SR 80	1.70E 08	1.22E 08	5.94E 09				
SR 90	1.79E 10	8.75E 08	7.01E 10				
ZR 95	5.58E 02	3.92E 05	3.23E 03	7.87E 02	8.48E 02		
I 131	6.92E 08	5.62E 07	1.34E 09	1.57E 09	1.84E 09	5.17E 11	
I 133	7.91E 06	4.57E 06	1.85E 07	2.70E 07	3.17E 07	4.91E 09	
CS 134	3.59E 09	9.65E 07	1.90E 10	3.55E 10	9.14E 09		3.75E 09
CS 136	1.03E 09	4.19E 07	9.37E 08	2.76E 09	1.10E 09		2.25E 08
CS 137	2.37E 09	1.04E 08	2.85E 10	3.34E 10	8.96E 09		3.63E 09
BA 148	5.94E 06	2.83E 07	1.15E 08	1.15E 05	2.74E 04		7.03E 04
CE 141	1.44E 03	6.30E 06	2.00E 04	1.22E 04	3.76E 03		

* $\frac{mrem/yr}{uCi/m^3}$

TABLE 3-4B
R VALUES - COW'S MILK - CHILD
$\frac{m^2\text{-mrem/yr}}{\text{uCi/sec}}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3*	1.58E 03	1.58E 03	1.58E 03	1.58E 03	1.58E 03	1.58E 03	1.58E 03
Cr 51	4.71E 04	2.50E 06			7.14E 03	2.61E 04	4.77E 04
Mn 54	2.87E 06	9.04E 06		1.08E 07	3.02E 06		
Fe 59	4.52E 07	9.45E 07	5.61E 07	9.08E 07			2.63E 07
Co 58	1.77E 07	3.37E 07		5.77E 06			
Co 60	6.81E 07	1.28E 08		2.31E 07			
Zn 65	4.10E 09	1.16E 09	2.47E 09	6.59E 09	4.15E 09		
Sr 89	8.93E 07	1.21E 08	3.13E 09				
Sr 90	1.63E 10	8.68E 08	6.44E 10				
Zr 95	3.56E 02	4.17E 05	1.82E 03	4.00E 02	5.72E 02		
I 131	3.66E 08	5.73E 07	6.40E 08	6.44E 08	1.06E 09	2.13E 11	
I 133	4.11E 06	4.38E 06	8.78E 06	1.09E 07	1.81E 07	2.02E 09	
Cs 134	4.09E 09	1.05E 08	1.18E 10	1.94E 10	6.01E 09		2.16E 09
Cs 136	8.53E 08	4.63E 07	4.80E 08	1.32E 09	7.07E 08		1.05E 08
Cs 137	2.52E 09	1.07E 08	1.79E 10	1.71E 10	5.57E 09		2.00E 09
Ba 140	3.27E 06	2.84E 07	5.60E 07	4.91E 04	1.60E 04		2.93E 04
Ce 141	7.47E 02	6.28E 06	1.01E 04	5.03E 03	2.21E 03		

* $\frac{\text{mrem/yr}}{\text{uCi/m}^3}$

TABLE 3-4C
R VALUES - COW'S MILK - TEEN

$\frac{m^2\text{-mrem/yr}}{\text{uCi/sec}}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3*	1.00E 03	1.00E 03		1.00E 03	1.00E 03	1.00E 03	1.00E 03
Cr 51	2.31E 04	3.88E 06			5.06E 03	1.28E 04	3.30E 04
Mn 54	1.43E 06	1.48E 07		7.20E 06	2.15E 06		
Fe 59	2.18E 07	1.34E 08	2.42E 07	5.65E 07			1.78E 07
Co 58	8.70E 06	5.21E 07		3.78E 06			
Co 60	3.35E 07	1.94E 08		1.49E 07			
Zn 65	2.04E 09	1.85E 09	1.26E 09	4.38E 09	2.80E 09		
Sr 89	3.62E 07	1.50E 08	1.26E 09				
Sr 90	9.42E 09	1.07E 09	3.81E 10				
Zr 95	1.70E 02	5.70E 05	7.83E 02	2.47E 02	3.63E 02		
I 131	1.98E 08	7.31E 07	2.64E 08	3.69E 08	6.36E 08	1.08E 11	
I 133	1.87E 06	4.64E 06	3.61E 06	6.13E 06	1.08E 07	8.56E 08	
Cs 134	5.60E 09	1.50E 08	5.12E 09	1.21E 10	3.83E 09		1.46E 09
Cs 136	5.62E 08	6.73E 07	2.13E 08	8.37E 08	4.55E 08		7.18E 07
Cs 137	3.44E 09	1.40E 08	7.42E 09	9.87E 09	3.36E 09		1.30E 09
Ba 140	1.58E 06	3.58E 07	2.32E 07	2.84E 04	9.65E 03		1.91E 04
Ce 141	3.14E 02	7.83E 06	4.10E 03	2.74E 03	1.29E 03		

* $\frac{\text{mrem/yr}}{\text{uCi/m}^3}$

TABLE 3-4D
R VALUES - COW'S MILK - ADULT
$\frac{m^2\text{-mrem/yr}}{\text{uCi/sec}}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3*	7.69E 02	7.69E 02		7.69E 02	7.69E 02	7.69E 02	7.69E 02
Cr 51	1.32E 04	3.32E 06			2.91E 03	7.90E 03	1.75E 04
Mn 54	8.25E 05	1.32E 07		4.32E 06	1.29E 06		
Fe 59	1.25E 07	1.09E 08	1.39E 07	3.26E 07			9.10E 06
Co 58	5.03E 06	4.56E 07		2.24E 06			
Co 60	1.93E 07	1.65E 08		8.77E 06			
Zn 65	1.18E 09	1.65E 09	8.21E 08	2.81E 09	1.75E 09		
Sr 89	1.97E 07	1.10E 08	6.85E 08				
Sr 90	6.62E 09	7.80E 08	2.70E 10				
Zr 95	9.72E 01	4.55E 05	4.48E 02	1.44E 02	2.25E 02		
I 131	1.19E 08	5.49E 07	1.45E 08	2.08E 08	3.57E 08	6.82E 10	
I 133	1.05E 06	3.09E 06	1.98E 06	3.44E 06	6.01E 06	5.06E 08	
Cs 134	5.74E 09	1.23E 08	2.95E 09	7.02E 09	2.27E 09		7.54E 08
Cs 136	3.55E 08	5.60E 07	1.25E 08	4.93E 08	2.74E 08		3.76E 07
Cs 137	3.65E 09	1.08E 08	4.09E 09	5.59E 09	1.90E 09		6.31E 08
Ba 140	8.43E 05	2.65E 07	1.29E 07	1.62E 04	5.49E 03		9.25E 03
Ce 141	1.71E 02	5.78E 06	2.24E 03	1.51E 03	7.02E 02		

* $\frac{\text{mrem/yr}}{\text{uCi/m}^3}$

TABLE 3-4E
R VALUES - GOAT'S MILK - INFANT

$\frac{m^2\text{-mrem/yr}}{\text{uCi/sec}}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3*	4.90E 03	4.90E 03		4.90E 03	4.90E 03	4.90E 03	4.90E 03
Cr 51	8.95E 03	2.61E 05			1.28E 03	5.84E 03	1.14E 04
Mn 54	5.45E 05	8.83E 05		2.40E 06	5.33E 05		
Fe 59	9.37E 05	1.14E 06	1.36E 06	2.38E 06			7.03E 05
Co 58	3.45E 06	3.45E 06		1.38E 06			
Co 60	1.34E 07	1.35E 07		5.65E 06			
Zn 65	6.31E 08	1.16E 09	3.99E 08	1.37E 09	6.63E 08		
Sr 89	3.58E 08	2.57E 08	1.25E 10				
Sr 90	3.57E 10	1.84E 09	1.47E 11				
Sr 95	6.70E 01	4.70E 04	3.88E 02	9.45E 01	1.02E 02		
I 131	8.31E 08	6.74E 07	1.60E 09	1.89E 09	2.21E 09	6.21E 11	
I 133	9.49E 06	5.48E 06	2.23E 07	3.24E 07	3.81E 07	5.89E 09	
Cs 134	1.08E 10	2.89E 08	5.71E 10	1.07E 11	2.74E 10		1.12E 10
Cs 136	3.09E 09	1.26E 08	2.81E 09	8.27E 09	3.30E 09		6.74E 08
Cs 137	7.10E 09	3.13E 08	8.55E 10	1.00E 11	2.69E 10		1.09E 10
Ba 140	7.13E 05	3.40E 06	1.38E 07	1.38E 04	3.29E 03		8.50E 03
Ce 141	1.72E 02	7.57E 05	2.40E 03	1.46E 03	4.52E 02		

* $\frac{\text{mrem/yr}}{\text{uCi/m}^3}$

TABLE 3-4F
R VALUES - GOAT'S MILK - CHILD
$\frac{m^2\text{-mrem/yr}}{\text{uCi/sec}}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3*	3.23E 03	3.23E 03		3.23E 03	3.23E 03	3.23E 03	3.23E 03
Cr 51	5.65E 03	3.00E 05			8.57E 02	3.14E 03	5.73E 03
Mn 54	3.44E 05	1.08E 06		1.29E 06	3.62E 05		
Fe 59	5.88E 05	1.23E 06	7.29E 05	1.18E 06			3.42E 05
Co 58	2.12E 06	4.04E 06		6.92E 05			
Co 60	8.17E 06	1.53E 07		2.77E 06			
Zn 65	4.92E 08	1.39E 08	2.97E 08	7.91E 08	4.98E 08		
Sr 89	1.87E 08	2.54E 08	6.56E 09				
Sr 90	3.43E 10	1.82E 09	1.35E 11				
Zr 95	4.27E 01	5.01E 04	2.18E 02	4.80E 01	6.87E 01		
I 131	4.39E 08	6.88E 07	7.68E 08	7.72E 08	1.27E 09	2.55E 11	
I 133	4.93E 06	5.25E 06	1.05E 07	1.30E 07	2.17E 07	2.42E 09	
Cs 134	1.23E 10	3.14E 08	3.55E 10	5.82E 10	1.80E 10		6.47E 09
Cs 136	2.56E 09	1.39E 08	1.44E 09	3.96E 09	2.11E 09		3.14E 08
Cs 137	7.57E 09	3.21E 08	5.36E 10	5.13E 10	1.67E 10		6.01E 09
Ba 140	3.92E 05	3.41E 06	6.72E 06	5.89E 03	1.92E 03		3.51E 03
Ce 141	8.97E 01	7.54E 05	1.21E 03	6.04E 02	2.65E 02		

* $\frac{\text{mrem/yr}}{\text{uCi/m}^3}$

TABLE 3-4G
R VALUES - GOAT'S MILK - TEEN
$\frac{m^2\text{-mrem/yr}}{\text{uCi/sec}}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3*	2.04E 03	2.04E 03		2.04E 03	2.04E 03	2.04E 03	2.04E 03
Cr 51	2.77E 03	4.66E 05			6.07E 02	1.54E 03	3.95E 03
Mn 54	1.71E 05	1.77E 06		8.64E 05	2.58E 05		
Fe 59	2.83E 05	1.74E 06	3.14E 05	7.34E 05			2.31E 05
Co 58	1.04E 06	6.25E 06		4.63E 05			
Co 60	4.02E 06	2.32E 07		1.78E 06			
Zn 65	2.45E 08	2.22E 08	1.51E 08	5.25E 08	3.36E 08		
Sr 89	7.59E 07	3.16E 08	2.65E 09				
Sr 90	1.98E 10	2.25E 09	8.81E 10				
Zr 95	2.04E 01	6.84E 04	9.40E 01	2.97E 01	4.36E 01		
I 131	2.38E 08	8.77E 07	3.17E 08	4.43E 08	7.63E 08	1.29E 11	
I 133	2.24E 06	5.57E 06	4.34E 06	7.36E 06	1.29E 07	1.03E 09	
Cs 134	1.68E 10	4.50E 08	1.54E 10	3.62E 10	1.15E 10		4.39E 09
Cs 136	1.69E 09	2.02E 08	6.38E 08	2.51E 09	1.37E 09		2.15E 08
Cs 137	1.03E 10	4.21E 08	2.22E 10	2.96E 10	1.01E 10		3.91E 09
Ba 140	1.80E 05	4.30E 06	2.79E 06	3.41E 03	1.16E 03		2.30E 03
Ce 141	3.77E 01	9.39E 05	4.92E 02	3.28E 02	1.55E 02		

* $\frac{\text{mrem/yr}}{\text{uCi/m}^3}$

TABLE 3-4H
R VALUES - GOAT'S MILK - ADULT

$\frac{m^2\text{-mrem/yr}}{\text{uCi/sec}}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3*	1.57E 03	1.57E 03		1.57E 03	1.57E 03	1.57E 03	1.57E 03
Cr 51	1.59E 03	3.99E 05			3.49E 02	9.48E 02	2.11E 03
Mn 54	9.89E 04	1.59E 06		5.19E 05	1.54E 05		
Fe 59	1.62E 05	1.41E 06	1.80E 05	4.23E 05			1.18E 05
Co 58	6.03E 05	5.46E 06		2.69E 05			
Co 60	2.32E 06	1.98E 07		1.05E 06			
Zn 65	1.42E 08	1.97E 08	9.85E 07	3.14E 08	2.10E 08		
Sr 89	4.13E 07	2.31E 08	1.44E 09				
Sr 90	1.39E 10	1.64E 09	5.67E 10				
Zr 95	1.17E 01	5.46E 04	5.37E 01	1.72E 01	2.70E 01		
I 131	1.43E 08	6.59E 07	1.74E 08	2.50E 08	4.28E 08	8.18E 10	
I 133	1.26E 06	3.71E 06	2.37E 06	4.13E 06	7.21E 06	6.07E 08	
Cs 134	1.72E 10	3.69E 08	8.85E 09	2.11E 10	6.82E 09		2.26E 09
Cs 136	1.06E 09	1.68E 08	3.75E 08	1.48E 09	8.23E 08		1.13E 08
Cs 137	1.10E 10	3.25E 08	1.25E 10	1.68E 10	5.70E 09		1.89E 09
Ba 140	1.01E 05	3.18E 06	1.54E 06	1.94E 03	6.59E 02		1.11E 03
Ce 141	2.06E 01	6.94E 05	2.68E 02	1.81E 02	8.43E 01		

* $\frac{\text{mrem/yr}}{\text{uCi/m}^3}$

TABLE 3-4I
R VALUES - MEAT - CHILD
$\frac{m^2\text{-mrem/yr}}{\text{uCi/sec}}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3*	2.36E 02	2.36E 02		2.36E 02	2.36E 02	2.36E 02	2.36E 02
Cr 51	4.07E 03	2.16E 05			6.17E 02	2.26E 03	4.12E 03
Mn 54	1.09E 06	3.45E 06		4.11E 06	1.15E 06		
Fe 59	1.42E 08	2.97E 08	1.76E 08	2.85E 08			8.26E 07
Co 58	2.39E 07	4.56E 07		7.82E 06			
Co 60	1.09E 08	2.05E 08		3.70E 07			
Zn 65	3.72E 08	1.05E 08	2.25E 08	5.99E 08	3.77E 08		
Sr 89	6.55E 06	8.87E 06	2.29E 08				
Sr 90	1.52E 09	8.08E 07	6.00E 09				
Zr 95	2.48E 05	2.91E 08	1.27E 06	2.79E 05	3.99E 05		
I 131	4.64E 06	7.29E 05	8.14E 06	8.19E 06	1.34E 07	2.71E 09	
I 133	1.55E-01	1.66E-01	3.32E-01	4.11E-01	6.85E-01	7.63E 01	
Cs 134	1.67E 08	4.26E 06	4.81E 08	7.90E 08	2.45E 08		8.78E 07
Cs 136	1.35E 07	7.34E 05	7.60E 06	2.09E 07	1.11E 07		1.66E 06
Cs 137	1.04E 08	4.43E 06	7.39E 08	7.07E 08	2.30E 08		8.29E 07
Ba 140	1.22E 06	1.06E 07	2.10E 07	1.84E 04	5.98E 03		1.10E 04
Ce 141	7.57E 02	6.36E 06	1.02E 04	5.10E 03	2.24E 03		

* $\frac{\text{mrem/yr}}{\text{uCi/m}^3}$

TABLE 3-4J
R VALUES - MEAT - TEEN
$\frac{m^2\text{-mrem/yr}}{\text{uCi/sec}}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3*	1.95E 02	1.95E 02		1.95E 02	1.95E 02	1.95E 02	1.95E 02
Cr 51	2.61E 03	4.39E 05			5.72E 02	1.45E 03	3.73E 03
Mn 54	7.12E 05	7.37E 06		3.59E 06	1.07E 06		
Fe 59	8.95E 07	5.48E 08	9.93E 07	2.32E 08			7.31E 07
Co 58	1.54E 07	9.22E 07		6.69E 06			
Co 60	7.03E 07	4.06E 08		3.12E 07			
Zn 65	2.43E 08	2.20E 08	1.50E 08	5.20E 08	3.33E 08		
Sr 89	3.47E 06	1.44E 07	1.21E 08				
Sr 90	1.15E 09	1.30E 08	4.64E 09				
Zr 95	1.55E 05	5.20E 08	7.15E 05	2.25E 05	3.31E 05		
I 131	3.30E 06	1.22E 06	4.39E 06	6.14E 06	1.06E 07	1.79E 09	
I 133	9.25E-02	2.30E-01	1.79E-01	3.03E-01	5.32E-01	4.23E 01	
Cs 134	2.98E 08	7.99E 06	2.73E 08	6.42E 08	2.04E 08		7.78E 07
Cs 136	1.16E 07	1.40E 06	4.41E 06	1.73E 07	9.44E 06		1.49E 06
Cs 137	1.86E 08	7.59E 06	4.01E 08	5.34E 08	1.82E 08		7.06E 07
Ba 140	7.33E 05	1.75E 07	1.14E 07	1.39E 04	4.72E 03		9.37E 03
Ce 141	4.14E 02	1.04E 07	5.43E 03	3.63E 03	1.71E 03		

* $\frac{\text{mrem/yr}}{\text{uCi/m}^3}$

TABLE 3-4K
R VALUES - MEAT - ADULT
$\frac{m^2\text{-mrem/yr}}{\text{uCi/sec}}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3*	3.27E 02	3.27E 02		3.27E 02	3.27E 02	3.27E 02	3.27E 02
Cr 51	3.26E 03	8.21E 05			7.19E 02	1.95E 03	4.33E 03
Mn 54	8.98E 05	1.44E 07		4.71E 06	1.40E 06		
Fe 59	1.12E 08	9.73E 08	1.24E 08	2.92E 08			8.16E 07
Co 58	1.95E 07	1.76E 08		8.68E 06			
Co 60	8.87E 07	7.56E 08		4.02E 07			
Zn 65	3.06E 08	4.27E 08	2.13E 08	6.78E 08	4.53E 08		
Sr 89	4.12E 06	2.30E 07	1.43E 08				
Sr 90	1.76E 09	2.07E 08	7.17E 09				
Zr 95	1.94E 05	9.07E 08	8.92E 05	2.86E 05	4.49E 05		
I 131	4.33E 06	1.99E 06	5.28E 06	7.55E 06	1.29E 07	2.48E 09	
I 133	1.13E-01	3.34E-01	2.14E-01	3.72E-01	6.49E-01	5.46E 01	
Cs 134	6.68E 08	1.43E 07	3.43E 08	8.15E 08	2.64E 08		8.78E 07
Cs 136	1.61E 07	2.53E 06	5.65E 06	2.23E 07	1.24E 07		1.70E 06
Cs 137	4.33E 08	1.28E 07	4.83E 08	6.61E 08	2.24E 08		7.46E 07
Ba 140	9.01E 05	2.83E 07	1.38E 07	1.73E 04	5.87E 03		9.89E 03
Ce 141	4.96E 02	1.67E 07	6.47E 03	4.38E 03	2.03E 03		

* $\frac{\text{mrem/yr}}{\text{uCi/m}^3}$

TABLE 3-4L
R VALUES - VEGETATION - CHILD
$\frac{m^2\text{-mrem/yr}}{\text{uCi/sec}}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3*	4.04E 03	4.04E 03		4.04E 03	4.04E 03	4.04E 03	4.04E 03
Cr 51	1.16E 05	6.15E 06			1.76E 04	6.44E 04	1.18E 05
Mn 54	1.73E 08	5.44E 08		6.49E 08	1.82E 08		
Fe 59	3.17E 08	6.62E 08	3.93E 08	6.36E 08			1.84E 08
Co 58	1.92E 08	3.66E 08		6.27E 07			
Co 60	1.11E 09	2.08E 09		3.76E 08			
Zn 65	1.70E 09	4.81E 08	1.03E 09	2.74E 09	1.73E 09		
Sr 89	1.03E 09	1.40E 09	3.62E 10				
Sr 90	3.49E 11	1.86E 10	1.38E 12				
Zr 95	7.44E 05	8.71E 08	3.80E 06	8.35E 05	1.20E 06		
I 131	8.16E 07	1.28E 07	1.43E 08	1.44E 08	2.36E 08	4.75E 10	
I 133	1.67E 06	1.78E 06	3.57E 06	4.42E 06	7.36E 06	8.21E 08	
Cs 134	5.40E 09	1.38E 08	1.56E 10	2.56E 10	7.93E 09		2.84E 09
Cs 136	1.43E 08	7.77E 06	8.04E 07	2.21E 08	1.18E 08		1.76E 07
Cs 137	3.52E 09	1.50E 08	2.48E 10	2.39E 10	7.78E 09		2.80E 09
Ba 140	1.61E 07	1.40E 08	2.76E 08	2.42E 05	7.87E 04		1.44E 05
Ce 141	4.75E 04	3.99E 08	6.42E 05	3.20E 05	1.40E 05		

* $\frac{\text{mrem/yr}}{\text{uCi/m}^3}$

TABLE 3-4M
R VALUES - VEGETATION - TEEN
$\frac{m^2\text{-mrem/yr}}{\text{uCi/sec}}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3*	2.61E 03	2.61E 03		2.61E 03	2.61E 03	2.61E 03	2.61E 03
Cr 51	6.11E 04	1.03E 07			1.34E 04	3.39E 04	8.72E 04
Mn 54	8.79E 07	9.89E 08		4.43E 08	1.32E 08		
Fe 59	1.60E 08	9.78E 08	1.77E 08	4.14E 08			1.30E 08
Co 58	9.79E 07	5.85E 08		4.25E 07			
Co 60	5.57E 08	3.22E 09		2.47E 08			
Zn 65	8.68E 08	7.88E 08	5.36E 08	1.86E 09	1.19E 09		
Sr 89	4.36E 08	1.81E 09	1.52E 10				
Sr 90	2.05E 11	2.33E 10	8.32E 11				
Zr 95	3.68E 05	1.23E 09	1.69E 06	5.35E 05	7.86E 05		
I 131	5.77E 07	2.13E 07	7.68E 07	1.07E 08	1.85E 08	3.14E 10	
I 133	1.01E 06	2.51E 06	1.96E 06	3.32E 06	5.83E 06	4.64E 08	
Cs 134	7.54E 09	2.02E 08	6.90E 09	1.62E 10	5.16E 09		1.97E 09
Cs 136	1.13E 08	1.35E 07	4.28E 07	1.68E 08	9.16E 07		1.44E 07
Cs 137	4.90E 09	2.00E 08	1.06E 10	1.41E 10	4.78E 09		1.86E 09
Ba 140	8.88E 06	2.12E 08	1.38E 08	1.69E 05	5.72E 04		1.14E 05
Ce 141	2.12E 04	5.29E 08	2.77E 05	1.85E 05	8.70E 04		

* $\frac{\text{mrem/yr}}{\text{uCi/m}^3}$

TABLE 3-4N
R VALUES - VEGETATION - ADULT

$\frac{m^2\text{-mrem/yr}}{\text{uCi/sec}}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3*	2.28E 03	2.28E 03		2.28E 03	2.28E 03	2.28E 03	2.28E 03
Cr 51	4.60E 04	1.16E 07			1.01E 04	2.75E 04	6.10E 04
Mn 54	5.83E 07	9.36E 08		3.05E 08	9.09E 07		
Fe 59	1.12E 08	9.75E 08	1.24E 08	2.93E 08			8.17E 07
Co 58	6.71E 07	6.07E 08		2.99E 07			
Co 60	3.67E 08	3.12E 09		1.66E 08			
Zn 65	5.77E 08	8.04E 08	4.01E 08	1.28E 09	8.54E 08		
Sr 89	2.87E 08	1.60E 09	1.08E 10				
Sr 90	1.64E 11	1.93E 10	6.70E 11				
Zr 95	2.51E 05	1.17E 09	1.16E 06	3.71E 05	5.82E 05		
I 131	6.61E 07	3.04E 07	8.07E 07	1.15E 08	1.98E 08	3.78E 10	
I 133	1.12E 06	3.30E 06	2.11E 06	3.67E 06	6.40E 06	5.39E 08	
Cs 134	8.83E 09	1.89E 08	4.54E 09	1.08E 10	3.49E 09		1.16E 09
Cs 136	1.19E 08	1.88E 07	4.19E 07	1.66E 08	9.21E 07		1.26E 07
Cs 137	5.94E 09	1.76E 08	6.63E 09	9.07E 09	3.08E 09		1.02E 09
Ba 140	8.40E 06	2.64E 08	1.28E 08	1.61E 05	5.47E 04		9.22E 04
Ce 141	1.48E 04	4.99E 08	1.93E 05	1.31E 05	6.07E 04		

* $\frac{\text{mrem/yr}}{\text{uCi/m}^3}$

TABLE 3-40
R VALUES - INHALATION - INFANT

$\frac{mrem/yr}{uCi/m^3}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3	6.46E 02	6.46E 02		6.46E 02	6.46E 02	6.46E 02	6.46E 02
Cr 51	8.93E 01	3.56E 02			1.32E 01	5.75E 01	1.28E 04
Mn 54	4.98E 03	7.05E 03		2.53E 04	4.98E 03		9.98E 05
Fe 59	9.46E 03	2.47E 04	1.35E 04	2.36E 04			1.01E 06
Co 58	1.82E 03	1.11E 04		1.22E 03			7.76E 05
Co 60	1.18E 04	3.18E 04		8.01E 03			4.50E 06
Zn 65	3.10E 04	5.13E 04	1.93E 04	6.25E 04	3.24E 04		6.46E 05
Sr 89	1.14E 04	6.39E 04	3.97E 05				2.03E 06
Sr 90	2.59E 06	1.31E 05	4.08E 07				1.12E 07
Zr 95	2.03E 04	2.17E 04	1.15E 05	2.78E 04	3.10E 04		1.75E 06
I 131	1.96E 04	1.06E 03	3.79E 04	4.43E 04	5.17E 04	1.48E 07	
I 133	5.59E 03	2.15E 03	1.32E 04	1.92E 04	2.24E 04	3.55E 06	
Cs 134	7.44E 04	1.33E 03	3.96E 05	7.02E 05	1.90E 05		7.95E 04
Cs 136	5.28E 04	1.43E 03	4.82E 04	1.34E 05	5.63E 04		1.17E 04
Cs 137	4.54E 04	1.33E 03	5.48E 05	6.11E 05	1.72E 05		7.12E 04
Ba 140	2.89E 03	3.83E 04	5.59E 04	5.59E 01	1.34E 01		1.59E 06
Ce 141	1.99E 03	2.15E 04	2.77E 04	1.66E 04	5.24E 03		5.16E 05

TABLE 3-4P
R VALUES - INHALATION - CHILD

$\frac{mrem/yr}{uCi/m^3}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3	1.12E 03	1.12E 03		1.12E 03	1.12E 03	1.12E 03	1.12E 03
Cr 51	1.54E 02	1.08E 03			2.43E 01	8.53E 01	1.70E 04
Mn 54	9.50E 03	2.29E 04		4.29E 04	1.00E 04		1.57E 06
Fe 59	1.67E 04	7.06E 04	2.07E 04	3.34E 04			1.27E 06
Co 58	3.16E 03	3.43E 04		1.77E 03			1.10E 06
Co 60	2.26E 04	9.61E 04		1.31E 04			7.06E 06
Zn 65	7.02E 04	1.63E 04	4.25E 04	1.13E 05	7.13E 04		9.94E 05
Sr 89	1.72E 04	1.67E 05	5.99E 05				2.15E 06
Sr 90	6.43E 06	3.43E 05	1.01E 08				1.47E 07
Zr 95	3.69E 04	6.10E 04	1.90E 05	4.17E 04	5.95E 04		2.23E 06
I 131	2.72E 04	2.84E 03	4.80E 04	4.80E 04	7.87E 04	1.62E 07	
I 133	7.68E 03	5.47E 03	1.66E 04	2.03E 04	3.37E 04	3.84E 06	
Cs 134	2.24E 05	3.84E 03	6.50E 05	1.01E 06	3.30E 05		1.21E 05
Cs 136	1.16E 05	4.17E 03	6.50E 04	1.71E 05	9.53E 04		1.45E 04
Cs 137	1.28E 05	3.61E 03	9.05E 05	8.24E 05	2.82E 05		1.04E 05
Ba 140	4.32E 03	1.02E 05	7.39E 04	6.47E 01	2.11E 01		1.74E 06
Ce 141	2.89E 03	5.65E 04	3.92E 04	1.95E 04	8.53E 03		5.43E 05

TABLE 3-4Q
R VALUES - INHALATION - TEEN

$\frac{mrem/yr}{uCi/m^3}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3	1.27E 03	1.27E 03		1.27E 03	1.27E 03	1.27E 03	1.27E 03
Cr 51	1.35E 02	3.00E 03			3.07E 01	7.49E 01	2.09E 04
Mn 54	8.39E 03	6.67E 04		5.10E 04	1.27E 04		1.98E 06
Fe 59	1.43E 04	1.78E 05	1.59E 04	3.69E 04			1.53E 06
Co 58	2.77E 03	9.51E 04		2.07E 03			1.34E 06
Co 60	1.98E 04	2.59E 05		1.51E 04			8.71E 06
Zn 65	6.23E 04	4.66E 04	3.85E 04	1.33E 05	8.63E 04		1.24E 06
Sr 89	1.25E 04	3.71E 05	4.34E 05				2.41E 06
Sr 90	6.67E 06	7.64E 05	1.08E 08				1.65E 07
Zr 95	3.15E 04	1.49E 05	1.45E 05	4.58E 04	6.73E 04		2.68E 06
I 131	2.64E 04	6.48E 03	3.54E 04	4.90E 04	8.39E 04	1.46E 07	
I 133	6.21E 03	1.03E 04	1.21E 04	2.05E 04	3.59E 04	2.92E 06	
Cs 134	5.48E 05	9.75E 03	5.02E 05	1.13E 06	3.75E 05		1.46E 05
Cs 136	1.37E 05	1.09E 04	5.14E 04	1.93E 05	1.10E 05		1.77E 04
Cs 137	3.11E 05	8.47E 03	6.69E 05	8.47E 05	3.04E 05		1.21E 05
Ba 140	3.51E 03	2.28E 05	5.46E 04	6.69E 01	2.24E 01		2.03E 06
Ce 141	2.16E 03	1.26E 05	2.84E 04	1.89E 04	8.87E 03		6.13E 05

TABLE 3-4R
R VALUES - INHALATION - ADULT
$\frac{mrem/yr}{uCi/m^3}$

NUCLIDE	T. BODY	GI-TRACT	BONE	LIVER	KIDNEY	THYROID	LUNG
H 3	1.26E 03	1.26E 03		1.26E 03	1.26E 03	1.26E 03	1.26E 03
Cr 51	9.99E 01	3.32E 03			2.28E 01	5.94E 01	1.44E 04
Mn 54	6.29E 03	7.72E 04		3.95E 04	9.83E 03		1.40E 06
Fe 59	1.05E 04	1.88E 05	1.17E 04	2.77E 04			1.01E 06
Co 58	2.07E 03	1.06E 05		1.58E 03			9.27E 05
Co 60	1.48E 04	2.84E 05		1.15E 04			5.96E 06
Zn 65	4.65E 04	5.34E 04	3.24E 04	1.03E 05	6.89E 04		8.63E 05
Sr 89	8.71E 03	3.49E 05	3.04E 05				1.40E 06
Sr 90	6.09E 06	7.21E 05	9.91E 07				9.59E 06
Zr 95	2.32E 04	1.50E 05	1.07E 05	3.44E 04	5.41E 04		1.77E 06
I 131	2.05E 04	6.27E 03	2.52E 04	3.57E 04	6.12E 04	1.19E 07	
I 133	4.51E 03	8.87E 03	8.63E 03	1.48E 04	2.58E 04	2.15E 06	
Cs 134	7.27E 05	1.04E 04	3.72E 05	8.47E 05	2.87E 05		9.75E 04
Cs 136	1.10E 04	1.17E 04	3.90E 04	1.46E 05	8.55E 04		1.20E 04
Cs 137	4.27E 05	8.39E 03	4.78E 05	6.20E 05	2.22E 05		7.51E 04
Ba 140	2.56E 03	2.18E 05	3.90E 04	4.90E 01	1.67E 01		1.27E 06
Ce 141	1.53E 03	1.20E 05	1.99E 04	1.35E 04	6.25E 03		3.61E 05

TABLE 3-4S

R VALUES - GROUND - ALL AGE GROUPS

$\frac{m^2\text{-mrem/yr}}{\text{uCi/sec}}$

NUCLIDE	T. BODY
Cr 51	4.66E 06
Mn 54	1.34E 09
Fe 59	2.75E 08
Co 58	3.79E 08
Co 60	2.15E 10
Zn 65	7.49E 08
Sr 89	2.23E 04
Zr 95	2.49E 08
I 131	1.72E 07
I 133	2.47E 06
Cs 134	6.82E 09
Cs 136	1.49E 08
Cs 137	1.03E 10
Ba 140	2.05E 07
Ce 141	1.36E 07
I 135	later
BA/LA 140	later
Nb 95	later
Sb 125	later

Nine Mile Point Nuclear Station Unit 1
Radiation Environmental Monitoring Program
Sampling Locations

Table 5.1

Type of Sample	* Map Location	Collection Site	Location
Radioiodine and Particulates (air)	1	Village of Lycoming, NY	1.9 mi @ 145° SE
Radioiodine and Particulates (air)	2	Near East Property Boundary of JAFNPP	1.0 mi @ 85° E
Radioiodine and Particulates (air)	3	Rt. 29	1.3 mi @ 115° ESE
Radioiodine and Particulates (air)	4	NE Shoreline Area	0.8 mi @ 68° ENE
Radioiodine and Particulates (air)	5	Montario Point Road	16.4 mi @ 42° NE
Direct Radiation (TLD)	6	North Shoreline Area	0.1 mi @ 0° N
Direct Radiation (TLD)	7	North Shoreline Area	0.1 mi @ 25° NNE
Direct Radiation (TLD)	8	North Shoreline Area	0.2 mi @ 45° NE
Direct Radiation (TLD)	9	North Shoreline Area	0.9 mi @ 75° ENE
Direct Radiation (TLD)	10	Sunset Bay Road	1.2 mi @ 90° E
Direct Radiation (TLD)	11	Rt. 29	1.3 mi @ 115° ESE
Direct Radiation (TLD)	12	Rt. 29	1.5 mi @ 135° SE
Direct Radiation (TLD)	13	Miner Road	1.8 mi @ 160° SSE
Direct Radiation (TLD)	14	Miner Road	1.7 mi @ 180° S
Direct Radiation (TLD)	15	Lakeview Road	1.1 mi @ 200° SSW
Direct Radiation (TLD)	16	Lakeview Road	0.7 mi @ 225° SW
Direct Radiation (TLD)	17	Site Meteorological Tower	0.7 mi @ 250° WSW
Direct Radiation (TLD)	18	Energy Information Center	0.5 mi @ 268° W

*Map - See Figures 5.1-1 and 5.1-2

Nine Mile Point Nuclear Station Unit 1
Radiation Environmental Monitoring Program
Sampling Locations

Table 5.1
(Continued)

Type of Sample	* Map Location	Collection Site	Location
Direct Radiation (TLD)	19	North Shoreline	0.2 mi @ 290° WNW
Direct Radiation (TLD)	20	North Shoreline	0.1 mi @ 315° NW
Direct Radiation (TLD)	21	North Shoreline	0.1 mi @ 335° NNW
Direct Radiation (TLD)	22	Demster Beach Road	4.5 mi @ 100° E
Direct Radiation (TLD)	23	Leavitt Road	4.2 mi @ 115° ESE
Direct Radiation (TLD)	24	Rt. 104	4.2 mi @ 140° SE
Direct Radiation (TLD)	25	Rt. 51A	4.8 mi @ 160° SSE
Direct Radiation (TLD)	26	Maiden Lane Road	4.4 mi @ 190° S
Direct Radiation (TLD)	27	Rt. 53	4.8 mi @ 205° SSW
Direct Radiation (TLD)	28	Mitchell Street	4.8 mi @ 220° SW
Direct Radiation (TLD)	29	Lake Shoreline	4.4 mi @ 240° WSW
Direct Radiation (TLD)	30	Phoenix, NY Control	20.0 mi @ 165° S-SSE
Direct Radiation (TLD)	31	S.W. Oswego, Control	12.8 mi @ 225° SW
Direct Radiation (TLD)	32	Scriba, NY	4.1 mi @ 195° SSW
Direct Radiation (TLD)	33	Alcan Aluminum, Rt. 1A	3.2 mi @ 220° SW
Direct Radiation (TLD)	34	Lycoming, NY	1.9 mi @ 145° SE
Direct Radiation (TLD)	35	New Haven, NY	5.4 mi @ 120° ESE
Direct Radiation (TLD)	36	W. Boundary, Bible Camp	0.9 mi @ 238° SW-WSW
Direct Radiation (TLD)	37	Lake Road	1.1 mi @ 105° E-ESE
Surface Water	38	OSS Inlet Canal	7.7 mi @ 230° SW-WSW
Surface Water	39	JAFNPP Inlet Canal	0.5 mi @ 70° ENE

*Map - See Figures 5.1-1 and 5.1-2

Nine Mile Point Nuclear Station Unit 1
Radiation Environmental Monitoring Program
Sampling Locations

Table 5.1
(Continued)

Type of Sample	*Map Location	Collection Site	Location
Shoreline Sediment	40	NMPNS Shoreline	1.3 mi @ 82° E
Fish	41	NMP Site Discharge Area	0.3 mi @ 315° NW and/or
Fish	42	NMP Site Discharge Area	0.6 mi @ 55° NE
Fish	43	Oswego Harbor Area	6.3 mi @ 235° WSW
Milk	44	Milk Location #45	8.0 mi @ 125° SE
Milk	45	Milk Location #7	5.5 mi @ 107° ESE
Milk	46	Milk Location #16	5.2 mi @ 190° S
Milk	47	Milk Location #40	15.2 mi @ 220° SW
Food Product	48	Produce Location #1**	1.6 mi @ 95° E
Food Product	49	Produce Location #2**	1.6 mi @ 115° ESE
Food Product	50	Produce Location #3**	2.0 mi @ 103° ESE
Food Product	51	Produce Location #4**	15.2 mi @ 220° SW
Food Product	52	Produce Location #5**	1.3 mi @ 225° S
Food Product	53	Produce Location #6**	1.6 mi @ 132° SE
Food Product	54	Produce Location #7**	2.3 mi @ 118° ESE
Food Product	55	Produce Location #8**	12.6 mi @ 225° SW

* Map - See Figures 5.1-1 and 5.1-2

** Food Product samples need not necessarily be collected from all listed locations. Collected samples will be of the highest calculated site average D/Q.

APPENDIX A

DOSE PARAMETERS FOR IODINE-131 AND -133, PARTICULATES AND TRITIUM

This appendix contains the methodology which was used to calculate the dose parameters for 1-131, 1-133, particulates, and tritium. The dose parameter, R_i, was calculated using the methodology outlined in NUREG-0133 and Regulatory Guide 1.109, Revision 1. The radioiodine and particulate Technical Specification (Section 3.6.15) is applicable to the location in the unrestricted area where the combination of existing pathways and receptor age groups indicates the maximum potential exposure occurs, i.e., the critical receptor. The inhalation and ground plane exposure pathways are considered to exist all locations but the critical location will be used for dose purposes. The grass-goat-milk, the grass-cow-milk, grass-cow-meat, and vegetation pathways are considered to exist at specific locations. R_i values have been calculated for the adult, teen, child and infant age groups for all pathways. The methodology used to calculate these values follows:

A.1 Inhalation Pathway

$$R_i^I = K^I (BR)_a \ (DFA_i)_a$$

where:

R_i^I = dose factor for each identified radionuclide i of the organ of interest (units = mrem/hr per uCi/m^3);

K^I = a constant of unit conversion:

= 10^6 pCi/uCi;

$(BR)_a$ = Breathing rate of the receptor of age group a, (units = m^3/yr);

$(DFA_i)_a$ = organ inhalation dose factor for radionuclide i for the receptor of age group a, (units = mrem/pCi).

APPENDIX — A

DOSE PARAMETERS FOR IODINE 131 AND 133, PARTICULATES AND TRITIUM

APPENDIX A

DOSE PARAMETERS FOR IODINE-131 AND -133, PARTICULATES AND TRITIUM

This appendix contains the methodology which was used to calculate the dose parameters for 1-131, 1-133, particulates, and tritium. The dose parameter, R_i, was calculated using the methodology outlined in NUREG-0133 and Regulatory Guide 1.109 Revision 1. The radioiodine and particulate Technical Specification (Section 3.6.15) is applicable to the location in the unrestricted area where the combination of existing pathways and receptor age groups indicates the maximum potential exposure occurs, i.e., the critical receptor. The inhalation and ground plane exposure pathways are considered to exist at all locations, but the critical location will be used for dose purposes. The grass-goat-milk, the grass-cow-milk, grass-cow-meat, and vegetation pathways are considered to exist at specific locations. R_i values have been calculated for the adult, teen, child, and infant age groups for all pathways. The methodology used to calculate these values follows:

A.1 Inhalation Pathway

$$R_i^1 = K'(BR)_a \ (DFA_i)_a$$

where:

R_i^1 = dose factor for each identified radionuclide i of the organ of interest (units = mrem/hr per uCi/m³);

K' = a constant of unit conversion;

= 10^6 pCi/uCi;

$(BR)_a$ = Breathing rate of the receptor of age group a, (units = m³/yr);

$(DFA_i)_a$ = organ inhalation dose factor for radionuclide i for the receptor of age group a, (units = mrem/pCi).

The breathing rates $(BR)_a$ for the various age groups, as given in Table E-5 of Regulatory Guide 1.109 Revision 1, are tabulated below.

Age Group (a)	Breathing Rate (m^3/yr)
Infant	1400
Child	3700
Teen	8000
Adult	8000

Inhalation dose factors $(DFA_i)_a$ for the various age groups are given in Tables E-7 through E-10 of Regulatory Guide 1.109 Revision 1.

A.2 Ground Plane Pathway

$$R_i^G = K'K''(SF)DFG_i \frac{(1-e^{-\lambda_i t})}{\lambda_i}$$

where:

R_i^G = dose factor for the ground plane pathway for each identified radionuclide i fór the organ of interest (units = mrem/yr per uCi/sec per m^2)

K' = a constant of unit conversion;

= 10^6 pCi/uCi;

K'' = a constant of unit conversion;

= 8760 hr/year;

λ_i = the radiological decay constant for radionuclide i, (units = sec^{-1})

t = the exposure time, sec;

= 4.73×10^8 sec (15 years);

DFG_i = the ground plane dose conversion factor for radionuclide i; (units = mrem/hr per pCi/m^2)

SF = the shielding factor (dimensionless);

A shielding factor of 0.7 is discussed in Table E-15 of Regulatory Guide 1.109 Revision 1. A tabulation of DFG_i values is presented in Table E-6 of Regulatory Guide 1.109 Revision 1.

A.3 Grass-Cow or Goat-Milk Pathway

$$R_i^M = K'Q_F U_{ap} F_m (DFL_i)_a e^{-\lambda_i t_f} \left[f_p f_s \left[\frac{r(1-e^{-\lambda_{E_i} t_e})}{Y_v \lambda_{E_i}} + \frac{B_{iv}(1-e^{-\lambda_i t_b})}{P\lambda_i} \right] + (1-f_p f_s) \left[\frac{r(1-e^{-\lambda_{E_i} t_e})}{Y_s \lambda_{E_i}} + \frac{B_{iv}(1-e^{-\lambda_i t_b})}{P\lambda_i} \right] e^{-\lambda_i t_h} \right]$$

where:

R_i^M = dose factor for the cow milk or goat milk pathway, for each identified radionuclide i for the organ of interest, (units = mrem/yr per uCi/sec per m^{-2})

K' = a constant of unit conversion;

= 10^6 pCi/uCi

Q_F = The cow's or goat's feed consumption rate, (units = Kg/day-wet weight)

U_{ap} = the receptor's milk consumption rate for age group a, (units = liters/yr);

Y_v = the agricultural productivity by unit area of pasture feed grass, (units = kg/m^2);

Y_s = the agricultural productivity by unit area of stored feed, (units = kg/m^2);

F_m = the stable element transfer coefficients, (units = pCi/liter per pCi/day);

r = fraction of deposited activity retained on cow's feed grass;

$(DFL_i)_a$ = the organ ingestion dose factor for radionuclide i for the receptor in age group a, (units = mrem/pCi);

λ_{E_i} = $\lambda_i + \lambda_w$;

λ_i = the radiological decay constant for radionuclide i, (units = sec^{-1});

λ_w = the decay constant for removal of activity on leaf and plant surfaces by weathering

= 5.73×10^{-7} sec^{-1} (corresponding to a 14 day half-life);

t_f = the transport time from feed to cow or goat to milk, to receptor, (units = sec);

t_h = the transport time from harvest, to cow or goat, to consumption, (units = sec);

t_b = period of time that soil is exposed to gaseous effluents, (units = sec);

B_{iv} = concentration factor for uptake of radionuclide i from the soil by the edible parts of crops, (units = pCi/Kg (wet weight) per pCi/Kg (dry soil);

P = effective surface density for soil, (units = Kg (dry soil)/m²);

f_p = fraction of the year that the cow or goat is on pasture*;

f_s = fraction of the cow feed that is pasture grass while the cow is on pasture*;

t_e = period of pasture grass and crop exposure during the growing season, (units = sec);

*Milk cattle and goats are considered to be fed from two potential sources, pasture grass and stored feeds. Following the development in Regulatory Guide 1.109 Revision 1, the value of f_s was considered unity in lieu of site-specific information. The value of f_p was 0.667 based upon an 8-month grazing period.

Table A-1 contains the appropriate values and their source in Regulatory Guide 1.109 Revision 1.

The concentration of tritium in milk is based on the airborne concentration rather than the deposition. Therefore, the R_i is based on X/Q:

$$R_T^M = K'K'''F_m Q_F U_{ap} (DFL_i)_a \quad 0.75(0.5/H)$$

where:

R_T^M = dose factor for the cow or goat milk pathway for tritium for the organ of interest, (units = mrem/yr per uCi/m^3);

K''' = a constant of unit conversion;

= 10^3 gm/kg;

H = absolute humidity of the atmosphere, (units = gm/m^3);

0.75 = the fraction of total feed that is water;

0.5 = the ratio of the specific activity of the feed grass water to the atmospheric water.

Other values are given above. A value of H of 8 grams/meter^3, was used in lieu of site-specific information.

A.4 Grass-Cow-Meat Pathway

$$R_i^B = K'Q_F\,U_{ap}F_f\,(DFL_i)_a\,e^{-\lambda_i t_f}\left[f_p f_s\left[\frac{r(1-e^{-\lambda_{E_i} t_e})}{Y_v\,\lambda_{E_i}} + \frac{B_{iv}(1-e^{-\lambda_i t_b})}{P\lambda_i}\right] + (1-f_p f_s)\left[\frac{r(1-e^{-\lambda_{E_i} t_e})}{Y_s\,\lambda_{E_i}} + \frac{B_{iv}\,(1-e^{-\lambda_i t_b})}{P_{\lambda_i}}\right]\cdot e^{-\lambda_i t_h}\right]$$

R_i^B = dose factor for the meat ingestion pathway for radionuclide i for any organ of interest, (units = mrem/yr per uCi/sec per m^{-2});

F_f = the stable element transfer coefficients, (units = days/Kg);

U_{ap} = the receptor's meat consumption rate for age group a, (units = kg/year;

t_s = the transport time from slaughter to consumption, (units = sec);

t_h = the transport time from harvest to animal consumption, (units = sec);

t_e = period of pasture grass and crop exposure during the growing season, (units = sec)

All other terms remain the same as defined for the milk pathway. Table A-2 contains the values which were used in calculating R_i^B.

The concentration of tritium in meat is based on airborne concentration rather than deposition. Therefore, the R_i is based on X/Q.

$$R_T^B = K'K'''F_fQ_FU_{ap}\,(DFL_i)_a\ \ [0.75(0.5/H)]$$

where:

R_T^B = dose factor for the meat ingestion pathway for tritium for any organ of interest, (units = mrem/yr per uCi/m³).

All terms are defined above.

A.5 Vegetation Pathway

The integrated concentration in vegetation consumed by man follows the expression developed for milk. Man is considered to consume two types of vegetation (fresh and stored) that differ only in the time period between harvest and consumption, therefore:

$$R_i^V = K'(DFL_i)_a \left[U_a^L f_L e^{-\lambda_i t_L} \left[\frac{r\left(1-e^{-\lambda_E t_e}\right)}{Y_v \lambda_{E_i}} + \frac{B_{iv}\left(1-e^{-\lambda_i t_b}\right)}{P\lambda_i} \right] + U_a^S f_g e^{-\lambda_i t_h} \left[\frac{r(1-e^{-\lambda_{E_i} t_e})}{Y_v \lambda E_i} + \frac{B_{iv}\ (1-e^{-\lambda_i t_b})}{P_{\lambda_i}} \right] \right]$$

where:

R_i^V = dose factor for vegetable pathway for radionuclide i for the organ of interest, (units = mrem/yr per uCi/sec per m^{-2});

K' = a constant of unit conversion;
= 10^6 pCi/uCi:

U_a^L = the consumption rate of fresh leafy vegetation by the receptor in age group a, (units = kg/yr);

f_L = the fraction of the annual intake of fresh leafy vegetation grown locally;

f_g = the fraction of the annual intake of stored vegetation grown locally;

t_L = the average time between harvest of leafy vegetation and its consumption, (units = sec);

t_h = the average time between harvest of stored vegetation and its consumption, (units = sec);

Y_v = the vegetation area density, (units = kg/m^2);

t_e = period of leafy vegetable exposure during growing season (units = sec);

All other factors are defined above.

Table A-3 presents the appropriate parameter values and their source in Regulatory Guide 1.109 Revision 1.

In lieu of site-specific data, values for f_L and f_g of, 1.0 and 0.76, respectively, were used in the calculation. These values were obtained from Table E-15 of Regulatory Guide 1.109 Revision 1.

The concentration of tritium in vegetation is based on the airborne concentration rather than the deposition. Therefore, the R_i is based on X/Q:

$$R_T^V = K'K'' \left[U_a^L f_L + U_a^S f_g \right] (DFL_i)_a \; 0.75(0.5/H)$$

where:

R_T^V = dose factor for the vegetable pathway for tritium for any organ of interest, (units = mrem/yr per uCi/m³).

All other terms are defined in preceeding sections.

TABLE A-1

Parameters for Cow and Goat Milk Pathways

Parameter	Value	Reference (Reg. Guide 1.109 Rev. 1)
Q_F (kg/day)	50 (cow) 6 (goat)	Table E-3 Table E-3
Y_v (kg/m²)	0.7	Table E-15
t_f (seconds)	1.73×10^5 (2 days)	Table E-15
r	1.0 (radioiodines) 0.2 (particulates)	Table E-15 Table E-15
$(DFL_i)_a$ (mrem/pCi)	Each radionuclide	Tables E-11 to E-14
F_m (pCi/day per pCi/liter)	Each stable element	Table E-1 (cow) Table E-2 (goat)
t_b (seconds)	4.73×10^8 (15 yr)	Table E-15
Y_s (kg/m²)	2.0	Table E-15
Y_v (kg/m²)	0.7	Table E-15
t_h (seconds)	7.78×10^6 (90 days)	Table E-15
U_{ap} (liters/yr)	330 infant 330 child 400 teen 310 adult	Table E-5 Table E-5 Table E-5 Table E-5
t_e (seconds)	2.59×10^6 (pasture) 5.18×10^6 (stored feed)	Table E-15
B_{iv} (pCi/Kg (wet weight) per pCi/Kg (dry soil))	Each stable element	Table E-1
P (Kg dry soil/m²)	240	Table E-15

TABLE A-2

Parameters for the Meat Pathway

Parameter	Value	Reference (Reg. Guide 1.109 Rev. 1)
r	1.0 (radioiodines) 0.2 (particulates)	Table E-15 Table E-15
F_f (pCi/Kg per pCi/day)	Each stable element	Table E-1
U_{ap} (Kg/yr)	0 infant 41 child 65 teen 110 adult	Table E-5 Table E-5 Table E-5 Table E-5
$(DFL_i)_a$ (mrem/pCi)	Each radionuclide	Tables E-11 to E-14
Y_v (kg/m²)	0.7	Table E-15
Y_s (kg/m²)	2.0	Table E-15
t_b (seconds)	4.73×10^8 (15 yr)	Table E-15
t_s (seconds)	1.73×10^6 (20 days)	Table E-15
t_h (seconds)	7.78×10^6 (90 days)	Table E-15
t_e (seconds)	2.59×10^6 (pasture) 5.18×10^6 (stored feed)	Table E-15
Q_F (kg/day)	50	Table E-3
B_{iv} (pCi/Kg (wet weight per pCi/Kg (dry soil))	Each stable element	Table E-1
P (Kg (dry soil)/m²)	240	Table E-15

TABLE A-3

Parameters for the Vegetable Pathway

Parameter	Value	Reference (Reg. Guide 1.109 Rev. 1)
r (dimensionless)	1.0 (radioiodines)	Table E-1
	0.2 (particulates)	Table E-1
$(DFL_i)_a$ (mrem/Ci)	Each radionuclide	Tables E-11 to E-14
U_a^L (kg/yr) - infant	0	Table E-5
- child	26	Table E-5
- teen	42	Table E-5
- adult	64	Table E-5
U_a^S (kg/yr) - infant	0	Table E-5
- child	520	Table E-5
- teen	630	Table E-5
- adult	520	Table E-5
t_L (seconds)	8.6×10^4 (1 day)	Table E-15
t_h (seconds)	5.18×10^6 (60 days)	Table E-15
Y_v (kg/m²)	2.0	Table E-15
t_e (seconds)	5.18×10^6 (60 days)	Table E-15
t_b (seconds)	4.73×10^8 (15 yr)	Table E-15
P(Kg(dry soil)/m²)	240	Table E-15
B_{iv}(pCi/Kg (wet weight) per pCi/kg (dry soil))	Each stable element	Table E-1

APPENDIX — B

DIAGRAMS OF LIQUID AND GASEOUS RADWASTE TREATMENT SYSTEMS

RADIOACTIVE WASTE DISPOSAL SYSTEM

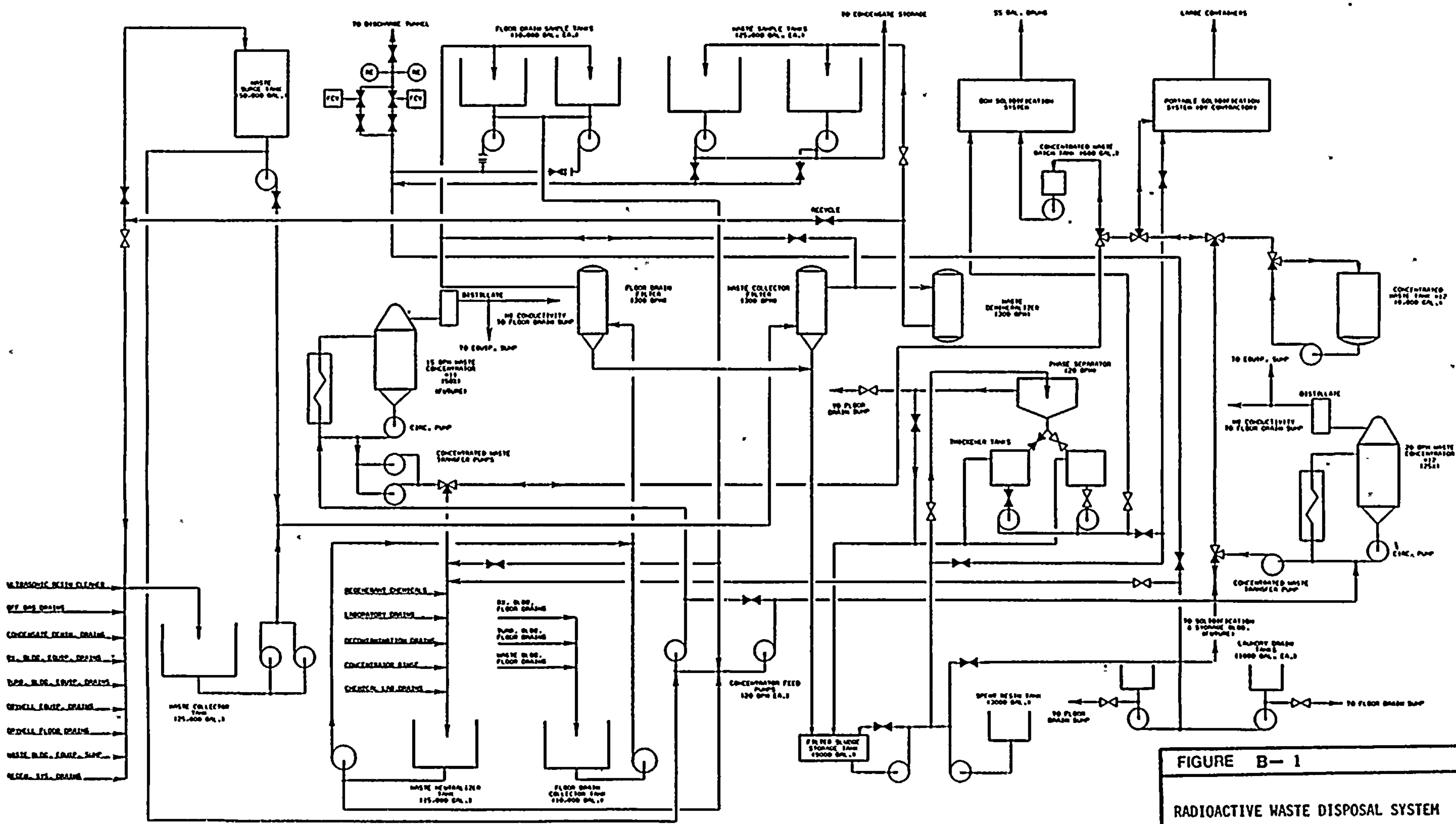


FIGURE B— 1

RADIOACTIVE WASTE DISPOSAL SYSTEM

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 1
OFFSITE DOSE CALC. MANUAL

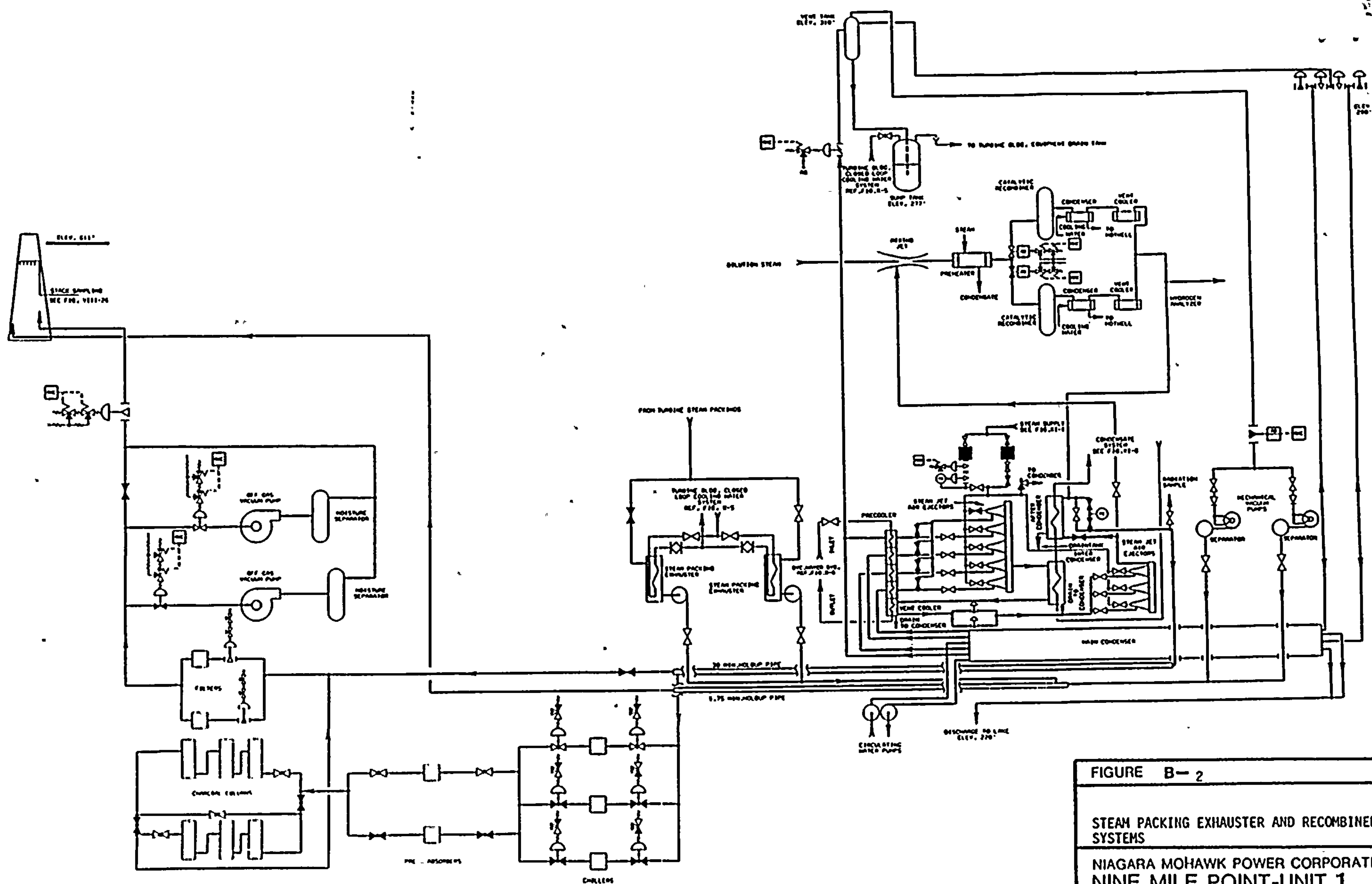


FIGURE B-2

STEAM PACKING EXHAUSTER AND RECOMBINER SYSTEMS

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 1
OFFSITE DOSE CALC. MANUAL

REACTOR BUILDING HEATING, COOLING, AND VENTILATION SYSTEM

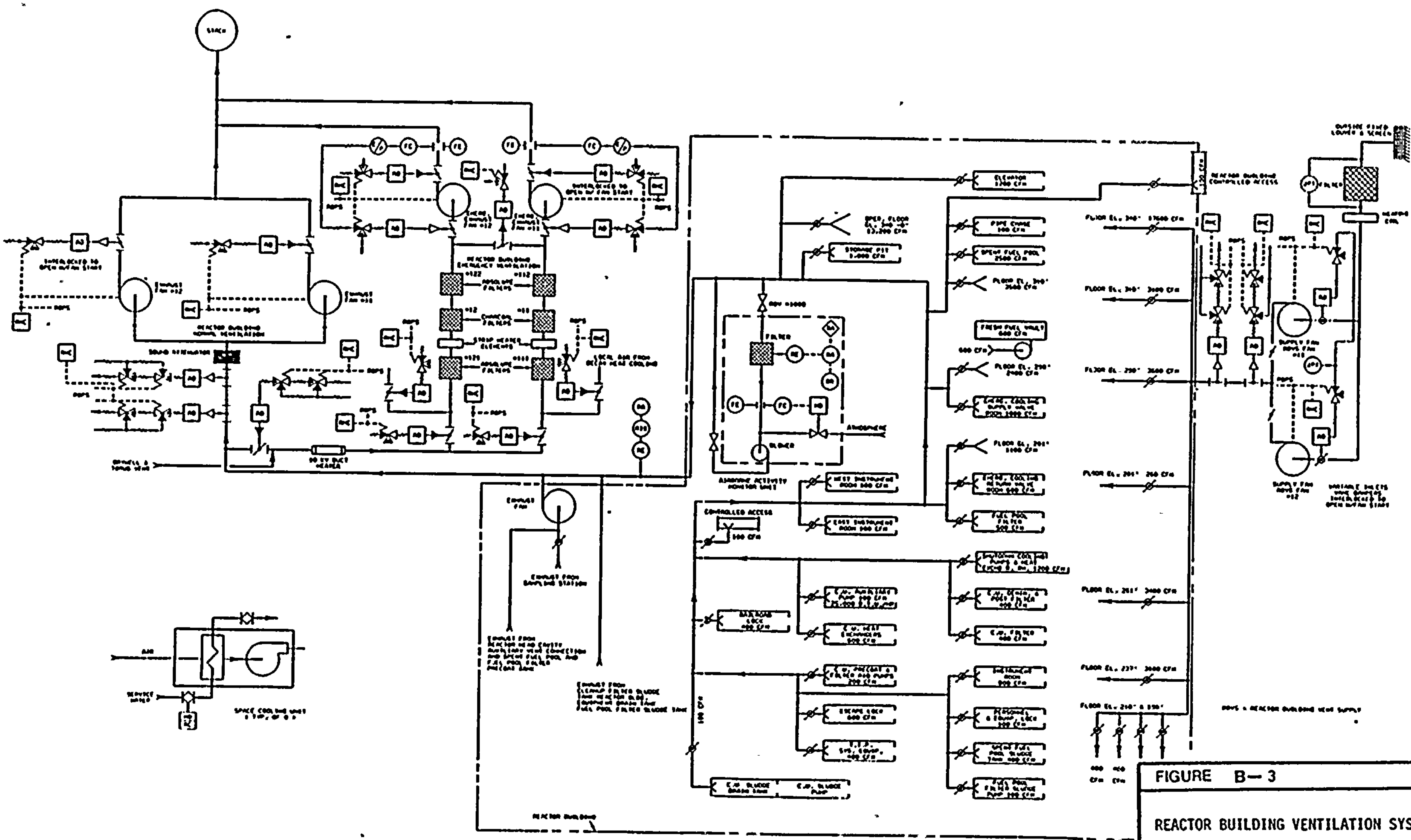


FIGURE B-3

REACTOR BUILDING VENTILATION SYSTEM

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 1
OFFSITE DOSE CALC. MANUAL

WASTE DISPOSAL BUILDING VENTILATION SYSTEM

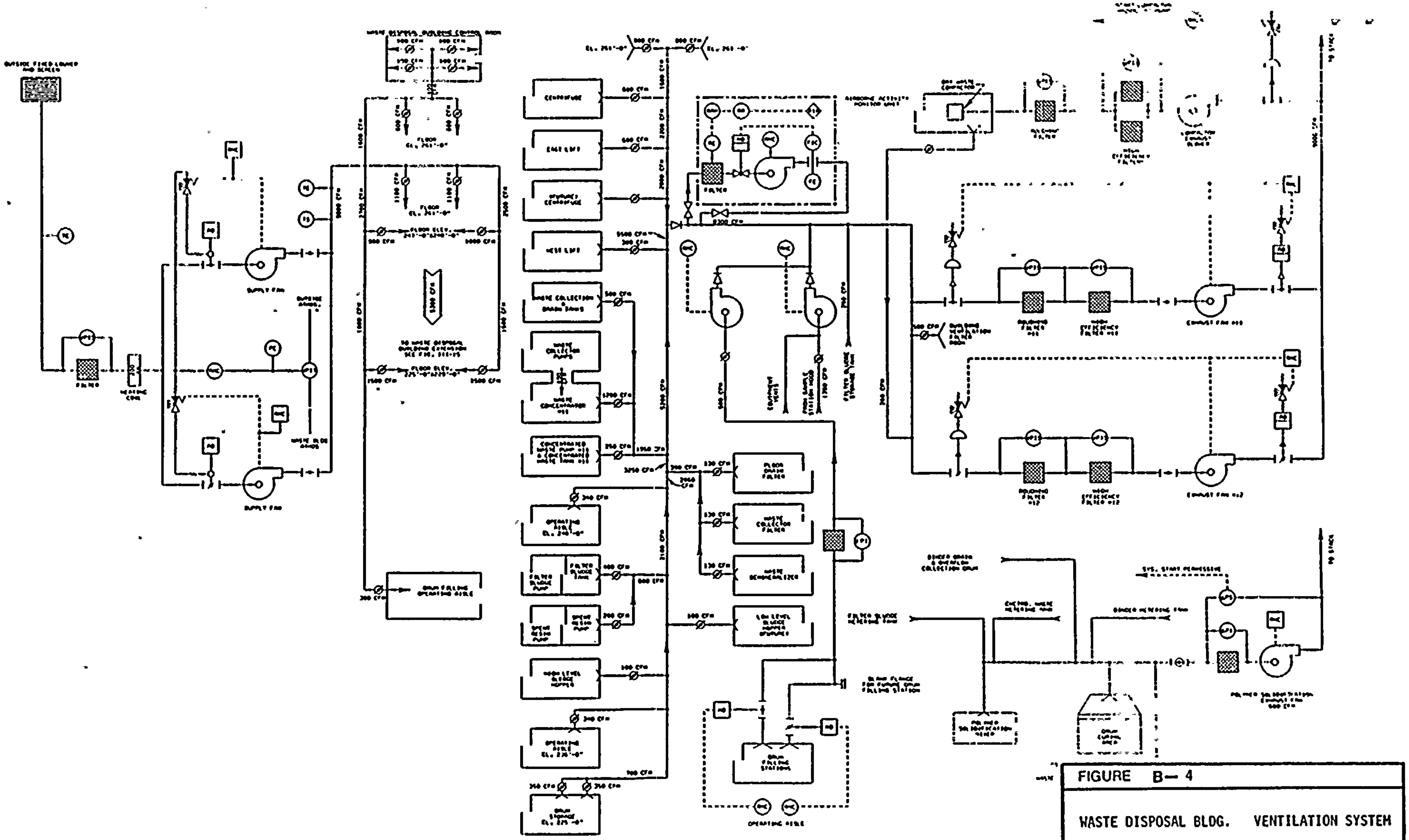
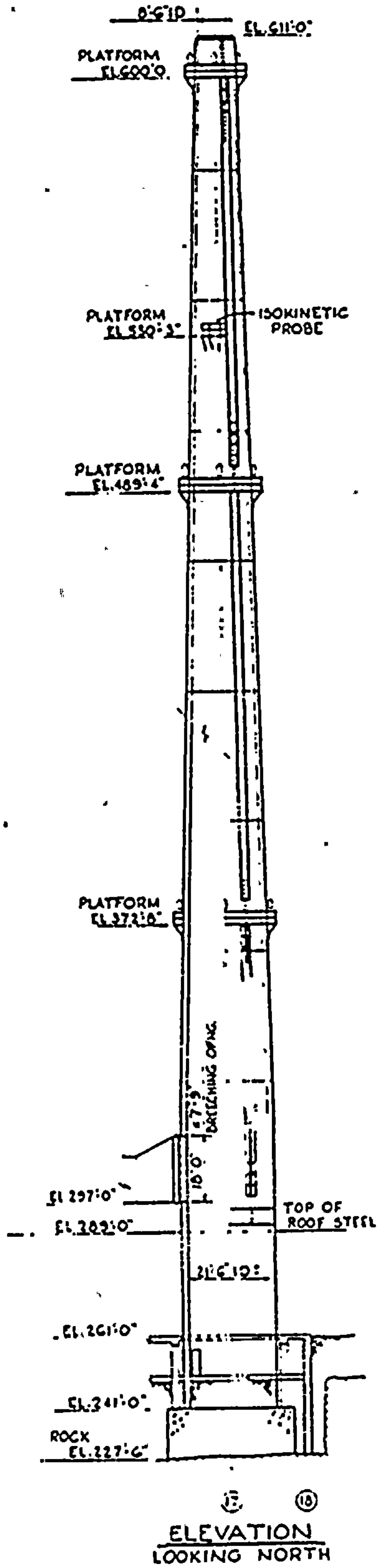


FIGURE B— 4

WASTE DISPOSAL BLDG. VENTILATION SYSTEM

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 1
OFFSITE DOSE CALC. MANUAL

STACK - PLAN AND ELEVATION



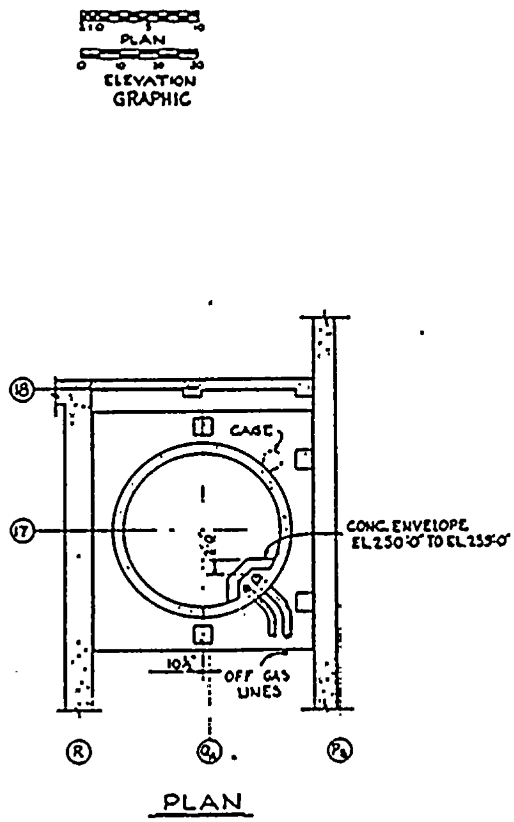


FIGURE B— 5
NMP-1 STACK
NIAGARA MOHAWK POWER CORPORATION NINE MILE POINT-UNIT 1 **OFFSITE DOSE CALC. MANUAL**

OFF GAS BUILDING VENTILATION SYSTEM

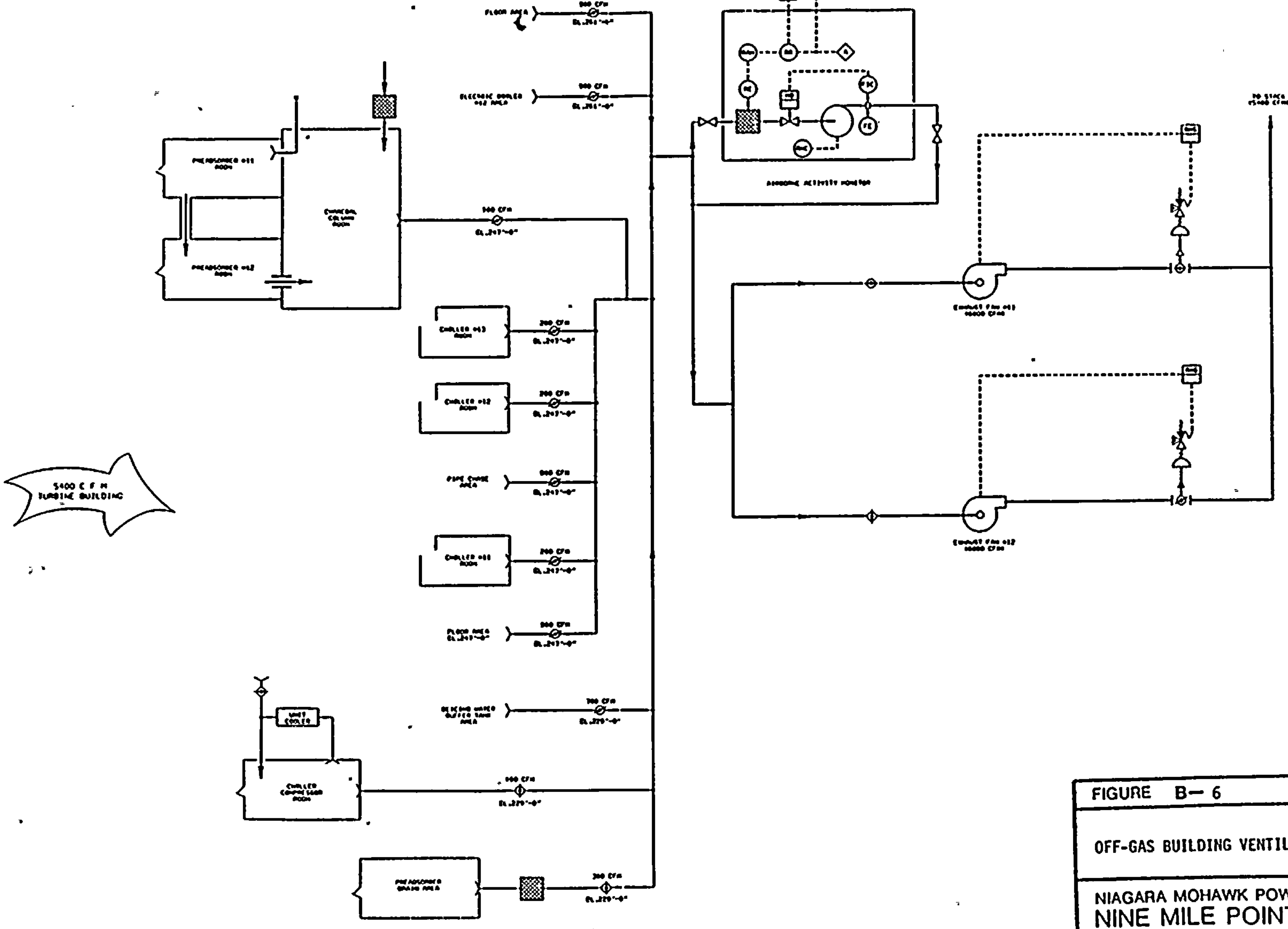


FIGURE B– 6

OFF-GAS BUILDING VENTILATION SYSTEM

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 1
OFFSITE DOSE CALC. MANUAL

APPENDIX – C

DISPERSION CALCULATION TABLES

TABLE C-1

D/Q TABLE
(ANNUAL METEOROLOGICAL DATA)

NMP UNIT #1 STACK
CORRECTED FOR OPEN TERRAIN RECIRCULATION
********************** RELATIVE DEPOSITION PER UNIT AREA (M**-2) AT FIXED POINTS BY DOWNWIND SECTORS **********************

DIRECTION FROM SITE	DISTANCES IN MILES 0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50
S	1.030E-08	3.762E-09	1.439E-09	7.797E-10	4.903E-10	3.380E-10	2.476E-10	1.894E-10	1.498E-10	1.215E-10	1.006E-10
SSW	4.517E-09	1.981E-09	8.620E-10	5.010E-10	3.288E-10	2.322E-10	1.724E-10	1.326E-10	1.048E-10	8.476E-11	6.977E-11
SW	3.226E-09	1.646E-09	7.733E-10	4.661E-10	3.121E-10	2.229E-10	1.664E-10	1.283E-10	1.015E-10	8.196E-11	6.731E-11
WSW	1.079E-09	5.597E-10	2.624E-10	1.582E-10	1.059E-10	7.569E-11	5.652E-11	4.360E-11	3.450E-11	2.787E-11	2.290E-11
W	1.187E-09	7.420E-10	3.757E-10	2.339E-10	1.593E-10	1.149E-10	8.616E-11	6.659E-11	5.270E-11	4.251E-11	3.486E-11
WNW	2.684E-09	1.456E-09	7.167E-10	4.396E-10	2.971E-10	2.132E-10	1.595E-10	1.230E-10	9.727E-11	7.843E-11	6.429E-11
NW	5.095E-09	2.214E-09	9.924E-10	5.828E-10	3.846E-10	2.723E-10	2.022E-10	1.555E-10	1.228E-10	9.903E-11	8.132E-11
NNW	4.302E-09	1.815E-09	7.896E-10	4.576E-10	2.997E-10	2.114E-10	1.567E-10	1.204E-10	9.511E-11	7.681E-11	6.317E-11
N	5.254E-09	2.265E-09	1.010E-09	5.914E-10	3.896E-10	2.757E-10	2.046E-10	1.573E-10	1.242E-10	1.002E-10	8.231E-11
NNE	1.788E-09	9.250E-10	4.526E-10	2.766E-10	1.665E-10	1.336E-10	9.986E-11	7.698E-11	6.082E-11	4.901E-11	4.015E-11
NE	2.686E-09	1.196E-09	5.733E-10	3.452E-10	2.308E-10	1.645E-10	1.224E-10	9.411E-11	7.418E-11	5.966E-11	4.880E-11
ENE	1.499E-08	5.440E-09	2.344E-09	1.337E-09	8.672E-10	6.071E-10	4.473E-10	3.420E-10	2.690E-10	2.164E-10	1.773E-10
E	2.120E-08	7.230E-09	3.029E-09	1.699E-09	1.090E-09	7.580E-10	5.561E-10	4.241E-10	3.331E-10	2.678E-10	2.194E-10
ESE	1.857E-08	6.185E-09	2.541E-09	1.409E-09	8.981E-10	6.220E-10	4.554E-10	3.469E-10	2.723E-10	2.190E-10	1.796E-10
SE	1.347E-08	4.983E-09	2.057E-09	1.155E-09	7.418E-10	5.172E-10	3.806E-10	2.913E-10	2.296E-10	1.853E-10	1.525E-10
SSE	5.194E-09	2.032E-09	8.291E-10	4.654E-10	2.991E-10	2.088E-10	1.540E-10	1.181E-10	9.333E-11	7.552E-11	6.231E-11

DIRECTION FROM SITE	DISTANCES IN MILES 6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00	15.00	20.00
S	8.474E-11	7.420E-11	6.562E-11	5.853E-11	5.261E-11	4.761E-11	4.334E-11	3.965E-11	3.646E-11	1.982E-11	1.280E-11
SSW	5.832E-11	5.148E-11	4.546E-11	4.049E-11	3.633E-11	3.282E-11	2.981E-11	2.723E-11	2.498E-11	1.329E-11	8.442E-12
SW	5.609E-11	4.968E-11	4.385E-11	3.903E-11	3.500E-11	3.159E-11	2.868E-11	2.617E-11	2.399E-11	1.265E-11	7.981E-12
WSW	1.909E-11	1.692E-11	1.493E-11	1.329E-11	1.192E-11	1.076E-11	9.769E-12	8.916E-12	8.175E-12	4.318E-12	2.728E-12
W	2.897E-11	2.575E-11	2.272E-11	2.021E-11	1.811E-11	1.634E-11	1.483E-11	1.352E-11	1.239E-11	6.490E-12	4.074E-12
WNW	5.344E-11	4.738E-11	4.180E-11	3.719E-11	3.333E-11	3.007E-11	2.728E-11	2.487E-11	2.279E-11	1.193E-11	7.480E-12
NW	6.779E-11	5.981E-11	5.279E-11	4.699E-11	4.214E-11	3.804E-11	3.453E-11	3.150E-11	2.888E-11	1.522E-11	9.596E-12
NNW	5.276E-11	4.651E-11	4.106E-11	3.657E-11	3.280E-11	2.962E-11	2.690E-11	2.456E-11	2.253E-11	1.194E-11	7.564E-12
N	6.863E-11	6.054E-11	5.344E-11	4.757E-11	4.266E-11	3.851E-11	3.496E-11	3.190E-11	2.925E-11	1.543E-11	9.732E-12
NNE	3.336E-11	2.955E-11	2.607E-11	2.319E-11	2.078E-11	1.874E-11	1.700E-11	1.550E-11	1.420E-11	7.415E-12	4.641E-12
NE	4.049E-11	3.574E-11	3.152E-11	2.803E-11	2.510E-11	2.263E-11	2.052E-11	1.869E-11	1.711E-11	8.876E-12	5.522E-12
ENE	1.475E-10	1.293E-10	1.141E-10	1.015E-10	9.097E-11	8.205E-11	7.444E-11	6.787E-11	6.217E-11	3.247E-11	2.030E-11
E	1.827E-10	1.595E-10	1.408E-10	1.252E-10	1.122E-10	1.012E-10	9.184E-11	8.374E-11	7.670E-11	4.004E-11	2.502E-11
ESE	1.496E-10	1.305E-10	1.151E-10	1.025E-10	9.185E-11	8.287E-11	7.519E-11	6.857E-11	6.282E-11	3.286E-11	2.058E-11
SE	1.275E-10	1.118E-10	9.870E-11	8.790E-11	7.887E-11	7.123E-11	6.470E-11	5.908E-11	5.419E-11	2.876E-11	1.822E-11
SSE	5.224E-11	4.592E-11	4.057E-11	3.616E-11	3.247E-11	2.935E-11	2.668E-11	2.438E-11	2.239E-11	1.201E-11	7.674E-12

TABLE C-2

D/Q TABLE
(GRAZING SEASON METEOROLOGICAL DATA)*

NMP UNIT #1 STACK
CORRECTED FOR OPEN TERRAIN RECIRCULATION
********************** RELATIVE DEPOSITION PER UNIT AREA (M**-2) AT FIXED POINTS BY DOWNWIND SECTORS **********************

DIRECTION FROM SITE	DISTANCES IN MILES										
	0.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50
S	1.200E-08	4.219E-09	1.566E-09	8.342E-10	5.183E-10	3.547E-10	2.588E-10	1.977E-10	1.562E-10	1.268E-10	1.052E-10
SSW	4.522E-09	1.877E-09	7.926E-10	4.535E-10	2.949E-10	2.072E-10	1.534E-10	1.178E-10	9.315E-11	7.533E-11	6.207E-11
SW	3.248E-09	1.523E-09	6.873E-10	4.066E-10	2.694E-10	1.914E-10	1.425E-10	1.097E-10	8.678E-11	7.011E-11	5.765E-11
WSW	1.067E-09	5.284E-10	2.435E-10	1.455E-10	9.703E-11	6.915E-11	5.156E-11	3.975E-11	3.145E-11	2.541E-11	2.088E-11
W	1.167E-09	6.910E-10	3.438E-10	2.124E-10	1.441E-10	1.037E-10	7.771E-11	6.003E-11	4.750E-11	3.833E-11	3.143E-11
WNW	2.584E-09	1.399E-09	6.846E-10	4.192E-10	2.831E-10	2.030E-10	1.519E-10	1.172E-10	9.264E-11	7.471E-11	6.126E-11
NW	5.102E-09	2.233E-09	1.001E-09	5.885E-10	3.885E-10	2.752E-10	2.044E-10	1.571E-10	1.241E-10	1.001E-10	8.224E-11
NNW	4.779E-09	2.012E-09	8.728E-10	5.052E-10	3.307E-10	2.332E-10	1.728E-10	1.328E-10	1.049E-10	8.471E-11	6.968E-11
N	6.102E-09	2.545E-09	1.115E-09	6.477E-10	4.246E-10	2.996E-10	2.220E-10	1.705E-10	1.346E-10	1.086E-10	8.927E-11
NNE	1.762E-09	8.623E-10	4.125E-10	2.495E-10	1.674E-10	1.196E-10	8.919E-11	6.871E-11	5.427E-11	4.374E-11	3.585E-11
NE	2.137E-09	1.025E-09	5.012E-10	3.051E-10	2.052E-10	1.468E-10	1.095E-10	8.428E-11	6.649E-11	5.350E-11	4.377E-11
ENE	1.466E-08	5.544E-09	2.408E-09	1.383E-09	9.008E-10	6.324E-10	4.668E-10	3.574E-10	2.814E-10	2.266E-10	1.858E-10
E	2.003E-08	7.030E-09	2.963E-09	1.671E-09	1.075E-09	7.496E-10	5.504E-10	4.207E-10	3.307E-10	2.661E-10	2.181E-10
ESE	1.506E-08	5.154E-09	2.124E-09	1.183E-09	7.559E-10	5.246E-10	3.846E-10	2.934E-10	2.306E-10	1.856E-10	1.523E-10
SE	1.201E-08	4.411E-09	1.804E-09	1.008E-09	6.457E-10	4.494E-10	3.305E-10	2.528E-10	1.993E-10	1.609E-10	1.325E-10
SSE	4.909E-09	1.847E-09	7.343E-10	4.061E-10	2.587E-10	1.796E-10	1.321E-10	1.012E-10	7.991E-11	6.470E-11	5.344E-11

DIRECTION FROM SITE	DISTANCES IN MILES										
	6.00	6.50	7.00	7.50	8.00	8.50	9.00	9.50	10.00	15.00	20.00
S	8.881E-11	7.757E-11	6.862E-11	6.124E-11	5.507E-11	4.986E-11	4.541E-11	4.157E-11	3.824E-11	2.091E-11	1.355E-11
SSW	5.196E-11	4.578E-11	4.043E-11	3.602E-11	3.233E-11	2.921E-11	2.655E-11	2.425E-11	2.226E-11	1.189E-11	7.571E-12
SW	4.811E-11	4.254E-11	3.756E-11	3.344E-11	3.000E-11	2.708E-11	2.460E-11	2.245E-11	2.059E-11	1.091E-11	6.906E-12
WSW	1.742E-11	1.542E-11	1.361E-11	1.212E-11	1.087E-11	9.812E-12	8.910E-12	8.132E-12	7.457E-12	3.944E-12	2.494E-12
W	2.614E-11	2.321E-11	2.048E-11	1.823E-11	1.634E-11	1.474E-11	1.337E-11	1.220E-11	1.118E-11	5.864E-12	3.685E-12
WNW	5.094E-11	4.516E-11	3.985E-11	3.546E-11	3.178E-11	2.867E-11	2.601E-11	2.372E-11	2.173E-11	1.139E-11	7.198E-12
NW	6.856E-11	6.050E-11	5.341E-11	4.754E-11	4.263E-11	3.848E-11	3.493E-11	3.188E-11	2.922E-11	1.541E-11	9.719E-12
NNW	5.920E-11	5.130E-11	4.530E-11	4.034E-11	3.619E-11	3.268E-11	2.968E-11	2.710E-11	2.486E-11	1.318E-11	8.353E-12
N	7.448E-11	6.563E-11	5.794E-11	5.158E-11	4.626E-11	4.177E-11	3.792E-11	3.461E-11	3.173E-11	1.677E-11	1.059E-11
NNE	2.980E-11	2.637E-11	2.327E-11	2.070E-11	1.855E-11	1.674E-11	1.518E-11	1.384E-11	1.268E-11	6.635E-12	4.159E-12
NE	3.632E-11	3.211E-11	2.832E-11	2.519E-11	2.256E-11	2.034E-11	1.844E-11	1.680E-11	1.538E-11	7.989E-12	4.976E-12
ENE	1.547E-10	1.358E-10	1.199E-10	1.067E-10	9.562E-11	8.626E-11	7.827E-11	7.138E-11	6.540E-11	3.426E-11	2.148E-11
E	1.817E-10	1.589E-10	1.402E-10	1.248E-10	1.119E-10	1.009E-10	9.157E-11	8.350E-11	7.650E-11	4.003E-11	2.507E-11
ESE	1.270E-10	1.109E-10	9.789E-11	8.713E-11	7.812E-11	7.050E-11	6.398E-11	5.837E-11	5.349E-11	2.809E-11	1.763E-11
SE	1.108E-10	9.714E-11	8.580E-11	7.643E-11	6.858E-11	6.195E-11	5.628E-11	5.140E-11	4.716E-11	2.500E-11	1.591E-11
SSE	4.487E-11	3.936E-11	3.479E-11	3.101E-11	2.785E-11	2.519E-11	2.290E-11	2.094E-11	1.923E-11	1.036E-11	6.637E-12

*Based on milk sampling season

TABLE. C-3

CHI/Q TABLE*
(ANNUAL METEOROLOGICAL DATA)

NMP UNIT #1 STACK
NO DECAY, UNDEPLETED
CORRECTED FOR OPEN TERRAIN RECIRCULATION

ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE IN MILES

SECTOR	0.500	1.000	1.500	2.000	2.500	3.000	3.500	4.000	4.500	5.000	5.500
S	2.180E-07	4.927E-08	2.787E-08	2.012E-08	1.635E-08	1.409E-08	1.253E-08	1.135E-08	1.041E-08	9.646E-09	9.005E-09
SSW	1.089E-07	3.470E-08	2.082E-08	1.616E-08	1.403E-08	1.269E-08	1.168E-08	1.083E-08	1.009E-08	9.455E-09	8.893E-09
SW	9.315E-08	2.877E-08	1.799E-08	1.544E-08	1.450E-08	1.385E-08	1.323E-08	1.261E-08	1.200E-08	1.143E-08	1.089E-08
WSW	3.331E-08	1.036E-08	6.301E-09	5.520E-09	5.646E-09	5.936E-09	6.169E-09	6.306E-09	6.357E-09	6.345E-09	6.286E-09
W	3.769E-08	1.203E-08	7.702E-09	7.714E-09	8.536E-09	9.270E-09	9.748E-09	9.995E-09	1.007E-08	1.003E-08	9.914E-09
WNW	1.228E-07	3.425E-08	1.949E-08	1.733E-08	1.727E-08	1.730E-08	1.710E-08	1.669E-08	1.616E-08	1.558E-08	1.498E-08
NW	2.257E-07	6.166E-08	3.180E-08	2.531E-08	2.361E-08	2.282E-08	2.210E-08	2.129E-08	2.043E-08	1.956E-08	1.871E-08
NNW	1.614E-07	4.457E-08	2.342E-08	1.856E-08	1.720E-08	1.657E-08	1.603E-08	1.545E-08	1.483E-08	1.422E-08	1.362E-08
N	2.080E-07	5.858E-08	3.048E-08	2.415E-08	2.235E-08	2.144E-08	2.062E-08	1.976E-08	1.888E-08	1.801E-08	1.717E-08
NNE	9.818E-08	2.743E-08	1.447E-08	1.187E-08	1.120E-08	1.084E-08	1.047E-08	1.005E-08	9.604E-09	9.161E-09	8.731E-09
NE	1.572E-07	4.073E-08	2.018E-08	1.548E-08	1.381E-08	1.285E-08	1.207E-08	1.137E-08	1.072E-08	1.011E-08	9.552E-09
ENE	5.400E-07	1.437E-07	6.870E-08	4.747E-08	3.791E-08	3.215E-08	2.807E-08	2.495E-08	2.245E-08	2.040E-08	1.869E-08
E	6.715E-07	1.793E-07	8.387E-08	5.550E-08	4.236E-08	3.458E-08	2.931E-08	2.545E-08	2.249E-08	2.015E-08	1.825E-08
ESE	5.056E-07	1.354E-07	6.377E-08	4.178E-08	3.139E-08	2.523E-08	2.109E-08	1.811E-08	1.585E-08	1.410E-08	1.269E-08
SE	3.346E-07	9.908E-08	5.100E-08	3.524E-08	2.741E-08	2.256E-08	1.918E-08	1.666E-08	1.471E-08	1.318E-08	1.193E-08
SSE	1.253E-07	3.697E-08	1.984E-08	1.421E-08	1.161E-08	1.007E-08	8.979E-09	8.141E-09	7.461E-09	6.907E-09	6.438E-09

ANNUAL AVERAGE CHI/Q (SEC/METER CUBED) DISTANCE IN MILES

BEARING	6.000	6.500	7.000	7.500	8.000	8.500	9.000	9.500	10.000	15.000	20.000
S	8.446E-09	7.997E-09	7.644E-09	7.313E-09	7.002E-09	6.709E-09	6.435E-09	6.176E-09	5.934E-09	4.374E-09	3.407E-09
SSW	8.386E-09	7.965E-09	7.632E-09	7.311E-09	7.005E-09	6.714E-09	6.439E-09	6.178E-09	5.932E-09	4.326E-09	3.378E-09
SW	1.037E-08	9.939E-09	9.595E-09	9.252E-09	8.916E-09	8.589E-09	8.274E-09	7.972E-09	7.682E-09	5.737E-09	4.466E-09
WSW	6.191E-09	6.102E-09	6.035E-09	5.944E-09	5.835E-09	5.715E-09	5.587E-09	5.454E-09	5.320E-09	4.295E-09	3.486E-09
W	9.744E-09	9.587E-09	9.470E-09	9.317E-09	9.141E-09	8.948E-09	8.747E-09	8.540E-09	8.332E-09	6.783E-09	5.571E-09
WNW	1.437E-08	1.386E-08	1.345E-08	1.303E-08	1.261E-08	1.219E-08	1.178E-08	1.139E-08	1.101E-08	8.456E-09	6.733E-09
NW	1.788E-08	1.718E-08	1.663E-08	1.606E-08	1.551E-08	1.497E-08	1.445E-08	1.394E-08	1.346E-08	1.024E-08	8.112E-09
NNW	1.304E-08	1.255E-08	1.215E-08	1.176E-08	1.137E-08	1.099E-08	1.061E-08	1.025E-08	9.911E-09	7.603E-09	6.063E-09
N	1.638E-08	1.570E-08	1.516E-08	1.463E-08	1.411E-08	1.360E-08	1.311E-08	1.264E-08	1.220E-08	9.253E-09	7.333E-09
NNE	8.320E-09	7.971E-09	7.692E-09	7.414E-09	7.142E-09	6.879E-09	6.625E-09	6.383E-09	6.152E-09	4.616E-09	3.621E-09
NE	9.037E-09	8.607E-09	8.264E-09	7.930E-09	7.610E-09	7.304E-09	7.014E-09	6.738E-09	6.478E-09	4.776E-09	3.707E-09
ENE	1.722E-08	1.604E-08	1.510E-08	1.425E-08	1.347E-08	1.276E-08	1.210E-08	1.150E-08	1.095E-08	7.581E-09	5.697E-09
E	1.667E-08	1.541E-08	1.442E-08	1.354E-08	1.275E-08	1.203E-08	1.138E-08	1.079E-08	1.025E-08	7.008E-09	5.249E-09
ESE	1.153E-08	1.061E-08	9.896E-09	9.260E-09	8.691E-09	8.180E-09	7.720E-09	7.302E-09	6.922E-09	4.671E-09	3.473E-09
SE	1.089E-08	1.007E-08	9.416E-09	8.835E-09	8.312E-09	7.840E-09	7.411E-09	7.021E-09	6.665E-09	4.542E-09	3.399E-09
SSE	6.027E-09	5.693E-09	5.430E-09	5.184E-09	4.953E-09	4.736E-09	4.533E-09	4.344E-09	4.166E-09	3.033E-09	2.345E-09