

OFFSITE DOSE CALCULATION MANUAL  
FOR  
DAVIS-BESSE NUCLEAR POWER STATION  
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8404030277 840315  
PDR ADOCK 05000346  
P PDR

# OFFSITE DOSE CALCULATION MANUAL

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## INTRODUCTION

This OFFSITE DOSE CALCULATION MANUAL (ODCM) describes the methodology and parameters to be used in the calculation of offsite doses due to radioactive liquid and gaseous effluents and in the calculation of liquid and gaseous effluent monitoring instrumentation alarm/trip setpoints. The ODCM also contains a list and graphic description of the specific sample locations for the radiological environmental monitoring program.

The ODCM will be maintained at the Station for use as a reference guide and training document of accepted methodologies and calculations. Changes in the calculational methods or parameters will be incorporated into the ODCM in order to assure that the ODCM represents the present methodology in all applicable areas.

The methodology stated in this manual is acceptable for use in demonstrating compliance with 10 CFR Part 20.106, 10 CFR Part 50 Appendix I, and 40 CFR Part 190. Only the dose attributable to the Davis-Besse Nuclear Power Station is considered in demonstrating compliance with 40 CFR Part 190.

More conservative calculation methods and/or conditions (e.g., location and/or exposure pathways expected to yield higher computed doses) than appropriate for the maximally exposed person may be assumed in the dose evaluations.

For the calculation of individual doses from gaseous effluents, the receptor is selected on the basis of applicable exposure pathways identified in the land use census. Methodologies and pathways considered in NUREG-0133 are consistent with those in the ODCM.

For liquid releases, doses are evaluated for the drinking water and freshwater fish pathways. In the Great Lakes region, invertebrates do not constitute a direct ingestion pathway to man.

## 1.0 LIQUID EFFLUENTS

### 1.1 Liquid Effluent Monitor Setpoints

#### 1.1.1 Liquid Radwaste Effluent Line Monitors

Liquid Radwaste Effluent Line Monitors provide alarm and automatic termination of release prior to exceeding the concentration limits specified in 10 CFR Part 20, Appendix B, Table II, Column 2 at the release point to the unrestricted area. To meet this specification, the alarm/trip setpoints for liquid effluent monitors and flow measurement devices are set to assure that the following equation is satisfied:

$$\frac{cf}{F+f} \leq C, \quad (1-1)$$

where:

C = the effluent concentration limit (RETS, section 3.11.1) implementing 10 CFR Part 20.106 for the site, in  $\mu\text{Ci/ml}$

c = the setpoint, in  $\mu\text{Ci/ml}$ , of the radioactivity monitor measuring the radioactivity concentration in the effluent line prior to dilution and subsequent release; the setpoint, which is proportional to the volumetric flow of the effluent line and inversely proportional to the volumetric flow of the dilution stream plus the effluent stream, represents a value which, if exceeded, would result in concentrations exceeding the limits of 10 CFR Part 20.106 in the unrestricted area

f = the flow setpoint as measured at the radiation monitor location, in volume per unit time, but in the same units as F, below

F = the dilution water flow setpoint as measured prior to the release point in volume per unit time.

At Davis-Besse Unit 1, the available dilution water flow (F) is constant for a given release, and the waste tank flow (f) and monitor setpoint (c) are set to meet the condition of Equation 1-1 for a given effluent concentration, C. The method by which this is accomplished is as follows:

- 1) The isotopic concentration for a waste tank to be released is determined by the analyses required in RETS Table 4.11-1. The ratio of the concentration to the unrestricted area MPC (10 CFR Part 20, Appendix B, Table II, Column 2) is calculated with the equation:

$$FMPC = \sum_i \frac{C_{g_i}}{MPC_i} \quad (1-2)$$

where:

FMPC = fraction of the unrestricted area MPC

$C_{g_i}$  = concentration of each radionuclide i measured in each tank prior to release ( $\mu\text{Ci/ml}$ )

$MPC_i$  = unrestricted area MPC for each radionuclide i from 10 CFR Part 20, Appendix B, Table II, Column 2. For dissolved and entrained noble gases a value of  $2 \times 10^{-4} \mu\text{Ci/ml}$  shall be used.

The total or gross beta or gamma activity alone may be used to conservatively determine the MPC fraction by the equation:

$$\text{FMPC} = \frac{C_t}{1 \times 10^{-7}} \quad (1-3)$$

Where:

$C_t$  = the total or gross beta or gamma activity

$1 \times 10^{-7}$  = MPC value for an unidentified mixture of radionuclides (from footnote 3.b to 10 CFR Part 20, Appendix B).

- 2) The MPC fraction (FMPC) as determined for each batch used to calculate a Dilution Factor, D.F., which is the ratio of total dilution flow rate to tank flow rate required to assure that the limiting concentration of 10 CFR Part 20, Appendix B, Table II, Column 2 are met at the point of discharge.

$$\text{D.F.} = \frac{\text{FMPC}}{\text{S.F.}} \quad (1-4)$$

where:

D.F. = dilution factor

S.F. = an administrative safety factor normally applied at Davis-Besse which causes the calculated Dilution Factor to be 3.33 times larger than the dilution factor required for compliance with 10 CFR Part 20 limits.



- 3) The maximum permissible waste tank flow rate,  $f_d$ , is calculated based on a fixed dilution flow rate,  $F_d$ :

$$f_d = \frac{F_d + f_d}{D.F.} \cong \frac{F_d}{D.F.} \text{ for } F_d \gg f_d \quad (1-5)$$

where:

$F_d$  = 0.9 x (dilution flow rate), as readout in control room

$f_d$  = maximum permissible waste tank flow rate

D.F. = Dilution Factor from Step 2.

NOTE that the equation is valid only for D.F. >1; for D.F.  $\leq$  1, the waste tank concentration meets the limits of 10 CFR Part 20 without dilution, and  $f_d$  may take on any desired value.

- 4) The minimum dilution flow (F), and waste tank maximum flow rate setpoint (f) are calculated as follows:

$F = F_d = 0.9 \times$  actual dilution flow rate as observed from the control room readout,

$f = 0.9 \times f_d = 0.9$  calculated maximum waste tank flow rate for the stated release conditions.

A control room alarm occurs if the dilution flow rate falls below the preset flow rate, or if the tank flow rate exceeds 0.9 of the preset flow rate, and the release is terminated.



- 5) The monitor setpoint may now be specified based on the values of F, and f which were specified to assure that releases are maintained below the concentrations of 10 CFR Part 20, Appendix B, Table II, Column 2. The monitor setpoint in counts per minute (cpm) is taken from the monitor calibration graph (e.g., Figure 1) to correspond to three times the concentration in the batch.

$$S.P. = 3 \times A \text{ } (\mu\text{Ci/ml}) \quad (1-6)$$

where:

S.P. = the monitor setpoint obtained from the calibration curve for the monitor (cpm)

A = total radioactivity concentration in the batch

$$A = \sum_i C_i g_i$$

or, if based on gross or total beta or gamma analysis,

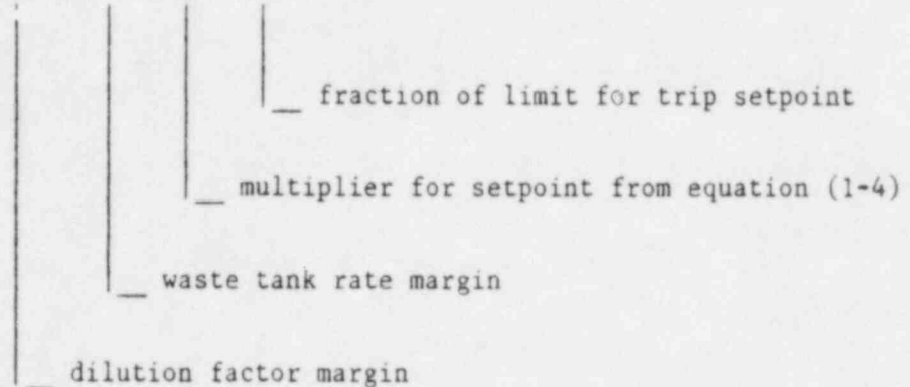
$$A = C_t$$

Normally, only one liquid release is conducted at a time. If more than one release of radioactive effluents is conducted simultaneously, the setpoints for the individual radiation monitors for the combined releases will be set to prevent exceeding the concentrations of 10 CFR Part 20, Appendix B, Table II, Column 2 in the environment.

NOTE that the setpoint contains a factor of conservatism, even if the calculated setpoint tank flow rate

is attained, since the calculated rate contains the factors as shown:

$$0.3 \times 0.9 \times 3 = 0.81$$



In practice, the actual tank flow rate normally is many times less than the calculated tank flow rate, thus providing an additional safety factor during a release.

#### 1.1.2 Turbine Building (Floor Drains) Sump Effluent Line (Applicable upon completion of modification)

The purpose of the monitor for the turbine building sump effluent line (or Unit Storm Sewer Outlet) is to detect abnormal radionuclide concentrations in the sump effluent system. Because the only sources to the sump effluent system are from the secondary steam system, activity is expected in the turbine building sump effluent system only if a significant primary-to-secondary leak is present. If a primary-to-secondary leak is present, the activity in the sump effluent system would be comprised of only those radionuclides found in the secondary system, but with reduced activity from decay and dilution.

Until activity is measured in the secondary system, it will not be practical to select radionuclides on which to calculate the setpoint of the inline monitor. The monitor is, therefore, operated normally as a gross gamma detector

at the lowest practical activity level to prevent false alarms. The lowest practical level has been determined to be three times the background count rate of the monitor when filled with clean water.

When activity above the level specified in RETS Table 4.11-1 is detected in the secondary system, the principal nuclide or nuclides comprising a major fraction of the activity in the secondary system condensate will be identified by gamma ray spectroscopy in the laboratory. The monitor setpoint will then be determined as follows:

- 1) The isotopic concentration for the turbine building sump effluent is determined by the sampling and analytical requirements per RETS Table 4.11-1 (only required when secondary system concentration exceeds  $10^{-5}$   $\mu\text{Ci/ml}$ ). The ratio of the concentration to the unrestricted area MPC is calculated with the equation:

$$\text{FMPC} = \sum_i \frac{C_{g_i}}{\text{MPC}_i} \quad (1-7)$$

Where:

FMPC = fraction of the unrestricted area MPC

$C_{g_i}$  = concentration of each radionuclide  $i$  measured in each grab sample

$\text{MPC}_i$  = unrestricted area MPC for each radionuclide  $i$  from 10 CFR Part 20, Appendix B, Table II, Column 2. For dissolved and entrained gases, a value of  $2 \times 10^{-4}$   $\mu\text{Ci/ml}$  shall be used.

If based on gross or total beta or gamma analysis, the unrestricted area MPC fraction is simply:

$$FMPC = \frac{C_t}{1 \times 10^{-7}} \quad (1-8)$$

$C_t$  = the total or gross beta or gamma activity

$1 \times 10^{-7}$  = MPC value for an unidentified mixture of radionuclides (from footnote 3.b to 10 CFR Part 20, Appendix B).

- 2) The actual dilution factor from fixed flow rates of the turbine building sump effluent flow rate and dilution flow rate is as follows:

$$\text{actual dilution factor} = \frac{f + F}{f}$$

where:

$f$  = turbine building sump effluent flow rate (gpm)

$F$  = dilution flow rate (gpm)

- 3) The concentration in the turbine building sump which corresponds to an unrestricted area MPC value after dilution is calculated from the previously defined quantities, and is:

$$c = \frac{A}{FMPC} * \frac{f + F}{f} \quad (1-9)$$

where:

c = concentration corresponding to the unrestricted area MPC value after dilution

A = total radioactivity concentration ( $\mu\text{Ci/ml}$ )

$$A = \sum_i C_i$$

or, if based on total or gross beta or gamma analysis,

$$A = C_t$$

The calibration curve for the monitor (e.g., Figure 1) is then used to determine the count rate (cpm) corresponding to the radionuclide concentration (c). The monitor setpoint is the sum of the calculated count rate plus the observed background count rate of the monitor.

To simplify the determination of setpoint or in the event that the concentration of radioactive material in the sample from the turbine building sump is below measurable levels (i.e., less than  $5 \times 10^{-7} \mu\text{Ci/ml}$  for principal gamma emitters), the value of  $1 \times 10^{-7} \mu\text{Ci/ml}$  may be substituted for the factor  $\frac{A}{\text{FMPC}}$  (i.e.,  $\frac{A}{\text{FMPC}} = 1 \times 10^{-7}$ ).

It may conservatively be assumed that the radionuclide concentrations in the secondary system are identical to those in the turbine building sump. Therefore, the results of the sampling and analysis of the secondary system may be used in conservatively determining the values of FMPC and c, above.

## 1.2 Dose Calculation for Liquid Effluents

Technical Specification 4.11.1.2.1 requires that an assessment be performed at least once every 31 days in any quarter in which radioactive effluent is discharged to determine whether the dose or dose commitment to a person offsite due to radioactive material released in liquid effluent calculated on a cumulative basis exceeds Specification 3.11.1.2. The requirement is satisfied by computing the accumulated dose commitment to the most exposed organ and to the total body of a hypothetical person exposed by eating fish and drinking water taken from Lake Erie.

The dose contribution from all radionuclides identified in liquid effluents released to unrestricted areas is calculated using the following expressions:

$$D_t = \sum_i A_{it} \left[ \sum_{l=1}^m \Delta t_l C_{il} F_l \right]$$

where:

$D_t$  = dose or dose commitment to organ  $t$ , including total body (mrem).

$A_{it} = K_o \left[ \frac{U_w}{D_w} + U_F BF_i \right] DF_i$ , the site-related ingestion dose commitment factor from radionuclide  $i$  ( $\frac{\text{mrem/hr}}{\mu\text{Ci/ml}}$ ) (from Table 3 of Appendix B).

$\Delta t_l$  = length of the  $l^{\text{th}}$  time period over which  $C_{il}$  and  $F_l$  are averaged for all liquid releases, in hours.

$C_{il}$  = average concentration of radionuclide  $i$  observed in undiluted liquid effluent during time period  $\Delta t_l$  from any liquid release, in  $\mu\text{Ci/ml}$ . Concentrations are determined

primarily from a gamma isotopic analysis of a liquid effluent sample. For Fe-55, Sr-89, Sr-90, and H-3, the last measured value will be used in dose calculations.

$F_L$  = near-field average dilution factor for  $C_i$  during any liquid effluent release. Defined as the ratio of the average undiluted liquid waste flow during release to the product of the average flow from the site discharge structure to unrestricted receiving waters times the near-field dilution factor of 10 times the collection box factor of 1.0 (Ref. 2).

$F_L$  = 
$$\frac{\text{average undiluted liquid waste flow}}{\text{average flow from the site discharge} \times 10 \times 1.0}$$

$K_o$  = units conversion factor  $1.14 \times 10^3$

$$(10^6 \frac{\text{pCi}}{\mu\text{Ci}} \times 10^3 \frac{\text{ml}}{\text{liter}} \div 8,760 \frac{\text{hr}}{\text{yr}})$$

$U_w$  = adult water consumption (730 liters/yr) (Ref. 3)

$D_w$  = dilution factor from the near-field area within one-quarter mile of the release point to the potable water intake for adult water consumption.  $D_w$  is  $(57/(10 \times 1.0)) = 5.7$ , where 57 = lowest dilution factor corresponding to beach wells located approximately 966 m NW of the discharge point (Ref. 2). The near-field dilution factor of 10, represents the mixing effect of the discharge structure (Ref. 2).

$U_F$  = adult fish consumption (21 kg/yr) (Ref. 3).

$BF_i$  = bioaccumulation factor for nuclide, i, in fish, in pCi/kg per pCi/liter from Table 1 of Appendix B (taken from Reference 3, Table A-1).



$DF_i$  = dose conversion factor for nuclide, i, for adults in preselected organ,  $\tau$ , in mrem/pCi, from Table 2 of Appendix B (taken from Reference 3, Table E-11).

### 1.3 Projected Personal Maximum Dose

The dose commitment to a person offsite due to radioactive material released in liquid effluent may be projected by calculating the extrapolated total body and most exposed organ dose commitments to a hypothetical person exposed by eating fish and drinking water. The potential dose commitments to organs and to the total body are computed separately.

The dose commitment to a maximally exposed hypothetical person will be projected by calculating the doses accumulated during the most recent three months according to the method described in Section 1.2 and by assuming that the result represents the projected doses during the current quarter.

Alternatively, the quarterly dose commitment may be projected by using the equation:

$$P_{\tau} = \frac{91}{X} D_{\tau} \quad (1-11)$$

where:

$P_{\tau}$  = projected dose commitment (mrem) to organ  $\tau$  (including total body) for the current quarter

91 = number of days in a quarter

X = number of days to date in current quarter

$D_{\tau}$  = accumulated personal dose to date during the current quarter via radioactive material in liquid effluent (mrem).



#### 1.4 REFERENCES TO 1.0 LIQUID EFFLUENTS

- 1.4.1 J.S. Boegli, W.L. Britz, R.R. Bellamy, and R.L. Waterfield. 1978. "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," NUREG-0133, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission.
- 1.4.2 D.W. McDougall. 1980. "Aquatic Dilution Factors within 50 miles of the Davis-Besse Unit 1 Nuclear Power Plant." Stone & Webster Engineering Corporation.
- 1.4.3 United States Nuclear Regulatory Commission. 1977. "Calculation of Annual Dose to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR50, Appendix I," Regulatory Guide 1.109, Revision 1.

## 2.0 GASEOUS EFFLUENTS

### 2.1 Gaseous Effluent Monitor Setpoints

#### 2.1.1 Station Vent Monitor

The station vent is the only normal radioactive gaseous release point.

For the purpose of implementation of section 3.3.3.10 of the RETS, the alarm setpoint level for the station vent noble gas monitor will be calculated as follows:

$$S_v = \text{the lesser of} \begin{cases} 0.5 (R_t) 500 \\ \text{or} \\ 0.5 (R_s) 3000 \end{cases} \quad (2-1)$$

Where:

$S_v$  = count rate of station vent noble gas monitor at alarm setpoint level (cpm)

0.5 = safety factor allowing 100% margin for cumulative uncertainties of measurements (dimensionless)

$R_t$  = count rate per mrem/yr to the total body

$R_s$  = count rate per mrem/yr to the skin.

The values of  $R_t$  and  $R_s$  are dependent on the radionuclide distribution and are derived by the equations:

$$R_t = C \div \left[ \overline{X/Q}_{NG} \sum_i K_i (\dot{Q}_i) \right] \quad (2-2)$$

$$R_s = C \div [(\overline{\chi/Q}_{NG}) \sum_i (L_i + 1.1 M_i) \dot{Q}_i] \quad (2-3)$$

where:

C = count rate of the station vent monitor corresponding to grab sample radionuclide concentrations (cpm)

$\overline{\chi/Q}_{NG}$  = highest sector annual average atmospheric dispersion at the unrestricted area boundary

=  $1.83 \times 10^{-6}$  sec/m<sup>3</sup> in the north-northeast sector

$K_i$  = total body dose factor due to gamma emissions from isotope i (mrem/yr per  $\mu\text{Ci}/\text{m}^3$ ) from Table 4 of Appendix B

$\dot{Q}_i$  = rate of release of each noble gas radionuclide i identified by the sampling and analysis per RETS Table 4.11-2 ( $\mu\text{Ci}/\text{sec}$ )

$L_i$  = skin dose factor due to beta emissions from isotope i (mrem/yr per  $\mu\text{Ci}/\text{m}^3$ ) from Table 4 of Appendix B

1.1 = mrem skin dose per mrad air dose

$M_i$  = air dose factor due to gamma emissions from isotope i (mrad/yr per  $\mu\text{Ci}/\text{m}^3$ ) from Table 4 of Appendix B.

A more conservative setpoint may be calculated to minimize requirements for adjustment of the monitor by using the equations:

$$R'_t = C' \div [(\overline{X/Q}_{NG})K] \quad (2-4)$$

$$R'_s = C' \div [(\overline{X/Q}_{NG})(L + 1.1M)] \quad (2-5)$$

where:

$R'_t$  = conservative count rate per mrem/yr to the total body (Xe-133 detection, Kr-89 dose)

$R'_s$  = conservative count rate per mrem/yr to the skin (Xe-133 detection, Kr-89 dose)

$C'$  = count rate of station vent monitor for an effluent concentration of Xe-133 corresponding to 1.0  $\mu$ Ci/sec release rate of Xe-133 (cpm)

$K$  = total body dose factor for Kr-89, from Table 4 of Appendix B

$L$  = skin dose factor for Kr-89, from Table 4 of Appendix B

$M$  = air dose factor for Kr-89, from Table 4 of Appendix B

#### 2.1.2 Waste Gas Decay System and Containment Purge Monitors

The waste gas decay tank releases and containment purges, in addition to being monitored by the station vent monitor, are controlled individually to provide additional assurance that releases do not exceed the limits of Technical Specifications 3.11.2.1.

The setpoint level ( $S_d$ ) for discharge through the waste gas decay system monitor will be calculated in a corresponding manner:

$$S_d = \text{the lesser of } \begin{cases} 0.5 (r_t) 500 \\ \text{or} \\ 0.5 (r_s) 3000 \end{cases} \quad (2-6)$$

where:

$S_d$  = count rate of waste gas decay system monitor at alarm setpoint level

$r_t$  = count rate per mrem/yr to the total body

$r_s$  = count rate per mrem/yr to the skin

The values of  $r_t$  and  $r_s$  are dependent on the radionuclide distribution and are derived by the equations:

$$r_t = c \div [(\overline{X/Q}_{NG}) \sum_i K_i \dot{q}_i] \quad (2-7)$$

$$r_s = c \div [(\overline{X/Q}_{NG}) \sum_i (L_i + 1.1M_i) \dot{q}_i] \quad (2-8)$$

where:

$c$  = count rate of the waste gas decay system monitor for radionuclide concentrations to be discharged (cpm)

$\dot{q}_i$  = rate of release of noble gas radionuclide  $i$  ( $\mu\text{Ci/sec}$ )

For a more conservative, simpler setpoint for the waste gas system monitor, the equations are:

$$r'_t = c' \div [(\overline{X/Q})_{NG}] K \quad (2-9)$$

$$r'_s = c' \div [(\overline{X/Q})_{NG}] (L + 1.1M) \quad (2-10)$$

where:

$r'_t$  = conservative count rate per mrem to the total body (Xe-133 detection, Kr-89 dose)

$r'_s$  = conservative count rate per mrem to the skin (Xe-133 detection, Kr-89 dose)

$c'$  = count rate of the waste gas decay system monitor for an effluent concentration corresponding to 1.0  $\mu\text{Ci/sec}$  release rate for Xe-133

The setpoint level for the containment purge noble gas monitor will be calculated using the same methodology as indicated for the waste gas decay system, utilizing the appropriate corresponding count and release rates.

The calculated setpoint values will be regarded as upper bounds for the actual setpoint adjustments (ie, setpoint adjustments are not required to be performed if the existing setpoint level corresponds to a lower count rate than the calculated value).

## 2.2 Gaseous Effluent Dose Rate and Dose Calculations

### 2.2.1 Unrestricted Area Boundary Dose Rate

- a. Technical Specification 3.11.2.1a limits the dose rate in the unrestricted area due to noble gas releases

from the station to  $\leq 500$  mrem/yr, total body and  $\leq 3000$  mrem/yr, skin. Radiation monitor alarm setpoints are established to assure that these release limits are not exceeded. In the event any gaseous releases from the station results in the alarm setpoints being exceeded, an evaluation of the unrestricted area dose rate resulting from the release shall be performed using the following equations:

$$D_{tb} = (\overline{\chi/Q}_{NG}) \sum_i K_i \dot{Q}_i \quad (2-11)$$

$$D_s = (\overline{\chi/Q}_{NG}) \sum_i (L_i + 1.1M_i) \dot{Q}_i \quad (2-12)$$

where:

$D_{tb}$  = total body dose rate (mrem/yr)

$D_s$  = skin dose rate (mrem/yr)

$\overline{\chi/Q}_{NG}$  = highest sector annual average atmospheric dispersion at the unrestricted area boundary  
 $= 1.83 \times 10^{-6}$  sec/m<sup>3</sup> in the north-northeast sector

- b. For I-131 and particulates with half-lives greater than 8 days, Technical Specification 3.11.2.1.b limits the dose rate to  $\leq 1500$  mrem/yr to any organ. To demonstrate compliance with this limit, an evaluation is performed at a frequency corresponding to the

sampling and analysis time period (e.g., normally once per 7 days for I-131). The following equation may be used for evaluation:

$$D_o = (\overline{\chi/Q})_I \sum_i (P_i \bar{Q}'_i) \quad (2-13)$$

where:

$D_o$  = average organ dose rate over the sampling time period (mrem/year)

$\overline{\chi/Q}_I$  = controlling sector annual average atmospheric dispersion at the site boundary for the inhalation pathway.

=  $1.68 \times 10^{-6}$  sec/m<sup>3</sup> in the north-northeast sector.

$P_i$  = dose parameter for radionuclide i, (mrem/yr per  $\mu\text{Ci}/\text{m}^3$ ) for inhalation pathway from Table 5 of Appendix B. Values for  $P_i$  are derived in accordance with the methods described in NUREG-0133.

$\bar{Q}'_i$  = average release rate over the appropriate sampling period and analysis frequency for isotope i, I-131 or other radionuclide in particulate form with half-life greater than eight days ( $\mu\text{Ci}/\text{sec}$ ).

By substituting 1500 mrem/yr for  $D_o$  (equation 2-13) and solving for  $\bar{Q}'_i$ , an allowable release rate for I-131 can be determined. Based on the annual average meteorological dispersion ( $1.68 \times 10^{-6}$  sec/m<sup>3</sup>) and the child inhalation pathway ( $P_i = 1.62 \times 10^7$  mrem/yr per  $\mu\text{Ci}/\text{m}^3$ ), the release rate for I-131 is 44.1  $\mu\text{Ci}/\text{sec}$ . An added conservatism



factor of 0.8 has been included in this calculation to account for any potential dose contribution from other radioactive particulate material. For a 7 day period which is the sampling and analysis frequency for I-131, the cumulative allowable release is 26.7 Ci. Therefore, as long as the I-131 releases in any 7 day period do not exceed 26.7 Ci, no additional analyses are needed to verify compliance with the Technical Specification 3.11.2.1.b limits on allowable release rate.

## 2.2.2 Unrestricted Area Dose to Individual

- a. Technical specification 4.11.2.2 requires at least a monthly assessment of releases of noble gases to evaluate compliance with the quarterly dose limits of  $\leq 5$  mrad, gamma-air dose and  $\leq 10$  mrad, beta-air dose. The following equations may be used to calculate the gamma-air and beta-air doses:

$$D_Y = 3.17 \times 10^{-8} \sum_i M_i [(\overline{X/Q}_{NG}) \tilde{Q}_i] \quad (2-14)$$

$$D_\beta = 3.17 \times 10^{-8} \sum_i N_i [(\overline{X/Q}_{NG}) \tilde{Q}_i] \quad (2-15)$$

where:

$D_Y$  = air dose due to gamma emissions for noble gas radionuclide  $i$  (mrad)

$\overline{X/Q}_{NG}$  = dispersion parameter for unrestricted areas  
 $= 1.83 \times 10^{-6} \text{ sec/m}^3$

$\tilde{Q}_i$  = cumulative release of noble gas radionuclide  $i$  over the period of interest ( $\mu\text{Ci}$ )

$D_{\beta}$  = air dose due to beta emissions from noble gas radionuclide  $i$  (mrad)

$N_i$  = air dose factor due to beta emissions from noble gas radionuclide  $i$  (mrad/yr per  $\mu\text{Ci}/\text{m}^3$ ) from Table 4 of Appendix B.

$3.17 \times 10^{-8}$  = conversion factor (yr/sec)

- b. Technical Specification 4.11.2.3 requires an assessment at least once per 31 days to evaluate compliance with the quarterly dose limit of  $\leq 7.5$  mrem to any organ. The following equation may be used to evaluate the maximum organ dose due to releases of I-131 and particulates with half-lives greater than 8 days.

$$D_p = 3.17 \times 10^{-8} \sum_i R_i (W' \tilde{Q}'_i) \quad (2-16)$$

where:

$D_p$  = dose or dose commitment to organ  $p$ , including the total body, from I-131 and radionuclides in particulate form with half-life greater than eight days (mrem)

$W'$  = dispersion or deposition parameter  
for the controlling receptor location

$$= \left[ \begin{array}{l} \overline{\chi/Q'} = 1.19 \times 10^{-6} \text{ sec/m}^3 \text{ for inhalation} \\ \text{pathway and H-3 dose contribution} \\ \text{via other pathways (from Table 7} \\ \text{of Appendix B)} \\ \overline{D/Q'} = 1.39 \times 10^{-8} \text{ m}^{-2} \text{ vegetation path-} \\ \text{way (from Table 7 of Appendix B)} \end{array} \right]$$

$R_i$  = dose factor for radionuclide  $i$ , (mrem/yr per  $\mu\text{Ci/m}^3$ ) or ( $\text{m}^2$  - mrem/hr per  $\mu\text{Ci/sec}$ ) from Table 6 of Appendix B. Values for  $R_i$  were derived in accordance with the methods described in NUREG-0133.

$\tilde{Q}'_i$  = cumulative release of radionuclide  $i$  of I-131 or material in particulate form in long-term releases over the period of interest ( $\mu\text{Ci}$ ).

The location of exposure pathways and the maximum organ dose may be based on the available pathways in the surrounding environment of Davis-Besse as identified by the annual land-use census (Technical Specification 3.12.2). Table 7 of Appendix B will be supplemented yearly by including in the Semi-Annual Radioactive Effluent Report the applicable exposure pathways as identified by the census.

- c. For the purpose of implementing RETS Technical Specification 3.11.3 on the EPA environmental radiation dose standard and 6.9.1.13 on reporting, dose calculations will be performed using the above equations with the substitution of average or actual meteorological parameters for the period of interest and applicable pathways.

## 2.3 Meteorological Model

### 2.3.1 Long-Term Atmospheric Dispersion

Atmospheric dispersion for long-term releases is calculated using a mixed-mode, wake-split form of the straight-line flow Gaussian dispersion model, referenced in Regulatory Guide 1.111, Revision 1.

$$\begin{aligned} \chi/Q &= \text{atmospheric dispersion (sec/m}^3\text{)} \\ &= \frac{2.03}{r} k \delta \left[ \frac{1-E}{u \sigma_z} \exp \left[ -\frac{h^2}{2\sigma_z^2} \right] + \frac{E}{u_g z} \right] \end{aligned} \quad (2-17)$$

where:

- k = open terrain recirculation factor at distance r from Figure 2 of Appendix A.
- $\delta$  = plume depletion factor at distance r for appropriate stability class and effective height from Figures 3-6 of Appendix A. (Note: This plume depletion factor applies only to releases of radioiodines. The depletion factor for noble gases is unity.)

E = fraction considered as ground level

1.0 for  $\frac{v}{u} \leq 1.0$

$2.58 - 1.58 \frac{v}{u}$  for  $1.0 < \frac{v}{u} \leq 1.5$

$0.3 - 0.06 \frac{v}{u}$  for  $1.5 < \frac{v}{u} \leq 5.0$

0 for  $\frac{v}{u} > 5.0$

v = station vent exit velocity (13.4 m/sec)

u = wind speed at vent height from the 75-m level of the main meteorological tower (m/sec)

$u_g$  = wind speed at ground level from the 10-m level of the satellite meteorological tower (m/sec)

$\sigma_z$  = vertical standard deviation of the plume at distance r for effective height under stability category indicated by temperature lapse rate  $\Delta T$  ( $^{\circ}\text{C}/100\text{m}$ ) from Figure 7 of Appendix A.

$\Delta T$  = temperature differential with vertical separation between the 10-m and 75-m levels of the main meteorological tower ( $^{\circ}\text{K}/100\text{m}$ )

h = effective height of release (m)

$$= h_v + h_{pr} - h_t$$

$h_v$  = height of station vent

$$= 75.3\text{m}$$

$h_{pr}$  = additional height due to plume rise (m)  
for stability classes A, B, C, D

$$\text{the lesser of } \left[ \begin{array}{c} \left[ 1.44 \frac{v}{u} \frac{r}{d} \right]^{2/3} \frac{1}{d} \\ \text{or} \\ 3 \frac{vd}{u} \end{array} \right] - c_v$$

subject to, for stable conditions ( $\Delta T > -0.5$  °K/100m):

$$\text{the lesser of } \left[ \begin{array}{c} 4 \left[ \frac{F_m}{S} \right]^{1/4} \\ \text{or} \\ 1.5 \left[ \frac{F_m}{u} \right]^{1/3} S^{-1/6} \end{array} \right]$$

$d$  = diameter of station vent  
= 2.12 m

$c_v$  = correction for low vent exit velocity (m)

$$= \left[ \begin{array}{c} 3 \left[ 1.5 - \frac{v}{u} \right] d \text{ for } \frac{v}{u} < 1.5 \\ 0 \text{ for } \frac{v}{u} \geq 1.5 \end{array} \right]$$

$F_m$  = momentum flux parameter ( $m^4/sec^2$ )  
=  $\left( \frac{vd}{2} \right)^2$

S = restoring acceleration per unit vertical displacement for adiabatic motion in the atmosphere

$$8.7 \times 10^{-4} \text{ sec}^{-2} \text{ for } \Delta T \leq 1.5 \text{ (E)}$$

$$1.75 \times 10^{-3} \text{ sec}^{-2} \text{ for } \Delta T \leq 4.0 \text{ (F)}$$

$$2.45 \times 10^{-3} \text{ sec}^{-2} \text{ for } \Delta T > 4.0 \text{ (G)}$$

$h_t$  = height of terrain at distance r in sector of interest (m)

r = downwind distance (m)

$\Sigma$  = vertical standard deviation of the plume with building wake correction (m)

$$= \text{the lesser of } \left[ \sigma_z^2 + (0.5) \frac{b^2}{\pi} \right]^{1/2} \text{ or } \sqrt{3} \sigma_z$$

b = height of reactor building

$$= 73.5\text{m}$$

### 2.3.2 Long-Term Deposition

Relative deposition per unit area for long term releases is calculated for a mixed mode release.

D/Q = relative deposition per unit area ( $\text{m}^{-2}$ )



$$= \frac{2.55k}{r} \left[ (1-E) D_e + ED_g \right] \quad (2-18)$$

where:

$D_e$  = relative deposition rate for elevated releases from Figures 9 through 11 of Appendix A.

$D_g$  = relative deposition rate for ground level releases from Figure 8 of Appendix A.

#### 2.4 Definitions of Gaseous Effluents Parameters

$b$  = height of reactor building (m) (Section 2.3.1)

$C$  = count rate of the station vent monitor corresponding to grab sample radionuclide concentrations (cpm) (Section 2.1.1)

$C'$  = count rate of station vent monitor corresponding to a 1.0  $\mu\text{Ci/sec}$  release rate of Xe-133 (cpm) (Section 2.1.1)

$c$  = count rate of the waste gas decay system monitor for radionuclide concentrations to be discharged (cpm) (Section 2.1.2)

$c'$  = count rate of the waste gas decay system monitor corresponding to a 1.0  $\mu\text{Ci/sec}$  release rate of Xe-133 (cpm) (Section 2.1.2)

$c_v$  = effective plume height correction for low vent exit velocity (m) (Section 2.3.1)



- $D_e$  = relative deposition rate for elevated releases from Figure 6 of Appendix A (Section 2.3.2)
- $D_g$  = relative deposition rate for ground level releases from Figure 7 of Appendix A (Section 2.3.2)
- $D_o$  = average organ dose rate (mrem/year) (Section 2.2.1.b)
- $D_p$  = dose or dose commitment to organ p, including the total body, from I-131 and radionuclides in particulate form, with half-life greater than eight days (mrem) (Section 2.2.2.b)
- $D_s$  = average skin dose rate (mrem/year) (Section 2.2.1.a)
- $D_{tb}$  = average total body dose rate (mrem/year) (Section 2.2.1.a)
- $D_\beta$  = air dose due to beta emissions from noble gas radionuclide i (mrad) (Section 2.2.2.a)
- $D_\gamma$  = air dose due to gamma emissions from noble gas radionuclide i (mrad) (Section 2.2.2.a)
- $\overline{D/Q}$  = relative deposition per unit area ( $m^{-2}$ ) (Section 2.3.2)
- $d$  = diameter of station vent (m) (Section 2.3.1)
- $\delta$  = plume depletion factor at distance r for appropriate stability class and effective height from Figures 3 and 4 of Appendix A (dimensionless) (Section 2.3.1)
- $E$  = fraction of release considered as ground level (dimensionless) (Section 2.3.1)
- $F_m$  = momentum flux parameter ( $m^4/sec^2$ ) (Section 2.3.1)

- $h$  = effective height of release (m) (Section 2.3.1)
- $h_t$  = height of terrain at distance  $r$  in sector of interest (m) (Section 2.3.1)
- $h_v$  = height of station vent (m) (Section 2.3.1)
- $h_{pr}$  = additional plume height due to plume rise (m) (Section 2.3.1)
- $K$  = total body dose factor for Kr-89, (mrem/yr per  $\mu\text{Ci}/\text{m}^3$ ) from Table 4 of Appendix B (Section 2.1.1)
- $K_i$  = total body dose factor due to gamma emissions from radionuclide (mrem/yr per  $\mu\text{Ci}/\text{m}^3$ ) from Table 4 of Appendix B (Section 2.1.1)
- $k$  = open terrain recirculation factor at distance  $r$  from Figure 2 of Appendix A (dimensionless) (Section 2.3.1)
- $L$  = skin dose factor for Kr-89, the most restrictive radionuclide, from Table 4 of Appendix B (mrem/yr per  $\mu\text{Ci}/\text{m}^3$ ) (Section 2.1.1)
- $L_i$  = skin dose factor due to beta emissions from radionuclide  $i$  (mrem/yr per  $\mu\text{Ci}/\text{m}^3$ ) from Table 4 of Appendix B (mrem/yr per  $\mu\text{Ci}/\text{m}^3$ ) (Section 2.1.1)
- $M$  = air dose factor for Kr-89, the most restrictive radionuclide, from Table 4 of Appendix B (mrad/yr per  $\mu\text{Ci}/\text{m}^3$ ) (Section 2.1.1)
- $M_i$  = air dose factor due to gamma emissions from radionuclide  $i$  (mrad/yr per  $\mu\text{Ci}/\text{m}^3$ ) from Table 4 of Appendix B (Section 2.1.1)

- $N_i$  = air dose factor due to beta emissions from noble gas radionuclide  $i$  (mrad/yr per  $\mu\text{Ci}/\text{m}^3$ ) from Table 4 of Appendix B (Section 2.2.2.a)
- $P_i$  = dose parameter for radionuclide  $i$ , (mrem/yr per  $\mu\text{Ci}/\text{m}^3$ ) for inhalation from Table 5 of Appendix B (Section 2.2.1.b)
- $\dot{Q}_i$  = rate of release of noble gas radionuclide  $i$  ( $\mu\text{Ci}/\text{sec}$ ) (Section 2.1.1)
- $\bar{Q}'_i$  = average release rate over appropriate sampling period of isotope  $i$  of I-131 or other radionuclide in particulate form, with half-life greater than eight (8) days ( $\mu\text{Ci}/\text{sec}$ ) (Section 2.2.1.b)
- $\tilde{Q}_i$  = cumulative release of noble gas radionuclide  $i$  over the period of interest ( $\mu\text{Ci}$ ) (Section 2.2.2.a)
- $\tilde{Q}'_i$  = cumulative release of radionuclide  $i$  of I-131 or material in particulate form over the period of interest ( $\mu\text{Ci}$ ) (Section 2.2.2.b)
- $\dot{q}_i$  = rate of release of noble gas radionuclide  $i$  ( $\mu\text{Ci}/\text{sec}$ ) (Section 2.1.2)
- $R_i$  = dose factor for radionuclide  $i$ , (mrem/yr per  $\mu\text{Ci}/\text{m}^3$ ) or ( $\text{m}^2$  - mrem/yr per  $\mu\text{Ci}/\text{sec}$ ) from Table 6 of Appendix B (Section 2.2.2.b)
- $R_s$  = count rate per mrem/yr to the skin based on current isotope distribution (Section 2.1.1)
- $R_t$  = count rate per mrem/yr to the total body based on current isotope distribution (Section 2.1.1)
- $R'_s$  = conservative count rate per mrem/yr to the skin (Xe-133 detection Kr-89 dose) (Section 2.1.1)

- $R'_t$  = conservative count rate per mrem/yr to the total body  
(Xe-133 detection, Kr-89 dose) (Section 2.1.1)
- $r$  = downwind distance (m)
- $r_s$  = count rate per mrem/yr to the skin based on waste gas decay  
system isotope distribution (Section 2.1.2)
- $r_t$  = count rate per mrem/yr to the total body based on current  
waste gas decay system isotope distribution (Section 2.1.2)
- $r'_s$  = conservative count rate per mrem to the skin for waste gas  
decay system only (Section 2.1.2)
- $r'_t$  = conservative count rate per mrem to the total body for  
waste gas decay system only (Section 2.1.2)
- $S$  = restoring acceleration per unit vertical displacement for  
adiabatic motion in the atmosphere ( $\text{sec}^{-2}$ ) (Section 2.3.1)
- $S_d$  = count rate of waste gas decay system noble gas monitor at  
alarm setpoint level (Section 2.1.2)
- $S_v$  = count rate of station vent noble gas monitor at alarm  
setpoint level (Section 2.1.1)
- $\Sigma$  = vertical standard deviation of the plume with building wake  
correction (m) (Section 2.3.1)
- $\sigma_z$  = vertical standard deviation of the plume at distance  $r$  for  
effective height under stability category indicated by  $\Delta T$   
from Figure 5 of Appendix A (m) (Section 2.3.1)
- $\Delta T$  = temperature differential with vertical separation ( $^{\circ}\text{K}/100\text{m}$ )  
(Section 2.3.1)

- $u$  = wind speed at vent height from the 75-m level of the main meteorological tower (m/sec) (Section 2.3.1)
- $u_g$  = wind speed at ground level from the 10-m level of the satellite meteorological tower (m/sec) (Section 2.3.1)
- $v$  = plant vent exit velocity (m/sec) (Section 2.3.1)
- $W'$  = dispersion and deposition parameter for the controlling receptor location (dispersion:  $\text{sec}/\text{m}^3$ , deposition:  $\text{m}^{-2}$ ) (Section 2.2.2.b)
- $\chi/Q$  = atmospheric dispersion ( $\text{sec}/\text{m}^3$ ) (Section 2.3.1)
- $\overline{\chi/Q}$  = highest sector annual average atmospheric dispersion value at the unrestricted area boundary ( $\text{sec}/\text{m}^3$ ) (Section 2.1.1)
- $\overline{\chi/Q}_I$  = controlling sector annual average atmospheric dispersion at the site boundary for the inhalation pathway (Section 2.2.1.b)
- $\overline{\chi/Q}_{NG}$  = highest sector annual average atmospheric dispersion at the unrestricted area boundary ( $\text{sec}/\text{m}^3$ ) (Section 2.2.2.a)

## 2.5 References to 2.0 Gaseous Effluents

- 2.5.1 J. S. Boegli, W. L. Britz, R. R. Belamy, and R. L. Waterfield. 1978. "Preparation of Radiological Effluent Technical Specifications for Nuclear Power Plants," NUREG-0133, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission.
- 2.5.2 United States Nuclear Regulatory Commission. 1977. "Methods for Estimating Atmospheric Transport and Dispersion of Gaseous Effluents in Routine Releases from Light-Water-Cooled Reactors," Regulatory Guide 1.111, Revision 1.



### 3.0 RADIOLOGICAL ENVIRONMENTAL MONITORING

Sampling locations as required in Section 3/4.12.1 of the Radiological Effluent Technical Specifications are described in Table 8 of Appendix B and shown on maps in Appendix A, pages A-12 and A-16 through A-50.

#### 3.1 Land Use Census

A land use census shall be conducted annually for the purpose of identifying changes in the use of the offsite area surrounding Davis-Besse which may substantially affect the radiological dose assessment or which may indicate needed adjustments to the Program. This census satisfies the criteria of 10 CFR Part 50, Appendix I, Section IV.B.3.

The census will include land within 5 miles of Davis-Besse and will be conducted at least annually. It will be conducted by either a door-to-door survey, aerial survey, or by consulting local agricultural authorities or by a combination thereof.

The locations of: 1) the nearest milk animal, 2) the nearest vegetable garden greater than 500 square feet, and 3) the nearest resident, within 5 miles of Davis-Besse in each of 16 sectors in cardinal compass point directions from the plant, are to be identified in the census. If a milk animal is not identified in a sector within 5 miles, one may conservatively assume that one is located at the 5-mile distance for purposes of evaluating maximum potential organ dose and identifying the controlling pathway, except in those sectors over Lake Erie.

If the land use census identifies a location(s) at which the dose or dose commitment calculated at the time is greater than the maximum calculated dose associated with the like pathway(s) at a location where sampling is conducted as specified by the monitoring program, then the pathways having maximum exposure

potential at the newly identified location will be added to the program, if samples are reasonably obtainable at the new location. Like pathways monitored (sampled) at a location, excluding control station location(s), having a lower associated calculated personal dose may be deleted from the program at the time the new pathway(s) and location(s) are added.

### 3.2 Sample Analyses

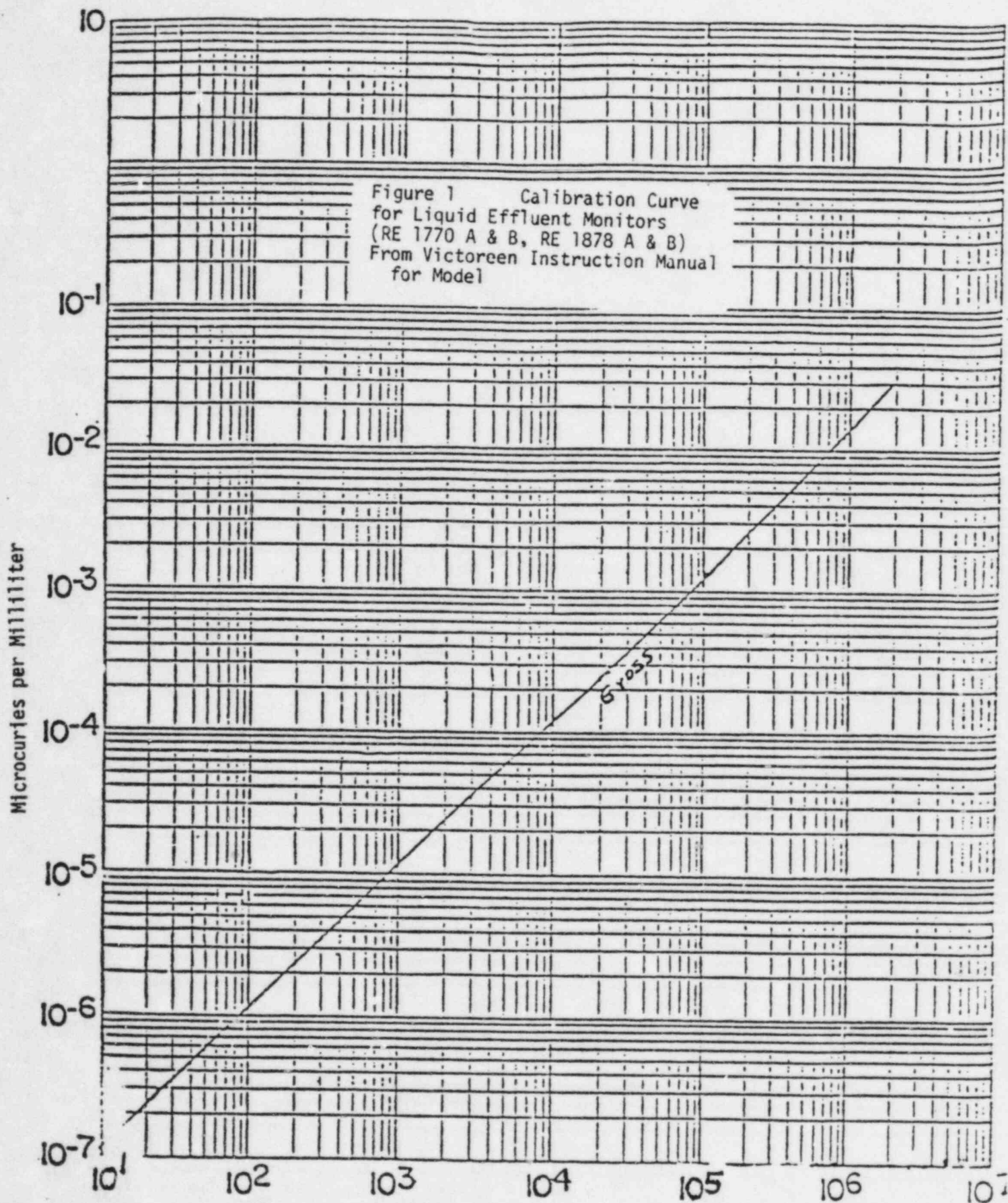
Radioactivity in environmental samples described in Table 8 of Appendix B may be analyzed either at Davis-Besse or at an offsite laboratory. In order to provide a comparative check on the accuracy and precision of these analyses, the laboratory participates in the USEPA Interlaboratory Comparison Program by analyzing radioactive samples distributed for the purpose.

Tables 9 and 10 of Appendix B identify the type and frequency of environmental sample collection.



APPENDIX A

Figures



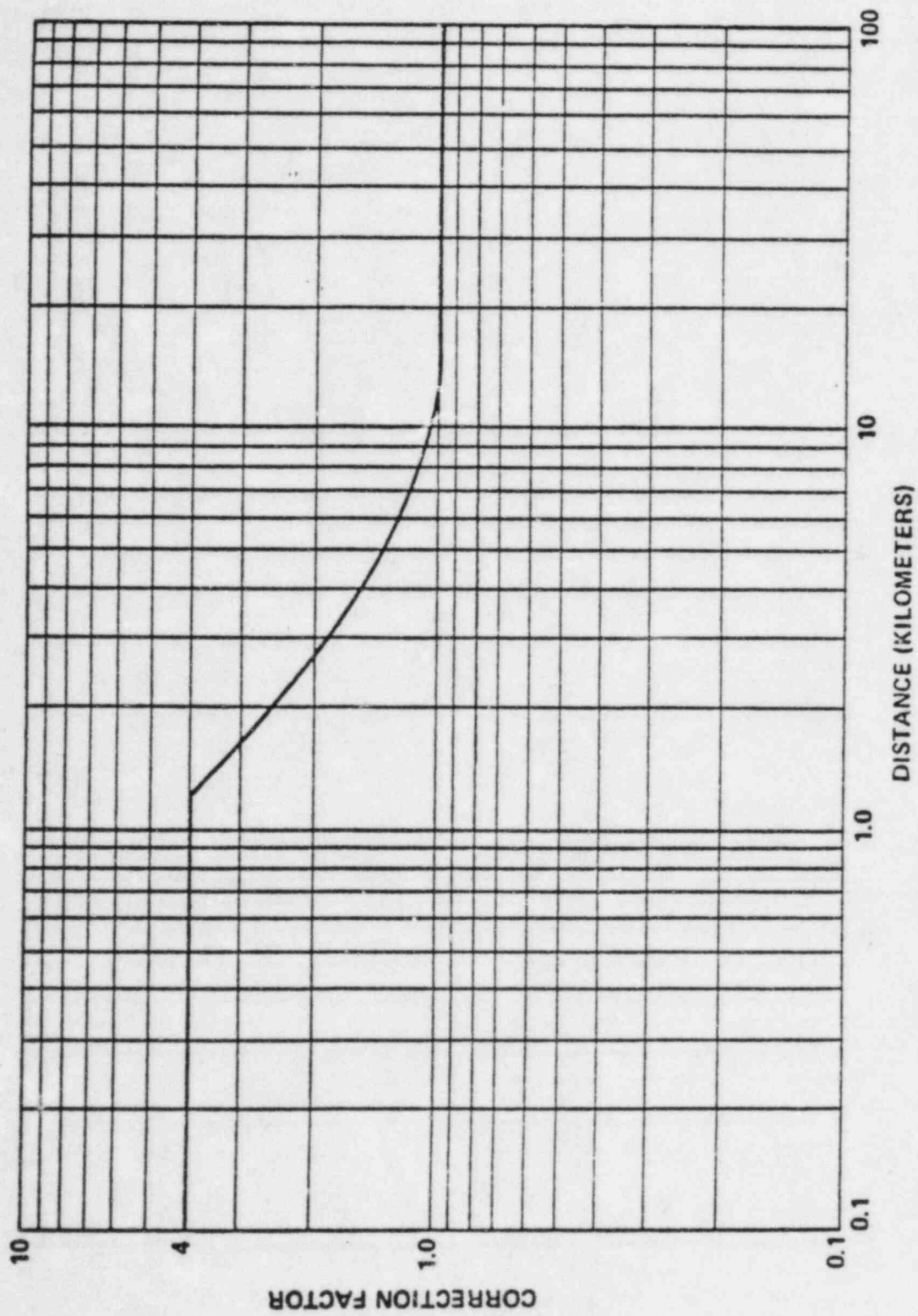


Figure 2 Open Terrain Correction Factor

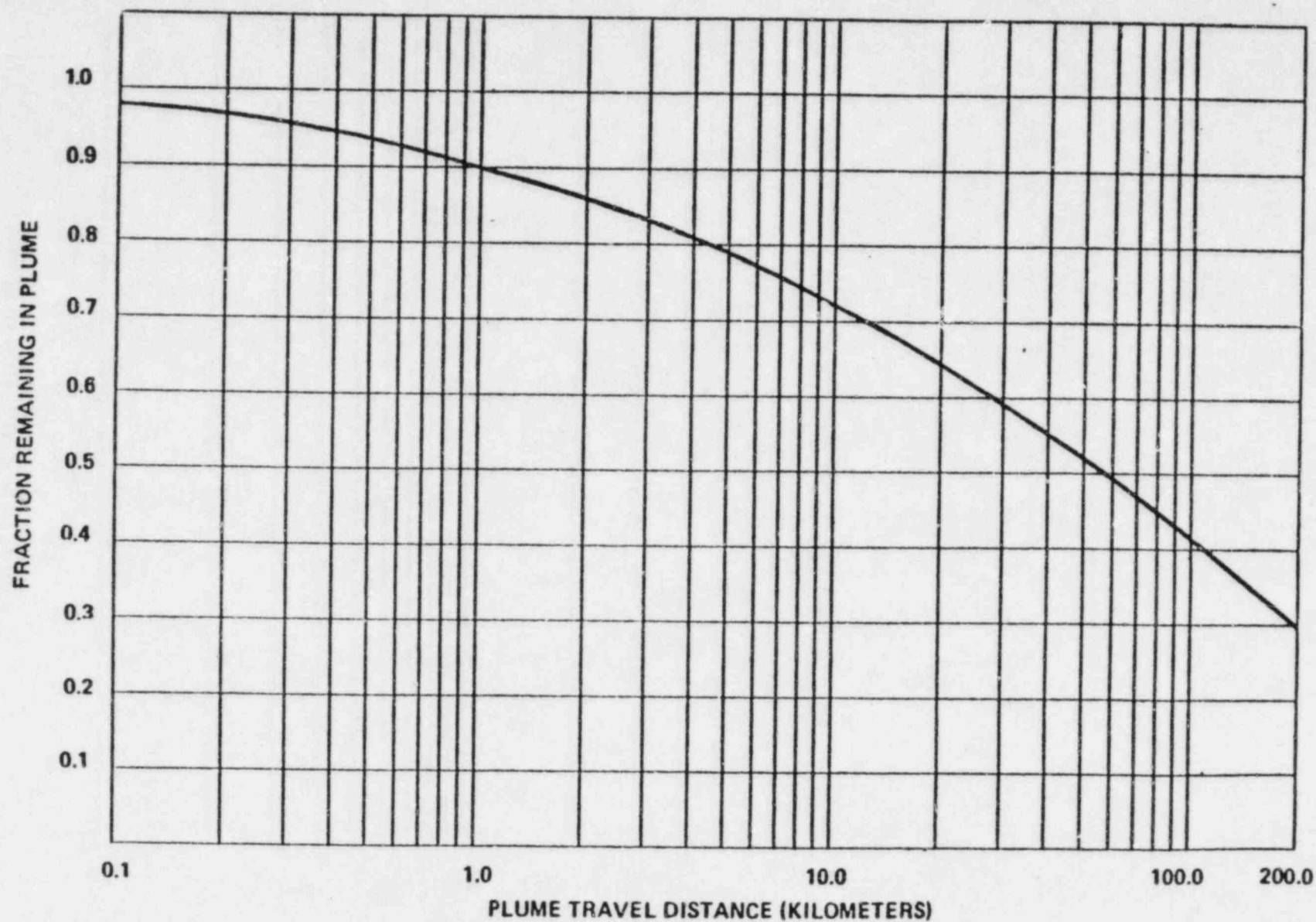


Figure 3 Plume Depletion Effect for Ground-Level Releases (All Atmospheric Stability Classes)

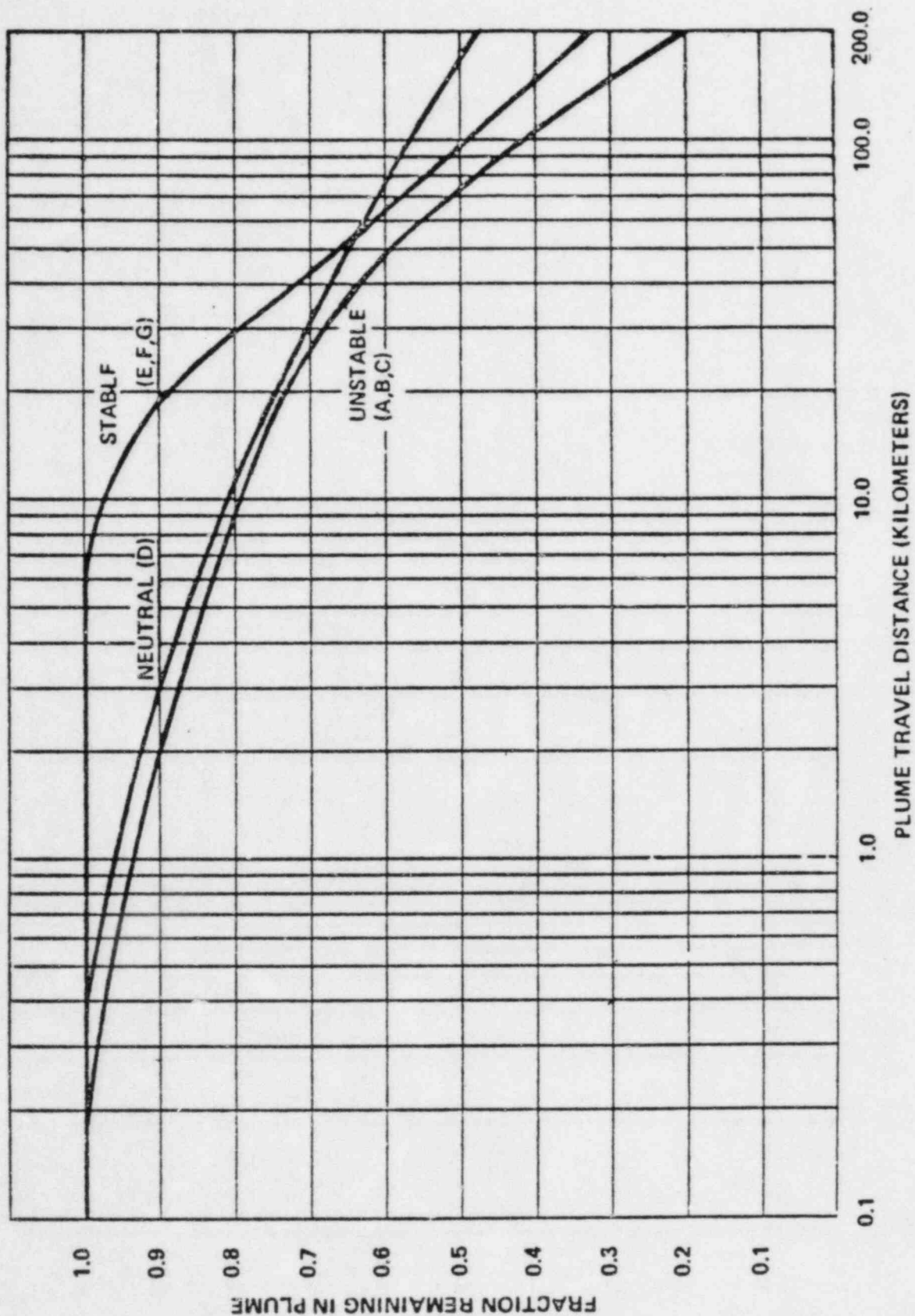


Figure 4 Plume Depletion Effect for 30-m Releases (Letters denote Pasquill Stability Class)



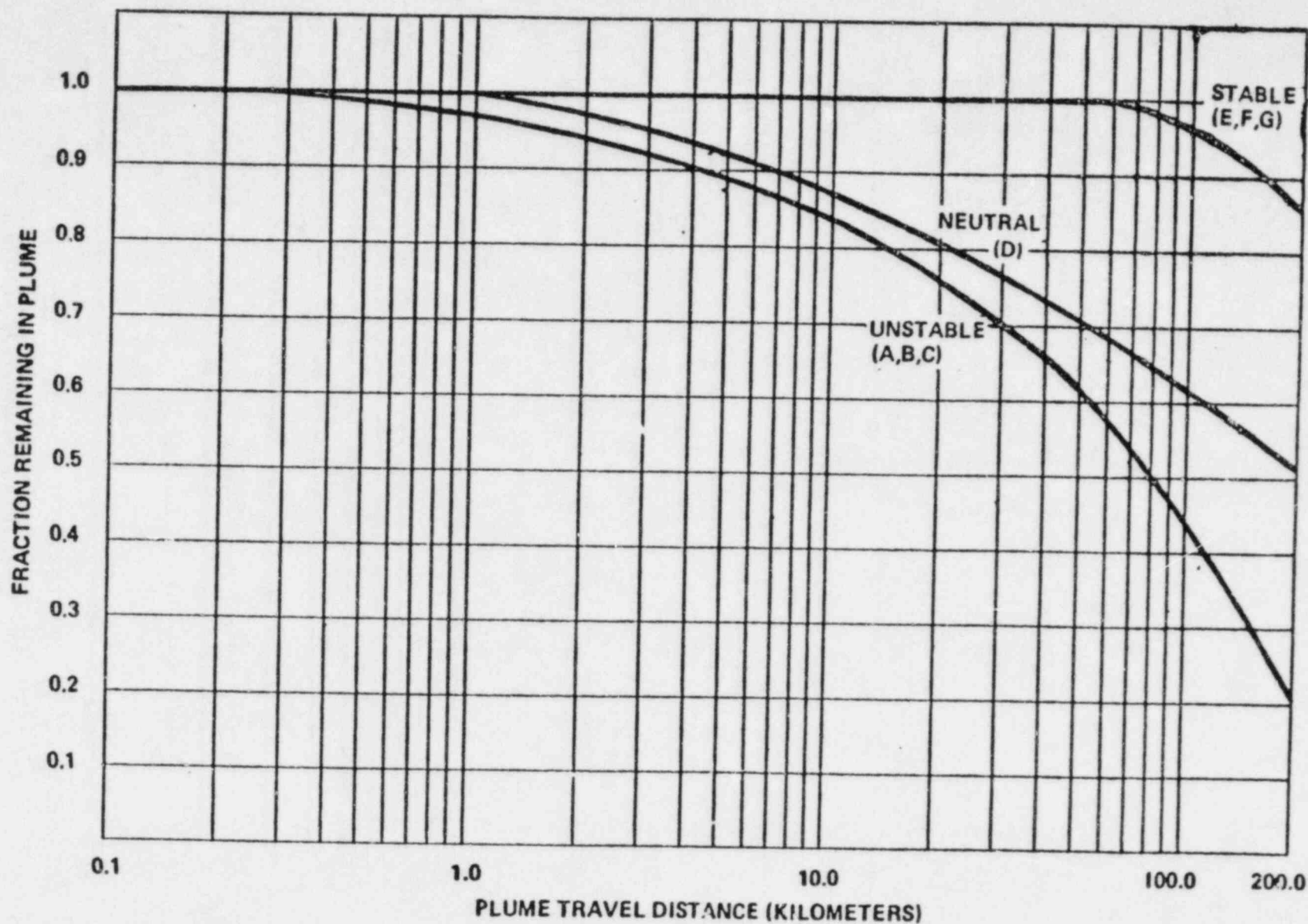


Figure 5

Plume Depletion Effect for 60-m Releases (Letters denote Pasquill Stability Class)

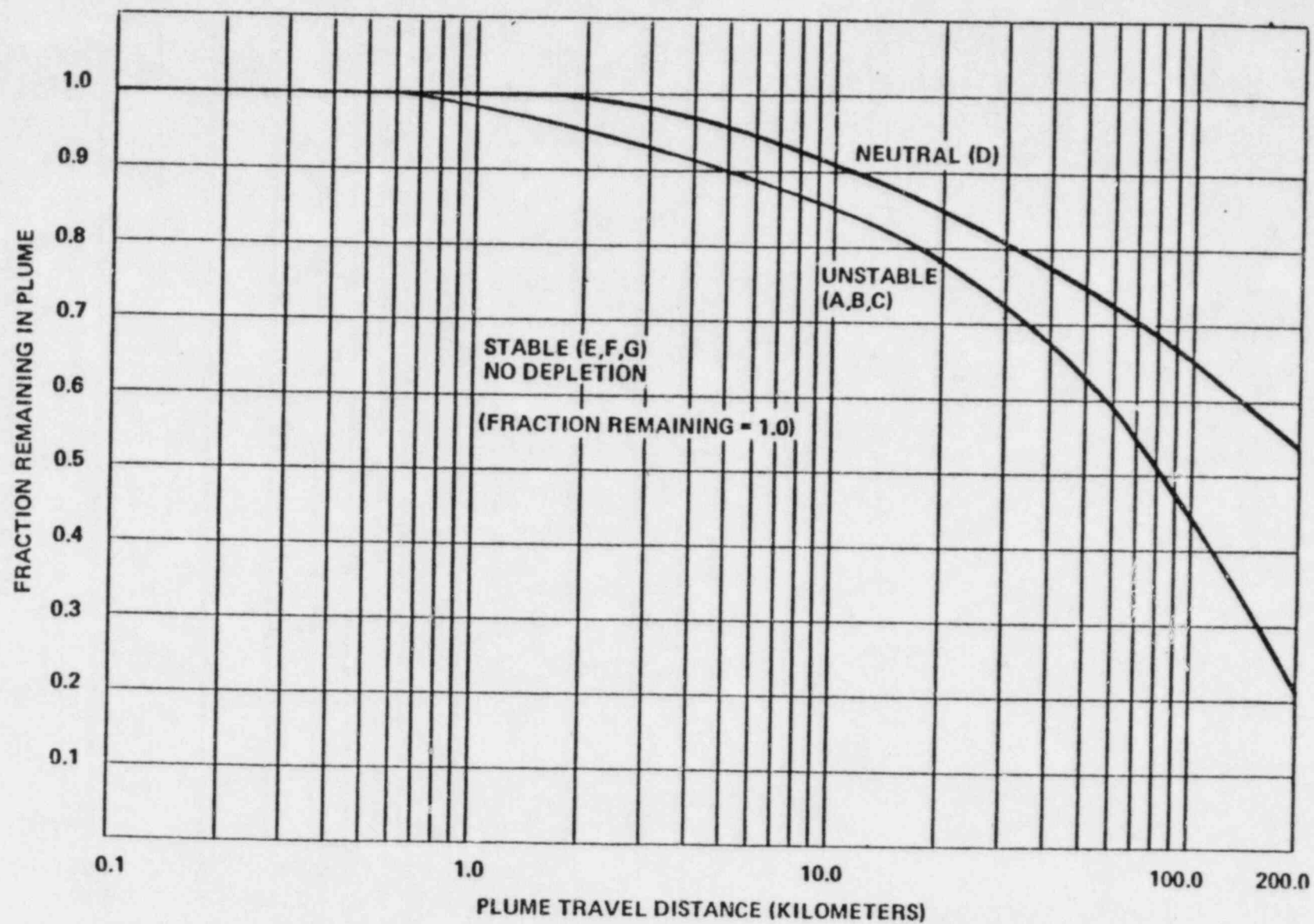


Figure 6 Plume Depletion Effect for 100-m Releases (Letters denote Pasquill Stability Class)



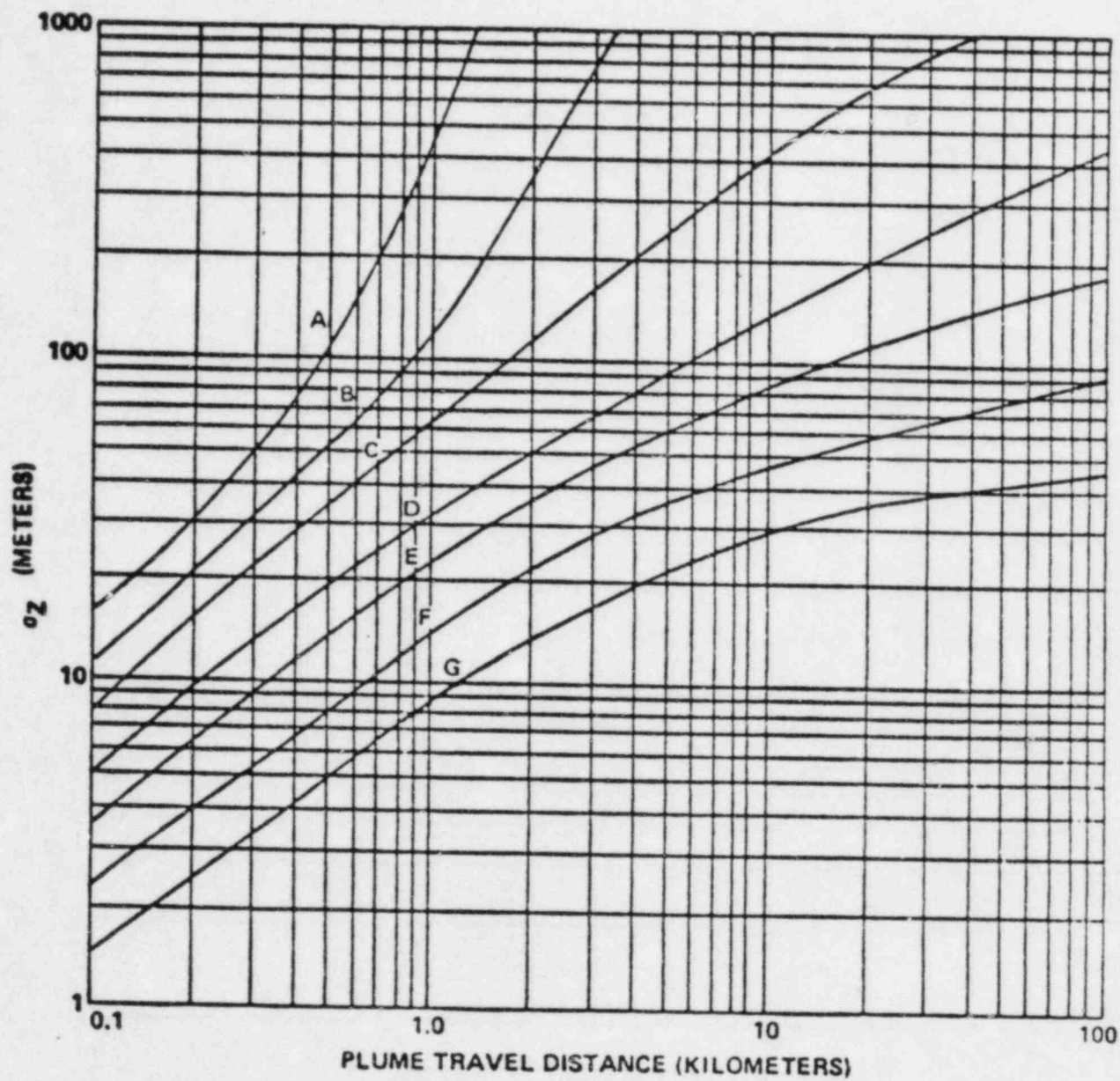


Fig. 7 Vertical Standard Deviation of Material in a Plume (Letters denote Pasquill Stability Class)

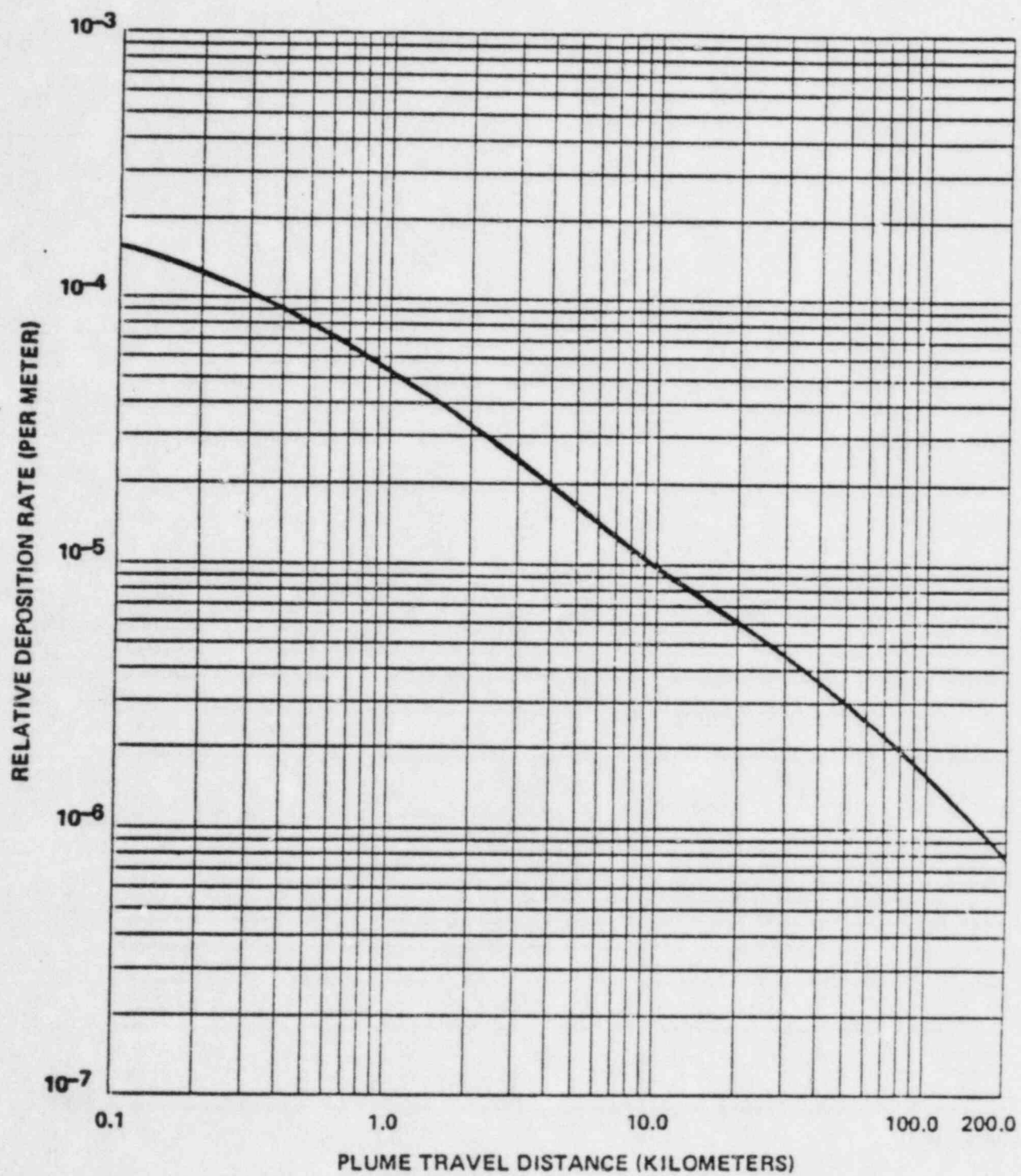


Figure 8 Relative Deposition for Ground-Level Releases (All Atmospheric Stability Classes)

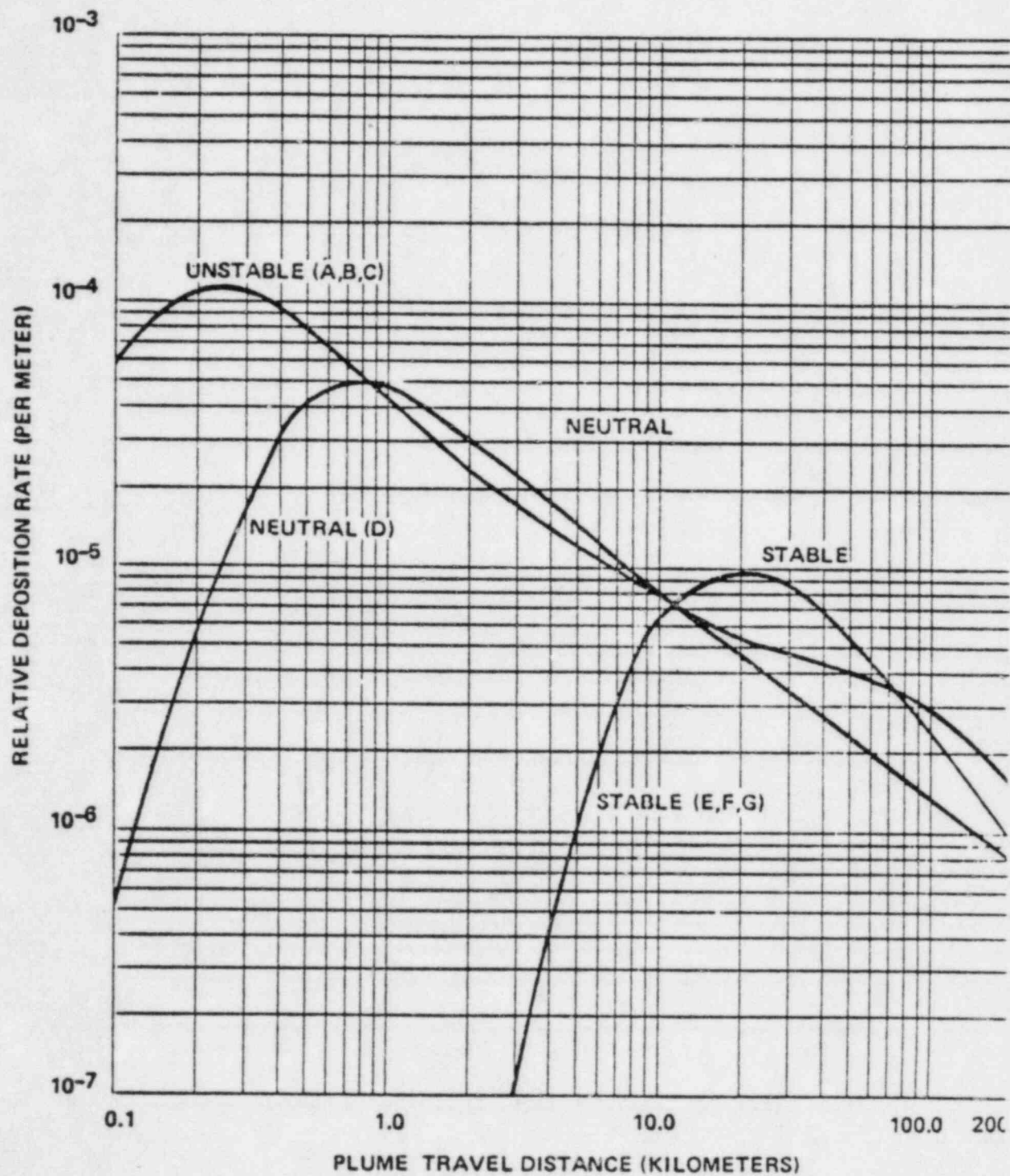


Figure 9 Relative Deposition for 30-m Releases (Letters denote Pasquill Stability Class)

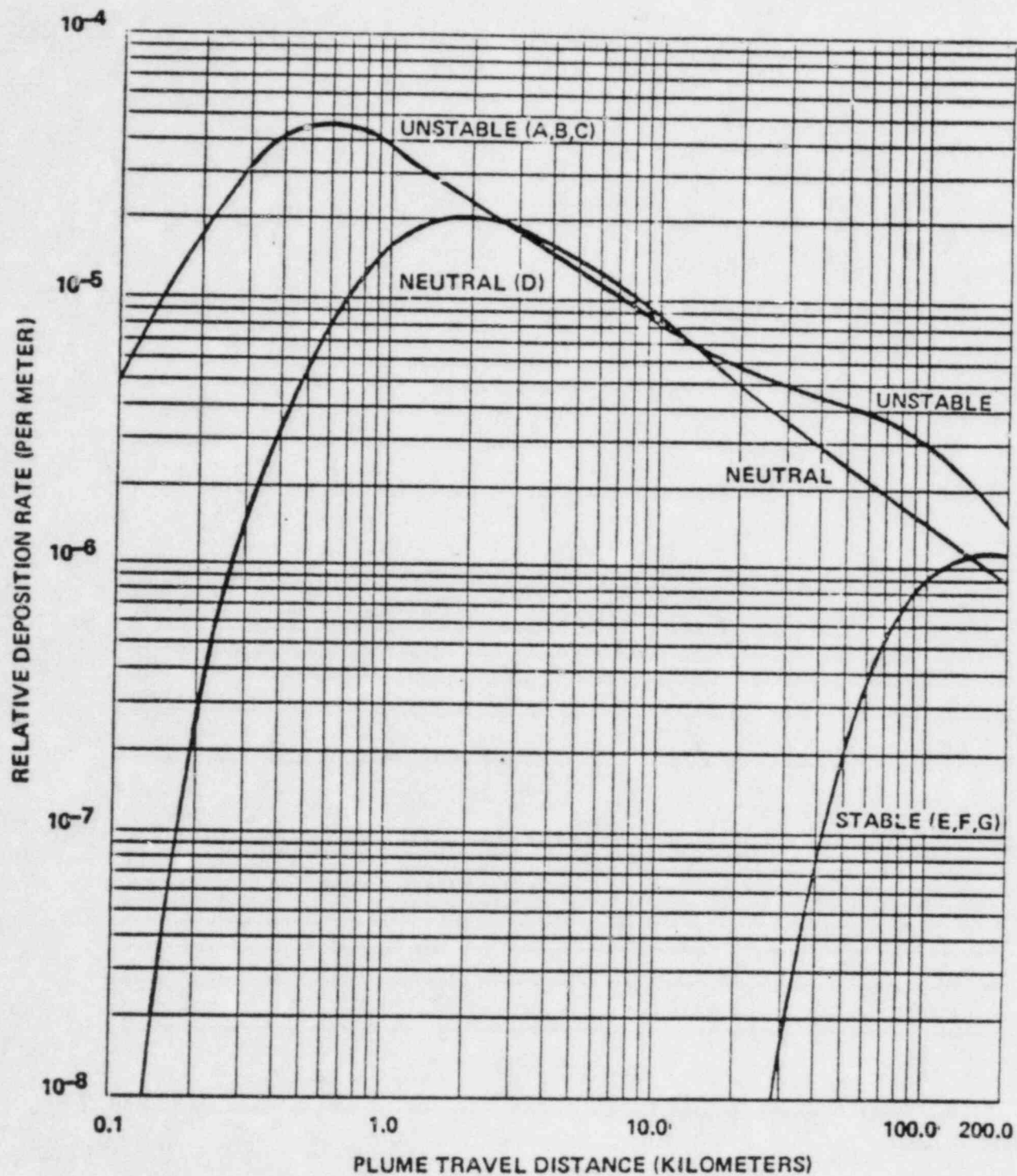


Figure 10 Relative Deposition for 60-m Releases (Letters denote Pasquill Stability Class)



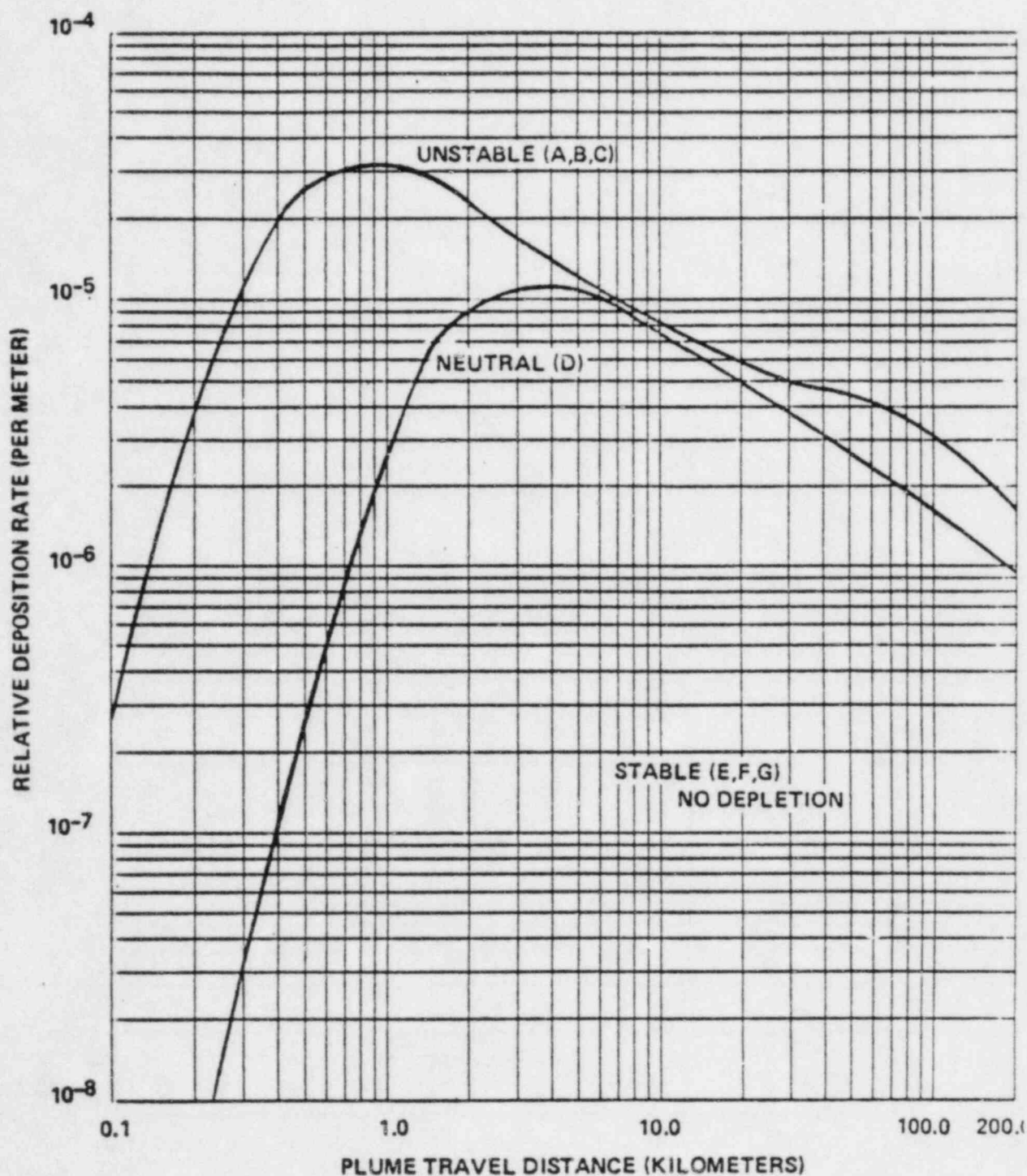


Figure 11 Relative Deposition for 100-m Releases (Letters denote Pasquill Stability Class)

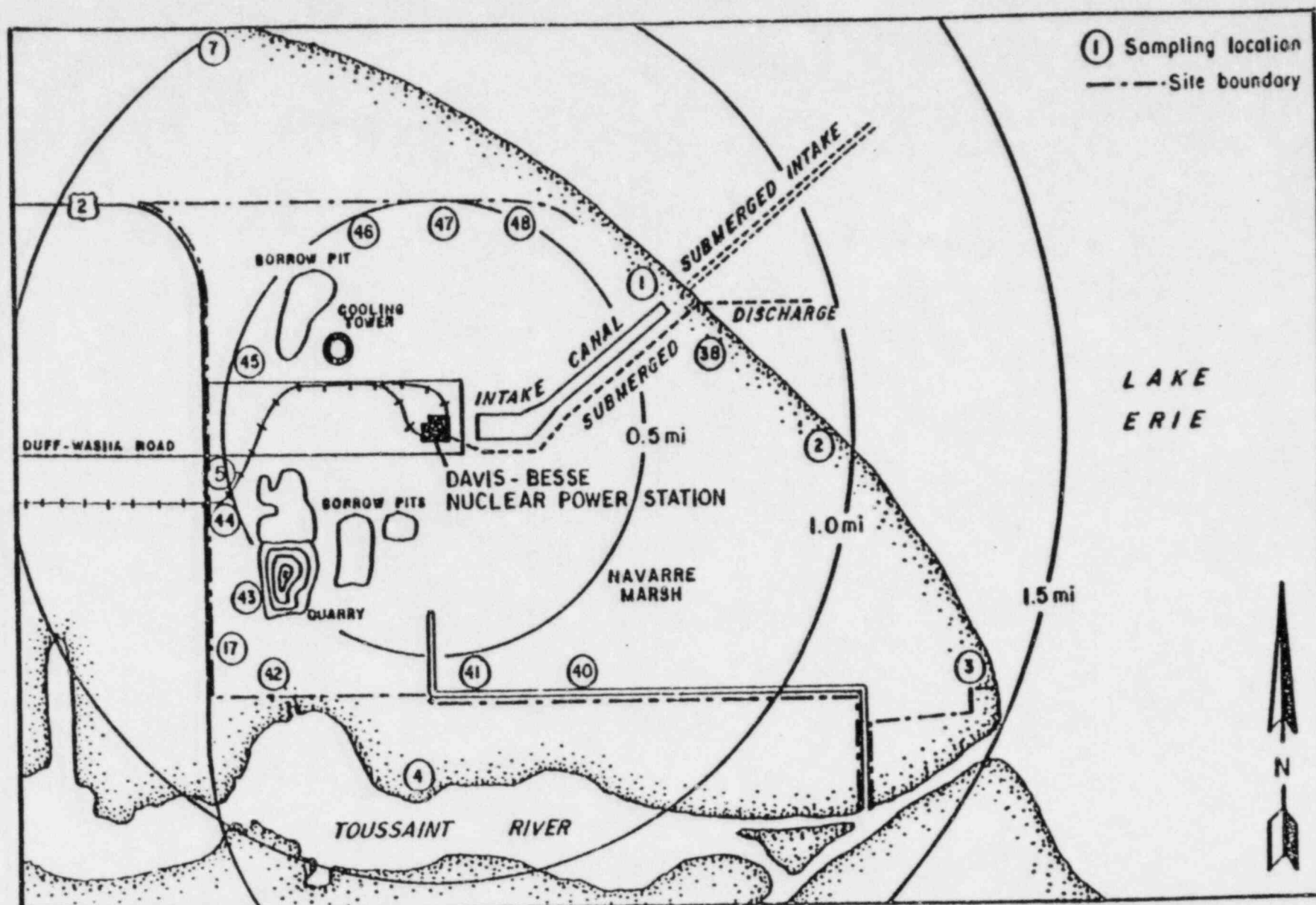


Figure 12. Sampling locations on the site periphery of the Davis-Besse Nuclear Power Station, Unit No. 1.

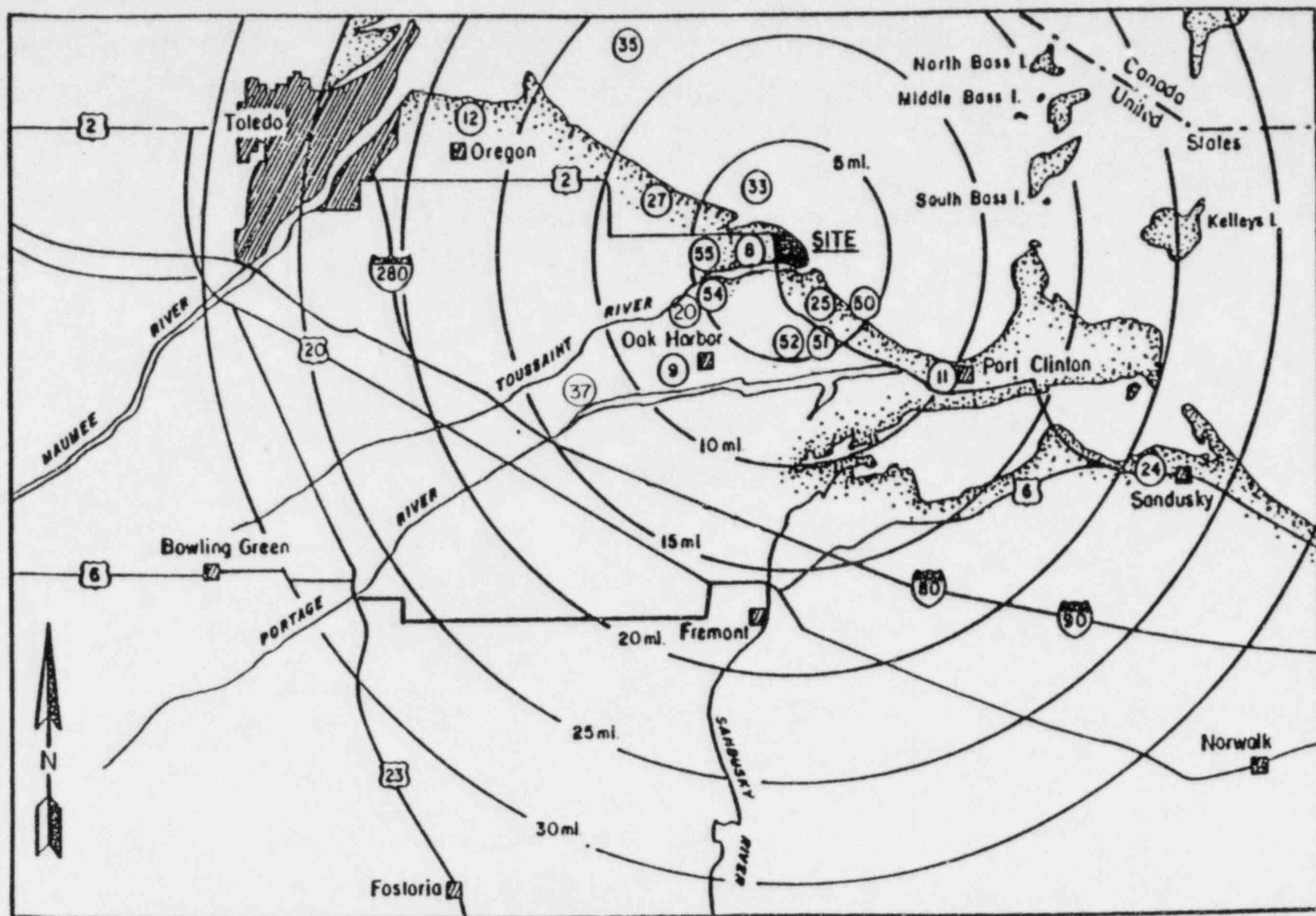


Figure 13 Sampling locations (excepting those on the site periphery), Davis-Besse Nuclear Power Station, Unit No. 1.



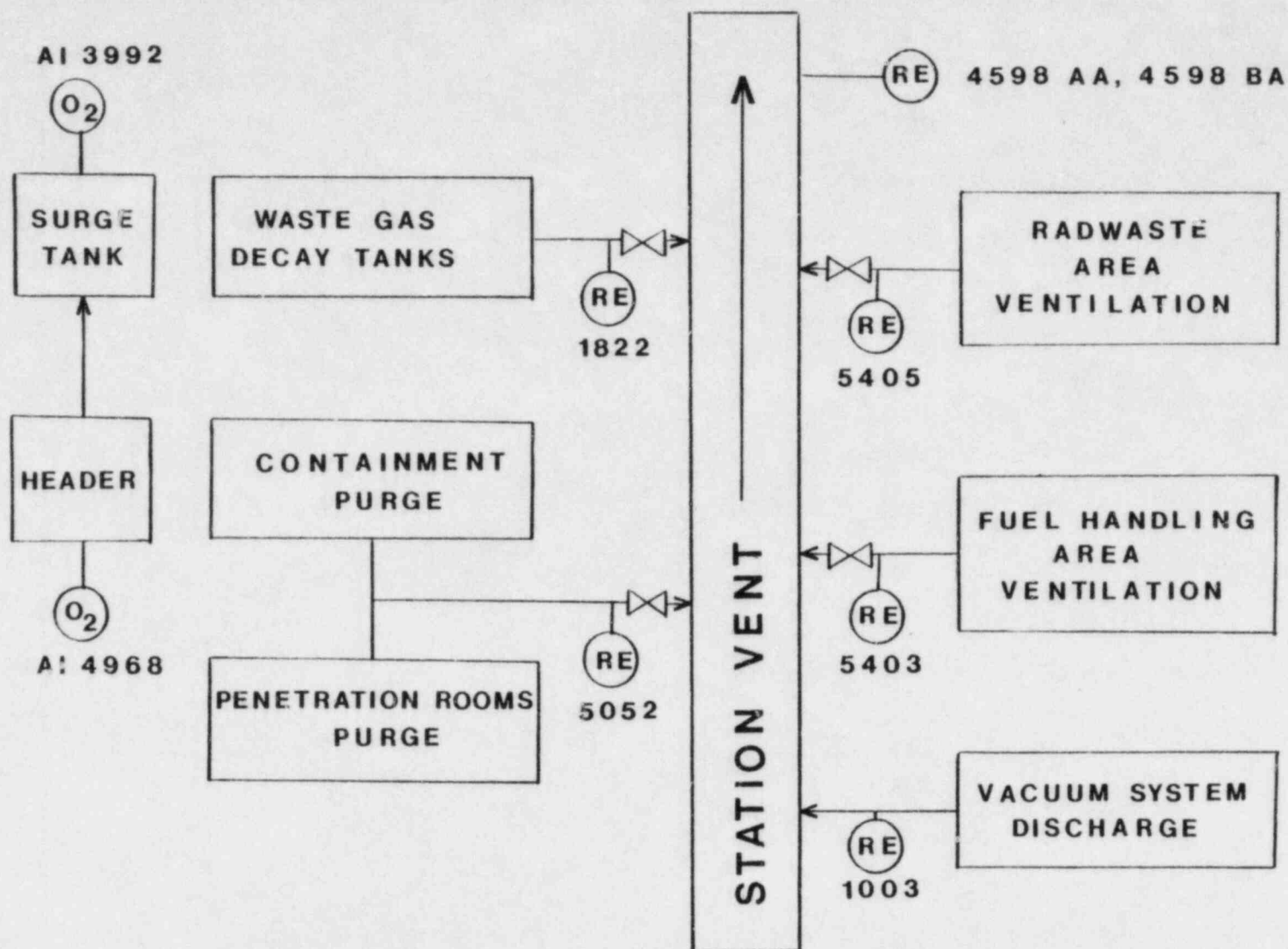


FIGURE 14. DAVIS-BESSE GASEOUS DISCHARGE

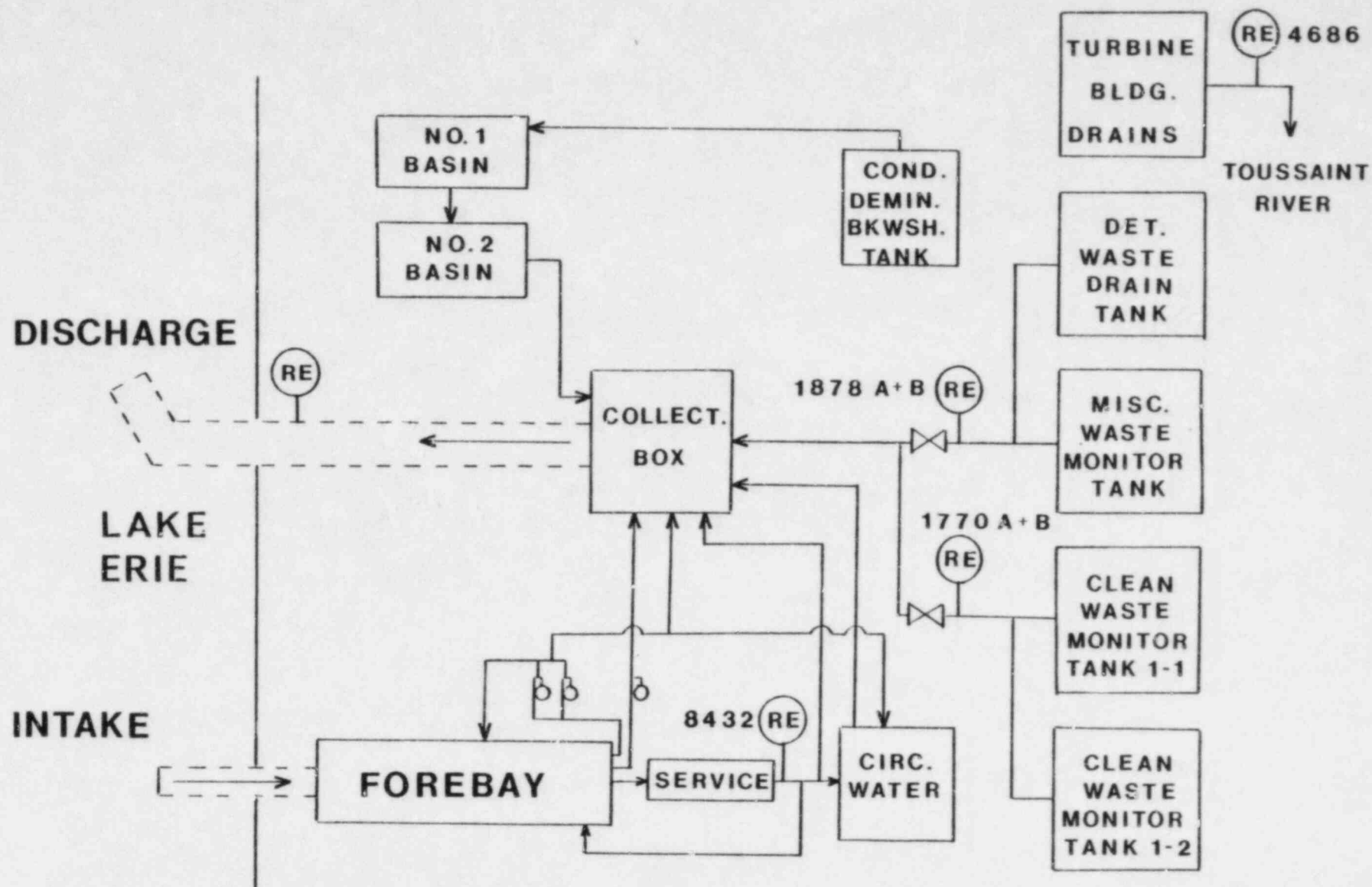
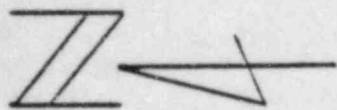


FIGURE 15. DAVIS - BESSE UNIT ONE LIQUID DISCHARGE

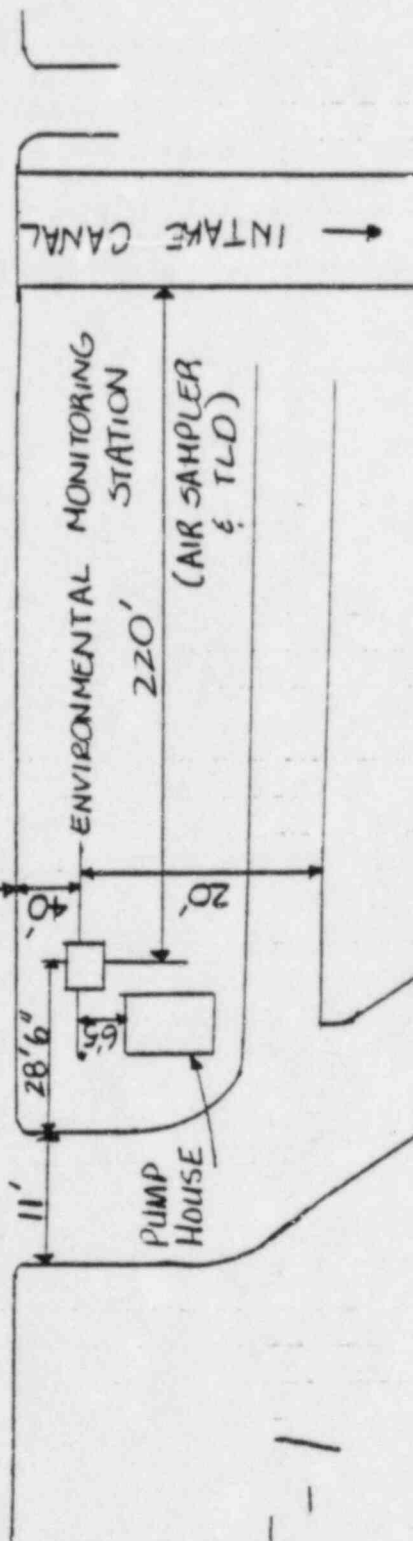


LAKE ERIE

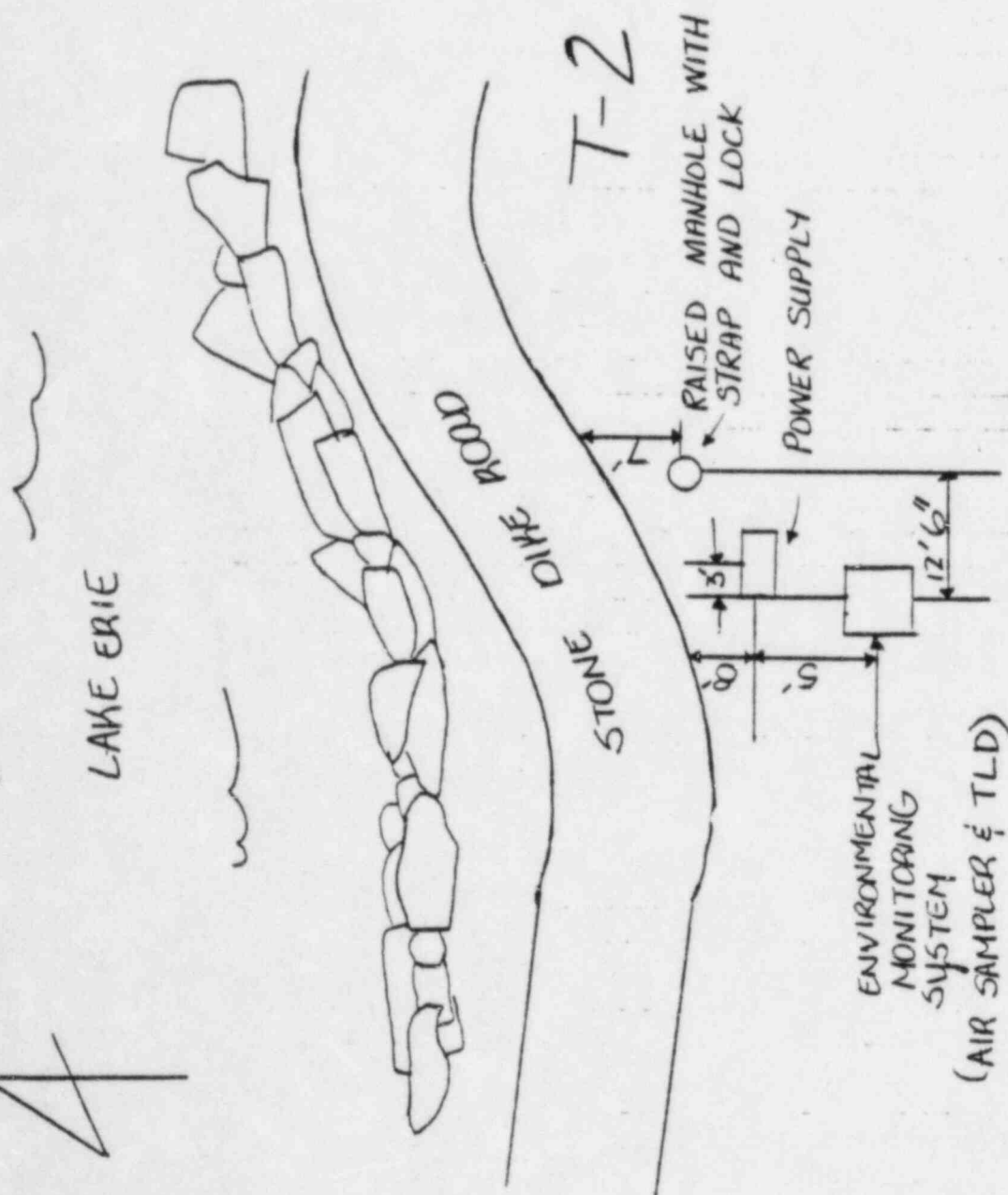
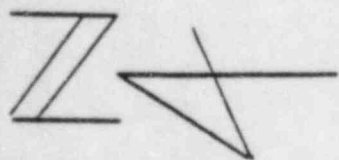


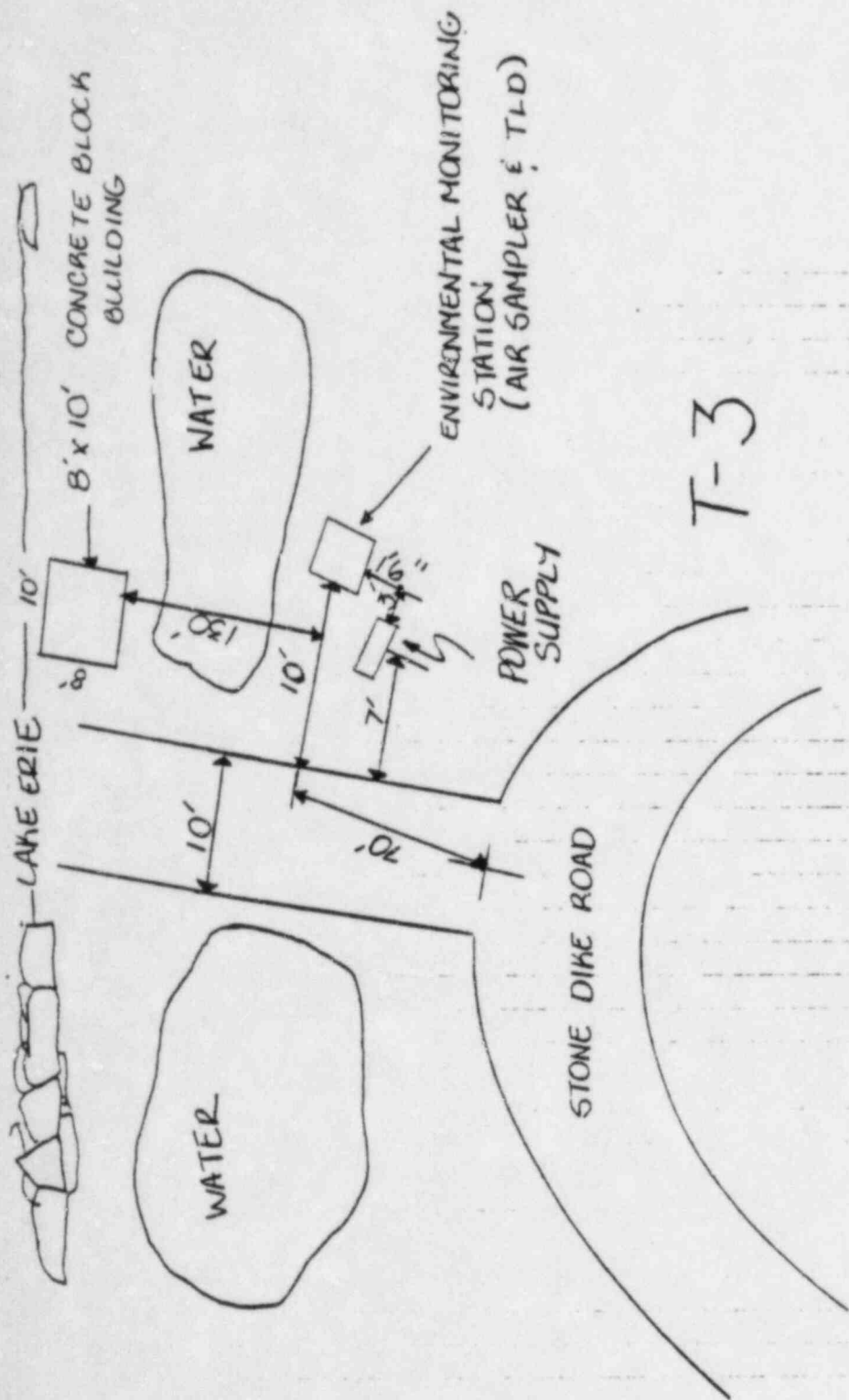
STONE BREAKWALL

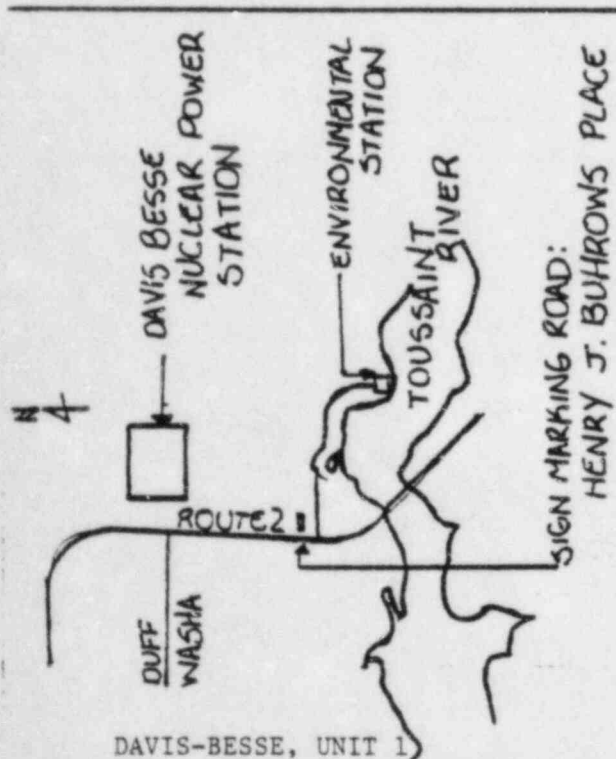
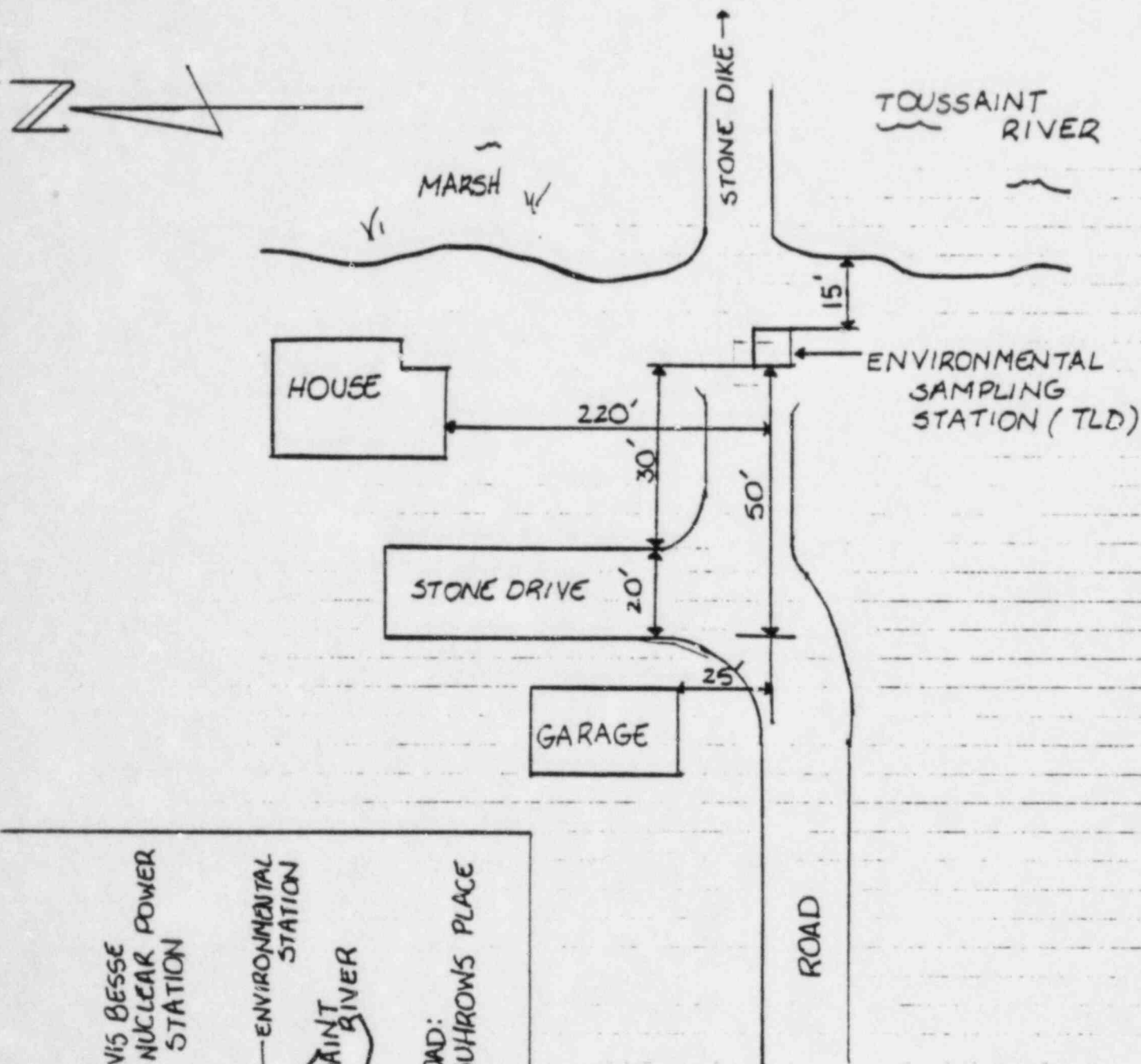
STONE DIKE ROAD



T-1





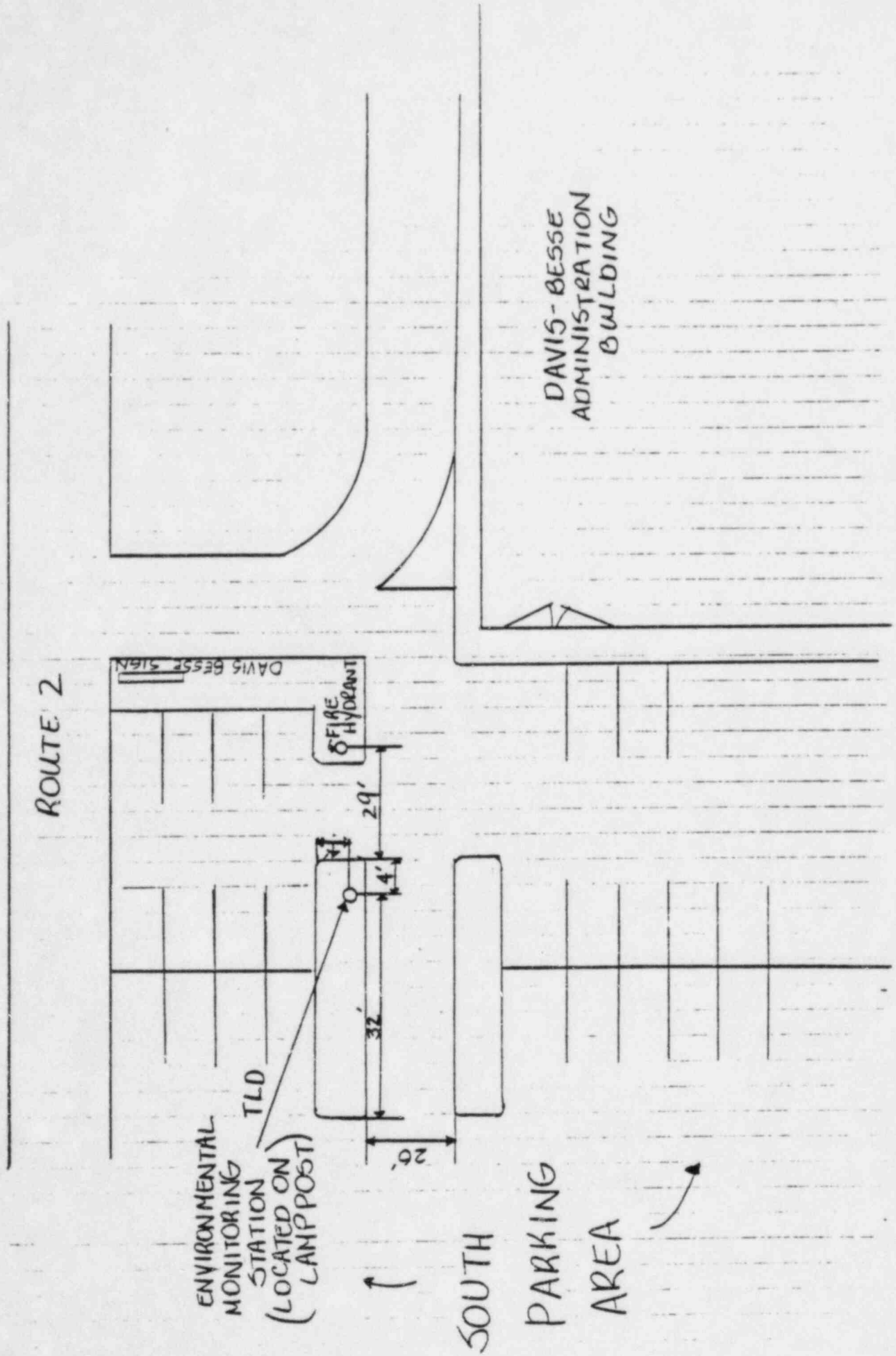


T-4



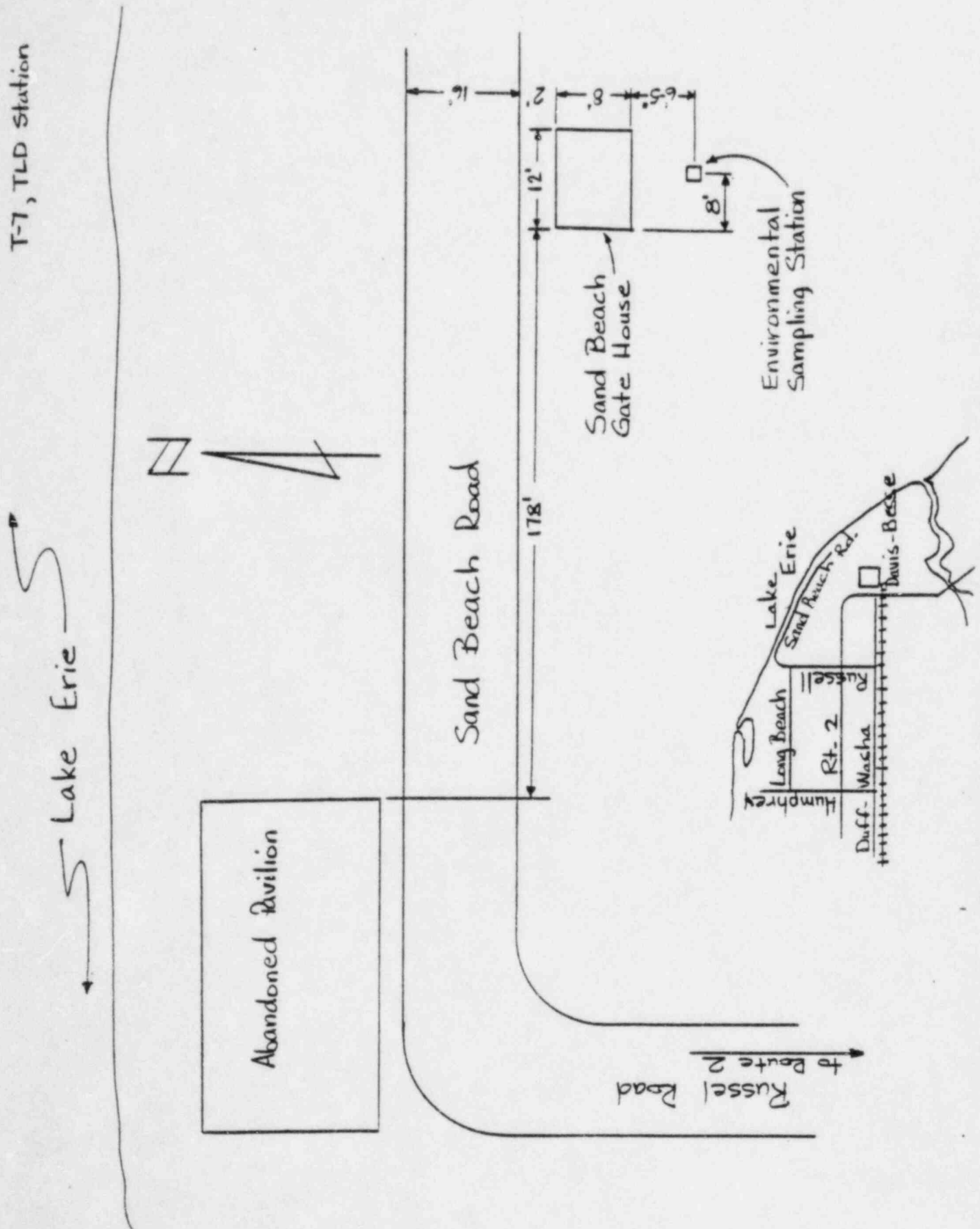
4Z T-5

DAVIS-BESSE, UNIT 1

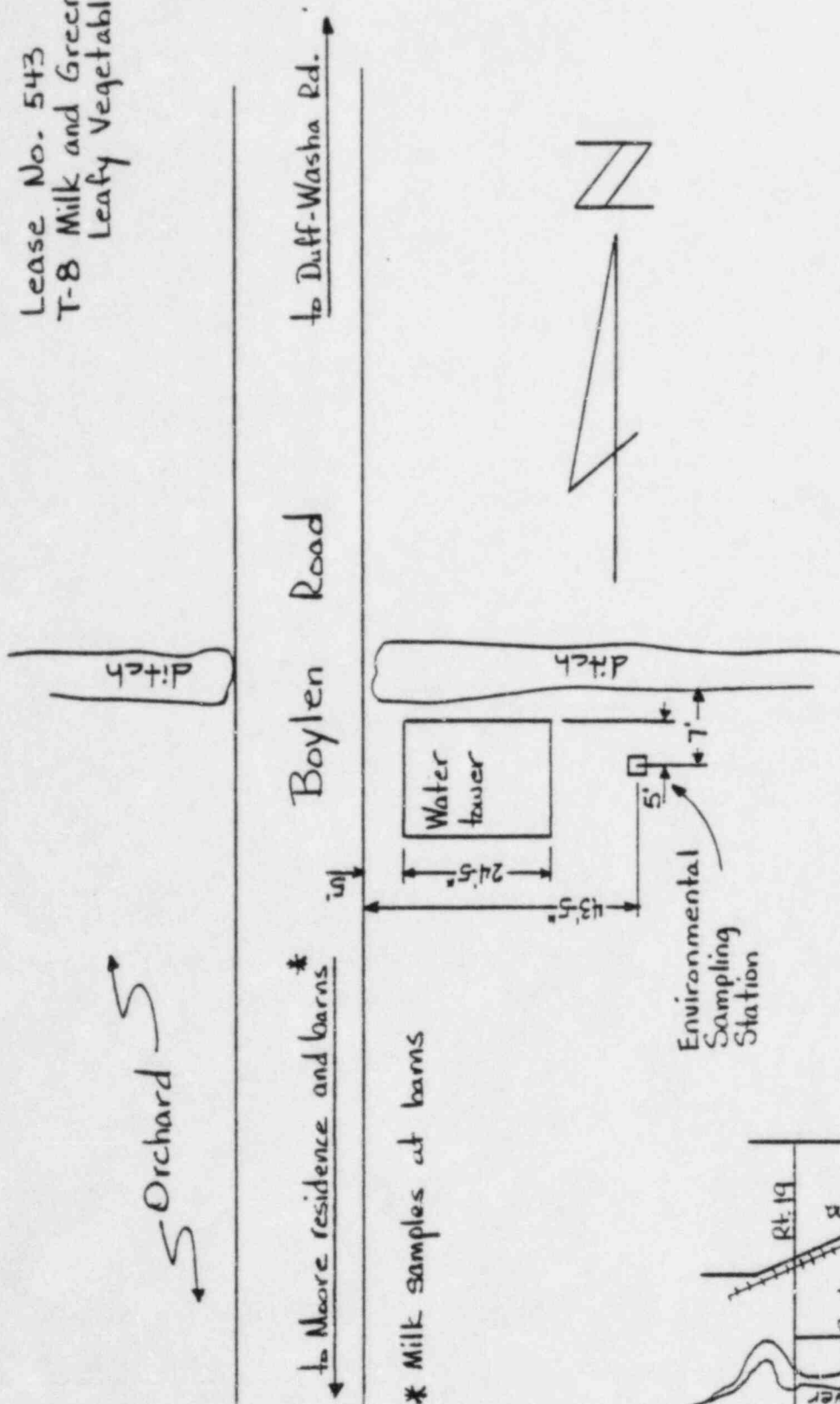


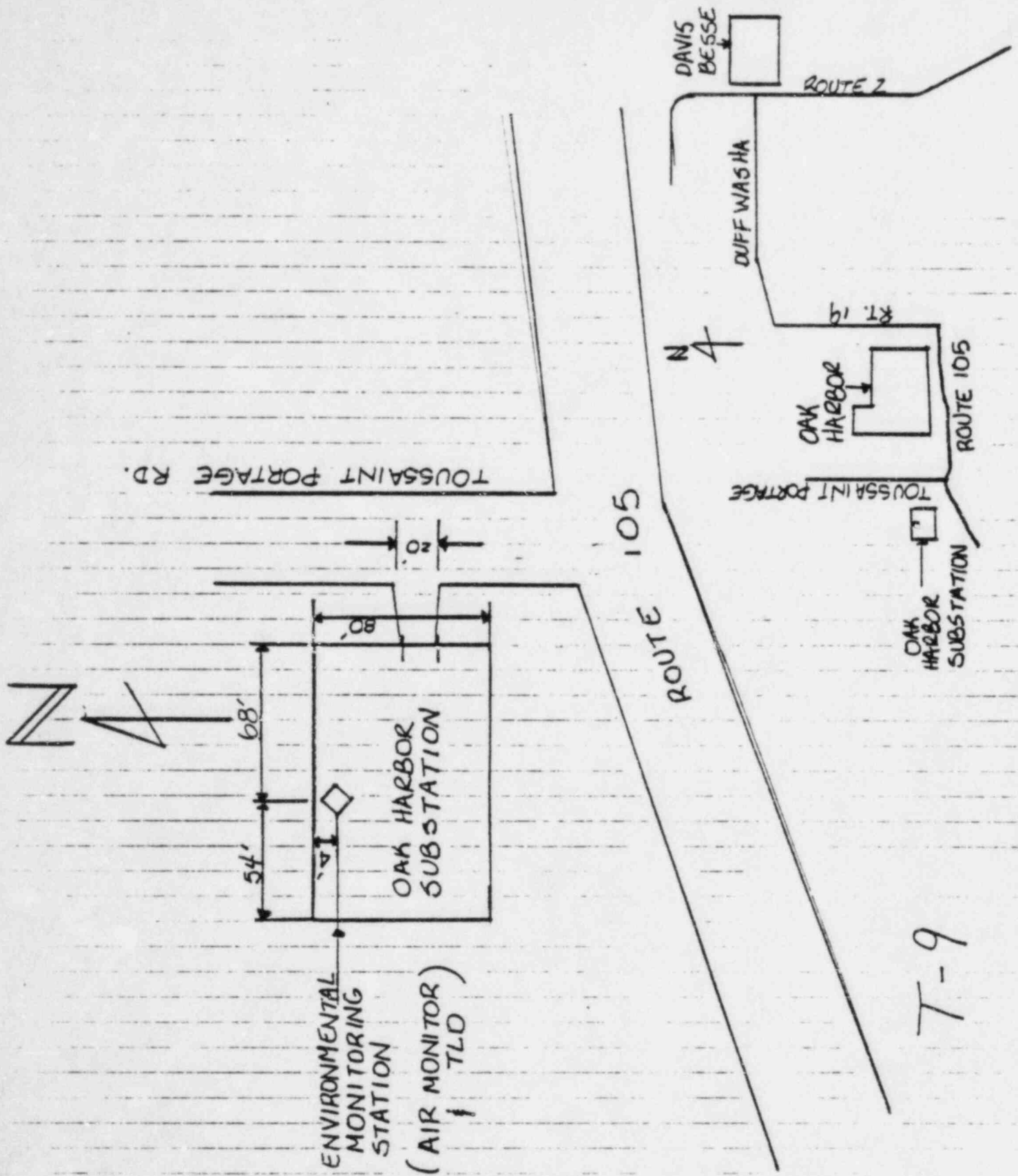


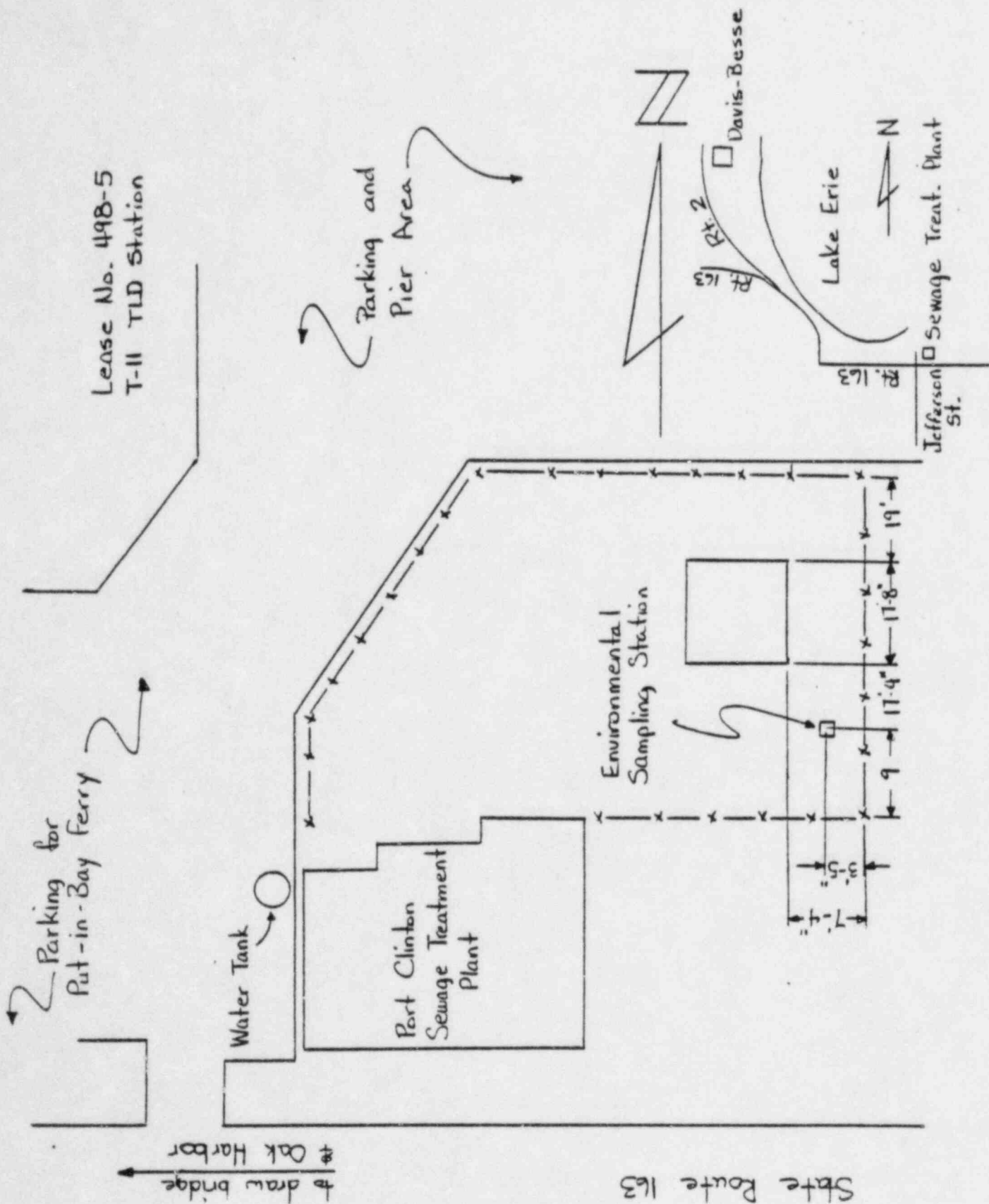
Lease No. 545  
T-7, TLD Station



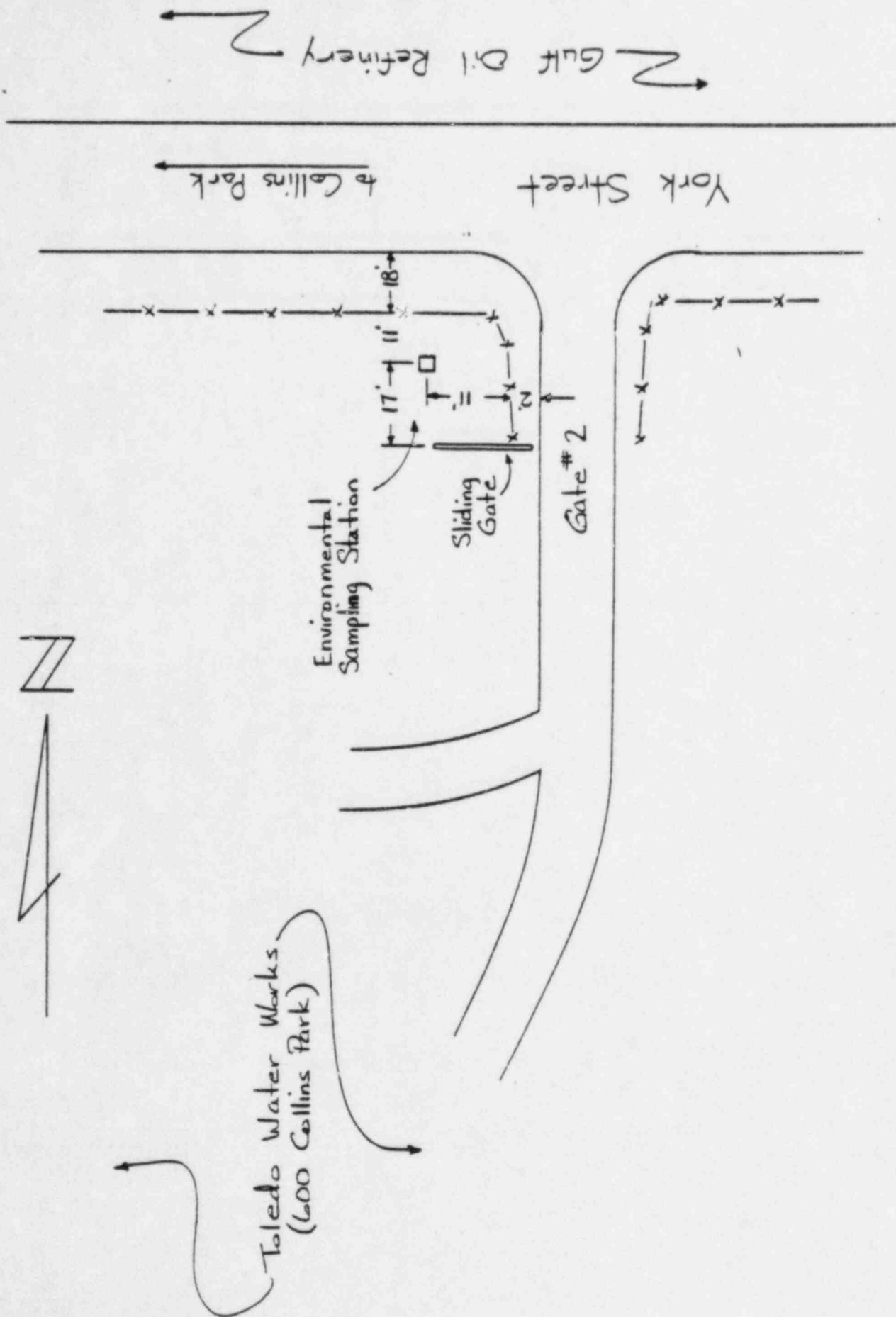
Lease No. 543  
T-8 Milk and Green  
Leafy Vegetables







Lease No. 49B-6  
 Air Particulate,  
 TLD and Treated and  
 Untreated Surface Water  
 T-12



T-17

ENVIRONMENTAL SAMPLING  
OF WATER FROM WELL

STONE DRIVE

utility pole

110'

HOUSE

RED BARN

2'

12'

26'

Well

ROUTE 2

MAP

DAVIS BESSE  
ADMINISTRATION BLDG

TLO, ENVIRONMENTAL  
MONITORING  
STATION

RED  
BARN

HOUSE

ROUTE 2



BARN

FARM  
HOUSE

FARM-LAND

DAVIS-BESSE, UNIT 1

ENVIRONMENTAL SAMPLING-MILK SAMPLES

T-20

A-27

STONE DRIVE

12'

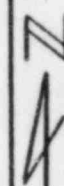
0.6 MILE TO TOUSSAINT PORTAGE RD.

TOUSSAINT EAST RD.

to  
BENTON-  
CARROL

M/A P

DAVIS  
BESSE



ROUTE 2

BENTON CARROL

TOUSSAINT PORTAGE

ROUTE 19

TOUSSAINT EAST

DAVIS-BESSE, UNIT 1

A-28

RAILROAD  
SWITCHYARD

T-24

RIES VENDING  
SERVICE

ABANDONED  
RAILROAD  
TRACKS

MONROE STREET

BRIDGE

GRASS

GRASS

GRASS

GRASS

STONE PARKING LOT

T-24 MILK SAMPLES

TOFT'S  
DAIRY  
STORE

CB  
MANUFACTURING  
COMPANY

LOADING  
DOCKS

MAP

LAKE ERIE

ROUTE 2

DAVIS  
BESSE

TOUSSAINT  
RIVER

ROUTE 2

PORT CLINTON

OLD RT. 2  
BRIDGE (NOT OPEN  
WINTER)

ROUTE 6

ROUTE 2

EDGEWATER

SANDUSKY

MONROE ST.

SUPERIOR ST.

LAKE ERIE

OLDS ST.

TOFT'S  
DAIRY

Farmland  $z$

to Route 6

Bardschar Road

Dead end road

House  
(1203)

## Workshop

TLD samples  
mounted on  
clothes line pole  
Catawba

Bay Bridge

Sandusky  
Bay

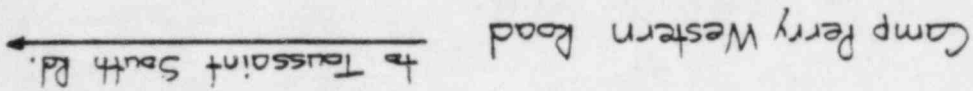
Sindusky

10  
24.2  
24.6

~~State Route 2 (overpass)~~

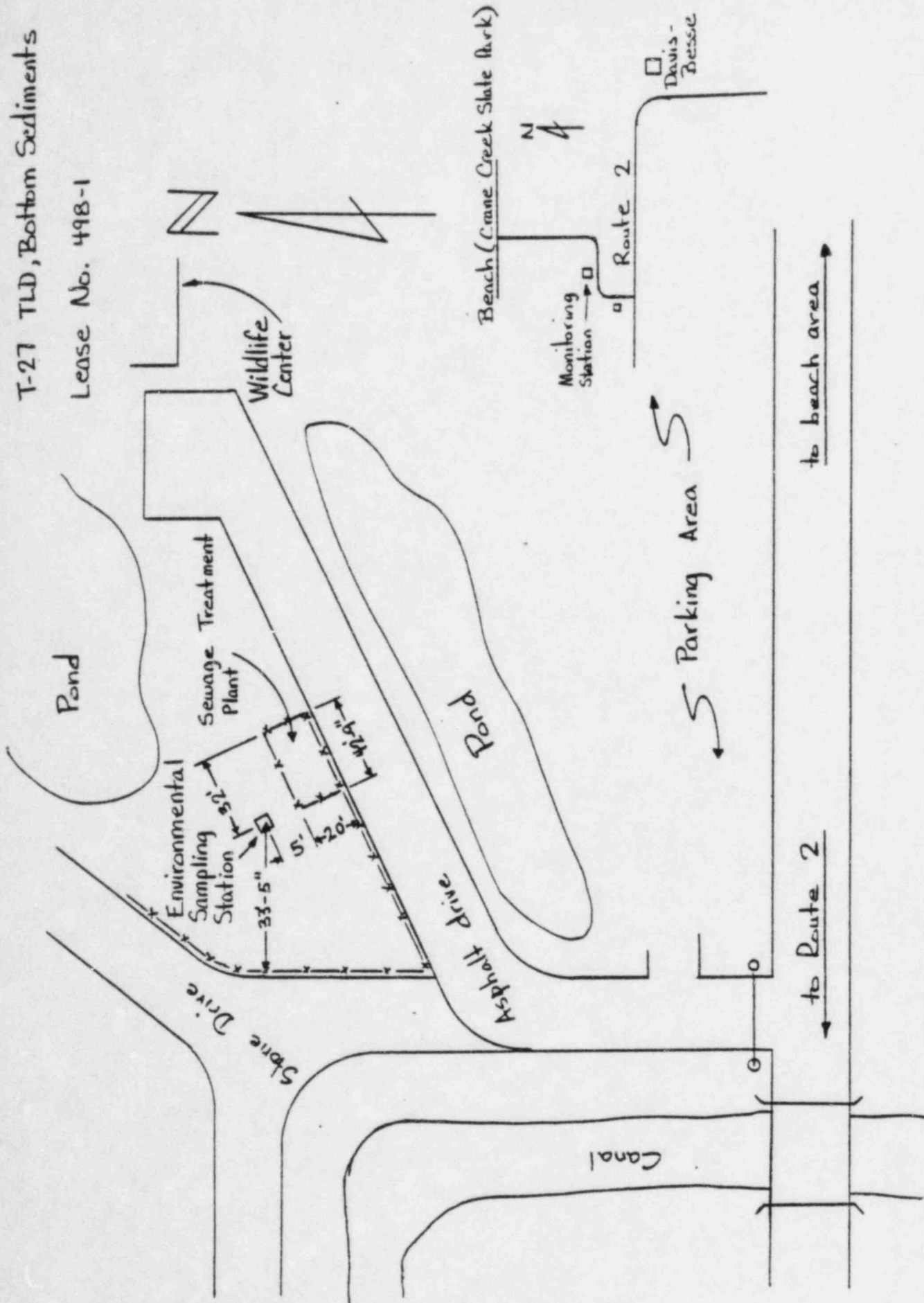
House  
(7898)

A-30



T-27 TLD, Bottom Sediments

Lease No. 498-1



T-28  
Surface Water-Treated

Station is located on-site in the Water Treatment Building.

The Water Treatment Building is located within  
the Protected Area of the Station.



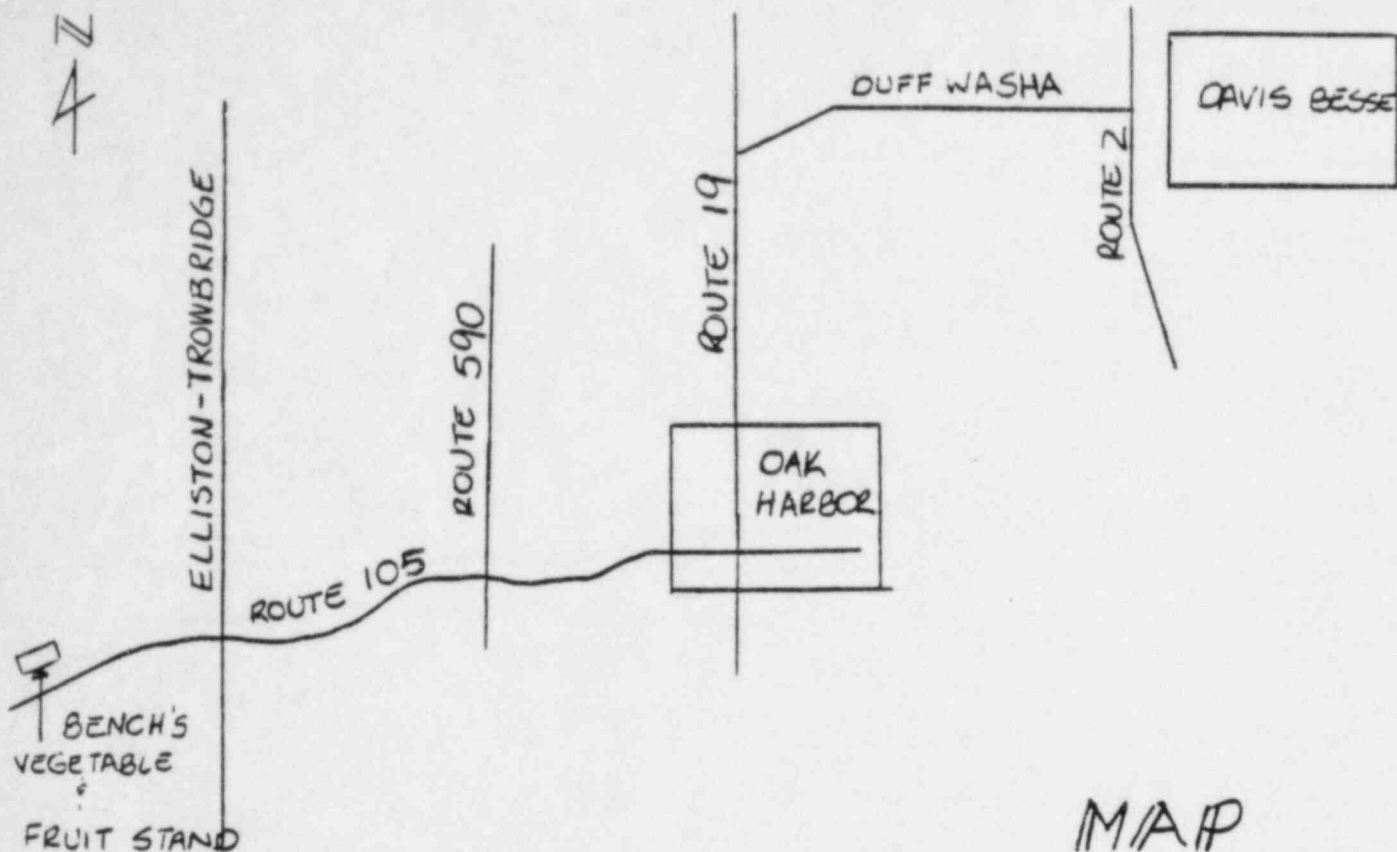
T-33

Fish samples

T-33 is located in Lake Erie  
within an 8.0 km radius of the  
site.

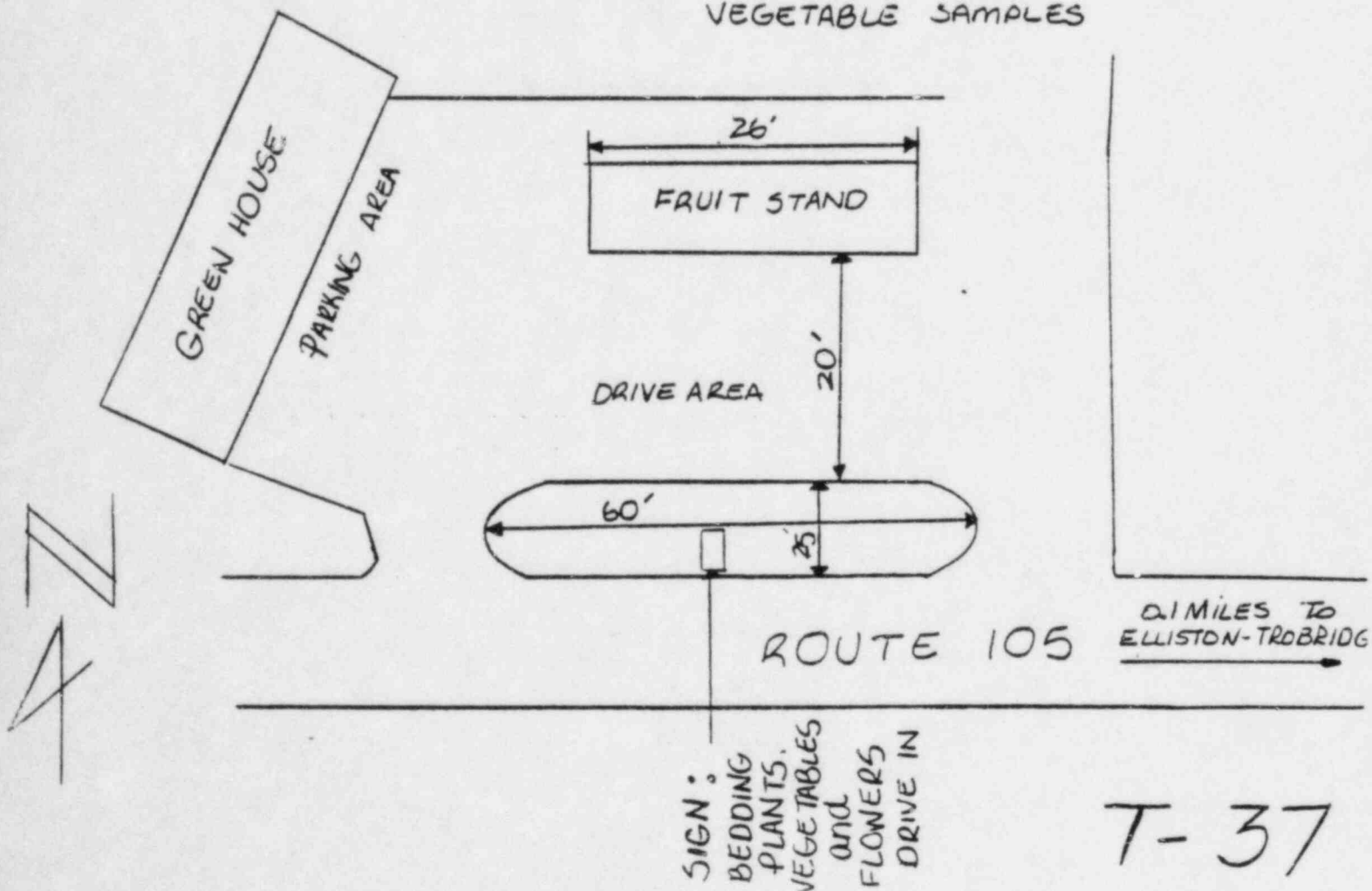
A-33

T-35 is located in Lake Erie at a distance greater than a 16 km radius from the site.



MAP

ENVIRONMENTAL MONITORING:  
VEGETABLE SAMPLES



T-37



DAVIS-BESSE, UNIT 1

LAKE ERIE

STONE BREAKWALL



POLE WITH CHAIN AND LOCK

STONE DIKE ROAD

TURNAROUND

A-3b

TLD Station

INTAKE CANAL

RAISED BELL MANHOLE  
WITH STRAP & LOCK

T-38

220'

16'

46'

12'

12'

12'

12'

12'

12'

12'

12'

12'

12'

12'

12'

12'

12'

12'

12'

12'

12'

12'

12'

12'

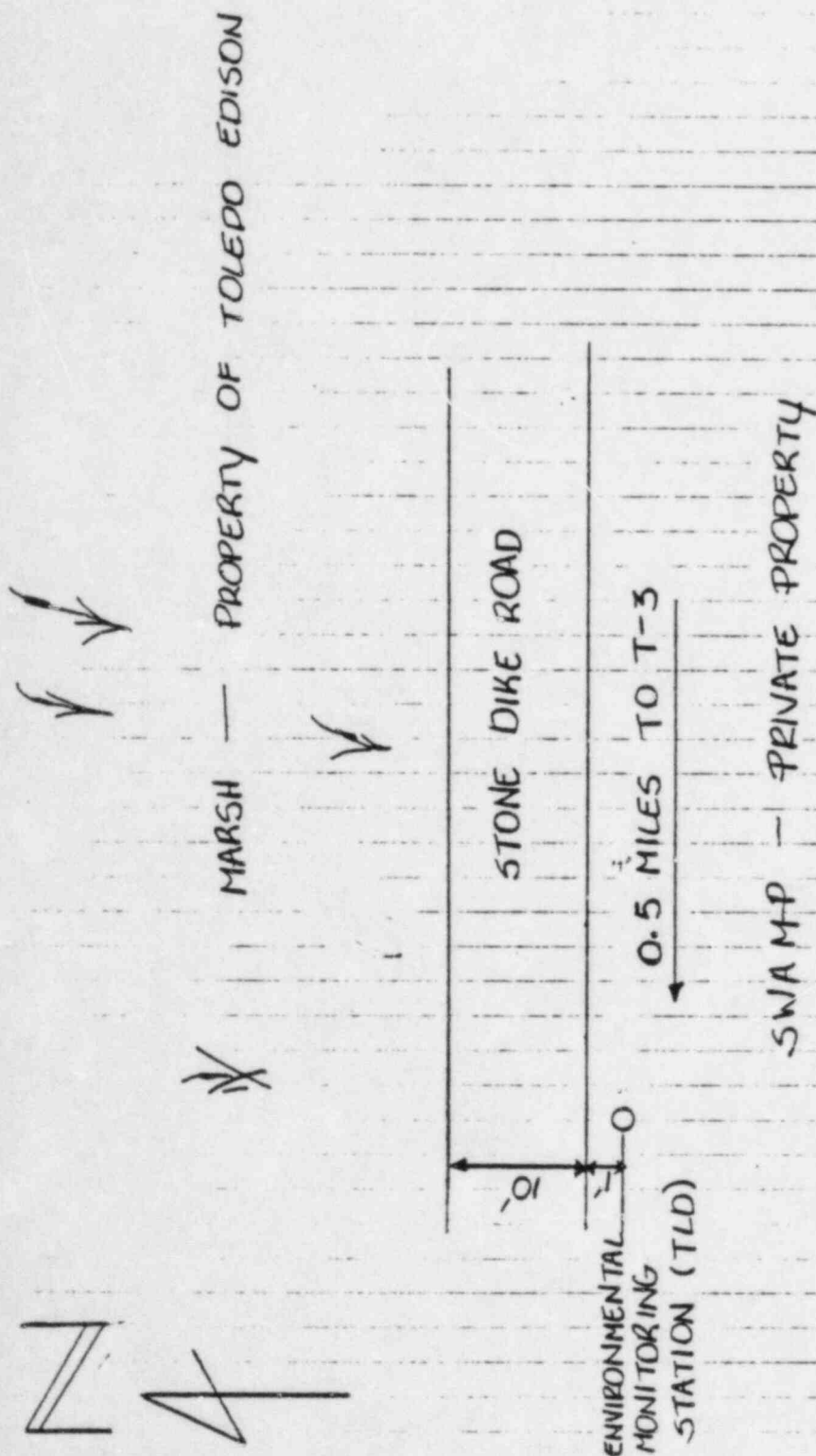
12'

12'

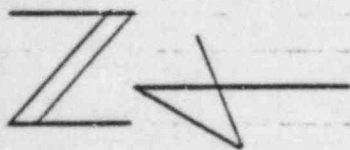
12'

12'

LAKE ERIE



T-40



MARSH — PROPERTY OF TOLEDO EDISON

STONE DIKE ROAD

ENVIRONMENTAL  
MONITORING  
STATION (TLD)

0.7 MILES TO T-40

SWAMP — PRIVATE PROPERTY

T-41

LAKE ERIE



T-42

DIRT & GRAVEL ROAD → TO COB & WAREHOUSE

STONE  
PARKING DRIVE

ENVIRONMENTAL MONITORING  
STATION (TLD)

MICRO  
WAVE

CHAIN LINK  
FENCE

SHELTER

PRIMARY  
TONER

GATE

DAVIS-BESSE, UNIT 1

N  
4

A-39

ROUTE 2

Cooling  
tower

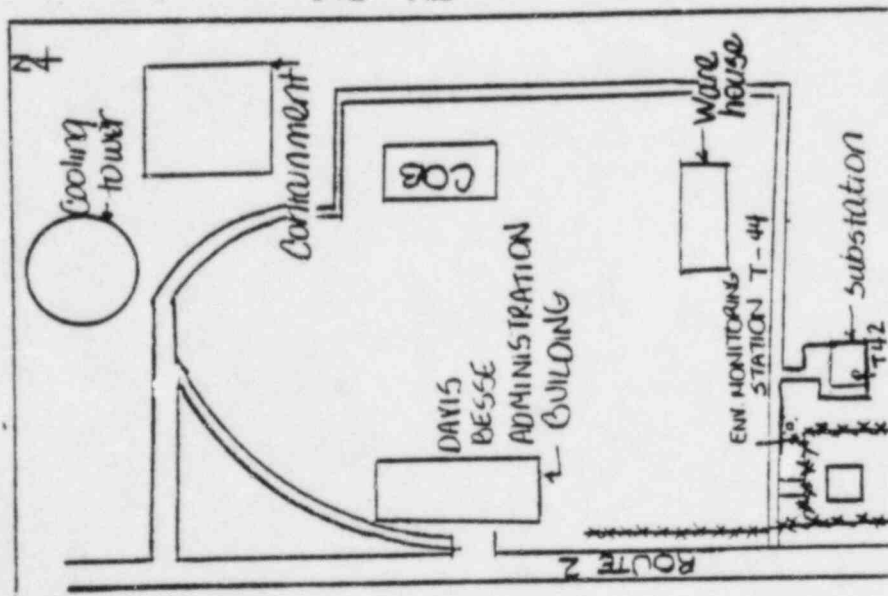
Containment

DAVIS  
BESSE  
ADMINISTRATION  
BUILDING

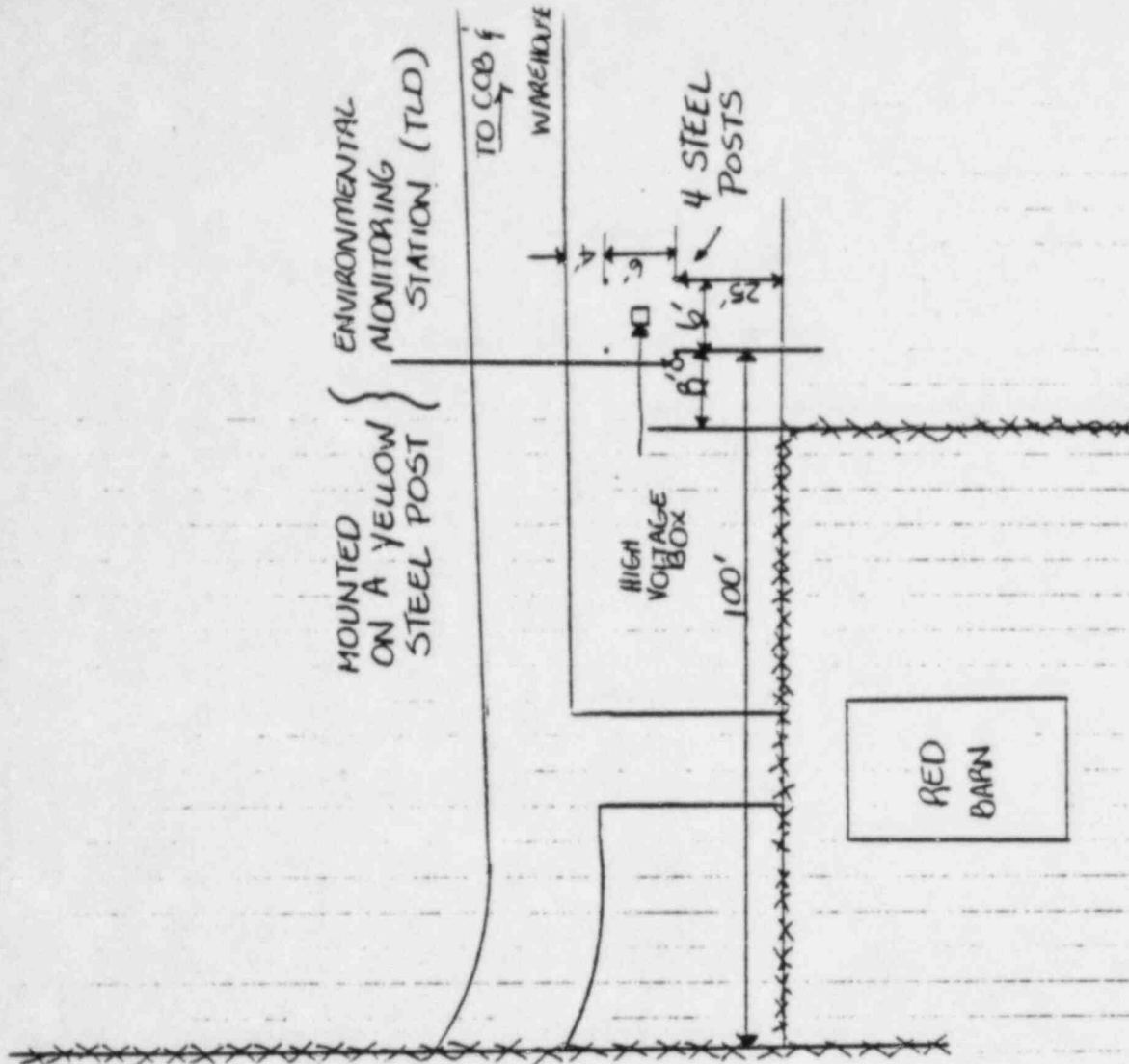
COB

Ware  
house

ENV.  
MONITORING  
substation



ROUTE 2



T-43

DAVIS BESSE PLANT

CHAIN LINK FENCE  
BARB WIRE

RAILROAD  
TRACKS

ENVIRONMENTAL  
MONITORING  
STATION  
(TLO)

23' STORE DRIVE

25'

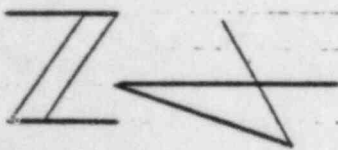
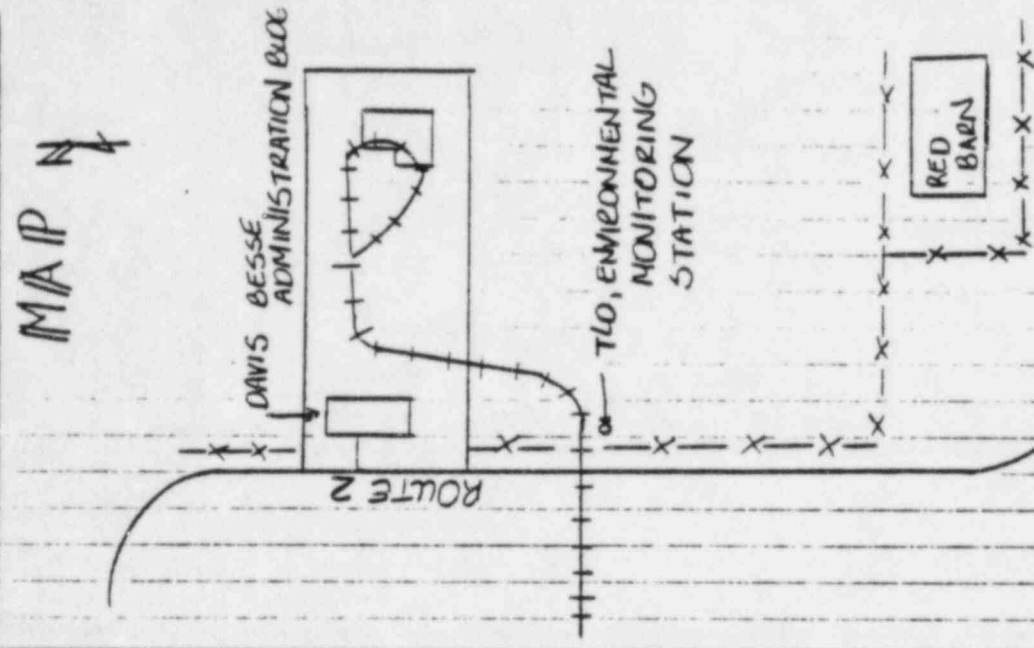
TRANSMISSION  
TOWER

180'

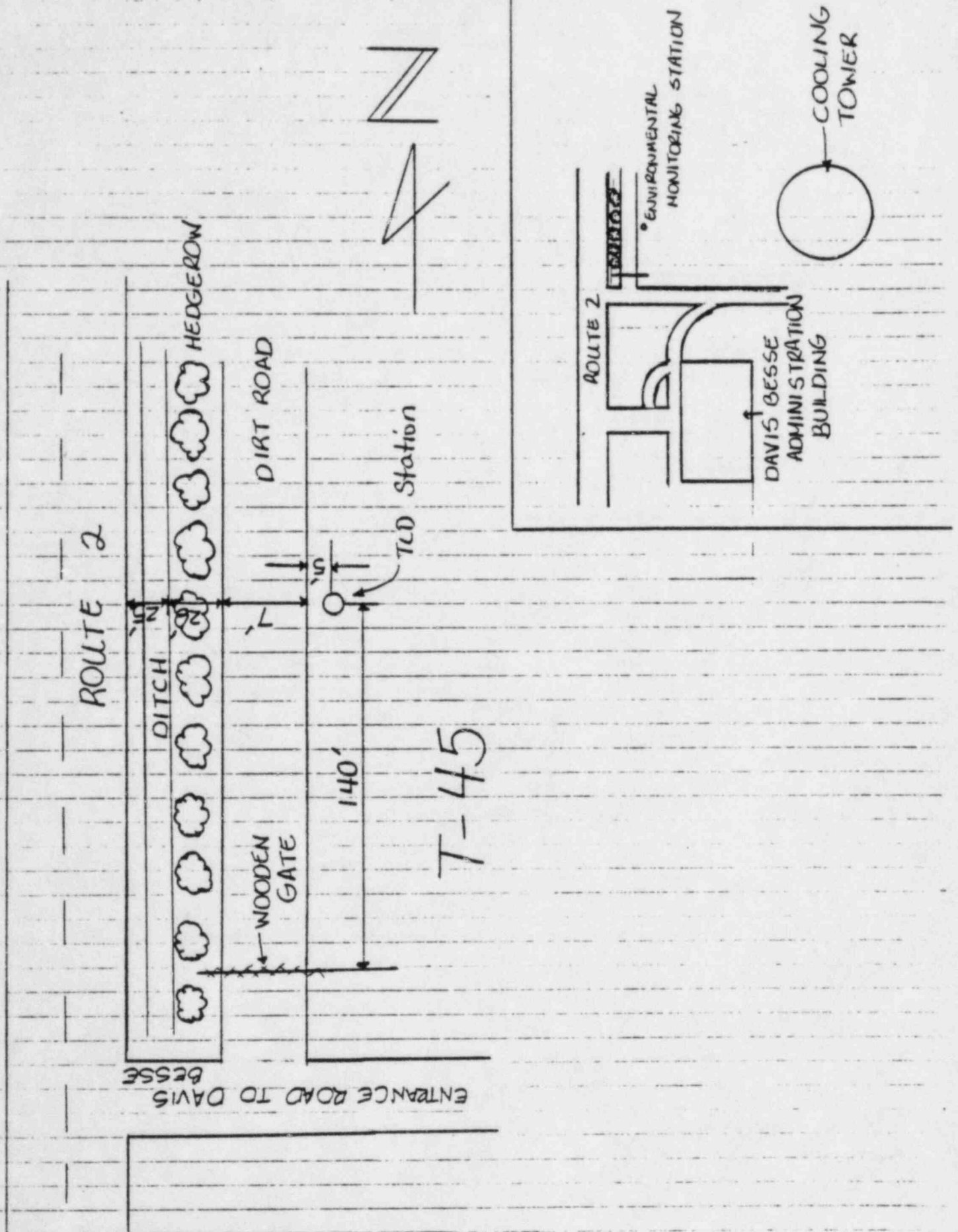
130'

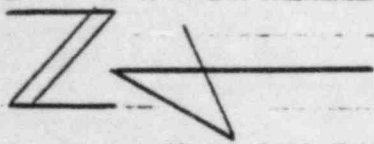
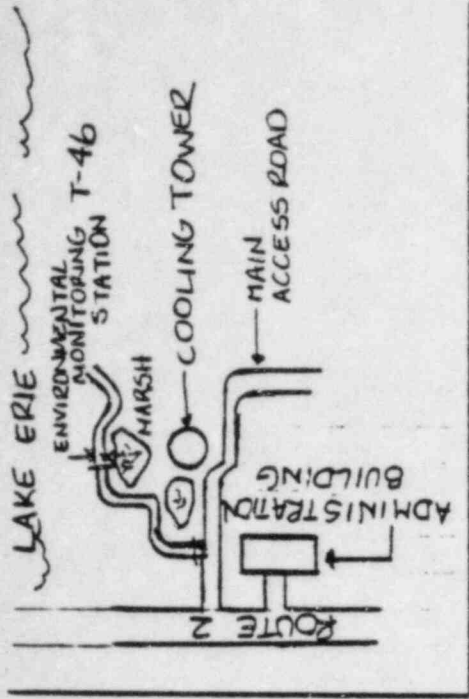
65'

ROUTE 2



T-44





CHAIN LINK FENCE & GATE

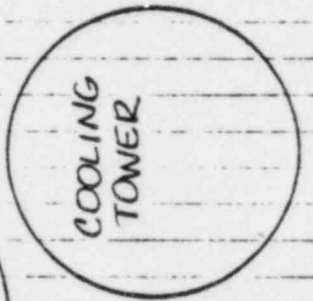
STONE DIKE

ENVIRONMENTAL SAMPLING STATION (TLD)

13'

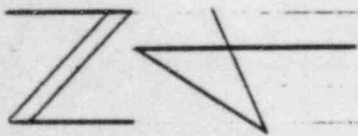
15' 4"

MARSH



T-46





PRIVATE PROPERTY

MARSH

CHAIN LINK FENCE

ENVIRONMENTAL MONITORING STATION (TLD)  
MOUNTED ON 4'-  
METAL POST WITH  
TECO PROPERTY  
SIGN

STONE DIKE ROAD

MARSH

PROPERTY - TOLEDO EDISON COMPANY

T-47





PRIVATE  
PROPERTY  
(WATER)

CHAIN LINK FENCE

STONE DIKE  
ROAD

ENVIRONMENTAL  
MONITORING  
STATION (TLD)

WATER &  
MARSH

PROPERTY OF TOLEDO EDISON COMPANY

T-48



Lease No. 576  
T-50 TLD Station

Rifle Range

Red & White Checked  
Water Tower

Environmental  
Sampling Station

Bldg. # 608

Concrete pad

Water Works  
Bldg. #606

Bldg.  
#5607

Underground  
Water Reservoir

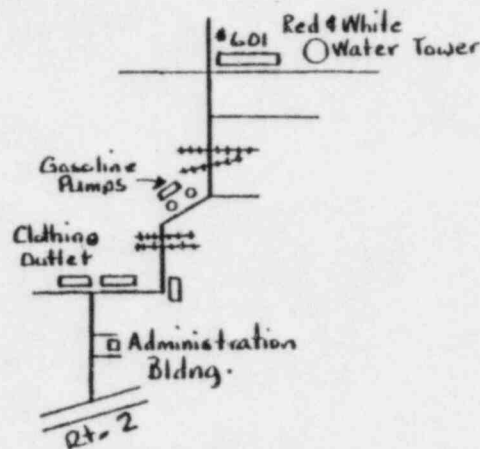
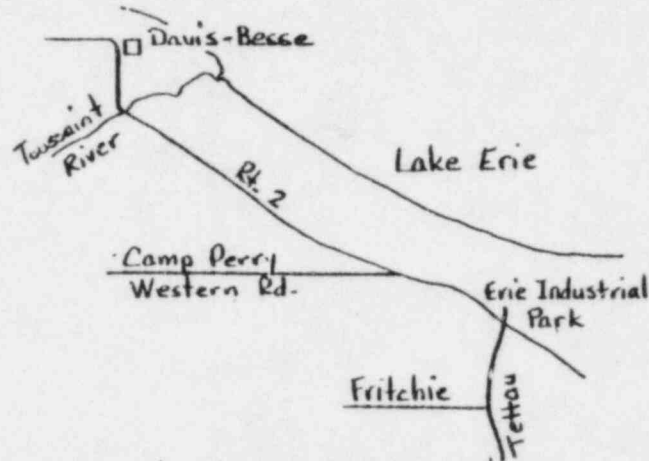
Gate 6

Seventh Street

±225'

±15'

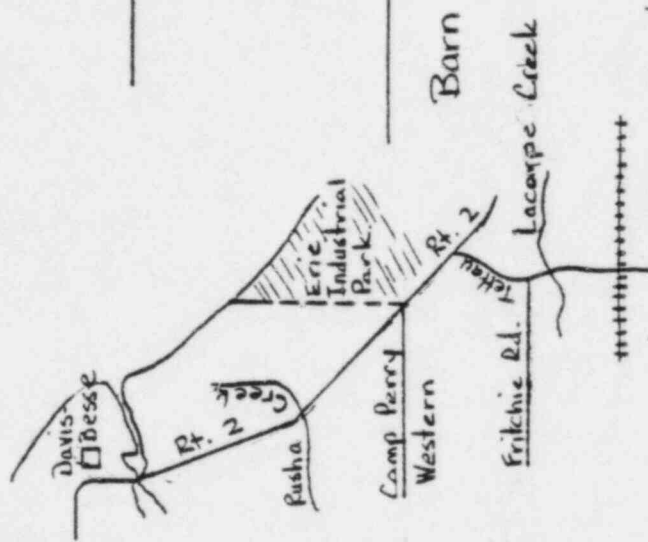
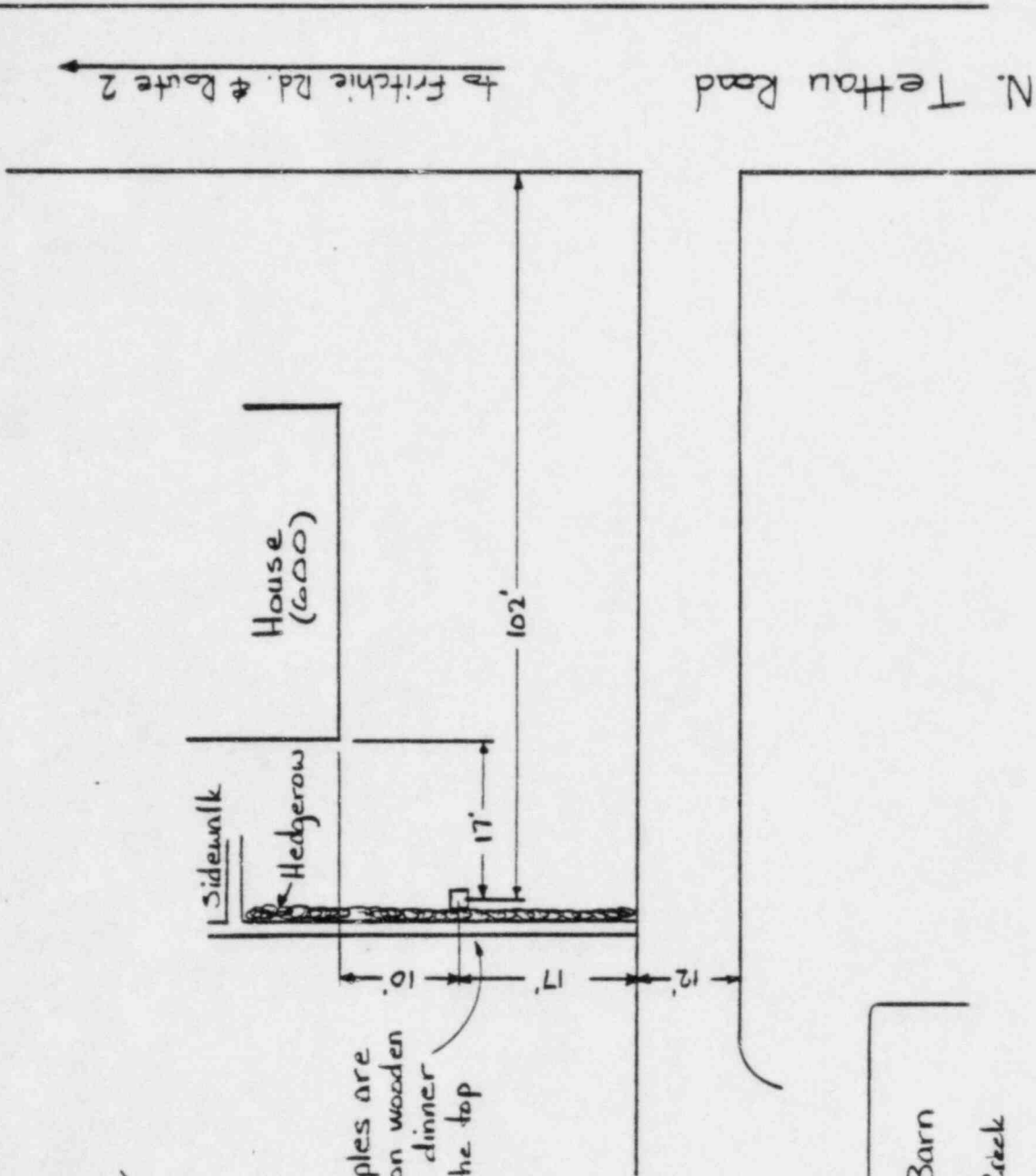
Avenue B



Lense No. 564  
TLD Station T-51

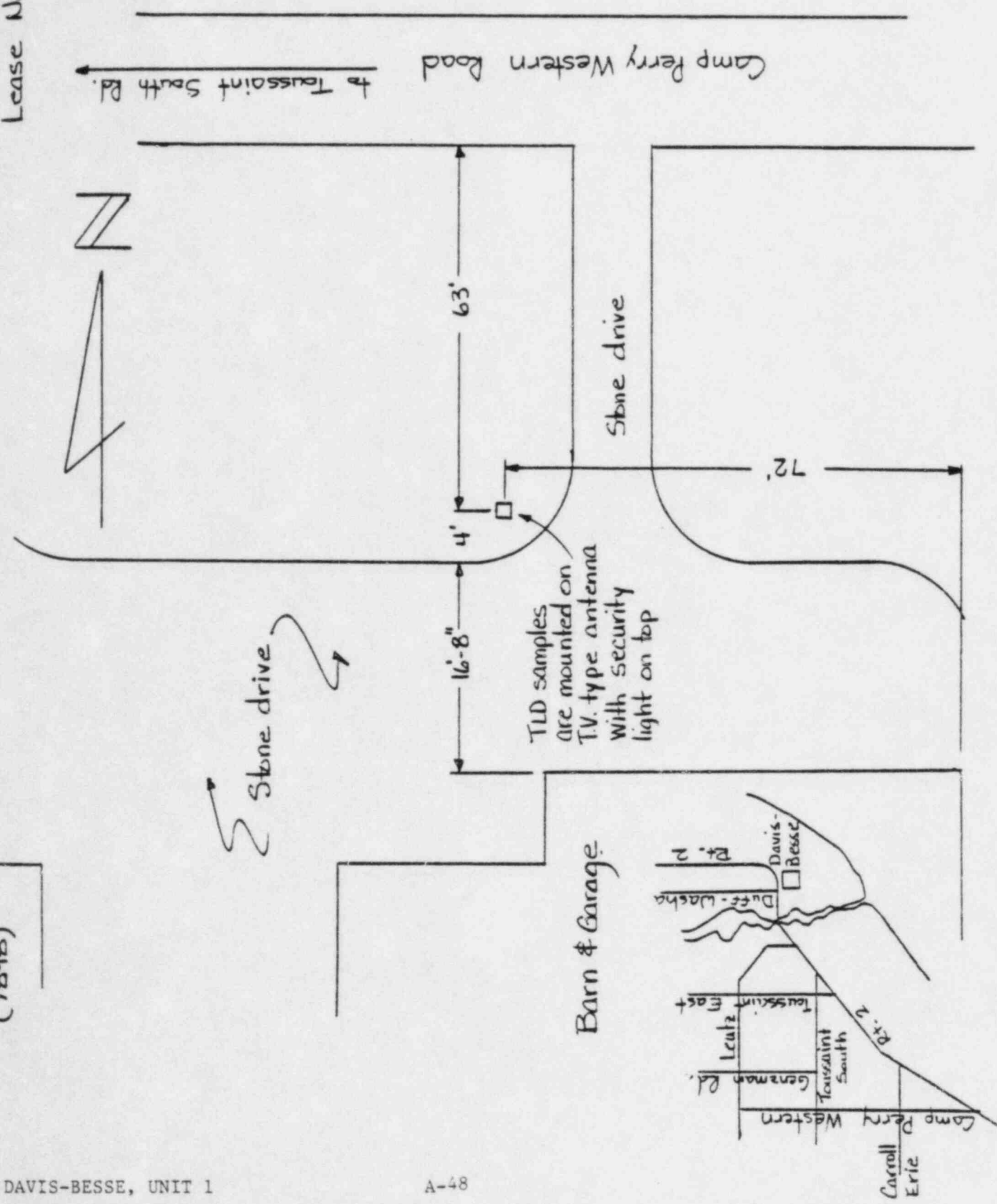


TLD samples are mounted on wooden pole with dinner bell on the top

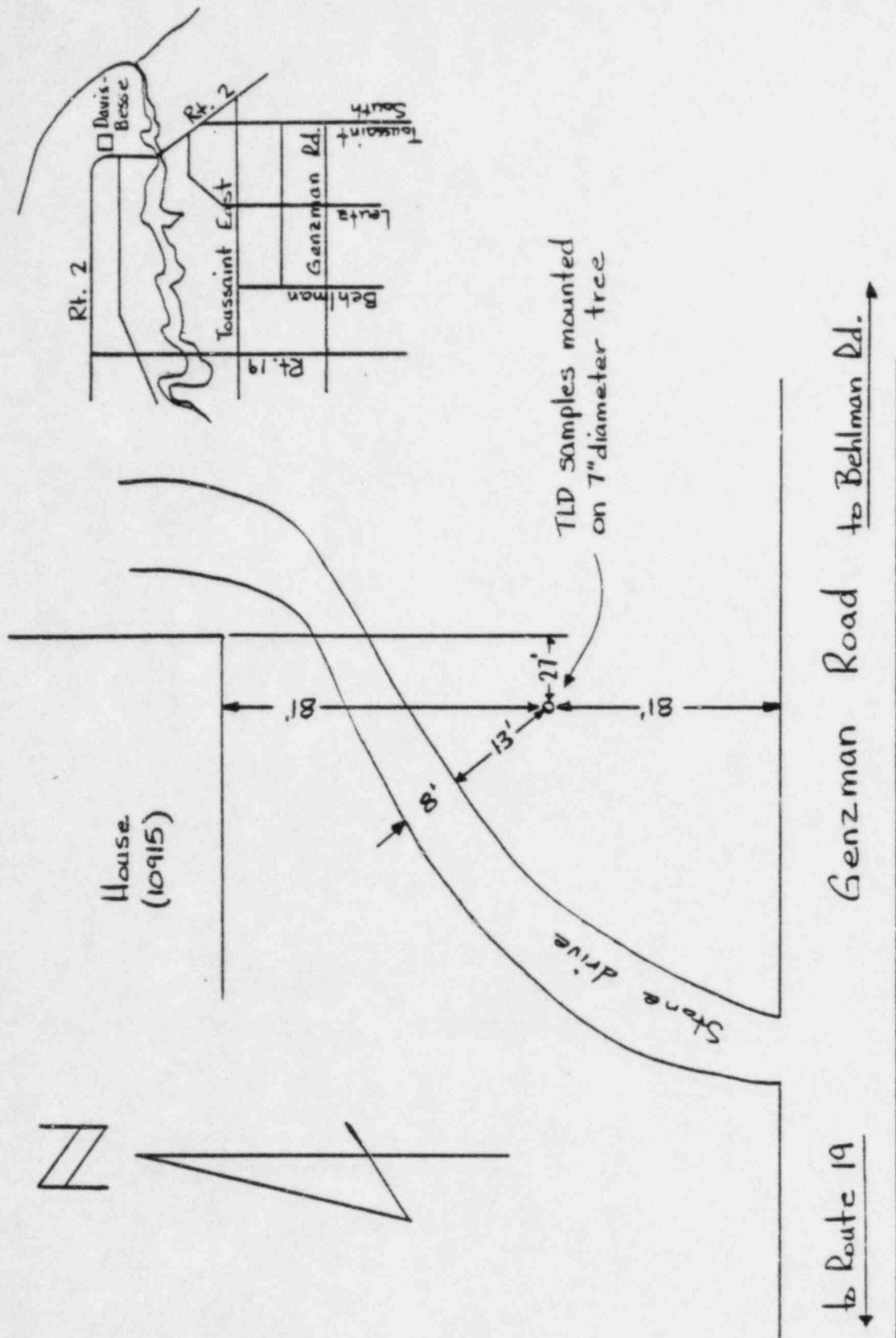


T-25 Green Leafy Veg.  
T-52 TLD station  
Lease No. 563

House  
(7898)



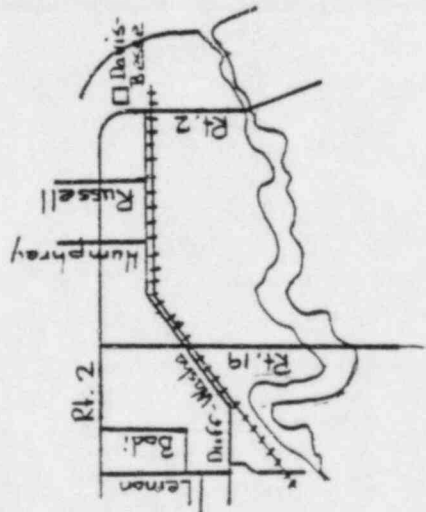
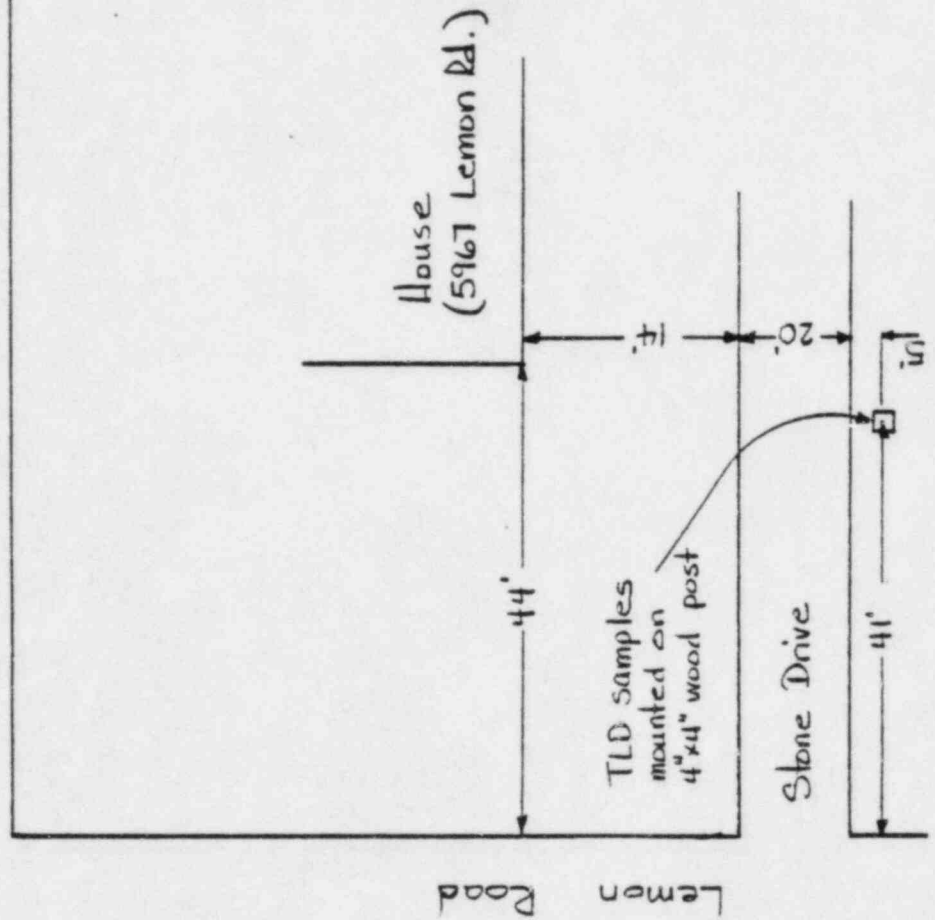
Lease No. 561  
TLD Station T-54



Lense No. 565  
TLD Station T-55



State Route 2





## APPENDIX B

### Tables

TABLE 1  
BIOACCUMULATION FACTORS  
(pCi/kg per pCi/liter)

<u>ELEMENT</u>	<u>FRESHWATER FISH</u>
H	9.0E-01
C	4.6E+03
NA	1.0E+02
P	3.0E+03
CR	2.0E+02
MN	4.0E+02
FE	1.0E+02
CO	5.0E+01
NI	1.0E+02
CU	5.0E+01
ZN	2.0E+03
BR	4.2E+02
RB	2.0E+03
SR	3.0E+01
Y	2.5E+01
ZR	3.3E+00
NB	3.0E+04
MO	1.0E+01
TC	1.5E+01
RU	1.0E+01
RH	1.0E+01
TE	4.0E+02
I	1.5E+01
CS	2.0E+03
BA	4.0E+00
LA	2.5E+01
CE	1.0E+00
PR	2.5E+01
ND	2.5E+01
W	1.2E+03
NP	1.0E+01

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Values in this Table are taken from Regulatory Guide 1.109  
except for Phosphorus which is taken from NUREG/CR-1336.

Table 2

Page 1 of 3

INGESTION DOSE FACTORS FOR ADULTS  
(MREM PER PCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
H 3	NO DATA	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07
C 14	2.84E-06	5.68E-07	5.68E-07	5.68E-07	5.68E-07	5.68E-07	5.68E-07
NA 24	1.70E-06	1.70E-06	1.70E-06	1.70E-06	1.70E-06	1.70E-06	1.70E-06
P 32	1.93E-04	1.20E-05	7.46E-06	NO DATA	NO DATA	NO DATA	2.17E-05
CR 51	NO DATA	NO DATA	2.66E-09	1.59E-09	5.86E-10	3.53E-09	6.69E-07
MN 54	NO DATA	4.57E-06	8.72E-07	NO DATA	1.36E-06	NO DATA	1.40E-05
MN 56	NO DATA	1.15E-07	2.04E-08	NO DATA	1.46E-07	NO DATA	3.67E-06
FE 55	2.75E-06	1.90E-06	4.43E-07	NO DATA	NO DATA	1.06E-06	1.09E-06
FE 59	4.34E-06	1.02E-05	3.91E-06	NO DATA	NO DATA	2.85E-06	3.40E-05
CO 58	NO DATA	7.45E-07	1.67E-06	NO DATA	NO DATA	NO DATA	1.51E-05
CO 60	NO DATA	2.14E-06	4.72E-06	NO DATA	NO DATA	NO DATA	4.02E-05
NI 63	1.30E-04	9.01E-06	4.36E-06	NO DATA	NO DATA	NO DATA	1.88E-06
NI 65	5.20E-07	6.86E-08	3.13E-08	NO DATA	NO DATA	NO DATA	1.74E-06
CU 64	NO DATA	8.33E-08	3.91E-08	NO DATA	2.10E-07	NO DATA	7.10E-06
ZN 65	4.84E-06	1.54E-05	6.96E-06	NO DATA	1.03E-05	NO DATA	9.70E-06
ZN 69	1.03E-08	1.37E-08	1.37E-09	NO DATA	1.28E-08	NO DATA	2.96E-09
BR 83	NO DATA	NO DATA	4.02E-08	NO DATA	NO DATA	NO DATA	5.79E-08
BR 84	NO DATA	NO DATA	5.21E-08	NO DATA	NO DATA	NO DATA	4.09E-13
BR 85	NO DATA	NO DATA	2.14E-09	NO DATA	NO DATA	NO DATA	LT E-24
RB 86	NO DATA	2.11E-05	9.83E-06	NO DATA	NO DATA	NO DATA	4.16E-06
RB 88	NO DATA	6.05E-08	3.21E-08	NO DATA	NO DATA	NO DATA	8.36E-19
RB 89	NO DATA	4.01E-08	2.82E-08	NO DATA	NO DATA	NO DATA	2.33E-21
SR 89	3.08E-04	NO DATA	8.84E-06	NO DATA	NO DATA	NO DATA	4.94E-05
SR 90	7.58E-03	NO DATA	1.86E-03	NO DATA	NO DATA	NO DATA	2.19E-04
SR 91	5.67E-06	NO DATA	2.29E-07	NO DATA	NO DATA	NO DATA	2.70E-05
SR 92	2.15E-06	NO DATA	9.30E-08	NO DATA	NO DATA	NO DATA	4.26E-05
Y 90	9.62E-09	NO DATA	2.58E-10	NO DATA	NO DATA	NO DATA	1.02E-04
Y 91M	9.09E-11	NO DATA	3.52E-12	NO DATA	NO DATA	NO DATA	2.67E-10
Y 91	1.41E-07	NO DATA	3.77E-09	NO DATA	NO DATA	NO DATA	7.76E-05
Y 92	8.45E-10	NO DATA	2.47E-11	NO DATA	NO DATA	NO DATA	1.48E-05

Reference: Regulatory Guide, 1.109, Table E-11

TABLE 2, continued

Page 2 of 3

 INGESTION DOSE FACTORS FOR ADULTS  
 (MREM PER PCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
Y 93	2.68E-09	NO DATA	7.40E-11	NO DATA	NO DATA	NO DATA	8.50E-05
ZR 95	3.04E-08	9.75E-09	6.60E-09	NO DATA	1.53E-08	NO DATA	3.09E-05
ZR 97	1.68E-09	3.39E-10	1.55E-10	NO DATA	5.12E-10	NO DATA	1.05E-04
NR 95	6.22E-09	3.46E-09	1.86E-09	NO DATA	3.42E-09	NO DATA	2.10E-05
MO 99	NO DATA	4.31E-06	8.20E-07	NO DATA	9.76E-06	NO DATA	9.99E-06
TC 99M	2.47E-10	6.98E-10	8.89E-09	NO DATA	1.06E-08	3.42E-10	4.13E-07
TC101	2.54E-10	3.66E-10	3.59E-09	NO DATA	6.59E-09	1.87E-10	1.10E-21
RUI03	1.85E-07	NO DATA	7.97E-08	NO DATA	7.06E-07	NO DATA	2.16E-05
RUI05	1.54E-08	NO DATA	6.08E-09	NO DATA	1.99E-07	NO DATA	9.42E-06
RUI06	2.75E-06	NO DATA	3.48E-07	NO DATA	5.31E-06	NO DATA	1.78E-04
AG110M	1.60E-07	1.48E-07	8.79E-08	NO DATA	2.91E-07	NO DATA	6.04E-05
TE125M	2.69E-06	9.71E-07	3.59E-07	8.06E-07	1.09E-05	NO DATA	1.07E-05
TE127M	6.77E-06	2.42E-06	8.25E-07	1.73E-06	2.75E-05	NO DATA	2.27E-05
TE127	1.10E-07	3.95E-08	2.38E-08	8.15E-08	4.48E-07	NO DATA	8.68E-06
TE129M	1.15E-05	4.29E-06	1.82E-06	3.95E-06	4.80E-05	NO DATA	5.79E-05
TE129	3.14E-08	1.18E-08	7.65E-09	2.41E-08	1.32E-07	NO DATA	2.37E-08
TE131M	1.73E-06	8.46E-07	7.05E-07	1.34E-06	8.57E-06	NO DATA	8.40E-05
TE131	1.97E-08	8.23E-09	6.22E-09	1.62E-08	8.63E-08	NO DATA	2.79E-09
TE132	2.52E-06	1.63E-06	1.53E-06	1.80E-06	1.57E-05	NO DATA	7.71E-05
I 130	7.56E-07	2.23E-06	8.80E-07	1.89E-04	3.48E-06	NO DATA	1.92E-06
I 131	4.16E-06	5.95E-06	3.41E-06	1.95E-03	1.02E-05	NO DATA	1.57E-06
I 132	2.03E-07	5.43E-07	1.90E-07	1.90E-05	8.65E-07	NO DATA	1.02E-07
I 133	1.42E-06	2.47E-06	7.53E-07	3.63E-04	4.31E-06	NO DATA	2.22E-06
I 134	1.06E-07	2.88E-07	1.03E-07	4.99E-06	4.58E-07	NO DATA	2.51E-10
I 135	4.43E-07	1.16E-06	4.28E-07	7.65E-05	1.86E-06	NO DATA	1.31E-06
CS134	6.22E-05	1.48E-04	1.21E-04	NO DATA	4.79E-05	1.59E-05	2.59E-06
CS136	6.51E-06	2.57E-05	1.85E-05	NO DATA	1.43E-05	1.96E-06	2.92E-06
CS137	7.97E-05	1.09E-04	7.14E-05	NO DATA	3.70E-05	1.23E-05	2.11E-06
CS138	5.52E-08	1.09E-07	5.40E-08	NO DATA	8.01E-08	7.91E-09	4.65E-13
BA139	9.70E-08	6.91E-11	2.84E-09	NO DATA	6.46E-11	3.92E-11	1.72E-07

TABLE 2, Continued

Page 3 of 3

 INGESTION DOSE FACTORS FOR ADULTS  
 (MREM PER PCI INGESTED)

NUCLIDE	BONE	LIVER	T.BODY	THYROID	KIDNEY	LUNG	GI-LLI
BA140	2.03E-05	2.55E-08	1.33E-06	NO DATA	8.67E-09	1.46E-08	4.18E-05
BA141	4.71E-08	3.56E-11	1.59E-09	NO DATA	3.31E-11	2.02E-11	2.22E-17
BA142	2.13E-08	2.19E-11	1.34E-09	NO DATA	1.85E-11	1.24E-11	3.00E-26
LA140	2.50E-09	1.26E-09	3.33E-10	NO DATA	NO DATA	NO DATA	9.25E-05
LA142	1.28E-10	5.82E-11	1.45E-11	NO DATA	NO DATA	NO DATA	4.25E-07
CE141	9.36E-09	6.33E-09	7.18E-10	NO DATA	2.94E-09	NO DATA	2.42E-05
CE143	1.65E-09	1.22E-06	1.35E-10	NO DATA	5.37E-10	NO DATA	4.56E-05
CE144	4.88E-07	2.04E-07	2.62E-08	NO DATA	1.21E-07	NO DATA	1.65E-04
PR143	9.20E-09	3.69E-09	4.56E-10	NO DATA	2.13E-09	NO DATA	4.03E-05
PR144	3.01E-11	1.25E-11	1.53E-12	NO DATA	7.05E-12	NO DATA	4.33E-18
ND147	6.29E-09	7.27E-09	4.35E-10	NO DATA	4.25E-09	NO DATA	3.49E-05
W 197	1.03E-07	8.61E-08	3.01E-08	NO DATA	NO DATA	NO DATA	2.82E-05
NP239	1.19E-09	1.17E-10	6.45E-11	NO DATA	3.65E-10	NO DATA	2.40E-05

TABLE 3

SITE-RELATED INGESTION  
DOSE COMMITMENT FACTOR
 $A_{IT}$   
(mrem/hr per  $\mu\text{Ci/ml}$ )  
Page 1 of 2

NUCLIDE	BONE	LIVER	TBODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3	0.00E-01	1.76E+00	1.76E+00	1.76E+00	1.76E+00	1.76E+00	1.76E+00
C-14	3.13E+04	6.26E+03	6.26E+03	6.26E+03	6.26E+03	6.26E+03	6.26E+03
NA-24	4.32E+02	4.32E+02	4.32E+02	4.32E+02	4.32E+02	4.32E+02	4.32E+02
CR-51	0.00E-01	0.00E-01	1.51E+00	7.85E-01	2.89E-01	1.77E+00	3.30E+02
MN-54	0.00E-01	4.44E+03	8.48E+02	0.00E-01	1.32E+03	0.00E-01	1.36E+04
MN-56	0.00E-01	1.12E+02	1.98E+01	0.00E-01	1.42E+02	0.00E-01	3.57E+03
FE-55	6.98E+02	4.83E+02	1.13E+02	0.00E-01	0.00E-01	2.69E+02	2.77E+02
FE-59	1.10E+03	2.59E+03	9.93E+02	0.00E-01	0.00E-01	7.24E+02	9.64E+03
CO-58	0.00E-01	1.00E+02	2.24E+02	0.00E-01	0.00E-01	0.00E-01	2.03E+03
CO-60	0.00E-01	2.87E+02	6.34E+02	0.00E-01	0.00E-01	0.00E-01	5.40E+03
NI-59	2.48E+03	9.51E+02	4.14E+02	0.00E-01	0.00E-01	0.00E-01	1.75E+02
NI-63	3.30E+04	2.29E+03	1.11E+03	0.00E-01	0.00E-01	0.00E-01	4.78E+02
NI-65	1.34E+02	1.74E+01	7.95E+00	0.00E-01	0.00E-01	0.00E-01	4.42E+02
CU-64	0.00E-01	1.12E+01	5.25E+00	0.00E-01	2.82E+01	0.00E-01	9.54E+02
ZN-65	2.32E+04	7.40E+04	3.34E+04	0.00E-01	4.95E+04	0.00E-01	4.66E+04
BR-84	0.00E-01	0.00E-01	5.31E+01	0.00E-01	0.00E-01	0.00E-01	4.17E-04
RB-88	0.00E-01	2.91E+02	1.54E+02	0.00E-01	0.00E-01	0.00E-01	4.01E-09
RB-89	0.00E-01	1.93E+02	1.35E+02	0.00E-01	0.00E-01	0.00E-01	1.12E-11
SR-89	2.66E+04	0.00E-01	7.64E+02	0.00E-01	0.00E-01	0.00E-01	4.27E+03
SR-90	6.55E+05	0.00E-01	1.61E+05	0.00E-01	0.00E-01	0.00E-01	1.89E+04
SR-91	4.90E+02	0.00E-01	1.98E+01	0.00E-01	0.00E-01	0.00E-01	2.33E+03
SR-92	1.86E+02	0.00E-01	8.04E+00	0.00E-01	0.00E-01	0.00E-01	3.68E+03
Y-90	7.16E-01	0.00E-01	1.92E-02	0.00E-01	0.00E-01	0.00E-01	7.59E+03
Y91M	6.77E-03	0.00E-01	2.62E-04	0.00E-01	0.00E-01	0.00E-01	1.99E-02
Y-91	1.05E+01	0.00E-01	2.81E-01	0.00E-01	0.00E-01	0.00E-01	5.78E+03
Y-92	6.29E-02	0.00E-01	1.84E-03	0.00E-01	0.00E-01	0.00E-01	1.10E+03
ZR-95	6.84E-01	2.19E-01	1.49E-01	0.00E-01	3.44E-01	0.00E-01	6.95E+02
ZR-97	3.78E-02	7.63E-03	3.49E-03	0.00E-01	1.15E-02	0.00E-01	2.36E+03
NB-95	4.47E+02	2.49E+02	1.34E+02	0.00E-01	2.46E+02	0.00E-01	1.51E+06
NB-97	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	2.87E+03

Calculations made according to the methods specified in Section 1.2 of the Offsite  
Dose Calculation Manual



TABLE 3  
(continued)  
SITE-RELATED INGESTION  
DOSE COMMITMENT FACTOR

$A_{it}$   
(mrem/hr per  $\mu\text{Ci/ml}$ )  
Page 2 of 2

NUCLIDE	BONE	LIVER	TBODY	THYROID	KIDNEY	LUNG	GI-LLI
MO-99	0.00E-01	1.66E+02	3.16E+01	0.00E-01	3.77E+02	0.00E-01	3.85E+02
TC99M	1.25E-02	3.53E-02	4.49E-01	0.00E-01	5.35E-01	1.73E-02	2.09E+01
RU-103	7.13E+00	0.00E-01	3.07E+00	0.00E-01	2.72E+01	0.00E-01	9.32E+02
RU-106	1.06E+02	0.00E-01	1.34E+01	0.00E-01	2.05E+02	0.00E-01	6.86E+03
AG110M	3.22E+00	2.98E+00	1.77E+00	0.00E-01	5.85E+00	0.00E-01	1.21E+03
CD115M	0.00E-01	9.08E+02	2.47E+01	0.00E-01	7.20E+02	0.00E-01	3.82E+04
SB-124	4.78E+01	8.50E-01	1.89E+01	0.00E-01	0.00E-01	3.70E+01	1.35E+03
TE-132	2.45E+03	1.58E+03	1.49E+03	1.75E+03	1.53E+04	0.00E-01	7.50E+04
I-131	2.10E+02	3.01E+02	1.72E+02	9.85E+04	5.15E+02	0.00E-01	7.93E+01
I-132	1.03E+01	2.74E+01	9.60E+00	9.60E+02	4.37E+01	0.00E-01	5.15E+00
I-133	7.17E+01	1.25E+02	3.80E+01	1.83E+04	2.18E+02	0.00E-01	1.12E+02
I-134	5.35E+00	1.45E+01	5.20E+00	2.52E+02	2.31E+01	0.00E-01	1.27E-02
I-135	2.24E+01	5.86E+01	2.16E+01	3.86E+03	9.39E+01	0.00E-01	6.62E+01
CS-134	2.99E+05	7.11E+05	5.81E+05	0.00E-01	2.30E+05	7.64E+04	1.24E+04
CS-136	3.13E+04	1.23E+05	8.88E+04	0.00E-01	6.87E+04	9.41E+03	1.40E+04
CS-137	3.83E+05	5.23E+05	3.43E+05	0.00E-01	1.78E+05	5.91E+04	1.01E+04
CS-138	2.65E+02	5.23E+02	2.59E+02	0.00E-01	3.85E+02	3.80E+01	2.23E-03
CS-139	1.44E+02	2.40E+02	4.80E+01	0.00E-01	1.92E+02	0.00E-01	0.00E-01
BA-139	2.35E+00	1.67E-03	6.87E-02	0.00E-01	1.56E-03	9.48E-04	4.16E+00
BA-140	4.91E+02	6.16E-01	3.22E+01	0.00E-01	2.10E-01	3.53E-01	1.01E+03
LA-140	1.86E-01	9.38E-02	2.48E-02	0.00E-01	0.00E-01	0.00E-01	6.89E+03
CE-141	1.59E-01	1.08E-01	1.22E-02	0.00E-01	5.00E-02	0.00E-01	4.11E+02
CE-143	2.80E-02	2.07E+01	2.29E-03	0.00E-01	9.13E-03	0.00E-01	7.75E+02
CE-144	8.29E+00	3.47E+00	4.45E-01	0.00E-01	2.04E+00	0.00E-01	2.80E+03
PR-144	2.24E-03	9.31E-04	1.14E-04	0.00E-01	5.25E-04	0.00E-01	3.22E-10
W-187	2.97E+02	2.49E+02	8.69E+01	0.00E-01	0.00E-01	0.00E-01	8.14E+04
U-235	1.55E+04	0.00E-01	9.42E+02	0.00E-01	3.63E+03	0.00E-01	1.51E+03
U-238	1.49E+04	0.00E-01	8.82E+02	0.00E-01	3.39E+03	0.00E-01	3.22E+03
NP-239	4.59E-02	4.51E-03	2.49E-03	0.00E-01	1.41E-02	0.00E-01	9.25E+02
P-32	1.39E+06	8.64E+04	5.37E+04	0.00E-01	0.00E-01	0.00E-01	1.56E+05

TABLE 4

DOSE FACTORS FOR EXPOSURE TO A SEMI-INFINITE CLOUD OF NOBLE GASES

<u>Nuclide</u>	<u><math>\gamma</math>-Body** (K)</u>	<u><math>\beta</math>-Skin** (L)</u>	<u><math>\gamma</math>-Air* (M)</u>	<u><math>\beta</math>-air* (N)</u>
Kr-85m	1.17E+03***	1.46E+03	1.23E+03	1.97E+03
Kr-85	1.61E+01	1.34E+03	1.72E+01	1.95E+03
Kr-87	5.92E+03	9.73E+03	6.17E+03	1.03E+04
Kr-88	1.47E+04	2.37E+03	1.52E+04	2.93E+03
Kr-89	1.66E+04	1.01E+04	1.73E+04	1.06E+04
Kr-90	1.56E+04	7.29E+03	1.63E+04	7.83E+03
Xe-131m	9.15E+01	4.76E+02	1.56E+02	1.11E+03
Xe-133m	2.51E+02	9.94E+02	3.27E+02	1.48E+03
Xe-133	2.94E+02	3.06E+02	3.53E+02	1.05E+03
Xe-135m	3.12E+03	7.11E+02	3.36E+03	7.39E+02
Xe-135	1.81E+03	1.86E+03	1.92E+03	2.46E+03
Xe-137	1.42E+03	1.22E+04	1.51E+03	1.27E+04
Xe-138	8.83E+03	4.13E+03	9.21E+03	4.75E+03
Ar-41	8.84E+03	2.69E+03	9.30E+03	3.28E+03

Reference: Regulatory Guide 1.109 Table B-1 and Section 2.1.1 of the Offsite Dose Calculation Manual

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$$* \frac{\text{mrad-m}^3}{\mu\text{Ci-yr}}$$

$$** \frac{\text{mrem-m}^3}{\mu\text{Ci-yr}}$$

$$*** 1.97\text{E}+03 = 1.97 \times 10^3$$

TABLE 5

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 20

(FOR SECTION 2.2.1.b)

AGE : ADULT  
PATHWAY : INHALATION

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1	H-3	1.264E+03	1.264E+03	0.000E-01	1.264E+03	1.264E+03	1.264E+03	1.264E+03	1.264E+03	W. BODY
2	C-14	3.408E+03	3.408E+03	1.816E+04	3.408E+03	3.408E+03	3.408E+03	3.408E+03	3.408E+03	BONE
3	Na-24	1.024E+04	1.024E+04	1.024E+04	1.024E+04	1.024E+04	1.024E+04	1.024E+04	0.000E-01	W. BODY
4	P-32	5.008E+04	0.000E-01	1.320E+06	7.712E+04	0.000E-01	0.000E-01	8.640E+04	0.000E-01	BONE
5	SC-46	2.480E+05	0.000E-01	4.408E+05	8.560E+05	8.000E+05	0.000E-01	2.584E+05	0.000E-01	LIVER
6	CR-51	1.000E+02	5.952E+01	0.000E-01	0.000E-01	2.280E+01	1.440E+04	3.320E+03	0.000E-01	LUNG
7	MH-54	6.296E+03	0.000E-01	0.000E-01	3.960E+04	9.840E+03	1.400E+06	7.736E+04	0.000E-01	LUNG
8	MH-56	1.832E-01	0.000E-01	0.000E-01	1.240E+00	1.304E+00	9.440E+03	2.024E+04	0.000E-01	GI-LLI
9	FE-55	3.944E+03	0.000E-01	2.456E+04	1.696E+04	0.000E-01	7.208E+04	6.032E+03	0.000E-01	LUNG
10	FE-59	1.056E+04	0.000E-01	1.176E+04	2.776E+04	0.000E-01	1.016E+06	1.880E+05	0.000E-01	LUNG
11	CO-58	2.072E+03	0.000E-01	0.000E-01	1.584E+03	0.000E-01	9.280E+05	1.064E+05	0.000E-01	LUNG
12	CO-60	1.480E+04	0.000E-01	0.000E-01	1.152E+04	0.000E-01	5.968E+06	2.848E+05	0.000E-01	LUNG
13	NI-59	5.416E+03	0.000E-01	3.248E+04	1.168E+04	0.000E-01	6.568E+04	4.888E+03	0.000E-01	LUNG
14	NI-63	1.448E+04	0.000E-01	4.320E+05	3.144E+04	0.000E-01	1.794E+05	1.336E+04	0.000E-01	BONE
15	NI-65	9.120E-02	0.000E-01	1.536E+00	2.096E-01	0.000E-01	5.600E+03	1.232E+04	0.000E-01	GI-LLI
16	CU-64	6.152E-01	0.000E-01	0.000E-01	1.464E+00	4.624E+00	6.784E+03	4.092E+04	0.000E-01	GI-LLI
17	ZN-65	6.556E+04	0.000E-01	3.240E+04	1.032E+05	6.096E+04	8.640E+05	5.344E+04	0.000E-01	LUNG
18	ZN-69	4.520E-04	0.000E-01	3.384E-02	4.512E-02	4.216E-02	9.200E+02	1.632E+01	0.000E-01	LUNG
19	SR-83	2.408E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	2.320E+02	0.000E-01	W. BODY
20	ER-84	3.128E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	1.640E-03	0.000E-01	W. BODY
21	ER-85	1.280E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
22	EL-86	5.896E+04	0.000E-01	0.000E-01	1.352E+05	0.000E-01	0.000E-01	1.564E+04	0.000E-01	LIVER
23	RB-88	1.928E+02	0.000E-01	0.000E-01	3.872E+02	0.000E-01	0.000E-01	3.344E-09	0.000E-01	LIVER
24	RB-89	1.696E+02	0.000E-01	0.000E-01	2.560E+02	0.000E-01	0.000E-01	9.280E-12	0.000E-01	LIVER
25	SR-89	8.720E+03	0.000E-01	3.040E+05	0.000E-01	0.000E-01	1.400E+06	3.496E+05	0.000E-01	LUNG
26	SR-90	6.096E+06	0.000E-01	9.920E+07	0.000E-01	0.000E-01	9.600E+06	7.216E+05	0.000E-01	BONE
27	SR-91	2.504E+00	0.000E-01	6.192E+01	0.000E-01	0.000E-01	3.648E+04	1.912E+05	0.000E-01	GI-LLI
28	SR-92	2.912E-01	0.000E-01	6.744E+00	0.000E-01	0.000E-01	1.548E+04	4.304E+04	0.000E-01	GI-LLI
29	Y-90	5.608E+01	0.000E-01	2.088E+03	0.000E-01	0.000E-01	1.696E+05	5.056E+05	0.000E-01	GI-LLI
30	Y-91M	1.016E-02	0.000E-01	2.608E-01	0.000E-01	0.000E-01	1.920E+03	1.329E+00	0.000E-01	LUNG
31	Y-91	1.240E+04	0.000E-01	4.624E+05	0.000E-01	0.000E-01	1.704E+06	3.848E+05	0.000E-01	LUNG
32	Y-92	3.016E-01	0.000E-01	1.032E+01	0.000E-01	0.000E-01	1.568E+04	7.352E+04	0.000E-01	GI-LLI
33	Y-93	2.608E+00	0.000E-01	9.440E+01	0.000E-01	0.000E-01	4.848E+04	4.216E+05	0.000E-01	GI-LLI
34	ZR-95	2.328E+04	0.000E-01	1.072E+05	3.410E+04	5.416E+04	1.758E+06	1.504E+05	0.000E-01	LUNG
35	ZR-97	9.040E+00	0.000E-01	9.680E+01	1.960E+01	2.968E+01	7.872E+04	5.232E+05	0.000E-01	GI-LLI

TABLE 5 (CONT)

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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 20

AGE : ADULT

PATHWAY : INHALATION

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
36	NB-95	4.208E+03	0.000E-01	1.408E+04	7.816E+03	7.736E+03	5.048E+05	1.040E+05	4.208E+03	LUNG
37	NB-97	2.048E-02	0.000E-01	2.224E-01	5.624E-02	6.544E-02	2.400E+03	2.416E+02	0.000E-01	LUNG
38	MO-99	2.296E+01	0.000E-01	0.000E-01	1.208E+02	2.912E+02	9.120E+04	2.480E+05	0.000E-01	GI-LLI
39	TC-99M	3.704E-02	0.000E-01	1.032E-03	2.912E-03	4.416E-02	7.640E+02	4.160E+03	0.000E-01	GI-LLI
40	TC-101	5.904E-04	0.000E-01	4.176E-05	6.016E-05	1.080E-03	3.992E+02	1.058E-11	0.000E-01	LUNG
41	KU-103	6.584E+02	0.000E-01	1.528E+03	0.000E-01	5.932E+03	5.048E+05	1.104E+05	0.000E-01	LUNG
42	KU-105	3.112E-01	0.000E-01	7.904E-01	0.000E-01	1.016E+00	1.096E+04	4.816E+04	0.000E-01	GI-LLI
43	KU-106	9.720E+03	0.000E-01	6.912E+04	0.000E-01	1.336E+05	9.360E+06	9.120E+05	0.000E-01	LUNG
44	AG-110M	5.944E+03	0.000E-01	1.080E+04	1.000E+04	1.968E+04	4.632E+06	3.024E+05	0.000E-01	LUNG
45	CD-115M	6.360E+03	0.000E-01	0.000E-01	1.968E+05	1.584E+05	1.408E+06	3.840E+05	0.000E-01	LUNG
46	SB-124	1.240E+04	7.552E+01	3.120E+04	5.888E+02	0.000E-01	2.480E+06	4.064E+05	0.000E-01	LUNG
47	TE-125M	4.672E+02	1.048E+03	3.416E+03	1.584E+04	1.240E+04	3.136E+05	7.064E+04	0.000E-01	LUNG
48	TE-127M	1.568E+03	3.288E+03	1.264E+04	5.768E+03	4.576E+04	9.600E+05	1.496E+05	0.000E-01	LUNG
49	TE-127	3.096E-01	1.056E+00	1.400E+00	6.424E-01	5.096E+00	6.512E+03	5.736E+04	0.000E-01	GI-LLI
50	TE-129M	1.584E+03	3.440E+03	9.760E+03	4.672E+03	3.656E+04	1.160E+06	3.832E+05	0.000E-01	LUNG
51	TE-129	1.240E-02	3.896E-02	4.976E-02	2.392E-02	1.872E-01	1.936E+03	1.568E+02	0.000E-01	LUNG
52	TE-131M	2.904E+01	5.504E+01	6.992E+01	4.360E+01	3.088E+02	1.456E+05	5.560E+05	0.000E-01	GI-LLI
53	TE-131	3.592E-03	9.360E-03	1.112E-02	5.952E-03	4.368E-02	1.392E+03	1.840E+01	0.000E-01	LUNG
54	TE-132	1.616E+02	1.896E+02	2.600E+02	2.152E+02	1.456E+03	2.880E+05	5.096E+05	0.000E-01	GI-LLI
55	I-130	5.280E+03	1.136E+06	4.576E+03	1.344E+04	2.088E+04	0.000E-01	7.688E+03	0.000E-01	THYROID
56	I-131	2.048E+04	1.192E+07	2.520E+04	3.576E+04	6.128E+04	0.000E-01	6.280E+03	0.000E-01	THYROID
57	I-132	1.160E+03	1.144E+05	1.160E+03	3.256E+03	5.184E+03	0.000E-01	4.064E+02	0.000E-01	THYROID
58	I-133	4.520E+03	2.152E+06	8.640E+03	1.480E+04	2.584E+04	0.000E-01	8.880E+03	0.000E-01	THYROID
59	I-134	6.152E+02	2.984E+04	6.440E+02	1.728E+03	2.752E+03	0.000E-01	1.008E+00	0.000E-01	THYROID
60	I-135	2.568E+03	4.480E+05	2.680E+03	6.984E+03	1.112E+04	0.000E-01	5.248E+03	0.000E-01	THYROID
61	CS-134	7.280E+05	0.000E-01	3.728E+05	8.480E+05	2.872E+05	9.760E+04	1.040E+04	0.000E-01	LIVER
62	CS-136	1.104E+05	0.000E-01	3.904E+04	1.464E+05	8.560E+04	1.200E+04	1.16E+04	0.000E-01	LIVER
63	CS-137	4.280E+05	0.000E-01	4.784E+05	6.208E+05	2.224E+05	7.520E+04	8.400E+03	0.000E-01	LIVER
64	CS-138	3.240E+02	0.000E-01	3.312E+02	6.208E+02	4.800E+02	4.856E+01	1.864E-03	0.000E-01	LIVER
65	CS-139	1.112E+02	0.000E-01	2.048E+02	2.904E+02	2.440E+02	2.272E+01	0.000E-01	0.000E-01	LIVER
66	BA-139	2.736E-02	0.000E-01	9.360E-01	6.656E-04	6.224E-04	3.760E+03	8.960E+02	0.000E-01	LUNG
67	BA-140	2.568E+03	0.000E-01	3.904E+04	4.904E+01	1.672E+01	1.272E+06	2.184E+05	0.000E-01	LUNG
68	BA-141	3.360E-03	0.000E-01	1.000E-01	7.528E-05	7.000E-05	1.936E+03	1.160E-07	0.000E-01	LUNG
69	BA-142	1.656E-03	0.000E-01	2.632E-02	2.704E-05	2.288E-05	1.192E+03	1.568E-16	0.000E-01	LUNG
70	LA-140	4.584E+01	0.000E-01	3.440E+02	1.736E+02	0.000E-01	1.360E+05	4.584E+05	0.000E-01	GI-LLI

TABLE 5 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 20

AGE : ADULT

PATHWAY : INHALATION

NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
71 LA-142	7.720E-02	0.000E-01	3.832E-01	3.104E-01	0.000E-01	6.328E+03	2.112E+03	7.720E-02	LUNG
72 CE-141	1.528E+03	0.000E-01	1.992E+04	1.352E+04	6.264E+03	3.616E+05	1.200E+05	0.000E-01	LUNG
73 CE-143	1.528E+01	0.000E-01	1.864E+02	1.376E+02	6.080E+01	7.976E+04	2.264E+05	0.000E-01	GI-LLI
74 CE-144	1.640E+05	0.000E-01	3.432E+06	1.432E+06	8.480E+05	7.776E+06	8.160E+05	0.000E-01	LUNG
75 PR-143	4.640E+02	0.000E-01	9.360E+03	3.752E+03	2.160E+03	2.808E+05	2.000E+05	0.000E-01	LUNG
76 PR-144	1.528E-03	0.000E-01	3.008E-02	1.248E-02	7.048E-03	1.016E+03	2.152E-08	0.000E-01	LUNG
77 ND-147	3.648E+02	0.000E-01	5.272E+03	6.096E+03	3.560E+03	2.208E+05	1.728E+05	0.000E-01	LUNG
78 W-185	5.448E+01	0.000E-01	1.560E+03	5.176E+02	0.000E-01	4.456E+05	8.560E+04	0.000E-01	LUNG
79 W-187	2.480E+00	0.000E-01	8.480E+00	7.080E+00	0.000E-01	2.904E+04	1.552E+05	0.000E-01	GI-LLI
80 U-235	4.856E+06	0.000E-01	8.000E+07	0.000E-01	1.872E+07	3.920E+08	3.872E+05	0.000E-01	LUNG
81 U-238	4.536E+06	0.000E-01	7.664E+07	0.000E-01	1.744E+07	3.664E+08	8.240E+05	0.000E-01	LUNG
82 NP-239	1.240E+01	0.000E-01	2.296E+02	2.256E+01	7.000E+01	3.760E+04	1.192E+05	0.000E-01	GI-LLI



TABLE 5 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 20

AGE : TEEN

PATHWAY : INHALATION

NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1 H-3	1.272E+03	1.272E+03	0.000E-01	1.272E+03	1.272E+03	1.272E+03	1.272E+03	1.272E+03	W. BODY
2 C-14	4.872E+03	4.872E+03	2.600E+04	4.872E+03	4.872E+03	4.872E+03	4.872E+03	4.872E+03	BONE
3 NA-24	1.376E+04	1.376E+04	1.376E+04	1.376E+04	1.376E+04	1.376E+04	1.376E+04	1.376E+04	W. BODY
4 P-32	7.160E+04	0.000E-01	1.889E+06	1.096E+05	0.000E-01	0.000E-01	9.280E+04	0.000E-01	BONE
5 SC-46	2.488E+05	0.000E-01	4.408E+05	8.560E+05	8.000E+05	0.000E-01	2.584E+05	0.000E-01	LIVER
6 CR-51	1.352E+02	7.496E+01	0.000E-01	0.000E-01	3.072E+01	2.096E+04	3.000E+03	0.000E-01	LUNG
7 MN-54	8.400E+03	0.000E-01	0.000E-01	5.112E+04	1.272E+04	1.984E+06	6.680E+04	0.000E-01	LUNG
8 MN-56	2.520E-01	0.000E-01	0.000E-01	1.696E+00	1.792E+00	1.520E+04	5.744E+04	0.000E-01	GI-LLI
9 FE-55	5.544E+03	0.000E-01	3.344E+04	2.384E+04	0.000E-01	1.240E+05	6.392E+03	0.000E-01	LUNG
10 FE-59	1.432E+04	0.000E-01	1.592E+04	3.696E+04	0.000E-01	1.528E+06	1.784E+05	0.000E-01	LUNG
11 CO-58	2.776E+03	0.000E-01	0.000E-01	2.072E+03	0.000E-01	1.344E+06	9.520E+04	0.000E-01	LUNG
12 CO-60	1.984E+04	0.000E-01	0.000E-01	1.512E+04	0.000E-01	8.720E+06	2.592E+05	0.000E-01	LUNG
13 NI-59	5.416E+03	0.000E-01	3.248E+04	1.168E+04	0.000E-01	6.568E+04	4.888E+03	0.000E-01	LUNG
14 NI-63	1.976E+04	0.000E-01	5.800E+05	4.344E+04	0.000E-01	3.072E+05	1.476E+04	0.000E-01	BONE
15 NI-65	1.272E-01	0.000E-01	2.184E+00	2.928E-01	0.000E-01	9.360E+03	3.672E+04	0.000E-01	GI-LLI
16 CU-64	8.480E-01	0.000E-01	0.000E-01	2.032E+00	6.408E+00	1.112E+04	6.144E+04	0.000E-01	GI-LLI
17 ZN-65	6.240E+04	0.000E-01	3.856E+04	1.336E+05	8.640E+04	1.240E+06	4.664E+04	0.000E-01	LUNG
18 ZN-69	6.456E-03	0.000E-01	4.832E-02	9.200E-02	6.024E-02	1.584E+03	2.848E+02	0.000E-01	LUNG
19 BR-83	3.440E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
20 BR-84	4.328E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
21 BR-85	1.832E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
22 RB-86	8.400E+04	0.000E-01	0.000E-01	1.904E+05	0.000E-01	0.000E-01	1.768E+04	0.000E-01	LIVER
23 RB-88	2.720E+02	0.000E-01	0.000E-01	5.456E+02	0.000E-01	0.000E-01	2.920E-05	0.000E-01	LIVER
24 RB-89	2.328E+02	0.000E-01	0.000E-01	3.520E+02	0.000E-01	0.000E-01	3.376E-07	0.000E-01	LIVER
25 SR-89	1.248E+04	0.000E-01	4.344E+05	0.000E-01	0.000E-01	2.416E+06	3.712E+05	0.000E-01	LUNG
26 SR-90	6.680E+06	0.000E-01	1.080E+08	0.000E-01	0.000E-01	1.648E+07	7.648E+05	0.000E-01	BONE
27 SR-91	3.512E+00	0.000E-01	8.800E+01	0.000E-01	0.000E-01	6.072E+04	2.592E+05	0.000E-01	GI-LLI
28 SR-92	4.064E-01	0.000E-01	9.520E+00	0.000E-01	0.000E-01	2.744E+04	1.192E+05	0.000E-01	GI-LLI
29 Y-90	8.000E+01	0.000E-01	2.984E+03	0.000E-01	0.000E-01	2.928E+05	5.592E+05	0.000E-01	GI-LLI
30 Y-91M	1.416E-02	0.000E-01	3.704E-01	0.000E-01	0.000E-01	3.200E+03	3.016E+01	0.000E-01	LUNG
31 Y-91	1.768E+04	0.000E-01	6.608E+05	0.000E-01	0.000E-01	2.936E+06	4.088E+05	0.000E-01	LUNG
32 Y-92	4.288E-01	0.000E-01	1.472E+01	0.000E-01	0.000E-01	2.680E+04	1.648E+05	0.000E-01	GI-LLI
33 Y-93	3.720E+00	0.000E-01	1.352E+02	0.000E-01	0.000E-01	8.320E+04	5.792E+05	0.000E-01	GI-LLI
34 ZR-95	3.152E+04	0.000E-01	1.456E+05	4.584E+04	6.736E+04	2.688E+06	1.488E+05	0.000E-01	LUNG
35 ZR-97	1.256E+01	0.000E-01	1.376E+02	2.720E+01	4.120E+01	1.296E+05	6.304E+05	0.000E-01	GI-LLI



TABLE 5 (CONT)

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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 20

AGE : TEEN  
PATHWAY : INHALATION

NO	ISOTOPE	W.	BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
36	NB-95	5.664E+03	0.000E-01	0.000E-01	1.856E+04	1.032E+04	1.000E+04	7.512E+05	9.680E+04	5.664E+03	LUNG
37	NB-97	2.048E-02	0.000E-01	0.000E-01	2.224E-01	5.524E-02	6.544E-02	2.400E+03	2.416E+02	0.000E-01	LUNG
38	MO-99	3.224E+01	0.000E-01	0.000E-01	0.000E-01	1.698E+02	4.112E+02	1.536E+05	2.688E+05	0.000E-01	GI-LLI
39	TC-99M	4.992E-02	0.000E-01	0.000E-01	1.384E-03	3.864E-03	5.760E-02	1.152E+03	6.128E+03	0.000E-01	GI-LLI
40	TC-101	8.240E-04	0.000E-01	0.000E-01	5.920E-05	8.400E-05	1.520E-03	6.572E+02	8.720E-07	0.000E-01	LUNG
41	RU-103	8.960E+02	0.000E-01	0.000E-01	2.104E+03	0.000E-01	7.432E+03	7.832E+05	1.088E+05	0.000E-01	LUNG
42	RU-105	4.336E-01	0.000E-01	0.000E-01	1.120E+00	0.000E-01	1.408E+00	1.816E+04	9.040E+04	0.000E-01	GI-LLI
43	RU-106	1.240E+04	0.000E-01	0.000E-01	9.840E+04	0.000E-01	1.904E+05	1.608E+07	9.600E+05	0.000E-01	LUNG
44	AO-110M	7.992E+03	0.000E-01	0.000E-01	1.384E+04	1.312E+04	2.504E+04	6.752E+05	2.728E+05	0.000E-01	LUNG
45	CB-115M	6.360E+03	0.000E-01	0.000E-01	0.000E-01	1.968E+05	1.584E+05	1.408E+06	3.840E+05	0.000E-01	LUNG
46	SB-124	1.240E+04	7.552E+01	3.120E+01	3.120E+04	5.888E+02	0.000E-01	2.430E+06	4.054E+05	0.000E-01	LUNG
47	TE-125M	6.672E+02	1.400E+03	4.880E+03	4.880E+03	2.240E+03	0.000E-01	5.360E+05	7.504E+04	0.000E-01	LUNG
48	TE-127M	2.184E+03	4.384E+03	1.800E+04	1.800E+04	8.160E+03	6.536E+04	1.656E+06	1.592E+05	0.000E-01	LUNG
49	TE-127	4.416E-01	1.416E+00	2.008E+00	2.008E+00	9.120E-01	7.280E+00	1.120E+04	8.030E+04	0.000E-01	GI-LLI
50	TE-129M	2.248E+03	4.576E+03	1.392E+04	1.392E+04	6.504E+03	5.192E+04	1.976E+06	4.048E+05	0.000E-01	LUNG
51	TE-129	1.760E-02	5.184E-02	7.096E-02	7.096E-02	3.376E-02	2.656E-01	3.296E+03	1.616E+03	0.000E-01	LUNG
52	TE-131M	4.024E+01	7.248E+01	9.840E+01	9.840E+01	6.008E+01	4.392E+02	2.376E+05	6.208E+05	0.000E-01	GI-LLI
53	TE-131	5.040E-03	1.240E-02	1.576E-02	1.576E-02	8.320E-03	6.176E-02	2.336E+03	1.512E+01	0.000E-01	LUNG
54	TE-132	2.192E+02	2.456E+02	3.600E+02	3.600E+02	2.904E+02	1.952E+03	4.488E+05	4.632E+05	0.000E-01	GI-LLI
55	I-130	7.168E+03	1.488E+05	6.240E+03	6.240E+03	1.792E+04	2.752E+04	0.000E-01	9.120E+03	0.000E-01	THYROID
56	I-131	2.640E+04	1.464E+07	3.544E+04	3.544E+04	4.912E+04	8.400E+04	0.000E-01	6.488E+03	0.000E-01	THYROID
57	I-132	1.576E+03	1.512E+05	1.592E+03	1.592E+03	4.276E+03	6.220E+03	0.000E-01	1.272E+03	0.000E-01	THYROID
58	I-133	6.224E+03	2.920E+06	1.216E+04	1.216E+04	2.048E+04	3.592E+04	0.000E-01	1.032E+04	0.000E-01	THYROID
59	I-134	8.400E+02	3.952E+04	8.880E+02	8.880E+02	2.320E+03	3.664E+03	0.000E-01	2.040E+01	0.000E-01	THYROID
60	I-135	3.488E+03	6.208E+05	3.696E+03	3.696E+03	9.440E+03	1.438E+04	0.000E-01	6.952E+03	0.000E-01	THYROID
61	CS-134	5.488E+05	0.000E-01	5.024E+05	5.024E+05	1.128E+06	3.752E+05	1.464E+05	9.760E+03	0.000E-01	LIVER
62	CS-136	1.368E+05	0.000E-01	5.152E+04	5.152E+04	1.936E+05	1.104E+05	1.776E+04	1.088E+04	0.000E-01	LIVER
63	CS-137	3.112E+05	0.000E-01	6.704E+05	6.704E+05	8.480E+05	3.040E+05	1.208E+05	8.480E+03	0.000E-01	LIVER
64	CS-138	4.464E+02	0.000E-01	4.656E+02	4.656E+02	8.560E+02	6.624E+02	7.872E+01	2.704E-01	0.000E-01	LIVER
65	CS-139	1.112E+02	0.000E-01	2.048E+02	2.048E+02	2.904E+02	2.440E+02	2.272E+01	0.000E-01	0.000E-01	LIVER
66	BA-139	3.896E-02	0.000E-01	1.336E+00	1.336E+00	9.440E-04	8.880E-04	6.464E+03	6.448E+03	0.000E-01	LUNG
67	BA-140	3.520E+03	0.000E-01	5.472E+04	5.472E+04	6.704E+01	2.280E+01	2.032E+06	2.288E+05	0.000E-01	LUNG
68	BA-141	4.744E-03	0.000E-01	1.424E-01	1.424E-01	1.056E-04	9.840E-05	3.288E+03	7.464E-04	0.000E-01	LUNG
69	BA-142	2.272E-03	0.000E-01	3.696E-02	3.696E-02	3.704E-05	3.136E-05	1.912E+03	4.792E-10	0.000E-01	LUNG
70	LA-140	6.256E+01	0.000E-01	4.792E+02	4.792E+02	2.360E+02	0.000E-01	2.144E+05	4.872E+05	0.000E-01	GI-LLI

TABLE 5 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 20

AGE : TEEN

PATHWAY : INHALATION

NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
71 LA-142	1.056E-01	0.000E-01	9.600E-01	4.248E-01	0.000E-01	1.016E+04	1.200E+04	1.056E-01	GI-LLI
72 CE-141	2.168E+03	0.000E-01	2.840E+04	1.896E+04	8.800E+03	6.136E+05	1.264E+05	0.000E-01	LUNG
73 CE-143	2.160E+01	0.000E-01	2.656E+02	1.936E+02	8.640E+01	1.304E+05	2.552E+05	0.000E-01	GI-LLI
74 CE-144	2.624E+05	0.000E-01	4.888E+06	2.024E+06	1.208E+06	1.336E+07	8.640E+05	0.000E-01	LUNG
75 PR-143	6.624E+02	0.000E-01	1.336E+04	5.312E+03	3.088E+03	4.832E+05	2.136E+05	0.000E-01	LUNG
76 PR-144	2.176E-03	0.000E-01	4.296E-02	1.760E-02	1.008E-02	1.752E+03	2.352E-04	0.000E-01	LUNG
77 ND-147	5.128E+02	0.000E-01	7.864E+03	8.560E+03	5.024E+03	3.720E+05	1.824E+05	0.000E-01	LUNG
78 W-185	5.448E+01	0.000E-01	1.560E+03	5.176E+02	0.000E-01	4.456E+05	8.560E+04	0.000E-01	LUNG
79 W-187	3.432E+00	0.000E-01	1.200E+01	9.760E+00	0.000E-01	4.736E+04	1.768E+05	0.000E-01	GI-LLI
80 U-235	4.856E+06	0.000E-01	8.000E+07	0.000E-01	1.872E+07	3.920E+08	3.872E+05	0.000E-01	LUNG
81 U-238	4.536E+06	0.000E-01	7.664E+07	0.000E-01	1.744E+07	3.664E+08	8.240E+05	0.000E-01	LUNG
82 NP-239	1.768E+01	0.000E-01	3.384E+02	3.192E+01	1.000E+02	6.488E+04	1.320E+05	0.000E-01	GI-LLI

TABLE 5 (CONT)

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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 20

AGE : CHILD  
PATHWAY : INHALATION

NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1 H-3	1.125E+03	1.125E+03	0.000E-01	1.125E+03	1.125E+03	1.125E+03	1.125E+03	1.125E+03	W. BODY
2 C-14	6.734E+03	6.734E+03	3.589E+04	6.734E+03	6.734E+03	6.734E+03	6.734E+03	6.734E+03	BONE
3 Na-24	1.610E+04	1.610E+04	1.610E+04	1.610E+04	1.610E+04	1.610E+04	1.610E+04	0.000E-01	W. BODY
4 P-32	9.879E+04	0.000E-01	2.605E+06	1.143E+05	0.000E-01	0.000E-01	4.219E+04	0.000E-01	BONE
5 SC-46	1.151E+05	0.000E-01	2.039E+05	3.959E+05	3.706E+05	0.000E-01	1.195E+05	0.000E-01	LIVER
6 CR-51	1.543E+02	8.547E+01	0.000E-01	0.000E-01	2.431E+01	1.699E+04	1.084E+03	0.000E-01	LUNG
7 NH-54	9.509E+03	0.000E-01	0.000E-01	4.292E+04	1.003E+04	1.575E+06	2.290E+04	0.000E-01	LUNG
8 NH-56	3.119E-01	0.000E-01	0.000E-01	1.658E+00	1.672E+00	1.314E+04	1.232E+05	0.000E-01	GI-LLI
9 FE-55	7.770E+03	0.000E-01	4.736E+04	2.516E+04	0.000E-01	1.110E+05	2.868E+03	0.000E-01	LUNG
10 FE-59	1.669E+04	0.000E-01	2.638E+04	3.345E+04	0.000E-01	1.269E+06	7.067E+04	0.000E-01	LUNG
11 CO-58	3.164E+03	0.000E-01	0.000E-01	1.772E+03	0.000E-01	1.106E+06	3.437E+04	0.000E-01	LUNG
12 CO-60	2.263E+04	0.000E-01	0.000E-01	1.314E+04	0.000E-01	7.057E+06	9.520E+04	0.000E-01	LUNG
13 NI-59	2.505E+03	0.000E-01	1.502E+04	5.402E+03	0.000E-01	3.038E+04	2.641E+03	0.000E-01	EDME
14 NI-63	2.797E+04	0.000E-01	8.214E+05	4.625E+04	0.000E-01	2.749E+05	6.327E+03	0.000E-01	GI-LLI
15 NI-65	1.643E-01	0.000E-01	2.970E+00	2.956E-01	0.000E-01	8.177E+03	8.399E+04	0.000E-01	GI-LLI
16 CU-64	1.073E+00	0.000E-01	0.000E-01	1.994E+00	6.031E+00	9.583E+03	3.670E+04	0.000E-01	LUNG
17 ZN-65	7.030E+04	0.000E-01	4.255E+04	1.133E+05	7.141E+04	9.953E+05	1.632E+04	0.000E-01	GI-LLI
18 ZN-69	8.917E-03	0.000E-01	6.877E-02	9.857E-02	5.845E-02	1.421E+03	1.019E+04	0.000E-01	GI-LLI
19 BR-83	4.736E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
20 BR-84	5.476E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
21 BR-85	2.531E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
22 RE-86	1.143E+05	0.000E-01	0.000E-01	1.983E+05	0.000E-01	0.000E-01	7.992E+03	0.000E-01	LIVER
23 RE-88	3.663E+02	0.000E-01	0.000E-01	5.624E+02	0.000E-01	0.000E-01	1.724E+01	0.000E-01	LIVER
24 RE-89	2.897E+02	0.000E-01	0.000E-01	3.452E+02	0.000E-01	0.000E-01	1.894E+00	0.000E-01	LIVER
25 SR-89	1.724E+04	0.000E-01	5.994E+05	0.000E-01	0.000E-01	2.157E+06	1.672E+05	0.000E-01	LUNG
26 SR-90	6.439E+06	0.000E-01	1.010E+08	0.000E-01	0.000E-01	1.476E+07	3.434E+05	0.000E-01	BONE
27 SR-91	4.589E+00	0.000E-01	1.214E+02	0.000E-01	0.000E-01	5.328E+04	1.739E+05	0.000E-01	GI-LLI
28 SR-92	5.254E-01	0.000E-01	1.310E+01	0.000E-01	0.000E-01	2.401E+04	2.424E+05	0.000E-01	GI-LLI
29 Y-90	1.106E+02	0.000E-01	4.107E+03	0.000E-01	0.000E-01	2.616E+05	2.679E+05	0.000E-01	LUNG
30 Y-91M	1.843E-02	0.000E-01	5.059E-01	0.000E-01	0.000E-01	2.812E+03	1.717E+03	0.000E-01	LUNG
31 Y-91	2.439E+04	0.000E-01	9.139E+05	0.000E-01	0.000E-01	2.627E+06	1.839E+05	0.000E-01	LUNG
32 Y-92	5.809E-01	0.000E-01	2.035E+01	0.000E-01	0.000E-01	2.390E+04	2.390E+05	0.000E-01	GI-LLI
33 Y-93	5.106E+00	0.000E-01	1.865E+02	0.000E-01	0.000E-01	7.437E+04	3.885E+05	0.000E-01	GI-LLI
34 ZR-95	3.700E+04	0.000E-01	1.899E+05	4.181E+04	5.957E+04	2.231E+06	6.105E+04	0.000E-01	LUNG
35 ZR-97	1.598E+01	0.000E-01	1.876E+02	2.716E+01	3.835E+01	1.132E+05	3.511E+05	0.000E-01	GI-LLI

TABLE 5 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 20

AGE : CHILD

PATHWAY : INHALATION

NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
36 NB-95	6.549E+03	0.000E-01	2.350E+04	9.176E+03	8.621E+03	6.142E+05	3.700E+04	6.549E+03	LUNG
37 NB-97	9.472E-03	0.000E-01	1.029E-01	2.601E-02	3.027E-02	1.110E+03	1.117E+02	0.000E-01	LUNG
38 MD-99	4.255E+01	0.000E-01	0.000E-01	1.724E+02	3.922E+02	1.354E+05	1.265E+05	0.000E-01	LUNG
39 TC-99M	5.772E-02	0.000E-01	1.780E-03	3.482E-03	5.069E-02	9.509E+02	4.810E+03	0.000E-01	GI-LLI
40 TC-101	1.077E-03	0.000E-01	8.103E-05	8.510E-05	1.450E-03	5.846E+02	1.632E+01	0.000E-01	LUNG
41 RU-103	1.073E+03	0.000E-01	2.868E+03	0.000E-01	7.030E+03	6.623E+05	4.477E+04	0.000E-01	LUNG
42 RU-105	5.550E-01	0.000E-01	1.528E+00	0.000E-01	1.343E+00	1.591E+04	9.953E+04	0.000E-01	GI-LLI
43 RU-106	1.691E+04	0.000E-01	1.362E+05	0.000E-01	1.839E+05	1.432E+07	4.292E+05	0.000E-01	LUNG
44 AG-110M	9.139E+03	0.000E-01	1.687E+04	1.140E+04	2.124E+04	5.476E+06	1.003E+05	0.000E-01	LUNG
45 CD-115M	2.942E+03	0.000E-01	0.000E-01	9.102E+04	7.326E+04	6.512E+05	1.775E+05	0.000E-01	LUNG
46 SB-124	5.735E+03	3.493E+01	1.443E+04	2.723E+02	0.000E-01	1.147E+06	1.880E+05	0.000E-01	LUNG
47 TE-125M	9.139E+02	1.924E+03	6.734E+03	2.327E+03	0.000E-01	4.773E+05	3.378E+04	0.000E-01	LUNG
48 TE-127M	3.027E+03	6.068E+03	2.486E+04	8.547E+03	6.364E+04	1.480E+06	7.141E+04	0.000E-01	LUNG
49 TE-127	6.105E-01	1.961E+00	2.771E+00	9.509E-01	7.067E+00	1.003E+04	5.624E+04	0.000E-01	GI-LLI
50 TE-129M	3.041E+03	6.327E+03	1.920E+04	6.845E+03	5.032E+04	1.761E+06	1.817E+05	0.000E-01	LUNG
51 TE-129	2.383E-02	7.141E-02	9.768E-02	3.497E-02	2.568E-01	2.934E+03	2.549E+04	0.000E-01	GI-LLI
52 TE-131M	5.069E+01	9.768E+01	1.343E+02	5.920E+01	3.996E+02	2.057E+05	3.078E+05	0.000E-01	GI-LLI
53 TE-131	6.586E-03	1.698E-02	2.172E-02	8.436E-03	5.883E-02	2.054E+03	1.332E+03	0.000E-01	LUNG
54 TE-132	2.634E+02	3.175E+02	4.810E+02	2.723E+02	1.772E+03	3.774E+05	1.376E+05	0.000E-01	LUNG
55 I-130	8.436E+03	1.846E+06	8.177E+03	1.639E+04	2.446E+04	0.000E-01	5.106E+03	0.000E-01	THYROID
56 I-131	2.727E+04	1.624E+07	4.810E+04	4.810E+04	7.891E+04	0.000E-01	2.842E+03	0.000E-01	THYROID
57 I-132	1.876E+03	1.935E+05	2.116E+03	4.070E+03	6.253E+03	0.000E-01	3.201E+03	0.000E-01	THYROID
58 I-133	7.696E+03	3.818E+06	1.658E+04	2.031E+04	3.378E+04	0.000E-01	5.476E+03	0.000E-01	THYROID
59 I-134	9.953E+02	5.069E+04	1.173E+03	2.161E+03	3.300E+03	0.000E-01	9.546E+02	0.000E-01	THYROID
60 I-135	4.144E+03	7.918E+05	4.921E+03	8.732E+03	1.339E+04	0.000E-01	4.440E+03	0.000E-01	THYROID
61 CS-134	2.246E+05	0.000E-01	6.512E+05	1.011E+06	3.304E+05	1.210E+05	3.848E+03	0.000E-01	LIVER
62 CS-136	1.162E+05	0.000E-01	6.512E+04	1.709E+05	9.546E+04	1.454E+04	4.181E+03	0.000E-01	LIVER
63 CS-137	1.284E+05	0.000E-01	9.065E+05	8.251E+05	2.823E+05	1.040E+05	3.619E+03	0.000E-01	BONE
64 CS-138	5.550E+02	0.000E-01	6.327E+02	8.399E+02	6.216E+02	6.808E+01	2.697E+02	0.000E-01	LIVER
65 CS-139	5.143E+01	0.000E-01	9.472E+01	1.343E+02	1.129E+02	1.051E+01	0.000E-01	0.000E-01	LIVER
66 BA-139	5.365E-02	0.000E-01	1.843E+00	9.842E-04	8.621E-04	5.772E+03	5.772E+04	0.000E-01	GI-LLI
67 BA-140	4.329E+03	0.000E-01	7.400E+04	6.475E+01	2.113E+01	1.743E+06	1.018E+05	0.000E-01	LUNG
68 BA-141	6.364E-03	0.000E-01	1.957E-01	1.092E-04	9.472E-05	2.919E+03	2.753E+02	0.000E-01	LUNG
69 BA-142	2.790E-03	0.000E-01	4.995E-02	3.600E-05	2.912E-05	1.643E+03	2.742E+00	0.000E-01	LUNG
70 LA-140	7.548E+01	0.000E-01	6.438E+02	2.250E+02	0.000E-01	1.828E+05	2.257E+05	0.000E-01	GI-LLI



TABLE 5 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 20

AGE : CHILD

PATHWAY : INHALATION

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
71	LA-142	1.291E-01	0.000E-01	1.295E+00	4.107E-01	0.000E-01	8.695E+03	7.585E+04	1.291E-01	GI-LLI
72	CE-141	2.897E+03	0.000E-01	3.922E+04	1.954E+04	8.547E+03	5.439E+05	5.661E+04	0.000E-01	LUNG
73	CE-143	2.875E+01	0.000E-01	3.659E+02	1.987E+02	8.362E+01	1.154E+05	1.273E+05	0.000E-01	GI-LLI
74	CE-144	3.615E+05	0.000E-01	6.771E+06	2.116E+06	1.173E+06	1.195E+07	3.885E+05	0.000E-01	LUNG
75	FR-143	9.139E+02	0.000E-01	1.846E+04	5.550E+03	3.001E+03	4.329E+05	9.731E+04	0.000E-01	LUNG
76	FR-144	2.997E-03	0.000E-01	5.957E-02	1.846E-02	9.768E-03	1.565E+03	1.968E+02	0.000E-01	LUNG
77	ND-147	6.808E+02	0.000E-01	1.080E+04	8.732E+03	4.810E+03	3.282E+05	8.214E+04	0.000E-01	LUNG
78	W-185	2.500E+01	0.000E-01	7.215E+02	2.494E+02	0.000E-01	2.061E+05	3.959E+04	0.000E-01	LUNG
79	W-187	4.329E+00	0.000E-01	1.632E+01	9.657E+00	0.000E-01	4.107E+04	9.102E+04	0.000E-01	GI-LLI
80	U-235	2.266E+06	0.000E-01	3.700E+07	0.000E-01	8.658E+06	1.813E+08	1.791E+05	0.000E-01	LUNG
81	U-238	2.098E+06	0.000E-01	3.545E+07	0.000E-01	8.066E+06	1.695E+08	3.611E+05	0.000E-01	LUNG
82	NP-239	2.350E+01	0.000E-01	4.662E+02	3.345E+01	9.731E+01	5.809E+04	6.401E+04	0.000E-01	GI-LLI

TABLE 5 (CONT)  
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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 20

AGE : INFANT  
PATHWAY : INHALATION

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1	H-3	6.468E+02	6.468E+02	0.000E-01	6.468E+02	6.468E+02	6.468E+02	6.468E+02	6.468E+02	W. BODY
2	C-14	5.306E+03	5.306E+03	2.646E+04	5.306E+03	5.306E+03	5.306E+03	5.306E+03	5.306E+03	BONE
3	Na-24	1.056E+04	1.056E+04	1.056E+04	1.056E+04	1.056E+04	1.056E+04	1.056E+04	1.056E+04	W. BODY
4	P-32	7.742E+04	0.000E-01	2.030E+06	1.124E+05	0.000E-01	0.000E-01	1.610E+04	0.000E-01	BONE
5	SC-46	4.354E+04	0.000E-01	7.714E+04	1.498E+05	1.400E+05	0.000E-01	4.522E+04	0.000E-01	LIVER
6	CR-51	8.946E+01	5.754E+01	0.000E-01	0.000E-01	1.323E+01	1.284E+04	3.570E+02	0.000E-01	LUNG
7	MN-54	4.984E+03	0.000E-01	0.000E-01	1.652E+04	4.984E+03	9.996E+05	7.056E+03	0.000E-01	LUNG
8	MN-56	2.212E-01	0.000E-01	0.000E-01	1.540E+00	1.100E+00	1.253E+04	7.158E+04	0.000E-01	GI-LLI
9	FE-55	3.332E+03	0.000E-01	1.974E+04	1.175E+04	0.000E-01	8.694E+04	1.095E+03	0.000E-01	LUNG
10	FE-59	9.478E+03	0.000E-01	1.357E+04	2.352E+04	0.000E-01	1.015E+06	2.478E+04	0.000E-01	LUNG
11	CO-58	1.820E+03	0.000E-01	0.000E-01	1.219E+03	0.000E-01	7.770E+05	1.113E+04	0.000E-01	LUNG
12	CO-60	1.177E+04	0.000E-01	0.000E-01	8.022E+03	0.000E-01	4.508E+06	3.192E+04	0.000E-01	LUNG
13	NI-59	9.479E+02	0.000E-01	5.684E+03	2.044E+03	0.000E-01	1.149E+04	9.554E+02	0.000E-01	LUNG
14	NI-63	1.151E+04	0.000E-01	3.383E+05	2.044E+04	0.000E-01	2.083E+05	2.422E+03	0.000E-01	BONE
15	NI-65	1.231E-01	0.000E-01	2.394E+00	2.842E-01	0.000E-01	8.120E+03	5.012E+04	0.000E-01	GI-LLI
16	CU-64	7.742E-01	0.000E-01	0.000E-01	1.876E+00	3.976E+00	9.296E+03	1.498E+04	0.000E-01	GI-LLI
17	ZN-65	3.108E+04	0.000E-01	1.932E+04	6.258E+04	3.248E+04	6.468E+05	5.138E+04	0.000E-01	LUNG
18	ZN-69	7.182E-03	0.000E-01	5.390E-02	9.674E-02	4.018E-02	1.470E+03	1.322E+04	0.000E-01	GI-LLI
19	BR-83	3.808E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
20	BR-84	4.004E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
21	BR-85	2.044E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
22	KR-86	8.820E+04	0.000E-01	0.000E-01	1.904E+05	0.000E-01	0.000E-01	3.038E+03	0.000E-01	LIVER
23	KR-88	2.870E+02	0.000E-01	0.000E-01	5.572E+02	0.000E-01	0.000E-01	3.588E+02	0.000E-01	LIVER
24	KR-89	2.058E+02	0.000E-01	0.000E-01	3.206E+02	0.000E-01	0.000E-01	6.818E+01	0.000E-01	LIVER
25	KR-89	1.141E+04	0.000E-01	3.976E+05	0.000E-01	0.000E-01	2.030E+06	6.392E+04	0.000E-01	LUNG
26	KR-90	2.590E+06	0.000E-01	4.086E+07	0.000E-01	0.000E-01	1.124E+07	1.310E+05	0.000E-01	BONE
27	KR-91	3.458E+00	0.000E-01	9.562E+01	0.000E-01	0.000E-01	5.264E+04	7.336E+04	0.000E-01	GI-LLI
28	KR-92	3.906E-01	0.000E-01	1.050E+01	0.000E-01	0.000E-01	2.380E+04	1.400E+05	0.000E-01	GI-LLI
29	Y-90	8.820E+01	0.000E-01	3.290E+03	0.000E-01	0.000E-01	2.688E+05	1.010E+05	0.000E-01	LUNG
30	Y-91M	1.386E-02	0.000E-01	4.074E-01	0.000E-01	0.000E-01	2.786E+03	2.352E+03	0.000E-01	LUNG
31	Y-91	1.538E+04	0.000E-01	5.880E+05	0.000E-01	0.000E-01	2.450E+06	7.028E+04	0.000E-01	LUNG
32	Y-92	4.606E-01	0.000E-01	1.638E+01	0.000E-01	0.000E-01	2.450E+04	1.266E+05	0.000E-01	GI-LLI
33	Y-93	4.071E+00	0.000E-01	1.498E+02	0.000E-01	0.000E-01	7.644E+04	1.666E+05	0.000E-01	GI-LLI
34	ZR-95	2.030E+04	0.000E-01	1.151E+05	2.786E+04	3.108E+04	1.750E+06	2.170E+04	0.000E-01	LUNG
35	ZR-97	1.170E+01	0.000E-01	1.498E+02	2.562E+01	2.590E+01	1.103E+05	1.400E+05	0.000E-01	GI-LLI



TABLE 5 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 20

AGE : INFANT  
PATHWAY : INHALATION

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
36	NB-95	3.780E+03	0.000E-01	1.558E+04	6.426E+03	4.718E+03	4.788E+05	1.267E+04	3.780E+03	LUNG
37	NB-97	3.584E-03	0.000E-01	3.392E-02	9.842E-03	1.145E-02	4.200E+02	4.228E+01	0.000E-01	LUNG
38	MO-99	3.234E+01	0.000E-01	0.000E-01	1.652E+02	2.646E+02	1.348E+05	4.872E+04	0.000E-01	LUNG
39	TC-99M	3.724E-02	0.000E-01	1.397E-03	2.884E-03	3.108E-02	8.106E+02	2.030E+03	0.000E-01	GI-LLI
40	TC-101	8.120E-04	0.000E-01	6.510E-05	8.232E-05	9.786E-04	5.838E+02	8.442E+02	0.000E-01	GI-LLI
41	RU-103	6.790E+02	0.000E-01	2.016E+03	0.000E-01	4.242E+03	5.516E+05	1.610E+04	0.000E-01	LUNG
42	RU-105	4.102E-01	0.000E-01	1.224E+00	0.000E-01	8.988E-01	1.558E+04	4.844E+04	0.000E-01	GI-LLI
43	RU-106	1.088E+04	0.000E-01	8.680E+04	0.000E-01	1.065E+05	1.156E+07	1.638E+05	0.000E-01	LUNG
44	AG-110M	4.998E+03	0.000E-01	9.982E+03	7.224E+03	1.092E+04	3.668E+06	3.304E+04	0.000E-01	LUNG
45	CD-115M	1.113E+03	0.000E-01	0.000E-01	3.444E+04	2.772E+04	2.464E+05	6.720E+04	0.000E-01	LUNG
46	SB-124	2.170E+03	1.322E+01	5.460E+03	1.030E+02	0.000E-01	4.340E+05	7.112E+04	0.000E-01	LUNG
47	TE-125M	6.580E+02	1.624E+03	4.760E+03	1.988E+03	0.000E-01	4.466E+05	1.291E+04	0.000E-01	LUNG
48	TE-127M	2.072E+03	4.872E+03	1.666E+04	6.902E+03	3.752E+04	1.312E+06	2.730E+04	0.000E-01	LUNG
49	TE-127	4.886E-01	1.848E+00	2.226E+00	9.534E-01	4.858E+00	1.035E+04	2.436E+04	0.000E-01	GI-LLI
50	TE-129M	2.226E+03	5.474E+03	1.414E+04	6.090E+03	3.178E+04	1.680E+06	6.902E+04	0.000E-01	LUNG
51	TE-129	1.876E-02	6.748E-02	7.882E-02	3.472E-02	1.750E-01	2.996E+03	2.632E+04	0.000E-01	GI-LLI
52	TE-131M	3.626E+01	8.932E+01	1.067E+02	5.502E+01	2.646E+02	1.988E+05	1.191E+05	0.000E-01	LUNG
53	TE-131	4.998E-03	1.592E-02	1.736E-02	8.218E-03	3.990E-02	2.058E+03	8.218E+03	0.000E-01	GI-LLI
54	TE-132	1.764E+02	2.786E+02	3.724E+02	2.366E+02	1.035E+03	3.402E+05	4.410E+04	0.000E-01	LUNG
55	I-130	5.572E+03	1.596E+06	6.356E+03	1.387E+04	1.526E+04	0.000E-01	1.986E+03	0.000E-01	THYROID
56	I-131	1.960E+04	1.484E+07	3.794E+04	4.438E+04	5.180E+04	0.000E-01	1.058E+03	0.000E-01	THYROID
57	I-132	1.259E+03	1.694E+05	1.694E+03	3.542E+03	3.948E+03	0.000E-01	1.904E+03	0.000E-01	THYROID
58	I-133	5.600E+03	3.556E+06	1.324E+04	1.918E+04	2.240E+04	0.000E-01	2.156E+03	0.000E-01	THYROID
59	I-134	6.650E+02	4.452E+04	9.212E+02	1.876E+03	2.086E+03	0.000E-01	1.289E+03	0.000E-01	THYROID
60	I-135	2.772E+03	6.958E+05	3.864E+03	7.602E+03	8.470E+03	0.000E-01	1.834E+03	0.000E-01	THYROID
61	CS-134	7.448E+04	0.000E-01	3.962E+05	7.028E+05	1.904E+05	7.966E+04	1.334E+03	0.000E-01	LIVER
62	CS-136	5.292E+04	0.000E-01	4.830E+04	1.345E+05	5.642E+04	1.176E+04	1.428E+03	0.000E-01	LIVER
63	CS-137	4.550E+04	0.000E-01	5.488E+05	6.118E+05	1.722E+05	7.126E+04	1.334E+03	0.000E-01	LIVER
64	CS-138	3.976E+02	0.000E-01	5.054E+02	7.812E+02	4.102E+02	6.538E+01	8.761E+02	0.000E-01	GI-LLI
65	CS-139	1.946E+01	0.000E-01	3.584E+01	5.082E+01	4.270E+01	3.976E+00	0.000E-01	0.000E-01	LIVER
66	BA-139	4.298E-02	0.000E-01	1.484E+00	9.842E-04	5.922E-04	5.950E+03	5.096E+04	0.000E-01	GI-LLI
67	BA-140	2.898E+03	0.000E-01	5.600E+04	5.600E+01	1.343E+01	1.596E+06	3.836E+04	0.000E-01	LUNG
68	BA-141	4.970E-03	0.000E-01	1.568E-01	1.078E-04	6.496E-05	2.968E+03	4.746E+03	0.000E-01	GI-LLI
69	BA-142	1.960E-03	0.000E-01	3.976E-02	3.304E-05	1.904E-05	1.554E+03	6.930E+02	0.000E-01	LUNG
70	LA-140	5.152E+01	0.000E-01	5.054E+02	2.062E+02	0.000E-01	1.680E+05	8.484E+04	0.000E-01	LUNG

TABLE 5 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 20

AGE : INFANT

PATHWAY : INHALATION

NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
71 LA-142	9.044E-02	0.000E-01	1.030E+00	3.766E-01	0.000E-01	8.218E+03	5.950E+04	9.044E-02	GI-LLI
72 CE-141	1.988E+03	0.000E-01	2.772E+04	1.666E+04	5.250E+03	5.166E+05	2.156E+04	0.000E-01	LUNG
73 CE-143	2.212E+01	0.000E-01	2.926E+02	1.932E+02	5.642E+01	1.162E+05	4.970E+04	0.000E-01	LUNG
74 CE-144	1.764E+05	0.000E-01	3.192E+06	1.211E+06	5.376E+05	9.842E+06	1.481E+05	0.000E-01	LUNG
75 PR-143	6.986E+02	0.000E-01	1.400E+04	5.236E+03	1.974E+03	4.326E+05	3.724E+04	0.000E-01	LUNG
76 PR-144	2.408E-03	0.000E-01	4.788E-02	1.848E-02	6.720E-03	1.610E+03	4.284E+03	0.000E-01	GI-LLI
77 ND-147	4.998E+02	0.000E-01	7.939E+03	8.134E+03	3.150E+03	3.220E+05	3.122E+04	0.000E-01	LUNG
78 W-185	9.534E+00	0.000E-01	2.730E+02	9.058E+01	0.000E-01	7.798E+04	1.498E+04	0.000E-01	LUNG
79 W-187	3.122E+00	0.000E-01	1.296E+01	9.016E+00	0.000E-01	3.962E+04	3.556E+04	0.000E-01	LUNG
80 U-235	8.498E+05	0.000E-01	1.400E+07	0.000E-01	3.276E+06	6.860E+07	6.776E+04	0.000E-01	LUNG
81 U-238	7.938E+05	0.000E-01	1.341E+07	0.000E-01	3.052E+06	6.412E+07	1.412E+05	0.000E-01	LUNG
82 NF-239	1.876E+01	0.000E-01	3.710E+02	3.318E+01	6.622E+01	5.950E+04	2.492E+04	0.000E-01	LUNG

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

(for section 2.2.2.b)

AGE : ADULT

PATHWAY : COW MILK

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1	H-3	7.629E+02	7.629E+02	0.000E-01	7.629E+02	7.629E+02	7.629E+02	7.629E+02	7.629E+02	W. BODY
2	C-14	7.263E+04	7.263E+04	3.632E+05	7.263E+04	7.263E+04	7.263E+04	7.263E+04	7.263E+04	BONE
3	NA-24	2.459E+06	2.459E+06	2.459E+06	2.459E+06	2.459E+06	2.459E+06	2.459E+06	2.459E+06	W. BODY
4	F-32	6.610E+08	0.000E-01	1.710E+10	1.063E+09	0.000E-01	0.000E-01	1.923E+09	0.000E-01	BONE
5	SC-46	1.013E+02	0.000E-01	1.794E+02	3.517E+02	3.256E+02	0.000E-01	1.697E+06	0.000E-01	GI-LLI
6	CR-51	2.860E+04	1.709E+04	0.000E-01	0.000E-01	6.300E+03	3.795E+04	7.193E+06	0.000E-01	GI-LLI
7	AN-54	1.605E+06	0.000E-01	0.000E-01	8.414E+06	2.504E+06	0.000E-01	2.577E+07	0.000E-01	GI-LLI
8	HI-56	7.324E-04	0.000E-01	0.000E-01	4.129E-03	5.242E-03	0.000E-01	1.318E-01	0.000E-01	GI-LLI
9	FE-55	4.045E+06	0.000E-01	2.511E+07	1.735E+07	0.00E-01	9.480E+06	9.954E+06	0.000E-01	BONE
10	FE-59	2.675E+07	0.000E-01	2.969E+07	6.978E+07	0.000E-01	1.950E+07	2.323E+08	0.000E-01	GI-LLI
11	CO-58	1.059E+07	0.000E-01	0.000E-01	4.724E+06	0.000E-01	0.000E-01	9.575E+07	0.000E-01	GI-LLI
12	CO-60	3.619E+07	0.000E-01	0.000E-01	1.641E+07	0.000E-01	0.000E-01	3.032E+08	0.000E-01	GI-LLI
13	NI-59	8.441E+07	0.000E-01	5.059E+08	1.735E+08	0.000E-01	0.000E-01	3.573E+07	0.000E-01	BONE
14	HI-63	2.257E+08	0.000E-01	6.729E+09	4.654E+08	0.000E-01	0.000E-01	9.731E+07	0.000E-01	BONE
15	HI-65	2.195E-02	0.000E-01	3.702E-01	4.810E-02	0.000E-01	0.000E-01	1.220E+00	0.000E-01	GI-LLI
16	CU-64	1.108E+04	0.000E-01	0.000E-01	2.361E+04	5.552E+04	0.000E-01	2.012E+06	0.000E-01	GI-LLI
17	ZN-65	1.973E+09	0.000E-01	1.371E+09	4.363E+09	2.918E+09	0.000E-01	2.749E+09	0.000E-01	LIVER
18	ZH-69	6.506E-13	0.000E-01	4.892E-12	9.356E-12	6.079E-12	0.000E-01	1.406E-12	0.000E-01	LIVER
19	BR-83	1.020E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	1.469E-01	0.000E-01	GI-LLI
20	BR-84	1.419E-23	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	1.114E-28	0.000E-01	W. BODY
21	BR-85	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
22	KB-86	1.207E+09	0.000E-01	0.000E-01	2.591E+09	0.000E-01	0.000E-01	5.109E+08	0.000E-01	LIVER
23	KB-88	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
24	KB-89	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
25	SR-89	4.162E+07	0.000E-01	1.450E+09	0.000E-01	0.000E-01	0.000E-01	2.320E+08	0.000E-01	BONE
26	SR-90	1.146E+10	0.000E-01	4.680E+10	0.000E-01	0.000E-01	0.000E-01	1.352E+09	0.000E-01	BONE
27	SR-91	1.160E+03	0.000E-01	2.872E+04	0.000E-01	0.000E-01	0.000E-01	1.368E+05	0.000E-01	GI-LLI
28	SR-92	2.092E-02	0.000E-01	4.836E-01	0.000E-01	0.000E-01	0.000E-01	9.582E+03	0.000E-01	GI-LLI
29	Y-90	1.903E+00	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	7.524E+05	0.000E-01	GI-LLI
30	Y-91M	2.485E-21	0.000E-01	6.418E-20	0.000E-01	0.000E-01	0.000E-01	1.895E-19	0.000E-01	GI-LLI
31	Y-91	2.296E+02	0.000E-01	8.589E+03	0.000E-01	0.000E-01	0.000E-01	4.727E+06	0.000E-01	GI-LLI
32	Y-92	1.628E-05	0.000E-01	5.568E-05	0.000E-01	0.000E-01	0.000E-01	9.753E-01	0.000E-01	GI-LLI
33	Y-93	6.398E-03	0.000E-01	2.317E-01	0.000E-01	0.000E-01	0.000E-01	7.349E+03	0.000E-01	GI-LLI
34	ZR-95	2.059E+02	0.000E-01	9.483E+02	3.041E+02	4.773E+02	0.000E-01	9.639E+05	0.000E-01	GI-LLI
35	ZR-97	3.989E-02	0.000E-01	4.323E-01	8.724E-02	1.316E-01	0.000E-01	2.702E+04	0.000E-01	GI-LLI

TABLE 6 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : ADULT  
PATHWAY : COW MILK

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
36	NB-95	2.468E+04	0.000E-01	8.253E+04	4.591E+04	4.538E+04	0.000E-01	2.786E+08	0.000E-01	GI-LLI
37	NB-97	5.419E-13	0.000E-01	5.880E-12	1.484E-12	1.731E-12	0.000E-01	5.475E-09	0.000E-01	GI-LLI
38	MO-99	4.705E+06	0.000E-01	0.000E-01	2.473E+07	5.600E+07	0.000E-01	5.732E+07	0.000E-01	GI-LLI
39	TC-99H	1.216E+02	0.000E-01	3.378E+00	9.545E+00	1.450E+02	4.577E+00	5.648E+03	0.000E-01	GI-LLI
40	TC-101	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
41	RU-103	4.398E+02	0.000E-01	1.021E+03	0.000E-01	3.894E+03	0.000E-01	1.192E+05	0.000E-01	GI-LLI
42	RU-105	3.425E-04	0.000E-01	8.676E-04	0.000E-01	1.121E-02	0.000E-01	5.307E-01	0.000E-01	GI-LLI
43	RU-106	2.582E+03	0.000E-01	2.040E+04	0.000E-01	3.939E+04	0.000E-01	1.321E+06	0.000E-01	GI-LLI
44	AG-110M	3.200E+07	0.000E-01	5.825E+07	5.389E+07	1.059E+08	0.000E-01	2.199E+10	0.000E-01	GI-LLI
45	CD-115M	3.981E+04	0.000E-01	0.000E-01	1.246E+06	9.894E+05	0.000E-01	5.240E+07	0.000E-01	GI-LLI
46	SB-124	1.021E+07	6.243E+04	2.584E+07	4.873E+05	0.000E-01	2.005E+07	7.310E+08	0.000E-01	GI-LLI
47	TE-125M	2.183E+06	4.702E+06	1.630E+07	5.905E+06	6.629E+07	0.000E-01	6.507E+07	0.000E-01	KIDNEY
48	TE-127H	5.579E+06	1.170E+07	4.578E+07	1.636E+07	1.860E+08	0.000E-01	1.535E+08	0.000E-01	KIDNEY
49	TE-127	1.442E+02	1.937E+02	6.663E+02	2.393E+02	2.714E+03	0.000E-01	5.258E+04	0.000E-01	GI-LLI
50	TE-129M	9.511E+06	2.064E+07	6.009E+07	2.242E+07	2.508E+08	0.000E-01	3.026E+08	0.000E-01	GI-LLI
51	TE-129	9.263E-11	2.584E-10	3.367E-10	1.265E-10	1.415E-09	0.000E-01	2.541E-10	0.000E-01	KIDNEY
52	TE-131M	1.470E+05	2.795E+05	3.608E+05	1.764E+05	1.787E+06	0.000E-01	1.752E+07	0.000E-01	GI-LLI
53	TE-131	0.000E-01	0.000E-01	0.000E-01	0.000E-01	1.913E-32	0.000E-01	0.000E-01	0.000E-01	KIDNEY
54	TE-132	1.452E+06	1.709E+06	2.392E+06	1.547E+06	1.490E+07	0.000E-01	7.319E+07	0.000E-01	GI-LLI
55	I-130	4.980E+05	1.070E+08	4.278E+05	1.262E+06	1.959E+06	0.000E-01	1.086E+06	0.000E-01	THYROID
56	I-131	2.428E+08	1.389E+11	2.963E+08	4.237E+08	7.264E+08	0.000E-01	1.118E+09	0.000E-01	THYROID
57	I-132	1.405E-01	1.405E+01	1.501E-01	4.015E-01	6.397E-01	0.000E-01	7.543E-02	0.000E-01	THYROID
58	I-133	2.056E+06	9.910E+08	3.877E+06	6.743E+06	1.177E+07	0.000E-01	6.061E+06	0.000E-01	THYROID
59	I-134	1.834E-12	8.985E-11	1.887E-12	5.128E-12	8.155E-12	0.000E-01	4.449E-15	0.000E-01	THYROID
60	I-135	1.222E+04	2.184E+06	1.265E+04	3.312E+04	5.311E+04	0.000E-01	3.741E+04	0.000E-01	THYROID
61	CS-134	1.100E+10	0.000E-01	5.652E+09	1.345E+10	4.353E+09	1.445E+09	2.354E+08	0.000E-01	LIVER
62	CS-136	7.425E+08	0.000E-01	2.613E+08	1.032E+09	5.739E+08	7.867E+07	1.172E+08	0.000E-01	LIVER
63	CS-137	6.613E+09	0.000E-01	7.381E+09	1.009E+10	3.427E+09	1.139E+09	1.954E+08	0.000E-01	LIVER
64	CS-138	1.013E-23	0.000E-01	1.036E-23	2.045E-23	1.503E-23	1.484E-24	8.724E-29	0.000E-01	LIVER
65	CS-139	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
66	BA-139	1.298E-09	0.000E-01	4.434E-09	3.159E-11	2.953E-11	1.792E-11	7.863E-09	0.000E-01	GI-LLI
67	BA-140	1.760E+06	0.000E-01	2.686E+07	3.374E+04	1.147E+04	1.932E+04	5.531E+07	0.000E-01	GI-LLI
68	BA-141	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
69	BA-142	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
70	LA-140	6.025E-01	0.000E-01	4.523E+00	2.280E+00	0.000E-01	0.000E-01	1.674E+05	0.000E-01	GI-LLI



TABLE 6 (CONT)  
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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : ADULT PATHWAY : COM MILK	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
71 LA-142	1.039E-12	0.000E-01	9.161E-12	4.165E-12	0.000E-01	0.000E-01	3.042E-08	0.000E-01	GI-LLI
72 CE-141	3.715E+02	0.000E-01	4.844E+03	3.276E+03	1.521E+03	0.000E-01	1.252E+07	0.000E-01	GI-LLI
73 CE-143	3.406E+00	0.000E-01	4.162E+01	3.078E+04	1.355E+01	0.000E-01	1.150E+06	0.000E-01	GI-LLI
74 CE-144	1.920E+04	0.000E-01	3.577E+05	1.495E+05	8.868E+04	0.000E-01	1.209E+08	0.000E-01	GI-LLI
75 FR-143	7.823E+00	0.000E-01	1.578E+02	6.331E+01	3.654E+01	0.000E-01	6.914E+05	0.000E-01	GI-LLI
76 FR-144	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
77 MD-147	6.509E+00	0.000E-01	9.412E+01	1.088E+02	6.359E+01	0.000E-01	5.222E+05	0.000E-01	GI-LLI
78 W-185	4.539E+04	0.000E-01	1.298E+06	4.315E+05	0.000E-01	0.000E-01	4.987E+07	0.000E-01	GI-LLI
79 W-187	1.915E+03	0.000E-01	6.551E+03	5.476E+03	0.000E-01	0.000E-01	1.794E+06	0.000E-01	GI-LLI
80 U-235	1.878E+08	0.000E-01	3.099E+09	0.000E-01	7.226E+08	0.000E-01	3.019E+08	0.000E-01	BONE
81 U-238	1.758E+08	0.000E-01	2.964E+09	0.000E-01	6.763E+08	0.000E-01	6.415E+08	0.000E-01	BONE
82 HP-239	1.979E-01	0.000E-01	3.652E+00	3.571E-01	1.120E+00	0.000E-01	7.355E+04	0.000E-01	GI-LLI

TABLE 6 (CONT)  
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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : TEEN  
PATHWAY : COW MILK

NO	ISOTOPE	M. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1	H-3	9.938E+02	9.938E+02	0.000E-01	9.938E+02	9.938E+02	9.938E+02	9.938E+02	9.938E+02	M. BODY
2	C-14	1.340E+05	1.340E+05	6.699E+05	1.340E+05	1.340E+05	1.340E+05	1.340E+05	1.340E+05	BONE
3	NA-24	4.294E+06	4.294E+06	4.294E+06	4.294E+06	4.294E+06	4.294E+06	4.294E+06	4.294E+06	M. BODY
4	P-32	1.223E+09	0.000E-01	3.155E+10	1.955E+09	0.000E-01	0.000E-01	2.652E+09	0.000E-01	BONE
5	SC-46	1.307E+02	0.000E-01	2.315E+02	4.538E+02	4.202E+02	0.000E-01	2.187E+06	0.000E-01	GI-LLI
6	CR-51	4.994E+04	2.775E+04	0.000E-01	0.000E-01	1.095E+04	7.131E+04	8.393E+03	0.000E-01	GI-LLI
7	MN-54	2.779E+06	0.000E-01	0.000E-01	1.402E+07	4.181E+06	0.000E-01	2.874E+07	0.000E-01	GI-LLI
8	NH-56	1.302E-03	0.000E-01	0.000E-01	7.320E-03	9.245E-03	0.000E-01	4.819E-01	0.000E-01	GI-LLI
9	FE-55	7.364E+06	0.000E-01	4.454E+07	3.159E+07	0.000E-01	2.003E+07	1.337E+07	0.000E-01	BONE
10	FE-59	4.670E+07	0.000E-01	5.182E+07	1.209E+08	0.000E-01	3.813E+07	2.860E+08	0.000E-01	GI-LLI
11	CO-58	1.833E+07	0.000E-01	0.000E-01	7.953E+06	0.000E-01	0.000E-01	1.098E+08	0.000E-01	GI-LLI
12	CO-50	6.262E+07	0.000E-01	0.000E-01	2.780E+07	0.000E-01	0.000E-01	3.621E+08	0.000E-01	GI-LLI
13	NI-59	1.059E+08	0.000E-01	6.528E+08	2.238E+08	0.000E-01	0.000E-01	4.610E+07	0.000E-01	BONE
14	NI-63	4.007E+08	0.000E-01	1.182E+10	8.348E+08	0.000E-01	0.000E-01	1.329E+08	0.000E-01	BONE
15	HI-65	3.945E-02	0.000E-01	6.777E-01	8.659E-02	0.000E-01	0.000E-01	4.655E+03	0.000E-01	GI-LLI
16	CU-64	1.979E+04	0.000E-01	0.000E-01	4.206E+04	1.054E+05	0.000E-01	3.232E+06	0.000E-01	GI-LLI
17	ZN-65	3.411E+09	0.000E-01	2.106E+09	7.312E+09	4.680E+09	0.000E-01	3.097E+09	0.000E-01	LIVER
18	ZN-69	1.201E-12	0.000E-01	9.008E-12	1.718E-11	1.121E-11	0.000E-01	3.152E-11	0.000E-01	GI-LLI
19	BR-83	1.879E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	M. BODY
20	BR-84	2.537E-23	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	M. BODY
21	BR-95	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	M. BODY
22	BR-86	2.219E+09	0.000E-01	0.000E-01	4.723E+09	0.000E-01	0.000E-01	6.989E+08	0.000E-01	LIVER
23	KB-88	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	M. BODY
24	RB-89	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	M. BODY
25	SR-89	7.655E+07	0.000E-01	2.673E+09	0.000E-01	0.000E-01	0.000E-01	3.184E+08	0.000E-01	BONE
26	SR-90	1.633E+10	0.000E-01	6.412E+10	0.000E-01	0.000E-01	0.000E-01	1.856E+09	0.000E-01	BONE
27	SR-91	2.098E+03	0.000E-01	5.274E+04	0.000E-01	0.000E-01	0.000E-01	2.392E+05	0.000E-01	GI-LLI
28	SR-92	3.773E-02	0.000E-01	8.852E-01	0.000E-01	0.000E-01	0.000E-01	2.255E+01	0.000E-01	GI-LLI
29	Y-90	3.512E+00	0.000E-01	1.304E+02	0.000E-01	0.000E-01	0.000E-01	1.075E+06	0.000E-01	GI-LLI
30	Y-91H	4.492E-21	0.000E-01	1.175E-19	0.000E-01	0.000E-01	0.000E-01	5.548E-18	0.000E-01	GI-LLI
31	Y-91	4.236E+02	0.000E-01	1.590E+04	0.000E-01	0.000E-01	0.000E-01	6.476E+03	0.000E-01	GI-LLI
32	Y-92	2.976E-06	0.000E-01	1.029E-04	0.000E-01	0.000E-01	0.000E-01	2.823E+00	0.000E-01	GI-LLI
33	Y-93	1.171E-02	0.000E-01	4.272E-01	0.000E-01	0.000E-01	0.000E-01	1.305E+04	0.000E-01	GI-LLI
34	ZR-95	3.598E+02	0.000E-01	1.658E+03	5.233E+02	4.065E+09	0.000E-01	1.208E+06	0.000E-01	KIDNEY
35	ZR-97	7.172E-02	0.000E-01	7.870E-01	1.557E-01	2.361E-01	0.000E-01	4.217E+04	0.000E-01	GI-LLI



TABLE 6 (CONT)  
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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : TEEN  
PATHWAY : COW MILK

NO	ISOTOPE	M. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
36	NB-95	4.297E+04	0.000E-01	1.407E+05	7.807E+04	7.567E+04	0.000E-01	3.339E+08	0.000E-01	GI-LLI
37	NB-97	6.992E-13	0.000E-01	7.587E-12	1.915E-12	2.234E-12	0.000E-01	7.054E-09	0.000E-01	GI-LLI
38	MD-99	8.514E+06	0.000E-01	0.000E-01	4.464E+07	1.022E+08	0.000E-01	7.996E+07	0.000E-01	KIDNEY
39	TC-99M	2.117E+02	0.000E-01	5.858E+00	1.634E+01	2.435E+02	9.070E+00	1.073E+04	0.000E-01	GI-LLI
40	TC-101	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	M. BODY
41	RU-103	7.751E+02	0.000E-01	1.816E+03	0.000E-01	6.401E+03	0.000E-01	1.517E+05	0.000E-01	GI-LLI
42	RU-105	6.150E-04	0.000E-01	1.585E-03	0.000E-01	1.999E-02	0.000E-01	1.279E+00	0.000E-01	GI-LLI
43	RU-106	4.729E+03	0.000E-01	3.752E+04	0.000E-01	7.237E+04	0.000E-01	1.800E+06	0.000E-01	GI-LLI
44	OG-110M	5.543E+07	0.000E-01	9.659E+07	9.113E+07	1.738E+08	0.000E-01	2.560E+10	0.000E-01	GI-LLI
45	CB-115M	5.136E+04	0.000E-01	0.000E-01	1.607E+06	1.275E+06	0.000E-01	6.761E+07	0.000E-01	GI-LLI
46	SB-124	1.317E+07	8.053E+04	3.334E+07	6.289E+05	0.000E-01	2.584E+07	9.432E+09	0.000E-01	GI-LLI
47	TE-125M	4.019E+06	8.397E+06	3.006E+07	1.083E+07	0.000E-01	0.000E-01	8.857E+07	0.000E-01	GI-LLI
48	TE-127M	1.003E+07	2.067E+07	8.438E+07	2.973E+07	3.420E+08	0.000E-01	2.103E+08	0.000E-01	KIDNEY
49	TE-127	2.658E+02	8.520E+02	1.235E+03	4.377E+02	5.063E+03	0.000E-01	9.536E+04	0.000E-01	GI-LLI
50	TE-129M	1.740E+07	3.547E+07	1.099E+08	4.079E+07	4.595E+08	0.000E-01	4.127E+08	0.000E-01	KIDNEY
51	TE-129	1.508E-10	4.428E-10	6.199E-10	2.311E-10	2.601E-09	0.000E-01	3.390E-09	0.000E-01	GI-LLI
52	TE-131M	2.627E+05	4.736E+05	6.566E+05	3.149E+05	3.783E+06	0.000E-01	2.527E+07	0.000E-01	GI-LLI
53	TE-131	0.000E-01	0.000E-01	0.000E-01	0.000E-01	3.490E-32	0.000E-01	0.000E-01	0.000E-01	KIDNEY
54	TE-132	2.548E+06	2.851E+06	4.275E+06	2.707E+06	2.597E+07	0.000E-01	8.574E+07	0.000E-01	GI-LLI
55	I-130	8.689E+05	1.774E+08	7.521E+05	2.174E+06	3.251E+06	0.000E-01	1.677E+06	0.000E-01	THYROID
56	I-131	4.043E+08	2.195E+11	5.376E+08	7.526E+08	1.296E+09	0.000E-01	1.489E+08	0.000E-01	THYROID
57	I-132	2.500E-01	2.347E+01	2.662E-01	6.935E-01	1.097E+00	0.000E-01	3.034E-01	0.000E-01	THYROID
58	I-133	3.663E+06	1.677E+09	7.080E+06	1.201E+07	2.106E+07	0.000E-01	9.088E+06	0.000E-01	THYROID
59	I-134	3.194E-12	1.482E-10	3.355E-12	8.892E-12	1.402E-11	0.000E-01	1.172E-13	0.000E-01	THYROID
60	I-135	2.144E+04	3.721E+05	2.248E+04	5.785E+04	9.137E+04	0.000E-01	6.411E+04	0.000E-01	THYROID
61	CS-134	1.072E+10	0.000E-01	9.815E+09	2.310E+10	7.340E+09	2.802E+09	2.873E+08	0.000E-01	LIVER
62	CS-136	1.176E+09	0.000E-01	4.449E+08	1.750E+09	9.529E+08	1.502E+08	1.409E+08	0.000E-01	LIVER
63	CS-137	6.202E+09	0.000E-01	1.239E+10	1.781E+10	6.059E+09	2.354E+09	2.533E+08	0.000E-01	LIVER
64	CS-138	1.804E-23	0.000E-01	1.879E-23	3.667E-23	2.663E-23	3.099E-24	1.637E-25	0.000E-01	LIVER
65	CS-139	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	M. BODY
66	BA-139	2.337E-09	0.000E-01	8.199E-08	5.769E-11	5.439E-11	3.976E-11	7.314E-07	0.000E-01	GI-LLI
67	BA-140	3.124E+06	0.000E-01	4.849E+07	5.941E+04	2.015E+04	3.995E+04	7.478E+07	0.000E-01	GI-LLI
68	BA-141	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	M. BODY
69	BA-142	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	M. BODY
70	LA-140	1.062E+00	0.000E-01	8.124E+00	3.992E+00	0.000E-01	0.000E-01	2.292E+05	0.000E-01	GI-LLI

TABLE 6 (CONT)

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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : TEEN	NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
71 LO-142	1.028E-12	0.000E-01	0.000E-01	1.653E-11	7.341E-12	0.000E-01	0.000E-01	2.235E-07	0.000E-01	GI-LLI
72 CE-141	6.811E+02	0.000E-01	0.000E-01	8.881E+03	5.929E+03	2.791E+03	0.000E-01	1.696E+07	0.000E-01	GI-LLI
73 CE-143	6.217E+00	0.000E-01	0.000E-01	7.649E+01	5.566E+04	2.497E+01	0.000E-01	1.673E+06	0.000E-01	GI-LLI
74 CE-144	3.537E+04	0.000E-01	0.000E-01	6.582E+05	2.724E+05	1.627E+05	0.000E-01	1.655E+08	0.000E-01	GI-LLI
75 FR-145	1.443E+01	0.000E-01	0.000E-01	2.900E+02	1.158E+02	6.730E+01	0.000E-01	9.541E+05	0.000E-01	GI-LLI
76 FR-146	0.000E-01	0.000E-01	0.000E-01	0.400E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
77 NO-147	1.180E+01	0.000E-01	0.000E-01	1.811E+02	1.869E+02	1.157E+02	0.000E-01	7.105E+05	0.000E-01	GI-LLI
78 W-185	5.857E+04	0.000E-01	0.000E-01	1.675E+06	5.568E+05	6.000E-01	0.000E-01	4.434E+07	0.000E-01	GI-LLI
79 U-187	3.422E+03	0.000E-01	0.000E-01	1.198E+04	9.767E+03	0.000E-01	0.000E-01	2.643E+06	0.000E-01	GI-LLI
80 U-235	2.423E+08	0.000E-01	0.000E-01	3.999E+09	0.000E-01	9.324E+08	0.000E-01	3.894E+08	0.000E-01	BONE
81 U-238	2.269E+08	0.000E-01	0.000E-01	3.824E+09	0.000E-01	8.726E+08	0.000E-01	8.277E+08	0.000E-01	BONE
82 NP-239	3.651E-01	0.000E-01	0.000E-01	6.969E+00	6.573E-01	2.063E+00	0.000E-01	1.057E+05	0.000E-01	GI-LLI

TABLE 6 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE ; CHILD  
PATHWAY : COM MILK

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1	H-3	1.570E+03	1.570E+03	0.000E-01	1.570E+03	1.570E+03	1.570E+03	1.570E+03	1.570E+03	W. BODY
2	C-14	3.294E+05	3.294E+05	1.647E+06	3.294E+05	3.294E+05	3.294E+05	3.294E+05	3.294E+05	BONE
3	Na-24	8.932E+06	8.932E+06	8.932E+06	8.932E+06	8.932E+06	8.932E+06	8.932E+06	8.932E+06	W. BODY
4	P-32	2.999E+09	0.000E-01	7.781E+10	3.641E+09	0.000E-01	0.000E-01	2.150E+09	0.000E-01	BONE
5	SC-46	1.078E+02	0.000E-01	1.910E+02	3.744E+02	3.466E+02	0.000E-01	1.906E+06	0.000E-01	GI-LLI
6	CR-51	1.019E+05	5.654E+04	0.000E-01	0.000E-01	1.545E+04	1.032E+05	5.402E+06	0.000E-01	GI-LLI
7	MN-54	5.505E+06	0.000E-01	0.000E-01	2.097E+07	5.879E+06	0.000E-01	1.760E+07	0.000E-01	LIVER
8	MN-56	2.882E-03	0.000E-01	0.000E-01	1.277E-02	1.544E-02	0.000E-01	1.850E+00	0.000E-01	GI-LLI
9	FE-55	1.837E+07	0.000E-01	1.118E+08	5.930E+07	0.000E-01	3.354E+07	1.098E+07	0.000E-01	BONE
10	FE-59	9.686E+07	0.000E-01	1.202E+08	1.944E+08	0.000E-01	5.637E+07	2.025E+08	0.000E-01	GI-LLI
11	CO-58	3.719E+07	0.000E-01	0.000E-01	1.215E+07	0.000E-01	0.000E-01	7.088E+07	0.000E-01	GI-LLI
12	CO-60	1.273E+05	0.000E-01	0.000E-01	4.318E+07	0.000E-01	0.000E-01	2.391E+08	0.000E-01	GI-LLI
13	NI-59	6.985E+07	0.000E-01	5.386E+08	1.847E+08	0.000E-01	0.000E-01	3.803E+07	0.000E-01	BONE
14	NI-63	1.008E+09	0.000E-01	2.964E+10	1.587E+09	0.000E-01	0.000E-01	1.069E+08	0.000E-01	BONE
15	NI-65	9.107E-02	0.000E-01	1.657E+00	1.560E-01	0.000E-01	0.000E-01	1.911E+01	0.000E-01	GI-LLI
16	CU-64	4.465E+04	0.000E-01	0.000E-01	7.392E+04	1.786E+05	0.000E-01	3.470E+06	0.000E-01	GI-LLI
17	ZH-65	6.847E+09	0.000E-01	4.132E+09	1.101E+10	6.937E+09	0.000E-01	1.933E+09	0.000E-01	LIVER
18	ZH-69	2.958E-12	0.000E-01	2.214E-11	3.200E-11	1.941E-11	0.000E-01	2.617E-09	0.000E-01	GI-LLI
19	BR-83	4.617E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
20	BR-84	5.739E-23	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
21	BR-85	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
22	KB-86	5.387E+09	0.000E-01	0.000E-01	8.760E+09	0.000E-01	0.000E-01	5.635E+08	0.000E-01	LIVER
23	KB-88	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
24	KB-89	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
25	SR-89	1.890E+08	0.000E-01	6.616E+09	0.000E-01	0.000E-01	0.000E-01	2.561E+08	0.000E-01	BONE
26	SR-90	2.833E+10	0.000E-01	1.117E+11	0.000E-01	0.000E-01	0.000E-01	1.505E+09	0.000E-01	BONE
27	SR-91	4.885E+03	0.000E-01	1.294E+05	0.000E-01	0.000E-01	0.000E-01	2.859E+05	0.000E-01	GI-LLI
28	SR-92	8.663E-02	0.000E-01	2.162E+00	0.000E-01	0.000E-01	0.000E-01	4.094E+01	0.000E-01	GI-LLI
29	Y-90	8.637E+00	0.000E-01	3.227E+02	0.000E-01	0.000E-01	0.000E-01	9.187E+05	0.000E-01	GI-LLI
30	Y-91H	1.045E-20	0.000E-01	2.871E-19	0.000E-01	0.000E-01	0.000E-01	5.622E-16	0.000E-01	GI-LLI
31	Y-91	1.044E+03	0.000E-01	3.904E+04	0.000E-01	0.000E-01	0.000E-01	5.200E+06	0.000E-01	GI-LLI
32	Y-92	7.272E-06	0.000E-01	2.525E-04	0.000E-01	0.000E-01	0.000E-01	7.296E+00	0.000E-01	GI-LLI
33	Y-93	2.881E-02	0.000E-01	1.049E+00	0.000E-01	0.000E-01	0.000E-01	1.565E+04	0.000E-01	GI-LLI
34	ZR-95	7.538E+02	0.000E-01	3.852E+03	8.468E+02	1.212E+03	0.000E-01	8.833E+05	0.000E-01	GI-LLI
35	ZR-97	1.633E-01	0.000E-01	1.915E+00	2.767E-01	3.972E-01	0.000E-01	4.191E+04	0.000E-01	GI-LLI

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : CHILD  
PATHWAY : COW MILK

NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
36 NB-95	8.842E+04	0.000E-01	3.178E+05	1.237E+05	1.162E+05	0.000E-01	2.288E+08	0.000E-01	GI-LLI
37 NB-97	5.768E-13	0.000E-01	6.259E-12	1.580E-12	1.843E-12	0.000E-01	5.828E-09	0.000E-01	GI-LLI
38 MO-99	2.009E+07	0.000E-01	0.000E-01	8.123E+07	1.735E+09	0.000E-01	6.719E+07	0.000E-01	KIDNEY
39 TC-99M	4.367E+02	0.000E-01	1.344E+01	2.635E+01	3.829E+02	1.338E+01	1.499E+04	0.000E-01	GI-LLI
40 TC-101	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
41 RU-103	1.651E+03	0.000E-01	4.294E+03	0.000E-01	1.091E+04	0.000E-01	1.110E+05	0.000E-01	GI-LLI
42 RU-105	1.403E-03	0.000E-01	3.868E-03	0.000E-01	3.400E-02	0.000E-01	2.525E+00	0.000E-01	GI-LLI
43 RU-106	1.153E+04	0.000E-01	9.240E+04	0.000E-01	1.248E+05	0.000E-01	1.437E+06	0.000E-01	GI-LLI
44 AG-110M	1.128E+08	0.000E-01	2.089E+08	1.411E+08	2.627E+08	0.000E-01	1.678E+10	0.000E-01	GI-LLI
45 CD-115M	4.237E+04	0.000E-01	0.000E-01	1.326E+06	1.052E+06	0.000E-01	5.578E+07	0.000E-01	GI-LLI
46 SB-124	1.086E+07	6.646E+04	2.751E+07	5.188E+05	0.000E-01	2.134E+07	7.782E+08	0.000E-01	GI-LLI
47 TE-125M	9.841E+06	2.072E+07	7.380E+07	2.000E+07	0.000E-01	0.000E-01	7.121E+07	0.000E-01	BONE
48 TE-127M	2.469E+07	4.974E+07	2.080E+08	5.601E+07	5.932E+08	0.000E-01	1.684E+08	0.000E-01	KIDNEY
49 TE-127	6.513E+02	2.102E+03	3.037E+03	8.190E+02	8.641E+03	0.000E-01	1.187E+05	0.000E-01	GI-LLI
50 TE-129M	4.205E+07	8.734E+07	2.709E+08	7.565E+08	7.955E+08	0.000E-01	3.304E+08	0.000E-01	KIDNEY
51 TE-129	3.630E-10	1.091E-09	1.530E-09	4.269E-10	4.475E-09	0.000E-01	9.520E-08	0.000E-01	GI-LLI
52 TE-131M	5.884E+05	1.137E+06	1.599E+06	5.528E+05	5.351E+06	0.000E-01	2.242E+07	0.000E-01	GI-LLI
53 TE-131	0.000E-01	1.499E-32	1.959E-32	0.000E-01	5.923E-32	0.000E-01	1.029E-31	0.000E-01	GI-LLI
54 TE-132	5.457E+06	6.578E+06	1.021E+07	4.517E+06	4.194E+07	0.000E-01	4.547E+07	0.000E-01	GI-LLI
55 I-130	1.831E+06	3.916E+08	1.759E+06	3.554E+06	5.313E+06	0.000E-01	1.663E+06	0.000E-01	THYROID
56 I-131	7.452E+08	4.336E+11	1.304E+09	1.312E+09	2.153E+09	0.000E-01	1.167E+08	0.000E-01	THYROID
57 I-132	5.321E-01	5.369E+01	6.298E-01	1.157E+00	1.771E+00	0.000E-01	1.362E+00	0.000E-01	THYROID
58 I-133	8.050E+06	3.952E+09	1.720E+07	2.127E+07	3.545E+07	0.000E-01	8.573E+06	0.000E-01	THYROID
59 I-134	6.786E-12	3.393E-10	7.942E-12	1.475E-11	2.256E-11	0.000E-01	9.781E-12	0.000E-01	THYROID
60 I-135	4.529E+04	8.481E+06	5.319E+04	9.575E+04	1.468E+05	0.000E-01	7.295E+04	0.000E-01	THYROID
61 CS-134	7.836E+09	0.000E-01	2.264E+10	3.715E+10	1.151E+10	4.131E+09	2.002E+08	0.000E-01	LIVER
62 CS-136	1.786E+09	0.000E-01	1.004E+09	2.760E+09	1.470E+09	2.192E+08	9.699E+07	0.000E-01	LIVER
63 CS-137	4.555E+09	0.000E-01	3.224E+10	3.086E+10	1.006E+10	3.618E+09	1.932E+08	0.000E-01	BONE
64 CS-138	4.014E-23	0.000E-01	4.554E-23	6.331E-23	4.454E-23	4.793E-24	2.916E-23	0.000E-01	LIVER
65 CS-139	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
66 BA-139	5.839E-09	0.000E-01	2.015E-07	1.075E-10	9.392E-11	6.326E-11	1.163E-05	0.000E-01	GI-LLI
67 BA-140	6.831E+06	0.000E-01	1.170E+08	1.025E+05	3.338E+04	6.113E+04	5.930E+07	0.000E-01	BONE
68 BA-141	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
69 BA-142	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
70 LA-140	2.119E+00	0.000E-01	1.945E+01	6.795E+00	0.000E-01	0.000E-01	1.895E+05	0.000E-01	GI-LLI

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : CHILD

PATHWAY : COW MILK

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
71	LA-142	3.984E-12	0.000E-01	3.992E-11	1.272E-11	0.000E-01	0.000E-01	2.522E-06	0.000E-01	GI-LLI
72	CE-141	1.620E+03	0.000E-01	2.187E+04	1.071E+04	4.781E+03	0.000E-01	1.361E+07	0.000E-01	GI-LLI
73	CE-143	1.474E+01	0.000E-01	1.877E+02	1.018E+05	4.270E+01	0.000E-01	1.490E+06	0.000E-01	GI-LLI
74	CE-144	8.660E+04	0.000E-01	1.623E+06	5.087E+05	2.816E+05	0.000E-01	1.326E+08	0.000E-01	GI-LLI
75	PR-143	3.561E+01	0.000E-01	7.177E+02	2.155E+02	1.167E+02	0.000E-01	7.744E+05	0.000E-01	GI-LLI
76	PR-144	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
77	ND-147	2.788E+01	0.000E-01	4.444E+02	3.600E+02	1.975E+02	0.000E-01	5.703E+05	0.000E-01	GI-LLI
78	W-185	4.832E+04	0.000E-01	1.382E+06	4.594E+05	0.000E-01	0.000E-01	5.308E+07	0.000E-01	GI-LLI
79	W-187	7.719E+03	0.000E-01	2.905E+04	1.720E+04	0.000E-01	0.000E-01	2.417E+06	0.000E-01	GI-LLI
80	U-235	1.997E+08	0.000E-01	3.299E+09	0.000E-01	7.693E+08	0.000E-01	3.213E+08	0.000E-01	BONE
81	U-238	1.872E+08	0.000E-01	3.155E+09	0.000E-01	7.199E+08	0.000E-01	6.829E+08	0.000E-01	BONE
82	NP-239	8.657E-01	0.000E-01	1.715E+01	1.232E+00	3.561E+00	0.000E-01	9.115E+04	0.000E-01	GI-LLI



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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : INFANT  
PATHWAY : COW MILK

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1	H-3	2.382E+03	2.382E+03	0.000E-01	2.382E+03	2.382E+03	2.382E+03	2.382E+03	2.382E+03	W. BODY
2	C-14	6.888E+05	6.888E+05	3.224E+06	6.888E+05	6.888E+05	6.888E+05	6.888E+05	6.888E+05	BONE
3	NA-24	1.555E+07	1.555E+07	1.555E+07	1.555E+07	1.555E+07	1.555E+07	1.555E+07	0.000E-01	W. BODY
4	P-32	6.215E+09	0.000E-01	1.603E+11	9.432E+09	0.000E-01	0.000E-01	2.169E+09	0.000E-01	BONE
5	SC-46	1.078E+02	0.000E-01	1.910E+02	3.744E+02	3.466E+02	0.000E-01	1.806E+06	0.000E-01	GI-LLI
6	CR-51	1.614E+05	1.053E+05	0.000E-01	0.000E-01	2.300E+04	2.049E+05	4.704E+06	0.000E-01	GI-LLI
7	MN-54	8.839E+06	0.000E-01	0.000E-01	3.900E+07	8.643E+06	0.000E-01	1.433E+07	0.000E-01	LIVER
8	MN-56	5.389E-03	0.000E-01	0.000E-01	3.126E-02	2.687E-02	0.000E-01	2.840E+00	0.000E-01	GI-LLI
9	FE-55	2.333E+07	0.000E-01	1.351E+08	8.729E+07	0.000E-01	4.267E+07	1.108E+07	0.000E-01	BONE
10	FE-59	1.544E+08	0.000E-01	2.243E+08	3.918E+08	0.000E-01	1.158E+08	1.872E+08	0.000E-01	LIVER
11	CO-58	6.028E+07	0.000E-01	0.000E-01	2.430E+07	0.000E-01	0.000E-01	6.055E+07	0.000E-01	GI-LLI
12	CO-60	2.081E+08	0.000E-01	0.000E-01	8.815E+07	0.000E-01	0.000E-01	2.098E+08	0.000E-01	GI-LLI
13	NI-59	8.985E+07	0.000E-01	5.386E+08	1.847E+08	0.000E-01	0.000E-01	3.803E+07	0.000E-01	BONE
14	NI-63	1.212E+09	0.000E-01	3.493E+10	2.160E+09	0.000E-01	0.000E-01	1.074E+08	0.000E-01	BONE
15	NI-65	1.806E-01	0.000E-01	3.508E+00	3.971E-01	0.000E-01	0.000E-01	3.023E+01	0.000E-01	GI-LLI
16	CU-64	8.509E+04	0.000E-01	0.000E-01	1.837E+05	3.108E+05	0.000E-01	3.772E+06	0.000E-01	GI-LLI
17	ZN-65	8.777E+09	0.000E-01	5.550E+09	1.903E+10	9.229E+09	0.000E-01	1.608E+10	0.000E-01	LIVER
18	ZN-69	6.319E-12	0.000E-01	4.717E-11	8.493E-11	3.529E-11	0.000E-01	6.926E-09	0.000E-01	GI-LLI
19	PR-83	9.892E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
20	BR-84	1.107E-22	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
21	BR-85	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
22	RB-86	1.098E+10	0.000E-01	0.000E-01	2.223E+10	0.000E-01	0.000E-01	5.687E+08	0.000E-01	LIVER
23	RB-88	0.000E-01	0.000E-01	0.000E-01	1.311E-32	0.000E-01	0.000E-01	1.276E-32	0.000E-01	LIVER
24	RB-89	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
25	SR-89	3.609E+08	0.000E-01	1.258E+10	0.000E-01	0.000E-01	0.000E-01	2.586E+08	0.000E-01	BONE
26	SR-90	3.096E+10	0.000E-01	1.216E+11	0.000E-01	0.000E-01	0.000E-01	1.518E+09	0.000E-01	BONE
27	SR-91	9.759E+03	0.000E-01	2.676E+05	0.000E-01	0.000E-01	0.000E-01	3.192E+05	0.000E-01	GI-LLI
28	SR-92	1.707E-01	0.000E-01	4.597E+00	0.000E-01	0.000E-01	0.000E-01	4.956E+01	0.000E-01	GI-LLI
29	Y-90	1.830E+01	0.000E-01	6.823E+02	0.000E-01	0.000E-01	0.000E-01	9.422E+05	0.000E-01	GI-LLI
30	Y-91M	2.075E-20	0.000E-01	6.088E-19	0.000E-01	0.000E-01	0.000E-01	2.029E-15	0.000E-01	GI-LLI
31	Y-91	1.952E+03	0.000E-01	7.327E+04	0.000E-01	0.000E-01	0.000E-01	5.252E+06	0.000E-01	GI-LLI
32	Y-92	1.508E-05	0.000E-01	5.367E-04	0.000E-01	0.000E-01	0.000E-01	1.024E+01	0.000E-01	GI-LLI
33	Y-93	6.093E-02	0.000E-01	2.237E+00	0.000E-01	0.000E-01	0.000E-01	1.767E+04	0.000E-01	GI-LLI
34	ZR-95	1.182E+03	0.000E-01	6.841E+03	1.667E+03	1.797E+03	0.000E-01	8.302E+05	0.000E-01	GI-LLI
35	ZR-97	3.178E-01	0.000E-01	4.054E+00	6.958E-01	7.013E-01	0.000E-01	4.438E+04	0.000E-01	GI-LLI



TABLE 6 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : INFANT  
PATHWAY : COW MILK

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
36	NR-95	1.412E+05	0.000E-01	5.932E+05	2.444E+05	1.751E+03	0.000E-01	2.062E+03	0.000E-01	GI-LLI
37	NR-97	5.768E-13	0.000E-01	6.259E-12	1.580E-12	1.843E-12	0.000E-01	5.828E-09	0.000E-01	GI-LLI
38	MD-99	4.049E+07	0.000E-01	0.000E-01	2.077E+08	3.103E+08	0.000E-01	6.841E+07	0.000E-01	KIDNEY
39	TC-99M	7.424E+02	0.000E-01	2.795E+01	5.765E+01	6.202E+02	3.013E+01	1.674E+04	0.000E-01	GI-LLI
40	TC-101	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
41	RU-103	2.908E+03	0.000E-01	8.694E+03	0.000E-01	1.809E+04	0.000E-01	1.057E+05	0.000E-01	GI-LLI
42	RU-105	2.747E-03	0.000E-01	8.156E-03	0.000E-01	5.997E-02	0.000E-01	3.245E+00	0.000E-01	GI-LLI
43	RU-106	2.377E+04	0.000E-01	1.903E+05	0.000E-01	2.251E+05	0.000E-01	1.445E+06	0.000E-01	GI-LLI
44	AB-110M	1.864E+08	0.000E-01	3.840E+08	2.817E+08	4.030E+08	0.000E-01	1.451E+10	0.000E-01	GI-LLI
45	CD-115M	4.237E+04	0.000E-01	0.000E-01	1.328E+06	1.052E+06	0.000E-01	5.570E+07	0.000E-01	GI-LLI
46	SE-124	1.085E+07	6.446E+04	2.751E+07	5.189E+05	0.000E-01	2.134E+07	7.782E+08	0.000E-01	GI-LLI
47	TE-125M	2.039E+07	5.076E+07	1.508E+08	5.043E+07	0.000E-01	0.000E-01	7.186E+07	0.000E-01	BONE
48	IE-127M	5.097E+07	1.217E+08	4.241E+08	1.397E+08	1.037E+09	0.000E-01	1.699E+08	0.000E-01	KIDNEY
49	IE-127	1.385E+03	5.249E+03	6.449E+03	2.160E+03	1.573E+04	0.000E-01	1.354E+05	0.000E-01	GI-LLI
50	IE-129M	8.567E+07	2.136E+08	5.563E+08	1.908E+08	1.391E+09	0.000E-01	3.321E+08	0.000E-01	KIDNEY
51	IE-129	7.568E-10	2.717E-09	3.242E-09	1.110E-09	8.071E-09	0.000E-01	2.591E-07	0.000E-01	GI-LLI
52	IE-131M	1.124E+06	2.753E+06	3.375E+06	1.359E+06	9.347E+06	0.000E-01	2.297E+07	0.000E-01	GI-LLI
53	IE-131	1.168E-32	3.705E-32	4.153E-32	1.534E-32	1.062E-31	0.000E-01	1.678E-30	0.000E-01	GI-LLI
54	IE-132	9.711E+06	1.536E+07	2.102E+07	1.041E+07	6.508E+07	0.000E-01	3.850E+07	0.000E-01	KIDNEY
55	I-130	3.193E+06	8.915E+08	3.614E+06	7.952E+06	8.735E+06	0.000E-01	1.705E+06	0.000E-01	THYROID
56	I-131	1.410E+09	1.054E+12	2.722E+09	3.207E+09	3.745E+09	0.000E-01	1.145E+08	0.000E-01	THYROID
57	I-132	9.415E-01	1.248E+02	1.307E+00	2.653E+00	2.960E+00	0.000E-01	2.149E+00	0.000E-01	THYROID
58	I-133	1.549E+07	9.619E+09	3.633E+07	5.289E+07	6.219E+07	0.000E-01	8.951E+06	0.000E-01	THYROID
59	I-134	1.200E-11	7.866E-10	1.647E-11	3.374E-11	3.772E-11	0.000E-01	3.483E-11	0.000E-01	THYROID
60	I-135	8.025E+04	1.973E+07	1.106E+05	2.201E+05	2.453E+05	0.000E-01	7.964E+04	0.000E-01	THYROID
61	CS-134	6.888E+09	0.000E-01	3.647E+10	6.901E+10	1.751E+10	7.178E+09	1.849E+08	0.000E-01	LIVER
62	CS-136	2.153E+09	0.000E-01	1.961E+09	5.768E+09	2.299E+09	4.700E+08	8.759E+07	0.000E-01	LIVER
63	CS-137	4.269E+09	0.000E-01	5.146E+10	6.034E+10	1.617E+10	5.546E+09	1.683E+08	0.000E-01	LIVER
64	CS-138	7.559E-23	0.000E-01	9.607E-23	1.562E-22	7.789E-23	1.216E-23	2.497E-22	0.000E-01	GI-LLI
65	CS-139	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
66	BA-139	1.241E-08	0.000E-01	4.287E-07	2.842E-10	1.708E-10	1.723E-10	2.715E-05	0.000E-01	GI-LLI
67	BA-140	1.241E+07	0.000E-01	2.408E+08	2.408E+05	5.718E+04	1.479E+05	5.916E+07	0.000E-01	BONE
68	BA-141	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
69	BA-142	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
70	LA-140	4.122E+00	0.000E-01	4.064E+01	1.602E+01	0.000E-01	0.000E-01	1.882E+05	0.000E-01	GI-LLI

TABLE 6 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : INFANT  
PATHWAY : COW MILK

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
71	LA-142	7.357E-12	0.000E-01	8.380E-11	3.078E-11	0.000E-01	0.000E-01	5.224E-06	0.000E-01	GI-LLI
72	CE-141	3.112E+03	0.000E-01	4.335E+04	2.841E+04	8.153E+03	0.000E-01	1.366E+07	0.000E-01	GI-LLI
73	CE-143	3.008E+01	0.000E-01	3.974E+02	2.637E+05	7.680E+01	0.000E-01	1.539E+06	0.000E-01	GI-LLI
74	CE-144	1.303E+05	0.000E-01	2.325E+06	9.518E+05	3.846E+05	0.000E-01	1.334E+08	0.000E-01	GI-LLI
75	FR-143	7.260E+01	0.000E-01	1.485E+03	5.552E+02	2.054E+02	0.000E-01	7.835E+05	0.000E-01	GI-LLI
76	FR-144	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
77	NI-147	5.543E+01	0.000E-01	8.809E+02	9.048E+02	3.488E+02	0.000E-01	5.734E+05	0.000E-01	GI-LLI
78	W-185	4.832E+04	0.000E-01	1.392E+06	4.594E+05	0.000E-01	0.000E-01	5.303E+07	0.000E-01	GI-LLI
79	W-187	1.459E+04	0.000E-01	6.114E+04	4.252E+04	0.000E-01	0.000E-01	2.499E+06	0.000E-01	GI-LLI
80	U-235	1.999E+08	0.000E-01	3.299E+09	0.000E-01	7.693E+08	0.000E-01	3.213E+08	0.000E-01	BONE
81	U-238	1.872E+08	0.000E-01	3.155E+09	0.000E-01	7.199E+08	0.000E-01	6.829E+08	0.000E-01	BONE
82	NP-239	1.833E+00	0.000E-01	3.626E+01	3.244E+00	6.468E+00	0.000E-01	9.375E+04	0.000E-01	GI-LLI

TABLE 6 (CONT)

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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50  
(USED IN SECTION 2.2.2.b. FOR TECHNICAL SPECIFICATIONS 4.11.2.4.1 AND 6.9.1.13)

AGE : ADULT  
PATHWAY : INHALATION

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1	H-3	1.264E+03	1.264E+03	0.000E-01	1.264E+03	1.264E+03	1.264E+03	1.264E+03	1.264E+03	W. BODY
2	C-14	3.408E+03	3.408E+03	1.816E+04	3.408E+03	3.408E+03	3.408E+03	3.408E+03	3.408E+03	BONE
3	Na-24	1.024E+04	1.024E+04	1.024E+04	1.024E+04	1.024E+04	1.024E+04	1.024E+04	1.024E+04	W. BODY
4	P-32	5.008E+04	0.000E-01	1.320E+06	7.712E+04	0.000E-01	0.000E-01	8.640E+04	0.000E-01	BONE
5	SC-46	2.488E+05	0.000E-01	4.408E+05	8.560E+05	8.000E+05	0.000E-01	2.584E+05	0.000E-01	LIVER
6	CR-51	1.000E+02	5.952E+01	0.000E-01	0.000E-01	2.280E+01	1.440E+04	3.320E+03	0.000E-01	LUNG
7	MN-54	6.296E+03	0.000E-01	0.000E-01	3.960E+04	9.840E+03	1.400E+03	7.736E+04	0.000E-01	LUNG
8	MN-56	1.832E-01	0.000E-01	0.000E-01	1.240E+00	1.304E+00	9.440E+03	2.024E+04	0.000E-01	GI-LLI
9	FE-55	3.944E+03	0.000E-01	2.456E+04	1.696E+04	0.000E-01	7.208E+04	5.032E+03	0.000E-01	LUNG
10	FE-59	1.056E+04	0.000E-01	1.176E+04	2.776E+04	0.000E-01	1.016E+06	1.890E+05	0.000E-01	LUNG
11	CO-58	2.072E+03	0.000E-01	0.000E-01	1.584E+03	0.000E-01	9.280E+05	1.054E+05	0.000E-01	LUNG
12	CO-60	1.480E+04	0.000E-01	0.000E-01	1.152E+04	0.000E-01	5.968E+06	2.848E+05	0.000E-01	LUNG
13	NI-59	5.416E+03	0.000E-01	3.248E+04	1.168E+04	0.000E-01	5.568E+01	4.888E+03	0.000E-01	LUNG
14	NI-63	1.448E+04	0.000E-01	4.320E+05	3.144E+04	0.000E-01	1.784E+05	1.336E+04	0.000E-01	BONE
15	NI-65	9.120E-02	0.000E-01	1.536E+00	2.096E-01	0.000E-01	5.600E+03	1.232E+04	0.000E-01	GI-LLI
16	CU-64	6.152E-01	0.000E-01	0.000E-01	1.464E+00	4.624E+00	6.784E+03	4.896E+04	0.000E-01	GI-LLI
17	ZN-65	4.656E+04	0.000E-01	3.240E+04	1.032E+05	6.896E+04	8.640E+05	5.344E+04	0.000E-01	LUNG
18	ZN-69	4.520E-03	0.000E-01	3.384E-02	6.512E-02	4.216E-02	9.200E+02	1.632E+01	0.000E-01	LUNG
19	BR-83	2.403E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	2.720E+02	0.000E-01	W. BODY
20	ER-84	3.128E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	1.640E-03	0.000E-01	W. BODY
21	LR-85	1.280E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
22	RB-86	5.896E+04	0.000E-01	0.000E-01	1.352E+05	0.000E-01	0.000E-01	1.664E+04	0.000E-01	LIVER
23	KB-88	1.928E+02	0.000E-01	0.000E-01	3.872E+02	0.000E-01	0.000E-01	3.344E-09	0.000E-01	LIVER
24	KB-89	1.696E+02	0.000E-01	0.000E-01	2.560E+02	0.000E-01	0.000E-01	9.280E-12	0.000E-01	LIVER
25	SR-89	8.720E+03	0.000E-01	3.040E+05	0.000E-01	0.000E-01	1.400E+06	3.496E+05	0.000E-01	LUNG
26	SR-90	6.096E+06	0.000E-01	9.920E+07	0.000E-01	0.000E-01	9.600E+06	7.216E+05	0.000E-01	FOHL
27	SR-91	2.504E+00	0.000E-01	6.192E+01	0.000E-01	0.000E-01	3.648E+04	1.912E+05	0.000E-01	GI-LLI
28	SR-92	2.912E-01	0.000E-01	6.744E+00	0.000E-01	0.000E-01	1.648E+04	4.304E+04	0.000E-01	GI-LLI
29	Y-90	5.608E+01	0.000E-01	2.088E+03	0.000E-01	0.000E-01	1.596E+05	5.056E+05	0.000E-01	GI-LLI
30	Y-91M	1.016E-02	0.000E-01	2.608E-01	0.000E-01	0.000E-01	1.920E+03	1.528E+00	0.000E-01	LUNG
31	Y-91	1.240E+04	0.000E-01	4.624E+05	0.000E-01	0.000E-01	1.704E+06	3.848E+05	0.000E-01	LUNG
32	Y-92	3.016E-01	0.000E-01	1.032E+01	0.000E-01	0.000E-01	1.568E+04	7.352E+04	0.000E-01	GI-LLI
33	Y-93	2.608E+00	0.000E-01	9.440E+01	0.000E-01	0.000E-01	4.848E+04	4.216E+05	0.000E-01	GI-LLI
34	ZR-95	2.328E+04	0.000E-01	1.072E+05	3.440E+04	5.416E+04	1.768E+06	1.504E+05	0.000E-01	LUNG
35	ZR-97	9.040E+00	0.000E-01	9.680E+01	1.960E+01	2.968E+01	7.872E+04	5.232E+05	0.000E-01	GI-LLI

TABLE 6 (CONT)  
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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : ADULT  
PATHWAY : INHALATION

NO	ISOTOPE	M. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
35	NB-95	4.208E+03	0.000E-01	1.408E+04	7.816E+03	7.735E+03	5.048E+05	1.040E+05	4.208E+03	LUNG
37	NB-97	2.048E-02	0.000E-01	2.224E-01	5.624E-02	6.544E-02	2.400E+02	2.416E+02	0.000E-01	LUNG
38	NB-99	2.296E+01	0.000E-01	0.000E-01	1.208E+02	2.912E+02	9.120E+04	2.480E+05	0.000E-01	GI-LLI
39	TC-99M	3.704E-02	0.000E-01	1.032E-03	2.912E-03	4.416E-02	7.640E+02	4.150E+03	0.000E-01	GI-LLI
40	TC-101	5.904E-04	0.000E-01	4.176E-05	6.016E-05	1.080E-03	3.992E+02	1.088E-11	0.000E-01	LUNG
41	RU-103	6.584E+02	0.000E-01	1.528E+03	0.000E-01	5.832E+03	5.048E+05	1.104E+05	0.000E-01	LUNG
42	RU-105	3.112E-01	0.000E-01	7.904E-01	0.000E-01	1.016E+00	1.096E+04	4.816E+04	0.000E-01	GI-LLI
43	RU-106	8.720E+03	0.000E-01	6.912E+04	0.000E-01	1.336E+05	9.360E+06	9.120E+05	0.000E-01	LUNG
44	AG-110M	5.944E+03	0.000E-01	1.080E+04	1.000E+04	1.968E+04	4.632E+05	3.024E+05	0.000E-01	LUNG
45	CR-115M	6.360E+03	0.000E-01	0.000E-01	1.968E+05	1.584E+05	1.408E+06	3.840E+05	0.000E-01	LUNG
46	SB-124	1.240E+04	7.552E+01	3.120E+04	5.888E+02	0.000E-01	2.480E+05	4.064E+05	0.000E-01	LUNG
47	TE-125M	4.672E+02	1.048E+03	3.416E+03	1.584E+03	1.240E+04	3.136E+05	7.064E+04	0.000E-01	LUNG
48	TE-127M	1.568E+03	3.288E+03	1.264E+04	5.768E+03	4.576E+04	9.600E+05	1.496E+05	0.000E-01	LUNG
49	TE-127	3.096E-01	1.056E+00	1.400E+00	6.424E-01	5.096E+00	6.512E+03	5.736E+04	0.000E-01	GI-LLI
50	TE-129M	1.584E+03	3.440E+03	9.760E+03	4.672E+03	3.656E+04	1.160E+06	3.832E+05	0.000E-01	LUNG
51	TE-129	1.240E-02	3.896E-02	4.976E-02	2.392E-02	1.972E-01	1.936E+03	1.568E+02	0.000E-01	LUNG
52	TE-131M	2.904E+01	5.504E+01	6.992E+01	4.360E+01	3.088E+02	1.456E+05	5.560E+05	0.000E-01	GI-LLI
53	TE-131	3.592E-03	9.360E-03	1.112E-02	5.952E-03	4.368E-02	1.392E+03	1.840E+01	0.000E-01	LUNG
54	TE-132	1.616E+02	1.896E+02	2.600E+02	2.152E+02	1.456E+03	2.890E+05	5.096E+05	0.000E-01	GI-LLI
55	I-130	5.280E+03	1.136E+06	4.576E+03	1.314E+04	2.088E+04	0.000E-01	7.688E+03	0.000E-01	THYROID
56	I-131	2.048E+04	1.192E+07	2.520E+04	3.576E+04	6.128E+04	0.000E-01	6.290E+03	0.000E-01	THYROID
57	I-132	1.160E+03	1.144E+05	1.160E+03	3.256E+03	5.184E+03	0.000E-01	4.064E+02	0.000E-01	THYROID
58	I-133	4.520E+03	2.152E+06	8.640E+03	1.480E+04	2.594E+04	0.000E-01	8.800E+03	0.000E-01	THYROID
59	I-134	6.152E+02	2.984E+04	6.440E+02	1.728E+03	2.752E+03	0.000E-01	1.008E+00	0.000E-01	THYROID
60	I-135	2.568E+03	4.480E+05	2.680E+03	6.984E+03	1.112E+04	0.000E-01	5.248E+03	0.000E-01	THYROID
61	CS-134	7.280E+05	0.000E-01	3.728E+05	8.480E+05	2.872E+05	9.760E+04	1.040E+04	0.000E-01	LIVER
62	CS-135	1.104E+05	0.000E-01	3.904E+04	1.464E+05	8.560E+04	1.200E+04	1.168E+04	0.000E-01	LIVER
63	CS-137	4.280E+05	0.000E-01	4.784E+05	6.208E+05	2.224E+05	7.520E+04	8.400E+03	0.000E-01	LIVER
64	CS-139	3.230E+02	0.000E-01	3.312E+02	6.208E+02	4.800E+02	4.856E+01	1.864E-03	0.000E-01	LIVER
65	CS-139	1.112E+02	0.000E-01	2.048E+02	2.904E+02	2.440E+02	2.272E+01	0.000E-01	0.000E-01	LIVER
66	EA-139	2.736E-02	0.000E-01	9.360E-01	6.656E-04	6.224E-04	3.760E+03	8.960E+02	0.000E-01	LUNG
67	BA-140	2.568E+03	0.000E-01	3.904E+04	4.904E+04	1.672E+04	1.272E+06	2.184E+05	0.000E-01	LUNG
68	BA-141	3.360E-03	0.000E-01	1.000E-01	7.528E-05	7.000E-05	1.936E+03	1.160E-07	0.000E-01	LUNG
69	FA-142	1.656E-03	0.000E-01	2.632E-02	2.704E-05	2.288E-05	1.192E+03	1.568E-16	0.000E-01	LUNG
70	LA-140	4.584E+01	0.000E-01	3.440E+02	1.736E+02	0.000E-01	1.360E+05	4.584E+05	0.000E-01	GI-LLI

TABLE 6 (CONT)  
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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : ADULT  
PATHWAY : INHALATION

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
71	LA-142	7.720E-02	0.000E-01	6.832E-01	3.104E-01	0.000E-01	6.328E+03	2.112E+03	7.720E-02	LUNG
72	CE-141	1.528E+03	0.000E-01	1.992E+04	1.352E+04	6.264E+03	3.616E+05	1.200E+05	0.000E-01	LUNG
73	CE-143	1.528E+01	0.000E-01	1.864E+02	1.376E+02	6.080E+01	7.976E+04	2.264E+05	0.000E-01	GI-LLI
74	CE-144	1.840E+05	0.000E-01	3.432E+06	1.432E+06	8.480E+05	7.776E+06	8.160E+05	0.000E-01	LUNG
75	PR-143	4.640E+02	0.000E-01	9.360E+03	3.752E+03	2.160E+03	2.808E+05	2.000E+05	0.000E-01	LUNG
76	PR-144	1.528E-03	0.000E-01	3.008E-02	1.248E-02	7.048E-03	1.016E+03	2.152E-09	0.000E-01	LUNG
77	ND-147	3.648E+02	0.000E-01	5.272E+03	6.096E+03	3.560E+03	2.208E+05	1.728E+05	0.000E-01	LUNG
78	W-185	5.448E+01	0.000E-01	1.560E+03	5.176E+02	0.000E-01	4.456E+05	8.560E+04	0.000E-01	LUNG
79	W-187	2.480E+00	0.000E-01	8.480E+00	7.080E+00	0.000E-01	2.904E+04	1.552E+05	0.000E-01	GI-LLI
80	U-235	4.856E+06	0.000E-01	8.000E+07	0.000E-01	1.872E+07	3.920E+08	3.872E+05	0.000E-01	LUNG
81	U-238	4.536E+06	0.000E-01	7.664E+07	0.000E-01	1.744E+07	3.664E+08	8.240E+05	0.000E-01	LUNG
82	NP-239	1.240E+01	0.000E-01	2.296E+02	2.256E+01	7.000E+01	3.760E+04	1.192E+05	0.000E-01	GI-LLI



TABLE 6 (CONT)

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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : TEEN  
PATHWAY : INHALATION

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1	H-3	1.27E+03	1.27E+03	0.00E-01	1.27E+03	1.27E+03	1.27E+03	1.27E+03	1.27E+03	W. BODY
2	C-14	4.87E+03	4.87E+03	2.60E+04	4.87E+03	4.87E+03	4.87E+03	4.87E+03	4.87E+03	BONE
3	NA-24	1.37E+04	1.37E+04	1.37E+04	1.37E+04	1.37E+04	1.37E+04	1.37E+04	1.37E+04	W. BODY
4	P-32	7.16E+04	0.00E-01	1.88E+05	1.09E+05	0.00E-01	0.00E-01	9.28E+04	0.00E-01	BONE
5	SC-46	2.48E+05	0.00E-01	4.40E+05	8.56E+05	0.00E+05	0.00E-01	2.58E+05	0.00E-01	LIVER
6	CR-51	1.35E+02	7.49E+01	0.00E-01	0.00E-01	3.07E+01	2.09E+04	3.00E+03	0.00E-01	LUNG
7	NN-54	8.40E+03	0.00E-01	0.00E-01	5.11E+04	1.27E+04	1.98E+06	6.68E+04	0.00E-01	LUNG
8	NN-55	2.52E-01	0.00E-01	0.00E-01	1.69E+00	1.79E+00	1.52E+04	5.74E+04	0.00E-01	GI-LLI
9	FE-55	5.51E+03	0.00E-01	3.34E+04	2.36E+04	0.00E-01	1.24E+05	6.39E+03	0.00E-01	LUNG
10	FE-59	1.82E+04	0.00E-01	1.59E+04	3.69E+04	0.00E-01	1.52E+06	1.78E+05	0.00E-01	LUNG
11	CO-58	2.77E+03	0.00E-01	0.00E-01	2.07E+03	0.00E-01	1.34E+06	9.52E+04	0.00E-01	LUNG
12	CO-60	1.98E+04	0.00E-01	0.00E-01	1.51E+04	0.00E-01	8.72E+05	2.59E+05	0.00E-01	LUNG
13	NI-59	5.41E+03	0.00E-01	3.24E+04	1.16E+04	0.00E-01	5.58E+04	4.88E+03	0.00E-01	LUNG
14	NI-63	1.97E+04	0.00E-01	5.80E+05	4.34E+04	0.00E-01	3.07E+05	1.41E+04	0.00E-01	BONE
15	NI-65	1.27E-01	0.00E-01	2.19E+03	2.92E-01	0.00E-01	9.36E+03	3.67E+04	0.00E-01	GI-LLI
16	CU-64	8.49E-01	0.00E-01	0.00E-01	2.03E+00	6.40E+00	1.11E+04	6.14E+04	0.00E-01	GI-LLI
17	ZN-65	6.24E+04	0.00E-01	3.85E+04	1.33E+05	8.40E+04	1.24E+06	4.53E+04	0.00E-01	LUNG
18	ZN-69	6.45E-03	0.00E-01	4.93E-02	9.20E-02	6.02E-02	1.58E+03	2.83E+02	0.00E-01	LUNG
19	FR-83	3.41E+02	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	W. BODY
20	BR-94	4.52E+02	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	W. BODY
21	BR-95	1.83E+01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	0.00E-01	W. BODY
22	RB-84	8.40E+04	0.00E-01	0.00E-01	1.90E+05	0.00E-01	0.00E-01	1.76E+04	0.00E-01	LIVER
23	RB-88	2.72E+02	0.00E-01	0.00E-01	5.45E+02	0.00E-01	0.00E-01	2.92E-05	0.00E-01	LIVER
24	RB-89	2.32E+02	0.00E-01	0.00E-01	3.52E+02	0.00E-01	0.00E-01	3.37E-07	0.00E-01	LIVER
25	SR-89	1.24E+04	0.00E-01	4.34E+05	0.00E-01	0.00E-01	2.41E+06	3.71E+05	0.00E-01	LUNG
26	SR-90	6.88E+06	0.00E-01	1.08E+08	0.00E-01	0.00E-01	1.61E+07	7.84E+05	0.00E-01	BONE
27	SR-91	3.51E+00	0.00E-01	8.80E+01	0.00E-01	0.00E-01	5.07E+04	2.59E+05	0.00E-01	GI-LLI
28	SR-92	4.06E-01	0.00E-01	9.52E+00	0.00E-01	0.00E-01	2.74E+04	1.19E+05	0.00E-01	GI-LLI
29	Y-90	8.00E+01	0.00E-01	2.98E+03	0.00E-01	0.00E-01	2.92E+05	5.59E+05	0.00E-01	GI-LLI
30	Y-91H	1.41E-02	0.00E-01	3.70E-01	0.00E-01	0.00E-01	3.20E+03	3.01E+01	0.00E-01	LUNG
31	Y-91	1.76E+04	0.00E-01	6.50E+05	0.00E-01	0.00E-01	2.93E+06	4.08E+05	0.00E-01	LUNG
32	Y-92	4.28E-01	0.00E-01	1.47E+01	0.00E-01	0.00E-01	2.68E+04	1.64E+05	0.00E-01	GI-LLI
33	Y-93	3.72E+00	0.00E-01	1.35E+02	0.00E-01	0.00E-01	8.32E+04	5.79E+05	0.00E-01	GI-LLI
34	ZR-95	3.15E+04	0.00E-01	1.45E+05	4.58E+04	6.73E+04	2.68E+06	1.48E+05	0.00E-01	LUNG
35	ZR-97	1.25E+01	0.00E-01	1.37E+02	2.72E+01	4.12E+01	1.29E+05	6.30E+05	0.00E-01	GI-LLI



TABLE 6 (CONT)  
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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : TEEN  
PATHWAY : INHALATION

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
35	NR-95	5.664E+03	0.000E-01	1.856E+04	1.032E+04	1.000E+04	7.512E+05	9.680E+04	5.664E+03	LUNG
37	NR-97	2.048E-02	0.000E-01	2.224E-01	5.624E-02	6.544E-02	2.400E+03	2.416E+02	0.000E-01	LUNG
38	MO-99	3.224E+01	0.000E-01	0.000E-01	1.598E+02	4.112E+02	1.536E+05	2.688E+05	0.000E-01	GI-LLI
39	TC-99M	4.992E-02	0.000E-01	1.384E-03	3.864E-03	5.760E-02	1.152E+03	6.128E+03	0.000E-01	GI-LLI
40	TC-101	8.240E-04	0.000E-01	5.920E-05	8.400E-05	1.520E-03	6.672E+02	8.720E-07	0.000E-01	LUNG
41	RU-103	8.960E+02	0.000E-01	2.104E+03	0.000E-01	7.432E+03	7.832E+05	1.088E+05	0.000E-01	LUNG
42	RU-105	4.336E-01	0.000E-01	1.120E+00	0.000E-01	1.408E+00	1.816E+04	9.040E+04	0.000E-01	GI-LLI
43	RU-106	1.240E+04	0.000E-01	9.840E+04	0.000E-01	1.904E+05	1.608E+07	9.600E+05	0.000E-01	LUNG
44	AS-110M	7.992E+03	0.000E-01	1.384E+04	1.312E+04	2.504E+04	6.752E+06	2.728E+05	0.000E-01	LUNG
45	CB-115M	6.360E+03	0.000E-01	0.000E-01	1.968E+05	1.584E+05	1.408E+06	3.840E+05	0.000E-01	LUNG
46	SB-124	1.240E+04	7.552E+01	3.120E+04	5.888E+02	0.000E-01	2.480E+06	4.064E+05	0.000E-01	LUNG
47	TE-125M	6.672E+02	1.400E+03	4.880E+03	2.240E+03	0.000E-01	5.360E+05	7.504E+04	0.000E-01	LUNG
48	TE-127M	4.316E-01	1.416E+00	1.800E+04	8.160E+03	6.536E+04	1.656E+06	1.592E+05	0.000E-01	LUNG
49	TE-127M	2.184E+03	4.334E+03	1.800E+04	9.120E-01	7.280E+00	1.120E+04	8.600E+04	0.000E-01	GI-LLI
50	TE-129M	2.248E+03	4.576E+03	1.392E+04	6.584E+03	5.192E+04	1.976E+06	4.048E+05	0.000E-01	LUNG
51	TE-129	1.760E-02	5.184E-02	7.096E-02	3.376E-02	2.656E-01	3.296E+03	1.616E+03	0.000E-01	LUNG
52	TE-131M	4.024E+01	7.248E+01	9.840E+01	6.003E+01	4.392E+02	2.376E+05	6.208E+05	0.000E-01	GI-LLI
53	TE-131	5.040E-03	1.240E-02	1.576E-02	8.320E-03	6.176E-02	2.336E+03	1.512E+01	0.000E-01	LUNG
54	TE-132	2.192E+02	2.456E+02	3.600E+02	2.904E+02	1.952E+03	4.488E+05	4.632E+05	0.000E-01	GI-LLI
55	I-130	7.168E+03	1.498E+06	6.240E+03	1.792E+04	2.752E+04	0.000E-01	9.120E+03	0.000E-01	THYROID
56	I-131	2.640E+04	1.464E+07	3.544E+04	4.912E+04	8.400E+04	0.000E-01	6.488E+03	0.000E-01	THYROID
57	I-132	1.576E+03	1.512E+05	1.592E+03	4.376E+03	6.920E+03	0.000E-01	1.272E+03	0.000E-01	THYROID
58	I-133	6.224E+03	2.920E+06	1.216E+04	2.048E+04	3.592E+04	0.000E-01	1.032E+04	0.000E-01	THYROID
59	I-134	8.400E+02	3.952E+04	8.880E+02	2.320E+03	3.664E+03	0.000E-01	2.040E+01	0.000E-01	THYROID
60	I-135	3.488E+03	6.208E+05	3.696E+03	9.440E+03	1.488E+04	0.000E-01	6.952E+03	0.000E-01	THYROID
61	CS-134	5.488E+05	0.000E-01	5.024E+05	1.128E+06	3.752E+05	1.454E+05	9.760E+03	0.000E-01	LIVER
62	CS-135	1.368E+05	0.000E-01	5.152E+04	1.936E+05	1.104E+05	1.776E+05	1.088E+04	0.000E-01	LIVER
63	CS-137	3.112E+05	0.000E-01	6.704E+05	8.480E+05	3.040E+05	1.268E+05	8.480E+03	0.000E-01	LIVER
64	CS-138	4.464E+02	0.000E-01	4.656E+02	8.560E+02	6.624E+02	7.872E+01	2.704E-01	0.000E-01	LIVER
65	CS-139	1.112E+02	0.000E-01	2.048E+02	2.904E+02	2.440E+02	2.272E+01	0.000E-01	0.000E-01	LIVER
66	BA-139	3.696E-02	0.000E-01	1.336E+00	9.440E-04	8.880E-04	6.464E+03	6.448E+03	0.000E-01	LUNG
67	BA-140	3.520E+03	0.000E-01	5.472E+04	6.704E+01	2.280E+01	2.032E+05	2.288E+05	0.000E-01	LUNG
68	BA-141	4.744E-03	0.000E-01	1.424E-01	1.056E-04	9.840E-05	3.288E+03	7.464E-04	0.000E-01	LUNG
69	BA-142	2.272E-03	0.000E-01	3.696E-02	3.704E-05	3.136E-05	1.912E+03	4.792E-10	0.000E-01	LUNG
70	LA-140	6.276E+01	0.000E-01	4.792E+02	2.360E+02	0.000E-01	2.144E+05	4.872E+05	0.000E-01	GI-LLI

TABLE 6 (CONT)  
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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : TEEN	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
71 LA-142	1.056E-01	0.000E-01	9.600E-01	4.248E-01	0.000E-01	1.016E+04	1.200E+04	1.056E-01	GI-LLI
72 CE-141	2.168E+03	0.000E-01	2.840E+04	1.896E+04	8.880E+03	6.136E+05	1.264E+05	0.000E-01	LUNG
73 CE-143	2.160E+01	0.000E-01	2.656E+02	1.936E+02	8.640E+01	1.304E+05	2.552E+05	0.000E-01	GI-LLI
74 CE-144	2.624E+05	0.000E-01	4.888E+06	2.024E+06	1.208E+06	1.336E+07	8.640E+05	0.000E-01	LUNG
75 FR-143	6.624E+02	0.000E-01	1.336E+04	5.312E+03	3.088E+03	4.832E+05	2.136E+05	0.000E-01	LUNG
76 FR-144	2.176E-03	0.000E-01	4.296E-02	1.760E-02	1.008E-02	1.752E+03	2.352E-04	0.000E-01	LUNG
77 ND-147	5.128E+02	0.000E-01	7.864E+03	8.560E+03	5.024E+03	3.720E+05	1.824E+05	0.000E-01	LUNG
78 W-185	5.448E+01	0.000E-01	1.560E+03	5.176E+02	0.000E-01	4.456E+05	8.560E+04	0.000E-01	LUNG
79 W-187	3.432E+00	0.000E-01	1.200E+01	9.760E+00	0.000E-01	4.736E+04	1.768E+05	0.000E-01	GI-LLI
80 U-235	4.856E+06	0.000E-01	8.000E+07	0.000E-01	1.872E+07	3.920E+08	3.872E+05	0.000E-01	LUNG
81 U-238	4.536E+06	0.000E-01	7.664E+07	0.000E-01	1.744E+07	3.664E+08	8.240E+05	0.000E-01	LUNG
82 Np-239	1.768E+01	0.000E-01	3.394E+02	3.192E+01	1.000E+02	6.488E+04	1.320E+05	0.000E-01	GI-LLI

TABLE 6 (CONT)

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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : CHILD  
PATHWAY : INHALATION

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1	H-3	1.125E+03	1.125E+03	0.000E-01	1.125E+03	1.125E+03	1.125E+03	1.125E+03	1.125E+03	W. BODY
2	C-14	6.734E+03	6.734E+03	3.589E+04	6.734E+03	6.734E+03	6.734E+03	6.734E+03	6.734E+03	BONE
3	NA-24	1.609E+04	1.609E+04	1.609E+04	1.609E+04	1.609E+04	1.609E+04	1.609E+04	0.000E-01	W. BODY
4	P-32	9.879E+04	0.000E-01	2.605E+06	1.143E+05	0.000E-01	0.000E-01	4.218E+04	0.000E-01	BONE
5	SC-46	1.151E+05	0.000E-01	2.039E+05	3.959E+05	3.700E+05	0.000E-01	1.195E+05	0.000E-01	LIVER
6	CR-51	1.543E+02	8.547E+01	0.000E-01	0.000E-01	2.431E+01	1.698E+04	1.084E+03	0.000E-01	LUNG
7	HN-54	9.509E+03	0.000E-01	0.000E-01	4.292E+04	1.003E+04	1.576E+06	2.290E+04	0.000E-01	LUNG
8	HN-56	3.119E-01	0.000E-01	0.000E-01	1.658E+00	1.672E+00	1.313E+04	1.232E+05	0.000E-01	GI-LLI
9	FE-55	7.770E+03	0.000E-01	4.736E+04	2.516E+04	0.000E-01	1.110E+05	2.867E+03	0.000E-01	LUNG
10	FE-59	1.659E+04	0.000E-01	2.068E+04	3.345E+04	0.000E-01	1.269E+06	7.067E+04	0.000E-01	LUNG
11	CO-58	3.163E+03	0.000E-01	0.000E-01	1.772E+03	0.000E-01	1.105E+06	3.437E+04	0.000E-01	LUNG
12	CO-60	2.264E+04	0.000E-01	0.000E-01	1.313E+04	0.000E-01	7.067E+06	9.620E+04	0.000E-01	LUNG
13	NI-59	2.505E+03	0.000E-01	1.502E+04	5.402E+03	0.000E-01	3.038E+04	2.261E+03	0.000E-01	LUNG
14	NI-63	2.797E+04	0.000E-01	8.214E+05	4.625E+04	0.000E-01	2.749E+05	6.327E+03	0.000E-01	BONE
15	NI-65	1.643E-01	0.000E-01	2.990E+00	2.956E-01	0.000E-01	8.177E+03	8.399E+04	0.000E-01	GI-LLI
16	CU-64	1.073E+00	0.000E-01	0.000E-01	1.994E+00	6.031E+00	9.593E+03	3.670E+04	0.000E-01	GI-LLI
17	ZH-65	7.030E+04	0.000E-01	4.255E+04	1.132E+05	7.141E+04	9.953E+05	1.632E+04	0.000E-01	LUNG
18	ZH-69	8.917E-03	0.000E-01	6.697E-02	9.657E-02	5.846E-02	1.421E+03	1.017E+04	0.000E-01	GI-LLI
19	BR-83	4.738E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
20	BR-84	5.476E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
21	BR-85	2.531E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
22	RB-86	1.143E+05	0.000E-01	0.000E-01	1.983E+05	0.000E-01	0.000E-01	7.992E+03	0.000E-01	LIVER
23	RB-98	3.663E+02	0.000E-01	0.000E-01	5.624E+02	0.000E-01	0.000E-01	1.724E+01	0.000E-01	LIVER
24	RS-89	2.897E+02	0.000E-01	0.000E-01	3.452E+02	0.000E-01	0.000E-01	1.891E+00	0.000E-01	LIVER
25	SR-89	1.724E+04	0.000E-01	5.994E+05	0.000E-01	0.000E-01	2.157E+06	1.672E+05	0.000E-01	LUNG
26	SR-90	6.438E+06	0.000E-01	1.010E+08	0.000E-01	0.000E-01	1.476E+07	3.434E+05	0.000E-01	BONE
27	SR-91	4.588E+00	0.000E-01	1.214E+02	0.000E-01	0.000E-01	5.328E+04	1.739E+05	0.000E-01	GI-LLI
28	SR-92	5.254E-01	0.000E-01	1.310E+01	0.000E-01	0.000E-01	2.401E+04	2.423E+05	0.000E-01	GI-LLI
29	Y-90	1.106E+02	0.000E-01	4.107E+03	0.000E-01	0.000E-01	2.616E+05	2.679E+05	0.000E-01	GI-LLI
30	Y-91M	1.843E-02	0.000E-01	5.069E-01	0.000E-01	0.000E-01	2.812E+03	1.717E+03	0.000E-01	LUNG
31	Y-91	2.438E+04	0.000E-01	9.139E+05	0.000E-01	0.000E-01	2.627E+06	1.839E+05	0.000E-01	LUNG
32	Y-92	5.809E-01	0.000E-01	2.035E+01	0.000E-01	0.000E-01	2.390E+04	2.390E+05	0.000E-01	GI-LLI
33	Y-93	5.106E+00	0.000E-01	1.865E+02	0.000E-01	0.000E-01	7.437E+04	3.885E+05	0.000E-01	GI-LLI
34	ZR-95	3.700E+04	0.000E-01	1.898E+05	4.181E+04	5.957E+04	2.231E+06	6.105E+04	0.000E-01	LUNG
35	ZR-97	1.598E+01	0.000E-01	1.876E+02	2.716E+01	3.885E+01	1.132E+05	3.511E+05	0.000E-01	GI-LLI

TABLE 6 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : CHILD

PATHWAY : INHALATION

NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
35 NB-95	6.549E+03	0.000E-01	2.349E+04	9.174E+03	8.621E+03	6.142E+05	3.700E+04	6.549E+03	LUNG
37 NB-97	9.472E-03	0.000E-01	1.029E-01	2.601E-02	3.027E-02	1.110E+03	1.117E+02	0.000E-01	LUNG
38 NB-99	4.255E+01	0.000E-01	0.000E-01	1.724E+02	3.922E+02	1.354E+05	1.265E+05	0.000E-01	LUNG
39 TC-99M	5.772E-02	0.000E-01	1.780E-03	3.482E-03	5.069E-02	9.509E+02	4.810E+03	0.000E-01	GI-LLI
40 TC-101	1.077E-03	0.000E-01	9.103E-05	8.510E-05	1.450E-03	5.846E+02	1.632E+01	0.000E-01	LUNG
41 RU-103	1.073E+03	0.000E-01	2.867E+03	0.000E-01	7.030E+03	6.623E+05	4.477E+04	0.000E-01	LUNG
42 RU-105	5.550E-01	0.000E-01	1.528E+00	0.000E-01	1.343E+00	1.591E+04	9.953E+04	0.000E-01	GI-LLI
43 RU-106	1.691E+04	0.000E-01	1.362E+05	0.000E-01	1.839E+05	1.432E+07	4.292E+05	0.000E-01	LUNG
44 AG-110M	9.139E+03	0.000E-01	1.687E+04	1.140E+04	2.124E+04	5.476E+06	1.003E+05	0.000E-01	LUNG
45 CD-115M	2.941E+03	0.000E-01	0.000E-01	9.102E+04	7.326E+04	6.512E+05	1.776E+05	0.000E-01	LUNG
46 SE-124	5.735E+03	3.493E+01	1.443E+04	2.723E+02	0.000E-01	1.147E+06	1.680E+05	0.000E-01	LUNG
47 TE-125M	9.139E+02	1.924E+03	6.734E+03	2.327E+03	0.000E-01	4.773E+05	3.378E+04	0.000E-01	LUNG
48 TE-127M	3.027E+03	6.068E+03	2.486E+04	8.547E+03	6.364E+04	1.480E+06	7.141E+04	0.000E-01	LUNG
49 TE-127	6.105E-01	1.961E+00	2.771E+00	9.509E-01	7.067E+00	1.003E+04	5.624E+04	0.000E-01	GI-LLI
50 TE-129M	3.041E+03	6.327E+03	1.920E+04	6.845E+03	5.032E+04	1.761E+06	1.817E+05	0.000E-01	LUNG
51 TE-129	2.383E-02	7.141E-02	9.768E-02	3.496E-02	2.568E-01	2.934E+03	2.549E+04	0.000E-01	GI-LLI
52 TE-131M	5.069E+01	9.768E+01	1.343E+02	5.920E+01	3.996E+02	2.057E+05	3.078E+05	0.000E-01	GI-LLI
53 TE-131	6.586E-03	1.698E-02	2.172E-02	8.436E-03	5.883E-02	2.053E+03	1.332E+03	0.000E-01	LUNG
54 TE-132	2.634E+02	3.175E+02	4.810E+02	2.723E+02	1.772E+03	3.774E+05	1.376E+05	0.000E-01	LUNG
55 I-130	8.436E+03	1.846E+04	8.177E+03	1.639E+04	2.446E+04	0.000E-01	5.106E+03	0.000E-01	THYROID
56 I-131	2.727E+04	1.624E+07	4.810E+04	4.810E+04	7.881E+04	0.000E-01	2.842E+03	0.000E-01	THYROID
57 I-132	1.876E+03	1.935E+05	2.116E+03	4.070E+03	6.253E+03	0.000E-01	3.200E+03	0.000E-01	THYROID
58 I-133	7.696E+03	3.818E+04	1.658E+04	2.031E+04	3.378E+04	0.000E-01	5.476E+03	0.000E-01	THYROID
59 I-134	9.953E+02	5.069E+04	1.173E+03	2.161E+03	3.300E+03	0.000E-01	9.546E+02	0.000E-01	THYROID
60 I-135	4.144E+03	7.718E+05	4.921E+03	8.732E+03	1.339E+04	0.000E-01	4.440E+03	0.000E-01	THYROID
61 CS-134	2.246E+05	0.000E-01	6.512E+05	1.014E+06	3.304E+05	1.210E+05	3.848E+03	0.000E-01	LIVER
62 CS-136	1.162E+05	0.000E-01	6.512E+04	1.709E+05	9.546E+04	1.454E+04	4.181E+03	0.000E-01	LIVER
63 CS-137	1.284E+05	0.000E-01	9.065E+05	8.251E+05	2.823E+05	1.040E+05	3.619E+03	0.000E-01	BONE
64 CS-138	5.560E+02	0.000E-01	6.327E+02	8.399E+02	6.216E+02	6.808E+01	2.697E+02	0.000E-01	LIVER
65 CS-139	5.143E+01	0.000E-01	9.472E+01	1.343E+02	1.128E+02	1.051E+01	0.000E-01	0.000E-01	LIVER
66 BA-139	5.365E-02	0.000E-01	1.843E+00	9.842E-04	8.621E-04	5.772E+03	5.772E+04	0.000E-01	GI-LLI
67 BA-140	4.329E+03	0.000E-01	7.400E+04	6.475E+01	2.113E+01	1.743E+06	1.017E+05	0.000E-01	LUNG
68 BA-141	6.364E-03	0.000E-01	1.957E-01	1.091E-04	9.472E-05	2.919E+03	2.753E+02	0.000E-01	LUNG
69 BA-142	2.790E-03	0.000E-01	4.995E-02	3.600E-05	2.912E-05	1.643E+03	2.742E+00	0.000E-01	LUNG
70 LA-140	7.548E+01	0.000E-01	6.438E+02	2.250E+02	0.000E-01	1.828E+05	2.257E+05	0.000E-01	GI-LLI

TABLE 6 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : CHILD

PATHWAY : INHALATION

NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
71 LA-142	1.291E-01	0.000E-01	1.295E+00	4.107E-01	0.000E-01	8.695E+03	7.585E+04	1.291E-01	GI-LLI
72 CE-141	2.897E+03	0.000E-01	3.922E+04	1.954E+04	8.547E+03	5.439E+05	5.661E+04	0.000E-01	LUNG
73 CE-143	2.875E+01	0.000E-01	3.659E+02	1.987E+02	8.362E+01	1.154E+05	1.273E+05	0.000E-01	GI-LLI
74 CE-144	3.615E+05	0.000E-01	6.771E+06	2.116E+06	1.173E+06	1.195E+07	3.885E+05	0.000E-01	LUNG
75 PR-143	9.139E+02	0.000E-01	1.846E+04	5.550E+03	3.001E+03	4.329E+05	9.731E+04	0.000E-01	LUNG
76 PR-144	2.997E-03	0.000E-01	5.957E-02	1.846E-02	9.768E-03	1.565E+03	1.968E+02	0.000E-01	LUNG
77 ND-147	6.808E+02	0.000E-01	1.080E+04	8.732E+03	4.810E+03	3.282E+05	8.213E+04	0.000E-01	LUNG
78 W-185	2.520E+01	0.000E-01	7.215E+02	2.494E+02	0.000E-01	2.061E+05	3.959E+04	0.000E-01	LUNG
79 W-187	4.329E+00	0.000E-01	1.632E+01	9.657E+00	0.000E-01	4.107E+04	9.102E+04	0.000E-01	GI-LLI
80 U-235	2.246E+06	0.000E-01	3.700E+07	0.000E-01	8.658E+06	1.813E+09	1.791E+05	0.000E-01	LUNG
81 U-238	2.098E+06	0.000E-01	3.545E+07	0.000E-01	8.066E+06	1.695E+09	3.811E+05	0.000E-01	LUNG
82 HF-239	2.349E+01	0.000E-01	4.662E+02	3.345E+01	9.731E+01	5.809E+04	6.401E+04	0.000E-01	GI-LLI



TABLE 6 (CONT)

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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : INFANT  
PATHWAY : INHALATION

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1	H-3	6.458E+02	6.468E+02	0.000E-01	6.468E+02	6.458E+02	6.468E+02	6.468E+02	6.468E+02	W. BODY
2	C-14	5.306E+03	5.306E+03	2.846E+04	5.306E+03	5.306E+03	5.306E+03	5.306E+03	5.306E+03	BONE
3	Na-24	1.056E+04	1.056E+04	1.056E+04	1.056E+04	1.056E+04	1.056E+04	1.056E+04	0.000E-01	W. BODY
4	F-32	7.742E+04	0.000E-01	2.030E+06	1.124E+05	0.000E-01	0.000E-01	1.810E+04	0.000E-01	BONE
5	SC-46	4.354E+04	0.000E-01	7.714E+04	1.498E+05	1.400E+05	0.000E-01	4.523E+04	0.000E-01	LIVER
6	CR-51	8.946E+01	5.754E+01	0.000E-01	0.000E-01	1.323E+01	1.284E+04	3.570E+02	0.000E-01	LUNG
7	HR-54	4.984E+03	0.000E-01	0.000E-01	1.652E+04	4.984E+03	9.994E+05	7.056E+03	0.000E-01	LUNG
8	HR-56	2.712E-01	0.000E-01	0.000E-01	1.540E+00	1.100E+00	1.253E+04	7.188E+04	0.000E-01	GI-LLI
9	FE-55	3.332E+03	0.000E-01	1.974E+04	1.175E+04	0.000E-01	8.694E+04	1.095E+03	0.000E-01	LUNG
10	FE-59	9.478E+03	0.000E-01	1.357E+04	2.352E+04	0.000E-01	1.015E+06	2.470E+04	0.000E-01	LUNG
11	CO-58	1.820E+03	0.000E-01	0.000E-01	1.217E+03	0.000E-01	7.770E+05	1.113E+04	0.000E-01	LUNG
12	CO-60	1.177E+04	0.000E-01	0.000E-01	8.022E+03	0.000E-01	4.508E+06	3.192E+04	0.000E-01	LUNG
13	NI-59	9.478E+02	0.000E-01	5.684E+03	2.044E+03	0.000E-01	1.147E+04	8.554E+02	0.000E-01	LUNG
14	NI-63	1.161E+04	0.000E-01	3.388E+05	2.044E+04	0.000E-01	2.086E+05	2.422E+03	0.000E-01	BONE
15	NI-65	1.231E-01	0.000E-01	2.394E+00	2.842E-01	0.000E-01	8.120E+03	5.012E+04	0.000E-01	GI-LLI
16	CU-64	7.712E-01	0.000E-01	0.000E-01	1.874E+00	3.978E+00	9.296E+03	1.498E+04	0.000E-01	GI-LLI
17	ZN-65	3.105E+04	0.000E-01	1.932E+04	6.258E+04	3.246E+04	6.468E+05	5.138E+04	0.000E-01	LUNG
18	ZN-69	7.182E-03	0.000E-01	5.390E-02	9.674E-02	4.018E-02	1.470E+03	1.322E+04	0.000E-01	GI-LLI
19	BR-83	3.808E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
20	BR-84	4.004E+02	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
21	BR-85	2.044E+01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
22	BR-86	8.820E+04	0.000E-01	0.000E-01	1.904E+05	0.000E-01	0.000E-01	3.038E+03	0.000E-01	LIVER
23	BR-89	2.870E+02	0.000E-01	0.000E-01	5.572E+02	0.000E-01	0.000E-01	3.398E+02	0.000E-01	LIVER
24	BR-89	2.058E+02	0.000E-01	0.000E-01	3.206E+02	0.000E-01	0.000E-01	6.818E+01	0.000E-01	LIVER
25	SR-89	1.141E+04	0.000E-01	3.976E+05	0.000E-01	0.000E-01	2.030E+06	6.398E+04	0.000E-01	LUNG
26	SR-90	2.590E+06	0.000E-01	4.088E+07	0.000E-01	0.000E-01	1.124E+07	1.310E+05	0.000E-01	BONE
27	SR-91	3.458E+00	0.000E-01	9.552E+01	0.000E-01	0.000E-01	5.264E+04	7.336E+04	0.000E-01	GI-LLI
28	SR-92	3.906E-01	0.000E-01	1.050E+01	0.000E-01	0.000E-01	2.380E+04	1.400E+05	0.000E-01	GI-LLI
29	Y-90	8.820E+01	0.000E-01	3.290E+03	0.000E-01	0.000E-01	2.688E+05	1.040E+05	0.000E-01	LUNG
30	Y-91M	1.386E-02	0.000E-01	4.074E-01	0.000E-01	0.000E-01	2.786E+03	2.352E+03	0.000E-01	LUNG
31	Y-91	1.568E+04	0.000E-01	5.880E+05	0.000E-01	0.000E-01	2.450E+06	7.028E+04	0.000E-01	LUNG
32	Y-92	4.606E-01	0.000E-01	1.639E+01	0.000E-01	0.000E-01	2.450E+04	1.245E+05	0.000E-01	GI-LLI
33	Y-93	4.074E+00	0.000E-01	1.498E+02	0.000E-01	0.000E-01	7.644E+04	1.666E+05	0.000E-01	GI-LLI
34	ZR-95	2.030E+04	0.000E-01	1.154E+05	2.786E+04	3.108E+04	1.750E+06	2.170E+04	0.000E-01	LUNG
35	ZR-97	1.170E+01	0.000E-01	1.498E+02	2.562E+01	2.590E+01	1.103E+05	1.400E+05	0.000E-01	GI-LLI



TABLE 6 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : INFANT  
PATHWAY : INHALATION

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
36	NB-95	3.780E+03	0.000E-01	1.568E+04	6.426E+03	4.718E+03	4.788E+05	1.267E+04	3.780E+03	LUNG
37	NB-97	3.584E-03	0.000E-01	3.892E-02	9.842E-03	1.145E-02	4.200E+02	4.229E+01	0.000E-01	LUNG
38	MO-99	3.234E+01	0.000E-01	0.000E-01	1.652E+02	2.646E+02	1.348E+05	4.872E+04	0.000E-01	LUNG
39	TC-99M	3.724E-02	0.000E-01	1.377E-03	2.884E-03	3.108E-02	9.106E+02	2.030E+03	0.000E-01	GI-LLI
40	TC-101	8.120E-04	0.000E-01	6.510E-05	8.232E-05	9.786E-04	5.838E+02	8.442E+02	0.000E-01	GI-LLI
41	RU-103	6.790E+02	0.000E-01	2.016E+03	0.000E-01	4.242E+03	5.516E+05	1.610E+04	0.000E-01	LUNG
42	RU-105	4.102E-01	0.000E-01	1.224E+00	0.000E-01	8.988E-01	1.568E+04	4.844E+04	0.000E-01	GI-LLI
43	RU-106	1.088E+04	0.000E-01	8.680E+04	0.000E-01	1.065E+05	1.156E+07	1.638E+05	0.000E-01	LUNG
44	AG-110M	4.998E+03	0.000E-01	9.982E+03	7.224E+03	1.092E+04	3.668E+06	3.304E+04	0.000E-01	LUNG
45	CB-115M	1.113E+03	0.000E-01	0.000E-01	3.444E+04	2.772E+04	2.464E+05	6.720E+04	0.000E-01	LUNG
46	SB-124	2.170E+03	1.322E+01	5.460E+03	1.030E+02	0.000E-01	4.340E+05	7.112E+04	0.000E-01	LUNG
47	TE-125M	6.580E+02	1.624E+03	4.760E+03	1.988E+03	0.000E-01	4.466E+05	1.291E+04	0.000E-01	LUNG
48	TE-127M	2.072E+03	4.872E+03	1.666E+04	6.902E+03	3.752E+04	1.312E+06	2.730E+04	0.000E-01	LUNG
49	TE-127	4.886E-01	1.848E+00	2.226E+00	9.534E-01	4.858E+00	1.035E+04	2.436E+04	0.000E-01	GI-LLI
50	TE-129M	2.226E+03	5.474E+03	1.414E+04	6.090E+03	3.178E+04	1.680E+06	6.902E+04	0.000E-01	LUNG
51	TE-129	1.876E-02	6.748E-02	7.882E-02	3.472E-02	1.750E-01	2.996E+03	2.632E+04	0.000E-01	GI-LLI
52	TE-131M	3.626E+01	8.932E+01	1.067E+02	5.502E+01	2.646E+02	1.988E+05	1.191E+05	0.000E-01	LUNG
53	TE-131	4.998E-03	1.582E-02	1.736E-02	8.218E-03	3.990E-02	2.058E+03	8.218E+03	0.000E-01	GI-LLI
54	TE-132	1.764E+02	2.786E+02	3.724E+02	2.366E+02	1.035E+03	3.402E+05	4.410E+04	0.000E-01	LUNG
55	I-130	5.572E+03	1.596E+06	6.356E+03	1.387E+04	1.526E+04	0.000E-01	1.988E+03	0.000E-01	THYROID
56	I-131	1.960E+04	1.484E+07	3.794E+04	4.438E+04	5.180E+04	0.000E-01	1.058E+03	0.000E-01	THYROID
57	I-132	1.259E+03	1.694E+05	1.694E+03	3.542E+03	3.948E+03	0.000E-01	1.904E+03	0.000E-01	THYROID
58	I-133	5.600E+03	3.556E+06	1.324E+04	1.918E+04	2.240E+04	0.000E-01	2.156E+03	0.000E-01	THYROID
59	I-134	6.650E+02	4.452E+04	9.212E+02	1.876E+03	2.086E+03	0.000E-01	1.289E+03	0.000E-01	THYROID
60	I-135	2.772E+03	6.958E+05	3.864E+03	7.602E+03	8.470E+03	0.000E-01	1.834E+03	0.000E-01	THYROID
61	CS-134	7.448E+04	0.000E-01	3.962E+05	7.028E+05	1.904E+05	7.966E+04	1.334E+03	0.000E-01	LIVER
62	CS-136	5.292E+04	0.000E-01	4.830E+04	1.345E+05	5.642E+04	1.176E+04	1.428E+03	0.000E-01	LIVER
63	CS-137	1.550E+04	0.000E-01	5.488E+05	6.118E+05	1.722E+05	7.126E+04	1.334E+03	0.000E-01	LIVER
64	CS-139	3.976E+02	0.000E-01	5.054E+02	7.812E+02	4.102E+02	6.538E+01	8.764E+02	0.000E-01	GI-LLI
65	CS-139	1.946E+01	0.000E-01	3.584E+01	5.082E+01	4.270E+01	3.976E+00	0.000E-01	0.000E-01	LIVER
66	BA-139	4.298E-02	0.000E-01	1.484E+00	9.842E-04	5.922E-04	5.950E+03	5.096E+04	0.000E-01	GI-LLI
67	BA-140	2.878E+03	0.000E-01	5.600E+04	5.600E+01	1.343E+01	1.596E+06	3.836E+04	0.000E-01	LUNG
68	BA-141	4.970E-03	0.000E-01	1.568E-01	1.078E-04	6.496E-05	2.968E+03	4.746E+03	0.000E-01	GI-LLI
69	BA-142	1.960E-03	0.000E-01	3.976E-02	3.304E-05	1.904E-05	1.554E+03	6.930E+02	0.000E-01	LUNG
70	LA-140	5.152E+01	0.000E-01	5.054E+02	2.002E+02	0.000E-01	1.680E+05	8.484E+04	0.000E-01	LUNG

TABLE 6 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : INFANT  
PATHWAY : INHALATION

NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
71 LA-142	9.044E-02	0.000E-01	1.030E+00	3.766E-01	0.000E-01	8.218E+03	5.950E+04	9.044E-02	GI-LLI
72 CE-141	1.988E+03	0.000E-01	2.772E+04	1.666E+04	5.250E+03	5.166E+05	2.156E+04	0.000E-01	LUNG
73 CE-143	2.212E+01	0.000E-01	2.926E+02	1.932E+02	5.642E+01	1.162E+05	4.970E+04	0.000E-01	LUNG
74 CE-144	1.764E+05	0.000E-01	3.192E+06	1.211E+06	5.376E+05	9.842E+06	1.484E+05	0.000E-01	LUNG
75 PR-143	6.986E+02	0.000E-01	1.400E+04	5.236E+03	1.974E+03	4.326E+05	3.724E+04	0.000E-01	LUNG
76 PR-144	2.408E-03	0.000E-01	4.788E-02	1.848E-02	6.720E-03	1.610E+03	4.284E+03	0.000E-01	GI-LLI
77 ND-147	4.998E+02	0.000E-01	7.938E+03	8.134E+03	3.150E+03	3.220E+05	3.122E+04	0.000E-01	LUNG
78 W-185	9.534E+00	0.000E-01	2.730E+02	9.058E+01	0.000E-01	7.798E+04	1.498E+04	0.000E-01	LUNG
79 W-187	3.122E+00	0.000E-01	1.296E+01	9.016E+00	0.000E-01	3.962E+04	3.556E+04	0.000E-01	LUNG
80 U-235	8.498E+05	0.000E-01	1.400E+07	0.000E-01	3.276E+06	6.860E+07	6.776E+04	0.000E-01	LUNG
81 U-238	7.938E+05	0.000E-01	1.341E+07	0.000E-01	3.052E+06	6.412E+07	1.442E+05	0.000E-01	LUNG
82 NP-239	1.876E+01	0.000E-01	3.710E+02	3.318E+01	6.622E+01	5.950E+04	2.492E+04	0.000E-01	LUNG

TABLE 6 (CONT)  
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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : ALL PATHWAY : GROUND FLAME	NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1 H-3	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
2 C-14	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
3 Na-24	1.198E+07	1.198E+07	1.198E+07	1.198E+07	1.198E+07	1.198E+07	1.198E+07	1.198E+07	1.387E+07	SKIN
4 P-32	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
5 SC-45	8.321E+08	8.321E+08	8.321E+08	8.321E+08	8.321E+08	8.321E+08	8.321E+08	8.321E+08	9.601E+08	SKIN
6 CR-51	4.658E+06	4.658E+06	4.658E+06	4.658E+06	4.658E+06	4.658E+06	4.658E+06	4.658E+06	5.517E+06	SKIN
7 RN-54	1.384E+09	1.384E+09	1.384E+09	1.384E+09	1.384E+09	1.384E+09	1.384E+09	1.384E+09	1.622E+09	SKIN
8 HN-56	9.030E+05	9.030E+05	9.030E+05	9.030E+05	9.030E+05	9.030E+05	9.030E+05	9.030E+05	1.057E+06	SKIN
9 FE-55	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
10 FE-59	2.725E+08	2.725E+08	2.725E+08	2.725E+08	2.725E+08	2.725E+08	2.725E+08	2.725E+08	3.202E+08	SKIN
11 CU-58	3.833E+08	3.833E+08	3.833E+08	3.833E+08	3.833E+08	3.833E+08	3.833E+08	3.833E+08	4.490E+08	SKIN
12 CO-60	2.152E+10	2.152E+10	2.152E+10	2.152E+10	2.152E+10	2.152E+10	2.152E+10	2.152E+10	2.532E+10	SKIN
13 NI-59	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
14 NI-63	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
15 NI-65	2.970E+05	2.970E+05	2.970E+05	2.970E+05	2.970E+05	2.970E+05	2.970E+05	2.970E+05	3.451E+05	SKIN
16 CU-64	6.051E+05	6.051E+05	6.051E+05	6.051E+05	6.051E+05	6.051E+05	6.051E+05	6.051E+05	6.858E+05	SKIN
17 ZN-65	7.410E+08	7.410E+08	7.410E+08	7.410E+08	7.410E+08	7.410E+08	7.410E+08	7.410E+08	8.522E+08	SKIN
18 ZN-69	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
19 ZK-83	4.887E+03	4.887E+03	4.887E+03	4.887E+03	4.887E+03	4.887E+03	4.887E+03	4.887E+03	7.102E+03	SKIN
20 BR-84	2.022E+05	2.022E+05	2.022E+05	2.022E+05	2.022E+05	2.022E+05	2.022E+05	2.022E+05	2.358E+05	SKIN
21 BR-85	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
22 BR-86	8.963E+06	8.963E+06	8.963E+06	8.963E+06	8.963E+06	8.963E+06	8.963E+06	8.963E+06	1.024E+07	SKIN
23 BR-88	3.287E+04	3.287E+04	3.287E+04	3.287E+04	3.287E+04	3.287E+04	3.287E+04	3.287E+04	3.756E+04	SKIN
24 BR-89	1.209E+05	1.209E+05	1.209E+05	1.209E+05	1.209E+05	1.209E+05	1.209E+05	1.209E+05	1.450E+05	SKIN
25 SR-89	2.160E+04	2.160E+04	2.160E+04	2.160E+04	2.160E+04	2.160E+04	2.160E+04	2.160E+04	2.507E+04	SKIN
26 SR-90	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
27 SR-91	2.145E+06	2.145E+06	2.145E+06	2.145E+06	2.145E+06	2.145E+06	2.145E+06	2.145E+06	2.507E+06	SKIN
28 SR-92	7.762E+05	7.762E+05	7.762E+05	7.762E+05	7.762E+05	7.762E+05	7.762E+05	7.762E+05	8.625E+05	SKIN
29 Y-90	4.497E+03	4.497E+03	4.497E+03	4.497E+03	4.497E+03	4.497E+03	4.497E+03	4.497E+03	5.314E+03	SKIN
30 Y-91M	1.004E+05	1.004E+05	1.004E+05	1.004E+05	1.004E+05	1.004E+05	1.004E+05	1.004E+05	1.163E+05	SKIN
31 Y-91	1.074E+06	1.074E+06	1.074E+06	1.074E+06	1.074E+06	1.074E+06	1.074E+06	1.074E+06	1.209E+06	SKIN
32 Y-92	1.804E+05	1.804E+05	1.804E+05	1.804E+05	1.804E+05	1.804E+05	1.804E+05	1.804E+05	1.916E+05	SKIN
33 Y-93	1.849E+05	1.849E+05	1.849E+05	1.849E+05	1.849E+05	1.849E+05	1.849E+05	1.849E+05	2.531E+05	SKIN
34 ZR-95	2.513E+08	2.513E+08	2.513E+08	2.513E+08	2.513E+08	2.513E+08	2.513E+08	2.513E+08	2.915E+08	SKIN
35 ZR-97	2.958E+06	2.958E+06	2.958E+06	2.958E+06	2.958E+06	2.958E+06	2.958E+06	2.958E+06	3.443E+06	SKIN

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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : ALL  
PATHWAY : GROUND PLANE

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
36	NB-95	1.366E+08	1.366E+08	1.366E+08	1.366E+08	1.366E+08	1.366E+08	1.366E+08	1.507E+08	SKIN
37	NB-97	1.797E+05	1.797E+05	1.797E+05	1.797E+05	1.797E+05	1.797E+05	1.797E+05	2.109E+05	SKIN
38	MC-99	3.990E+06	3.990E+06	3.990E+06	3.990E+06	3.990E+06	3.990E+06	3.990E+06	4.620E+06	SKIN
39	TC-99M	1.845E+05	1.845E+05	1.845E+05	1.845E+05	1.845E+05	1.845E+05	1.845E+05	2.115E+05	SKIN
40	TC-101	2.034E+04	2.034E+04	2.034E+04	2.034E+04	2.034E+04	2.034E+04	2.034E+04	2.260E+04	SKIN
41	RU-103	1.093E+08	1.093E+08	1.093E+08	1.093E+08	1.093E+08	1.093E+08	1.093E+08	1.275E+08	SKIN
42	RU-105	6.373E+05	6.373E+05	6.373E+05	6.373E+05	6.373E+05	6.373E+05	6.373E+05	7.223E+05	SKIN
43	RU-106	4.239E+08	4.239E+08	4.239E+08	4.239E+08	4.239E+08	4.239E+08	4.239E+08	5.086E+08	SKIN
44	AS-110M	3.460E+09	3.460E+09	3.460E+09	3.460E+09	3.460E+09	3.460E+09	3.460E+09	4.037E+09	SKIN
45	CD-115M	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
46	SB-124	5.994E+08	5.994E+08	5.994E+08	5.994E+08	5.994E+08	5.994E+08	5.994E+08	6.916E+08	SKIN
47	TE-125M	1.555E+06	1.555E+06	1.555E+06	1.555E+06	1.555E+06	1.555E+06	1.555E+06	2.133E+06	SKIN
48	TE-127M	9.165E+04	9.165E+04	9.165E+04	9.165E+04	9.165E+04	9.165E+04	9.165E+04	1.083E+05	SKIN
49	TE-127	2.991E+03	2.991E+03	2.991E+03	2.991E+03	2.991E+03	2.991E+03	2.991E+03	3.290E+03	SKIN
50	TE-129M	1.967E+07	1.967E+07	1.967E+07	1.967E+07	1.967E+07	1.967E+07	1.967E+07	2.300E+07	SKIN
51	TE-129	2.639E+04	2.639E+04	2.639E+04	2.639E+04	2.639E+04	2.639E+04	2.639E+04	3.122E+04	SKIN
52	TE-131M	8.023E+06	8.023E+06	8.023E+06	8.023E+06	8.023E+06	8.023E+06	8.023E+06	9.456E+06	SKIN
53	TE-131	2.926E+04	2.926E+04	2.926E+04	2.926E+04	2.926E+04	2.926E+04	2.926E+04	3.450E+04	SKIN
54	TE-132	4.220E+06	4.220E+06	4.220E+06	4.220E+06	4.220E+06	4.220E+06	4.220E+06	4.965E+06	SKIN
55	I-130	5.539E+06	5.539E+06	5.539E+06	5.539E+06	5.539E+06	5.539E+06	5.539E+06	6.726E+06	SKIN
56	I-131	1.722E+07	1.722E+07	1.722E+07	1.722E+07	1.722E+07	1.722E+07	1.722E+07	2.091E+07	SKIN
57	I-132	1.238E+06	1.238E+06	1.238E+06	1.238E+06	1.238E+06	1.238E+06	1.238E+06	1.457E+06	SKIN
58	I-133	2.453E+06	2.453E+06	2.453E+06	2.453E+06	2.453E+06	2.453E+06	2.453E+06	2.983E+06	SKIN
59	I-134	4.460E+05	4.460E+05	4.460E+05	4.460E+05	4.460E+05	4.460E+05	4.460E+05	5.296E+05	SKIN
60	I-135	2.520E+06	2.520E+06	2.520E+06	2.520E+06	2.520E+06	2.520E+06	2.520E+06	2.940E+06	SKIN
61	CS-134	6.834E+09	6.834E+09	6.834E+09	6.834E+09	6.834E+09	6.834E+09	6.834E+09	7.972E+09	SKIN
62	CS-136	1.491E+08	1.491E+08	1.491E+08	1.491E+08	1.491E+08	1.491E+08	1.491E+08	1.690E+08	SKIN
63	CS-137	1.030E+10	1.030E+10	1.030E+10	1.030E+10	1.030E+10	1.030E+10	1.030E+10	1.202E+10	SKIN
64	CS-138	3.597E+05	3.597E+05	3.597E+05	3.597E+05	3.597E+05	3.597E+05	3.597E+05	4.111E+05	SKIN
65	CS-139	3.115E+04	3.115E+04	3.115E+04	3.115E+04	3.115E+04	3.115E+04	3.115E+04	3.561E+04	SKIN
66	BA-139	1.059E+05	1.059E+05	1.059E+05	1.059E+05	1.059E+05	1.059E+05	1.059E+05	1.191E+05	SKIN
67	BA-140	2.051E+07	2.051E+07	2.051E+07	2.051E+07	2.051E+07	2.051E+07	2.051E+07	2.343E+07	SKIN
68	BA-141	4.179E+04	4.179E+04	4.179E+04	4.179E+04	4.179E+04	4.179E+04	4.179E+04	4.762E+04	SKIN
69	BA-142	4.486E+04	4.486E+04	4.486E+04	4.486E+04	4.486E+04	4.486E+04	4.486E+04	5.110E+04	SKIN
70	LA-140	1.924E+07	1.924E+07	1.924E+07	1.924E+07	1.924E+07	1.924E+07	1.924E+07	2.181E+07	SKIN

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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : ALL

PATHWAY : GROUND PLANE

[illegible]



TABLE 6 (CONT)

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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : ADULT  
PATHWAY : VEGETATION

NO	ISOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1	H-3	2.260E+03	2.260E+03	0.000E-01	2.260E+03	2.260E+03	2.260E+03	2.260E+03	2.260E+03	W. BODY
2	C-14	1.793E+05	1.793E+05	8.966E+05	1.793E+05	1.793E+05	1.793E+05	1.793E+05	1.793E+05	BONE
3	NA-24	2.692E+05	2.692E+05	2.692E+05	2.692E+05	2.692E+05	2.692E+05	2.692E+05	2.692E+05	W. BODY
4	P-32	5.433E+07	0.000E-01	1.406E+09	8.740E+07	0.000E-01	0.000E-01	1.580E+08	0.000E-01	BONE
5	SC-46	1.414E+05	0.000E-01	2.505E+05	4.910E+05	4.547E+05	0.000E-01	2.369E+09	0.000E-01	GI-LLI
6	CR-51	4.556E+04	2.783E+04	0.000E-01	0.000E-01	1.026E+04	6.178E+04	1.171E+07	0.000E-01	GI-LLI
7	MI-54	5.969E+07	0.000E-01	0.000E-01	3.128E+08	9.309E+07	0.000E-01	9.503E+08	0.000E-01	GI-LLI
8	MN-56	2.730E+00	0.000E-01	0.000E-01	1.539E+01	1.954E+01	0.000E-01	4.912E+02	0.000E-01	GI-LLI
9	FE-55	3.376E+07	0.000E-01	2.096E+08	1.448E+08	0.000E-01	9.077E+07	8.306E+07	0.000E-01	BONE
10	FE-59	1.135E+08	0.000E-01	1.260E+08	2.961E+08	0.000E-01	8.273E+07	9.869E+08	0.000E-01	GI-LLI
11	CO-58	6.939E+07	0.000E-01	0.000E-01	3.096E+07	0.000E-01	0.000E-01	6.274E+03	0.000E-01	GI-LLI
12	CO-60	3.686E+08	0.000E-01	0.000E-01	1.671E+08	0.000E-01	0.000E-01	3.139E+09	0.000E-01	GI-LLI
13	NI-59	1.306E+08	0.000E-01	7.830E+08	2.685E+08	0.000E-01	0.000E-01	5.530E+07	0.000E-01	BONE
14	NI-63	3.489E+08	0.000E-01	0.000E-01	7.211E+08	0.000E-01	0.000E-01	1.505E+08	0.000E-01	BONE
15	NI-65	3.537E+00	0.000E-01	5.967E+01	7.752E+00	0.000E-01	0.000E-01	1.966E+02	0.000E-01	GI-LLI
16	CU-64	4.267E+03	0.000E-01	0.000E-01	9.090E+03	0.000E-01	0.000E-01	7.743E+05	0.000E-01	GI-LLI
17	ZN-65	4.556E+08	0.000E-01	3.168E+08	1.008E+09	6.742E+08	0.000E-01	6.350E+08	0.000E-01	LIVER
18	ZN-69	1.040E-05	0.000E-01	7.819E-06	1.495E-05	9.716E-06	0.000E-01	2.247E-06	0.000E-01	LIVER
19	BR-83	3.087E+00	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	4.416E+00	0.000E-01	GI-LLI
20	BR-84	2.009E-11	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	1.577E-16	0.000E-01	W. BODY
21	BR-85	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
22	RB-87	1.019E+08	0.000E-01	0.000E-01	2.187E+08	0.000E-01	0.000E-01	4.311E+07	0.000E-01	LIVER
23	RB-88	9.882E-23	0.000E-01	0.000E-01	1.863E-22	0.000E-01	0.000E-01	0.000E-01	0.000E-01	LIVER
24	RB-89	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
25	SR-89	2.857E+08	0.000E-01	9.954E+09	0.000E-01	0.000E-01	0.000E-01	1.596E+09	0.000E-01	BONE
26	SR-90	1.424E+11	0.000E-01	6.046E+11	0.000E-01	0.000E-01	0.000E-01	1.747E+10	0.000E-01	BONE
27	SR-91	1.215E+04	0.000E-01	3.009E+05	0.000E-01	0.000E-01	0.000E-01	1.433E+06	0.000E-01	GI-LLI
28	SR-92	1.784E+01	0.000E-01	4.125E+02	0.000E-01	0.000E-01	0.000E-01	8.172E+03	0.000E-01	GI-LLI
29	Y-90	3.566E+02	0.000E-01	1.330E+04	0.000E-01	0.000E-01	0.000E-01	1.410E+08	0.000E-01	GI-LLI
30	Y-91M	1.909E-10	0.000E-01	4.930E-09	0.000E-01	0.000E-01	0.000E-01	1.448E-08	0.000E-01	GI-LLI
31	Y-91	1.368E+05	0.000E-01	5.116E+06	0.000E-01	0.000E-01	0.000E-01	2.816E+09	0.000E-01	GI-LLI
32	Y-92	2.515E-02	0.000E-01	8.946E-01	0.000E-01	0.000E-01	0.000E-01	1.567E+04	0.000E-01	GI-LLI
33	Y-93	4.751E+00	0.000E-01	1.721E+02	0.000E-01	0.000E-01	0.000E-01	5.457E+06	0.000E-01	GI-LLI
34	ZR-95	2.596E+05	0.000E-01	1.196E+06	3.835E+05	6.019E+05	0.000E-01	1.216E+09	0.000E-01	GI-LLI
35	ZR-97	3.094E+01	0.000E-01	3.354E+02	6.767E+01	1.022E+02	0.000E-01	2.096E+07	0.000E-01	GI-LLI



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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : ADULT  
PATHWAY : VEGETATION

NO	ISOTOPE	M. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
35	RB-95	4.254E+04	0.000E-01	1.423E+05	7.914E+04	7.822E+04	0.000E-01	4.903E+03	0.000E-01	GI-LLI
37	RB-97	2.516E-07	0.000E-01	2.730E-01	6.889E-07	8.037E-07	0.000E-01	2.542E-03	0.000E-01	GI-LLI
38	RB-99	1.167E+06	0.000E-01	0.000E-01	6.135E+06	1.390E+07	0.000E-01	1.422E+07	0.000E-01	GI-LLI
39	IC-99H	1.113E+02	0.000E-01	3.093E+00	8.740E+00	1.327E+02	4.283E+00	5.172E+03	0.000E-01	GI-LLI
40	IC-101	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	M. BODY
41	RU-103	2.074E+06	0.000E-01	4.815E+06	0.000E-01	1.837E+07	0.000E-01	5.621E+03	0.000E-01	GI-LLI
42	RU-105	2.104E+01	0.000E-01	5.330E+01	0.000E-01	6.888E+02	0.000E-01	3.261E+04	0.000E-01	GI-LLI
43	RU-106	2.441E+07	0.000E-01	1.929E+08	0.000E-01	3.724E+08	0.000E-01	1.248E+10	0.000E-01	GI-LLI
44	OG-110H	5.796E+06	0.000E-01	1.055E+07	9.758E+06	1.919E+07	0.000E-01	3.993E+09	0.000E-01	GI-LLI
45	CB-115H	1.648E+06	0.000E-01	0.000E-01	5.157E+07	4.092E+07	0.000E-01	2.169E+09	0.000E-01	GI-LLI
46	SB-124	4.115E+07	2.517E+05	1.042E+08	1.945E+06	0.000E-01	8.081E+07	2.947E+09	0.000E-01	GI-LLI
47	TE-125H	1.296E+07	2.909E+07	9.672E+07	3.504E+07	3.934E+08	0.000E-01	3.862E+03	0.000E-01	KIDNEY
48	TE-127H	4.255E+07	8.924E+07	3.492E+08	1.248E+08	1.418E+09	0.000E-01	1.171E+09	0.000E-01	KIDNEY
49	TE-127	1.230E+03	1.211E+03	5.684E+03	2.041E+03	2.315E+04	0.000E-01	4.485E+05	0.000E-01	GI-LLI
50	TE-129H	3.955E+07	8.584E+07	2.499E+08	9.323E+07	1.043E+09	0.000E-01	1.258E+09	0.000E-01	GI-LLI
51	TE-129	1.904E-04	5.997E-04	7.813E-04	2.936E-04	3.284E-03	0.000E-01	5.897E-04	0.000E-01	KIDNEY
52	TE-131H	3.705E+05	7.043E+05	9.092E+05	4.446E+05	4.504E+06	0.000E-01	4.415E+07	0.000E-01	GI-LLI
53	TE-131	4.341E-16	1.131E-15	1.375E-15	5.744E-16	6.023E-15	0.000E-01	1.947E-16	0.000E-01	KIDNEY
54	TE-132	2.600E+06	3.058E+06	4.282E+06	2.769E+06	2.668E+07	0.000E-01	1.310E+08	0.000E-01	GI-LLI
55	I-130	4.591E+05	8.861E+07	3.944E+05	1.163E+06	1.816E+06	0.000E-01	1.002E+06	0.000E-01	THYROID
56	I-131	6.622E+07	3.787E+10	8.079E+07	1.155E+08	1.981E+08	0.000E-01	3.049E+07	0.000E-01	THYROID
57	I-132	4.948E+01	4.948E+03	5.308E+01	1.420E+02	2.262E+02	0.000E-01	2.667E+01	0.000E-01	THYROID
58	I-133	1.103E+06	5.318E+08	2.060E+06	3.618E+06	5.314E+06	0.000E-01	3.252E+06	0.000E-01	THYROID
59	I-134	8.306E-05	4.024E-03	8.548E-05	2.322E-04	3.693E-04	0.000E-01	2.024E-07	0.000E-01	THYROID
60	I-135	3.591E+04	6.597E+06	3.820E+04	1.000E+05	1.601E+05	0.000E-01	1.130E+05	0.000E-01	THYROID
61	CS-134	9.076E+09	0.000E-01	4.666E+09	1.110E+10	3.593E+09	1.193E+09	1.936E+07	0.000E-01	LIVER
62	CS-136	1.195E+08	0.000E-01	4.204E+07	1.660E+08	9.235E+07	1.266E+07	1.886E+07	0.000E-01	LIVER
63	CS-137	5.694E+09	0.000E-01	6.358E+09	8.696E+09	2.952E+09	9.813E+08	1.683E+08	0.000E-01	LIVER
64	CS-138	3.553E-11	0.000E-01	3.633E-11	7.174E-11	5.272E-11	5.206E-12	3.061E-15	0.000E-01	LIVER
65	CS-139	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	M. BODY
66	BA-139	7.925E-04	0.000E-01	2.707E-02	1.928E-05	1.803E-05	1.094E-05	4.800E-02	0.000E-01	GI-LLI
67	BA-140	8.405E+06	0.000E-01	1.283E+08	1.611E+05	5.479E+04	9.227E+04	2.642E+08	0.000E-01	GI-LLI
68	BA-141	3.389E-23	0.000E-01	1.004E-21	7.589E-25	7.056E-25	0.000E-01	0.000E-01	0.000E-01	ECHE
69	BA-142	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	M. BODY
70	LA-140	2.634E+02	0.000E-01	1.970E+03	9.938E+02	0.000E-01	0.000E-01	7.318E+07	0.000E-01	GI-LLI

TABLE 6 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : ADULT

PATHWAY : VEGETATION

NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
71 LA-142	1.508E-05	0.000E-01	1.331E-04	6.051E-05	0.000E-01	0.000E-01	4.419E-01	0.000E-01	GI-LLI
72 CE-141	1.511E+04	0.000E-01	1.970E+05	1.332E+05	6.188E+04	0.000E-01	5.094E+08	0.000E-01	GI-LLI
73 CE-143	8.154E+01	0.000E-01	9.966E+02	7.369E+05	3.244E+02	0.000E-01	2.754E+07	0.000E-01	GI-LLI
74 CE-144	1.765E+06	0.000E-01	3.288E+07	1.375E+07	8.153E+06	0.000E-01	1.112E+10	0.000E-01	GI-LLI
75 PR-143	3.101E+03	0.000E-01	6.256E+04	2.509E+04	1.448E+04	0.000E-01	2.740E+08	0.000E-01	GI-LLI
76 PR-144	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
77 ND-147	2.303E+03	0.000E-01	3.330E+04	3.849E+04	2.250E+04	0.000E-01	1.848E+08	0.000E-01	GI-LLI
78 W-185	6.065E+05	0.000E-01	1.734E+07	5.766E+06	0.000E-01	0.000E-01	6.663E+08	0.000E-01	GI-LLI
79 W-187	1.112E+04	0.000E-01	3.806E+04	3.181E+04	0.000E-01	0.000E-01	1.042E+07	0.000E-01	GI-LLI
80 U-235	3.895E+09	0.000E-01	6.427E+10	0.000E-01	1.499E+10	0.000E-01	6.259E+09	0.000E-01	BONE
81 U-238	3.646E+09	0.000E-01	6.147E+10	0.000E-01	1.402E+10	0.000E-01	1.330E+10	0.000E-01	BONE
82 NP-239	7.693E+01	0.000E-01	1.419E+03	1.396E+02	4.354E+02	0.000E-01	2.863E+07	0.000E-01	GI-LLI

TABLE 6 (CONT)

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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : TEEN	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1 H-3	2.588E+03	2.588E+03	0.000E-01	2.588E+03	2.588E+03	2.588E+03	2.588E+03	2.588E+03	W. BODY
2 C-14	2.907E+05	2.907E+05	1.454E+06	2.907E+05	2.907E+05	2.907E+05	2.907E+05	2.907E+05	BONE
3 Na-24	2.390E+05	2.390E+05	2.390E+05	2.390E+05	2.390E+05	2.390E+05	2.390E+05	2.390E+05	W. BODY
4 P-32	6.247E+07	0.000E-01	1.611E+09	9.983E+07	0.000E-01	0.000E-01	1.354E+08	0.000E-01	BONE
5 SC-46	1.519E+05	0.000E-01	2.745E+05	5.380E+05	4.981E+05	0.000E-01	2.595E+09	0.000E-01	GI-LLI
6 CR-51	6.196E+04	3.437E+04	0.000E-01	0.000E-01	1.356E+04	8.832E+04	1.049E+07	0.000E-01	GI-LLI
7 H-54	9.010E+07	0.000E-01	0.000E-01	4.543E+03	1.355E+08	0.000E-01	9.319E+08	0.000E-01	GI-LLI
8 H-56	2.468E+00	0.000E-01	0.000E-01	1.388E+01	1.757E+01	0.000E-01	9.134E+02	0.000E-01	BONE
9 FE-55	5.398E+07	0.000E-01	3.259E+08	2.310E+08	0.000E-01	1.466E+08	1.000E+08	0.000E-01	GI-LLI
10 FE-59	1.615E+08	0.000E-01	1.792E+08	4.181E+08	0.000E-01	1.318E+08	9.000E+08	0.000E-01	GI-LLI
11 CO-60	1.013E+03	0.000E-01	0.000E-01	4.394E+07	0.000E-01	0.000E-01	4.057E+08	0.000E-01	GI-LLI
12 CO-60	5.599E+08	0.000E-01	0.000E-01	2.486E+08	0.000E-01	0.000E-01	3.239E+09	0.000E-01	GI-LLI
13 NI-59	1.492E+08	0.000E-01	8.880E+08	3.045E+08	0.000E-01	0.000E-01	6.271E+07	0.000E-01	BONE
14 NI-53	5.446E+08	0.000E-01	1.606E+10	1.135E+09	0.000E-01	0.000E-01	1.805E+08	0.000E-01	BONE
15 NI-55	3.233E+00	0.000E-01	5.554E+01	7.097E+00	0.000E-01	0.000E-01	3.819E+02	0.000E-01	GI-LLI
16 CU-64	3.874E+03	0.000E-01	0.000E-01	8.235E+03	2.084E+04	0.000E-01	6.383E+05	0.000E-01	GI-LLI
17 ZN-65	6.854E+08	0.000E-01	4.231E+08	1.469E+09	9.403E+08	0.000E-01	6.222E+08	0.000E-01	LIVER
18 ZN-69	9.764E-07	0.000E-01	7.323E-06	1.395E-05	9.116E-06	0.000E-01	2.570E-05	0.000E-01	GI-LLI
19 BR-83	2.892E+00	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
20 BR-84	1.827E-11	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
21 BR-85	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
22 RB-86	1.280E+08	0.000E-01	0.000E-01	2.725E+08	0.000E-01	0.000E-01	4.033E+07	0.000E-01	LIVER
23 RB-88	9.172E-23	0.000E-01	0.000E-01	1.721E-22	0.000E-01	0.000E-01	0.000E-01	0.000E-01	LIVER
24 RB-89	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
25 SR-89	4.230E+08	0.000E-01	1.512E+10	0.000E-01	0.000E-01	0.000E-01	1.801E+09	0.000E-01	BONE
26 SR-90	1.854E+11	0.000E-01	7.507E+11	0.000E-01	0.000E-01	0.000E-01	2.107E+10	0.000E-01	BONE
27 SR-91	1.118E+04	0.000E-01	2.811E+05	0.000E-01	0.000E-01	0.000E-01	1.275E+06	0.000E-01	GI-LLI
28 SR-92	1.637E+01	0.000E-01	3.840E+02	0.000E-01	0.000E-01	0.000E-01	9.702E+03	0.000E-01	GI-LLI
29 Y-90	3.347E+02	0.000E-01	1.243E+04	0.000E-01	0.000E-01	0.000E-01	1.025E+08	0.000E-01	GI-LLI
30 Y-91M	1.755E-10	0.000E-01	4.591E-09	0.000E-01	0.000E-01	0.000E-01	2.168E-07	0.000E-01	GI-LLI
31 Y-91	2.103E+05	0.000E-01	7.842E+06	0.000E-01	0.000E-01	0.000E-01	3.215E+09	0.000E-01	GI-LLI
32 Y-92	2.432E-02	0.000E-01	8.407E-01	0.000E-01	0.000E-01	0.000E-01	2.307E+04	0.000E-01	GI-LLI
33 Y-93	4.424E+00	0.000E-01	1.614E+02	0.000E-01	0.000E-01	0.000E-01	4.930E+06	0.000E-01	GI-LLI
34 ZR-95	3.808E+05	0.000E-01	1.755E+06	5.538E+05	4.303E+12	0.000E-01	1.278E+09	0.000E-01	KIDNEY
35 ZR-97	2.830E+01	0.000E-01	3.105E+02	6.144E+01	9.314E+01	0.000E-01	1.664E+07	0.000E-01	GI-LLI

TABLE 6 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : TEEN  
PATHWAY : VEGETATION

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
36	NB-95	5.86E+04	0.000E-01	1.921E+05	1.065E+05	1.033E+05	0.000E-01	4.556E+08	0.000E-01	GI-LLI
37	NB-97	1.65E-07	0.000E-01	1.791E-06	4.521E-07	5.274E-07	0.000E-01	1.668E-03	0.000E-01	GI-LLI
38	NB-99	1.07E+06	0.000E-01	0.000E-01	5.634E+06	1.289E+07	0.000E-01	1.009E+07	0.000E-01	KIDNEY
39	TC-99M	9.861E+01	0.000E-01	2.728E+00	7.610E+00	1.134E+02	4.224E+00	4.996E+03	0.000E-01	GI-LLI
40	TC-101	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
41	RU-103	2.96E+06	0.000E-01	6.891E+06	0.000E-01	2.429E+07	0.000E-01	5.756E+08	0.000E-01	GI-LLI
42	RU-105	1.922E+01	0.000E-01	4.952E+01	0.000E-01	6.247E+02	0.000E-01	3.998E+04	0.000E-01	GI-LLI
43	RU-106	3.903E+07	0.000E-01	3.097E+08	0.000E-01	5.973E+08	0.000E-01	1.485E+10	0.000E-01	GI-LLI
44	AG-110M	8.735E+06	0.000E-01	1.517E+07	1.436E+07	2.739E+07	0.000E-01	4.034E+09	0.000E-01	GI-LLI
45	CD-115M	1.726E+06	0.000E-01	0.000E-01	5.401E+07	4.285E+07	0.000E-01	2.272E+09	0.000E-01	GI-LLI
46	SB-124	4.433E+07	2.712E+05	1.122E+08	2.116E+06	0.000E-01	8.706E+07	3.175E+09	0.000E-01	GI-LLI
47	TE-125M	1.986E+07	4.150E+07	1.486E+08	5.352E+07	0.000E-01	0.000E-01	4.383E+08	0.000E-01	GI-LLI
48	TE-127M	6.559E+07	1.312E+08	5.515E+08	1.956E+08	2.236E+09	0.000E-01	1.374E+09	0.000E-01	KIDNEY
49	TE-127	1.153E+03	3.696E+03	5.358E+03	1.899E+03	2.170E+04	0.000E-01	4.137E+05	0.000E-01	GI-LLI
50	TE-129M	5.689E+07	1.160E+08	3.594E+08	1.334E+08	1.504E+09	0.000E-01	1.349E+09	0.000E-01	KIDNEY
51	TE-129	1.780E-04	5.225E-04	7.315E-04	2.727E-04	3.070E-03	0.000E-01	4.001E-03	0.000E-01	GI-LLI
52	TE-131M	3.366E+05	6.070E+05	8.416E+05	4.035E+05	4.208E+06	0.000E-01	3.239E+07	0.000E-01	GI-LLI
53	TE-131	3.994E-16	9.818E-16	1.278E-15	5.267E-16	5.988E-15	0.000E-01	1.019E-16	0.000E-01	KIDNEY
54	TE-132	2.319E+06	2.598E+06	3.891E+06	2.464E+06	2.364E+07	0.000E-01	7.805E+07	0.000E-01	GI-LLI
55	I-130	4.074E+05	8.320E+07	3.527E+05	1.020E+06	1.572E+06	0.000E-01	7.841E+05	0.000E-01	THYROID
56	I-131	5.783E+07	3.141E+10	7.689E+07	1.076E+08	1.853E+08	0.000E-01	2.129E+07	0.000E-01	THYROID
57	I-132	4.496E+01	4.221E+03	4.788E+01	1.253E+02	1.973E+02	0.000E-01	5.457E+01	0.000E-01	THYROID
58	I-133	9.998E+05	4.576E+08	1.932E+06	3.278E+06	5.749E+06	0.000E-01	2.480E+06	0.000E-01	THYROID
59	I-134	7.356E-05	3.413E-03	7.726E-05	2.048E-04	3.228E-04	0.000E-01	2.699E-06	0.000E-01	THYROID
60	I-135	3.293E+04	5.715E+06	3.452E+04	8.894E+04	1.403E+05	0.000E-01	9.846E+04	0.000E-01	THYROID
61	CS-134	7.750E+09	0.000E-01	7.097E+09	1.670E+10	5.308E+09	2.027E+09	2.077E+08	0.000E-01	LIVER
62	CS-136	1.133E+08	0.000E-01	4.269E+07	1.688E+08	9.187E+07	1.418E+07	1.358E+07	0.000E-01	LIVER
63	CS-137	4.695E+09	0.000E-01	1.013E+10	1.318E+10	4.586E+09	1.782E+09	1.918E+08	0.000E-01	LIVER
64	CS-138	3.218E-11	0.000E-01	3.352E-11	4.435E-11	4.751E-11	5.529E-12	2.920E-14	0.000E-01	LIVER
65	CS-139	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
66	BA-139	7.417E-04	0.000E-01	2.545E-02	1.791E-05	1.688E-05	1.234E-05	2.271E-01	0.000E-01	GI-LLI
67	BA-140	8.882E+06	0.000E-01	1.378E+08	1.689E+05	5.727E+04	1.136E+05	2.126E+08	0.000E-01	GI-LLI
68	BA-141	3.134E-23	0.000E-01	9.387E-22	7.009E-25	6.505E-25	4.798E-25	0.000E-01	0.000E-01	BONE
69	BA-142	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
70	LA-140	2.362E+02	0.000E-01	1.807E+03	8.878E+02	0.000E-01	0.000E-01	5.098E+07	0.000E-01	GI-LLI



TABLE 6 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : TEEN

PATHWAY : VEGETATION

NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
71 LA-142	1.351E-05	0.000E-01	1.221E-04	5.424E-05	0.000E-01	0.000E-01	1.651E+00	0.000E-01	GI-LLI
72 CE-141	2.168E+04	0.000E-01	2.827E+05	1.888E+05	8.886E+04	0.000E-01	5.399E+08	0.000E-01	GI-LLI
73 CE-143	7.571E+01	0.000E-01	9.315E+02	6.778E+05	3.040E+02	0.000E-01	2.037E+07	0.000E-01	GI-LLI
74 CE-144	2.833E+06	0.000E-01	5.271E+07	2.181E+07	1.303E+07	0.000E-01	1.325E+10	0.000E-01	GI-LLI
75 PR-143	3.482E+03	0.000E-01	6.995E+04	2.793E+04	1.623E+04	0.000E-01	2.301E+08	0.000E-01	GI-LLI
76 PR-144	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
77 ND-147	2.356E+03	0.000E-01	3.617E+04	3.933E+04	2.310E+04	0.000E-01	1.419E+08	0.000E-01	GI-LLI
78 W-185	6.613E+05	0.000E-01	1.891E+07	6.287E+06	0.000E-01	0.000E-01	7.265E+08	0.000E-01	GI-LLI
79 W-187	1.011E+04	0.000E-01	3.540E+04	2.885E+04	0.000E-01	0.000E-01	7.808E+06	0.000E-01	GI-LLI
80 U-235	4.417E+09	0.000E-01	7.289E+10	0.000E-01	1.700E+10	0.000E-01	7.099E+09	0.000E-01	BONE
81 U-238	4.136E+09	0.000E-01	6.971E+10	0.000E-01	1.591E+10	0.000E-01	1.509E+10	0.000E-01	BONE
82 NP-239	7.217E+01	0.000E-01	1.378E+03	1.299E+02	4.078E+02	0.000E-01	2.090E+07	0.000E-01	GI-LLI



TABLE 6 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : CHILD

PATHWAY : VEGETATION

NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1 H-3	4.008E+03	4.008E+03	0.000E-01	4.008E+03	4.008E+03	4.008E+03	4.008E+03	4.008E+03	W. BODY
2 C-14	7.008E+05	7.008E+05	3.504E+06	7.008E+05	7.008E+05	7.008E+05	7.008E+05	7.008E+05	BONE
3 NA-24	3.732E+05	3.732E+05	3.732E+05	3.732E+05	3.732E+05	3.732E+05	3.732E+05	0.000E-01	W. BODY
4 P-32	1.301E+08	0.000E-01	3.375E+09	1.579E+08	0.000E-01	0.000E-01	9.323E+07	0.000E-01	BONE
5 SC-46	1.239E+05	0.000E-01	2.195E+05	4.302E+05	3.983E+05	0.000E-01	2.075E+09	0.000E-01	GI-LLI
6 CR-51	1.175E+05	6.522E+04	0.000E-01	0.000E-01	1.782E+04	1.191E+05	6.232E+06	0.000E-01	GI-LLI
7 MN-54	1.770E+08	0.000E-01	0.000E-01	6.646E+08	1.863E+08	0.000E-01	5.578E+08	0.000E-01	LIVER
8 MN-56	4.100E+00	0.000E-01	0.000E-01	1.816E+01	2.197E+01	0.000E-01	2.632E+03	0.000E-01	GI-LLI
9 FE-55	1.317E+08	0.000E-01	8.012E+08	4.250E+08	0.000E-01	2.404E+08	7.873E+07	0.000E-01	BONE
10 FE-59	3.200E+08	0.000E-01	3.970E+08	6.423E+08	0.000E-01	1.862E+08	6.688E+08	0.000E-01	GI-LLI
11 CO-58	1.987E+08	0.000E-01	0.000E-01	6.490E+07	0.000E-01	0.000E-01	3.786E+08	0.000E-01	GI-LLI
12 CO-60	1.116E+09	0.000E-01	0.000E-01	3.783E+08	0.000E-01	0.000E-01	2.095E+09	0.000E-01	GI-LLI
13 NI-59	1.198E+08	0.000E-01	7.182E+08	2.463E+08	0.000E-01	0.000E-01	5.072E+07	0.000E-01	BONE
14 NI-63	1.343E+09	0.000E-01	2.114E+09	3.949E+10	0.000E-01	0.000E-01	1.424E+08	0.000E-01	BONE
15 NI-65	5.601E+00	0.000E-01	1.019E+02	9.595E+00	0.000E-01	0.000E-01	1.175E+03	0.000E-01	GI-LLI
16 CU-64	6.561E+03	0.000E-01	0.000E-01	1.086E+04	2.624E+04	0.000E-01	5.098E+05	0.000E-01	GI-LLI
17 ZN-65	1.344E+09	0.000E-01	8.112E+08	2.161E+09	1.362E+09	0.000E-01	3.795E+08	0.000E-01	LIVER
18 ZN-69	1.804E-06	0.000E-01	1.351E-05	1.952E-05	1.184E-05	0.000E-01	1.230E-03	0.000E-01	GI-LLI
19 BR-83	5.334E+00	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
20 BR-84	3.101E-11	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
21 BR-85	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
22 RB-86	2.767E+08	0.000E-01	0.000E-01	4.500E+08	0.000E-01	0.000E-01	2.895E+07	0.000E-01	LIVER
23 RB-88	1.651E-22	0.000E-01	0.000E-01	2.376E-22	0.000E-01	0.000E-01	1.166E-23	0.000E-01	LIVER
24 RB-89	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
25 SR-89	1.025E+09	0.000E-01	3.590E+10	0.000E-01	0.000E-01	0.000E-01	1.390E+09	0.000E-01	BONE
26 SR-90	3.152E+11	0.000E-01	1.243E+12	0.000E-01	0.000E-01	0.000E-01	1.675E+10	0.000E-01	BONE
27 SR-91	1.953E+04	0.000E-01	5.175E+05	0.000E-01	0.000E-01	0.000E-01	1.143E+06	0.000E-01	GI-LLI
28 SR-92	2.821E+01	0.000E-01	7.038E+02	0.000E-01	0.000E-01	0.000E-01	1.333E+04	0.000E-01	GI-LLI
29 Y-90	6.177E+02	0.000E-01	2.308E+04	0.000E-01	0.000E-01	0.000E-01	6.570E+07	0.000E-01	GI-LLI
30 Y-91M	3.063E-10	0.000E-01	8.417E-09	0.000E-01	0.000E-01	0.000E-01	1.648E-05	0.000E-01	GI-LLI
31 Y-91	4.990E+05	0.000E-01	1.866E+07	0.000E-01	0.000E-01	0.000E-01	2.486E+09	0.000E-01	GI-LLI
32 Y-92	4.430E-02	0.000E-01	1.548E+00	0.000E-01	0.000E-01	0.000E-01	4.473E+04	0.000E-01	GI-LLI
33 Y-93	8.164E+00	0.000E-01	2.973E+02	0.000E-01	0.000E-01	0.000E-01	4.434E+06	0.000E-01	GI-LLI
34 ZR-95	7.702E+05	0.000E-01	3.936E+06	8.652E+05	1.238E+06	0.000E-01	9.025E+08	0.000E-01	GI-LLI
35 ZR-97	4.833E+01	0.000E-01	5.669E+02	8.191E+01	1.176E+02	0.000E-01	1.241E+07	0.000E-01	GI-LLI

TABLE 6 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : CHILD

PATHWAY : VEGETATION

NO ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
34 NB-95	1.141E+05	0.000E-01	4.101E+05	1.597E+05	1.500E+05	0.000E-01	2.953E+08	0.000E-01	GI-LLI
37 NB-97	1.022E-07	0.000E-01	1.109E-06	2.799E-07	3.265E-07	0.000E-01	1.033E-03	0.000E-01	GI-LLI
38 MO-99	1.903E+06	0.000E-01	0.000E-01	7.693E+06	1.643E+07	0.000E-01	6.362E+06	0.000E-01	KIDNEY
39 TC-99M	1.526E+02	0.000E-01	4.695E+00	9.208E+00	1.338E+02	4.675E+00	5.210E+03	0.000E-01	GI-LLI
40 TC-101	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
41 RU-103	5.959E+06	0.000E-01	1.550E+07	0.000E-01	3.902E+07	0.000E-01	4.008E+08	0.000E-01	GI-LLI
42 RU-105	3.290E+01	0.000E-01	9.070E+01	0.000E-01	7.973E+02	0.000E-01	5.920E+04	0.000E-01	GI-LLI
43 RU-106	9.308E+07	0.000E-01	7.459E+08	0.000E-01	1.007E+09	0.000E-01	1.160E+10	0.000E-01	GI-LLI
44 AG-110M	1.736E+07	0.000E-01	3.216E+07	2.172E+07	4.046E+07	0.000E-01	2.584E+09	0.000E-01	GI-LLI
45 CB-115M	1.359E+06	0.000E-01	0.000E-01	4.251E+07	3.373E+07	0.000E-01	1.788E+09	0.000E-01	GI-LLI
46 SB-124	3.524E+07	2.156E+05	8.921E+07	1.683E+06	0.000E-01	6.921E+07	2.521E+09	0.000E-01	GI-LLI
47 TE-125M	4.683E+07	9.859E+07	3.512E+08	9.520E+07	0.000E-01	0.000E-01	3.389E+08	0.000E-01	BONE
48 TE-127M	1.569E+08	3.161E+08	1.322E+09	3.559E+08	3.767E+09	0.000E-01	1.070E+09	0.000E-01	KIDNEY
49 TE-127	2.120E+03	6.813E+03	9.887E+03	2.666E+03	2.813E+04	0.000E-01	3.862E+05	0.000E-01	GI-LLI
50 TE-129M	1.297E+08	2.693E+08	8.354E+08	2.333E+08	2.453E+09	0.000E-01	1.019E+09	0.000E-01	KIDNEY
51 TE-129	3.215E-04	9.664E-04	1.355E-03	3.781E-04	3.963E-03	0.000E-01	8.431E-02	0.000E-01	GI-LLI
52 TE-131M	5.658E+05	1.093E+06	1.537E+06	5.316E+05	5.146E+06	0.000E-01	2.156E+07	0.000E-01	GI-LLI
53 TE-131	7.003E-16	1.800E-15	2.353E-15	7.174E-16	7.117E-15	0.000E-01	1.236E-14	0.000E-01	GI-LLI
54 TE-132	3.727E+06	4.494E+06	6.972E+06	3.086E+06	2.855E+07	0.000E-01	3.106E+07	0.000E-01	GI-LLI
55 I-130	6.443E+05	1.378E+08	6.189E+05	1.251E+06	1.859E+06	0.000E-01	5.850E+05	0.000E-01	THYROID
56 I-131	8.175E+07	4.757E+10	1.430E+08	1.439E+08	2.362E+08	0.000E-01	1.281E+07	0.000E-01	THYROID
57 I-132	7.191E+01	7.245E+03	8.498E+01	1.562E+02	2.390E+02	0.000E-01	1.838E+02	0.000E-01	THYROID
58 I-133	1.649E+06	8.094E+09	3.523E+06	4.356E+06	7.261E+06	0.000E-01	1.756E+06	0.000E-01	THYROID
59 I-134	1.173E-04	5.864E-03	1.373E-04	2.549E-04	3.898E-04	0.000E-01	1.690E-04	0.000E-01	THYROID
60 I-135	5.220E+04	9.774E+06	6.130E+04	1.103E+05	1.692E+05	0.000E-01	8.407E+04	0.000E-01	THYROID
61 CS-134	5.549E+09	0.000E-01	1.603E+10	2.631E+10	8.152E+09	2.925E+09	1.418E+08	0.000E-01	LIVER
62 CS-136	1.434E+08	0.000E-01	8.062E+07	2.216E+08	1.180E+08	1.760E+07	7.787E+06	0.000E-01	LIVER
63 CS-137	3.380E+09	0.000E-01	2.392E+10	2.290E+10	7.462E+09	2.685E+09	1.434E+08	0.000E-01	BONE
64 CS-138	5.375E-11	0.000E-01	6.097E-11	8.476E-11	5.963E-11	6.417E-12	3.904E-11	0.000E-01	LIVER
65 CS-139	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
66 BA-139	1.360E-03	0.000E-01	4.693E-02	2.505E-05	2.188E-05	1.474E-05	2.709E+00	0.000E-01	GI-LLI
67 BA-140	1.611E+07	0.000E-01	2.761E+08	2.419E+05	7.875E+04	1.442E+05	1.399E+08	0.000E-01	BONE
68 BA-141	5.638E-23	0.000E-01	1.732E-21	9.699E-25	8.392E-25	5.698E-24	9.872E-22	0.000E-01	BONE
69 BA-142	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
70 LA-140	3.535E+02	0.000E-01	3.246E+03	1.134E+03	0.000E-01	0.000E-01	3.162E+07	0.000E-01	GI-LLI

TABLE 6 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : CHILD PATHWAY : VEGETATION	NO ISOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
71 LA-142	2.209E-05	0.000E-01	0.000E-01	2.213E-04	7.054E-05	0.000E-01	0.000E-01	1.398E+01	0.000E-01	GI-LLI
72 CE-141	4.854E+04	0.000E-01	0.000E-01	6.555E+05	3.269E+05	1.433E+05	0.000E-01	4.078E+08	0.000E-01	GI-LLI
73 CE-143	1.347E+02	0.000E-01	0.000E-01	1.715E+03	9.300E+05	3.902E+02	0.000E-01	1.362E+07	0.000E-01	GI-LLI
74 CE-144	6.788E+05	0.000E-01	0.000E-01	1.270E+08	3.982E+07	2.205E+07	0.000E-01	1.038E+10	0.000E-01	GI-LLI
75 PR-143	7.216E+03	0.000E-01	0.000E-01	1.454E+05	4.367E+04	2.365E+04	0.000E-01	1.569E+08	0.000E-01	GI-LLI
76 PR-144	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	2.632E-23	0.000E-01	GI-LLI
77 NB-147	4.475E+03	0.000E-01	0.000E-01	7.140E+04	5.783E+04	3.173E+04	0.000E-01	9.161E+07	0.000E-01	GI-LLI
78 W-195	5.279E+05	0.000E-01	0.000E-01	1.509E+07	5.019E+06	0.000E-01	0.000E-01	5.809E+08	0.000E-01	GI-LLI
79 W-197	1.711E+04	0.000E-01	0.000E-01	6.439E+04	3.813E+04	0.000E-01	0.000E-01	5.359E+06	0.000E-01	GI-LLI
80 W-235	3.573E+09	0.000E-01	0.000E-01	5.895E+10	0.000E-01	1.375E+10	0.000E-01	5.741E+09	0.000E-01	BONE
81 W-238	3.345E+09	0.000E-01	0.000E-01	5.638E+10	0.000E-01	1.286E+10	0.000E-01	1.230E+10	0.000E-01	BONE
82 NB-239	1.283E+02	0.000E-01	0.000E-01	2.544E+03	1.827E+02	5.282E+02	0.000E-01	1.352E+07	0.000E-01	GI-LLI

TABLE 6 (CONT)  
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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : INFANT  
PATHWAY : VEGETATION

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
1	H-3	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
2	C-14	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
3	NA-24	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
4	P-32	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
5	SC-46	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
6	CR-51	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
7	MN-54	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
8	MN-56	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
9	FE-55	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
10	FE-59	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
11	CO-58	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
12	CO-60	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
13	NI-59	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
14	NI-63	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
15	NI-65	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
16	CU-64	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
17	ZN-65	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
18	ZN-69	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
19	BR-83	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
20	BR-84	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
21	BR-85	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
22	BR-86	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
23	BR-88	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
24	BR-89	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
25	SR-89	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
26	SR-90	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
27	SR-91	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
28	SR-92	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
29	Y-90	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
30	Y-91M	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
31	Y-91	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
32	Y-92	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
33	Y-93	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
34	ZR-95	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
35	ZR-97	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY



TABLE 6 (CONT)  
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PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : INFANT  
PATHWAY : VEGETATION

NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL
36	NB-95	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
37	NB-97	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
38	MO-99	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
39	TC-99M	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
40	TC-101	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
41	RU-103	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
42	RU-105	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
43	RU-106	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
44	AS-110M	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
45	CB-115M	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
46	SB-124	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
47	TE-125M	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
48	TE-127M	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
49	TE-129M	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
50	TE-129M	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
51	TE-129	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
52	TE-131M	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
53	TE-131	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
54	TE-132	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
55	I-130	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
56	I-131	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
57	I-132	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
58	I-133	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
59	I-134	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
60	I-135	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
61	CS-134	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
62	CS-135	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
63	CS-137	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
64	CS-138	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
65	CS-139	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
66	EA-139	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
67	EA-140	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
68	EA-141	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
69	EA-142	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY
70	LA-140	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY



TABLE 6 (CONT)

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## PATHWAY DOSE PARAMETER FACTORS FOR IMPLEMENTING 10 CFR PART 50

AGE : INFANT											
PATHWAY : VEGETATION											
NO	ISOTOPE	W. BODY	THYROID	BONE	LIVER	KIDNEY	LUNG	GI-LLI	SKIN	CRITICAL	
71	LA-142	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY	
72	CE-141	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY	
73	CE-143	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY	
74	CE-144	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY	
75	FR-143	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY	
76	FR-144	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY	
77	ND-147	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY	
78	U-185	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY	
79	U-187	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY	
80	U-235	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY	
81	U-238	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY	
82	NP-239	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	0.000E-01	W. BODY	

TABLE 7

CONTROLLING RECEPTORS, LOCATIONS, PATHWAYS, AND ATMOSPHERIC DISPERSION PARAMETERS

Sector	Distance (meters)	Pathways	Age Group	X/Q <sub>I</sub>	D/Q
N*	870	Inhalation	Infant	8.76E-07	8.09E-09
NNE	900	Vegetation	Infant	1.19E-06	1.39E-08
NE**	900	Inhalation	Child	1.26E-06	1.58E-08
ENE**	--	----	---	----	----
E**	--	----	---	----	----
ESE**	--	----	---	----	----
SE***	8000	Cow/Milk	Infant	3.43E-08	1.45E-10
SSE	2680	Vegetation	Child	7.38E-08	9.13E-10
S	1990	Vegetation	Child	7.66E-08	1.29E-09
SSW	1000	Vegetation	Child	1.92E-07	4.18E-09
SW	990	Vegetation	Child	3.10E-07	5.64E-09
WSW	4250	Cow/Milk	Infant	5.74E-08	5.36E-10
W	980	Vegetation	Child	6.21E-07	9.58E-09
WNW	2500	Vegetation	Child	8.58E-08	8.61E-10
NW	1160	Vegetation	Child	2.29E-07	1.97E-09
NNW	1250	Vegetation	Child	2.51E-07	1.79E-09

\*Default value, no vegetable gardens within five miles.

\*\*These sectors are located over Lake Erie, so no ingestion pathways are present.

\*\*\*Default value, no real receptors within five miles.

TABLE 8

Page 1 of 2

SAMPLING LOCATIONS, DAVIS-BESSE NUCLEAR POWER STATION

Code	Appendix A Page Reference	Type of Location *	Location
T-1	A-16	I	Site boundary, 0.96 km NE of station, near intake canal.
T-2	A-17	I	Site boundary, 1.44 km E of Station.
T-3	A-18	I	Site boundary, 2.24 km ESE of station, near Toussaint River and storm drain.
T-4	A-19	I	Site boundary, 1.28 km S of station, near Locust Point and Toussaint River.
T-5	A-20	I	Main entrance to site, 0.80 km W of station.
T-7	A-21	I	Sand Beach, 1.44 km NNW of site.
T-8	A-22	I	Earl Moore Farm, 4.32 km WSW of site.
T-9	A-23	C	Oak Harbor, 10.9 km SSW of site.
T-11	A-24	C	Port Clinton, 18.4 km SE of site.
T-12	A-25	C	Toledo, 37.6 km WNW of site (water samples are taken from an intake located 17.6 km NNW of site).
T-17	A-26	I	Irv Fick's well on site, 1.12 km SW of station.
T-20	A-27	C	Carl Gaeth, 12639 W. Toussaint E Road, 7.20 km WSW of site.
T-24	A-28, A-29	C	Sandusky, 39.8 km SE of site.
T-25	A-30	I	Miller Farm, 5.92 km S of site.
T-27	A-31	C	Magee Marsh, 8.48 km WNW of site.
T-28	A-32	I	Unit 1 treated and untreated water supply, onsite.
T-33	A-33	I	Lake Erie, within a 8.0 km radius of site.
T-35	A-34	C	Lake Erie, greater than 16.0 km radius of site.
T-37	A-35	C	Fruit stand, 19.2 km SW of station (or the farm 16 to 30 km from the site in the least prevalent wind direction).
T-38	A-36	I	Site boundary 0.96 km ENE of station near lake.
T-40	A-37	I	Site boundary 1.12 km SE of station near ditch to Toussaint.
T-41	A-38	I	Site boundary 0.96 km SSE of station near ditch to Toussaint.

\* I=Indicator locations; C=Control Locations

TABLE 8 (continued)

Page 2 of 2

SAMPLING LOCATIONS, DAVIS-BESSE NUCLEAR POWER STATION

Code	Appendix A Page Reference	Type of Location *	Location
T-42	A-39	I	Site boundary 1.28 km SSW of station by ECC.
T-43	A-40	I	Site boundary 0.80 km SW of station along Route 2 fence.
T-44	A-41	I	Site boundary 0.80 km WSW of station by railroad tracks.
T-45	A-42	I	Site boundary 0.80 km WNW of station on access road behind Cooling Tower.
T-46	A-43	I	Site boundary 0.80 km NW of station along access road.
T-47	A-44	I	Site boundary 0.80 km N of station along access road by gate.
T-48	A-45	I	Site boundary 0.80 km NNE of station along access road by lake.
T-50	A-46	I	Erie Industrial Park 7.20 km SE of station by Water Tower.
T-51	A-47	I	Daup Farm, 600 Tettau Road, Port Clinton, Ohio 8.80 km SSE of the station.
T-52	A-48	I	Miller Farm 5.92 km S of site on West Camp Perry Road W.
T-54	A-49	I	M. Beier Farm 7.68 km SW of site on Genzman Road.
T-55	A-50	I	Lenke Farms 8.0 km W of site on Route 2.

\* I=Indicator location; C=Control locations.

TABLE 9

Page 1 of 2  
 Type and Frequency of Sample Collection  
 Environmental Radiation Monitoring Program

Location	Type	Weekly	Monthly	Quarterly	Semi-annually	Annually
1	I	AP AI		TLD		
2	I	AP AI		TLD		
3	I	AP AI SWU <sup>a</sup>		TLD		
4	I	AP AI SWU <sup>a</sup>				
5	I			TLD		
7	I			TLD		
8	I		M <sup>b</sup> GLV <sup>d</sup>			
9	C	AP AI		TLD		
11	C			TLD		
12	C	AP AI SWU <sup>a</sup> SWT <sup>a</sup>		TLD		
17	I			WW		
20	I		M <sup>b</sup>			
24	C		M <sup>b</sup>	TLD		
25	I		GLV <sup>d</sup>			
27	C			TLD	BS	
28	I	SWT <sup>a</sup>				F <sup>c</sup>
33	I					F <sup>c</sup>
35	C					
37	C		GLV <sup>d</sup>			
38	I			TLD		
40	I			TLD		
41	I			TLD		

(Continued on next page)



Table 9, continued

Page 2 of 2

Type and Frequency of Sample Collection  
Environmental Radiation Monitoring Program (Continued)

Location	Type	Weekly	Monthly	Quarterly	Semi-annually	Annually
42	I			TLD		
43	I			TLD		
44	I			TLD		
45	I			TLD		
46	I			TLD		
47	I			TLD		
48	I			TLD		
50	I			TLD		
51	I			TLD		
52	I			TLD		
54	I			TLD		
55	I			TLD		

<sup>a</sup>Composite sample over 1-week period<sup>b</sup>Semi-monthly when animals are on pasture (May-October), monthly at other times<sup>c</sup>Summer months<sup>d</sup>Monthly when available (July, August, September)

Table 10  
Sample Collection Codes

Code	Description
AP	Airborne Particulates
AI	Airborne Iodine
TLD	Thermoluminescent Dosimeter
M	Milk
WW	Well Water (Ground Water)
GLV	Green Leafy Vegetables
SWT	Surface Water - Treated
SWU	Surface Water - Untreated
F	Fish
BS	Bottom Sediments

OFFSITE DOSE CALCULATION MANUAL

APPENDIX J

JUSTIFICATIONS

Safety Evaluation for the Davis-Besse  
Radiological Effluent Technical Specifications Amendment

Overview

Revisions to the Davis-Besse Appendix A and Appendix B Technical Specifications are proposed which will implement the regulatory requirement of 10 CFR 50, Appendix I on ALARA for radioactive effluents and other NRC regulations and criteria on radioactive material monitoring instrumentation, radioactive material control, and radiological environmental monitoring. In keeping with NRC guidelines, all radiological requirements are being deleted from Appendix B and placed in Appendix A.

This proposed amendment is a revision to a previously submitted amendment to the NRC dated March 16, 1979 (Serial No. 483).

The major areas that are addressed in the revised submittal are as follows:

- ° Liquid and gaseous effluent monitoring instrumentation--operation and periodic operability checks;
- ° Liquid and gaseous radioactive material releases--maximum release rates, quarterly dose limits and yearly dose limits;
- ° Sampling and analysis requirements on batch and continuous radioactive material releases;
- ° Operation requirements on the liquid radwaste treatment system;
- ° Curie inventory limit on outside temporary liquid storage tanks,
- ° Maximum allowable oxygen concentration in the waste gas system;

- ° Requirements to assure all solid waste meets applicable burial site requirements;
- ° Radiological environmental monitoring program--minor revisions to reflect current program and current NRC guidelines.

Changes have also been made to Section 6 of Appendix A to reflect the applicable administrative controls needed for the Section 3/4 revisions.

A notable addition to the amendment is the inclusion of a requirement for an Off-site Dose Calculation Manual (ODCM) and a Process Control Program (PCP). The ODCM and PCP are not licensed documents but are referenced in the Technical Specification as presenting acceptable methods for evaluating compliance with applicable Technical Specification requirements. The ODCM provides calculational methods for determining radioactive effluent instrumentation alarm setpoints, and for evaluating releases of radioactive effluents and corresponding doses. The ODCM also includes the sampling locations for the environmental monitoring program. The PCP presents the methods used to verify that waste (dewatered resins) as processed for disposal meets appropriate shipping and burial ground regulations. Changes may be made to these documents without NRC approval; review by the SRB is required.

#### Safety Evaluation

An evaluation of the revised amendment has been performed to assure that the revisions as proposed do not involve an unreviewed safety question as defined in 10 CFR 50.59. The three criteria of 10 CFR 50.59 for the unreviewed safety question determination are addressed below.

- i) Probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report.



Except for the addition of the turbine building liquid effluent radiation monitor (for which an FCR has already been initiated), no plant equipment modifications are required by the proposed amendment. Certain procedural requirements will need to be developed but these address routine radioactive material effluents and controls; no accident procedures are involved.

- ii) Probability for accident or malfunction of a different type than any evaluated previously in the SAR may be created.

For reasons as stated in response to item (i) above, the proposed amendment does not directly or indirectly pose a probability for an accident or malfunction. The amendment will implement the NRC regulations for routine releases and controls of radioactive material. The amendment does not address any engineered safety features of the plant design.

- iii) Margin of safety as defined in the basis for any technical specification is reduced.

The proposed amendment does not reduce the margin of safety. The proposed amendment addresses routine releases and control of radioactive material; except as noted in item (i), no plant modifications are involved. Several operating procedure changes may be needed, but these changes will be only for routine operations and will have no impact on accident probability or consequences.

For the reasons discussed above for each of the criteria of 10 CFR 50.59, it is concluded that the amendment as proposed does not involve an unreviewed safety question.

### Service Water System--Radiological Effluent Monitoring Requirements

The service water system is classified as a non-radioactive system, being removed from radioactive systems by two boundaries. Radioactive systems are serviced by the component cooling water system interface; and, the service water system provides cooling to the component cooling water system through closed loop heat exchangers. Therefore, any leaks from radioactive systems into the plant water systems would first be identified by the monitoring of the component cooling water system prior to any additional unexpected leakage into the service water system. As a prudent measure, the service water system is monitored in accordance with the NRC guidance of Standard Review Plan, Section 11.5. However, because this system is a non-radioactive system and is separated from radioactive systems through two closed-loop boundaries, no Technical Specification requirements are needed for routine monitoring and analysis for radioactive effluents.

### Radioactive Effluent Instrumentation--Automatic Isolation Feature

The radioactive effluent monitoring instrumentation at Davis-Besse does not include provisions as called for in the NRC Standard Radiological Effluent Technical Specifications for automatic isolation should any of the following conditions exist: circuit failure, downscale failure, or instrument not set in operate mode. Even though the automatic isolation features do not exist, administrative controls have been established such that should any of these conditions exist the control of radioactive effluents would not be significantly impacted. Essentially all releases of liquid radwaste are controlled as individual batch releases with predetermined allowable release conditions. Thereby the radiation monitor serves mainly as a back-up; primary control is established by the prerelease radiological analyses and evaluations. To assure the availability of the back-up monitoring, the status of the instruments is checked once per shift by the control room operators. Indicator lights on the instrument panel are checked to verify operability. An indicator would illuminate should a failure occur such as the ones delineated above. Therefore, in addition to the administrative controls on allowable releases, the verification of instrument operability prior to releases of radioactive effluents and the "once per shift" status check by the control room operators provides adequate assurance of the proper control of the radioactive effluents.

Technical Bases for Eliminating Curie Inventory  
Limit for Gaseous Waste Decay Tanks

The NRC Standard Technical Specifications include a limit for the amount of radioactivity that can be stored in a single waste gas decay tank. This curie inventory limit is established to assure that in the event of a tank failure releasing the radioactive content to the environment the resulting total body dose at the site boundary would not exceed 0.5 rem. For Davis-Besse the inventory limit in the waste gas storage tank has been determined to be approximately 45,000 curies (Xe-133, equivalent).

An allowable primary coolant radioactivity concentration is established by the Technical Specifications which limit the primary coolant radioactivity concentrations to  $100/E$  with  $E$  being the average energy of the radioactivity in Mev. This equation yields an upper primary coolant gross activity limit of about  $200 \mu\text{Ci/ml}$ . By applying this activity concentration limit to the total liquid volume of the primary system, a total activity limit can be determined. For Davis-Besse the primary system volume is about 56,000 gallons, which yields a limiting total inventory of approximately 41,000 Ci.

By assuming a typical radionuclide distribution an equivalent Xe-133 inventory can be determined. Table 1 provides the typical radionuclide (noble gases) distribution and the Xe-133 equivalent concentration. The equivalent concentration is determined by multiplying the radionuclide concentration by the ratio of the nuclide total body dose factor to the Xe-133 total body dose factor. Summing all the individual radionuclide equivalent concentrations provides the overall Xe-133 equivalent concentration. For determining concentration in a waste gas decay tank, a conservative assumption of 48 hours decay in degassing the primary system has been used to correct the primary coolant concentrations. The data show that the equivalent concentration (decay corrected) is less than the gross concentration (i.e.,  $16 \mu\text{Ci/gm}$  total in primary coolant versus  $12 \mu\text{Ci/gm}$  equivalent). The resulting Xe-133 equivalent curie inventory for WGDT input is approximately 31,000 Ci.

Therefore, even if the total primary system at the maximum Tech Spec allowable concentration was degassed to a single waste gas decay tank, the tank curie inventory would be well below the 45,000 Ci limit. Based on this evaluation, the curie inventory limit on a single waste gas storage tank has not been included as a Technical Specification requirement.



Table 1

## Xe-133 Effective Concentration

	Primary* Coolant ( $\mu\text{Ci/GM}$ )	Half-life	Concentration @ 48 hr decay ( $\mu\text{Ci/ml}$ )	Reg Guide 1.109 TB Dose Factor $\frac{\text{mrem/yr}}{\text{pCi/m}^3}$	Ratio $\frac{\text{TB DF}}{\text{Xe-133 DF}}$	Xe-133 Effective Conc @ 48 hr decay ( $\mu\text{Ci/ml}$ )
Kr-83M	2.0-02	1.9 hr	--	$7.6 \times 10^{-8}$	--	--
Kr-85M	1.1-01	4.5 hr	--	$1.2 \times 10^{-3}$	4.1	--
Kr-85	7.4-02	10.7 yr	$7.4 \times 10^{-2}$	$1.6 \times 10^{-5}$	0.06	$4.4 \times 10^{-3}$
Kr-87	5.8-02	76.3 min	--	$5.2 \times 10^{-3}$	20.	--
Kr-88	1.9-01	2.84 hr	--	$1.5 \times 10^{-2}$	52.	--
Kr-89	4.8-03	3.16 min	--	$1.7 \times 10^{-2}$	57.	--
Xe-131M	8.4-02	12 days	$7.5 \times 10^{-2}$	$9.2 \times 10^{-5}$	0.32	$2.4 \times 10^{-2}$
Xe-133M	2.0-01	2.2 days	$1.1 \times 10^{-1}$	$2.5 \times 10^{-4}$	0.86	$9.5 \times 10^{-2}$
Xe-133	1.5+01	5.3 days	$1.2 \times 10^{+1}$	$2.9 \times 10^{-4}$	1.0	$1.2 \times 10^{+1}$
Xe-135M	1.3-02	16 min	--	$3.1 \times 10^{-3}$	11.	--
Xe-135	3.3-01	9.1 hr	$8.5 \times 10^{-3}$	$1.8 \times 10^{-3}$	6.2	$5.3 \times 10^{-2}$
Xe-137	8.7-03	4 min	--	$1.4 \times 10^{-3}$	4.8	--
Xe-138	4.3-02	17 min	--	$8.8 \times 10^{-3}$	30	--
Total	$1.6 \times 10^{+1}$		$1.2 \times 10^{+1}$			$1.2 \times 10^{+1}$

\*Adapted from Davis-Besse Evaluation of Compliance with Appendix I to 10 CFR 50, June 4, 1976.

### Lower Limit of Detection--Decay Correction Factor

The equation and definition of the lower limit of detection in the NRC Standard Radiological Effluent Technical Specification include the term  $e^{-\lambda t}$  which is used to decay correct the analysis. The LLD is further defined as an a priori (before the fact) limit representing the capabilities of a measurement system and not an a posteriori (after the fact) limit for a particular measurement.

Providing a decay correction for an evaluation of the capabilities of a system does not appear appropriate. It may be appropriate to decay correct certain analyses of specific samples to determine radionuclide concentrations at the time of release. Even in this case, such a correction is not appropriate for batch releases. Analyses are performed prior to any release; and, the sample will be decaying at the same rate as the batch from which the sample was taken. For continuous releases, decay correcting analyses of samples obtained over a specified sampling interval must take into account the accumulation of radioactivity in the sampling medium, the decay during the sampling interval and, especially for short lived radionuclides, equilibrium or quasi-equilibrium conditions that may be achieved.

Short-lived radionuclides will tend to reach an equilibrium value in the sampling medium as a function of source input and half-life. A single decay correction to adjust for sampling interval will provide an unacceptable overestimate. Equilibrium concentrations must be considered if analyses are to be indicative of actual release quantities.

Employing  $\exp(-\lambda \Delta t)$  to adjust for radioactive decay between the end of sampling and the time of analysis is straightforward. However, to attempt to use the same term to adjust for decay during the sampling period is not proper. As a practical matter, when the half-life of a radionuclide is long relative to the sampling time and the time between sampling and analysis, i.e., minimal decay, the correction term will be near unity. In that event, the correction term is relatively unimportant.

At the other extreme, when the half-life of a radionuclide is much shorter than the sampling time or the time between the end of sampling and the analysis, the term  $\exp(-\lambda\Delta t)$  could be used to adjust for decay between the end of sampling and the analysis. However, it would not be appropriate in that case to use the same term to attempt to adjust for decay during sampling.

The relationship between the radioactivity in a sample at the end of sampling and the activity concentration in the medium being sampled is somewhat more involved. To explain this in the simplest condition, assume the radionuclide concentration is constant in the medium being sampled and that the medium is sampled at a constant rate.

In the instance of water sampling, the relationship between the activity concentration in the water being sampled and the activity concentration in the water sample at the end of sampling is:

$$C_1 = C_2 \frac{\lambda t}{1 - e^{-\lambda t}} \quad (2)$$

where

$C_1$  = radionuclide concentration in the water being sampled  
 $C_2$  = radionuclide concentration in the water sample at the end of sampling  
 $t$  = duration of sampling  
 $\lambda$  = radionuclide decay constant

when  $\lambda t \gg 1$ ,  $C_1 \approx C_2 \lambda t$

In the separate case of sampling a radionuclide in air by filtering the air and analyzing radioactive material collected on the filter, the radionuclide of interest is concentrated. Absent diluent air in the sample being analyzed, the relation between radioactivity on the sample media and radionuclide concentration in the air being sampled is:

$$C_1 = C \frac{\lambda t}{F(1 - e^{-\lambda t})} \quad (2)$$

where

$C_1$  = radionuclide concentration in the air being sampled  
 $q$  = radioactivity on the sample media (assuming 100% collection efficiency)  
 $F$  = sampler flow rate (volume/time)  
 $\lambda$  = radionuclide decay constant  
 $t$  = duration of sampling

when  $\lambda t \gg 1$ ,  $C_1 \sim q \lambda / F$ .

This merely recognizes that the rate of loss from the filter by radioactive decay equals the rate of collection onto the filter at equilibrium.

The NRC proposed equation appears to incorporate an adulterated way of encouraging analysis soon after the end of sampling and to encourage efficient sample concentration or radiochemical extraction. Although not rigorous, it combines both objectives in a simple and thus practical way, provided the decay correction is not extrapolated to a time earlier than the end of sampling.

A more nearly rigorous way of determining the activity concentration (or minimum detectable activity) in the medium being sampled is to assess the LLD in the sample at the time of analysis. Then the activity concentration in the medium being sampled can be calculated with the product of  $\exp(-\lambda \Delta t)$  for decay between the end of sampling and the analysis and one of the equations derived herein for the relation between the medium being sampled and the activity in the sample at the end of sampling.

However, this method is not very practical or necessary considering the types of sampling and analysis at nuclear power plants, the significant radionuclides, and the offsite potential doses. The bulk of the radioactivity is released as batch releases with all sampling and analysis performed prior to release. Therefore, no decay corrections are applicable. It is in the sampling and analysis of continuous releases that the accumulation and decay of the radioactive material may need to be considered. The use of NRC's guidance for decay correction to the mid-point of the sampling period can grossly overestimate actual release quantities of short-lived radionuclides, while providing little improvement for the

quantification of the longer half-life radionuclides that are the major dose contributors.

Overall, it may be appropriate to decay correct certain analysis to account for radionuclide decay during the sampling period. However, simple decay correction to the mid-point of sampling will grossly overestimate any short-lived radionuclides that may be detected. More consideration needs to be given by the NRC to address this problem. In any case, the use of a decay correction factor in defining a lower limit of detection is inappropriate. The LLD is a measurement of the capability of the measurement system and should not be used to try to establish a regulatory position on sampling and decay correction for quantification of releases.



## Technical Basis for Liquid Radwaste System Operations

Technical Specification 3.11.1.3 requires that appropriate subsystems of the liquid radwaste treatment system be routinely used to reduce the radioactive material levels prior to discharge when cumulative doses averaged over 31 days would exceed 0.25 mrem to the total body or 0.833 mrem to any organ. This specification implements the requirements of 10 CFR 50.36a(a) (1). The liquid radwaste treatment system should be used to process liquid waste in order to maintain potential doses to members of the public to less than the Appendix I design objective values of 3 mrem/yr, total body and 10 mrem/yr, any organ. Also, additional processing should be conducted to further reduce releases of radioactive material if it is cost-beneficial. This cost-benefit evaluation of the radwaste equipment operation should be based on a cost value of \$1,000 per man-rem.

For the Davis-Besse Appendix I evaluation,\* the quantities of radioactive material in liquid effluents released annually have been calculated to be:

total iodines	0.104 Ci
total others (excluding H-3)	<u>0.123 Ci</u>
Total	0.227 Ci

\*Davis-Besse Nuclear Power Station Unit No. 1, "Evaluation of Compliance with Appendix I to 10 CFR 50," June 4, 1976.

The population dose commitments resulting from these releases have been calculated to be:

thyroid	0.41 man-rem
total body	0.64 man-rem

Therefore, population doses are about 4 man-rem/Ci of iodines released and about 5 man-rem/Ci of other radionuclides (excluding H-3).

At Davis-Besse, liquid radwaste is processed by demineralization. From Regulatory Guide 1.110, the operating cost of a demineralizer is \$75/ft<sup>3</sup> for resins and \$20/ft<sup>3</sup> for disposal or \$95, total per ft<sup>3</sup> of resins used. Based on a 100 ft<sup>3</sup> resin bed with a service life of 200,000 gallons, the cost to process waste is about \$0.05 per gallon. To process a 13,000-gallon batch of miscellaneous liquid radwaste would cost about \$650. Thereby, the radioactivity concentration below which it is not cost-beneficial to process can be calculated as follows:

$$C = \frac{\$650}{13,000 \text{ gal} * 3785 \text{ ml/gal}} * \frac{1 \text{ Ci}}{5 \text{ man-rem}} * \frac{10^6 \text{ } \mu\text{Ci}}{\text{Ci}} * \frac{1 \text{ man-rem}}{\$1,000}$$

$$= 2.6 \times 10^{-3} \text{ } \mu\text{Ci/ml}$$

Individual doses have been calculated to be:

thyroid	0.034 mrem/0.104 Ci (iodines)
total body	0.032 mrem/0.123 Ci (others, excluding H-3)

Conservatively assuming that 100% of the dirty radwaste (2875 gpd) and 20% of the clean radwaste (890 gpd) is discharged to the environment containing all of the radioactive material released, the average gross radioactivity concentration corresponding to the Appendix I individual dose design objectives can be determined as follows:

$$3 \text{ mrem, total body} = \frac{0.123 \text{ Ci} * 3 \text{ mrem}}{0.032 \text{ mrem}} * \frac{1}{1.4 \times 10^6 \text{ gal} * 3785 \frac{\text{ml}}{\text{gal}}} * \frac{10^6 \mu\text{Ci}}{\text{Ci}}$$

$$= 2.2 \times 10^{-3} \mu\text{Ci/ml}$$

$$10 \text{ mrem, thyroid} = \frac{0.104/\text{Ci} * 10 \text{ mrem}}{0.034 \text{ mrem}} * \frac{1}{1.4 \times 10^6 \text{ gal} * 3785 \frac{\text{ml}}{\text{gal}}} * \frac{10^6 \mu\text{Ci}}{\text{Ci}}$$

$$= 5.8 \times 10^{-3} \mu\text{Ci/ml}$$

The radioactivity concentrations below which it is not cost-beneficial to process ( $2.6 \times 10^{-3} \mu\text{Ci/ml}$ ) are about the same as the limiting concentration corresponding to the Appendix I design objective dose ( $2.2 \times 10^{-3} \mu\text{Ci/ml}$ ). Therefore, it is reasonable to establish the liquid radwaste system operation requirement at a value corresponding to the Appendix I design objective class (i.e., 0.25 mrem/31 days, total body and 0.833 mrem/31 days, any organ).

## Waste Gas Decay System and Ventilation System--Operability Requirements

At Davis-Besse, the operation of the waste gas decay system is essentially continuous, similar to the routine operation of such a system at other PWRs. The system consists of a surge tank which receives the waste gases from the primary system, dual compressors (one in-service and the other in reserve), and three waste gas hold-up tanks (one in-service, one isolated for gas decay, and the third in reserve). Once the system is on-line with a waste gas decay tank receiving primary system gases for the surge tank, operation is automatic; no operator actions are required.

The operating philosophy at Davis-Besse is to essentially operate the waste gas system continuously. Not only is this philosophy prudent from an ALARA standpoint, but it is also conservative and protective from an operational standpoint. Having to periodically evaluate primary system off-gas activity levels and anticipate unexpected increases in radioactivity would be an unnecessary burden in determining needed waste gas system operation.

For the ventilation systems, the operating philosophy is similar to that for the waste gas system; operation is continuous. But for the ventilation systems, the reasons for continuous operation are even more straightforward. Areas within the plant must be provided with outside air in order to provide an inside environment suitable for continued occupancy. Without continuous ventilation system operation, heat, humidity, and airborne radioactive material levels would increase and worker occupancy would be jeopardized.

As described in the Davis-Besse Appendix I evaluation, the ventilation systems contain HEPA filters for removal of airborne radioactive particulate material prior to release to the outside environment. (As evaluated for Appendix I compliance, only the waste gas vent includes charcoal filters for removal of radioiodines) The operation of the systems can essentially be considered a passive operation. No active operational

procedures are required for normal system operation for removal of airborne radioactive material.

Davis-Besse's operating philosophy (and operating procedures) for the waste gas system and ventilation systems is a commitment in itself to the routine continuous operation of the systems. Having to commit to such a requirement (in lieu of a technical specification requirement on operation) without appropriate consideration of system down-time and plant shut-down (where operation may not be needed or feasible) is unacceptable and not in keeping with the principles of ALARA. Including special technical specifications that would impose additional procedures and periodic surveillance requirements in excess of those already established (which at present assure appropriate operation) is unnecessary and excessive.



Radiological Effluent Dose Analysis--  
Meteorology for Short Term Releases

Except for the waste gas decay tank (WGDT) releases and the containment purges releases, gaseous effluents from the Davis-Besse Station are from ventilation systems and are considered continuous releases. Most of the radioactive material in gaseous effluents is released from the WGDT. However, because of the essentially random nature of WGDT releases (i.e., no prescribed diurnal time, frequency or duration), the dose analysis of these releases is better modeled by the use of annual average meteorological conditions rather than short term meteorology. Containment purges are so infrequent that special meteorological analyses are not warranted; reasonable evaluations of off-site doses can be provided by the use of annual average meteorological conditions.

### Radiological Environmental Reporting Levels

Only the radionuclides listed in Table 3.12-2 of the proposed Radiological Effluent Technical Specifications for Davis-Besse are considered in the reporting requirements for elevated levels of radioactive material in environmental sampling media. The radionuclides listed are those that are dominant in the plant effluents and contribute essentially all of the environmental dose. Other radionuclides will be present in plant effluents, but their contribution to the calculated total environmental dose will be minor compared to the contribution of the radionuclides listed in Table 3.12-2. Even the contents of the NRC's Standard RETS reflect this position; not all pathways include reporting levels for all the radionuclides listed (e.g., no reporting levels are presented for Co-58, Co-60, or Fe-59 for the milk, airborne particulate, or vegetable pathway). This very selective identification of pathway and important radionuclides reflects the very well defined concept of significant radionuclides for each particular pathway.

Based on past experience in monitoring plant effluents and environmental sampling media, it can be stated with confidence that for the routine operation of Davis-Besse the radionuclides listed in Table 3.12-2 with applicable reporting levels by the identified pathways are the only radionuclides that need be considered when evaluating potential doses in the offsite environment. Also, even if reporting levels were included for other radionuclides, the values would be higher than those for the significant radionuclides and would have a very minor role in determining actual reporting requirements. The reporting levels for the significant radionuclides would be reached well before any identified levels of other radionuclides would even be controlling.

Technical Basis for Eliminating Curie Inventory  
Limit of Outside Liquid Tanks

At Davis-Besse, outside liquid tanks that potentially contain radioactive material are limited to the borated water storage tanks (2 tanks @ 550,000 gallons) and the primary water storage tank (1 tank, @ 140,000 gallons).

The borated water storage tanks are part of ECCS and are of seismic design. These tanks are designed to withstand extremely adverse environmental conditions and for purposes of this evaluation can be considered rupture-proof. Also, overflow from the tanks is piped back to radwaste. For these reasons, it is considered unnecessary to impose curie inventory limits on these tanks.

The primary water storage tank is used for normal make-up and letdown to the primary system. Water contained within the PW storage tank is typically processed primary coolant or clean (non-radioactive) water. Prior to adding primary system water to the PW storage tank, the water is processed by evaporation and demineralization. This processing limits the levels of radioactivity in the tank. Past sampling and analysis of the tank has indicated only detectable levels of tritium, no other radionuclides have been identified. Also, the overflow on the PW storage tank is piped to radwaste. Therefore, due to the processing of any radioactive waste prior to addition to the PW storage tank and the piping of the overflow to radwaste, the probability of any abnormal discharges to the environment that could exceed the concentrations of 10 CFR 20, Appendix B, Table II, Column 2 at the nearest drinking water supply is extremely remote.

Because of the design of the BWST and the design and operating conditions of the PW storage tank, it is considered unnecessary to impose curie inventory limits on these tanks. Having to routinely sample and analyze for radioactivity concentration imposes an undue burden on plant personnel without providing any additional assurance of the public health and safety.

### Sampling Frequency for I-131: Significance of Power Changes and Increases in Coolant Activity Levels

The NRC guidance on effluent monitoring for I-131 (RETS Table 4.11-2, footnote c) calls for increased sampling frequency for I-131 during increases (or decreases) in reactor power level and increases in primary coolant level or noble gas effluent activity level. By system design, releases of radioactive material from plant operation are minor. Trying to identify small increases in I-131 releases that may (or may not) be associated with power changes is unnecessary. To evaluate the potential significance of increases in I-131 releases associated with power changes and the effect that sampling time may have on actual quantification of releases, the following example situation is evaluated.

Consider a power increase (or decrease) on the first day of a seven (7) day sampling period that leads to an increase in I-131 release rate by a factor of 10 for one (1) day. After this one day increase, the release rate returns to the steady-state condition for the remaining 6 days of the sampling period. To evaluate the amount of I-131 on the sampling cartridge as a function of sampling time and concentration, the following equation is used:

$$q_i = \frac{C_i F}{m \lambda_i} (1 - e^{-\lambda_i t})$$

where:

- $Q_i$  = quantity of activity on collection medium
- $C_i$  = air concentration of radionuclide i
- $\lambda_i$  = decay constant for radionuclide i
- $t$  = sample time
- $m$  = correction factor for collection efficiency

Assuming 100% collection efficiency, at the end of the one day increase the total amount of activity (I-131) on the collection cartridge is determined to be 9.54 C<sub>1</sub>F. (For this example, the steady-state I-131 concentration is designated as C<sub>1</sub> and the one day increase is 10 C<sub>1</sub>.) For the remainder of the sampling period with a concentration equal to C<sub>1</sub>, the I-131 activity on the collection cartridge is equal to 4.66 C<sub>1</sub>F.

By decaying the activity on the collection cartridge for the one day increase to the end of the sampling period and adding this quantity to 4.66 C<sub>1</sub>F, the total I-131 activity is determined to be 10.3 C<sub>1</sub>F.

If this value is decay corrected to the mid-point of the sampling period in accordance with the guidance of Regulatory Guide 1.21, the I-131 activity which is used to determine the release quantity is equal to 14.0  $C_i F_i$ .

If a similar analysis is performed for the case of analyzing the collection cartridge at the end of the one day increase and analyzing a new cartridge at the end of 6 days sampling (constituting a 7 day sampling period), the total activity (decay corrected to mid-point of sampling periods) is determined to be 16.0  $C_i F_i$ .

By not analyzing the collection cartridge at the end of the one day increase, the total quantity of I-131 is underestimated by 14%. This analysis represents a somewhat worse case situation. The later into the sampling period that the increase occurs, the less the error. If the increase in release rate occurs after the mid-point of the 7 day sampling period, the actual release will be overestimated.

Over a period of time involving numerous increases and decreases in effluent level, the rules of probability dictate that the overestimations and underestimations will tend to cancel out, providing an overall closer approximation to actual releases.

Both the NRC in-plant measurement program and a study by EPRI\* have indicated that minor increases in I-131 releases may be associated with reactor power changes and the iodine spiking phenomenon. However, these studies also indicate that overall such increases are minor, not being a significant contributor to the total releases of I-131. As was concluded by the EPRI study for other PWRs, the main source of I-131 releases at Davis-Besse is associated with containment purges.

Regardless of the source, the total I-131 releases are negligible. Since initial start-up of Davis-Besse, the annual releases of I-131 have been less than 0.06  $C_i$  and calculated maximum individual doses less than 0.01 mrem. Even considering a hypothetical 14% increase for sampling periods that may include iodine spiking in the primary coolant, the effect on

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\*EPRI NP-939, "Sources of Radioiodine at Pressurized Water Reactors". Science Applications, Inc., November 1978



total releases and calculated doses is still negligible. The actual increase will be even more insignificant considering the fact that the major source of I-131 at Davis-Besse is from containment purges.

Based on a review of plant operating data and the above analysis of the I-131 release quantification as a function of concentration and sampling time, it is concluded that for Davis-Besse, a sampling frequency based on power changes and increases in primary coolant I-131 concentrations is not justified. Determining the releases (and the insignificant environmental doses of these releases) on a weekly basis is sufficient verification of the negligible impact of plant operation. Trying to "fine tune" these releases is not justified considering the manpower and material costs associated with the additional sampling and analysis.

### Condensate Demineralizer Backwash Receiving Tank - Radioactivity Control

The discharge from the condensate demineralizer backwash receiving tank is controlled on a batch-by-batch basis in lieu of continuous radioactive effluent monitoring. This method of operation has been determined to provide better control over the discharge of the backwash receiving tank, preventing any unanticipated, unevaluated releases of radioactively contaminated secondary-side clean-up resins to the on-site settling basin. Prior to discharge, the contents of the backwash receiving tank are sampled and analyzed for radioactivity. As required, radioactively contaminated resins are transferred to radwaste for processing and disposal as radioactive material.

The condensate demineralizer backwash receiving tank discharge line as originally designed included a radiation monitor. However, because of the nature of the resin-slurry mixture and the accumulation of resin beads in the monitor line, the radiation monitor has failed to provide the reliable indication of radioactivity and control as originally intended. For this reason, it has been determined that the sampling and analysis of each batch prior to discharge is needed to identify and evaluate radioactive contamination resulting from minor steam generator tube leaks (or residual radioactive material from previous leaks) that might otherwise go undetected and unevaluated by a gross radiation effluent monitor.

The condensate demineralizer backwash receiving tank discharges to an on-site settling basin. No resin discharges are made directly to the off-site environment. Therefore, even in the event of personnel error resulting in the inadvertent discharge of unacceptably radioactive, contaminated resins to the settling basin, no off-site releases would occur. All resins and radioactive material would be retained on-site within the settling basin. Appropriate follow-up measures could then be initiated to control the radioactive material and prevent any potential for releases to the off-site environment in excess of the regulatory limits.

Controlling the discharge of the condensate demineralizer backwash receiving tank on a batch-by-batch basis provides adequate control over the releases of any radioactive material to the off-site environment from this pathway. Also, the discharge is to an on-site settling basin, representing an additional passive barrier from release off-site. Even in the unlikely event of personnel error, by discharging to an on-site settling basin and its isolation from the off-site environment, the probability of unwanted, unevaluated releases of radioactive material to the off-site environment is exceedingly remote. Any additional protective measures provided by a continuous radiation monitor (for which operational performance and reliability are unlikely, based on past experience) are not considered needed.

## Lower Limit Of Detection

### Definition And Application To Detection Capabilities For Ce-144

The lower limit of detection (LLD), as defined in the Radiological Effluent Technical Specifications (RETS) is an "... a priori (before the fact) limit representing the capabilities of a measurement system and not as a posteriori (after the fact) limit for a particular measurement." As defined by this definition applicable to the detection capability for radioactive effluent analysis, the LLD is a statistical analysis of a background spectrum and represents the detection limits for a radionuclide if it is the only radionuclide present above background. LLDs should be determined based on an analysis of a blank (or background) sample.

However, even with this definition and application of LLD, it can be increasingly difficult to achieve a predesignated LLD value for particular radionuclides as the photon abundance (i.e., decay yield) decreases. To address this problem, specific radionuclides have been identified in the RETS as being the principal radionuclides for which the required LLD must be met. For the analysis of samples of liquid radioactive effluents, an LLD of  $5 \times 10^{-7}$   $\mu\text{Ci/ml}$  is required. For the principal gamma emitters listed, all have characteristic gammas with energy levels and abundances that provide for sufficient analytical sensitivity yielding LLDs within the required value of  $5 \times 10^{-7}$   $\mu\text{Ci/ml}$  - except Ce-144. With a 10.8% abundance and an energy level of 133.5 KeV, being able to meet the LLD of  $5 \times 10^{-7}$   $\mu\text{Ci/ml}$  requires optimum conditions--conditions which cannot be repeatedly achieved for an operational radiochemistry program at Davis-Besse. The low gamma yield is a major factor; however, with an energy level which is located within the Compton continuum, the detection capability for Ce-144 even for a blank, background sample is significantly higher compared with other so-called principal gamma emitters.

The equation for LLD in the Davis-Besse RETS is:

$$\text{LLD} = \frac{4.66 S_b}{E \cdot V \cdot 2.22 \cdot Y}$$

where:

$S_b$  = the standard deviation of the background counting rate

$$= \sqrt{R/T}$$

R = background counting rate

T = counting time

E = counting efficiency

V = sample size

2.22 = conversion factor (transformations per minute per picocurie)

Y = fractional chemical yield (when applicable)

By substitution of typical values in this equation, the LLDs for different principal gamma emitters can be compared. For analysis of a typical background sample at Davis-Besse, the ratio of the LLDs for Ce-144 and Co-60 is about 5.35; for Ce-144 and Mn-54 the ratio is 8.34. These large ratios are demonstrative of some of the relative difficulties in achieving an LLD of  $5 \times 10^{-7}$   $\mu\text{Ci/ml}$  for Ce-144 compared with other principal gamma emitters.

Examining the equation of LLD, two main factors can be altered in an attempt to improve the detection capability - counting time and detector efficiency. (Altering sample size is not considered realistic since larger samples would pose operational and standard calibration problems. It can also be shown that increasing sample volume does not strongly influence efficiency for counting on contact with the detector face due in part to sample self-shielding and decreased relative efficiency for the increased volume).



LLD improves at best as the square root of the counting time. Therefore, increasing the counting time from 2000 seconds to 5000 seconds would only provide a 1.6 reduction in LLD. A 5000 second count is considered to be a reasonable maximum for radioactive effluent analysis. Having to extend to longer counting times would introduce a potential operational delay without commensurate improvement in detection capability.

An improvement in the efficiency can be accomplished by the use of a more efficient GeLi detector. However, this increased efficiency is negated in part by the corresponding increase in background count rate. A comparison of 5 GeLi detectors with relative efficiencies ranging from 7.2% to 22% was performed at the University of Michigan\*. For a 500 ml sample on contact with the detectors, the 15% relative efficiency detector demonstrated the highest photopeak efficiency in the 80-200 KeV range. Even the 10% relative efficiency detector had a higher photopeak efficiency in this energy range than did the 21% and 22% relative efficiency detectors. Some unexplainable differences may be due to inherent manufacturer specifications; however, a valid conclusion is that increasing the detector efficiency provides little if any improvement in detection capability, especially in the low energy range (<200 KeV).

Therefore, the analysis of effluent samples at Davis-Besse with a 10% relative efficiency GeLi and a 5000 second counting time provides a detection system that is not only practical for an operational radiochemistry program but can also be considered as representative of state-of-the-art for routine, general purpose radionuclide detection. Since the required LLD of  $5 \times 10^{-7}$   $\mu\text{Ci/ml}$  can not be met on a routine basis for Ce-144, therefore the LLD for Ce-114 will be  $2.0 \times 10^{-6}$   $\mu\text{Ci/ml}$  (Table 4.11-1, footnote b.).

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\*D. M. Minnema, C. G. Hudson and J. D. Jones. "A Comparison of Ge(Li) Detectors with Different Efficiencies for Low-Level General Purpose Counting"; University of Michigan, 1978.