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PROCEDURE NUMBER: EI-6.0

TITLE: OFFSITE DOSE CALCULATION AND
RECOMMENDATIONS FOR PROTECTIVE ACTIONS

TRANSMITTAL: LISTED BELOW ARE NEW/REVISED PROCEDURES WHICH MUST BE
IMMEDIATELY INSERTED INTO OR DISCARDED FROM YOUR PROCEDURE
MANUAL.

Action Required	Section or Description
REMOVE AND DESTROY	EI-6.0, R/9, ENTIRE PROCEDURE
REPLACE WITH	EI-6.0, R/9, ENTIRE PROCEDURE
	EDITORIAL/WORD 2000 CONVERSION

*SIGN, DATE, AND RETURN THE ACKNOWLEDGEMENT FORM WITHIN 10 DAYS TO THE PALISADES
PLANT DOCUMENT CONTROL.*

SIGNATURE OR INITIALS   DATE

_____   _____

A045

PALISADES NUCLEAR PLANT
EMERGENCY IMPLEMENTING PROCEDURE

TITLE: OFFSITE DOSE CALCULATION AND RECOMMENDATIONS FOR PROTECTIVE ACTIONS

(signature)   /   4/9/02
Procedure Sponsor   **Date**

TRLoudenslager   /   9/24/99
Technical Reviewer   **Date**

DJFitzgibbon   /   2/9/00
User Reviewer   **Date**

TITLE: OFFSITE DOSE CALCULATION AND RECOMMENDATIONS
FOR PROTECTIVE ACTIONS

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TITLE: OFFSITE DOSE CALCULATION AND RECOMMENDATIONS FOR PROTECTIVE ACTIONS

USER ALERT
INFORMATION USE PROCEDURE

The activities covered by this procedure may be performed from memory.

1.0 PERSONNEL RESPONSIBILITY

The Health Physics Support Group Leader shall implement this procedure. In the absence of a Health Physics Support Group Leader, the Site Emergency Director (SED) or the EOF Director shall delegate this function.

2.0 PURPOSE

To determine the appropriate steps required to calculate offsite dose and recommend offsite protective actions.

3.0 REFERENCES

3.1 SOURCE DOCUMENTS

3.1.1 NUREG 0654, Section J, "Protective Response"

3.1.2 Palisades Site Emergency Plan Section 6, "Emergency Measures"

3.2 REFERENCE DOCUMENTS

3.2.1 Emergency Implementing Procedure EI-1, "Emergency Classification and Actions"

3.2.2 Emergency Implementing Procedure EI-3, "Communications and Notifications"

3.2.3 Emergency Implementing Procedure EI-6.1, "Release Rate Determination From Stack Gas Monitors"

3.2.4 Emergency Implementing Procedure EI-6.2, "Release Rate Determination From Steam Line Monitors RIA-2323 and RIA-2324 for Steam Releases Through Atmospheric Dump Valves"

3.2.5 Emergency Implementing Procedure EI-6.3, "Release Rate Determination From High Range Effluent Monitors"

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3.2.7   Emergency Implementing Procedure EI-6.6, "Gamma $\bar{E}$ Determination"

3.2.8   Emergency Implementing Procedure EI-6.7, "Plant Site Meteorological System"

3.2.9   Emergency Implementing Procedure EI-6.8, "Backup and Supplemental Meteorology"

3.2.10   Emergency Implementing Procedure EI-6.9, "Automated Dose Assessment Program"

3.2.11   Emergency Implementing Procedure EI-6.10, "Offsite Dose Calculation - Straight Line Gaussian (Manual Method)"

3.2.12   Emergency Implementing Procedure EI-6.13, "Protective Action Recommendations for Offsite Populations"

3.2.13   Palisades Administrative Procedure 10.46, "Plant Records"

3.2.14   Palisades Administrative Procedure 10.41, "Procedure Initiation and Revision"

4.0   DEFINITIONS

4.1   CDE

Committed Dose Equivalent: 50-year integrated dose to organs or tissues due to an intake at time zero.

4.2   CEDE

Committed Effective Dose Equivalent: The dose committed to an individual over the next 50 years due to intake of radioactive material, weighted (by organ) to represent a risk equivalent to that of whole body external exposure.

4.3   DDE

Deep Dose Equivalent: Dose equivalent due to external radiation at 1 cm tissue depth.

4.4   TEDE

Total Effective Dose Equivalent: Sum of deep dose equivalent due to external radiation exposure and committed effective dose equivalent due to internal exposure. When no other designator is applied to dose in units of rem, TEDE is implied.

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4.5 RELEASE OF RADIOACTIVE MATERIAL

Any discharge of radioactive material to the environment that is the result of, or
associated with, the emergency event.

5.0 INITIAL CONDITIONS AND/OR REQUIREMENTS

This procedure shall be implemented when there is a potential for, or an actual
significant release of radioactive materials from the Plant site, per Emergency
Implementing Procedure EI-1, "Emergency Classification and Actions."

Two methods are available to perform dose assessment functions. The preferred
method is the use of the IBM PC automated dose assessment program "Offsite."
The alternate method is the manual dose assessment procedures which are used as
backup to the preferred method.

All EI-6 Emergency Implementing Procedures pertain to dose assessment functions
and making protective action recommendations. Not all procedures are applicable
for all dose calculations. The following sections direct the user to the appropriate
procedures to complete the dose assessment tasks.

6.0 PROCEDURE

+---+
| **USER ALERT** |
| INFORMATION USE PROCEDURE |
| |
| The activities covered by this procedure may |
| be performed from memory. |
+---+

6.1 "QUICK METHOD" DOSE ASSESSMENT

6.1.1   The "Quick Method" Dose Assessment is intended for use by the Control Room staff
during the initial phases of an event when a quick offsite dose calculation or
protective action recommendation is required.

6.1.2   Due to the limitations of the "Quick Method," the following prerequisites must be met:

a. The release is through the Plant Stack or Atmospheric Steam Dump/Code
Safety Relief Valves.

b. The RGEM system or Main Steam Gamma Monitors are operational
(depending on release path).

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c. The Reactor is currently at power or was shutdown within the last 2 hours.

d. An IBM PC computer with the "Offsite" Dose Assessment program installed and a printer, tied directly to the computer are available.

6.1.3 **IF** the above prerequisites are met, **THEN** use Attachment 1 to perform the "Quick Method" Dose Assessment.

a. If you are **NOT** able to retrieve meteorological data from the PPC, this data may be retrieved by the Palisades Dose Assessment Program, Option 9, "Meteorological Data Menu." Options exist for obtaining met data from the Palisades Meteorological Tower and from Weather Services International (WSI).

b. If either of the 10-meter data values is "NA" (NOT AVAILABLE), use the available corresponding 60-meter value. If the WS10 is "NA," but WD10 has a value listed, multiply the WS60 value by 0.77 to obtain the comparable WS10 value and use the WD10 value that was listed (not the WD60 value). Always use either 10-meter value available to you, (WS10 OR WD10) over that of the corresponding 60-meter value.

6.1.4 **IF** the above prerequisites are not met, **THEN**:

a. With no time constraints, perform the "Normal Method " Dose Assessment per Section 6.2.

b. With time constraints, determine if Protective Action Recommendations based on Containment/Core Status are required per Emergency Implementing Procedure EI-6.13, "Protective Action Recommendations for Offsite Population."

6.2 "NORMAL METHOD" DOSE ASSESSMENT

6.2.1 Release Rate Calculations

a. The iodine release rate calculated in the automated dose assessment program "Offsite" is determined as 1/1000 of the noble gas release rate. As soon as possible, the iodine release should be verified through sampling (ie, RGEM and/or Plume Centerline Air Samples).

b. The Plant Process Computer (PPC page 352) contains process monitor readouts. Attachment 3, "Plant Process Computer Job Aid," provides guidance for accessing the PPC. Process monitor readouts are also available on the back of Control Panel C-11A.

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c. Instructions on how to display the Palisades Dose Assessment Main Menu are provided in Emergency Implementing Procedure EI-6.9, "Automated Dose Assessment Program."

d. Choose one of the following release rate calculation methods:

1. Stack

NOTE: If RIA-2326 is in a High Alarm condition for greater than 1 minute, all stack flow is directed through the Accident Loop monitored by RIA-2327.

(a) Option 2 on the Palisades Dose Assessment Main Menu is used to calculate noble gas and iodine release rates through the Plant Stack.

(b) If the Offsite program is not functional, the manual stack release rate calculation procedure Emergency Implementing Procedure EI-6.1, "Release Rate Determination from Stack Gas Monitors," shall be used.

2. Atmospheric Steam Dumps/Code Safety Reliefs

(a) Option 3 on the Palisades Dose Assessment Main Menu is used to calculate noble gas and iodine release rates through the steam generator atmospheric steam dumps and/or the steam generator code safety relief valves.

(b) If the Offsite program is not functional, the manual release rate calculation procedure Emergency Implementing Procedure EI-6.2, "Release Rate Determination from Main Steam Line Monitors RIA-2323 and RIA-2324 for Steam Releases Through Atmospheric Dump Valves," shall be used.

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3.   Containment Leakage - Containment High Range Monitors

    (a)   Option 4 on the Palisades Dose Assessment Main Menu is used to calculate noble gas and iodine release rates using the containment High Range Monitors whenever there is a release of radioactivity into the Containment Building.

    (b)   If the Offsite program is not functional, Emergency Implementing Procedure EI-6.4, "Release/Potential Release Determination from Containment High Range Effluent Monitors," shall be used.

4.   Backup High Range Effluent Monitors - Stack or Atmospheric Dump/Code Safety

    (a)   Option 5 on the Palisades Dose Assessment Main Menu is used to calculate noble gas and iodine release rates through the steam generator atmospheric steam dumps and/or the steam generator code safety relief valves or the Plant stack using the backup High Range Effluent Monitors.

    (b)   If the Offsite program is not functional, the manual High Range Effluent Monitor release rate calculation procedure Emergency Implementing Procedure EI-6.3, "Release Rate Determination From High Range Effluent Monitors," shall be used.

5.   Unmonitored Release/Offsite Survey Data

    Option 6 on the Palisades Dose Assessment Main Menu is used to calculate noble gas and iodine release rates based on offsite survey measurements of centerline whole body dose rates and iodine concentrations.

6.2.2   Average Gamma Energy (Ē)

a.   Option 1 on the Palisades Dose Assessment Main Menu is used to calculate the noble gas average gamma energy per disintegration. Instructions on how to display the Palisades Dose Assessment Main Menu are provided in Emergency Implementing Procedure EI-6.9, "Automated Dose Assessment Program."

b.   If the Offsite program is not functional, the manual average energy calculation procedure Emergency Implementing Procedure EI-6.6, "Gamma Ē Determination," shall be used.

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6.2.3   Meteorological Data Collection

a.   If the site meteorological station is functioning, current weather conditions should be determined using Emergency Implementing Procedure EI-6.7, "Plant Site Meteorological System."

b.   Backup meteorological data, regional meteorological data, and weather forecasts are obtained using Emergency Implementing Procedure EI-6.8, "Backup and Supplemental Meteorology." The backup system shall be used when the onsite system is not available. Regional meteorological data and weather forecasts may be used to anticipate changing weather conditions. The regional and forecast data should be used only as staffing and time permits.

6.2.4   Dose Calculations

a.   Option 7 on the Palisades Dose Assessment Main Menu is used to calculate offsite dose rates. Instructions on how to display the Palisades Dose Assessment Main Menu are provided in Emergency Implementing Procedure EI-6.9, "Automated Dose Assessment."

b.   If the Offsite program is not available, dose rates shall be calculated manually using Emergency Implementing Procedure EI-6.10, "Offsite Dose Calculation - Straight Line Gaussian (Manual Method)."

c.   A segmented gaussian dose assessment program may be used to supplement the dose calculations provided by Emergency Implementing Procedure EI-6.9, "Automated Dose Assessment Program," or EI-6.10, "Offsite Dose Calculation - Straight Line Gaussian (Manual Method)," once the Emergency Operations Facility has become fully staffed and operational.

6.2.5   Generation of the Emergency Notification Form

Option 8 on the Palisades Dose Assessment Main Menu is used to generate the Emergency Notification Form. Refer to Emergency Implementing Procedure EI-3, "Communication and Notifications," for Emergency Notification Form approval and use requirements.

6.2.6   Offsite Protective Action Recommendations

Emergency Implementing Procedure EI-6.13, "Protective Action Recommendations for Offsite Populations," shall be used to determine if any Protective Action Recommendations are required. If required, they shall be included on the Emergency Notification Form.

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6.3 CALCULATING PROJECTED DOSE FROM FIELD DATA

6.3.1 Field data may also be used to determine the projected offsite doses for comparison to the PAGs in Emergency Implementing Procedure EI-6.13, "Protective Action Recommendations for Offsite Populations." Attachment 2, "Projected Dose Evaluation From Field Data Worksheet" may be used to assist in determining projected TEDE, thyroid CDE, and/or Shallow Dose Equivalent (SDE).

7.0 ATTACHMENTS AND RECORDS

7.1 ATTACHMENTS

7.1.1 Attachment 1, "Offsite Dose/PAR Worksheet - Quick Method"

7.1.2 Attachment 2, "Projected Dose Evaluation From.Field Data Worksheet"

7.1.3 Attachment 3, "Plant Process Computer Job Aid"

7.2 RECORDS

Records generated by the EI-6 series procedures shall be filed in accordance with Palisades Administrative Procedure 10.46, "Plant Records."

8.0 SPECIAL REVIEWS

The scope of this procedure does not include activities that require a 50.59 review per Palisades Administrative Procedure 10.41, "Procedure Initiation and Revision." Therefore, changes to this procedure do not require a 50.59 review.

The scope of this procedure includes activities that require a PRC review per Palisades Administrative Procedure 10.41, "Procedure Initiation and Revision." Therefore, changes to this procedure require a PRC review.

OFFSITE DOSE/PAR
QUICK METHOD

Proc No EI-6.0
Attachment 1
Revision 9
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1.0   PREREQUISITES

a.   The release is through the Plant Stack or Atmospheric Steam Dump/Code Safety
Relief Valves.

b.   The RGEM system or Main Steam Gamma Monitors are operational (depending on
release path).

c.   The Reactor is currently at power or was shutdown within the last 2 hours.

d.   An IBM PC computer with the "Offsite" Dose Assessment program installed and a
printer tied directly to the computer are available.

2.0   DATA ACQUISITION

2.1   Obtain meteorological data from the PPC, page 351 or from the Dose Assessment Main
Menu via the Met tower (Selection #9).

Stability Class (STAB)   _____ A-G
Wind Speed (WS10 or WS60)   _____ MPH
Wind Direction (WD10 or WD60)   _____ (Degrees From)

(WS60 and WD60 should only be used if WS10 or WD10 are not available.)

2.2   Obtain the noble gas release rate from the appropriate display located at the back of Control
Panel C-11A.

QN = ____ Ci/sec   RIA-2326 ( ) Normal Range Stack Monitor
                      IF RIA-2326 is in a High Alarm condition, **THEN** use RIA-2327.

                      RIA-2327 ( ) High Range Stack Monitor

                      RIA-2324 ( ) Main Steam Gamma Monitor, A

                      RIA-2323 ( ) Main Steam Gamma Monitor, B

2.3   Divide noble gas release rate (QN) by 1000 to obtain iodine release rate. Record below.

QI = _____ Ci/sec (QN/1000)

2.4   Use an E-Bar = 0.7 MeV/dis

2.5   Use a release duration = 2.0 hours

2.6   Use a release height = 0.0 meters

OFFSITE DOSE/PAR
QUICK METHOD

Proc No EI-6.0
Attachment 1
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3.0   DOSE CALCULATION

3.1   To initiate the Offsite Dose Assessment Program on the IBM compatible PC:

  a.   IF the computer is on, THEN reboot the computer by pressing and holding down the "Ctrl" and "Alt" keys, and then press the "Delete" key. Release all three keys.

  b.   IF the computer is not on, THEN press the power switch on the master power board.

3.2   Select Option 1 "Palisades Dose Assessment Program" from the menu. The Palisades Dose Assessment Main Menu will be displayed.

3.3   From the Palisades Dose Assessment Main Menu, select Option 7.

3.4   Input the data obtained in Section 2.0 and press <Enter>.

NOTE: The information displayed on the screen will not be the same information that is contained on the notification forms. The form contains the information required by the state of Michigan.

3.5   IF the output display indicates that "PAGs ARE EXCEEDED," THEN:

  a.   Print the emergency notification forms using Option 8 on the Palisades Dose Assessment Main Menu.

  b.   Go to Section 4.0 of this attachment to determine PARs.

  c.   Process the emergency notification forms in accordance with Emergency Implementing Procedure EI-3, "Communication and Notifications."

3.6   IF the output display indicates that "PAGs ARE NOT EXCEEDED," THEN:

  a.   Print the emergency notification forms using Option 8 on the Palisades Dose Assessment Main Menu.

  b.   Review Emergency Implementing Procedure EI-6.13, "Protective Action Recommendations for Offsite Populations," to determine if protective actions are required based on Containment/Core status or declaration of a General Emergency.

  c.   Process the emergency notification forms in accordance with Emergency Implementing Procedure EI-3, "Communications and Notifications."

3.7   Repeat this Worksheet about every 15-minutes.

3.8   When the TSC is activated, turnover Dose Calculations and Protective Action determination to HP personnel.

**OFFSITE DOSE/PAR
QUICK METHOD**

Proc No EI-6.0
Attachment 1
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Page 3 of 5

4.0   PROTECTIVE ACTION DETERMINATION

4.1   Select a PAR based on TEDE or Adult Thyroid CDE. See Notes 1 and 2 below regarding conditions when sheltering may be the preferred protective action recommendation.

If TEDE at 10 miles is ≥ 1000 mrem AND/OR Adult Thyroid CDE at 10 miles is ≥ 5000 mrem, THEN

Record on line 7D of the Notification Form the Areas **1, 2, 3, 4, 5** (evacuate all areas out to 10 miles) AND

The SED shall consult with the State on additional ad hoc protective actions.
(EI-6.13, Section 5.0)

If TEDE at 5 miles is ≥ 1000 mrem AND/OR Adult Thyroid CDE at 5 miles is ≥ 5000 mrem, THEN

Record on line 7D of the Notification Form the Areas **1, 2, 3, 4, 5** (evacuate all areas out to 10 miles).

If TEDE at 2 miles ≥ 1000 mrem AND/OR Adult Thyroid CDE at 2 miles is ≥ 5000 mrem, THEN

Record on line 7D of the Notification Form the Areas **1, 2, 3** (evacuate 5 mile radius) AND the affected areas in a 10 mile radius. Determine the affected areas as per Conversion Table 1-1 below.

If TEDE at site boundary (SB) is ≥ 1000 mrem AND/OR Adult Thyroid CDE at site boundary is ≥ 5000 mrem, THEN the SED should make a determination based on Plant conditions whether to Shelter or Evacuate.

Record on line 7C or 7D of the Notification Form the Areas **1, 2, 3** (shelter or evacuate 5 mile radius) AND the affected areas in a 10 mile radius. Determine the affected areas as per Conversion Table 1-1 below.

NOTE 1:   If there are very dangerous travel conditions, initially shelter rather than evacuate until conditions improve.

NOTE 2:   Shelter may be the appropriate action for controlled releases from containment if there is assurance that the release is short term (puff release) and the area near the Plant cannot be evacuated before plume arrives.
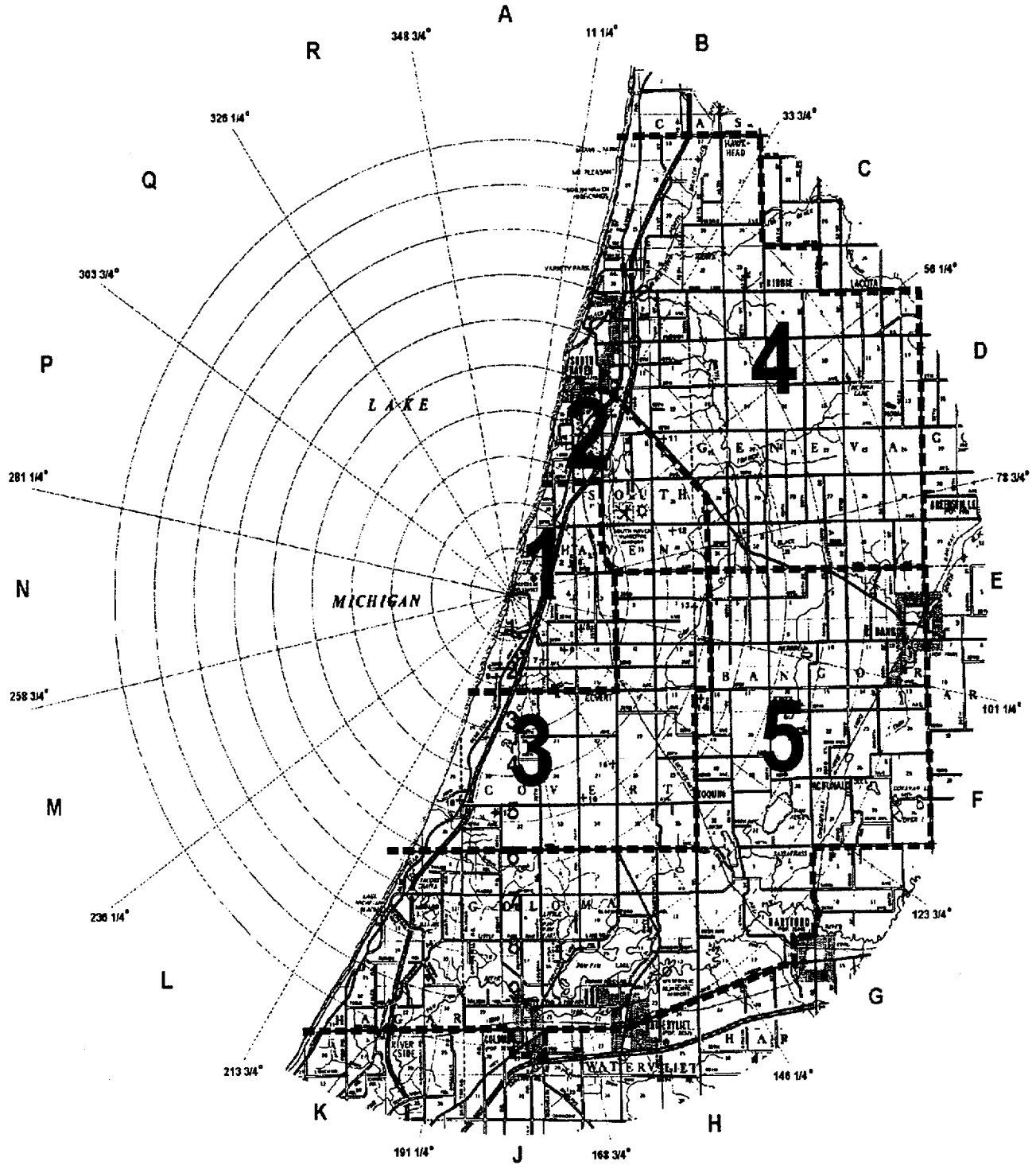
OFFSITE DOSE/PAR
QUICK METHOD

Conversion Table 1-1 (For PARs out to 10 Miles)

Wind Direction Degrees (FROM)	Affected Areas
Between 170 and 236	1, 2, 3, & 4
Between 237 and 303	1, 2, 3, 4, & 5
Between 304 and 56	1, 2, 3 & 5
Between 57 and 169	None additional beyond 5 miles

OFFSITE DOSE/PAR
QUICK METHOD

PALISADES N-PS 10-MILE EPZ

PROJECTED DOSE EVALUATION
FROM FIELD DATA WORKSHEET

NOTE: Perform A <u>OR</u> B, and then perform C <u>AND</u> D.

1. Determination of <u>Projected</u> TEDE:

    A.   DDE (Plume Shine of Immersion):

3 - Foot Closed Window Reading	_____	mrem/h
Expected Duration (Default 2h)	**x** _____	h
Projected DDE	**=** _____	mrem (A)

    B.   DDE (Ground Deposition)

3 - inch Closed Window Reading	_____	mrem/h
Expected Duration (Default 96h)	**x** _____	h
Projected DDE	**=** _____	mrem (B)

    C.   CEDE:

    Particulate:

    _____ μCi/cc **x** 3.9E7 mrem$\cdot$cc/μCi$\cdot$h **x** _____ h = _____ mrem (C)

    Iodine:

    _____ μCi/cc **x** 3.9E7 mrem$\cdot$cc/μCi$\cdot$h **x** _____ h = _____ mrem (D)

    D.   Projected TEDE:

    _____ mrem (A or B) + _____ mrem (C) + _____ mrem (D) =_____ mrem (TEDE)

---

2. Determination of <u>Projected</u> Adult Thyroid CDE:

    Iodine CDE: _____ μCi/cc **x** 1.3E9 mrem$\cdot$cc/μCi$\cdot$h **x** _____ h = _____ mrem

---

3. Determination of **Projected** SDE:

3 ft or 3 in: (OW - CW) x BCF	**=** _____	mrem (mrad)
Expected Duration (Default 2h)	**x** _____	h
Projected Beta SDE	**=** _____	mrem
Projected DDE (A or B)	**+** _____	mrem
Total Projected SDE	**=** _____	mrem

PLANT PROCESS COMPUTER JOB AID

I.   ACCESSING PLANT PROCESS COMPUTER (PPC) RAD/MET DATA

The following steps will access PPC Radiological and Meteorological data which may be needed to perform Dose Assessment:

1.   If the screen is not displaying the Main Menu, press the 'MAIN MENU' key.

2.   Using the mouse, move the cursor to 'ENVIRONMENTAL SYSTEMS'.

3.   Press the left mouse key, and then the right mouse key. The screen will display:

> - Environmental Overview,   pg 350
> - Meteorological,   pg 351
> - Radiological,   pg 352

4.   Select the appropriate page and press the left mouse key, and then the right mouse key. The 'PREVIOUS' and 'NEXT' keys allow you to move from page to page.

5.   A page may be copied by pressing the 'PRINTER' key.

II.   AUTOMATIC PRINTOUTS

1.   If the screen is not displaying the Main Menu, press the 'MAIN MENU' key.

2.   Using the mouse, move the cursor to 'EMERGENCY, OFFNORM, POST TRIP'.

3.   Press the left mouse key, and then the right mouse key to display the 'EMERGENCY, OFFNORMAL MENU'.

4.   Move the cursor to 'AUTOMATIC EMERG PLAN PRINTOUTS', and press the left mouse key, followed by the right mouse key.

5.   On the 'AUTOMATIC EMERG PLAN PRINTOUTS' screen press the left mouse key on 'No', and type 'Yes'.

6.   Ensure that Printer_2 is identified as the 'OUTPUT DEVICE', and press the 'UPDATE' key at the lower right of the keyboard.