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***9* GETS: E-PLAN, IP-EP-115 (FORMS), IP-EP-260(JOINT CENTER INFORMATION)**

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NRC

ATTACHMENT 10.1 SMM CONTROLLED DOCUMENT TRANSMITTAL FORM

SITE MANAGEMENT MANUAL CONTROLLED DOCUMENT TRANSMITTAL FORM - **PROCEDURES**
Page 1 of 1

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IP-EP-310 REV.10
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		REFERENCE USE	Page 1 of 10	

Protective Action Recommendations

Prepared by:	Lori Glander Print Name	 Signature	5-12-10 Date
Approval:	Brian Sullivan Print Name	 Signature	5/19/10 Date

Effective Date: May 27, 2010

This procedure excluded from further LI-100 review

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PROTECTIVE ACTION RECOMMENDATIONS

1.0 PURPOSE

To prescribe the responsibilities and methods for determining recommended protective actions for New York state and County authorities.

2.0 REFERENCES

EPA Protective Action Guidelines

3.0 DEFINITIONS

Protective Action Recommendations (PARs) – Specific recommendations made by the Emergency Director to the local authorities in accordance with Emergency Plan procedures based on Protection Action Guidelines.

4.0 RESPONSIBILITIES

4.1 The Shift Manager is responsible for evaluating accident conditions, classifying the accident, and recommending protective actions to offsite authorities during the initial phases of the accident. The Emergency Director assumes these responsibilities when he takes control of the emergency response from the Shift Manager. The Offsite Radiological Manager will assist the Emergency Director with protective action recommendations.

4.2 The decision to initiate any protective actions is solely the responsibility of the local authorities.

5.0 DETAILS

5.1 NUE, Alert, Site Area Emergency

Recommend no protective actions be taken.

5.2 General Emergency

5.2.1 The initial protective action recommendation should be made within 15 minutes of the GENERAL EMERGENCY declaration.

5.2.2 Protective Action Recommendations (PARs) shall be made in accordance with Attachment 9.1. Downwind Sectors are identified on Attachment 9.2.

5.2.3 Downwind sectors in Attachment 9.2 are determined using MIDAS wind fields. If MIDAS is unavailable, the isopleth overlays may be used as backup (Attachment 9.6. Use Attachment 9.4 to support isopleth selection) **NOTE: Due to the wind field origin change between MIDAS and MEANS there is a difference in the down-valley plume shape. When using the overlays as a substitute for MIDAS, down-valley PARs may be different by one sector.**

5.2.4 The initial PAR shall be made in the first GENERAL EMERGENCY notification to the State/Counties. All subsequent, Part I notifications shall include the latest PAR.

5.2.5 Re-evaluate the PARs based on the following:

- Changes in Wind Direction or Speed
- Dose Assessment – (When release duration is NOT able to be estimated, use four hours as a default value),
- Field Data
- EPA PAGs – Attachment 9.3,

5.2.55.2.6 As protective action recommendations change, ensure appropriate steps are taken to protect the onsite population.

5.2.65.2.7 **IF** dose projections indicate a EPA PAG will be exceeded beyond 10 miles **THEN** send field teams to confirm projections and discuss possible protective actions with offsite officials if projections prove possible.

6.0 INTERFACES

6.1 Evacuation Travel Time Estimates

6.2 IP-EP-310, Dose Assessment

6.3 State of New York KI Policy Paper

7.0 RECORDS

NONE

8.0 REQUIREMENTS AND COMMITMENT CROSS-REFERENCE

NONE

9.0 ATTACHMENTS

9.1 Flowchart for General Emergency Protective Action Decisions

9.2 Stability Category – Downwind Keyhole Sector Correlation Table

9.3 EPA Protective Action Guidelines

9.4 Overlay Selection Flow Chart

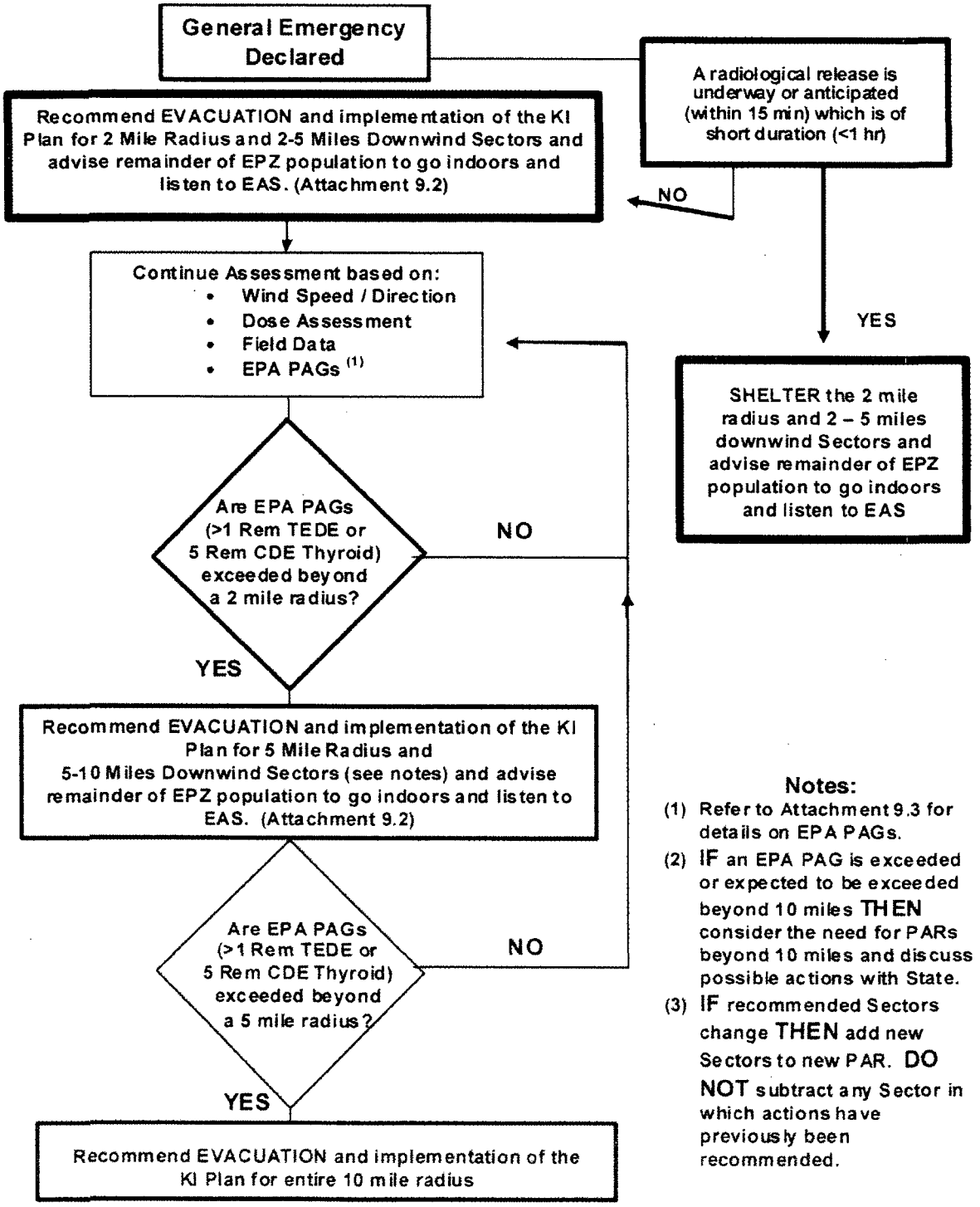
9.5 Basis for Sector Selection in PAR Determination

9.6 Overlay Stability Category-Downwind Keyhole Sector Correlation Table

Attachment 9.1

FLOWCHART FOR GENERAL EMERGENCY PROTECTIVE ACTION DECISIONS

Sheet 1 of 1



Notes:

(1) Refer to Attachment 9.3 for details on EPA PAGs.

(2) IF an EPA PAG is exceeded or expected to be exceeded beyond 10 miles THEN consider the need for PARs beyond 10 miles and discuss possible actions with State.

(3) IF recommended Sectors change THEN add new Sectors to new PAR. DO NOT subtract any Sector in which actions have previously been recommended.

Attachment 9.2

Stability Category – Downwind Keyhole Sector Correlation Table

Sheet 1 of 1

TABLE I – MIDAS Up-Valley Plumes

Up-Valley Plumes (wind speed ≤ 4 m/sec and wind direction from 102°-209°)	
Pasquil Stability Categories	Sectors affected
A, B	16, 1, 2, , 3, 44
C, D, E, F, G	16, 1, 2, 3

TABLE II – MIDAS Down-Valley Plumes

Down-Valley Plumes (wind speed ≤ 4 m/sec and wind direction from 349°-101°)	
Pasquill Stability Categories	Sectors affected
A, B	7, 8, 9, 10, 11
C, D, E, F, G	7, 8, 9, 10

TABLE III – MIDAS Cross-Valley Plumes

Cross-Valley (wind speed > 4 m/sec OR wind direction from 210°-348°)			
Wind Direct From (deg)	Center Sector No	Pasquil Stability Categories A & B Sectors affected	Pasquil Stability Categories C-G Sectors affected
169 - 190	1 N	15, 16, 1, 2, 3	16, 1, 2
191 - 213	2 NNE	16, 1, 2, 3, 4	1, 2, 3
214 - 235	3 NE	1, 2, 3, 4, 5	2, 3, 4
236 - 258	4 ENE	2, 3, 4, 5, 6	3, 4, 5
259 - 280	5 E	3, 4, 5, 6, 7	4, 5, 6
281 - 303	6 ESE	4, 5, 6, 7, 8	5, 6, 7
304 - 325	7 SE	5, 6, 7, 8, 9	6, 7, 8
326 - 348	8 SSE	6, 7, 8, 9, 10	7, 8, 9
349 - 010	9 S	7, 8, 9, 10, 11	8, 9, 10
011 - 033	10 SSW	8, 9, 10, 11, 12	9, 10, 11
034 - 055	11 SW	9, 10, 11, 12, 13	10, 11, 12
056 - 078	12 WSW	10, 11, 12, 13, 14	11, 12, 13
079 - 100	13 W	11, 12, 13, 14, 15	12, 13, 14
101 - 123	14 WNW	12, 13, 14, 15, 16	13, 14, 15
124 - 145	15 NW	13, 14, 15, 16, 1	14, 15, 16
146 - 168	16 NNW	14, 15, 16, 1, 2	15, 16, 1

Attachment 9.3

EPA PROTECTIVE ACTION GUIDELINES

Sheet 1 of 1

Recommended protective actions to reduce whole body and thyroid dose from exposure to a gaseous plume.

PROJECTED DOSE (REM) TO THE POPULATION		RECOMMENDED ACTIONS (a)	COMMENTS
Whole Body (TEDE) Thyroid (CDE)	< 1 <5	No planned actions. (b) State may issue an advisory to seek shelter and await further instructions. Monitor environmental radiation levels	Previously recommended protective actions may be reconsidered or terminated.
Whole Body (TEDE) Thyroid (CDE)	≥ 1 ≥ 5	Evacuate unless constraints make it impractical; then shelter. Monitor environmental radiation levels. Control access.	If constraints exist, special consideration should be given for evacuation of children and pregnant women.

GUIDANCE ON DOSE LIMITS FOR WORKERS PERFORMING EMERGENCY SERVICES (REM)

Whole Body (TEDE):		
10	Protecting valuable property	Lower dose not practicable.
25	Lifesaving or protection of large populations	Lower dose not practicable.
> 25	Lifesaving or protection of large population	Only on a voluntary basis to persons fully aware of the risks involved.

TEDE- Total Effective Dose Equivalent: Sum of external effective dose equivalent and committed effective dose equivalent to nonpregnant adults from exposure and intake during an emergency situation. Workers performing services during emergencies should limit dose to the lens of the eye to three times the listed value and doses to any organ (including skin and body extremities) to ten times the listed value.

CDE- Committed dose equivalent (to the Thyroid).

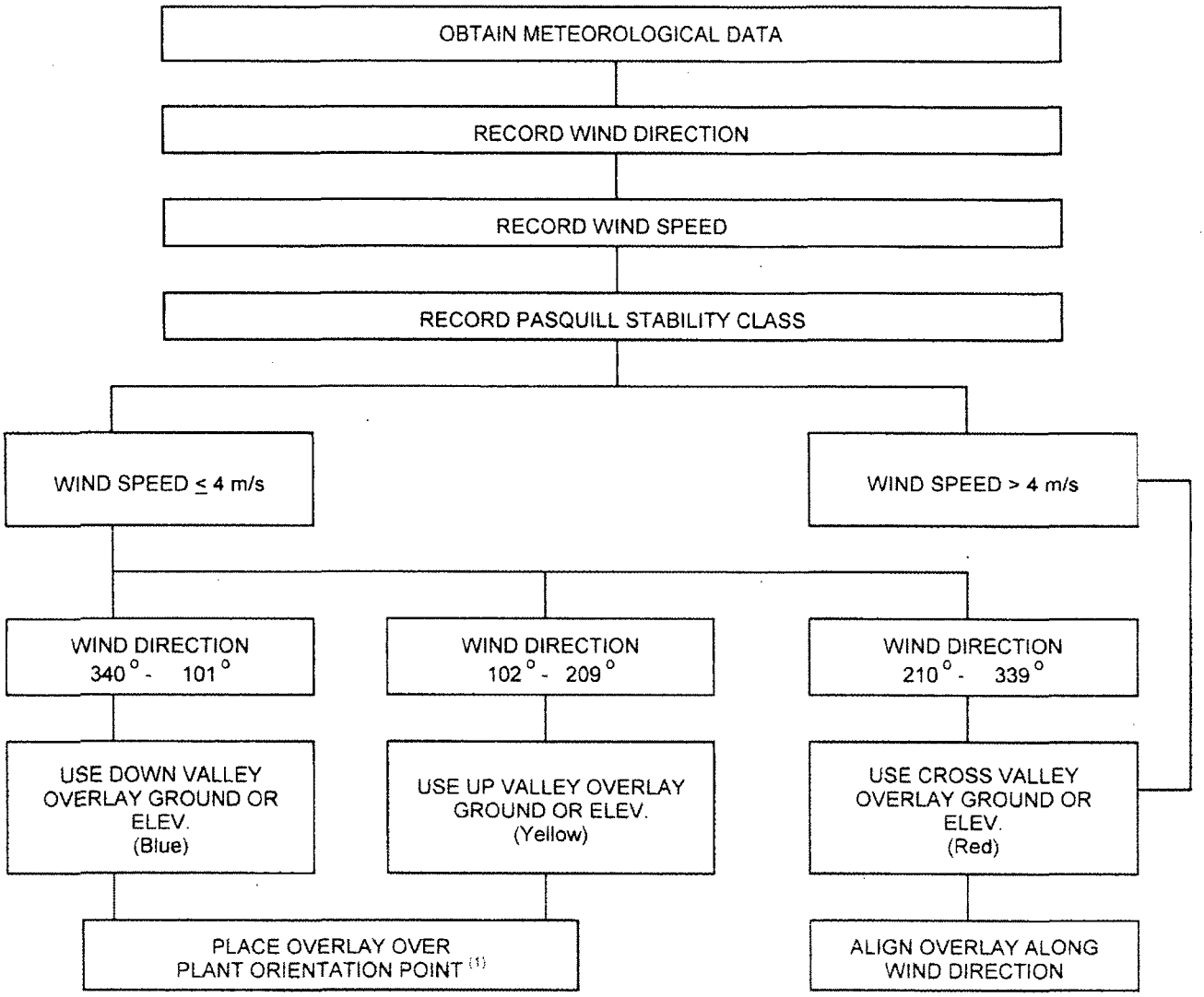
(a) These actions are recommended for planning purposes. Protective action decisions at the time of the incident must take existing conditions into consideration.

(b) At the time of the incident, officials may implement low-impact protective actions in keeping with the principle of maintaining radiation exposures as low as reasonably achievable (ALARA)

Attachment 9.4

OVERLAY SELECTION FLOW CHART(MEANS and HAND CALC)

Sheet 1 of 1



[1] Plant Orientation Point

a. Using down valley overlay (Blue) align horizontal axis on 90° - 270° line with plume extending south.

b. Using up valley overlay (Yellow) align horizontal axis on 90° - 270° line with plume extending north.

Attachment
9.5

Basis for Sector Selection in PAR Determination

Sheet 1 of 1

The Sectors provided in the Protective Action Recommendations (PARs) in this procedure are based on the following determinations:

When the conditions support **Up-Valley Plumes** (wind speed ≤ 4 m/sec and wind direction from 102°-209°) and either **Pasquil Category A or B** is in effect, the MIDAS display and appropriate overlay were viewed on the map and the affected Sectors were determined (Affected Sectors are any Sector that the Isopleth Lines touch beyond 2 miles). This was determined to be Sectors 16, 1, 2, 3 and 4.

When the conditions support **Up-Valley Plumes** (wind speed ≤ 4 m/sec and wind direction from 102°-209°) and either **Pasquil Category C, D, E, F or G** is in effect, the MIDAS display and appropriate overlay were placed on the map and the affected Sectors were determined. (Affected Sectors are any Sector that the Isopleth Lines touch beyond 2 miles). This was determined to be Sectors 16, 1, 2 and 3.

When the conditions support **Down-Valley Plumes** (wind speed ≤ 4 m/sec and wind direction from (349-101 for MIDAS and 340°-101° for overlay) and either **Pasquil Category A or B** is in effect, the appropriate overlay was placed on the map and the affected Sectors were determined. (Affected Sectors are any Sector that the Isopleth Lines touch beyond 2 miles). This was determined to be Sectors 7, 8, 9, 10 and 11.

When the conditions support **Down-Valley Plumes** (wind speed ≤ 4 m/sec and wind direction from 349-101 for MIDAS and 340°-101° for overlay) and either **Pasquil Category C, D, E, F or G** is in effect, the appropriate MIDAS display or overlay was placed on the map and the affected Sectors were determined. (Affected Sectors are any Sector that the Isopleth Lines touch beyond 2 miles). This was determined to be Sectors 7, 8, 9 and 10.

When the conditions support **Cross-Valley Plumes** (wind speed > 4 m/sec OR wind direction from 210°-348 for MIDAS and 210-339° for overlay) and either **Pasquil Category A or B** is in effect, the appropriate MIDAS display or overlay was placed on the map and the affected Sectors were determined. (Affected Sectors are any Sector that the Isopleth Lines touch beyond 2 miles). This was determined to be the Sector in which the Plume Centerline lays and 2 Sectors on either side of the centerline Sector.

When the conditions support **Cross-Valley Plumes** (wind speed > 4 m/sec OR wind direction from 210°-348 for MIDAS and 210 – 339 for overlay) and either **Pasquil Category C, D, E, F and G** is in effect, the appropriate overlay was placed on the map and the affected Sectors were determined. (Affected Sectors are any Sector that the Isopleth Lines touch beyond 2 miles). This was determined to be the Sector in which the Plume Centerline lays and 1 Sector on either side of the centerline Sector.

Attachment 9.6

For Use as Backup ONLY

Overlay Stability Category – Downwind Keyhole Sector Correlation Table

Sheet 1 of 1

TABLE I – OVERLAY/MEANS Up-Valley Plumes

Up-Valley Plumes (wind speed ≤ 4 m/sec and wind direction from 102°-209°)	
Pasquil Stability Categories	Sectors affected
A, B	16, 1, 2, , 3, 44
C, D, E, F, G	16, 1, 2, 3

TABLE II – OVERLAY/MEANS Down-Valley Plumes

Down-Valley Plumes (wind speed ≤ 4 m/sec and wind direction from 340°-101°)	
Pasquill Stability Categories	Sectors affected
A, B	7, 8, 9, 10, 11
C, D, E, F, G	7, 8, 9, 10

TABLE III – OVERLAY/MEANS Cross-Valley Plumes

Cross-Valley (wind speed > 4 m/sec OR wind direction from 210°-339°)

Wind Direct From (deg)	Center Sector No	Pasquil Stability Categories A & B Sectors affected	Pasquil Stability Categories C-G Sectors affected
169 - 190	1 N	15, 16, 1, 2, 3	16, 1, 2
191 - 213	2 NNE	16, 1, 2, 3, 4	1, 2, 3
214 - 235	3 NE	1, 2, 3, 4, 5	2, 3, 4
236 - 258	4 ENE	2, 3, 4, 5, 6	3, 4, 5
259 - 280	5 E	3, 4, 5, 6, 7	4, 5, 6
281 - 303	6 ESE	4, 5, 6, 7, 8	5, 6, 7
304 - 325	7 SE	5, 6, 7, 8, 9	6, 7, 8
326 - 348	8 SSE	6, 7, 8, 9, 10	7, 8, 9
349 - 010	9 S	7, 8, 9, 10, 11	8, 9, 10
011 - 033	10 SSW	8, 9, 10, 11, 12	9, 10, 11
034 - 055	11 SW	9, 10, 11, 12, 13	10, 11, 12
056 - 078	12 WSW	10, 11, 12, 13, 14	11, 12, 13
079 - 100	13 W	11, 12, 13, 14, 15	12, 13, 14
101 - 123	14 WNW	12, 13, 14, 15, 16	13, 14, 15
124 - 145	15 NW	13, 14, 15, 16, 1	14, 15, 16
146 - 168	16 NNW	14, 15, 16, 1, 2	15, 16, 1

CONTROLLED

Dose Assessment

Prepared by: Lori Glander (Print Name) Lori A Glander (Signature) 5/11/10 (Date)

Approval: Brian Sullivan (Print Name) (Signature) 5/19/10 (Date)

Effective Date: May 27, 2010

This procedure excluded from further LI-100 review

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1.0 PURPOSE

To describe the methods of estimating the whole body and thyroid dose the offsite population in the event of an accidental release of radioactivity to the environment. This manual method of calculation is provided in case the computer method is unavailable.

2.0 REFERENCES

2.1 IP-EP-330, Airborne Sample Analysis

2.2 IP-EP-340, Meteorological Information and Dose Assessment System (MIDAS)

2.3 IP-EP-510, Obtaining Meteorological, Radiological and Dose Assessment Data from MRP-DAS

2.4 IP-2 Manual Determination of Release Rate (IP-EP-115 Form EP-17)

2.5 IP-3 Manual Determination of Release Rate (IP-EP-115 Form EP-18)

2.6 IPEC Manual Dose Assessment Worksheet/TEDE Whole Body Exposure Calculations and Thyroid Exposure Calculations (IP-EP-115 Form EP-13)

2.7 IPEC Manual Dose Assessment Worksheet/Release Rate Back-Calculated from Field Reading (IP-EP-115 Form EP-19)

2.8 Estimating Containment Activity via R-25 / 26 (IP-EP-115 Form EP-11)

3.0 DEFINITIONS

3.1 Meteorological Information and Data Acquisition System (MIDAS) - the computer system that collects radiation monitor data, meteorological data, and calculates/displays offsite radiation doses in an emergency or in an exercise.

3.2 Meteorological, Radiological, and Plant Parameter Data Acquisition System (MRP- DAS) – the system which provides meteorological, Reuter Stokes and certain plant parameter data (VC Temperature, VC Pressure, Plant Vent and VC High Radiation Monitors)

3.3 Total Effective Dose Equivalent (TEDE) – The sum of the Deep Dose Equivalent (DDE) and the Committed Effective Dose Equivalent (CEDE).

3.4 Committed Effective Dose Equivalent – The sum of the products of the weighting factors applicable to each of the body organs or tissues that

are irradiated and the committed dose equivalent to these organs or tissues.

3.5 Committed Dose Equivalent-Thyroid (CDE-Thy) - The committed dose from an intake of radioactive material to a body organ (i.e., thyroid).

3.6 Site Boundary – For Dose Assessment and Protective Action Recommendation purposes the Site Boundary is the closest distance at which members of the public would be exposed to a radioactive release. When the plume is traveling toward the water, the distance to the nearest point on opposite side of Hudson River will be considered as the Site Boundary.

4.0 RESPONSIBILITIES

Dose Assessment staff in the Control Room (CR) and in the Emergency Operations Facility (EOF) are responsible for assessing actual and potential radioactive releases to the environment in an emergency or in an emergency preparedness exercise.

5.0 DETAILS

5.1 Use of Meteorological Information and Dose Assessment System (MIDAS):

Refer to procedure IP-EP-340, "Meteorological Information and Dose Assessment System (MIDAS)" for guidance on performing dose assessments using computer program.

5.2 Use of Meteorological, Radiological & Plant Data Acquisition System (MRP-DAS):

Refer to IP-EP-510, "Meteorological, Radiological & Plant Data Acquisition System".

5.3 Use of Modular Emergency Assessment and Notification System (MEANS):

Refer to procedure IP-EP-520, "Modular Emergency Assessment and Notification System (MEANS)" for guidance on performing dose assessments. The MEANS program should be used only as a backup computer program when MIDAS is not available.

NOTE

All forms specified in Section 5.0 are provided in procedure IP-EP-115.

5.4 Upon activation of the IPEC ERO and the IPEC Plant Conditions require, perform dose assessment. When performing the Dose Assessment function, use MIDAS (EP IP 340) as the primary method. MEANS (EP IP 520) is to be used only as a backup to MIDAS. If there is no access to a dose assessment software program, dose assessment is to be completed using Hand Calculations (Section 5.6).

5.5 Necessary information to perform Dose Assessment is available using MRP-DAS(IP EP 510).

5.6 Hand calculations for dose assessment are to be performed if the necessary dose assessment software is not available. Perform hand calculations as follows:

5.6.1 Obtain the proper release rate calculation form (Form EP-17 for Unit 2 and Form EP-18 for Unit 3).

5.6.2 Determine radioactive release concentration or rate (µCi/cc, µCi/sec, OR CPM) and enter onto the appropriate Release Rate calculation form (Form EP-17 for Unit 2 or Form EP-18 for Unit 3):
Values determined from installed radiation monitors OR via a Chemistry sample may be entered directly into the Release Rate calculation form. **IF** a Chemistry sample is available, **THEN** use Attachment 9.7 to calculate the radioiodine release rate.

a. **IF** the plant vent survey is to be used **THEN**:

1. Follow guidance provided in Attachment 9.4, Accident Monitoring of Noble Gas Concentration in the Plant Vent.

2. Convert contact field reading on the plant vent to µCi/cc using conversion factor for appropriate time after shutdown, obtained from the appropriate Release Rate calculation form (Form EP-17 for Unit 2 and Form EP-18 for Unit 3).

b. **IF** back-calculating the Noble Gas release rate (NGRR) from field readings, **THEN** use Form EP-19.

c. **IF** using R-25 or R-26 to calculate the Noble Gas release rate (NGRR), **THEN** use Form EP-11.

d. **IF** back-calculating the release rate from airborne samples, **THEN** refer to IP-EP-330, Airborne Sample Analysis, and Attachment 9.5.

5.6.3 If Noble Gas concentrations (µCi/cc) are entered in the Release Rate calculation form (Form EP-17 for Unit 2 or EP-18 for Unit 3), use the proper equation(s) on the appropriate section of the Release Rate calculation form to calculate the noble gas release rate (NGRR).

5.6.4 Calculate the radioiodine release rate (Ci/sec) using the default equation (with the assumed NG/I ratio for the release point) on the appropriate Release Rate calculation form (Form EP-17 for Unit 2 and EP-18 for Unit 3).

IF a chem. sample is available, **THEN** use Attachment 9.7 to:

e. Calculate the radioiodine release rate, and

f. Determine the sample-specific thyroid dose conversion factor.

5.6.5 Obtain the appropriate Xµ/Qs from Attachment 9.1 or 9.2. Record these values on the IPEC Manual Dose Assessment Worksheet (Form EP-13).

5.6.6 Obtain meteorological data in accordance with IP-EP-510.

5.6.7 Enter the release rates (RR), wind speed (WS) AND appropriate constants on the IPEC Manual Dose Assessment Worksheet (Form EP-13).

Determine the TEDE (Whole Body) AND CDE-Thyroid dose rates at the site boundary, 2, 5, AND 10 mile distances. (Form EP-13)

NOTE

Use four (4) hours as the default release duration, unless information exists that clearly supports a different release duration.

5.6.8 Determine exposure rates if desired, at other distances utilizing the Xµ/Q values from Attachment 9.2.

5.6.9 Due to required Protective Action Recommendations (Procedure IP-EP-410, Attachment 9.1), **IF** the projected or actual doses at any offsite location exceed the following:

a. 1 Rem Integrated Dose TEDE, or

b. 5 Rem Integrated Dose CDE-thyroid

THEN:

- If in the CR, inform the Shift Manager (SM) or Emergency Plant Manager (EPM).
- If in the Emergency Operations Facility (EOF)/ Alternate Emergency Operations Facility (AEOF), inform the Offsite Radiological Manager (ORM).

5.6.10 Determine if there is a plant release above Federal Limits based on the following table:

Release Point	Rad Monitor	Tech Spec Release Rate Setpoint
Plant Vent	R-27	1.4E+5 uCi/sec (or 20 uCi/sec Iodine)
Plant Vent	R-44 (U2) / R-14 (U3)	3.3 E-3 uCi/cc
SG Safety or Atmospheric Relief Valve	Main Steam Line Monitors	P/S leak > 15 gpd and Steam line activity > .01 uCi/cc with Atmospheric at 10% open or greater
Hole in the VC	R-25 / R-26	1 R/hr

5.6.11 **IF** there is a radioactive release, **THEN** contact Environmental Personnel as time permits to determine if it is above the Reportable Quantities set forth in 40 CFR302, Appendix B. If so, ensure the reportability requirements specified in IP-SMM-LI-108 are met within 24 hours.

5.6.12 **IF** there is a radioactive release to the environment above Federal limits (per the above table), **THEN** complete Parts I & II of New York Radiological Data Form (Forms EP-1 and EP-2). These forms can be filled in by hand or refer to procedure IP-EP-340, "Meteorological Information and Dose Assessment System" to have MIDAS automatically print out these forms.

5.6.13 "New York State Radiological Data Form, Part I" (Form EP-1), shall be transmitted:

- Within 15 minutes of the declaration of an emergency,
- Within 15 minutes of a significant change in plant status or emergency classification change.
- With updates approximately every 30 minutes; time interval may be lengthened with concurrence of offsite agencies.

5.6.14 "New York State Radiological Data Form Part II, Radiological Assessment Data" (Form EP-2) shall be completed and transmitted:

- As soon as possible after it has been determined that a release above Federal Limits exists.
- If there is a significant change in the radioactive release
- With updates approximately every 30 minutes; time interval may be lengthened with concurrence of offsite agencies.

5.6.15 To help visualize plume location, MIDAS plume data can be displayed directly from the MIDAS program or a shape file can be exported to a Geographical Information System display map.

a. IF Speed < 4 m/s AND Direction between 349° - 101° **THEN:**The plume will follow a down-valley path.

b. IF Speed < 4 m/s AND Direction between 102° - 209° **THEN**: The plume will follow an up-valley path.

c. IF speed ≥ 4 m/s OR direction between 210° - 348° **THEN:** The plume will follow a cross valley (normal) path.

5.6.16 **IF** a General Emergency has been declared, **THEN** use IP-EP-410 "Protective Action Recommendations" to determine what protective action recommendations should be conveyed to the EPM/ED.

5.6.17 When using MEANS as a backup dose assessment tool:

To help visualize plume location, determine the proper plume dispersion overlay:

a. **IF** Speed < 4 m/s AND Direction between 340° - 101° **THEN:**

1. Use BLUE down valley overlays.
2. CENTER overlay on plant and ALIGN N - S and E — W lines with those on map.

b. **IF** Speed < 4 m/s AND Direction between 102° - 209° **THEN:**

1. Use YELLOW up valley overlays.
2. CENTER overlay on plant and ALIGN N - S and E — W lines with those on map.

c. **IF** speed ≥ 4 m/s OR direction between 210° - 339° **THEN:**

1. Use RED cross valley overlays.
2. CENTER overlay and point plume along wind direction

5.7 In the EOF only:

5.7.1 Calculate projected doses using MIDAS, MEANS or manual methods.

5.7.2 If available, verify projected doses with actual field radiological data.

5.7.3 At the earliest time when offsite radioiodine concentration is available, calculate the ratio of CDE-thyroid dose rate to gamma dose rate using Attachment 9.6. Report this ratio to the stakeholders on the Part II Form, Field Measurement Section.

a. Obtain gamma reading in the plume (mrem/hr)

b. Obtain iodine concentration in the plume (uCi/cc)

c. Convert iodine concentration to CDE-thyroid dose rate (mrem/hr = mrem committed thyroid dose per hr breathed).

d. Calculate the ratio of CDE-thyroid dose rate to gamma dose rate.

1. IF the ratio is 5.0 or higher, **THEN** thyroid dose rates will be more limiting than whole body dose rates. Evaluate protective actions for possible changes.

2. IF the ratio is less than 5.0, **THEN** whole body dose rates will be more limiting than thyroid dose rates. Evaluate protective actions for possible changes.

5.7.4 IF offsite gamma dose rates are available, THEN verify release rates determined from plant data using the "IPEC Manual Dose Assessment Worksheet, Back Calculating Release Rate from Field Data" (IP-EP-115 Form EP-19).

5.7.5 Review Site Perimeter surveys.

5.7.6 Review Field Surveys.

5.7.7 Review current and historical Reuter Stokes data, to determine if a release has occurred or is occurring. Attachment 9.3, "Reuter-Stokes Location Xμ/Q Values" provides Xμ/Q values for comparison purposes.

5.7.8 Exchange offsite monitoring and projected data with State and Counties.

5.7.9 If required, estimate release rates utilizing High Range Vapor Containment radiation monitors R-25/26 (IP-EP-115 Form EP-11).

6.0 INTERFACES

6.1 IP-EP-410, Protective Action Recommendations

6.2 IP-EP-340, Meteorological Information and Dose Assessment System (MIDAS)

6.3 IP-EP-520, Modular Emergency Assessment & Notification System (MEANS)

6.4 IP-EP-510, Obtaining Meteorological, Radiological and Dose Assessment Data from MRP-DAS.

6.5 Westchester, Rockland, Putnam, Orange County Radiological Emergency Response Plans

7.0 RECORDS

Forms and reports completed during an actual emergency are permanent records.

8.0 REQUIREMENTS AND COMMITMENT CROSS-REFERENCE

IPEC Emergency Plan

9.0 ATTACHMENTS

9.1 Site Boundary Xμ/Q by Pasquill Stability Category

9.2 Xμ/Q Values for other Distances

9.3 Reuter-Stokes Location Xμ/Q Values

9.4 Accident Monitoring of Noble Gas Concentration in the Plant Vent.

9.5 Determination of Noble Gas Release Rate – Discussion

9.6 Determination Ratio of CDE-Thyroid to Gamma Dose Rates

9.7 Use of Chemistry Sample to Determine Radioiodine Release Rate and Thyroid Dose Conversion Factor

Attachment 9.1

Site Boundary Xμ/Q (m^{-2}) by Pasquill Stability Category

Cross Valley (Wind Direction from 210° – 348° or Wind Speed ≥ 4 m/s)

Sheet 1 of 2

Sector	Wind From	Distance (Meters)	Pasquill Categories						
			A	B	C	D	E	F	G
1*	168.7° to 191.2°	2977	5.5 E-7	9.0 E-7	5.7 E-6	2.1 E-5	4.3 E-5	1.1 E-4	2.0 E-4
2*	191.2° to 213.7°	3234	5.2 E-7	1.0 E-6	5.0 E-6	1.9 E-5	3.9 E-5	9.6 E-5	1.8 E-4
3	213.7° to 236.2°	716	3.6 E-6	2.0 E-5	5.3 E-5	1.5 E-4	2.7 E-4	4.9 E-4	7.1 E-4
4	236.2° to 258.7°	701	3.7 E-6	2.0 E-5	5.4 E-5	1.6 E-4	2.7 E-4	5.0 E-4	7.2 E-4
5	258.7° to 281.2°	762	3.2 E-6	1.8 E-5	4.8 E-5	1.4 E-4	2.5 E-4	4.7 E-4	6.8 E-4
6	281.2° to 303.7°	625	4.7 E-6	2.5 E-5	6.4 E-5	1.8 E-4	3.1 E-4	5.5 E-4	7.9 E-4
7	303.7° to 326.2°	610	4.9 E-6	2.6 E-5	6.6 E-5	1.9 E-4	3.2 E-4	5.6 E-4	8.0 E-4
8	326.2° to 348.7°	701	3.7 E-6	2.0 E-5	5.4 E-5	1.6 E-4	2.7 E-4	5.0 E-4	7.2 E-5
9	348.7° to 11.2°	1006	2.1 E-6	1.0 E-5	3.2 E-5	9.9 E-5	1.8 E-4	3.6 E-4	5.4 E-4
10	11.2° to 33.7°	1006	2.1 E-6	1.0 E-5	3.2 E-5	9.9 E-5	1.8 E-4	3.6 E-4	5.4 E-4
11	33.7° to 56.2°	488	7.7 E-6	3.6 E-5	8.8 E-5	2.5 E-4	4.0 E-4	6.7 E-4	9.2 E-4
12*	56.2° to 78.7°	2349	6.6 E-7	1.5 E-6	8.3 E-6	3.0 E-5	6.0 E-5	1.4 E-4	2.6 E-4
13*	78.7° to 101.2°	1802	8.1 E-7	3.2 E-6	1.3 E-5	4.3 E-5	8.5 E-5	1.9 E-4	3.3 E-4
14*	101.2° to 123.7°	1689	9.0 E-7	3.7 E-6	1.4 E-5	4.8 E-5	9.2 E-5	2.0 E-4	3.5 E-4
15*	123.7° to 146.2°	1432	1.2 E-6	5.1 E-6	1.9 E-5	6.1 E-5	1.2 E-4	2.4 E-4	4.0 E-4
16*	146.2° to 168.7°	1416	1.2 E-6	5.2 E-6	1.9 E-5	6.2 E-5	1.2 E-4	2.5 E-4	4.0 E-4

* Plume for these sectors goes over the water before it touches public or private land. Site boundary in these cases is taken to be the landfall point at the sector center.

Attachment 9.1
Sheet 2 of 2

Site Boundary Xμ/Q (m^{-2}) by Pasquill Stability Category

Up Valley Plumes (wind speed <4 m/s) Wind Direction from 102° – 209° (1)

Pasquill Categories						
A	B	C	D	E	F	G
5.2 E-7	1.0 E-6	5.0 E-6	1.9 E-5	3.9 E-5	9.6 E-5	1.8 E-4

Site Boundary Xμ/Q (m^{-2}) by Pasquill Stability Category

Down Valley Plumes (wind speed <4 m/s) Wind Direction from 349° – 101° (2)

Pasquill Categories						
A	B	C	D	E	F	G
3.7 E-6	1.0 E-5	3.2 E-5	9.9 E-5	1.8 E-4	3.6 E-4	5.4 E-4

(1) Plume centerline will always cross the site boundary at Sector 2. Therefore, the Sector 2 Xμ/Q values are used.

(2) Plume centerline will cross the site boundary at either Sector 8 (Pasquill Category A) or Sector 10 (for Pasquill Category B – G)

Attachment 9.2

Xμ/Q Values for other Distances (m^{-2})

Sheet 1 of 1

Miles	Distance (Meters)	Pasquill Categories						
		A	B	C	D	E	F	G
1.0	1608	9.5 E-7	4.0 E-6	1.5 E-5	5.0 E-5	9.0 E-5	2.1 E-4	3.4 E-4
1.5	2412	6.3 E-7	2.1 E-6	1.1 E-5	5.4 E-5	5.4 E-5	1.3 E-4	2.2 E-4
2.0	**3216**	**5.2 E-7**	**8.3 E-7**	**5.0 E-6**	**1.9 E-5**	**3.9 E-5**	**9.6 E-5**	**1.8 E-4**
2.5	4020	4.4 E-7	5.8 E-7	3.5 E-6	1.4 E-5	3.7 E-5	7.0 E-5	1.7 E-4
3.0	4824	3.6 E-7	5.0 E-7	2.8 E-6	1.0 E-5	2.2 E-5	5.7 E-5	1.3 E-4
3.5	5628	3.2 E-7	4.2 E-7	2.0 E-6	8.1 E-6	1.8 E-5	4.7 E-5	1.1 E-4
4.0	6432	2.8 E-7	3.7 E-7	1.6 E-6	6.8 E-6	1.5 E-5	4.0 E-5	9.4 E-5
4.5	7236	2.6 E-7	3.5 E-7	1.4 E-6	5.8 E-6	1.3 E-5	3.5 E-5	7.3 E-5
5.0	**8040**	**2.4 E-7**	**3.2 E-7**	**1.2 E-6**	**5.1 E-6**	**1.1 E-5**	**3.1 E-5**	**6.7 E-5**
5.5	8844	2.1 E-7	3.1 E-7	9.9 E-7	4.4 E-6	1.0 E-5	2.8 E-5	5.9 E-5
6.0	9648	2.0 E-7	2.7 E-7	8.3 E-7	3.8 E-6	9.1 E-6	2.5 E-5	5.4 E-5
6.5	10452	1.9 E-7	2.5 E-7	7.5 E-7	3.5 E-6	8.2 E-6	2.3 E-5	5.0 E-5
7.0	11256	1.8 E-7	2.4 E-7	6.7 E-7	3.2 E-6	7.5 E-6	2.1 E-5	4.7 E-5
7.5	12060	1.7 E-7	2.3 E-7	6.1 E-7	3.0 E-6	6.9 E-6	1.9 E-6	4.3 E-5
8.0	12864	1.6 E-7	2.2 E-7	5.5 E-7	2.7 E-6	6.3 E-6	1.8 E-5	4.1 E-5
8.5	13668	1.5 E-7	2.1 E-7	5.0 E-7	2.5 E-6	5.8 E-6	1.7 E-5	3.8 E-5
9.0	14472	1.5 E-7	2.0 E-7	4.6 E-7	2.3 E-6	5.5 E-6	1.6 E-5	3.6 E-5
9.5	15276	1.4 E-7	1.9 E-7	4.2 E-7	2.1 E-6	5.4 E-6	1.5 E-5	3.4 E-5
10.0	**16080**	**1.4 E-7**	**1.8 E-7**	**4.0 E-7**	**2.1 E-6**	**5.3 E-6**	**1.5 E-5**	**3.4 E-5**

Attachment 9.3

Reuter-Stokes Location Xμ/Q Values (m^{-2})

Sheet 1 of 1

Sector Monitor Distance (m)		Stability Class						
		A	B	C	D	E	F	G
1	3226	5.3E-7	8.4E-7	5.1E-6	1.9E-5	4.0E-5	9.8E-5	1.8E-4
2	3379	5.2E-7	8.3E-7	5.0E-6	1.8E-5	3.9E-5	9.7E-5	1.7E-4
3	2574	6.3E-7	1.2E-6	7.3E-6	2.6E-5	5.3E-5	1.2E-4	2.4E-4
4	1448	1.2E-6	4.6E-6	1.8E-5	6.1E-5	1.1E-4	2.4E-4	3.9E-4
5	1287	1.4E-6	6.4E-6	2.3E-5	7.3E-5	1.4E-4	2.8E-4	4.4E-4
6	643	4.3E-6	2.2E-5	6.0E-5	1.8E-4	3.0E-4	5.5E-4	7.7E-4
7	643	4.3E-6	2.2E-5	6.0E-5	1.8E-4	3.0E-4	5.5E-4	7.7E-4
8	804	2.9E-6	1.7E-5	4.5E-5	1.3E-4	2.4E-4	4.5E-4	6.6E-4
9	1126	1.8E-6	8.5E-6	2.6E-5	8.1E-5	1.5E-4	3.2E-4	4.9E-4
10	1287	1.4E-6	6.4E-6	2.3E-5	7.3E-5	1.4E-4	2.8E-4	4.4E-4
11	1287	1.4E-6	6.4E-6	2.3E-5	7.3E-5	1.4E-4	2.8E-4	4.4E-4
12	2494	6.4E-7	1.3E-6	7.5E-6	2.7E-5	5.6E-5	1.2E-4	2.4E-4
13	1870	8.0E-7	2.7E-6	1.2E-5	4.2E-5	8.1E-5	1.8E-4	3.2E-4
14	1870	8.0E-7	2.7E-6	1.2E-5	4.2E-5	8.1E-5	1.8E-4	3.2E-4
15	1648	9.4E-7	3.9E-6	1.5E-5	5.0E-5	9.7E-5	2.1E-4	3.6E-4
16	1770	8.4E-7	3.3E-6	1.3E-5	4.5E-5	8.8E-5	1.9E-4	3.4E-4

Attachment 9.4

Accident Monitoring of Noble Gas Concentrations in the Plant Vent

Sheet 1 of 2

NOTES

1. The Operations Support Center (OSC) Radiation Protection Team Leader will determine which reading to obtain first; plant vent or back-up plant vent monitoring.
2. Locations and equipment may be different from Unit 2 or Unit 3

Radiation readings may be obtained on the plant vent by the following:

a. Follow the provisions used by the OSC to plan and track team assignments.

b. Use a telescoping radiation monitoring instrument (e.g. teletector or equivalent) to perform this function.

c. As requested by OSC Radiation Protection Coordinator or Control Room (CR), REPORT radiation levels.

d. Proceed to the Containment Airlock area.

e. Using the fan-building wall for shielding, obtain radiation readings by Vapor Containment purge and exhaust ducts.

f. CAUTION
The door leading out to the plant vent area may lock when closed. To prevent being trapped in the plant vent area, BLOCK OPEN THE DOOR prior to going to the plant vent area.

g. Proceed through the door to the plant vent area.

h. Obtain radiation readings at the following locations:

i. 6 feet from the plant vent 10 feet above the floor.

j. Contact with the plant vent 10 feet above the floor.

k. Notify the OSC or CR that radiation readings have been obtained and follow instructions as directed.

Attachment 9.4

Accident Monitoring of Noble Gas Concentrations in the Plant Vent

Sheet 2 of 2

Backup plant vent monitoring readings may be obtained by the following:

a. Follow the provisions used by the OSC to plan and track team assignments.

b. Proceed to the Auxiliary Building (PAB) Post Accident (PASS) Plant Vent Sample Cave

c. Ensure that the RMS-2 meter is positioned on top of the PASS plant vent shield.

d. Ensure that the RMS-2 detector is positioned on the floor of the PASS plant vent shield near the gas-sampling bulb.

e. Ensure that detector is connected properly to meter with the cable run through the 1-inch hole in the top of the PASS plant vent shield.

f. Ensure that the meter is energized by A/C and the power is on.

g. With the shield door closed, establish recirculation flow of plant vent gases through the PASS plant vent piping as outlined in procedure.

h. After recirculation reaches equilibrium (about 5 minutes)

i. Record backup plant vent readings from the RMS-2 monitor.

j. Using a hand held meter, OBTAIN a background radiation reading outside of the PASS plant vent shield.

k. Report RMS-2 readings to the OSC or CR and FOLLOW instructions as directed.

Attachment 9.5
Determination of Noble Gas Release Rate – Discussion
Sheet 1 of 2

The following instrumentation/methodology can be used to determine the noble gas release rate.

- Plant vent monitor-low range (Direct Readout)
- Plant vent monitor-high range (Direct Readout)
- Plant vent survey-hand held instrument or remote readout
- Isotopic analysis of sample taken from release point.
- Condenser air ejector monitor (Direct Readout).
- Main steam line monitors.
- Back-calculating a release rate based on actual field radiological data.
- Containment radiation monitors R-25 and R-26 to measure the source term within containment and to estimate potential releases from containment.
- Potential exposure to the population if a future release of the existing containment source term occurs, utilizing the following information:
    1. Containment pressure relief line contains three isolation valves (one in containment and two outside).
    2. Containment purge system contains two isolation valves on the Inlet Duct (one in containment and one outside).
    3. Containment purge system contains two isolation valves on the Exhaust Duct (one in containment and one outside).
    4. Weld Channel (WC) and Isolation Valve Seal Water System (IVSWS) are pressurized to ensure that during accident conditions, a pressure build up to AT LEAST 50 psi in containment would NOT cause a leak of radioactive material to the environment as long as the isolation valves remained in the closed position.

Attachment 9.5

Determination of Noble Gas Release Rate – Discussion

Sheet 2 of 2

5. WITHOUT WC AND IVSWS, BUT with isolation valves closed, the containment leak rate is expected to be LESS THAN 0.1% of the containment volume per day (Tech Spec) WITH a pressure buildup to 50 psi inside containment. At lower pressures the leak rate would be smaller, approaching zero as the pressure differential approaches zero.

6. Containment Volume = **2.6×10^6 ft^3 = 7.4×10^{10} cc**

7. For Post-Steam Generator Tube Rupture (SGTR) cooldown using blowdown situations, the determination of the gaseous release rate from the blowdown flash tank shall be accomplished by determining the noble gas concentration in the faulted SG blowdown (Chem sample µCi/cc) AND the blowdown rate (GPM).

8. Complete Form EP-32 by using the following general formula when applying Airborne Sample Data to determine concentration or release rate. This is for a 10 cubic foot sample.

a. NG Release Concentration, µCi/cc =

$$\frac{\text{mR/hr in field}}{\text{DCF, mR/hr per µCi/cc}}$$

b. NG Release Rate, Ci/sec =

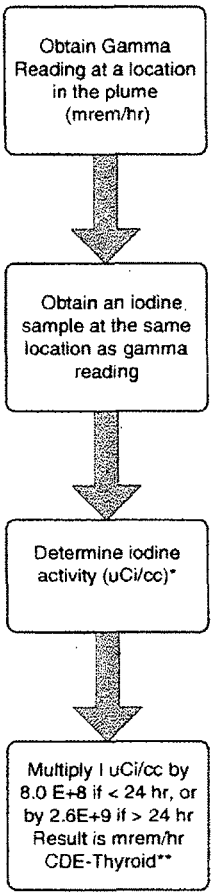
$$\frac{\text{Concentration(Ci/m}^3\text{)} * \text{Wind Speed (m/sec)}}{\text{X}\mu\text{/Q (m}^{-2}\text{)}}$$

Note That µCi/cc = Ci/m^3

Attachment 9.6, Sheet 1 of 2

Determine Ratio of CDE-Thyroid to Gamma Dose Rates

Part 1 – Flow Chart – Gamma Dose Rate and CDE-Thyroid Dose Rate



$= _____ \text{mrem/hr}$
(G)

$[I(cpm) - Bkgd(cpm)] x 4.6E-9 / sample.volume(ft^3)$

$= _____ \text{uCi/cc Iodine}$
(I-conc)

$= _____ \text{mrem/hr CDE Thyroid}$
(I)

* This equation is based on a frisker efficiency (cpm/dpm) of about 0.0034 for iodine, and conversion of dpm to uCi, and cu ft to cc.
** If the iodine isotopic mix is known, then use the CDE-Thyroid Dose Conversion Factors from Attachment 9.7

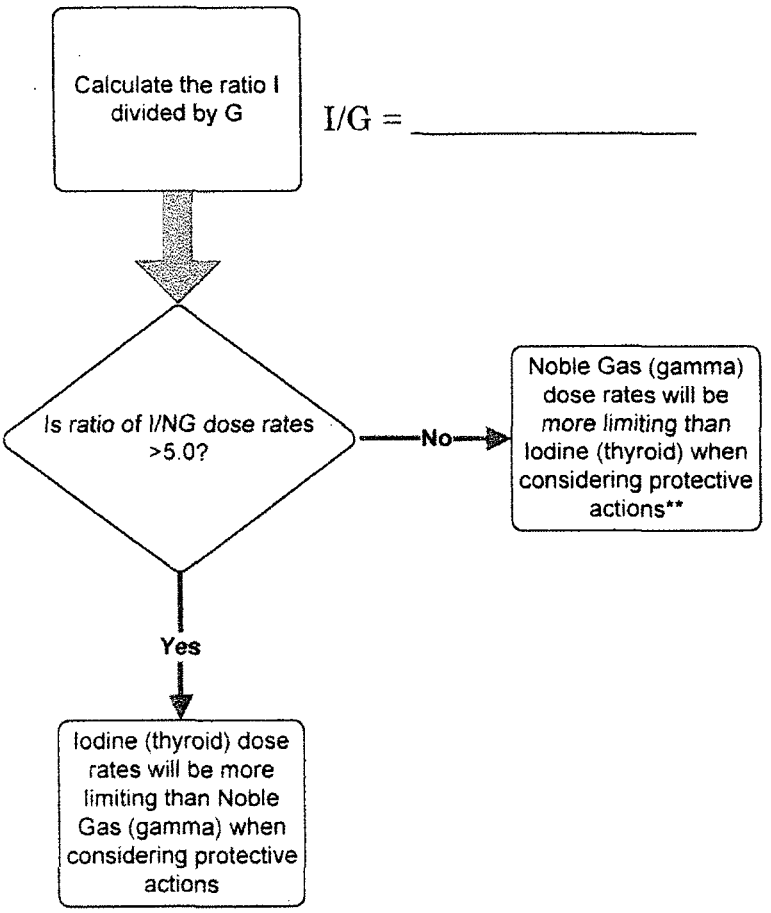
Attachment 9.6, Sheet 2 of 2

Determine Ratio of CDE-Thyroid to Gamma Dose Rates

Part 2 – Flow Chart – Ratio of CDE-Thyroid to Gamma Dose Rates

I = _____ mrem/hr

G = _____ mrem/hr



Notes:

- The calculation above is for one location at one time. If practical, 3 or more such determinations of I/NG dose rate ratio should be performed.
- Note that actual TEDE will be somewhat higher than gamma dose rates, as it includes a portion of the thyroid dose; however, for the purpose of determining the limiting radionuclide, *the use of gamma* dose rate is adequate and removes unnecessary calculations.

Attachment 9.7
Use of Chemistry Sample to Determine Radioiodine Release Rate and Thyroid Dose Conversion Factor
Sheet 1 of 2

Part 1 – Determine Radioiodine Release Rate Based on Chem. Sample

Multiply [iodine uCi/cc] x [volume or mass release rate] x [constant] = iodine Ci/sec

For plant vent or air ejector:

uCi/cc iodine	cfm	Constant (1)	Iodine Ci/sec
		4.70E-04	

For main steam line release

uCi/cc iodine	lbm/hr	Constant (2)	Iodine Ci/sec
		3.2 E-6	

For steam generator blow down release

uCi/cc iodine	gpm	Constant (3)	Iodine Ci/sec
		6.30E-05	

(1) constant converts uCi/cc x cfm to Ci/sec, using Ci/uCi, cc/cu ft, and min/sec

(2) constant converts uCi/cc x lbm/hr to Ci/sec, using Ci/uCi, expected steam density, and hr/sec

(3) constant converts uCi/cc x gpm to Ci/sec, using Ci/uCi, cc/gal, and min/sec

Attachment 9.7

Use of Chemistry Sample to Determine Radioiodine Release Rate and Thyroid Dose Conversion Factor

Sheet 2 of 2

Determination of Iodine Dose Factor Based on Chem. Sample			
Sample Date		**Sample Time**	
Sample Description and Unit of Measurement (e.g., uCi/cc)			
Col. 1	Col. 2	Col. 3	Col. 4 = Col 2 x 3
Iodine Isotopes	**Thyroid Dose Conv. Factor (K2)**	**Concentration of Iodine Isotopes**	**Weighted Conversion Factor**
I-131	2.60E+09		
I-132	1.50E+07		
I-133	4.40E+08		
I-134	2.60E+06		
I-135	7.60E+07		
Total	N/A		
K2 = mrad/hr per uCi/cc Iodine (mrad CDE thyroid per hour breathed)		**Wtd, K2 = sum of Col. 4 divided by sum of Col. 3**	