

## Harris Nuclear Plant (HNP)

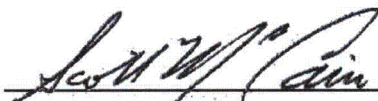
# Radiological Effluent EAL Values

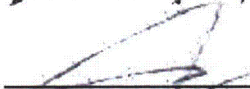
**EP-EALCALC-HNP-1401**  
**Revision 0**

Document Author: Scott McCain

Technical Reviewer: Jeff White

EPM Reviewer: Greg Simmons

Document Author:  03/18/15

Technical Reviewer:  03/19/15

EPM Approval:  03/19/15

**Table of Contents**

1. Purpose.....	3
2. Development Methodology and Bases .....	4
2.1. Threshold Limits .....	4
2.2. Effluent Release Points .....	6
2.3. Source Term.....	9
2.4. Release Duration.....	10
2.5. Meteorology.....	10
3. Design Inputs .....	12
3.1. General Constants and Conversion Factors .....	12
3.2. Liquid Effluent.....	12
3.3. Gaseous Effluent.....	13
4. Calculations .....	16
4.1. RU1.1 Liquid Release.....	16
4.2. RU1.1 Gaseous Release .....	17
4.3. RA1.1, RS1.1 and RG1.1 Gaseous Release .....	17
5. Conclusion .....	18
6. References.....	19

**ATTACHMENTS**

Attachment 1, Median Wind Speed and Stability Values Memo .....	18
Attachment 2, RU1.1 Liquid Effluent EAL Calculations.....	23
Attachment 3, RU1.1 Gaseous Effluent EAL Calculations.....	24
Attachment 4, RA1.1, RS1.1 and RG1.1 URI Gaseous Effluent EAL Calculations .....	25

**1. Purpose**

The Harris Nuclear Plant (HNP) Emergency Action Level (EAL) Technical Bases Manual contains background information, event declaration thresholds, bases and references for the site specific EAL and Fission Product Barrier (FPB) values used to implement the Nuclear Energy Institute (NEI) 99-01 Rev. 6 EAL guidance methodology. This calculation document provides additional technical detail specific to the derivation of the gaseous and liquid radiological effluent EAL values developed in accordance with the guidance in NEI 99-01 Rev. 6.

Documentation of the assumptions, calculations and results are provided for the HNP site specific Rx1 series EAL effluent monitor values associated the NEI 99-01 Rev 6 EALs listed below.

- NEI EAL AU1.1 (gaseous and liquid)
- NEI EAL AA1.1 (gaseous and liquid)
- NEI EAL AS1.1 (gaseous)
- NEI EAL AG1.1 (gaseous)

## 2. DEVELOPMENT METHODOLOGY AND BASES

### 2.1. Threshold Limits

#### 2.1.1. RU1.1 Liquid Threshold Limits

##### Guidance Criteria

The RU1 Initiating Condition (IC) addresses a release of gaseous or liquid radioactivity greater than 2 times the Offsite Dose Calculation Manual (ODCM) limits for 60 minutes or longer.

##### HNP Bases

The ODCM Sections 2.0 and 2.1 (with reference to ODCM Operational Requirement 3.11.1.1) limits for the concentration of radioactive liquid effluents released from the site to the unrestricted area are as follows:

- 10 times the effluent concentration (EC) levels of 10CFR20, Appendix B, Table 2
- 2.0E-04  $\mu\text{Ci/ml}$  for dissolved and entrained noble gases

The RU1.1 liquid effluent EAL threshold values will equate to 2 times the ODCM limit.

#### 2.1.2. RU1.1 Gaseous Threshold Limits

##### Guidance Criteria

The RU1 Initiating Condition (IC) addresses a release of gaseous or liquid radioactivity greater than 2 times the Offsite Dose Calculation Manual (ODCM) limits for 60 minutes or longer.

##### HNP Bases

The ODCM Section 3.1 (with reference to ODCM Operational Requirement 3.11.2.1) limits for the concentration of radioactive gaseous effluents at the site boundary are as follows:

- Less than or equal to 500 mrem/yr to the whole body (Noble Gasses)
- Less than or equal to 3000 mrem/yr to the skin (Noble Gasses)
- Less than or equal to 1500 mrem/yr to any organ (I-131, I-133, tritium, and particulate with half-lives greater than 8 days)

Inhalation (internal organ) limits are not applicable for EAL threshold determination since the specified surveillance involves collection and analysis of composite samples. This after-the-fact assessment (individual uptake) could not be made in a timely manner conducive to accident classification.

The RU1.1 gaseous effluent EAL threshold values will equate to 2 times the ODCM limit for the lesser of the whole body or skin exposure pathways.



**2.1.3. RA1.1 Liquid Threshold Limits****Guidance Criteria**

The RA1 Initiating Condition (IC) addresses a release of radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE.

This is based on values at 1% of the EPA Protective Action Guides (PAGs).

Per NEI 99-01, the effluent monitor readings should correspond to the above dose limits at the "site-specific dose receptor point" (consistent with the calculation methodology employed) for one hour of exposure.

**HNP Bases**

The liquid effluent limits are based on the water concentration values given in 10 CFR 20 Appendix B Table 2 Column 2 (see Section 2.1.1 above). The 10 CFR 20 values are equivalent to the radionuclide concentrations which, if ingested continuously over the course of a year, would produce a total effective dose equivalent of 0.05 rem (50 millirem). The EPA PAGs are based on a TEDE dose from immersion, inhalation and deposition. The 10 CFR 20 limits and the EPA limits do not represent the same type of exposure and thus cannot be compared on a one to one basis.

Additionally, significant dilution assumptions are incorporated in determining ODCM ingestion limits for liquid releases such that obtaining a dose of 10 mrem in one hour would require a discharge concentration above the effluent monitor threshold (ingestion of radioactivity from a liquid release at the site boundary is not practical).

Thus, the site specific EALs will not contain the RA1.1 liquid effluent monitor threshold value that equates to 1% of the EPA PAG. However, EALs RA1.3 and RA1.4 will remain applicable for liquid effluent releases that exceed the threshold based upon sample and field survey results.

**2.1.4. RA1.1 Gaseous Threshold Limits****Guidance Criteria**

The RA1 IC addresses a release of radioactivity resulting in offsite dose greater than 10 mrem TEDE or 50 mrem thyroid CDE.

Per NEI 99-01, the effluent monitor readings are based on values at 1% of the EPA Protective Action Guides (PAGs) at the "site-specific dose receptor point" (consistent with the calculation methodology employed) for one hour of exposure.

**HNP Bases**

The gaseous effluent limits for RA1.1 are based on values that equate to an offsite dose greater than 10 mrem TEDE or 50 mrem CDE thyroid, which are 1% of the EPA PAGs.

2.1.5. RS1.1 Gaseous Threshold Limits

**Guidance Criteria**

The RS1 IC addresses a release of radioactivity resulting in offsite dose greater than 100 mrem TEDE or 500 mrem thyroid CDE.

This is based on values at 10% of the EPA Protective Action Guides (PAGs) at the "site-specific dose receptor point" (consistent with the calculation methodology employed) for one hour of exposure.

**HNP Bases**

The gaseous effluent limits for RS1.1 are based on values that equate to an offsite dose greater than 100 mrem TEDE or 500 mrem CDE thyroid, which are 10% of the EPA PAGs.

2.1.6. RG1.1 Gaseous Threshold Limits

**Guidance Criteria**

The RG1 IC addresses a release of radioactivity resulting in offsite dose greater than 1,000 mrem TEDE or 5,000 mrem thyroid CDE.

This is based on values at 100% of the EPA Protective Action Guides (PAGs) at the "site-specific dose receptor point" (consistent with the calculation methodology employed) for one hour of exposure.

**HNP Bases**

The gaseous effluent limits for RG1.1 are based on values that equate to an offsite dose greater than 1,000 mrem TEDE or 5,000 mrem CDE thyroid, which are 100% of the EPA PAGs.

2.2. Effluent Release Points

**Note** – All effluent release points assume a background reading of zero to conservatively account for all modes of operation applicable to the EALs.

2.2.1. Liquid Release Points

**Guidance Criteria**

Per NEI 99-01, the RU1 IC addresses normally occurring continuous radioactivity releases from monitored gaseous or liquid effluent pathways (EAL #1) and planned batch releases from non-continuous release pathways (EAL #2).

Per NEI 99-01, the RA1 IC includes events or conditions involving a radiological release, whether gaseous or liquid, monitored or un-monitored. Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

The "site-specific monitor list and threshold values" should be determined with consideration of the selection of the appropriate installed gaseous and liquid effluent monitors.

### **HNP Bases**

There are seven liquid radwaste discharge points to the environment at HNP (ODCM 2.0 and Figures 2.1-1 through 2.1-3):

1. Treated Laundry and Hot Shower Tank (TL&HST) – REM-1WL-3540
2. Waste Evaporator Condensate Tank (WECT) – REM-1WL-3541
3. Waste Monitor Tank (WMT) – REM-1WL-3542
4. Normal Service Water (NSW) System – REM-3500A/B

Per the ODCM, the NSW system has a low potential for radioactive effluent releases, thus the NSW pathway does not meet the NEI 99-01 criteria for use as an EAL threshold.

5. Turbine Building Floor Drains (TBFD) – REM-1MD-3528

Per the ODCM, the TBFD effluent has a low probability of radioactive contamination, thus the TBFD pathway does not meet the NEI 99-01 criteria for use as an EAL threshold.

6. Outside Tank Area Drains (OTAD) – REM-1MD-3530

Per the ODCM, the OTAD effluent has a low probability of radioactive contamination, thus the OTAD pathway does not meet the NEI 99-01 criteria for use as an EAL threshold.

7. Secondary Waste Sample Tank (SWST) – REM-1WL-3542

Per the ODCM, the SWST has a low potential for radioactive effluent releases, thus the SWST pathway does not meet the NEI 99-01 criteria for use as an EAL threshold.

Cooling tower blowdown minimum dilution flow rates range from 14,250 gpm to 3,800 gpm (ODCM Table 2.1-2). Minimum dilution flow for the EAL threshold values for the release pathways above is assumed to be 3800 gpm.

### 2.2.2. Gaseous Release Points

#### **Guidance Criteria**

Per NEI 99-01, the RU1 IC addresses normally occurring continuous radioactivity releases from monitored gaseous or liquid effluent pathways (EAL #1) and planned batch releases from non-continuous release pathways (EAL #2).

Per NEI 99-01, the RA1 IC includes events or conditions involving a radiological release, whether gaseous or liquid, monitored or un-monitored. Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

Per NEI 99-01, the RS1 and RG1 ICs addresses monitored and un-monitored releases of gaseous radioactivity. Classification based on effluent monitor readings assumes that a release path to the environment is established. If the effluent flow past an effluent monitor is known to have stopped due to actions to isolate the release path, then the effluent monitor reading is no longer valid for classification purposes.

The "site-specific monitor list and threshold values" should include the effluent monitors described in emergency plan and emergency dose assessment procedures.

#### **HNP Bases**

There are four gaseous effluent release points to the environment at HNP (ODCM 3.0 and Figure 3.1):

1. Plant Vent Stack 1 – RM-21AV-3509-1SA
2. Turbine Building Vent Stack 3A – RM-1TV3536-1
3. Waste Processing Building Vent Stack 5 – RM-1WV-3546-1
4. Waste Processing Building Vent Stack 5A – RM-1WV-3547-1

ODCM Figure 3.1 illustrates the waste streams that can flow into the four gaseous effluent release points. Containment purge and vent during refueling and decay tank pathways are not considered because they are intermittent or mode restricted sources.

The HNP vent flow rates, in cfm, for the gaseous EAL thresholds is based on the Maximum Effluent Design Flow Rates (ODCM Table 3-1-3).

2.3. Source Term

2.3.1. RU1.1 Liquid Source Term

**Guidance Criteria**

NEI 99-01 does not provide specific guidance for AU1 liquid source term assumptions.

**HNP Bases**

The source term used for liquid effluent releases is Cs-134. Cs-134 has been selected based on it being the lowest effluent concentration value for any detectable radionuclide not known to be absent from the liquid effluent (ODCM 2.1.1).

2.3.2. RU1.1 Gaseous Source Term

**Guidance Criteria**

NEI 99-01 does not provide specific guidance for AU1 gaseous source term assumptions.

**HNP Bases**

The gaseous source term used for the Plant Vent release is based upon the NUREG-1940 Table 1-6 noble gas fraction of activity available at shutdown for fleet standardization.

The RU1.1 gaseous source term used for the Turbine Building vent, Waste Process Building vent 5 and Waste Process Building vent 5A are based upon the averaged annual release concentration given in ODCM Table 3.1-1.

The RU1.1 source term is based on an activity mix that is limited to gaseous isotopes whereby all activity is assumed to be monitored as it is discharged.

2.3.3. RA1.1, RS1.1 and RG1.1 Gaseous Source Terms

**Guidance Criteria**

NEI 99-01 specifies that the calculation of monitor readings will require use of an assumed release isotopic mix; the selected mix should be the same for ICs AA1, AS1 and AG1.

**HNP Bases**

DEC utilizes a common plant vent RCS source term basis for fleet standardization. The source term utilized in the URI dose model provides the relative fractions and is taken from NUREG-1940 (referenced from URI Requirements Specification Appendix A Section A.1) with the release path 'I' selected to model a LOCA type event with fuel clad damage.

<b>RCS</b>	<b>Containment HUT &lt; 2 hrs Sprays Off</b>	<b>Aux Bldg HUT &lt; 2 hrs</b>	<b>Norm Filter Working</b>	<b>Plant Vent</b>	<b>Env</b>
------------	--	------------------------------------	--------------------------------	-------------------	------------



The RA/S/G1.1 source term for the pathway from the Turbine Building is taken from NUREG-1940 (referenced from URI Requirements Specification Appendix A Section A.1) with the release path 'E' selected to model a SGTR type event with fuel clad damage.

<b>RCS</b>	<b>S/G</b> Boiling	<b>Turb Bldg</b> HUT < 2 hrs	<b>Filter</b> Working	<b>TB Vent</b>	<b>Env</b>
------------	-----------------------	---------------------------------	--------------------------	----------------	------------

The RA/S/G1.1 source term utilized in the URI dose model for the pathway from the Waste Gas Decay Tank via the Waste Process Building vents is taken from FSAR table 15.7.1-2 (referenced from URI Requirements Specification Appendix A Section A.1) with the release path 'T' selected to model a tank rupture event.

<b>WGT</b> (Path T)	<b>WPB</b> HUT < 2 hrs	<b>WPB Vent 5</b>	<b>Env</b>
<b>WGT</b> (Path U)	<b>WPB</b> HUT < 2 hrs	<b>WPB Vent 5A</b>	<b>Env</b>

No credit is taken for source term decay. The start of release time entered into URI is coincident with the time of reactor trip.

## 2.4. Release Duration

### Guidance Criteria

Per NEI 99-01, the effluent monitor readings for RA1.1, RS1.1 and RG1.1 gaseous EAL threshold values should correspond to a dose at the "site-specific dose receptor point" (consistent with the calculation methodology employed) for one hour of exposure.

### HNP Bases

The effluent monitor readings for RA1.1, RS1.1 and RG1.1 gaseous EAL threshold values are calculated for a release duration of one hour.

## 2.5. Meteorology

### Guidance Criteria

The effluent monitor readings should correspond to the applicable dose limit at the "site-specific dose receptor point." The "site-specific dose receptor point" is the distance(s) and/or locations used by the licensee to distinguish between on-site and offsite doses. The selected distance(s) and/or locations should reflect the content of the emergency plan, and the procedural methodology used to determine offsite doses and protective action recommendations. This is typically the boundary of the Owner Controlled Area.

Monitor readings will be calculated using a set of assumed meteorological data or atmospheric dispersion factors; the data or factors selected for use should be the same for ICs AA1, AS1 and AG1.

### HNP Bases

The site specific meteorology used for the calculation of monitor readings is based on selections and inputs for the URI dose assessment model as documented below.

**2.5.1. Wind Speed and Stability Class (Median WS and stability memo – see Attachment 1)**

The median meteorology values for the stations used to develop the EAL thresholds are as follows:

Median Wind Speed ..... 3.5 mph

Stability Class (A-G) ..... D

**2.5.2. Wind Direction (ODCM 3.1.1 and Table A-1 through A-4)**

The HNP “site-specific dose receptor point” utilized in the derivation of the EAL effluent release thresholds has been established as the closest on-land site boundary line, which is in the SW (wind direction from 045°) sector at 1.33 miles.

**2.5.3. Other Parameters**

No precipitation is assumed to occur for the duration of the release and plume transport across the EPZ.

### 3. DESIGN INPUTS

#### 3.1. General Constants and Conversion Factors

3.1.1. 472 cc/sec per cfm

3.1.2.  $10^6$   $\mu$ Ci per Ci

#### 3.2. Liquid Effluent

##### 3.2.1. Liquid Effluent Monitor Ranges (FSAR Table 11.5.2-2)

TL&HST (REM-1WL-3540).....	$10^1$ - $10^7$ cpm
WECT (REM-21WL-3541).....	$10^1$ - $10^7$ cpm
WMT (REM-21WL-3542).....	$10^1$ - $10^7$ cpm

##### 3.2.2. Liquid Effluent Dilution Flow ( $F$ )

Liquid Effluent Dilution Flow (ODCM Table 2.1-2) .....	$3.80\text{E}+03$ gpm
--	-----------------------

##### 3.2.3. Liquid Effluent Source Flow ( $f$ )

TL&HST pump (ODCM Table 2.1-1a).....	100 gpm
WECT pump (ODCM Table 2.1-1a).....	35 gpm
WMT pump (ODCM Table 2.1-1a).....	100 gpm

##### 3.2.4. Recirculation Factor ( $\sigma$ )

The recirculation factor accounts for the fraction of discharged water reused by the station. The HNP ODCM liquid effluent setpoint calculation does not account for a recirculation factor, thus a value of 1.0 is used.

##### 3.2.5. 10CFR20 Appendix B, Table 2, Column 2 Source Term Limit ( $EC_i$ )

Cs-134.....	$9.0\text{E}-07$ $\mu$ Ci/ml
-------------	------------------------------

##### 3.2.6. Cs-137 to Cs-134 Equivalency Factor ( $E_{q_i}$ )

Liquid radiation monitors are calibrated to Cs-137. The Cs-137 equivalence factor accounts for the different gamma energies and abundance of isotopes other than Cs-137. The equivalency factor is applied to the Cs-134 source term isotope as follows:

REM-3540/41 (ODCM Table 2.1-4) .....	2.5
--------------------------------------	-----

**3.2.7. Cs-137 Correlation Factor (CFi)**

The liquid effluent monitor Cs-137 correlation factor converts the release concentration in  $\mu\text{Ci/ml}$  to effluent monitor to cpm. The Cs-137 correlation factor is as follows:

REM-3540/41 (ODCM Table 2.1-4) .....  $1.04\text{E}+08 \text{ cpm}/\mu\text{Ci/ml}$

**3.3. Gaseous Effluent**

**3.3.1. Gaseous Effluent Monitor Ranges (UFSAR Table 11.5.2-2)**

- Plant Vent – RM-21AV-3509-1SA .....  $10^{-7}\text{-}10^5 \mu\text{Ci/cc}$   
This equates to a low scale of  $1.96\text{E}+01 \mu\text{Ci/sec}$  and a high scale of  $1.96\text{E}+13 \mu\text{Ci/sec}$  for a vent flow of  $4.15\text{E}+05 \text{ CFM}$ .
- Turbine Building Stack – RM-1TV-3536-1 .....  $10^{-7}\text{-}10^5 \mu\text{Ci/cc}$   
This equates to a low scale of  $1.35\text{E}+00 \mu\text{Ci/sec}$  and a high scale of  $1.35\text{E}+12 \mu\text{Ci/sec}$  for a vent flow of  $2.862\text{E}+04 \text{ CFM}$ .
- WPB Vent Stack 5 – RM-1WV-3546-1 .....  $10^{-7}\text{-}10^5 \mu\text{Ci/cc}$   
This equates to a low scale of  $1.1\text{E}+01 \mu\text{Ci/sec}$  and a high scale of  $1.1\text{E}+13 \mu\text{Ci/sec}$  for a vent flow of  $2.325\text{E}+05 \text{ CFM}$ .
- WPB Vent Stack 5A – RM-1WV-3547-1 .....  $10^{-7}\text{-}10^5 \mu\text{Ci/cc}$   
This equates to a low scale of  $4.86\text{E}+00 \mu\text{Ci/sec}$  and a high scale of  $4.86\text{E}+12 \mu\text{Ci/sec}$  for a vent flow of  $1.0305\text{E}+05 \text{ CFM}$ .

**3.3.2. RU1.1 Gaseous Effluent Source Flow (f)**

Plant Vent Stack (ODCM Table 3.1-3) .....  $4.15\text{E}+05 \text{ cfm}$   
 Turbine Building Stack (ODCM Table 3.1-3) .....  $2.862\text{E}+04 \text{ cfm}$   
 WPB Vent Stack 5 (ODCM Table 3.1-3) .....  $2.325\text{E}+05 \text{ cfm}$   
 WPB Vent Stack 5A (ODCM Table 3.1-3) .....  $1.0305\text{E}+05 \text{ cfm}$

**3.3.3. RU1.1 Dispersion Factor (X/Q)**

Dispersion Factor (ODCM 3.1.1) .....  $2.30\text{E}-05 \text{ sec}/\text{m}^3$

### 3.3.4. RU1.1 Source Term Fraction (S<sub>i</sub>)

NUREG-1940 Table 1-6 noble gas fraction of activity available at shutdown is the fleet standard source term used for events that originate from the RCS and are release from the plant vent.

	PV Fraction (unitless)
Kr-83m	1.83E-02
Kr-85	1.70E-03
Kr-85m	3.71E-02
Kr-87	7.40E-02
Kr-88	1.02E-01
Xe-131m	2.20E-03
Xe-133	3.26E-01
Xe-133m	1.03E-02
Xe-135	8.54E-02
Xe-135m	6.90E-02
Xe-138	2.74E-01
	1.00E+00

### 3.3.5. RU1.1 Source Term Concentrations

HNP source term concentrations for site specific release points other than the plant vent are taken from the averaged annual release concentrations in ODCM Table 3.1-1.

	Stack 3A ( $\mu\text{Ci/cc}$ )	Stack 5 ( $\mu\text{Ci/cc}$ )	Stack 5A ( $\mu\text{Ci/cc}$ )
Kr-83m	0.00E+00	0.00E+00	0.00E+00
Kr-85	0.00E+00	1.60E-07	0.00E+00
Kr-85m	4.70E-09	0.00E+00	1.96E-09
Kr-87	4.70E-09	0.00E+00	1.96E-09
Kr-88	7.04E-09	0.00E+00	3.91E-09
Xe-131m	0.00E+00	4.86E-09	1.30E-09
Xe-133	1.17E-08	0.00E+00	7.17E-09
Xe-133m	0.00E+00	0.00E+00	0.00E+00
Xe-135	1.64E-08	0.00E+00	9.78E-09
Xe-135m	2.35E-09	0.00E+00	1.96E-09
Xe-138	2.35E-09	0.00E+00	1.96E-09



3.3.6. ODCM Dose Factors (Regulatory Guide 1.109 Table B-1)

**Note** – RG1.109 values converted from mRem/yr per pCi/m<sup>3</sup> to mRem/yr per µCi/m<sup>3</sup>.

	Total Body Dose Factor Ki (mRem/yr per µCi/m <sup>3</sup> )	Skin Beta Dose Factor Li (mRem/yr per µCi/m <sup>3</sup> )	Gamma Air Dose Factor Mi (mRad/yr per µCi/m <sup>3</sup> )
<b>Kr-83m</b>	7.56E-02	0.00E+00	1.93E+01
<b>Kr-85</b>	1.61E+01	1.34E+03	1.72E+01
<b>Kr-85m</b>	1.17E+03	1.46E+03	1.23E+03
<b>Kr-87</b>	5.92E+03	9.73E+03	6.17E+03
<b>Kr-88</b>	1.47E+04	2.37E+03	1.52E+04
<b>Xe-131m</b>	9.15E+01	4.76E+02	1.56E+02
<b>Xe-133</b>	2.94E+02	3.06E+02	3.53E+02
<b>Xe-133m</b>	2.51E+02	9.94E+02	3.27E+02
<b>Xe-135</b>	1.81E+03	1.86E+03	1.92E+03
<b>Xe-135m</b>	3.12E+03	7.11E+02	3.36E+03
<b>Xe-138</b>	8.83E+03	4.13E+03	9.21E+03

**4. Calculations**

**4.1. RU1.1 Liquid Release**

**4.1.1. ODCM Liquid Release Limit**

$$C_i \leq \frac{(F + f) \times (10 \times EC_i)}{\sigma \times f} \qquad SP \leq \sum_i (C_i \times Eq_i \times CF_{Cs-137}) + bkg$$

**Where:**

<b><math>C_i</math></b>	concentration of radionuclide 'i' in the liquid effluent (μCi/ml) – this is considered the ODCM limit for EAL purposes
<b><math>F</math></b>	dilution flow (gpm)
<b><math>f</math></b>	undiluted flow from the source of the release (gpm)
<b>10</b>	TS multiplier – component of ODCM Limit (see definition)
<b><math>EC_i</math></b>	concentration of radionuclide 'i' from 10CFR20, Appendix B, Table 2, Column 2 (μCi/ml)
<b><math>\sigma</math></b>	most restrictive recirculation factor at equilibrium (unitless)
<b><math>SP</math></b>	radiation monitor setpoint equivalent to the ODCM limit (cpm)
<b><math>Eq_i</math></b>	Cs-137 equivalence factor for radionuclide 'i' (unitless)
<b><math>CF_{Cs-137}</math></b>	radiation monitor correlation factor for Cs-137 (cpm per μCi/ml)
<b><math>bkg</math></b>	background reading for the radiation monitor (cpm)

**4.1.2. RU1.1 Liquid Release EAL Threshold**

$$RU1.1 = 2 \left( \sum_i (C_i \times Eq_i \times CF_{Cs-137}) \right) + bkg$$

See Attachment 2 for the spreadsheet calculations that develop the RU1.1 liquid effluent EAL threshold values for each applicable monitor at each station.

**4.2. RU1.1 Gaseous Release**

**4.2.1. ODCM Gaseous Release Limit**

$$SP_{\text{total body}} (\mu\text{Ci/sec}) = \left( \frac{500}{\frac{X}{Q} \times \sum_i (S_i \times K_i)} \right) + bkg$$

$$SP_{\text{skin}} (\mu\text{Ci/sec}) = \left( \frac{3000}{\frac{X}{Q} \times \sum_i (S_i \times (L_i + 1.1M_i))} \right) + bkg$$

**Where:**

**500/3000** ODCM Limit – 500 total body or 3000 skin (mrem/yr)

**X/Q** annual average meteorological dispersion to the controlling site boundary location (sec/m<sup>3</sup>)

**S<sub>i</sub>** isotopic fraction of the mix activity released (unitless)

**K<sub>i</sub>** total body dose factor (mrem/yr per μCi/m<sup>3</sup>)

**L<sub>i</sub> + 1.1M<sub>i</sub>** skin dose factor (mrem/yr per μCi/m<sup>3</sup>)

**bkg** background reading for the radiation monitor (μCi/sec)

**4.2.2. RU1.1 Gaseous Release EAL Threshold**

RU1.1 is two times the lesser of the calculated total body or skin value plus background.

See Attachment 3 for the spreadsheet calculations that develop the RU1.1 gaseous effluent EAL threshold values for each applicable monitor at each station.

**4.3. RA1.1, RS1.1 and RG1.1 Gaseous Release**

The RA1.1, RS1.1 and RG1.1 gaseous release EAL threshold are developed using the URI site specific dose assessment models with the inputs described in Section 2 above.

Refer to Attachment 4 for the results of the URI gaseous effluent EAL threshold calculations.

## 5. Conclusion

	Release Point	Monitor	GE	SAE	Alert	UE
	Plant Vent	RM-21AV-3509-1SA	1.05E+8 ( $\mu$ Ci/sec)	1.05E+7 ( $\mu$ Ci/sec)	1.05E+6 ( $\mu$ Ci/sec)	8.93E+3 ( $\mu$ Ci/sec)
Gaseous	Turbine Building	RM-1TV-3536-1	4.60E+8 ( $\mu$ Ci/sec)	4.60E+7 ( $\mu$ Ci/sec)	4.60E+6 ( $\mu$ Ci/sec)	1.08E+4 ( $\mu$ Ci/sec)
	Waste Process Building Vent 5	RM-1WV-3546-1	7.74E+9 ( $\mu$ Ci/sec)	7.74E+8 ( $\mu$ Ci/sec)	7.75E+7 ( $\mu$ Ci/sec)	1.95E+5 ( $\mu$ Ci/sec)
	Waste Process Building Vent 5A	RM-1WV-3547-1	7.76E+9 ( $\mu$ Ci/sec)	7.76E+8 ( $\mu$ Ci/sec)	7.76E+7 ( $\mu$ Ci/sec)	1.14E+4 ( $\mu$ Ci/sec)
	TL&HST	REM-1WL-3540	N/A	N/A	N/A	1.83E+5 (cpm)
Liquid	WECT	REM-1WL-3541	N/A	N/A	N/A	5.13E+5 (cpm)
	WMT	REM-1WL-3542	N/A	N/A	N/A	1.83E+5 (cpm)

**6. References**

- 6.1. NEI 99-01 R6, Methodology for Development of Emergency Action Levels, November 2012
- 6.2. NUREG-1940, RASCAL 4: Description of Models and Methods, December 2012
- 6.3. Shearon Harris Nuclear Power Plant Offsite Dose Calculation Manual (ODCM), Revision 24
- 6.4. Unified RASCAL Interface Requirements Specification, Harris, Version 2
- 6.5. SHNPP UFSAR Table 11.5.2-2, Effluent Radiation Monitors, Amendment No. 59
- 6.6. Memo: Median Wind Speed and Stability Values at Duke Energy Nuclear Sites, 06/19/14



Date: June 19, 2014  
To: Caryl Ingram, NGO-EP

From: Stanton Lanham, Meteorology - Environmental Services  
Marsha Kinley, Meteorology - Environmental Services

Subject: Median Wind Speed and Stability Values at Duke Energy Nuclear Sites

#### 1.0 Overview

Data from the most recent full five years (2009-2013) was used to calculate the median wind speed (WS), vertical temperature gradient (Delta-T), and stability class at each of the Duke Energy nuclear sites in the Carolinas. Upper level winds were used at Brunswick. All other sites use the lower level. Singular median values for WS, Delta-T, and stability class from all wind direction sectors are given in Table 1. NEI 99-01 Rev. 6 does not provide any guidance on selection of default meteorological conditions.

- These median values are irrespective of season or time of day, so the difference between the median values and actual meteorological conditions could be large.
- Also note that the median Delta-T values are in normalized units of (deg C/100m), and would need to be converted to reflect actual sensor separation distance on a tower, if needed.

Table 2.1 through Table 2.6 contains sector-specific median values of Wind Speed, Delta-T and Stability Class for each of the 16 directional sectors. This information provides more site-specific characteristics, similar to what would have been evaluated for the previous Rev. 4 of NEI-99-01 guidance. In addition, the most frequent sector from which the wind is blowing at each site for the five year period is also indicated in these tables.

Table 1 Median Values from Years 2009-2013

	Median WS (mph)	Median Delta-T (C/100m) **	Stability Class
<b>DEC Sites</b>			
CNS	4.8	-0.7	D
MNS	6	-0.9	D
ONS	3.7	-0.78	D
<b>DEP Sites</b>			
BNP*	13.4	-0.71	D
HNP	3.5	-0.51	D
RNP	4.4	-0.84	D

\* Upper level winds are used at BNP. All other sites use lower level winds.

\*\*Note: Delta-T values listed are in degs C/100 m. The units may need to be converted if actual delta-T based on tower-specific separation distances are required.

## 2.0 Data

The data presented represents the median of the entire five-year span at each site (Table 1), as well as the overall medians broken down by directional sector (Tables 2.1 - 2.6). Each value represents the middle of the dataset, with 50% of values above the median, and 50% of values below the median.

Data for the Legacy Duke Energy sites was obtained from the Duke's Environmental Monitoring "Ambient Administration" archive, which contains validated hourly meteorological data. Data for the Legacy Progress sites was obtained from hourly meteorological data files provided by the vendor (Murray and Trettel), and has undergone their data review/QA process. The five-year analysis results presented here were determined independently of previous studies, however comparison to the Annual Effluent reports (2013 MET) for all sites showed good agreement with the values presented in Table 1. The sector-specific median values (Tables 2.1 through 2.6) had not been investigated previously.

### Legacy Duke Sites (DEC):

**Table 2.1 Catawba Nuclear: 5-year Lower Level Medians by Sector**

Sector	Median WS (mph)	Median Delta-T (C/100m)	Stability Class
N	7.4	-1.08	D
NNE	8.7	-1.3	D
NE	9	-1.2	D
ENE	6.1	-1.06	D
E	4.6	-0.94	D
ESE	4.4	-0.9	D
SE	4.8	-0.8	D
SSE	4.4	-0.76	D
S*	3.9	-0.36	E
SSW	4.1	-0.66	D
SW	3.8	-0.7	D
WSW	3.4	-0.4	E
W	3.6	0	E
WNW	4	0	E
NW	4.4	0	E
NNW	5.1	0	E

\* Most frequent CNS wind direction (2009-2013): from South

Table 2.2 McGuire Nuclear: 5-year Lower Level Medians by Sector

Sector	Median WS (mph)	Median Delta-T (C/100m)	Stability Class
N	6.9	-1.18	D
NNE	7	-1.16	D
NE	7.8	-1.06	D
ENE	6.6	-1.02	D
E	6.2	-0.88	D
ESE	5.5	-0.88	D
SE	5.1	-0.68	D
SSE	4.2	-0.42	E
S	4.6	-0.12	E
SSW	5	-0.14	E
SW*	6.3	-0.72	D
WSW	5.2	-0.74	D
W	4.9	-0.76	D
WNW	6.3	-0.52	D
NW	8.5	-1.06	D
NNW	9.1	-1.16	D

\* Most frequent MNS wind direction (2009-2013): from SW

Table 2.3 Oconee Nuclear: 5-year Lower Level Medians by Sector

Sector	Median WS (mph)	Median Delta-T (C/100m)	Stability Class
N	2.5	-0.44	E
NNE	2.8	-0.58	D
NE	3.9	-0.64	D
ENE	4.6	-0.88	D
E	3.7	-0.72	D
ESE	3.2	-0.4	E
SE	3.3	-0.42	E
SSE	3.3	-0.5	D
S	3.4	-0.68	D
SSW	4.6	-1.2	D
SW*	5	-1.32	D
WSW	4.8	-1.06	D
W	3.6	-0.8	D
WNW	2.8	-0.46	E
NW	2.7	-0.2	E
NNW	2.5	-0.42	E

\* Most frequent ONS wind direction (2009-2013): from SW

**Legacy Progress Sites (DEP):****Table 2.4 Brunswick Nuclear: 5-year Upper Level Medians by Sector**

Sector	Median WS (mph)	Median Delta-T (C/100m)	Stability Class
N	14	-0.71	D
NNE	14.7	-0.68	D
NE	14.2	-0.69	D
ENE	13.6	-0.81	D
E	11.2	-0.79	D
ESE	9.5	-0.635	D
SE	9	-0.67	D
SSE	9.5	-0.46	E
S	11.4	-0.34	E
SSW	13.6	-0.79	D
SW*	16.2	-0.95	D
WSW	14.2	-0.74	D
W	9.6	-0.24	E
WNW	14.3	-0.28	E
NW	14.4	-0.44	E
NNW	15	-0.7	D

\* Most frequent BNP wind direction (2009-2013): from SW

**Table 2.5 Harris Nuclear: 5-year Lower Level Medians by Sector**

Sector	Median WS (mph)	Median Delta-T (C/100m)	Stability Class
N	3.3	-0.35	E
NNE*	3.1	-0.26	E
NE	1.6	0.92	E
ENE	2.1	0.26	E
E	2.2	-0.07	E
ESE	2.6	-0.39	E
SE	2.9	-0.49	E
SSE	3.4	-0.59	D
S	4.2	-0.64	D
SSW	4.7	-0.58	D
SW	4.7	-0.64	D
WSW	4.6	-0.86	D
W	3.7	-0.68	D
WNW	4.2	-0.74	D
NW	4.1	-0.805	D
NNW	3.5	-0.55	D

\* Most frequent HNP wind direction (2009-2013): from NNE

Table 2.6 Robinson Nuclear: 5-year Lower Level Medians by Sector

Sector	Median WS (mph)	Median Delta-T (C/100m)	Stability Class
N*	5.8	-1.03	D
NNE	5.2	-1.09	D
NE	4	-1.11	D
ENE	3.8	-1.14	D
E	3.6	-1.2	D
ESE	3.3	-1.28	D
SE	3.5	-1.12	D
SSE	4.2	-0.69	D
S	4.7	-0.6	D
SSW	4.6	-0.68	D
SW	4.6	-0.83	D
WSW	4	-0.71	D
W	3.9	-0.59	D
WNW	3.9	-0.47	E
NW	4.1	0.28	E
NNW	4.7	0.31	E

\* Most frequent RNP wind direction (2009-2013): from North

### 3.0 Discussion and Conclusion

The median wind speed data presented in Table 1 compared to Tables 2.1 through 2.6 indicates typically varying conditions, depending on the directional sectors at each site. The overall median wind speed at a site (3-6 mph) is in the middle of the wider range of the sector-specific medians (1-9 mph). The singular median values sometime match well with the sector-specific median conditions of the most frequent directional sector, but can also be entirely different from the median of the most frequent wind direction sector. These differences span from potentially lower wind speeds which would be conservative for dose (i.e. Brunswick), to potentially higher wind speeds which would be non-conservative for dose (i.e. Catawba).

- Thus, the median values of wind speed should only be used for dose assessment as a last resort, when actual meteorological data is not available, or dose calculation is for some reason impaired.

The median Stability Class is generally neutral (class D), but varies between D and E (slightly more stable) in the sector-specific tables (Tables 2.1 through 2.6). These median values are typical of daytime conditions, with a thermally mixed boundary layer.

- Thus, the median stability class should only be used when there is no concern about actual time of day, seasonal variances, or extreme weather events.



Monitor	Dilution Flow (F)	Undiluted Flow (f)	Recirculation Factor ( $\sigma$ )	Cs-137 Equivalence Factor (Eq)	Correlation Factor (CFi)	Maximum Allowable Concentration - Ci ( $\mu\text{Ci/ml}$ )	Radiation Monitor Setpoint - SP (cpm)	RU1.1 EAL Threshold Value (cpm)
TL&HST REM-3540	3.80E+03	100	1	2.5	1.04E+08	3.51E-04	9.13E+04	
WECT REM-3541	3.80E+03	35	1	2.5	1.04E+08	9.86E-04	2.56E+05	
WMT REM-3541	3.80E+03	100	1	2.5	1.04E+08	3.51E-04	9.13E+04	

Cs-134 10CFR20 Limit - ECI ( $\mu\text{Ci/ml}$ ):	9.0E-07
TS Multiplier:	1.0E+01
Background (cpm):	0

	TBV ODCM Annual Average	WPBV 5 ODCM Annual Average	WPBV 5A ODCM Annual Average	PV Fraction - Si	TBV Fraction - Si	WPBV 5 Fraction - Si	WPBV 5A Fraction - Si
<b>Kr-83m</b>	0.00E+00	0.00E+00	0.00E+00	1.83E-02	0.00E+00	0.00E+00	0.00E+00
<b>Kr-85</b>	0.00E+00	1.60E-07	0.00E+00	1.70E-03	0.00E+00	9.71E-01	0.00E+00
<b>Kr-85m</b>	4.70E-09	0.00E+00	1.96E-09	3.71E-02	9.55E-02	0.00E+00	6.53E-02
<b>Kr-87</b>	4.70E-09	0.00E+00	1.96E-09	7.40E-02	9.55E-02	0.00E+00	6.53E-02
<b>Kr-88</b>	7.04E-09	0.00E+00	3.91E-09	1.02E-01	1.43E-01	0.00E+00	1.30E-01
<b>Xe-131m</b>	0.00E+00	4.86E-09	1.30E-09	2.20E-03	0.00E+00	2.95E-02	4.33E-02
<b>Xe-133</b>	1.17E-08	0.00E+00	7.17E-09	3.26E-01	2.38E-01	0.00E+00	2.39E-01
<b>Xe-133m</b>	0.00E+00	0.00E+00	0.00E+00	1.03E-02	0.00E+00	0.00E+00	0.00E+00
<b>Xe-135</b>	1.64E-08	0.00E+00	9.78E-09	8.54E-02	3.33E-01	0.00E+00	3.26E-01
<b>Xe-135m</b>	2.35E-09	0.00E+00	1.96E-09	6.90E-02	4.77E-02	0.00E+00	6.53E-02
<b>Xe-138</b>	2.35E-09	0.00E+00	1.96E-09	2.74E-01	4.77E-02	0.00E+00	6.53E-02
	4.92E-08	1.65E-07	3.00E-08	1.00E+00	1.00E+00	1.00E+00	1.00E+00

	Total Body Dose Factor - Ki (mRem/yr per $\mu\text{Ci}/\text{m}^3$ )	Skin Beta Dose Factor - Li (mRem/yr per $\mu\text{Ci}/\text{m}^3$ )	Gamma Air Dose Factor - Mi (mRad/yr per $\mu\text{Ci}/\text{m}^3$ )	Plant Vent		TB Vent		WPB Vent 5		WPB Vent 5A	
				Si x Ki (mRem/yr per $\mu\text{Ci}/\text{m}^3$ )	Si x (Li + 1.1Mi) (mRem/yr per $\mu\text{Ci}/\text{m}^3$ )	Si x Ki (mRem/yr per $\mu\text{Ci}/\text{m}^3$ )	Si x (Li + 1.1Mi) (mRem/yr per $\mu\text{Ci}/\text{m}^3$ )	Si x Ki (mRem/yr per $\mu\text{Ci}/\text{m}^3$ )	Si x (Li + 1.1Mi) (mRem/yr per $\mu\text{Ci}/\text{m}^3$ )	Si x Ki (mRem/yr per $\mu\text{Ci}/\text{m}^3$ )	Si x (Li + 1.1Mi) (mRem/yr per $\mu\text{Ci}/\text{m}^3$ )
<b>Kr-83m</b>	7.56E-02	0.00E+00	1.93E+01	1.38E-03	3.89E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<b>Kr-85</b>	1.61E+01	1.34E+03	1.72E+01	2.74E-02	2.31E+00	0.00E+00	0.00E+00	1.56E+01	1.32E+03	0.00E+00	0.00E+00
<b>Kr-85m</b>	1.17E+03	1.46E+03	1.23E+03	4.34E+01	1.04E+02	1.12E+02	2.69E+02	0.00E+00	0.00E+00	7.64E+01	1.84E+02
<b>Kr-87</b>	5.92E+03	9.73E+03	6.17E+03	4.38E+02	1.22E+03	5.65E+02	1.58E+03	0.00E+00	0.00E+00	3.87E+02	1.08E+03
<b>Kr-88</b>	1.47E+04	2.37E+03	1.52E+04	1.50E+03	1.95E+03	2.10E+03	2.73E+03	0.00E+00	0.00E+00	1.92E+03	2.49E+03
<b>Xe-131m</b>	9.15E+01	4.76E+02	1.56E+02	2.01E-01	1.42E+00	0.00E+00	0.00E+00	2.70E+00	1.91E+01	3.97E+00	2.81E+01
<b>Xe-133</b>	2.94E+02	3.06E+02	3.53E+02	9.59E+01	2.26E+02	6.99E+01	1.65E+02	0.00E+00	0.00E+00	7.03E+01	1.66E+02
<b>Xe-133m</b>	2.51E+02	9.94E+02	3.27E+02	2.59E+00	1.39E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<b>Xe-135</b>	1.81E+03	1.86E+03	1.92E+03	1.55E+02	3.39E+02	6.03E+02	1.32E+03	0.00E+00	0.00E+00	5.90E+02	1.29E+03
<b>Xe-135m</b>	3.12E+03	7.11E+02	3.36E+03	2.15E+02	3.04E+02	1.49E+02	2.10E+02	0.00E+00	0.00E+00	2.04E+02	2.88E+02
<b>Xe-138</b>	8.83E+03	4.13E+03	9.21E+03	2.42E+03	3.90E+03	4.21E+02	6.81E+02	0.00E+00	0.00E+00	5.77E+02	9.32E+02
				4.87E+03	8.07E+03	4.02E+03	6.95E+03	1.83E+01	1.34E+03	3.82E+03	6.46E+03

	PV	TBV	WPB 5	WPB 5A
ODCM Limit for Total Body ( $\mu\text{Ci}/\text{sec}$ ):	4.46E+03	5.41E+03	1.19E+06	5.68E+03
ODCM Limit for Skin ( $\mu\text{Ci}/\text{sec}$ ):	1.62E+04	1.88E+04	9.75E+04	2.02E+04
2x ODCM Limit ( $\mu\text{Ci}/\text{sec}$ ):	8.93E+03	1.08E+04	1.95E+05	1.14E+04

Total Body Dose Rate Limit (mRem/yr):	500
Skin Dose Rate Limit (mRem/yr):	3000
Background ( $\mu\text{Ci}/\text{sec}$ ):	0
X/Q (sec/m <sup>3</sup> ):	2.30E-05



## Dose Assessment

Shearon Harris

Monday, January 12, 2015 13:57

Method: Detailed Assessment - Monitored Release

Release Pathway: (I) &lt;RCS&gt; &lt;Containment&gt; &lt;Aux Bldg&gt; &lt;NormFilter&gt; &lt;Plant Vent&gt; &lt;Env&gt;

PRF: 1.60E-02

Containment HUT: = &lt; 2 Hours

Cont Sprays: = OFF

Purge Filter: = N/A

Aux/Fuel Bldg HUT: = &lt; 2 Hours

Aux/Fuel Filter: = Working

Steam Gen: = N/A

Turb Bldg HUT: = N/A

Turb Bldg Filter: = N/A

Source Term: Reactor Core Accident - Clad

Lower

Time After S/D (hh:mm): 0:00

Wind: From 45° @ 3.5 mph

Release Duration (hh:mm): 1:00

ETE (hh:mm): [N/A]

Stability Class: D

Precipitation: None

Monitor: Plant Vent rate

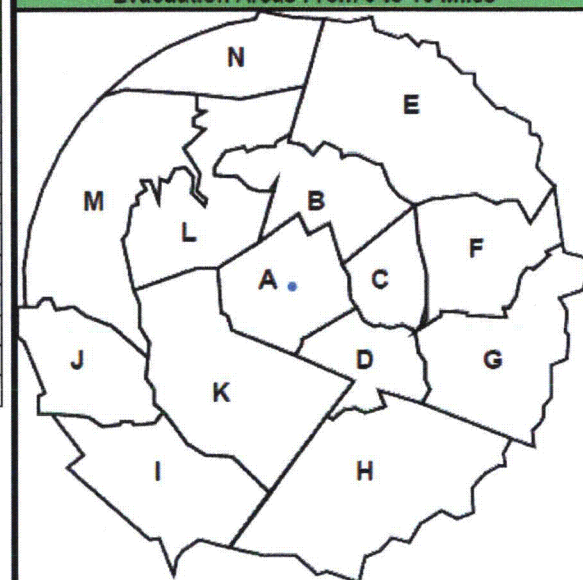
Readings: 1.05E+06 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	3.23E+00	2.16E+00	2.03E+00	7.68E-01	4.95E+00	5.03E+01
0.5	2.93E+00	1.95E+00	1.75E+00	6.82E-01	4.39E+00	4.32E+01
0.7	2.01E+00	1.32E+00	1.10E+00	4.57E-01	2.88E+00	2.68E+01
1.0	1.23E+00	7.96E-01	6.44E-01	2.81E-01	1.72E+00	1.53E+01
1.5	6.48E-01	4.16E-01	3.64E-01	1.58E-01	9.38E-01	8.56E+00
2.0	5.16E-01	3.39E-01	2.63E-01	1.06E-01	7.08E-01	6.24E+00
3.0	5.16E-01	3.48E-01	2.11E-01	0.00E+00	5.59E-01	4.98E+00
4.0	3.63E-01	2.46E-01	1.73E-01	0.00E+00	4.20E-01	4.11E+00
5.0	3.07E-01	2.09E-01	1.58E-01	0.00E+00	3.67E-01	3.76E+00
7.0	1.76E-01	1.20E-01	1.11E-01	0.00E+00	2.31E-01	2.67E+00
10.0	9.80E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.85E+00

Assessment Data Results Saved to File:

Shearon Harris 10Miles Monitored Release 01122015 135718.URI7

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

## Release Rates (Ci / sec)

Particulate	1.04E-03 (0.1%)
Iodine	2.56E-02 (2.4%)
Noble Gas	1.05E+00 (97.5%)

\*\*\* Classification: Validate against Emergency Action Levels \*\*\*

Reviewed By: \_\_\_\_\_



## Dose Assessment

Shearon Harris

Monday, January 12, 2015 13:57

Method: Detailed Assessment - Monitored Release

Release Pathway: (I) &lt;RCS&gt; &lt;Containment&gt; &lt;Aux Bldg&gt; &lt;NormFilter&gt; &lt;Plant Vent&gt; &lt;Env&gt;

PRF: 1.60E-02

Containment HUT: = &lt; 2 Hours

Cont Sprays: = OFF

Purge Filter: = N/A

Aux/Fuel Bldg HUT: = &lt; 2 Hours

Aux/Fuel Filter: = Working

Steam Gen: = N/A

Turb Bldg HUT: = N/A

Turb Bldg Filter: = N/A

Source Term: Reactor Core Accident - Clad

Lower

Time After S/D (hh:mm): 0:00

Wind: From 45° @ 3.5 mph

Release Duration (hh:mm): 1:00

ETE (hh:mm): [N/A]

Stability Class: D

Precipitation: None

Monitor: Plant Vent rate

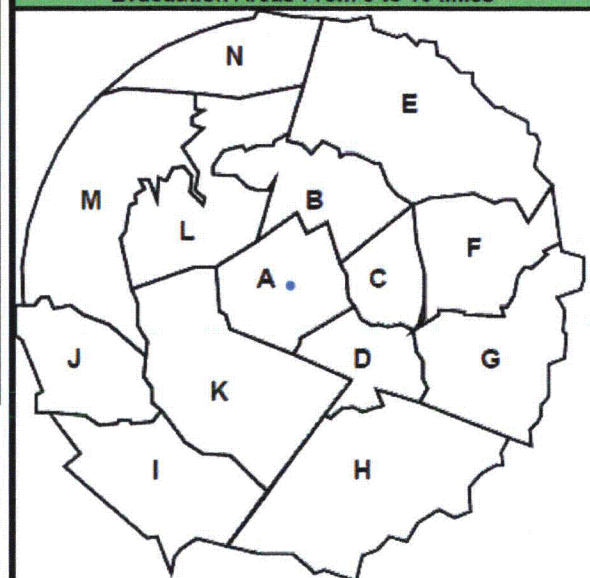
Readings: 1.05E+07 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	3.23E+01	2.16E+01	2.03E+01	7.68E+00	4.95E+01	5.03E+02
0.5	2.93E+01	1.95E+01	1.75E+01	6.82E+00	4.39E+01	4.32E+02
0.7	2.01E+01	1.32E+01	1.10E+01	4.57E+00	2.88E+01	2.68E+02
1.0	1.23E+01	7.96E+00	6.44E+00	2.81E+00	1.72E+01	1.53E+02
1.5	6.48E+00	4.16E+00	3.64E+00	1.58E+00	9.38E+00	8.56E+01
2.0	5.16E+00	3.39E+00	2.63E+00	1.06E+00	7.08E+00	6.24E+01
3.0	5.16E+00	3.48E+00	2.11E+00	8.46E-01	6.44E+00	4.98E+01
4.0	3.63E+00	2.46E+00	1.73E+00	6.50E-01	4.85E+00	4.11E+01
5.0	3.07E+00	2.09E+00	1.58E+00	5.71E-01	4.24E+00	3.76E+01
7.0	1.76E+00	1.20E+00	1.11E+00	3.59E-01	2.67E+00	2.67E+01
10.0	9.80E-01	6.68E-01	7.59E-01	2.24E-01	1.65E+00	1.85E+01

Assessment Data Results Saved to File:

Shearon Harris 10Miles Monitored Release 01122015 135755.URI7

Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

## Release Rates (Ci / sec)

Particulate	1.04E-02 (0.1%)
Iodine	2.56E-01 (2.4%)
Noble Gas	1.05E+01 (97.5%)

\*\*\* Classification: Site Area Emergency \*\*\*

Reviewed By: \_\_\_\_\_



## Dose Assessment

Shearon Harris

Monday, January 12, 2015 13:58

Method: Detailed Assessment - Monitored Release

Release Pathway: (I) &lt;RCS&gt; &lt;Containment&gt; &lt;Aux Bldg&gt; &lt;NormFilter&gt; &lt;Plant Vent&gt; &lt;Env&gt;

PRF: 1.60E-02

Containment HUT: = &lt; 2 Hours

Cont Sprays: = OFF

Purge Filter: = N/A

Aux/Fuel Bldg HUT: = &lt; 2 Hours

Aux/Fuel Filter: = Working

Steam Gen: = N/A

Turb Bldg HUT: = N/A

Turb Bldg Filter: = N/A

Source Term: Reactor Core Accident - Clad

Lower

Time After S/D (hh:mm): 0:00

Wind: From 45° @ 3.5 mph

Release Duration (hh:mm): 1:00

ETE (hh:mm): [N/A]

Stability Class: D

Precipitation: None

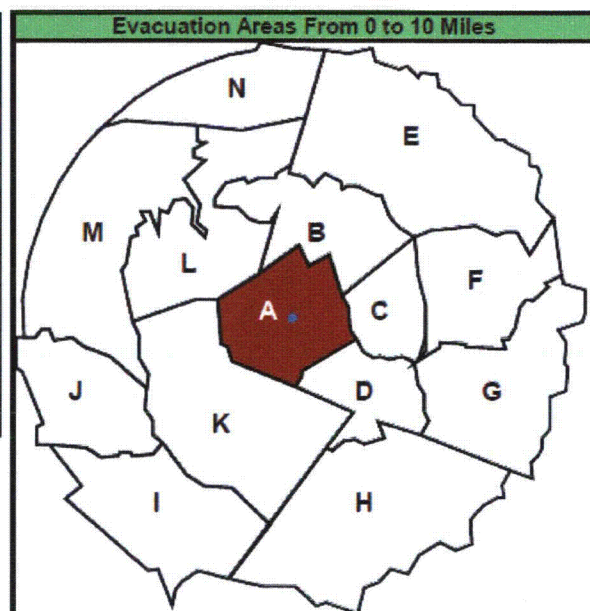
Monitor: Plant Vent rate

Readings: 1.05E+08 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	3.23E+02	2.16E+02	2.03E+02	7.68E+01	4.95E+02	5.03E+03
0.5	2.93E+02	1.95E+02	1.75E+02	6.82E+01	4.39E+02	4.32E+03
0.7	2.01E+02	1.32E+02	1.10E+02	4.57E+01	2.88E+02	2.68E+03
1.0	1.23E+02	7.96E+01	6.44E+01	2.81E+01	1.72E+02	1.53E+03
1.5	6.48E+01	4.16E+01	3.64E+01	1.58E+01	9.38E+01	8.56E+02
2.0	5.16E+01	3.39E+01	2.63E+01	1.06E+01	7.08E+01	6.24E+02
3.0	5.16E+01	3.48E+01	2.11E+01	8.46E+00	6.44E+01	4.98E+02
4.0	3.63E+01	2.46E+01	1.73E+01	6.50E+00	4.85E+01	4.11E+02
5.0	3.07E+01	2.09E+01	1.58E+01	5.71E+00	4.24E+01	3.76E+02
7.0	1.76E+01	1.20E+01	1.11E+01	3.59E+00	2.67E+01	2.67E+02
10.0	9.80E+00	6.68E+00	7.59E+00	2.24E+00	1.65E+01	1.85E+02

Assessment Data Results Saved to File:

Shearon Harris 10Miles Monitored Release 01122015 135842.URI7



PAGs Exceeded in Designated Areas

\*\*\* Classification: General Emergency \*\*\*

Release Rates (Ci / sec)

Particulate	1.04E-01 (0.1%)
Iodine	2.56E+00 (2.4%)
Noble Gas	1.05E+02 (97.5%)

Reviewed By: \_\_\_\_\_



## Dose Assessment

Shearon Harris

Wednesday, January 14, 2015 09:24

Method: Detailed Assessment - Monitored Release

Release Pathway: (E) &lt;RCS&gt; &lt;Steam Gen&gt; &lt;Turb Bldg&gt; &lt;Filter&gt; &lt;TB Vent&gt; &lt;Env&gt;

PRF: 8.00E-04

Containment HUT: = N/A

Cont Sprays: = N/A

Purge Filter: = N/A

Aux/Fuel Bldg HUT: = N/A

Aux/Fuel Filter: = N/A

Steam Gen: = Boiling

Turb Bldg HUT: = &lt; 2 Hours

Turb Bldg Filter: = Working

Source Term: Reactor Core Accident - Clad

Time After S/D (hh:mm): 0:00

Lower

Release Duration (hh:mm): 1:00

ETE (hh:mm): [N/A]

Wind: From 45° @ 3.5 mph

Stability Class: D

Precipitation: None

Monitor: Turb Vent rate

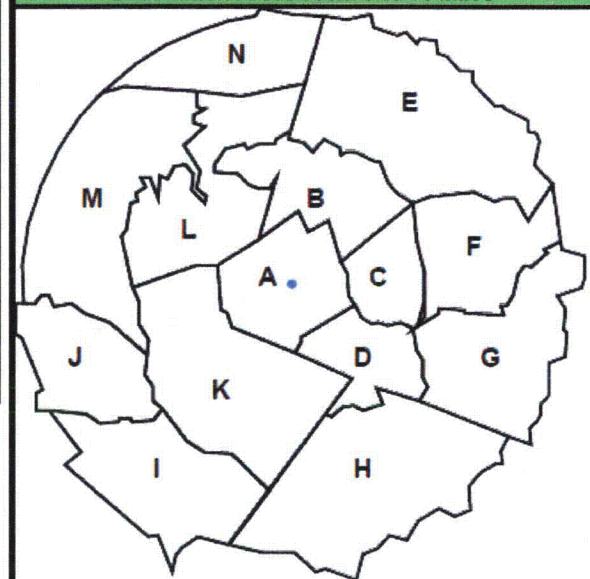
Readings: 4.60E+06 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.32E+01	8.99E+00	5.86E-01	4.66E-01	1.00E+01	1.08E+01
0.5	1.20E+01	8.12E+00	5.52E-01	4.99E-01	9.17E+00	9.28E+00
0.7	8.00E+00	5.24E+00	4.76E-01	5.62E-01	6.28E+00	5.68E+00
1.0	4.76E+00	3.10E+00	3.08E-01	3.72E-01	3.78E+00	3.23E+00
1.5	3.12E+00	2.05E+00	1.84E-01	2.05E-01	2.44E+00	1.85E+00
2.0	2.15E+00	1.43E+00	1.28E-01	1.21E-01	1.68E+00	1.40E+00
3.0	2.02E+00	1.37E+00	1.05E-01	1.10E-01	1.59E+00	1.06E+00
4.0	1.53E+00	1.04E+00	0.00E+00	0.00E+00	1.04E+00	9.47E-01
5.0	1.22E+00	8.36E-01	0.00E+00	0.00E+00	8.36E-01	8.30E-01
7.0	7.04E-01	4.66E-01	0.00E+00	0.00E+00	4.66E-01	5.78E-01
10.0	3.55E-01	2.55E-01	0.00E+00	0.00E+00	2.55E-01	3.98E-01

Assessment Data Results Saved to File:

Shearon Harris 10Miles Monitored Release 01142015 092450.URI7

## Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

\*\*\* Classification: Validate against Emergency Action Levels \*\*\*

## Release Rates (Ci / sec)

Particulate	2.28E-04 (0.0%)
Iodine	5.60E-03 (0.1%)
Noble Gas	4.60E+00 (99.9%)

Reviewed By: \_\_\_\_\_



## Dose Assessment

Shearon Harris

Wednesday, January 14, 2015 09:25

Method: Detailed Assessment - Monitored Release

Release Pathway: (E) &lt;RCS&gt; &lt;Steam Gen&gt; &lt;Turb Bldg&gt; &lt;Filter&gt; &lt;TB Vent&gt; &lt;Env&gt;

PRF: 8.00E-04

Containment HUT: = N/A

Cont Sprays: = N/A

Purge Filter: = N/A

Aux/Fuel Bldg HUT: = N/A

Aux/Fuel Filter: = N/A

Steam Gen: = Boiling

Turb Bldg HUT: = &lt; 2 Hours

Turb Bldg Filter: = Working

Source Term: Reactor Core Accident - Clad

Time After S/D (hh:mm): 0:00

Lower

Wind: From 45° @ 3.5 mph

Release Duration (hh:mm): 1:00

ETE (hh:mm): [N/A]

Stability Class: D

Precipitation: None

Monitor: Turb Vent rate

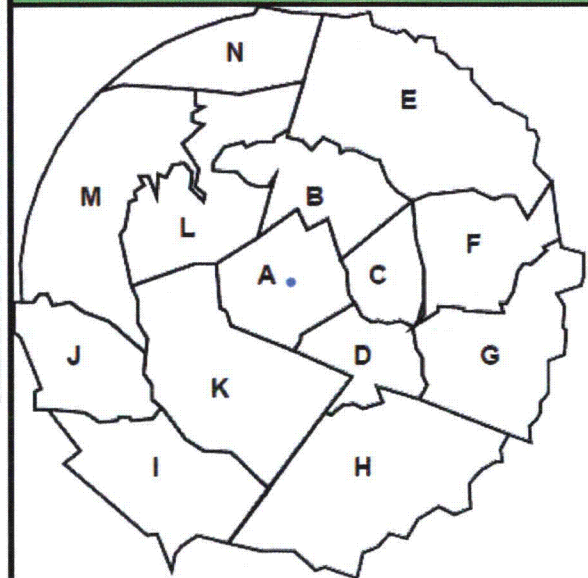
Readings: 4.60E+07 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.32E+02	8.99E+01	5.86E+00	4.66E+00	1.00E+02	1.08E+02
0.5	1.20E+02	8.12E+01	5.52E+00	4.99E+00	9.17E+01	9.28E+01
0.7	8.00E+01	5.24E+01	4.76E+00	5.62E+00	6.28E+01	5.68E+01
1.0	4.76E+01	3.10E+01	3.08E+00	3.72E+00	3.78E+01	3.23E+01
1.5	3.12E+01	2.05E+01	1.84E+00	2.05E+00	2.44E+01	1.85E+01
2.0	2.15E+01	1.43E+01	1.28E+00	1.21E+00	1.68E+01	1.40E+01
3.0	2.02E+01	1.37E+01	1.05E+00	1.10E+00	1.59E+01	1.06E+01
4.0	1.53E+01	1.04E+01	8.96E-01	8.13E-01	1.21E+01	9.47E+00
5.0	1.22E+01	8.36E+00	7.54E-01	6.26E-01	9.74E+00	8.30E+00
7.0	7.04E+00	4.66E+00	4.61E-01	2.94E-01	5.41E+00	5.78E+00
10.0	3.55E+00	2.55E+00	2.78E-01	1.32E-01	2.96E+00	3.98E+00

Assessment Data Results Saved to File:

Shearon Harris 10Miles Monitored Release 01142015 092557.URI7

## Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

## Release Rates (Ci / sec)

Particulate	2.28E-03 (0.0%)
Iodine	5.60E-02 (0.1%)
Noble Gas	4.60E+01 (99.9%)

\*\*\* Classification: Site Area Emergency \*\*\*

Reviewed By: \_\_\_\_\_



## Dose Assessment

Shearon Harris

Wednesday, January 14, 2015 09:26

Method: Detailed Assessment - Monitored Release

Release Pathway: (E) &lt;RCS&gt; &lt;Steam Gen&gt; &lt;Turb Bldg&gt; &lt;Filter&gt; &lt;TB Vent&gt; &lt;Env&gt;

Containment HUT: = N/A

Cont Sprays: = N/A

Purge Filter: = N/A

PRF: 8.00E-04

Aux/Fuel Filter: = N/A

Steam Gen: = Boiling

Turb Bldg HUT: = &lt; 2 Hours

Aux/Fuel Bldg HUT: = N/A

Turb Bldg Filter: = Working

Source Term: Reactor Core Accident - Clad

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00

ETE (hh:mm): [N/A]

Lower

Wind: From 45° @ 3.5 mph

Stability Class: D

Precipitation: None

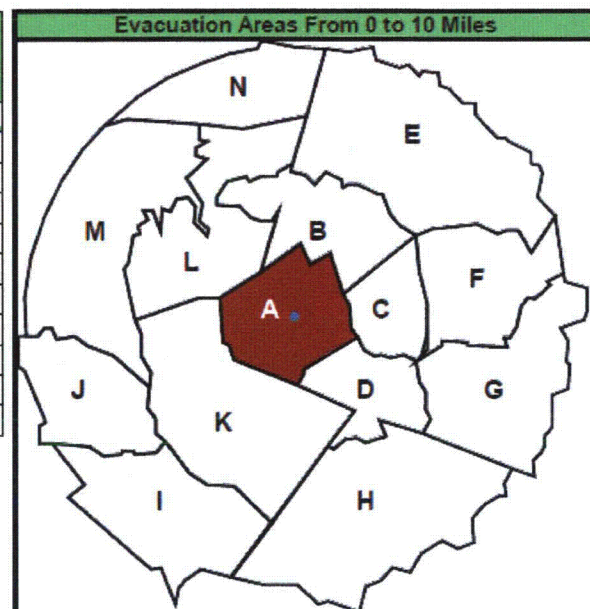
Monitor: Turb Vent rate

Readings: 4.60E+08 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.32E+03	8.99E+02	5.86E+01	4.66E+01	1.00E+03	1.08E+03
0.5	1.20E+03	8.12E+02	5.52E+01	4.99E+01	9.17E+02	9.28E+02
0.7	8.00E+02	5.24E+02	4.76E+01	5.62E+01	6.28E+02	5.68E+02
1.0	4.76E+02	3.10E+02	3.08E+01	3.72E+01	3.78E+02	3.23E+02
1.5	3.12E+02	2.05E+02	1.84E+01	2.05E+01	2.44E+02	1.85E+02
2.0	2.15E+02	1.43E+02	1.28E+01	1.21E+01	1.68E+02	1.40E+02
3.0	2.02E+02	1.37E+02	1.05E+01	1.10E+01	1.59E+02	1.06E+02
4.0	1.53E+02	1.04E+02	8.96E+00	8.13E+00	1.21E+02	9.47E+01
5.0	1.22E+02	8.36E+01	7.54E+00	6.26E+00	9.74E+01	8.30E+01
7.0	7.04E+01	4.66E+01	4.61E+00	2.94E+00	5.41E+01	5.78E+01
10.0	3.55E+01	2.55E+01	2.78E+00	1.32E+00	2.96E+01	3.98E+01

Assessment Data Results Saved to File:

Shearon Harris 10Miles Monitored Release 01142015 092629.URI7



## PAGs Exceeded in Designated Areas

## Release Rates (Ci / sec)

Particulate	2.28E-02 (0.0%)
Iodine	5.60E-01 (0.1%)
Noble Gas	4.60E+02 (99.9%)

\*\*\* Classification: General Emergency \*\*\*

Reviewed By: \_\_\_\_\_



## Dose Assessment

Shearon Harris

Thursday, February 19, 2015 07:54

Method: Detailed Assessment - Monitored Release

Release Pathway: (T) &lt;Waste Gas&gt; &lt;WPB&gt; &lt;WPB Vent 5&gt; &lt;Env&gt;

Containment HUT: = N/A

Cont Sprays: = N/A

Purge Filter: = N/A

PRF: 4.00E-01

Aux/Fuel Filter: = N/A

Steam Gen: = N/A

Turb Bldg HUT: = N/A

Aux/Fuel Bldg HUT: = &lt; 2 Hours

Turb Bldg Filter: = N/A

Source Term: Waste Gas Tank

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00

ETE (hh:mm): [N/A]

Lower

Wind: From 45° @ 3.5 mph

Stability Class: D

Precipitation: None

Monitor: WPB 5 rate

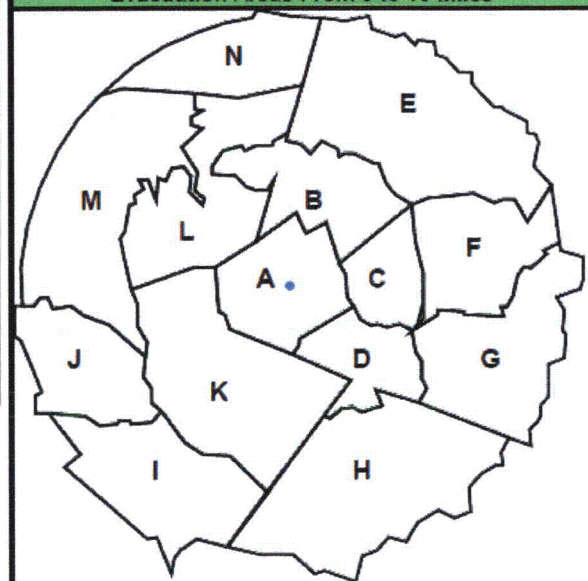
Readings: 7.75E+07 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.43E+01	1.00E+01	0.00E+00	0.00E+00	1.00E+01	0.00E+00
0.5	1.28E+01	9.00E+00	0.00E+00	0.00E+00	9.00E+00	0.00E+00
0.7	8.48E+00	5.92E+00	0.00E+00	0.00E+00	5.92E+00	0.00E+00
1.0	5.16E+00	3.61E+00	0.00E+00	0.00E+00	3.61E+00	0.00E+00
1.5	3.72E+00	2.60E+00	0.00E+00	0.00E+00	2.60E+00	0.00E+00
2.0	3.07E+00	2.14E+00	0.00E+00	0.00E+00	2.14E+00	0.00E+00
3.0	2.46E+00	1.70E+00	0.00E+00	0.00E+00	1.70E+00	0.00E+00
4.0	2.14E+00	1.49E+00	0.00E+00	0.00E+00	1.49E+00	0.00E+00
5.0	1.92E+00	1.32E+00	0.00E+00	0.00E+00	1.32E+00	0.00E+00
7.0	1.32E+00	9.30E-01	0.00E+00	0.00E+00	9.30E-01	0.00E+00
10.0	9.04E-01	6.48E-01	0.00E+00	0.00E+00	6.48E-01	0.00E+00

Assessment Data Results Saved to File:

Shearon Harris 10Miles Monitored Release 02192015 075412.URI7

## Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

\*\*\* Classification: Validate against Emergency Action Levels \*\*\*

## Release Rates (Ci / sec)

Particulate	0.00E+00 (0.0%)
Iodine	0.00E+00 (0.0%)
Noble Gas	7.75E+01 (100.0%)

Reviewed By: \_\_\_\_\_



## Dose Assessment

Shearon Harris

Thursday, February 19, 2015 07:55

Method: Detailed Assessment - Monitored Release

Release Pathway: (T) &lt;Waste Gas&gt; &lt;WPB&gt; &lt;WPB Vent 5&gt; &lt;Env&gt;

PRF: 4.00E-01

Containment HUT: = N/A

Cont Sprays: = N/A

Purge Filter: = N/A

Aux/Fuel Bldg HUT: = &lt; 2 Hours

Aux/Fuel Filter: = N/A

Steam Gen: = N/A

Turb Bldg HUT: = N/A

Turb Bldg Filter: = N/A

Source Term: Waste Gas Tank

Time After S/D (hh:mm): 0:00

Lower

Release Duration (hh:mm): 1:00

ETE (hh:mm): [N/A]

Wind: From 45° @ 3.5 mph

Stability Class: D

Precipitation: None

Monitor: WPB 5 rate

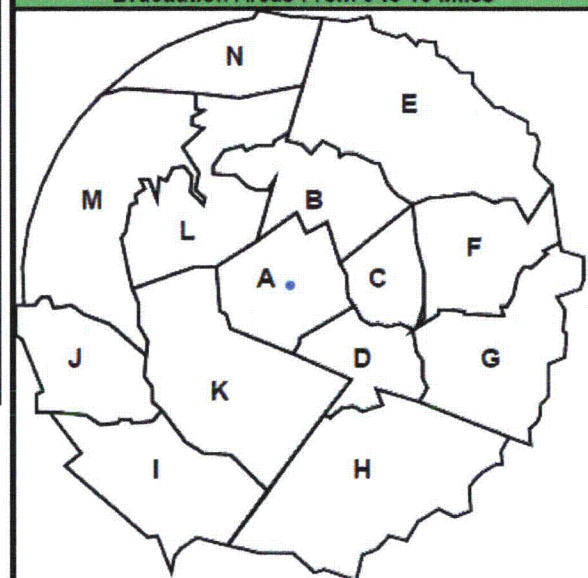
Readings: 7.74E+08 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.43E+02	9.99E+01	2.44E-01	1.44E-01	1.00E+02	0.00E+00
0.5	1.28E+02	8.96E+01	2.87E-01	1.69E-01	9.01E+01	0.00E+00
0.7	8.44E+01	5.92E+01	3.19E-01	1.86E-01	5.97E+01	0.00E+00
1.0	5.16E+01	3.60E+01	2.97E-01	1.72E-01	3.65E+01	0.00E+00
1.5	3.72E+01	2.59E+01	2.32E-01	1.32E-01	2.63E+01	0.00E+00
2.0	3.07E+01	2.14E+01	1.84E-01	1.03E-01	2.16E+01	0.00E+00
3.0	2.46E+01	1.70E+01	1.28E-01	0.00E+00	1.71E+01	0.00E+00
4.0	2.14E+01	1.49E+01	1.22E-01	0.00E+00	1.50E+01	0.00E+00
5.0	1.92E+01	1.32E+01	1.09E-01	0.00E+00	1.33E+01	0.00E+00
7.0	1.32E+01	9.28E+00	0.00E+00	0.00E+00	9.28E+00	0.00E+00
10.0	9.04E+00	6.47E+00	0.00E+00	0.00E+00	6.47E+00	0.00E+00

Assessment Data Results Saved to File:

Shearon Harris 10Miles Monitored Release 02192015 075553.URI7

## Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

## Release Rates (Ci / sec)

Particulate	0.00E+00 (0.0%)
Iodine	0.00E+00 (0.0%)
Noble Gas	7.74E+02 (100.0%)

\*\*\* Classification: Site Area Emergency \*\*\*

Reviewed By: \_\_\_\_\_



## Dose Assessment

Shearon Harris

Thursday, February 19, 2015 07:56

Method: Detailed Assessment - Monitored Release

Release Pathway: (T) &lt;Waste Gas&gt; &lt;WPB&gt; &lt;WPB Vent 5&gt; &lt;Env&gt;

Containment HUT: = N/A

Cont Sprays: = N/A

Purge Filter: = N/A

PRF: 4.00E-01

Aux/Fuel Filter: = N/A

Steam Gen: = N/A

Turb Bldg HUT: = N/A

Aux/Fuel Bldg HUT: = &lt; 2 Hours

Turb Bldg Filter: = N/A

Source Term: Waste Gas Tank

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00

ETE (hh:mm): [N/A]

Lower

Wind: From 45° @ 3.5 mph

Stability Class: D

Precipitation: None

Monitor: WPB 5 rate

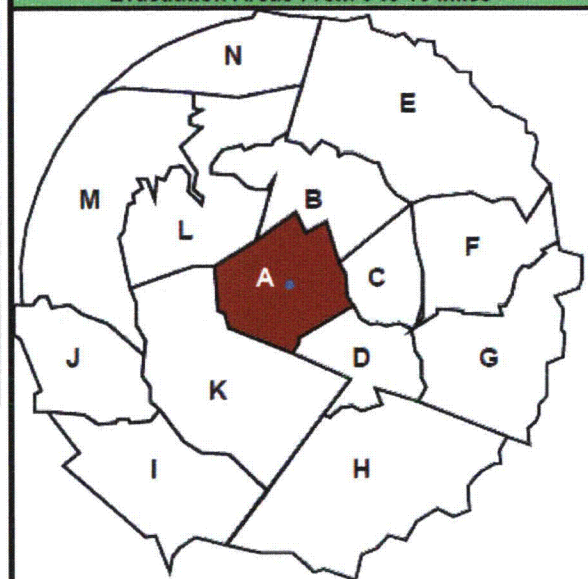
Readings: 7.74E+09 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.43E+03	9.99E+02	2.44E+00	1.44E+00	1.00E+03	1.51E-01
0.5	1.28E+03	8.96E+02	2.87E+00	1.69E+00	9.01E+02	1.78E-01
0.7	8.44E+02	5.92E+02	3.19E+00	1.86E+00	5.97E+02	1.97E-01
1.0	5.16E+02	3.60E+02	2.97E+00	1.72E+00	3.65E+02	1.83E-01
1.5	3.72E+02	2.59E+02	2.32E+00	1.32E+00	2.63E+02	1.42E-01
2.0	3.07E+02	2.14E+02	1.84E+00	1.03E+00	2.16E+02	1.12E-01
3.0	2.46E+02	1.70E+02	1.28E+00	6.74E-01	1.72E+02	0.00E+00
4.0	2.14E+02	1.49E+02	1.22E+00	6.28E-01	1.51E+02	0.00E+00
5.0	1.92E+02	1.32E+02	1.09E+00	5.52E-01	1.34E+02	0.00E+00
7.0	1.32E+02	9.28E+01	7.20E-01	3.53E-01	9.38E+01	0.00E+00
10.0	9.04E+01	6.47E+01	4.36E-01	2.08E-01	6.53E+01	0.00E+00

Assessment Data Results Saved to File:

Shearon Harris 10Miles Monitored Release 02192015 075653.URI7

Evacuation Areas From 0 to 10 Miles



PAGs Exceeded in Designated Areas

Release Rates (Ci / sec)

Particulate	0.00E+00 (0.0%)
Iodine	0.00E+00 (0.0%)
Noble Gas	7.74E+03 (100.0%)

\*\*\* Classification: General Emergency \*\*\*

Reviewed By: \_\_\_\_\_



## Dose Assessment

Shearon Harris

Thursday, February 19, 2015 07:59

## Method: Detailed Assessment - Monitored Release

Release Pathway: (U) &lt;Waste Gas&gt; &lt;WPB&gt; &lt;WPB Vent 5A&gt; &lt;Env&gt;

Containment HUT: = N/A

Cont Sprays: = N/A

Purge Filter: = N/A

PRF: 4.00E-01

Aux/Fuel Filter: = N/A

Steam Gen: = N/A

Turb Bldg HUT: = N/A

Aux/Fuel Bldg HUT: = &lt; 2 Hours

Turb Bldg Filter: = N/A

Source Term: Waste Gas Tank

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00

ETE (hh:mm): [N/A]

Lower

Wind: From 45° @ 3.5 mph

Stability Class: D

Precipitation: None

Monitor: WPB 5A rate

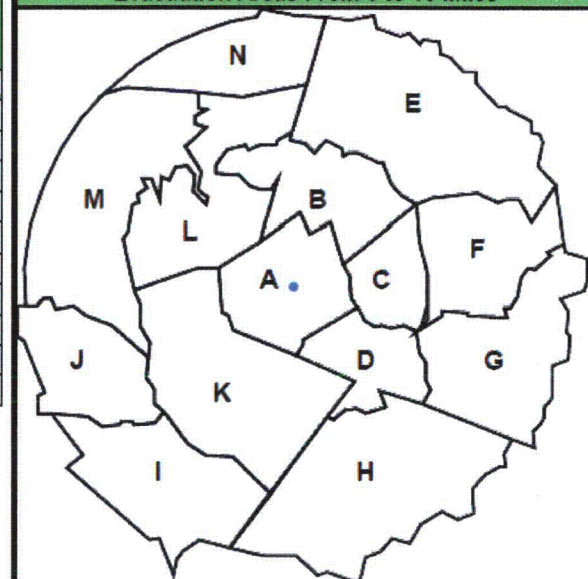
Readings: 7.76E+07 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.43E+01	1.00E+01	0.00E+00	0.00E+00	1.00E+01	0.00E+00
0.5	1.28E+01	8.96E+00	0.00E+00	0.00E+00	8.96E+00	0.00E+00
0.7	8.36E+00	5.84E+00	0.00E+00	0.00E+00	5.84E+00	0.00E+00
1.0	5.04E+00	3.50E+00	0.00E+00	0.00E+00	3.50E+00	0.00E+00
1.5	3.77E+00	2.63E+00	0.00E+00	0.00E+00	2.63E+00	0.00E+00
2.0	3.23E+00	2.25E+00	0.00E+00	0.00E+00	2.25E+00	0.00E+00
3.0	2.44E+00	1.72E+00	0.00E+00	0.00E+00	1.72E+00	0.00E+00
4.0	2.18E+00	1.53E+00	0.00E+00	0.00E+00	1.53E+00	0.00E+00
5.0	1.91E+00	1.34E+00	0.00E+00	0.00E+00	1.34E+00	0.00E+00
7.0	1.36E+00	9.30E-01	0.00E+00	0.00E+00	9.30E-01	0.00E+00
10.0	8.76E-01	6.37E-01	0.00E+00	0.00E+00	6.37E-01	0.00E+00

Assessment Data Results Saved to File:

Shearon Harris 10Miles Monitored Release 02192015 075950.URI7

## Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

## Release Rates (Ci / sec)

Particulate	0.00E+00 (0.0%)
Iodine	0.00E+00 (0.0%)
Noble Gas	7.76E+01 (100.0%)

\*\*\* Classification: Validate against Emergency Action Levels \*\*\*

Reviewed By: \_\_\_\_\_



## Dose Assessment

Shearon Harris

Thursday, February 19, 2015 08:00

Method: Detailed Assessment - Monitored Release

Release Pathway: (U) &lt;Waste Gas&gt; &lt;WPB&gt; &lt;WPB Vent 5A&gt; &lt;Env&gt;

Containment HUT: = N/A

Cont Sprays: = N/A

Purge Filter: = N/A

PRF: 4.00E-01

Aux/Fuel Filter: = N/A

Steam Gen: = N/A

Turb Bldg HUT: = N/A

Aux/Fuel Bldg HUT: = &lt; 2 Hours

Turb Bldg Filter: = N/A

Source Term: Waste Gas Tank

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00

ETE (hh:mm): [N/A]

Lower

Wind: From 45° @ 3.5 mph

Stability Class: D

Precipitation: None

Monitor: WPB 5A rate

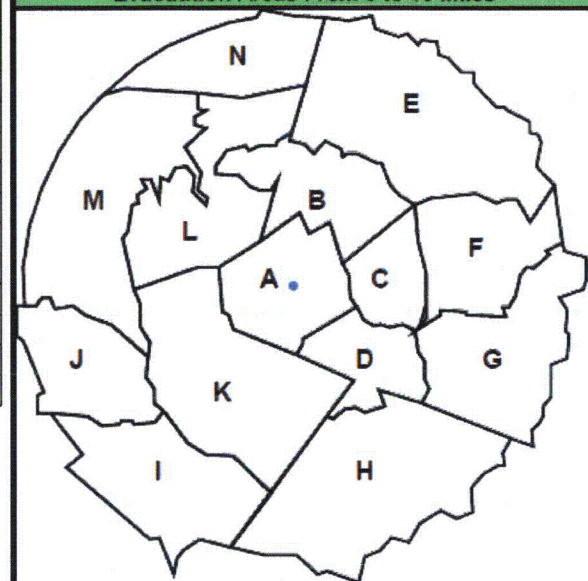
Readings: 7.76E+08 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.43E+02	1.00E+02	2.40E-01	1.41E-01	1.00E+02	0.00E+00
0.5	1.28E+02	8.96E+01	2.82E-01	1.65E-01	9.00E+01	0.00E+00
0.7	8.36E+01	5.84E+01	4.20E-01	2.45E-01	5.91E+01	0.00E+00
1.0	5.04E+01	3.50E+01	3.26E-01	1.88E-01	3.56E+01	0.00E+00
1.5	3.77E+01	2.63E+01	2.37E-01	1.35E-01	2.67E+01	0.00E+00
2.0	3.23E+01	2.25E+01	1.87E-01	1.05E-01	2.28E+01	0.00E+00
3.0	2.44E+01	1.72E+01	1.32E-01	0.00E+00	1.74E+01	0.00E+00
4.0	2.18E+01	1.53E+01	1.26E-01	0.00E+00	1.54E+01	0.00E+00
5.0	1.91E+01	1.34E+01	1.10E-01	0.00E+00	1.35E+01	0.00E+00
7.0	1.36E+01	9.30E+00	0.00E+00	0.00E+00	9.30E+00	0.00E+00
10.0	8.76E+00	6.37E+00	0.00E+00	0.00E+00	6.37E+00	0.00E+00

Assessment Data Results Saved to File:

Shearon Harris 10Miles Monitored Release 02192015 080011.URI7

## Evacuation Areas From 0 to 10 Miles



No PAGs Exceeded

## Release Rates (Ci / sec)

Particulate	0.00E+00 (0.0%)
Iodine	0.00E+00 (0.0%)
Noble Gas	7.76E+02 (100.0%)

\*\*\* Classification: Site Area Emergency \*\*\*

Reviewed By: \_\_\_\_\_



## Dose Assessment

Shearon Harris

Thursday, February 19, 2015 08:00

Method: Detailed Assessment - Monitored Release

Release Pathway: (U) &lt;Waste Gas&gt; &lt;WPB&gt; &lt;WPB Vent 5A&gt; &lt;Env&gt;

Containment HUT: = N/A

Cont Sprays: = N/A

Purge Filter: = N/A

PRF: 4.00E-01

Aux/Fuel Filter: = N/A

Steam Gen: = N/A

Turb Bldg HUT: = N/A

Aux/Fuel Bldg HUT: = &lt; 2 Hours

Turb Bldg Filter: = N/A

Source Term: Waste Gas Tank

Time After S/D (hh:mm): 0:00

Release Duration (hh:mm): 1:00

ETE (hh:mm): [N/A]

Lower

Wind: From 45° @ 3.5 mph

Stability Class: D

Precipitation: None

Monitor: WPB 5A rate

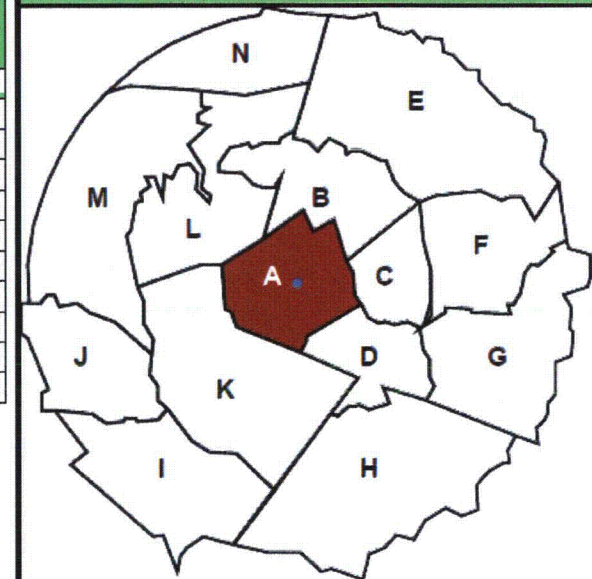
Readings: 7.76E+09 uCi/sec

Distance (Miles)	Exposure Rate (mR/hr)	External Plume DDE (mRem)	Inhalation CEDE (mRem)	Deposition Ground DDE (mRem)	TEDE (mRem)	CDE Thyroid (mRem)
S.B.	1.43E+03	1.00E+03	2.40E+00	1.41E+00	1.00E+03	1.49E-01
0.5	1.28E+03	8.96E+02	2.82E+00	1.65E+00	9.00E+02	1.74E-01
0.7	8.36E+02	5.84E+02	4.20E+00	2.45E+00	5.91E+02	2.60E-01
1.0	5.04E+02	3.50E+02	3.26E+00	1.88E+00	3.56E+02	2.01E-01
1.5	3.77E+02	2.63E+02	2.37E+00	1.35E+00	2.67E+02	1.45E-01
2.0	3.23E+02	2.25E+02	1.87E+00	1.05E+00	2.28E+02	1.14E-01
3.0	2.44E+02	1.72E+02	1.32E+00	6.92E-01	1.74E+02	0.00E+00
4.0	2.18E+02	1.53E+02	1.26E+00	6.40E-01	1.55E+02	0.00E+00
5.0	1.91E+02	1.34E+02	1.10E+00	5.54E-01	1.36E+02	0.00E+00
7.0	1.36E+02	9.30E+01	7.05E-01	3.44E-01	9.40E+01	0.00E+00
10.0	8.76E+01	6.37E+01	4.16E-01	1.95E-01	6.44E+01	0.00E+00

Assessment Data Results Saved to File:

Shearon Harris 10Miles Monitored Release 02192015 080033.URI7

Evacuation Areas From 0 to 10 Miles



PAGs Exceeded in Designated Areas

Release Rates (Ci / sec)

Particulate	0.00E+00 (0.0%)
Iodine	0.00E+00 (0.0%)
Noble Gas	7.76E+03 (100.0%)

\*\*\* Classification: General Emergency \*\*\*

Reviewed By: \_\_\_\_\_

U.S. Nuclear Regulatory Commission  
Serial HNP-15-025, Enclosure 5

**SERIAL HNP-15-025**

**ENCLOSURE 5**

**SUPPORTING CALCULATION FOR HARRIS NUCLEAR PLANT RADIOLOGICAL  
EFFLUENT EAL VALUES**

**SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1**

**DOCKET NO. 50-400**

**RENEWED LICENSE NUMBER NPF-63**



U.S. Nuclear Regulatory Commission  
Serial HNP-15-025, Enclosure 6

**SERIAL HNP-15-025**

**ENCLOSURE 6**

**HARRIS NUCLEAR PLANT EMERGENCY ACTION LEVEL WALLCHARTS**

**SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1**

**DOCKET NO. 50-400**

**RENEWED LICENSE NUMBER NPF-63**

U.S. Nuclear Regulatory Commission  
Serial HNP-15-025, Enclosure 7

**SERIAL HNP-15-025**

**ENCLOSURE 7**

**REGULATORY COMMITMENT**

**SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1**

**DOCKET NO. 50-400**

**RENEWED LICENSE NUMBER NPF-63**

### Regulatory Commitment

The following table identifies an action committed to in this letter. Statements in this submittal with the exception of those in the table below are provided for information purposes and are not considered commitments.

Commitment	Expected Completion Dates
Duke Energy commits to providing a review of the new classification scheme to State and local emergency management officials following NRC approval and prior to implementation.	Duke Energy requests approval of the proposed EAL scheme by April 30, 2016, with a 180 day implementation period. Therefore, this commitment is currently expected to be completed by October 27, 2016.

**The 2 drawings specifically  
referenced in the document  
have been processed into  
ADAMS.**

**These drawings can be  
accessed within the ADAMS  
package or by performing a  
search on the  
Document/Report Number.**

**D01 – D02X**