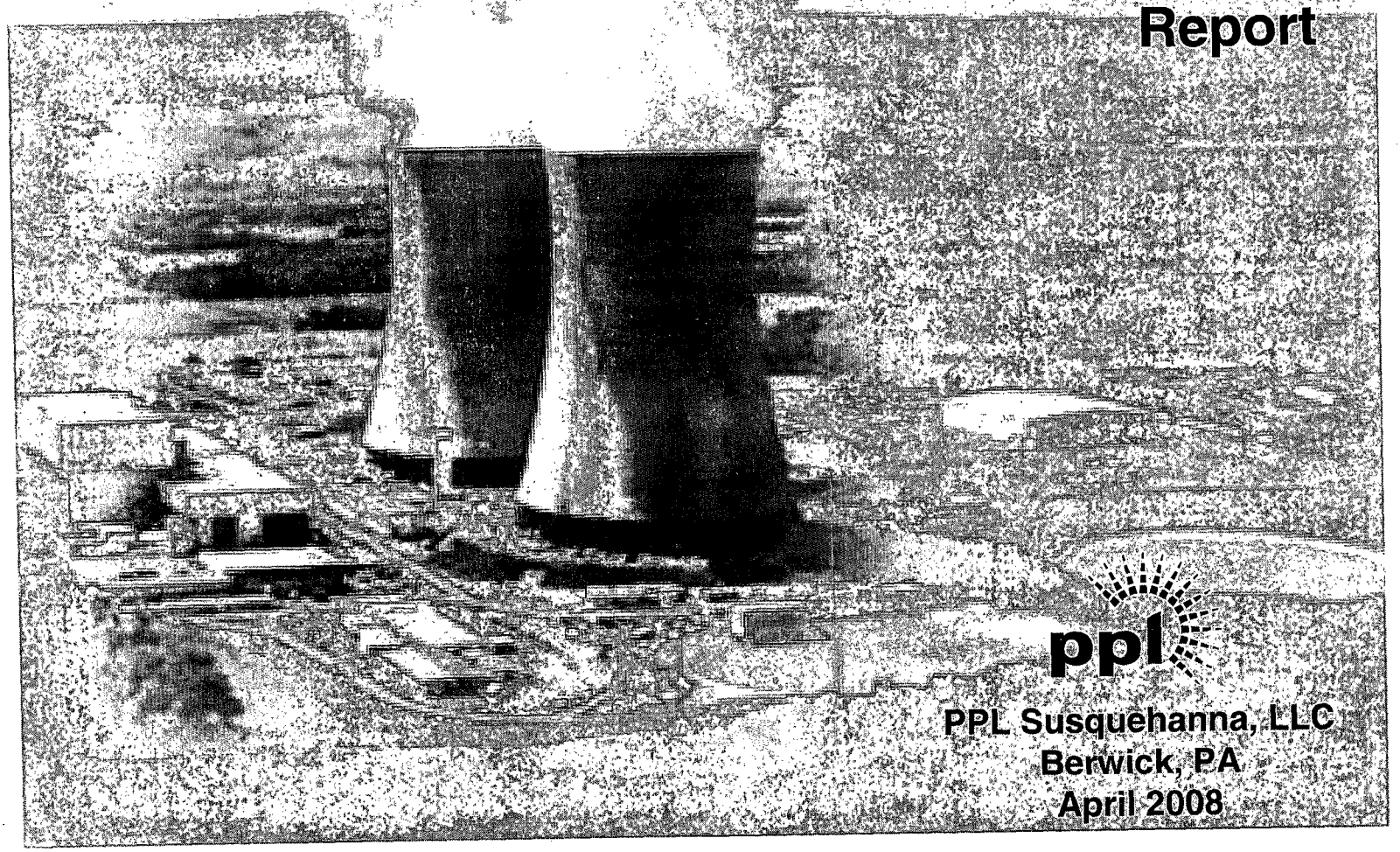
Susquehanna Steam Electric Station

Units 1 & 2

Radioactive Effluent Release Report

2007
Annual
Report



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PPL Susquehanna, LLC
Berwick, PA
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RADIOACTIVE EFFLUENT RELEASE REPORT

REPORT PERIOD: 01/01/07 - 12/31/07

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SECTION 1

INTRODUCTION, SUMMARY AND SUPPLEMENTAL INFORMATION

INTRODUCTION

The submittal of the 2007 Radioactive Effluent Release Report is in accordance with PPL Susquehanna, LLC Tech Spec. 5.6.3. The enclosed information is consistent with the objectives outlined in the Offsite Dose Calculation Manual (ODCM) and Process Control Program (PCP). The 2007 Radioactive Effluent Release Report is in conformance with 10CFR50.36a and 10CFR50, Appendix I, Section IV.B.1.

PPL Susquehanna, LLC is located in Salem Township, Luzerne County, Pennsylvania. It is on the west bank of the Susquehanna River, 8 km northeast of Berwick. The Station consists of two boiling water reactor generating units, each with about 1,200 MW net electrical capacity. The reactor and generating units were supplied by General Electric, while the Bechtel Corporation served as architect-engineer and constructor.

Construction of the Station began in the early 1970s. Fuel load began in Unit 1 in July of 1982. Initial criticality was achieved in the Unit 1 reactor on September 10, 1982. The reactor reached 100% power for the first time on February 4, 1983. Commercial operation of Unit 1 was declared on June 8, 1983. Initial criticality of Unit 2 occurred on May 8, 1984. Unit 2 was declared commercial on February 12, 1985.

Airborne effluents are released from the Station via five rooftop vents on the reactor building (see Figure 1-1). Continuous sampling for particulates and iodines is performed at each vent as well as continuous monitoring for noble gases. A program of periodic sampling and analysis for tritium and noble gases along with periodic analysis of particulate and iodine samples is conducted as specified in the plant Technical Requirements. All waterborne effluents are released in batch mode and are sampled and analyzed prior to release. Waterborne effluents from the site are released into the cooling tower blowdown line for dilution prior to release to the Susquehanna River (see Figure 1-2). Blowdown line flow rates are at least 5,000 gpm during periods of liquid radwaste release. The diluted effluent is introduced to the river by way of a perforated diffuser pipe placed on the river bed. The diffuser serves to rapidly and uniformly mix the station discharge with the main flow of the river.

This report presents a summary of the quantities of radioactive materials which were released from the Station during the period from January 1, 2007 to December 31, 2007. In addition, this report serves as a medium for notifying the US Nuclear Regulatory Commission staff of changes to the ODCM, PCP and documentation of any exceptions to the effluent monitoring program which must be reported per Technical Requirements.

Airborne and waterborne radioactive effluent releases to the environment during the report period were sampled and analyzed in accordance with the Technical Requirements. All radioactive effluent releases were within the concentration and release limits specified in the Technical Requirements. Calculations and terms utilized in this report are those outlined in the ODCM.

Section 1 contains supplemental information pertaining to effluents from the Susquehanna plant. Included are regulatory limits (Table 1-1), sampling and analysis methods, characterization of the number and duration of batch and abnormal releases and a brief summary of the applicable year's effluents.

Section 2 contains effluent and waste disposal data for the report period. Table 2-1 contains a summation of all airborne releases, grouped into the radionuclide categories of gases, particulates, iodines, and tritium. Average release rates are presented and compared to the applicable limits. Table 2-2 presents the activity totals of specific radionuclides in airborne effluents.

Waterborne effluents are summarized in Table 2-3. Average diluted concentrations are presented and compared to the applicable limits. Table 2-4 presents the release quantities of specific radionuclides in waterborne effluents over the report period. Figures 2-1 and 2-2 present the Susquehanna River Monthly Average Flow Rates for 2007 and the Monthly Liquid Radwaste Discharge Totals for 2007, respectively.

Table 2-5 contains estimates of the errors associated with the measurements involved in quantifying effluents. Sampling errors, counting errors, and errors associated with determining effluent flow rates and volumes all contribute to the total error of effluent measurements. Error estimates are presented for each category of radionuclide detected in airborne and waterborne effluents and solid wastes during the report period.

Tables 2-7 through 2-21 present a characterization of the solid radioactive waste shipped offsite during the report period. An estimate of major nuclide composition is presented for each waste type. Also included are the volumes and curie contents associated with each type of solid waste. The number of waste shipments from the site transported directly for burial or disposal are listed in Table 2-6.

Section 3 presents meteorological data for 2007, including data recovery, joint frequency distribution of wind speed and direction, stability class distribution, and atmospheric dispersion estimates for selected locations.

Section 4 of this report contains an assessment of the calculated doses attributed to the reported radiological effluents for the calendar year. The Radioactive Effluent Tracking and Dose Assessment Software (RETDAS) computer code was used for calculation of doses from waterborne effluents. Site-specific parameters used in the calculations for the Danville receiver are shown in Table 4-1. The RETDAS code was also used for calculation of doses from airborne effluents. The calculated doses and direct radiation estimates can be used to estimate the doses to maximally exposed members of the public. Table 4-2 summarizes maximum calculated doses to members of the public from airborne and waterborne effluents. Table 4-3 presents calculated collective doses to members of the public within the Riverlands/Energy Information Center Complex. Table 4-4 summarizes the calculated doses for residences and other occupied areas within the site boundary and the nearest dairy.

Section 5 of this report documents changes to the Offsite Dose Calculation Manual, Technical Requirements Manual and the Solid Radioactive Waste Process Control Program.

Section 6 presents a listing of cases (if any) in which airborne or waterborne effluent monitoring instrumentation was declared inoperable and was not restored to operability within the time period specified in Technical Requirements 3.11.1.4, 3.11.1.5 and 3.11.2.6 Action Statements. In addition, this section presents issues (if any) with the collection of milk or fresh leafy vegetables per Technical Requirement 3.11.4.1 and changes due to the land use census per Technical Requirement 3.11.4.2. Section 6 also includes reporting associated with the Nuclear Energy Institute (NEI) Groundwater Protection Initiative.

Section 7 contains corrections (if any) to previous Radioactive Effluent Release Reports.

Section 8 contains information on effluent and offsite dose from the systems classified as insignificant effluent pathways.

SUMMARY

Liquid effluent releases for 2007 were similar to those of previous years. During 2007 there were ninety-three (93) liquid batch releases resulting in a total release volume of one million two hundred thousand (1,200,000) gallons. The total number of liquid batch releases and total volume released in 2007 was lower than the corresponding values for 2006 (103 releases resulting in 1,530,000 gallons released in 2006). The predominant radionuclide released in liquid effluents during 2007 was tritium. Approximately seventy (70) curies of tritium were released in liquid effluents in 2007, compared to eighty-nine (89) curies released in 2006. When compared with all radionuclides released in liquid effluents in 2007, tritium was the main contributor to the resultant offsite dose. Consistent with previous years, the offsite dose from liquid releases in 2007 was less than one percent (1%) of the annual limits for both organ and whole body dose.

Gaseous effluents for 2007 were also comparable to those of previous years. Similar to liquid effluents in 2007, the predominant radionuclide released in gaseous effluents was tritium. When compared with all radionuclides released in gaseous effluents in 2007, tritium was the main contributor to the resultant offsite dose. Approximately eighty-nine (89) curies of tritium were released in gaseous effluents in 2007 compared to fifty-nine (59) curies in 2006. The resultant maximum offsite organ dose due to gaseous effluents from Unit-1 for 2007 was 3.88E-01 mrem, which is 2.6 percent (2.6%) of the per unit annual limit of fifteen (15) mrem. The resultant maximum offsite organ dose due to gaseous effluents from Unit-2 for 2007 was 4.06E-01 mrem, which is 2.7 percent (2.7 %) of the per unit annual limit of fifteen (15) mrem. The maximum offsite dose from gaseous effluents was higher in 2007 when compared with 2006 (4.06E-01 vs. 3.31E-01 mRem) due to a slight increase in airborne effluents coupled with higher X/Q values. The main source of the tritium in liquid and gaseous effluents is from control rod blades currently in each reactor's core.

FIGURE 1-1

AIRBORNE EFFLUENT RELEASE POINTS

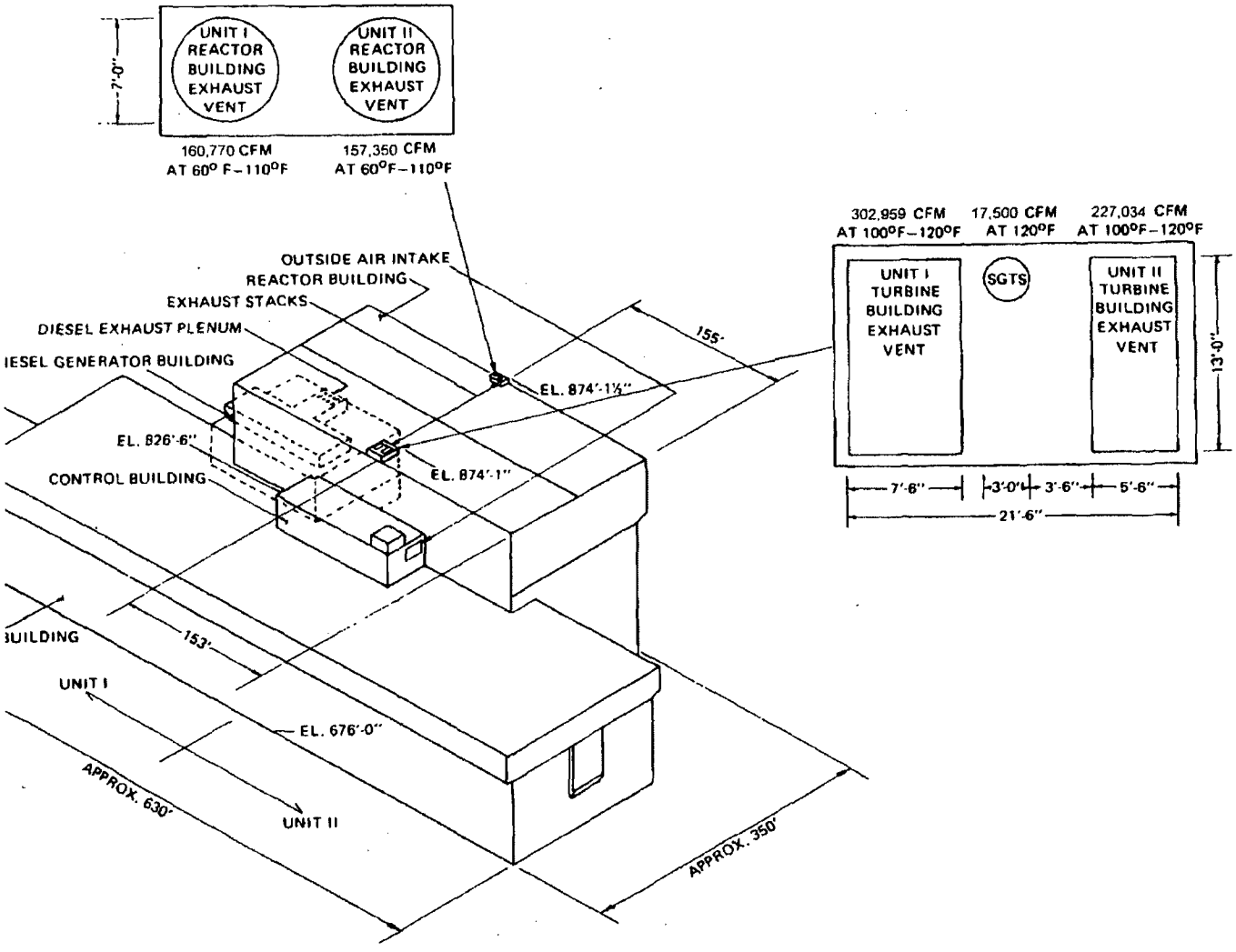
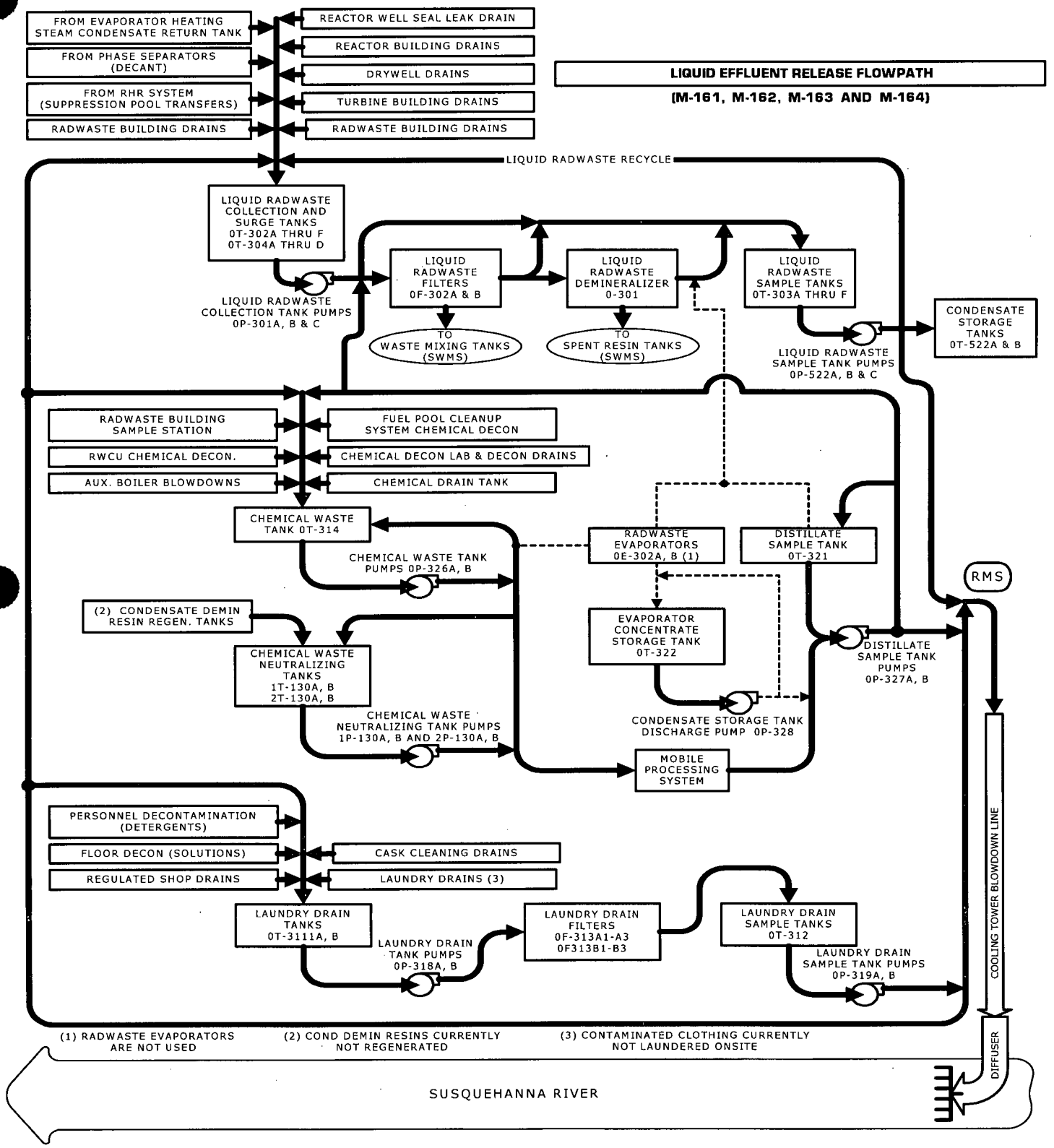


FIGURE 1-2

WATERBORNE EFFLUENT PATHWAY



SUPPLEMENTAL INFORMATION

1. Regulatory Limits

Technical Requirements 3.11.1 and 3.11.2 outline requirements for release of radioactive liquid and gaseous effluents, respectively. Concentration of radioactive materials released in liquid effluents and resulting dose are limited in unrestricted areas. Dose and dose rate due to radioactive materials released in gaseous effluents are limited in areas at or beyond the site boundary. Technical Requirement limits are listed in Table 1-1.

2. Maximum Permissible Concentrations in Waterborne Effluents

The concentration of radioactive material released in liquid effluents to unrestricted areas is limited to 10 times the concentrations specified in 10 CFR Part 20 Appendix B Table 2, Column 2, for radionuclides other than dissolved or entrained noble gases.

For dissolved or entrained noble gases, the concentration is limited to 2.0E-04 μCi/ml total activity (TRO 3.11.1.1).

3. Average Energy of Fission and Activation Gas

The Calculation of Noble Gas Effluent Average Energies E-Bar Beta and Gamma for 2007 resulted in an annual E-Bar Beta value of 5.16E-01 MeV and an E-Bar Gamma value of 1.07 MeV.

4. Measurements and Approximations of Total Radioactivity

Analyses of specific radionuclides in effluent samples are used to evaluate the radioactive composition and concentration of effluents.

5. Methods of Quantifying Effluents

a. **Fission and Activation Gases**: Gas samples are routinely collected monthly and analyzed with a high resolution (HPGE) detector system which incorporates a data reduction program to determine radionuclide composition in terms of specific activity. Data from the continuous vent monitors are used to determine the average concentration of noble gases. The high resolution (HPGE) isotopic scan is used to convert the continuous vent monitor activity to actual activity based on the determined nuclide mixture. The vent and sample flow rates are continuously monitored and the average flow rates for each vent are used to calculate the total activity released in a given time period. When the continuous monitors are out of service, manual grab

samples are taken from each vent once each eight hours (once each four hours for the standby gas treatment vent).

b. **Iodines**: Iodine is continuously collected on charcoal or silver zeolite cartridges via an isokinetic sampling assembly in each vent. Filters are normally exchanged once per week and analyzed on a high resolution (HPGE) system. The daily average flow rates for the vents and sample pumps are averaged for the duration of the sampling period and a ratio of vent flow rate to sample flow rate is determined. The ratio is used to determine the total activity of each isotope released during the time period in question. When the continuous samplers are out of service, iodine is continuously collected from alternate sampling ports available on the sample lines or directly from the affected rooftop vent(s).

c. **Particulates**: Particulates are continuously collected via an isokinetic sampling assembly in each vent. Filters are normally exchanged once per week and analyzed on a high resolution (HPGE) system. Flow rate corrections are performed as for iodines. When the continuous samplers are out of service, particulates are continuously collected from alternate sampling ports available on the sample lines or directly from the affected rooftop vent(s).

d. **Tritium**: Airborne tritium is collected monthly via bubbler sampler. The sample is collected for one hour at a flow rate of approximately 1000 cc/min. Tritium activity in the bubbler sample is determined by liquid scintillation counting. The liquid sample tritium concentration is then converted to air concentration by volume proportion.

e. **Waterborne Effluents**: Each tank of liquid radwaste is sampled and analyzed for principal gamma emitters prior to release. Each sample tank is recirculated for a sufficient amount of time prior to sampling to ensure that a representative sample is obtained. Samples are analyzed on a high resolution (HPGE) system and release permits are generated based on the values obtained from the isotopic analysis and the most recent values for tritium, gross alpha, iron-55, and strontium-89 and -90. An aliquot based on release volume is saved and added to monthly and quarterly composite containers. The monthly tritium analysis is done in-house. A monthly composite is sent to a vendor laboratory for gross alpha analysis. A quarterly composite is sent to a vendor laboratory for iron-55, strontium-89 and-90 analyses.

The concentration of each radionuclide in each batch is multiplied by the volume of the batch to determine the total quantity of each nuclide released in each batch. The isotopic totals for each batch are summed to determine the total source term for the report period.

TABLE 1-1

TECHNICAL REQUIREMENT LIMITS

A. NOBLE GASES:

1. ≤500 mrem/year - TOTAL BODY
   ≤3000 mrem/year - SKIN

   - dose rate limit at and beyond the site boundary
     (TRO 3.11.2.1.I)

2. ≤5 mrad - AIR GAMMA
   ≤10 mrad - AIR BETA

   - quarterly air dose limits per reactor unit at and beyond the site boundary
     (TRO 3.11.2.2a)

3. ≤10 mrad - AIR GAMMA
   ≤20 mrad - AIR BETA

   - annual air dose limits per reactor unit at and beyond the site boundary
     (TRO 3.11.2.2.b)

B. AIRBORNE I-131, I-133, TRITIUM, PARTICULATES WITH HALF-LIVES > 8 DAYS:

1. ≤1500 mrem/year - ORGAN
   (inhalation pathways only)

   - dose rate limit at and beyond the site boundary
     (TRO 3.11.2.1.II.A)

2. ≤7.5 mrem - ORGAN

   - quarterly dose limit per reactor unit at and beyond the site boundary
     (TRO 3.11.2.3.a)

3. ≤15 mrem - ORGAN

   - annual dose limit per reactor unit at and beyond the site boundary
     (TRO 3.11.2.3.b)

C. LIQUID EFFLUENTS:

1. ≤1.5 mrem - TOTAL BODY
   ≤5.0 mrem - ORGAN
   - quarterly dose limits per unit (TRO 3.11.1.2.a)

2. ≤3.0 mrem - TOTAL BODY
   ≤10.0 mrem - ORGAN
   - annual dose limits per unit (TRO 3.11.1.2.b)

D. AIRBORNE EFFLUENT: BASES FOR PERCENT OF APPLICABLE LIMIT VALUES IN TABLE 2-1

Fission and Activation Gases

Derived release rate limits based on the Technical Requirement (TRO 3.11.2.1.I.A and B) limits of 500 mrem/yr to the total body and 3000 mrem/yr to the skin were calculated from the expected mix of noble gas radionuclides presented in Attachment A of ODCM-QA-003, Effluent Monitor Setpoints. The lower limit of 1.00E+06 µCi/min (1.67E+04 µCi/sec) based on total body dose rate is used.

Iodine-131

A derived release rate limit for I-131 based on the Technical Requirement (TRO 3.11.2.1.II.A) limit of 1500 mrem/yr from I-131, I-133, tritium and particulates with half-lives greater than 8 days was calculated based on the ratio of the expected annual release quantities of I-131 and I-133 provided in Attachment E of ODCM-QA-004, Airborne Effluent Dose Calculations. The limit is 1.04E+02 µCi/min I-131 (1.73E+00 µCi/sec).

Particulates

A derived release rate limit for particulate activity other than iodines based on the Technical Requirement (TRO 3.11.2.1.II.A) limit of 1500 mrem/yr from I-131, I-133, tritium and particulates with half-lives greater than 8 days was calculated (PPL calculation EC-ENVR-1041) based on the expected annual release quanities of particulate radionuclides provided in Attachment E of ODCM-QA-004, Airborne Effluent Dose Calculations. The limit is 3.02E+03 µCi/min (5.03E+01 µCi/sec).

Tritium

A derived release rate was calculated based on the 10 CFR 20, Appendix B, Table 2, Column 1, Effluent Concentration Limit for tritium (1.0E-07 µCi/cc) to unrestricted areas. A relative concentration of 4.1E-05 sec/m^3 was assumed (PPL calculation EC-ENVR-1040). The limit is 1.46E+05 µCi/min (2.44E+03 µCi/sec).

Radionuclide Fractional Summation

The sum of the percents of applicable limits for particulates, iodine and tritium must be less than 100%.

E. WATERBORNE EFFLUENT: BASES FOR PERCENT OF APPLICABLE LIMIT VALUES IN TABLE 2-3

Fission and Activation Products

Concentrations of fission and activation products in liquid effluent from radwaste effluent are determined for each batch prior to release. Each isotope concentration is compared to ten times the 10CFR20 Appendix B, Table 2, Column 2 Effluent Concentration Values (TRO 3.11.1.1).

Tritium

Liquid effluent quarterly tritium concentrations are compared to ten times the 10 CFR 20 Appendix B, Table 2, Column 2, Effluent Concentration value of 1.0E-03 µCi/ml to unrestricted areas.

Dissolved and Entrained Gases

Liquid effluent concentrations for dissolved and entrained gases are compared to the limiting value for total noble gas activity of 2.0E-04 µCi/ml (TRO 3.11.1.1).

Radionuclide Fractional Summation

The sum of the percents of applicable limits for fission and activation products, tritium and dissolved and entrained gases must be less than 100%.

SECTION 2

EFFLUENT AND WASTE DISPOSAL DATA

Airborne Effluents

Summaries of the radionuclide total curie activities and average release rates are included in Tables 2-1 and 2-2. If a radionuclide was not detected, zero activity was used for that isotope in dose calculations and the activity is listed as "<MDC" (less than the minimum detectable concentration) in Tables 2-1 and 2-2. <MDC indicates that no activity was positively detected in any sample when samples were analyzed with techniques which achieved the required Lower Limits of Detection (LLD) as specified in the Technical Requirement (TRO) Table 3.11.2.1-1, Radioactive Gaseous Effluent Sampling and Analysis Program. In all cases, the measurement laboratory MDCs were at or below the LLD levels required by Technical Requirements. The following are typical measurement laboratory MDCs.

Typical MDCs

Radionuclide	MDC (µCi/cc)
Kr-87	4.3 E-08
Kr-88	4.6 E-08
Xe-133	3.0 E-08
Xe-133m	1.1 E-07
Xe-135	1.5 E-08
Xe-135m	8.0 E-08
Xe-138	1.5 E-07
Mn-54	2.9 E-13
Fe-59	2.8 E-13
Co-58	1.8 E-13
Co-60	3.8 E-13
Zn-65	1.0 E-13
Mo-99	1.0 E-12
Cs-134	2.4 E-13
Cs-137	1.1 E-13
Ce-141	1.0 E-13
Ce-144	5.0 E-13
I-131	4.4 E-14
Sr-89	1.1 E-13
Sr-90	1.3 E-14
H-3	1.5 E-08
Gross Alpha	2.3 E-14

Batch Releases

1. Number of Batch Releases:	0
2. Total Time Period for Batch Release:	NA
3. Maximum Time Period for a Batch Release:	NA
4. Average Time Period for a Batch Release:	NA
5. Minimum Time Period for a Batch Release:	NA

Abnormal Releases

1. Number of Releases	0
2. Total Activity Released	NA

TABLE 2-1

AIRBORNE EFFLUENT - SUMMATION OF ALL RELEASES

A. Fission and Activation Gas	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Total Release	Ci	<MDC	6.17E+01	1.19E+01	<MDC
Average Release Rate for Period	µCi/sec	0	7.84E+00	1.49E+00	0
Percent of Applicable Limit (1.67E+04 µCi/sec)	%	0	4.70E-02	8.92E-03	0

B. Iodines

Total I-131	Ci	2.32E-06	<MDC	<MDC	<MDC
Average Release Rate for Period	µCi/sec	2.98E-07	0	0	0
Percent of Applicable Limit (1.73E+00 µCi/sec)	%	1.72E-05	0	0	0

C. Particulate

Particulate with Half-Life >8 Days	Ci	2.18E-04	5.36E-04	8.13E-05	1.74E-04
Average Release Rate for Period	µCi/sec	2.80E-05	6.81E-05	1.02E-05	2.19E-05
Percent of Applicable Limit (5.03E+01 µCi/sec)	%	5.57E-05	1.35E-04	2.03E-05	4.35E-05
Gross Alpha Radioactivity	Ci	<MDC	<MDC	<MDC	<MDC

D. Tritium

Total Release	Ci	7.97E+00	2.90E+01	2.35E+01	2.89E+01
Average Release Rate for Period	µCi/sec	1.03E+00	3.69E+00	2.95E+00	3.63E+00
Percent of Applicable Limit (2.44E+03 µCi/sec)	%	4.22E-02	1.51E-01	1.21E-01	1.49E-01

E. Radionuclide Fractional Summation

Sum of Percent of Applicable Limit During Period for B, C and D (Limit = 100%)	%	0.04	0.15	0.12	0.15

TABLE 2-2

AIRBORNE EFFLUENT - RADIONUCLIDES RELEASED

		Releases in Continuous Mode			
Nuclides Released	**Unit**	**First Quarter**	**Second Quarter**	**Third Quarter**	**Fourth Quarter**
A. Fission and Activation Gases					
N-13	Ci	<MDC	5.81E+01	<MDC	<MDC
Ar-41	Ci	<MDC	7.37E-02	5.52E+00	<MDC
Kr-85	Ci	<MDC	<MDC	<MDC	<MDC
Kr-85m	Ci	<MDC	1.11E-02	4.95E-01	<MDC
Kr-87	Ci	<MDC	7.20E-02	<MDC	<MDC
Kr-88	Ci	<MDC	3.44E-02	5.28E+00	<MDC
Kr-89	Ci	<MDC	<MDC	<MDC	<MDC
Xe-133	Ci	<MDC	2.36E-03	5.56E-01	<MDC
Xe-135	Ci	<MDC	3.39E-02	<MDC	<MDC
Xe-135m	Ci	<MDC	2.05E-01	<MDC	<MDC
Xe-137	Ci	<MDC	2.38E+00	<MDC	<MDC
Xe-138	Ci	<MDC	7.93E-01	<MDC	<MDC
Total for Period	**Ci**	**0**	**6.17E+01**	**1.19E+01**	**0**
B. Iodines					
I-131	Ci	2.32E-06	<MDC	<MDC	<MDC
I-133	Ci	<MDC	<MDC	<MDC	<MDC
I-135	Ci	<MDC	<MDC	<MDC	<MDC
Total for Period	**Ci**	**2.32E-06**	**0**	**0**	**0**
C. Particulate					
Cr-51	Ci	1.33E-04	7.30E-05	<MDC	8.43E-05
Mn-54	Ci	3.68E-05	7.94E-05	<MDC	7.10E-06
Fe-59	Ci	<MDC	<MDC	<MDC	<MDC
Co-57	Ci	<MDC	<MDC	<MDC	<MDC
Co-58	Ci	<MDC	<MDC	<MDC	6.86E-06
Co-60	Ci	4.81E-05	3.81E-04	8.13E-05	7.56E-05
Zn-65	Ci	<MDC	<MDC	<MDC	<MDC
Sr-89	Ci	<MDC	<MDC	<MDC	<MDC
Sr-90	Ci	<MDC	<MDC	<MDC	<MDC
Cs-134	Ci	<MDC	<MDC	<MDC	<MDC
Cs-137	Ci	<MDC	<MDC	<MDC	<MDC
Ce-141	Ci	<MDC	<MDC	<MDC	<MDC
Ce-144	Ci	<MDC	<MDC	<MDC	<MDC
Nb-95	Ci	<MDC	2.33E-06	<MDC	<MDC
Ba-La-140	Ci	<MDC	<MDC	<MDC	<MDC
Total for Period	**Ci**	**2.18E-04**	**5.36E-04**	**8.13E-05**	**1.74E-04**

Waterborne Effluents

Summaries of the radionuclide total curie activities, average diluted concentrations, and percent of applicable Technical Requirement limits are included in Tables 2-3 and 2-4.

	Batch Releases*	Qtr. 1	Qtr. 2	Qtr. 3	Qtr. 4	Annual
1.	Number of Batch Releases	11	26	25	31	93
2.	Total Time Period for a Batch Release	7.84E+02	3.72E+03	4.37E+03	6.21E+03	1.51E+04
3.	Maximum Time Period for a Batch Release	2.83E+02	3.36E+02	3.07E+02	2.95E+02	3.36 E+02
4.	Average Time Period for a Batch Release	7.13E+01	1.43E+02	1.75E+02	2.00E+02	1.62E+02
5.	Minimum Time Period for a Batch Release	3.00E+01	2.70E+01	2.90E+01	2.80E+01	2.70E+01
6.	Average Cooling Tower Blowdown Flow Rate During Periods of Release	7.40E+03	9.58E+03	6.17E+03	6.17E+03	7.07E+03
7.	Susquehanna River Flow Rate	1.21E+07	7.92E+06	1.06E+06	7.84E+06	7.21E+06

*Units of time and flow are expressed in minutes and gallons per minute (gpm), respectively.

If a radionuclide was not detected, zero activity was used for that isotope in dose calculations and the activity is listed as "<MDC" (less than the miniumum detectable concentration) in Tables 2-3 and 2-4. <MDC indicates that no activity was positively detected in any sample when samples were analyzed with techniques which achieved the required Lower Limits of Detection (LLD) as specified in the Technical Requirement 3.11.1.1-1, Radioactive Liquid Waste Sampling and Analysis Program. In all cases, the measurement laboratory MDCs were at or below the LLD levels required by Technical Requirements. The following are typical measurement laboratory MDCs.

Radionuclide	MDC (µCi/ml)
Mn-54	4.5 E-08
Fe-59	5.0 E-08
Co-58	4.0 E-08
Co-60	5.4 E-08
Zn-65	4.9 E-08
Mo-99	1.7 E-07
I-131	2.0 E-08
Cs-134	2.2 E-08
Cs-137	2.6 E-08
Ce-141	3.2 E-08
Ce-144	1.3 E-07
Sr-89	4.4 E-08
Sr-90	1.6 E-08
Fe-55	8.2 E-07
H-3	3.6 E-06
Gross Alpha	3.7 E-09

Abnormal Releases

1.	Number of releases	0	0	0	0
2.	Volume Released	N/A	N/A	N/A	N/A
3.	Total Activity Released	N/A	N/A	N/A	N/A

TABLE 2-3

WATERBORNE EFFLUENT - SUMMATION OF ALL RELEASES

A. Fission and Activation Products	Unit	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
1. Total Release (excluding: Tritium, Ent. Gases, Alpha)	Ci	7.24E-05	1.89E-04	6.61E-05	1.12E-04
2. Average Diluted Concentration During Period	µCi/ml	3.30E-09	1.40E-09	6.48E-10	7.72E-10
3. Sum of Average Diluted C_n/L_n Ratio During Period	Unitless	8.42E-05	3.51E-05	1.87E-05	1.77E-05
4. Percent of Applicable Limit (Ratio < 1.0)	%	0.008	0.003	0.002	0.002
B. Tritium					
1. Total Release	Ci	2.06E+00	1.72E+01	2.10E+01	3.02E+01
2. Average Diluted Concentration During Period	µCi/ml	9.37E-05	1.27E-04	2.06E-04	2.08E-04
3. Percent of Applicable Limit (1.0E-2 µCi/ml)	%	0.937	1.27	2.06	2.08
C. Dissolved and Entrained Gases					
1. Total Release	Ci	<MDC	4.48E-05	1.19E-05	1.37E-05
2. Average Diluted Concentration During Period	µCi/ml	0.00E+00	3.32E-10	1.17E-10	9.44E-11
3. Percent of Applicable Limit (2.0E-4 µCi/ml)	%	0.00E+00	1.66E-04	5.85E-05	4.72E-05
D. Radionuclide Fractional Summation					
1. Sum of Percent of Applicable Limit During Period for A, B and C (Limit = 100%)	%	0.945	1.27	2.06	2.08
E. Gross Alpha Radioactivity					
1. Total Release	Ci	<MDC	<MDC	<MDC	<MDC
F. Volume of Water Released (Prior to Dilution)	Gallons	5.34E+04	2.88E+05	3.51E+05	5.06E+05
	Liters	2.02E+05	1.09E+06	1.33E+06	1.92E+06
G. Volume of Dilution Water Used During Period of Release	Gallons	5.73E+06	3.54E+07	2.66E+07	3.78E+07
	Liters	2.17E+07	1.34E+08	1.01E+08	1.43E+08
H. Volume of Dilution Water Used Over Entire Period	Gallons	9.40E+08	1.35E+09	1.52E+09	1.02E+09
	Liters	3.56E+09	5.09E+09	5.77E+09	3.85E+09

TABLE 2-4

WATERBORNE EFFLUENT - RADIONUCLIDES RELEASED

		Releases in Batch Mode			
Nuclides Released	**Unit**	**First Quarter**	**Second Quarter**	**Third Quarter**	**Fourth Quarter**
A. Fission and Activation Products					
F-18	Ci	<MDC	<MDC	<MDC	<MDC
Na-24	Ci	<MDC	<MDC	<MDC	<MDC
Cr-51	Ci	<MDC	1.00E-05	<MDC	<MDC
Mn-54	Ci	1.74E-05	2.29E-05	7.45E-06	2.53E-05
Fe-55	Ci	<MDC	<MDC	<MDC	<MDC
Co-58	Ci	1.48E-06	2.91E-06	1.88E-07	1.42E-05
Fe-59	Ci	<MDC	<MDC	<MDC	<MDC
Co-60	Ci	4.88E-05	1.18E-04	5.49E-05	7.25E-05
Zn-65	Ci	3.92E-06	3.52E-05	2.55E-06	<MDC
Sr-89	Ci	<MDC	<MDC	<MDC	<MDC
Sr-90	Ci	<MDC	<MDC	<MDC	<MDC
Tc-99m	Ci	<MDC	<MDC	1.04E-06	<MDC
Sb-124	Ci	<MDC	<MDC	<MDC	<MDC
Cs-137	Ci	7.61E-07	<MDC	<MDC	<MDC
Ce-141	Ci	<MDC	<MDC	<MDC	<MDC
Ta-182	Ci	<MDC	<MDC	<MDC	<MDC
Total for Period	**Ci**	**7.24E-05**	**1.89E-04**	**6.61E-05**	**1.12E-04**
B. Tritium					
Total for Period	**Ci**	**2.06E+00**	**1.72E+01**	**2.10E+01**	**3.02E+01**
C. Dissolved and Entrained Gases					
Ar-41	Ci	<MDC	<MDC	<MDC	<MDC
Kr-85	Ci	<MDC	<MDC	<MDC	<MDC
Kr-85m	Ci	<MDC	<MDC	<MDC	<MDC
Kr-87	Ci	<MDC	<MDC	<MDC	<MDC
Kr-88	Ci	<MDC	<MDC	<MDC	<MDC
Xe-131m	Ci	<MDC	<MDC	<MDC	<MDC
Xe-133m	Ci	<MDC	<MDC	<MDC	<MDC
Xe-133	Ci	<MDC	2.04E-05	4.07E-06	<MDC
Xe-135m	Ci	<MDC	<MDC	<MDC	<MDC
Xe-135	Ci	<MDC	2.44E-05	7.86E-06	1.37E-05
Total for Period	**Ci**	**0**	**4.48E-05**	**1.19E-05**	**1.37E-05**

Figure 2-1

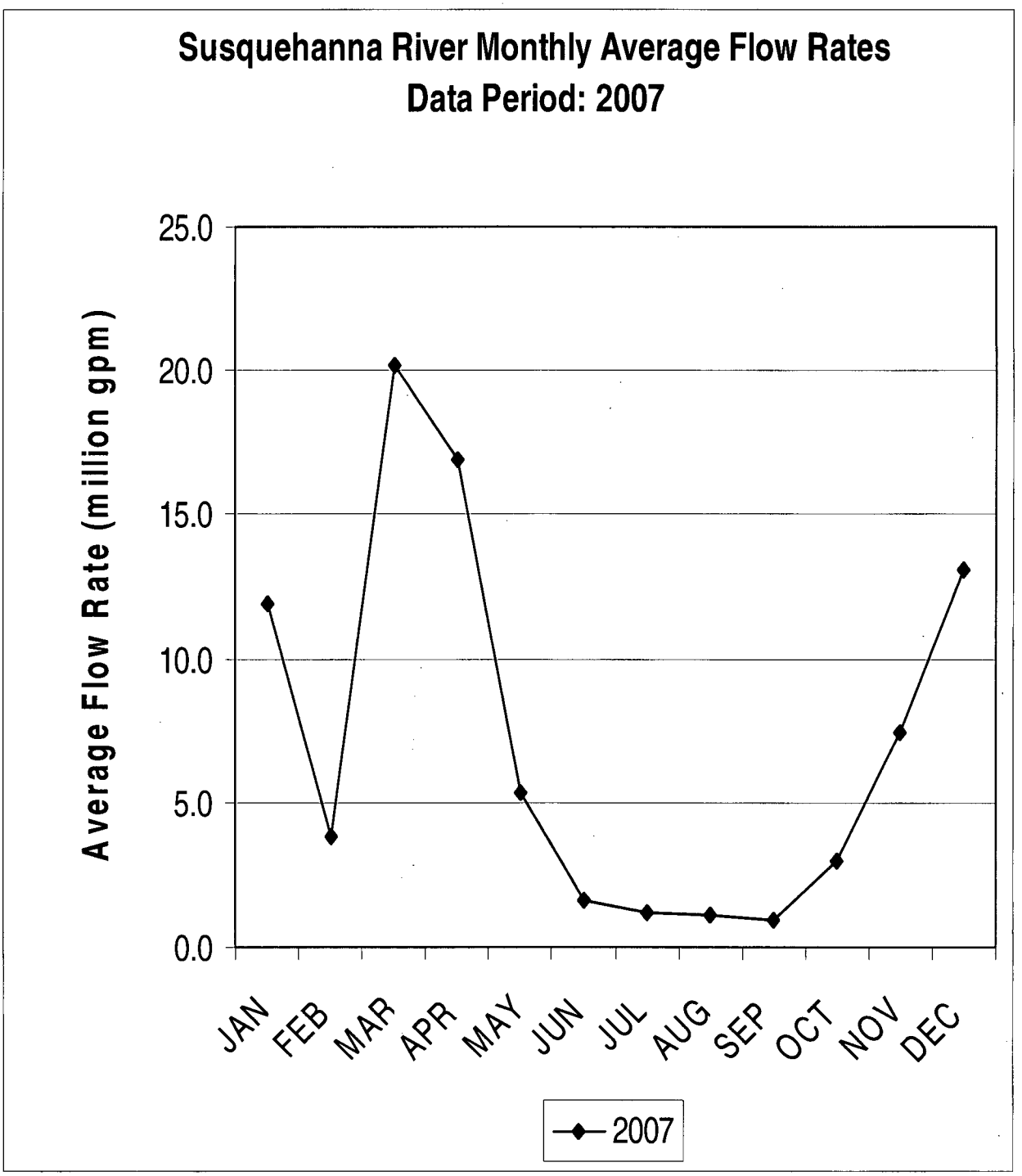

Susquehanna River Monthly Average Flow Rates
Data Period: 2007
Average Flow Rate (million gpm)
25.0
20.0
15.0
10.0
5.0
0.0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
2007

Figure 2-2

Monthly Liquid Radwaste Discharge Totals

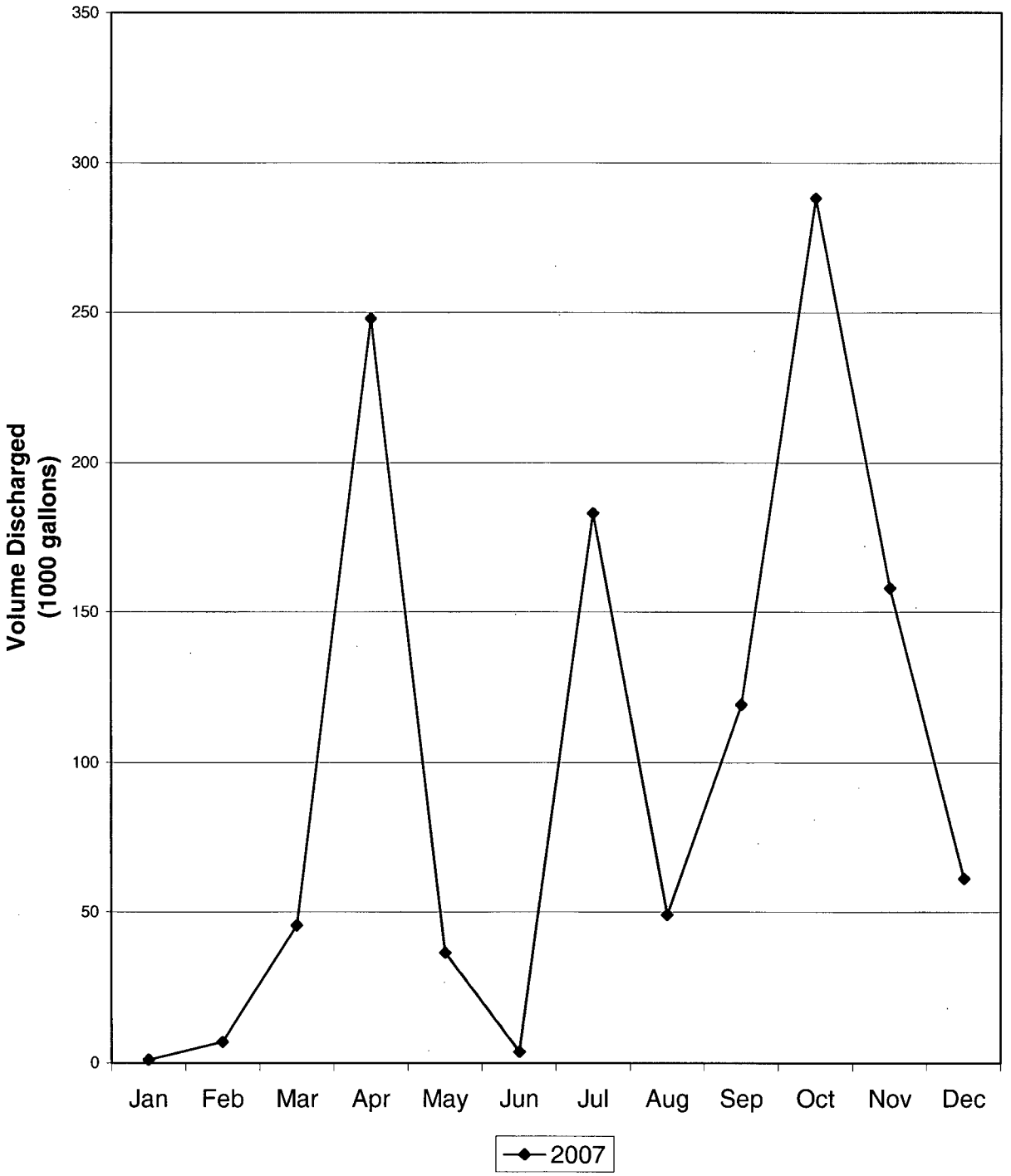


TABLE 2-5

ESTIMATED TOTAL ERRORS ASSOCIATED WITH EFFLUENTS MEASUREMENTS

		MEASUREMENT	ESTIMATED TOTAL ERROR
1.	**Airborne Effluents**		
	a.	Fission and Activation Gases	15.9%
	b.	I-131	13.3%
	c.	Particulates (incl. Gross Alpha)	15.8%
	d.	Tritium	13.6%
2.	**Waterborne Effluents**		
	a.	Fission and Activation Products	5.0%
	b.	Tritium	3.3%
	c.	Dissolved and Entrained Gases	8.4%
	d.	Gross Alpha Activity	6.0%
	e.	Volume of Waste Released (Prior to Dilution)	5.0%
	f.	Volume of Dilution Water Used During Period	15.0%
			ESTIMATED MAXIMUM MEASUREMENT ERROR
3.	**Solid Wastes**		
	a.	RWCU Filter Media – Class A HIC (Dewatered)	±25%
	b.	Ash – Class A Strong Tight Container (Incineration)	±25%
	c.	CFS Backwash Media – Class A HIC (Pyrolysis)	±25%
	d.	Condensate Demineratizer/Radwaste Demineralizer Class A HIC (Pyrolysis)	±25%
	e.	Contaminated Waste Oil – Class A (Fuel Blending for Co-Generation)	±25%
	f.	Liquid Radwaste Filter Media – Class A HIC (Compacted)	±25%
	g.	Mixed Waste – Class A Incineration	±25%
	h.	Processed DAW – Class A Strong Tight Container (Compacted)	±25%
	i.	Processed DAW – Class A Strong Tight Container (Dewatered)	±25%

		ESTIMATED MAXIMUM MEASUREMENT ERROR
3.	**Solid Wastes (cont.)**	
j.	Condensate Demineralizer/RadwasteDemineralizer Class B HIC (Pyrolysis)	±25%
k.	Liquid Radwaste Filter Media – Class B HIC (Pyrolysis)	±25%
l.	Suppression Pool Sludge – Class B HIC (Pyrolysis)	±25%
m.	Irradiated Components – Class C Steel Liner	±25%
n.	Liquid Radwaste Filter Media – Class C HIC (Pyrolysis)	±25%
o.	Suppression Pool Sludge – Class C HIC (Pyrolysis)	±25%

SUSQUEHANNA STEAM ELECTRIC STATION

RADIOACTIVE WASTE REPORT

RADIOACTIVE EFFLUENT RELEASE REPORT

SOLID RADIOACTIVE WASTE

DATA PERIOD: JANUARY 1, 2007 - DECEMBER 31, 2007

PREPARED BY:

MICHAEL C. MICCA
HEALTH PHYSICIST

APPROVED BY:

ERIC WOLF
RADIOLOGICAL OPERATIONS SUPERVISOR

REPORT NOTES

1. All activities reported in Milli-Curies (mCi) unless otherwise noted.

2. Reported activities, as indicated with the (<) sign, are comprised in whole or part of MDL values.

3. Estimated maximum measurement error is ±25%.

TABLE 2-6

WASTE DISPOSITION

Data Period: January 1, 2007 - December 31, 2007

A. SOLID WASTE SHIPPED OFF-SITE FOR BURIAL OR DISPOSAL

Number of Shipments	Mode of Transportation	Destination
11	Truck	Barnwell, SC

B. IRRADIATED FUEL SHIPMENTS

Number of Shipments	Mode of Transportation	Destination
NONE		

NOTE: The number of shipments listed in A include only the shipments from PPL Susquehanna, LLC to a disposal site. It does not include shipments made to or from volume reduction vendors.

Table 2-7

Annual Waste Release Summary Report

Year: 2007

Class: A Volume Reduction Vendor: No

Source: RWCU Filter Media

Container: HIC (High Integrity Container)

Process: Dewatered

Nuclides	Activity (mCi)	% of Total
C-14	1.870E+02	0.03 %
CE-144	4.950E+00	0.00 %
CO-58	5.500E+03	0.97 %
CO-60	2.330E+05	40.93 %
CR-51	3.610E+03	0.63 %
CS-137	9.800E+02	0.17 %
FE-55	1.740E+05	30.57 %
FE-59	8.180E+02	0.14 %
H-3	1.600E+02	0.03 %
I-129	< 3.460E-06	0.00 %
MN-54	8.160E+04	14.34 %
NB-95	1.290E+04	2.27 %
NI-59	3.550E+01	0.01 %
NI-63	1.910E+03	0.34 %
SB-125	4.810E+03	0.84 %
SR-89	1.370E+01	0.00 %
SR-90	2.590E+00	0.00 %
TC-99	< 1.610E-04	0.00 %
ZN-65	4.310E+04	7.57 %
ZR-95	6.600E+03	1.16 %
Total Activity (Ci)	569.232	100.00 %
Container Volume	132.400 ft^3	3.749 m^3

Table 2-8

Annual Waste Release Summary Report

Year: 2007
Class: A
Volume Reduction Vendor: Yes
Source: Ash
Container: Strong Tight Container
Process: Incineration

Nuclides	Activity (mCi)	% of Total
C-14	2.582E+01	0.08 %
CO-58	3.333E+01	0.11 %
CO-60	3.935E+03	12.73 %
CS-137	6.085E+00	0.02 %
FE-55	2.497E+04	80.77 %
FE-59	2.857E+01	0.09 %
H-3	1.154E+01	0.04 %
I-129	0.000E+00	0.00 %
MN-54	1.627E+03	5.26 %
NI-63	1.681E+02	0.54 %
SR-89	8.917E-02	0.00 %
SR-90	4.158E-02	0.00 %
TC-99	0.000E+00	0.00 %
ZN-65	1.093E+02	0.35 %
Total Activity (Ci)	30.915	100.00 %
Container Volume	225.700 ft^3	6.391 m^3

Table 2-9

Annual Waste Release Summary Report

Year: 2007
Class: A Volume Reduction Vendor: Yes
Source: CFS Backwash Media
Container: HIC (High Integrity Container)
Process: Pyrolysis

Nuclides	Activity (mCi)	% of Total
BA-131	3.857E+00	0.01 %
C-14	5.256E+01	0.09 %
CO-58	2.131E+02	0.35 %
CO-60	7.868E+03	12.88 %
CR-51	4.808E+02	0.79 %
CS-137	1.381E+01	0.02 %
FE-55	4.917E+04	80.51 %
FE-59	8.466E+01	0.14 %
H-3	4.687E+01	0.08 %
I-129	1.663E-02	0.00 %
MN-54	1.836E+03	3.01 %
NB-95	2.210E+01	0.04 %
NI-63	3.414E+02	0.56 %
SB-124	9.351E+00	0.02 %
SR-90	8.445E-02	0.00 %
TC-99	3.510E-02	0.00 %
ZN-65	9.136E+02	1.50 %
ZR-95	1.479E+01	0.02 %
Total Activity (Ci)	61.071	100.00 %
Container Volume	32.500 ft^3	0.920 m^3

Table 2-10

Annual Waste Release Summary Report

Year: 2007
Class: A Volume Reduction Vendor: Yes
Source: Condensate Demineralizer / Radwaste Demineralizer
Container: HIC (High Integrity Container)
Process: Pyrolysis

Nuclides	Activity (mCi)	% of Total
C-14	5.888E+02	0.73 %
CE-144	5.810E+00	0.01 %
CM-242	1.391E-02	0.00 %
CM-244	7.680E-02	0.00 %
CO-58	2.209E+02	0.27 %
CO-60	4.776E+03	5.94 %
CR-51	2.752E+02	0.34 %
CS-137	5.495E+00	0.01 %
FE-55	7.040E+04	87.58 %
FE-59	1.367E+02	0.17 %
H-3	4.750E+02	0.59 %
I-129	4.646E-02	0.00 %
MN-54	2.439E+03	3.03 %
NB-95	1.458E+01	0.02 %
NI-63	2.327E+02	0.29 %
PU-241	2.917E+01	0.04 %
SB-124	1.501E+01	0.02 %
SB-125	4.960E+00	0.01 %
SR-90	5.476E-01	0.00 %
TC-99	2.804E-01	0.00 %
ZN-65	6.636E+02	0.83 %
ZR-95	9.680E+01	0.12 %
Total Activity (Ci)	80.381	100.00 %
Container Volume	188.350 ft^3	5.334 m^3

Table 2-11

Annual Waste Release Summary Report

Year: 2007
Class: A Volume Reduction Vendor: Yes
Source: Contaminated Waste Oil
Container: None
Process: Fuel Blending for Co-Generation

Nuclides	Activity (mCi)	% of Total
C-14	< 3.430E-07	0.00 %
CO-57	1.810E-03	0.01 %
CO-58	3.720E-01	1.12 %
CO-60	1.650E+01	49.65 %
CR-51	8.490E-01	2.55 %
CS-137D	1.080E-02	0.03 %
FE-55	3.050E+00	9.18 %
FE-59	8.420E-01	2.53 %
H-3	3.220E+00	9.69 %
I-129	< 1.020E-06	0.00 %
MN-54	6.930E+00	20.85 %
NB-95	7.000E-02	0.21 %
NI-63	1.580E-01	0.48 %
SB-125	3.680E-01	1.11 %
TC-99	< 5.790E-07	0.00 %
ZN-65	7.520E-01	2.26 %
ZR-95	1.080E-01	0.32 %
Total Activity (Ci)	0.033	100.00 %
Container Volume	0.000 ft^3	0.000 m^3

Table 2-12

Annual Waste Release Summary Report

Year: 2007
Class: A Volume Reduction Vendor: Yes
Source: Liquid Radwaste Filter Media
Container: HIC (High Integrity Container)
Process: Compacted

Nuclides	Activity (mCi)	% of Total
C-14	9.140E-04	0.00 %
CE-144	2.220E-02	0.01 %
CO-58	9.880E-01	0.30 %
CO-60	1.620E+01	4.96 %
CR-51	2.310E+00	0.71 %
CS-137	7.590E-03	0.00 %
FE-55	2.940E+02	90.02 %
FE-59	8.620E-01	0.26 %
H-3	5.030E-02	0.02 %
I-129	1.550E-02	0.00 %
MN-54	8.900E+00	2.73 %
NB-95	8.800E-02	0.03 %
NI-63	8.850E-01	0.27 %
PU-241	3.560E-02	0.01 %
SB-124	8.220E-02	0.03 %
SR-90	1.500E-04	0.00 %
TC-99	9.640E-04	0.00 %
ZN-65	2.070E+00	0.63 %
ZR-95	8.270E-02	0.03 %
Total Activity (Ci)	0.327	100.00 %
Container Volume	19.000 ft^3	0.538 m^3

Table 2-13

Annual Waste Release Summary Report

Year: 2007

Class: A

Volume Reduction Vendor: Yes

Source: Mixed Waste

Container: None

Process: Incineration

Nuclides	Activity (mCi)	% of Total
CO-57	2.990E-05	0.01 %
CO-58	4.170E-03	0.97 %
CO-60	2.700E-01	63.01 %
CR-51	1.520E-02	3.55 %
CS-137	1.920E-04	0.04 %
FE-55	5.020E-02	11.71 %
FE-59	4.360E-03	1.02 %
MN-54	5.770E-02	13.47 %
NB-95	8.480E-03	1.98 %
NI-63	2.590E-03	0.60 %
SB-125	6.540E-03	1.53 %
ZN-65	7.060E-03	1.65 %
ZR-95	1.990E-03	0.46 %
Total Activity (Ci)	0.000	100.00 %
Container Volume	0.000 ft^3	0.000 m^3

Table 2-14

Annual Waste Release Summary Report

Year: 2007

Class: A Volume Reduction Vendor: Yes

Source: Processed DAW

Container: Strong Tight Container

Process: Compacted

Nuclides	Activity (mCi)	% of Total
C-14	1.128E+00	0.00 %
CE-144	1.921E+01	0.02 %
CM-244	1.528E-03	0.00 %
CO-57	9.590E-02	0.00 %
CO-58	2.699E+01	0.03 %
CO-60	5.824E+03	5.85 %
CR-51	3.645E+01	0.04 %
CS-137	8.967E+00	0.01 %
FE-55	9.164E+04	92.11 %
FE-59	2.227E+01	0.02 %
H-3	2.280E+01	0.02 %
I-129	2.248E-02	0.00 %
MN-54	1.116E+03	1.12 %
NB-95	4.470E+01	0.04 %
NI-63	2.914E+02	0.29 %
PU-241	4.604E-01	0.00 %
SB-124	3.818E-01	0.00 %
SB-125	2.642E+02	0.27 %
SR-89	5.312E-03	0.00 %
SR-90	1.608E-02	0.00 %
TC-99	1.257E-01	0.00 %
ZN-65	1.190E+02	0.12 %
ZR-95	4.842E+01	0.05 %
Total Activity (Ci)	99.487	100.00 %
Container Volume	4717.530 ft^3	133.588 m^3

Table 2-15

Annual Waste Release Summary Report

Year: 2007

Class: A Volume Reduction Vendor: Yes

Source: Processed DAW

Container: Strong Tight Container

Process: Dewatered

Nuclides	Activity (mCi)	% of Total
C-14	1.370E-06	0.00 %
CE-144	3.180E-05	0.01 %
CO-58	1.050E-03	0.22 %
CO-60	2.410E-02	4.96 %
CR-51	8.020E-04	0.16 %
CS-137	1.140E-05	0.00 %
FE-55	4.340E-01	89.26 %
FE-59	5.060E-04	0.10 %
H-3	8.770E-05	0.02 %
I-129	7.190E-03	1.48 %
MN-54	1.310E-02	2.69 %
NB-95	1.170E-04	0.02 %
NI-63	1.320E-03	0.27 %
PU-241	5.320E-05	0.01 %
SB-124	7.060E-05	0.01 %
SR-90	2.240E-07	0.00 %
TC-99	1.440E-06	0.00 %
ZN-65	3.730E-03	0.77 %
ZR-95	6.400E-05	0.01 %
Total Activity (Ci)	0.000	100.00 %
Container Volume	10.000 ft^3	0.283 m^3

Table 2-16

Annual Waste Release Summary Report

Year: 2007
Class: B Volume Reduction Vendor: Yes
Source: Condensate Demineralizer / Radwaste Demineralizer
Container: HIC (High Integrity Container)
Process: Pyrolysis

Nuclides	Activity (mCi)	% of Total
C-14	1.320E+00	17.19 %
CE-144	1.620E-03	0.02 %
CM-242	2.610E-05	0.00 %
CM-244	1.430E-04	0.00 %
CO-60	1.610E+00	20.96 %
CS-137	6.760E-03	0.09 %
FE-55	4.710E-01	6.13 %
H-3	3.640E+00	47.39 %
I-129	< 7.990E-04	0.01 %
MN-54	5.600E-01	7.29 %
NI-63	2.950E-02	0.38 %
PU-241	3.810E-02	0.50 %
SR-90	9.510E-04	0.01 %
TC-99	< 2.160E-03	0.03 %
Total Activity (Ci)	0.008	100.00 %
Container Volume	1.280 ft^3	0.036 m^3

Table 2-17

Annual Waste Release Summary Report

Year: 2007
Class: B Volume Reduction Vendor: Yes
Source: Liquid Radwaste Filter Media
Container: HIC (High Integrity Container)
Process: Pyrolysis

Nuclides	Activity (mCi)	% of Total
C-14	3.364E-02	0.00 %
CE-144	3.110E+00	0.00 %
CM-244	1.895E-01	0.00 %
CO-58	3.142E+02	0.38 %
CO-60	1.622E+04	19.66 %
CR-51	1.449E+02	0.18 %
CS-137	1.742E-01	0.00 %
FE-55	5.490E+04	66.56 %
FE-59	2.829E+02	0.34 %
H-3	3.064E+01	0.04 %
I-129	< 6.140E-02	0.00 %
MN-54	8.230E+03	9.98 %
NB-95	1.493E+01	0.02 %
NI-63	1.519E+03	1.84 %
PU-241	4.336E+01	0.05 %
SB-124	3.071E+01	0.04 %
SR-90	1.257E+00	0.00 %
TC-99	1.190E-02	0.00 %
ZN-65	7.500E+02	0.91 %
Total Activity (Ci)	82.485	100.00 %
Container Volume	19.560 ft^3	0.554 m^3

Table 2-18

Annual Waste Release Summary Report

Year: 2007
Class: B Volume Reduction Vendor: Yes
Source: Suppression Pool Sludge
Container: HIC (High Integrity Container)
Process: Pyrolysis

Nuclides	Activity (mCi)	% of Total
C-14	5.140E-02	0.00 %
CE-144	2.300E+01	0.02 %
CO-58	1.320E+01	0.01 %
CO-60	5.450E+03	4.90 %
CR-51	6.550E+00	0.01 %
CS-137	9.600E+00	0.01 %
FE-55	1.040E+05	93.44 %
FE-59	9.330E+00	0.01 %
H-3	4.640E-01	0.00 %
I-129	< 8.190E-04	0.00 %
MN-54	9.990E+02	0.90 %
NB-95	3.380E+01	0.03 %
NI-63	3.120E+02	0.28 %
SB-125	2.910E+02	0.26 %
SR-89	2.390E-03	0.00 %
SR-90	5.100E-03	0.00 %
TC-99	< 7.000E-02	0.00 %
ZN-65	1.010E+02	0.09 %
ZR-95	5.460E+01	0.05 %
Total Activity (Ci)	111.304	100.00 %
Container Volume	2.520 ft^3	0.071 m^3

Table 2-19

Annual Waste Release Summary Report

Year: 2007

Class: C Volume Reduction Vendor: No

Source: Irradiated Components

Container: Steel Liner

Process: N/A

Nuclides	Activity (mCi)	% of Total
C-14	6.306E+03	0.00 %
CO-58	4.752E+05	0.11 %
CO-60	1.466E+07	3.43 %
CR-51	1.270E+06	0.30 %
CS-137	1.960E+03	0.00 %
FE-55	4.624E+06	1.08 %
FE-59	3.697E+04	0.01 %
H-3	2.669E+02	0.00 %
HF-181	6.091E+05	0.14 %
I-129	1.900E-08	0.00 %
MN-54	5.155E+05	0.12 %
NB-94	2.212E+02	0.00 %
NB-95	1.566E+08	36.68 %
NI-59	1.142E+03	0.00 %
NI-63	1.850E+05	0.04 %
SB-124	1.745E+04	0.00 %
SB-125	2.879E+07	6.74 %
SN-113	5.039E+06	1.18 %
SN-119M	6.750E+07	15.81 %
SN-123	2.126E+06	0.50 %
TC-99	3.995E+00	0.00 %
TE-125M	3.948E+06	0.92 %
ZR-95	1.405E+08	32.91 %
Total Activity (Ci)	426926.71	100.00 %
Container Volume	574.000 ft^3	16.254 m^3

Table 2-20

Annual Waste Release Summary Report

Year: 2007
Class: C Volume Reduction Vendor: Yes
Source: Liquid Radwaste Filter Media
Container: HIC (High Integrity Container)
Process: Pyrolysis

Nuclides	Activity (mCi)	% of Total
C-14	1.680E+00	0.04 %
CE-144	1.380E-01	0.00 %
CM-244	1.020E-02	0.00 %
CO-58	7.460E+00	0.18 %
CO-60	8.570E+02	20.49 %
CR-51	9.420E-01	0.02 %
CS-137	9.470E-03	0.00 %
FE-55	2.820E+03	67.41 %
FE-59	4.120E+00	0.10 %
H-3	1.650E+00	0.04 %
I-129	< 4.350E-03	0.00 %
MN-54	3.720E+02	8.89 %
NB-95	1.510E-01	0.00 %
NI-63	8.280E+01	1.98 %
PU-241	2.340E+00	0.06 %
SB-124	6.290E-01	0.02 %
SR-90	6.820E-02	0.00 %
TC-99	< 2.820E-03	0.00 %
ZN-65	3.210E+01	0.77 %
Total Activity (Ci)	4.183	100.00 %
Container Volume	0.310 ft^3	0.009 m^3

Table 2-21

Annual Waste Release Summary Report

Year: 2007
Class: C Volume Reduction Vendor: Yes
Source: Suppression Pool Sludge
Container: HIC (High Integrity Container)
Process: Pyrolysis

Nuclides	Activity (mCi)	% of Total
C-14	2.402E-02	0.00 %
CE-144	9.900E+00	0.02 %
CO-58	4.480E+00	0.01 %
CO-60	2.508E+03	4.94 %
CR-51	1.339E+00	0.00 %
CS-137	4.469E+00	0.01 %
FE-55	4.742E+04	93.47 %
FE-59	2.615E+00	0.01 %
H-3	2.146E-01	0.00 %
I-129	< 2.320E-04	0.00 %
MN-54	4.326E+02	0.85 %
NB-95	8.220E+00	0.02 %
NI-63	1.455E+02	0.29 %
SB-125	1.330E+02	0.26 %
SR-89	7.100E-04	0.00 %
SR-90	2.372E-03	0.00 %
TC-99	7.580E-03	0.00 %
ZN-65	4.294E+01	0.08 %
ZR-95	1.780E+01	0.04 %
Total Activity (Ci)	50.731	100.00 %
Container Volume	1.130 ft^3	0.032 m^3

SECTION 3

METEOROLOGICAL DATA AND DISPERSION ESTIMATES

METEOROLOGY AND DISPERSION DATA

Meteorological data have been collected at the PPL Susquehanna, LLC site since the early 1970s. At the present time, the meteorological system is based on a 300-foot high tower located approximately 1,000 feet to the southeast of the plant. Wind sensors are mounted at the 10m and 60m elevations on this tower. Vertical temperature differential is measured with redundant sensor pairs between the 10m and 60m levels. Sigma theta (the standard deviation of horizontal wind direction) is calculated from wind direction at both levels. Dew point and ambient temperature sensors are present at the 10m level. Precipitation is measured at ground level.

A back-up meteorological tower was erected in 1982. It is a 10m tower providing alternate measurements of wind speed, wind direction, and sigma theta. A 10m supplemental downriver meteorological tower is also available. This tower measures wind speed, wind direction, sigma theta, temperature and dew point.

Meteorological data are transmitted to the plant Control Room, Technical Support Center, Emergency Operations Facility for emergency response availability, and ABSG Consulting, Inc. ABSG Consulting, Inc., located in Rockville, Maryland, provides meteorological consulting services to PPL Susquehanna, LLC.

Regulatory Guide 1.23 (Safety Guide 23) requires at least 90% data recovery for meteorological instrumentation. During 2007, all meteorological instrumentation met the 90% data recovery requirement. Table 3-1 lists the percent valid data recovery values for the parameters monitored as part of the PPL Susquehanna Meteorological Monitoring Program.

Dispersion modeling for effluents from normal operation is done using the MIDAS system XDCALC program, a straight-line Gaussian plume model designed to estimate average relative concentration. The model was developed in accordance with Regulatory Guide 1.111. For periods when the wind speed is calm, the actual wind direction that last occurred is used.

XDCALC and the XQINTR program that interpolates X/Q values to exact locations both use terrain correction factors to account for the temporal and spatial variations in the airflow in the region. A straight-line trajectory model assumes that a constant mean wind transports and diffuses effluents in the direction of airflow at the release point within the entire region of interest. The terrain correction factors were taken from FSAR Table 2.3-128.

Tables 3-2 and 3-3 provide the joint frequency distribution of wind speed and direction (as a function of delta temperature) at the 10 and 60 meter elevations of the primary meteorological tower. Table 3-4 lists no decay, undepleted X/Q values at various distances from the site. Table 3-5 lists 2.26 day decay, undepleted X/Q values at various distances from the site. Table 3-6 lists 8-day decay, depleted X/Q values at various distances from the site and Table 3-7 is a listing of D/Q (relative deposition) values at various distances from the site.

TABLE 3-1

METEOROLOGICAL DATA RECOVERY FOR 2007

Parameter	Percent Valid Data Recovery
Wind Speed 10m - Primary (1) Wind Speed 60m – Primary Wind Speed 10m – Backup (2) Wind Speed 10m – Downriver (3)	99.8 99.3 92.4 99.3
Wind Direction 10m - Primary Wind Direction 60m – Primary Wind Direction 10m – Backup Wind Direction 10m – Downriver	99.9 99.0 92.4 99.3
Temperature 10m – Primary Dew Point 10m – Primary	99.2 98.7
Delta Temperature 60m – Primary	99.3
Sigma Theta 10m – Primary Sigma Theta 60m – Primary Sigma Theta 10m – Backup Sigma Theta 10m – Downriver	99.8 99.3 92.4 99.3
Precipitation – Primary	100.0(4)
Composite Parameters	
Wind Speed and Direction 10m, Delta Temperature 60-10m	99.2
Wind Speed and Direction 60m, Delta Temperature 60-10m	99.6

(1) SSES "Primary" meteorological tower

(2) SSES "Backup" meteorological tower

(3) SSES "Downriver" meteorological tower

(4) Data supplemented with data from the NWS for the period of August 29 through October 31, 2007.

TABLE 3-2

JOINT FRQUENCY DISTRIBUTION OF WIND SPEED AND WIND DIRECTION 10m VERSUS DELTA TEMPERATURE 60-10m FOR THE PERIOD OF JANUARY 1, 2007 THROUGH DECEMBER 31, 2007

Hours at Each Wind Speed and Direction

Period of Record = 1/1/2007 00:00 12/31/2007 23:00 Total Period

Elevation: **Speed:** 10M SPD **Direction:** 10M WD **Lapse:** DT60-10

Stability Class A Delta Temperature Extremely Unstable

Wind Speed (m/s)

Wind Direction (from)	0.23 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	0	0	0	0	0	0	1	0	0	0	0	0	1
NNE	0	0	0	0	1	0	2	0	0	0	0	0	3
NE	0	0	0	1	0	0	0	0	0	0	0	0	1
ENE	0	0	0	0	0	0	0	0	0	0	0	0	0
E	0	0	2	0	0	0	0	0	0	0	0	0	2
ESE	0	0	0	1	0	0	0	0	0	0	0	0	1
SE	0	0	1	1	0	0	0	0	0	0	0	0	2
SSE	0	0	0	1	0	0	0	0	0	0	0	0	1
S	0	0	0	1	0	0	0	0	0	0	0	0	1
SSW	0	0	1	0	1	2	2	0	0	0	0	0	6
SW	0	0	0	1	2	7	11	2	0	0	0	0	23
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	0	0	0	1	0	0	0	0	0	0	0	0	1
NW	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	0	0	4	7	4	9	16	2	0	0	0	0	42

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	68
Number of Valid Hours for this Table	42
Total Hours for the Period	8760

TABLE 3-2
(continued)

Hours at Each Wind Speed and Direction

Period of Record = 1/1/2007 00:00 12/31/2007 23:00 Total Period

Elevation: **Speed:** 10M SPD **Direction:** 10M WD **Lapse:** DT60-10

Stability Class B Delta Temperature Moderately Unstable

Wind Speed (m/s)

Wind Direction (from)	0.23 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	0	0	0	0	1	2	6	0	0	0	0	0	9
NNE	0	0	0	0	0	3	8	0	0	0	0	0	11
NE	0	0	0	0	3	3	5	0	0	0	0	0	11
ENE	0	0	0	0	1	0	0	0	0	0	0	0	1
E	0	0	0	1	0	0	0	0	0	0	0	0	1
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	1	0	0	1	0	0	0	0	0	2
S	0	0	0	0	0	2	0	0	0	0	0	0	2
SSW	0	0	0	0	0	16	4	0	0	0	0	0	20
SW	0	0	0	0	1	6	13	2	0	0	0	0	22
WSW	0	0	0	0	0	0	4	0	0	0	0	0	4
W	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	0	0	0	0	0	1	0	0	0	0	0	0	1
Totals	0	0	0	2	6	33	41	2	0	0	0	0	84

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	68
Number of Valid Hours for this Table	84
Total Hours for the Period	8760

TABLE 3-2
(continued)

Hours at Each Wind Speed and Direction

Period of Record = 1/1/2007 00:00 12/31/2007 23:00 Total Period

Elevation: **Speed:** 10M SPD **Direction:** 10M WD **Lapse:** DT60-10

Stability Class C Delta Temperature Slightly Unstable

Wind Speed (m/s)

Wind Direction (from)	0.23 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	0	0	0	2	0	5	23	0	0	0	0	0	30
NNE	0	0	0	0	2	20	20	2	0	0	0	0	44
NE	0	0	0	2	4	14	2	0	0	0	0	0	22
ENE	0	0	1	1	4	6	0	0	0	0	0	0	12
E	0	0	0	1	1	0	0	0	0	0	0	0	2
ESE	0	0	0	3	0	0	0	0	0	0	0	0	3
SE	0	0	0	0	1	0	0	0	0	0	0	0	1
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	4	2	0	0	0	0	0	6
SSW	0	0	0	0	4	14	3	0	0	0	0	0	21
SW	0	0	0	0	0	48	56	4	0	0	0	0	108
WSW	0	0	0	0	1	2	24	5	1	0	0	0	33
W	0	0	0	0	0	0	3	1	0	0	0	0	4
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	0	0	0	0	0	2	3	2	0	0	0	0	7
NNW	0	0	0	0	0	4	15	6	0	0	0	0	25
Totals	0	0	1	9	17	119	151	20	1	0	0	0	318

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	68
Number of Valid Hours for this Table	318
Total Hours for the Period	8760

TABLE 3-2
(continued)

Hours at Each Wind Speed and Direction

Period of Record = 1/1/2007 00:00 12/31/2007 23:00 Total Period

Elevation: **Speed:** 10M SPD **Direction:** 10M WD **Lapse:** DT60-10

Stability Class D Delta Temperature Neutral

Wind Speed (m/s)

Wind Direction (from)	0.23 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	0	2	5	20	36	103	163	7	0	0	0	0	336
NNE	0	4	15	58	83	129	79	2	0	0	0	0	370
NE	0	6	22	77	77	81	46	0	0	0	0	0	309
ENE	4	10	30	46	24	23	6	1	0	0	0	0	144
E	3	17	29	29	24	14	11	1	0	0	0	0	128
ESE	4	10	33	37	12	15	12	0	0	0	0	0	123
SE	3	12	33	40	31	36	29	0	0	0	0	0	184
SSE	0	8	25	51	38	32	14	0	0	0	0	0	168
S	2	7	16	52	58	105	39	0	0	0	0	0	279
SSW	1	3	12	73	72	120	46	1	0	0	0	0	328
SW	1	2	13	41	49	159	219	56	2	0	0	0	542
WSW	0	1	2	10	26	61	181	105	15	0	0	0	401
W	0	0	2	7	14	42	108	74	3	0	0	0	250
WNW	0	1	0	7	10	35	75	23	4	0	0	0	155
NW	0	1	0	8	21	41	157	88	5	0	0	0	321
NNW	0	0	1	5	8	43	172	42	0	0	0	0	271
Totals	18	84	238	561	583	1039	1357	400	29	0	0	0	4309

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	68
Number of Valid Hours for this Table	4309
Total Hours for the Period	8760

TABLE 3-2
(continued)

Hours at Each Wind Speed and Direction

Period of Record = 1/1/2007 00:00 12/31/2007 23:00 Total Period

Elevation: **Speed:** 10M SPD **Direction:** 10M WD **Lapse:** DT60-10

Stability Class E Delta Temperature Slightly Stable

Wind Speed (m/s)

Wind Direction (from)	0.23 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	0	7	7	22	35	27	5	0	0	0	0	0	103
NNE	0	8	26	79	57	38	3	0	0	0	0	0	211
NE	2	17	52	90	29	15	2	0	0	0	0	0	207
ENE	8	60	95	69	8	3	4	0	0	0	0	0	247
E	9	75	88	25	6	1	1	0	0	0	0	0	205
ESE	8	56	52	20	2	0	0	0	0	0	0	0	138
SE	4	37	49	23	7	4	3	1	0	0	0	0	128
SSE	2	18	41	44	19	5	3	1	0	0	0	0	133
S	0	17	39	98	47	52	12	3	0	0	0	0	268
SSW	1	10	19	72	92	79	16	0	0	0	0	0	289
SW	0	3	10	30	26	68	43	1	0	0	0	0	181
WSW	0	2	4	6	10	16	11	5	0	0	0	0	54
W	0	0	1	10	6	5	5	1	0	0	0	0	28
WNW	0	1	0	5	2	5	5	2	0	0	0	0	20
NW	0	0	0	4	9	18	6	1	0	0	0	0	38
NNW	0	1	1	7	3	24	8	0	0	0	0	0	44
Totals	34	312	484	604	358	360	127	15	0	0	0	0	2294

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	68
Number of Valid Hours for this Table	2294
Total Hours for the Period	8760

TABLE 3-2
(continued)

Hours at Each Wind Speed and Direction

Period of Record = 1/1/2007 00:00 12/31/2007 23:00 Total Period

Elevation: **Speed:** 10M SPD **Direction:** 10M WD **Lapse:** DT60-10

Stability Class F Delta Temperature Moderately Stable

Wind Speed (m/s)

Wind Direction (from)	0.23 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	0	0	1	3	5	1	1	0	0	0	0	0	11
NNE	0	1	6	11	7	0	0	0	0	0	0	0	25
NE	1	21	55	66	5	1	0	0	0	0	0	0	149
ENE	2	73	157	166	11	0	0	0	0	0	0	0	409
E	5	69	56	15	0	0	0	0	0	0	0	0	145
ESE	1	29	24	7	0	0	0	0	0	0	0	0	61
SE	1	13	18	7	0	0	0	0	0	0	0	0	39
SSE	1	3	15	12	1	0	0	0	0	0	0	0	32
S	1	8	7	11	2	0	0	0	0	0	0	0	29
SSW	0	4	4	11	4	1	0	0	0	0	0	0	24
SW	0	0	0	6	9	4	0	0	0	0	0	0	19
WSW	0	0	1	0	0	0	0	0	0	0	0	0	1
W	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	0	0	0	0	1	0	1	0	0	0	0	0	2
NW	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	0	0	2	1	1	2	0	0	0	0	0	0	6
Totals	12	221	346	316	46	9	2	0	0	0	0	0	952

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	68
Number of Valid Hours for this Table	952
Total Hours for the Period	8760

TABLE 3-2
(continued)

Hours at Each Wind Speed and Direction

Period of Record = 1/1/2007 00:00 12/31/2007 23:00 Total Period

Elevation: **Speed:** 10M SPD **Direction:** 10M WD **Lapse:** DT60-10

Stability Class G Delta Temperature Extremely Stable

Wind Speed (m/s)

Wind Direction (from)	0.23 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	0	0	0	0	0	0	0	0	0	0	0	0	0
NNE	1	1	7	1	0	0	0	0	0	0	0	0	10
NE	0	16	63	22	4	0	0	0	0	0	0	0	105
ENE	2	48	188	168	9	0	0	0	0	0	0	0	415
E	2	31	47	14	1	0	0	0	0	0	0	0	95
ESE	1	12	12	4	0	0	0	0	0	0	0	0	29
SE	1	6	11	2	0	0	0	0	0	0	0	0	20
SSE	1	1	6	0	0	0	0	0	0	0	0	0	8
S	0	0	2	4	0	0	0	0	0	0	0	0	6
SSW	0	0	0	1	1	0	0	0	0	0	0	0	2
SW	0	0	0	1	0	0	0	0	0	0	0	0	1
WSW	0	0	0	0	0	0	0	0	0	0	0	0	0
W	0	0	0	1	0	0	0	0	0	0	0	0	1
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	0	0	1	0	0	0	0	0	0	0	0	0	1
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	8	115	337	218	15	0	0	0	0	0	0	0	693

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	68
Number of Valid Hours for this Table	693
Total Hours for the Period	8760

TABLE 3-2
(continued)

Hours at Each Wind Speed and Direction

Period of Record = 1/1/2007 00:00 12/31/2007 23:00 Total Period

Elevation: **Speed:** 10M SPD **Direction:** 10M WD **Lapse:** DT60-10

Summary of All Stability Classes Delta Temperature

Wind Speed (m/s)

Wind Direction (from)	0.23 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	0	9	13	47	77	138	199	7	0	0	0	0	490
NNE	1	14	54	149	150	190	112	4	0	0	0	0	674
NE	3	60	192	258	122	114	55	0	0	0	0	0	804
ENE	16	191	471	450	57	32	10	1	0	0	0	0	1228
E	19	192	222	85	32	15	12	1	0	0	0	0	578
ESE	14	107	121	72	14	15	12	0	0	0	0	0	355
SE	9	68	112	73	39	40	32	1	0	0	0	0	374
SSE	4	30	87	109	58	37	18	1	0	0	0	0	344
S	3	32	64	166	107	163	53	3	0	0	0	0	591
SSW	2	17	36	157	174	232	71	1	0	0	0	0	690
SW	1	5	23	79	87	292	342	65	2	0	0	0	896
WSW	0	3	7	16	37	79	220	115	16	0	0	0	493
W	0	0	3	18	20	47	116	76	3	0	0	0	283
WNW	0	2	0	13	13	40	81	25	4	0	0	0	178
NW	0	1	1	12	30	61	166	91	5	0	0	0	367
NNW	0	1	4	13	12	74	195	48	0	0	0	0	347
Totals	72	732	1410	1717	1029	1569	1694	439	30	0	0	0	8692

Number of Calm Hours for this Table	0
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	68
Number of Valid Hours for this Table	8692
Total Hours for the Period	8760

TABLE 3-3

JOINT FRQUENCY DISTRIBUTION OF WIND SPEED AND WIND DIRECTION 60m VERSUS DELTA TEMPERATURE 60-10m FOR THE PERIOD OF JANUARY 1, 2007 THROUGH DECEMBER 31, 2007

Hours at Each Wind Speed and Direction

Period of Record = 1/1/2007 00:00 12/31/2007 23:00 Total Period

Elevation: **Speed:** 60M SPD **Direction:** 60M WD **Lapse:** DT60-10

Stability Class A Delta Temperature Extremely Unstable

Wind Speed (m/s)

Wind Direction (from)	0.23 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	0	0	0	0	0	0	1	0	0	0	0	0	1
NNE	0	0	0	0	2	0	1	1	0	0	0	0	4
NE	0	0	0	0	0	0	0	0	0	0	0	0	0
ENE	0	0	1	1	0	0	0	0	0	0	0	0	2
E	0	0	0	1	0	0	0	0	0	0	0	0	1
ESE	0	0	1	1	0	0	0	0	0	0	0	0	2
SE	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	1	0	0	0	0	0	0	0	0	1
S	0	0	2	0	0	0	0	1	0	0	0	0	3
SSW	0	0	0	1	2	0	1	0	0	0	0	0	4
SW	0	0	0	0	2	1	13	6	1	0	0	0	23
WSW	0	0	0	0	0	0	0	1	1	0	0	0	2
W	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	0	0	4	5	6	1	16	9	2	0	0	0	43

Number of Calm Hours for this Table	1
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	124
Number of Valid Hours for this Table	43
Total Hours for the Period	8760

TABLE 3-3
(continued)

Hours at Each Wind Speed and Direction

Period of Record = 1/1/2007 00:00 12/31/2007 23:00 Total Period

Elevation: **Speed:** 60M SPD **Direction:** 60M WD **Lapse:** DT60-10

Stability Class B Delta Temperature Moderately Unstable

Wind Speed (m/s)

Wind Direction (from)	0.23 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	0	0	0	0	0	1	3	4	0	0	0	0	8
NNE	0	0	0	0	1	4	3	6	0	0	0	0	14
NE	0	0	0	1	0	2	2	5	0	0	0	0	10
ENE	0	0	0	0	0	1	0	0	0	0	0	0	1
E	0	0	0	0	0	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	1	0	0	0	0	1
S	0	0	0	1	0	0	1	0	0	0	0	0	2
SSW	0	0	0	0	0	0	13	0	0	0	0	0	13
SW	0	0	0	0	0	1	17	8	0	0	0	0	26
WSW	0	0	0	0	0	0	2	4	2	0	0	0	8
W	0	0	0	0	0	0	0	0	0	0	0	0	0
WNW	0	0	0	0	0	0	0	0	0	0	0	0	0
NW	0	0	0	0	0	0	0	0	0	0	0	0	0
NNW	0	0	0	0	0	0	0	0	0	0	0	0	0
Totals	0	0	0	2	1	9	41	28	2	0	0	0	83

Number of Calm Hours for this Table	1
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	124
Number of Valid Hours for this Table	83
Total Hours for the Period	8760

TABLE 3-3
(continued)

Hours at Each Wind Speed and Direction

Period of Record = 1/1/2007 00:00 12/31/2007 23:00 Total Period

Elevation: **Speed:** 60M SPD **Direction:** 60M WD **Lapse:** DT60-10

Stability Class C Delta Temperature Slightly Unstable

Wind Speed (m/s)

Wind Direction (from)	0.23 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	0	0	0	1	0	0	18	8	0	0	0	0	27
NNE	0	0	0	0	1	4	24	7	2	0	0	0	38
NE	0	0	1	1	3	9	14	0	1	0	0	0	29
ENE	0	0	0	3	2	1	3	0	0	0	0	0	9
E	0	0	0	1	1	0	0	0	0	0	0	0	2
ESE	0	0	0	0	0	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	3	3	0	0	0	0	6
SSW	0	0	0	0	0	3	13	0	0	0	0	0	16
SW	0	0	0	0	0	9	77	15	2	0	0	0	103
WSW	0	0	0	0	0	0	15	19	7	1	0	0	42
W	0	0	0	0	0	0	1	0	1	0	0	0	2
WNW	0	0	0	0	1	0	1	0	0	0	0	0	2
NW	0	0	0	0	0	2	5	5	3	0	0	0	15
NNW	0	0	0	0	0	2	12	4	1	0	0	0	19
Totals	0	0	1	6	8	30	186	61	17	1	0	0	310

Number of Calm Hours for this Table	1
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	124
Number of Valid Hours for this Table	310
Total Hours for the Period	8760

TABLE 3-3
(continued)

Hours at Each Wind Speed and Direction

Period of Record = 1/1/2007 00:00 12/31/2007 23:00 Total Period

Elevation: **Speed:** 60M SPD **Direction:** 60M WD **Lapse:** DT60-10

Stability Class D Delta Temperature Neutral

Wind Speed (m/s)

Wind Direction (from)	0.23 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	1	0	4	14	18	45	146	50	3	0	0	0	281
NNE	1	8	7	32	30	92	169	72	19	0	0	0	430
NE	0	7	15	38	26	74	83	34	4	0	0	0	281
ENE	1	5	18	29	24	33	23	1	3	0	0	0	137
E	1	9	8	14	22	16	21	13	1	0	0	0	105
ESE	1	6	9	13	10	11	17	11	0	0	0	0	78
SE	0	8	8	16	18	32	30	23	0	0	0	0	135
SSE	1	4	9	25	20	29	35	12	0	0	0	0	135
S	0	5	12	24	22	34	75	46	1	0	0	0	219
SSW	1	2	6	37	56	76	91	46	10	0	0	0	325
SW	0	2	6	23	39	103	179	85	30	1	0	0	468
WSW	0	0	1	8	22	31	149	216	179	17	0	0	623
W	0	1	0	3	8	26	74	133	77	3	0	0	325
WNW	0	1	0	1	3	19	93	76	23	0	0	0	216
NW	0	0	0	2	6	19	94	131	48	0	0	0	300
NNW	0	0	0	2	5	14	97	102	12	0	0	0	232
Totals	7	58	103	281	329	654	1376	1051	410	21	0	0	4290

Number of Calm Hours for this Table	1
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	124
Number of Valid Hours for this Table	4290
Total Hours for the Period	8760

TABLE 3-3
(continued)

Hours at Each Wind Speed and Direction

Period of Record = 1/1/2007 00:00 12/31/2007 23:00 Total Period

Elevation: **Speed:** 60M SPD **Direction:** 60M WD **Lapse:** DT60-10

Stability Class E Delta Temperature Slightly Stable

Wind Speed (m/s)

Wind Direction (from)	0.23 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	0	3	6	21	19	39	45	1	0	0	0	0	134
NNE	1	7	8	68	69	135	44	8	0	0	0	0	340
NE	4	18	28	75	26	46	49	4	1	0	0	0	251
ENE	2	12	22	28	12	17	10	3	0	0	0	0	106
E	1	11	20	15	8	5	5	2	0	0	0	0	67
ESE	1	8	19	16	2	4	1	1	0	0	0	0	52
SE	1	11	19	20	12	13	11	1	1	0	0	0	89
SSE	1	10	10	27	17	20	23	1	2	0	0	0	111
S	1	4	14	30	18	36	69	23	6	3	0	0	204
SSW	0	1	5	35	31	53	107	40	7	0	0	0	279
SW	0	5	7	17	25	66	130	36	2	1	0	0	289
WSW	0	0	3	4	8	29	60	66	22	0	0	0	192
W	0	0	1	4	2	11	13	7	1	0	0	0	39
WNW	0	1	0	0	1	10	13	5	4	0	0	0	34
NW	1	1	2	3	3	6	25	4	1	0	0	0	46
NNW	0	0	4	5	6	9	22	3	0	0	0	0	49
Totals	13	92	168	368	259	499	627	205	47	4	0	0	2282

Number of Calm Hours for this Table	1
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	124
Number of Valid Hours for this Table	2282
Total Hours for the Period	8760

TABLE 3-3
(continued)

Hours at Each Wind Speed and Direction

Period of Record = 1/1/2007 00:00 12/31/2007 23:00 Total Period

Elevation: **Speed:** 60M SPD **Direction:** 60M WD **Lapse:** DT60-10

Stability Class F Delta Temperature Moderately Stable

Wind Speed (m/s)

Wind Direction (from)	0.23 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	0	2	3	21	26	58	11	1	0	0	0	0	122
NNE	1	3	5	70	111	117	14	0	0	0	0	0	321
NE	2	8	14	36	29	13	0	0	0	0	0	0	102
ENE	1	9	19	18	6	4	0	0	0	0	0	0	57
E	0	0	15	13	5	2	1	0	0	0	0	0	36
ESE	0	6	11	6	3	1	0	0	0	0	0	0	27
SE	0	3	6	8	1	1	1	0	0	0	0	0	20
SSE	0	3	2	12	13	3	1	0	0	0	0	0	34
S	0	2	5	14	7	15	6	1	0	0	0	0	50
SSW	0	0	3	7	13	22	11	0	0	0	0	0	56
SW	0	0	2	5	7	20	22	2	0	0	0	0	58
WSW	0	0	2	3	0	3	13	6	0	0	0	0	27
W	0	0	0	0	0	1	0	0	1	0	0	0	2
WNW	0	0	0	1	3	0	1	0	0	0	0	0	5
NW	0	0	1	0	4	4	2	0	0	0	0	0	11
NNW	0	0	3	2	2	4	3	0	0	0	0	0	14
Totals	4	36	91	216	230	268	86	10	1	0	0	0	942

Number of Calm Hours for this Table	1
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	124
Number of Valid Hours for this Table	942
Total Hours for the Period	8760

TABLE 3-3
(continued)

Hours at Each Wind Speed and Direction

Period of Record = 1/1/2007 00:00 12/31/2007 23:00 Total Period

Elevation: **Speed:** 60M SPD **Direction:** 60M WD **Lapse:** DT60-10

Stability Class G Delta Temperature Extremely Stable

Wind Speed (m/s)

Wind Direction (from)	0.23 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	0	0	1	9	19	30	5	0	0	0	0	0	64
NNE	1	0	4	36	78	78	5	0	0	0	0	0	202
NE	0	4	8	42	39	11	1	0	0	0	0	0	105
ENE	0	1	9	18	3	1	0	0	0	0	0	0	32
E	1	5	9	12	2	0	0	0	0	0	0	0	29
ESE	0	3	8	12	3	0	0	0	0	0	0	0	26
SE	0	2	5	9	2	1	0	0	0	0	0	0	19
SSE	0	2	1	10	4	3	0	0	0	0	0	0	20
S	1	0	5	16	8	19	7	0	0	0	0	0	56
SSW	0	0	3	8	13	15	22	0	0	0	0	0	61
SW	0	2	1	3	8	14	9	0	0	0	0	0	37
WSW	0	0	1	0	3	5	4	0	0	0	0	0	13
W	0	0	0	1	0	0	1	0	0	0	0	0	2
WNW	0	0	0	0	1	4	2	0	0	0	0	0	7
NW	0	0	0	1	1	2	4	0	0	0	0	0	8
NNW	0	0	0	2	1	1	0	0	0	0	0	0	4
Totals	3	19	55	179	185	184	60	0	0	0	0	0	685

Number of Calm Hours for this Table	1
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	124
Number of Valid Hours for this Table	685
Total Hours for the Period	8760

TABLE 3-3
(continued)

Hours at Each Wind Speed and Direction

Period of Record = 1/1/2007 00:00 12/31/2007 23:00 Total Period
Elevation: **Speed:** 60M SPD **Direction:** 60M WD **Lapse:** DT60-10

Summary of All Stability Classes Delta Temperature

Wind Speed (m/s)

Wind Direction (from)	0.23 - 0.50	0.51 - 0.75	0.76 - 1.0	1.1 - 1.5	1.6 - 2.0	2.1 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 10.0	10.1 - 13.0	13.1 - 18.0	> 18.0	Total
N	1	5	14	66	82	173	229	64	3	0	0	0	637
NNE	4	18	24	206	292	430	260	94	21	0	0	0	1349
NE	6	37	66	193	123	155	149	43	6	0	0	0	778
ENE	4	27	69	97	47	57	36	4	3	0	0	0	344
E	3	25	52	56	38	23	27	15	1	0	0	0	240
ESE	2	23	48	48	18	16	18	12	0	0	0	0	185
SE	1	24	38	53	33	47	42	24	1	0	0	0	263
SSE	2	19	22	75	54	55	59	14	2	0	0	0	302
S	2	11	38	85	55	104	161	74	7	3	0	0	540
SSW	1	3	17	88	115	169	258	86	17	0	0	0	754
SW	0	9	16	48	81	214	447	152	35	2	0	0	1004
WSW	0	0	7	15	33	68	243	312	211	18	0	0	907
W	0	1	1	8	10	38	89	140	80	3	0	0	370
WNW	0	2	0	2	9	33	110	81	27	0	0	0	264
NW	1	1	3	6	14	33	130	140	52	0	0	0	380
NNW	0	0	7	11	14	30	134	109	13	0	0	0	318
Totals	27	205	422	1057	1018	1645	2392	1364	479	26	0	0	8635

Number of Calm Hours for this Table	1
Number of Variable Direction Hours for this Table	0
Number of Invalid Hours	124
Number of Valid Hours for this Table	8635
Total Hours for the Period	8760

TABLE 3-4

2007 SSES ANNUAL RELATIVE CONCENTRATIONS
NO DECAY, UNDEPLETED X/Q (sec/m^3)

	Miles									
Direction From	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 10	10 - 20	20 - 30	30 - 40	40 - 50
N	4.70E-06	9.00E-07	3.71E-07	1.94E-07	1.24E-07	4.54E-08	1.22E-08	5.87E-09	3.67E-09	2.58E-09
NNE	8.82E-06	1.77E-06	7.84E-07	4.17E-07	2.69E-07	9.91E-08	2.69E-08	1.31E-08	8.29E-09	5.90E-09
NE	1.89E-05	3.49E-06	1.60E-06	9.15E-07	6.08E-07	2.41E-07	7.36E-08	3.71E-08	2.39E-08	1.74E-08
ENE	4.95E-05	9.05E-06	4.42E-06	2.63E-06	1.76E-06	7.00E-07	2.04E-07	9.94E-08	6.44E-08	4.74E-08
E	2.15E-05	3.90E-06	1.72E-06	9.72E-07	6.51E-07	2.66E-07	8.43E-08	4.27E-08	2.75E-08	2.01E-08
ESE	1.26E-05	2.44E-06	1.10E-06	6.18E-07	4.10E-07	1.66E-07	4.61E-08	2.03E-08	1.30E-08	9.42E-09
SE	1.20E-05	2.35E-06	1.07E-06	6.07E-07	4.03E-07	1.64E-07	4.11E-08	1.52E-08	9.67E-09	6.96E-09
SSE	8.76E-06	1.71E-06	7.57E-07	4.23E-07	2.84E-07	1.22E-07	3.16E-08	1.13E-08	7.15E-09	5.12E-09
S	8.20E-06	1.76E-06	8.47E-07	4.87E-07	3.33E-07	1.54E-07	4.21E-08	1.44E-08	9.10E-09	6.49E-09
SSW	9.34E-06	1.90E-06	8.66E-07	4.87E-07	3.22E-07	1.33E-07	3.41E-08	1.29E-08	8.11E-09	5.76E-09
SW	6.83E-06	1.38E-06	6.51E-07	3.71E-07	2.47E-07	1.07E-07	2.72E-08	9.03E-09	5.66E-09	3.98E-09
WSW	3.32E-06	6.49E-07	3.00E-07	1.75E-07	1.19E-07	5.58E-08	1.71E-08	6.32E-09	3.20E-09	1.73E-09
W	1.65E-06	3.15E-07	1.35E-07	7.36E-08	4.81E-08	1.95E-08	5.20E-09	2.08E-09	1.27E-09	8.80E-10
WNW	1.25E-06	2.30E-07	9.21E-08	4.81E-08	3.06E-08	1.12E-08	3.03E-09	1.42E-09	8.73E-10	6.02E-10
NW	2.46E-06	4.56E-07	1.81E-07	9.19E-08	5.82E-08	2.09E-08	5.46E-09	2.56E-09	1.57E-09	1.08E-09
NNW	2.45E-06	4.63E-07	1.96E-07	1.04E-07	6.57E-08	2.29E-08	5.71E-09	2.72E-09	1.69E-09	1.18E-09

TABLE 3-5

2007 SSES ANNUAL RELATIVE CONCENTRATIONS
2.26-DAY DECAY, UNDEPLETED X/Q (sec/m^3)

	Miles									
Direction From	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 10	10 - 20	20 - 30	30 - 40	40 - 50
N	4.69E-06	8.95E-07	3.67E-07	1.91E-07	1.22E-07	4.42E-08	1.16E-08	5.35E-09	3.22E-09	2.18E-09
NNE	8.80E-06	1.76E-06	7.75E-07	4.11E-07	2.63E-07	9.57E-08	2.50E-08	1.16E-08	7.00E-09	4.75E-09
NE	1.89E-05	3.45E-06	1.57E-06	8.96E-07	5.92E-07	2.30E-07	6.71E-08	3.18E-08	1.92E-08	1.32E-08
ENE	4.93E-05	8.96E-06	4.35E-06	2.57E-06	1.71E-06	6.66E-07	1.85E-07	8.43E-08	5.12E-08	3.53E-08
E	2.14E-05	3.85E-06	1.68E-06	9.46E-07	6.28E-07	2.50E-07	7.49E-08	3.50E-08	2.09E-08	1.41E-08
ESE	1.25E-05	2.41E-06	1.08E-06	6.01E-07	3.96E-07	1.56E-07	4.10E-08	1.67E-08	9.89E-09	6.62E-09
SE	1.20E-05	2.33E-06	1.06E-06	5.92E-07	3.90E-07	1.56E-07	3.70E-08	1.27E-08	7.54E-09	5.06E-09
SSE	8.73E-06	1.70E-06	7.46E-07	4.14E-07	2.76E-07	1.16E-07	2.88E-08	9.64E-09	5.76E-09	3.87E-09
S	8.18E-06	1.74E-06	8.37E-07	4.79E-07	3.25E-07	1.48E-07	3.89E-08	1.26E-08	7.58E-09	5.13E-09
SSW	9.32E-06	1.88E-06	8.57E-07	4.80E-07	3.15E-07	1.28E-07	3.19E-08	1.15E-08	6.96E-09	4.73E-09
SW	6.82E-06	1.37E-06	6.45E-07	3.67E-07	2.44E-07	1.05E-07	2.59E-08	8.31E-09	5.03E-09	3.43E-09
WSW	3.32E-06	6.46E-07	2.98E-07	1.74E-07	1.18E-07	5.46E-08	1.64E-08	5.87E-09	2.88E-09	1.51E-09
W	1.65E-06	3.13E-07	1.34E-07	7.29E-08	4.75E-08	1.91E-08	4.99E-09	1.94E-09	1.16E-09	7.77E-10
WNW	1.25E-06	2.29E-07	9.14E-08	4.77E-08	3.02E-08	1.10E-08	2.90E-09	1.32E-09	7.87E-10	5.27E-10
NW	2.46E-06	4.54E-07	1.80E-07	9.11E-08	5.76E-08	2.05E-08	5.25E-09	2.40E-09	1.43E-09	9.64E-10
NNW	2.45E-06	4.61E-07	1.95E-07	1.03E-07	6.49E-08	2.24E-08	5.48E-09	2.53E-09	1.53E-09	1.03E-09

TABLE 3-6

2007 SSES ANNUAL RELATIVE CONCENTRATIONS
8-DAY DECAY, DEPLETED X/Q (sec/m^3)

	Miles									
Direction From	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 10	10 - 20	20 - 30	30 - 40	40 - 50
N	4.30E-06	7.62E-07	3.00E-07	1.50E-07	9.27E-08	3.16E-08	7.55E-09	3.16E-09	1.77E-09	1.13E-09
NNE	8.06E-06	1.50E-06	6.34E-07	3.23E-07	2.01E-07	6.88E-08	1.65E-08	7.01E-09	3.96E-09	2.55E-09
NE	1.73E-05	2.95E-06	1.29E-06	7.07E-07	4.54E-07	1.67E-07	4.49E-08	1.96E-08	1.12E-08	7.39E-09
ENE	4.52E-05	7.65E-06	3.57E-06	2.03E-06	1.31E-06	4.84E-07	1.25E-07	5.24E-08	3.02E-08	2.00E-08
E	1.96E-05	3.30E-06	1.39E-06	7.50E-07	4.85E-07	1.83E-07	5.11E-08	2.23E-08	1.28E-08	8.36E-09
ESE	1.15E-05	2.06E-06	8.90E-07	4.77E-07	3.06E-07	1.14E-07	2.79E-08	1.06E-08	6.03E-09	3.92E-09
SE	1.10E-05	1.99E-06	8.66E-07	4.69E-07	3.01E-07	1.14E-07	2.50E-08	7.97E-09	4.51E-09	2.92E-09
SSE	8.00E-06	1.45E-06	6.11E-07	3.27E-07	2.12E-07	8.41E-08	1.93E-08	5.95E-09	3.37E-09	2.17E-09
S	7.49E-06	1.49E-06	6.85E-07	3.77E-07	2.49E-07	1.07E-07	2.58E-08	7.65E-09	4.33E-09	2.79E-09
SSW	8.53E-06	1.61E-06	7.00E-07	3.77E-07	2.41E-07	9.21E-08	2.09E-08	6.89E-09	3.89E-09	2.50E-09
SW	6.24E-06	1.17E-06	5.26E-07	2.87E-07	1.85E-07	7.47E-08	1.68E-08	4.88E-09	2.74E-09	1.75E-09
WSW	3.04E-06	5.50E-07	2.43E-07	1.36E-07	8.96E-08	3.89E-08	1.06E-08	3.42E-09	1.55E-09	7.64E-10
W	1.51E-06	2.67E-07	1.09E-07	5.71E-08	3.61E-08	1.36E-08	3.22E-09	1.13E-09	6.21E-10	3.90E-10
WNW	1.14E-06	1.95E-07	7.45E-08	3.73E-08	2.30E-08	7.83E-09	1.87E-09	7.69E-10	4.24E-10	2.66E-10
NW	2.25E-06	3.86E-07	1.46E-07	7.13E-08	4.37E-08	1.46E-08	3.38E-09	1.39E-09	7.66E-10	4.81E-10
NNW	2.24E-06	3.92E-07	1.59E-07	8.09E-08	4.93E-08	1.59E-08	3.53E-09	1.47E-09	8.22E-10	5.21E-10

TABLE 3-7

2007 SSES ANNUAL RELATIVE DEPOSITION
D/Q (meters^{-2})

	Miles									
Direction From	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 10	10 - 20	20 - 30	30 - 40	40 - 50
N	2.85E-08	4.19E-09	1.72E-09	8.15E-10	4.82E-10	1.53E-10	3.65E-11	1.34E-11	7.18E-12	4.51E-12
NNE	3.64E-08	5.63E-09	2.44E-09	1.16E-09	6.84E-10	2.13E-10	4.97E-11	1.83E-11	9.77E-12	6.13E-12
NE	4.05E-08	6.12E-09	2.61E-09	1.27E-09	7.51E-10	2.42E-10	5.93E-11	2.18E-11	1.16E-11	7.32E-12
ENE	6.62E-08	1.03E-08	4.58E-09	2.24E-09	1.32E-09	4.19E-10	9.54E-11	3.34E-11	1.79E-11	1.12E-11
E	3.02E-08	4.41E-09	1.80E-09	8.57E-10	5.11E-10	1.69E-10	4.27E-11	1.57E-11	8.39E-12	5.27E-12
ESE	2.13E-08	3.22E-09	1.37E-09	6.62E-10	3.95E-10	1.31E-10	2.98E-11	9.62E-12	5.14E-12	3.23E-12
SE	2.68E-08	4.07E-09	1.78E-09	8.77E-10	5.27E-10	1.78E-10	3.70E-11	1.01E-11	5.41E-12	3.40E-12
SSE	2.33E-08	3.47E-09	1.48E-09	7.31E-10	4.45E-10	1.59E-10	3.50E-11	9.30E-12	4.96E-12	3.12E-12
S	2.88E-08	4.61E-09	2.17E-09	1.11E-09	6.94E-10	2.68E-10	6.27E-11	1.61E-11	8.58E-12	5.39E-12
SSW	4.03E-08	6.16E-09	2.76E-09	1.40E-09	8.47E-10	2.95E-10	6.56E-11	1.87E-11	1.00E-11	6.28E-12
SW	4.70E-08	7.46E-09	3.51E-09	1.82E-09	1.12E-09	4.22E-10	9.53E-11	2.43E-11	1.30E-11	8.14E-12
WSW	2.96E-08	4.56E-09	2.13E-09	1.14E-09	7.25E-10	2.99E-10	8.42E-11	2.43E-11	1.07E-11	5.22E-12
W	1.42E-08	2.14E-09	9.25E-10	4.61E-10	2.81E-10	1.01E-10	2.46E-11	7.70E-12	4.11E-12	2.58E-12
WNW	9.92E-09	1.43E-09	5.77E-10	2.76E-10	1.64E-10	5.30E-11	1.31E-11	4.82E-12	2.58E-12	1.62E-12
NW	2.21E-08	3.24E-09	1.30E-09	6.03E-10	3.57E-10	1.13E-10	2.72E-11	1.00E-11	5.34E-12	3.35E-12
NNW	2.13E-08	3.16E-09	1.33E-09	6.45E-10	3.78E-10	1.15E-10	2.59E-11	9.54E-12	5.09E-12	3.20E-12

TABLE 3-8

2007 ATMOSPHERIC DISPERSION ESTIMATES FOR RETDAS INPUT AT SELECTED LOCATIONS

AFFECTED SECTOR	LOCATION	MILES	X/Q(1)	X/Q DEC(2)	X/Q DEC+DEP(3)	DEPOSITION(4)
11/SW	Maximum (X/Q) Site Boundary	0.61	1.33E-05	1.32E-05	1.19E-05	2.74E-08
9/S	Closest (X/Q) Site Boundary	0.38	6.67E-06	6.66E-06	6.21E-06	4.31E-08
12 / WSW	Maximum (X/Q) Residence	1.3	1.12E-05	1.11E-05	9.60E-06	1.30E-08
7 / SE	Maximum (D/Q) Residence	0.5	2.33E-06	2.32E-06	2.13E-06	2.09E-08
7 / SE	Maximum (D/Q) Garden	0.6	1.78E-06	1.78E-06	1.61E-06	1.54E-08
12 / WSW	Maximum (D/Q) Dairy	1.7	7.66E-06	7.57E-06	6.40E-06	8.50E-09
12 / WSW	Maximum (D/Q) Meat Producer	1.7	7.66E-06	7.57E-06	6.40E-06	8.50E-09
3 / NE	Riverlands / EIC	0.7	4.25E-06	4.24E-06	3.79E-06	2.72E-08
12 / WSW	Tower's Club	0.5	3.91E-05	3.90E-05	3.57E-05	5.23E-08
5 / E	East Gate	0.5	1.78E-06	1.78E-06	1.63E-06	1.54E-08

NEAREST RESIDENCE WITHIN A 5-MILE RADIUS BY SECTOR

SECTOR NUMBER	AFFECTED SECTOR	NAME	MILES	X/Q	X/Q DEC	X/Q DEC+DEP	DEPOSITION
1	N	H. Burd	1.3	2.13E-06	2.11E-06	1.82E-06	5.80E-09
2	NNE	E. Ashbridge III	1	3.42E-06	3.40E-06	2.98E-06	1.23E-08
3	NE	W. Tuggle	0.9	2.95E-06	2.94E-06	2.59E-06	1.78E-08
4	ENE	D. Barberi	2.1	3.89E-07	3.87E-07	3.20E-07	2.75E-09
5	E	L. Kozlowski/ W. Witts	1.4	3.46E-07	3.45E-07	2.95E-07	2.39E-09
6	ESE	R. Panetta	0.5	1.35E-06	1.35E-06	1.23E-06	1.07E-08
7	SE	J. Futoma	0.5	2.33E-06	2.32E-06	2.13E-06	2.09E-08
8	SSE	J. Naunczek	0.6	1.95E-06	1.95E-06	1.76E-06	1.63E-08
9	S	S. Slusser	1	1.70E-06	1.69E-06	1.48E-06	8.70E-09
10	SSW	S. Molnar	0.9	3.84E-06	3.82E-06	3.37E-06	1.38E-08
11	SW	F. Michael	1.5	3.51E-06	3.47E-06	2.97E-06	6.15E-09
12	WSW	F. Michael	1.3	1.12E-05	1.11E-05	9.60E-06	1.30E-08
13	W	F. Hummel	1.2	5.59E-06	5.53E-06	4.80E-06	6.60E-09
14	WNW	R. Orlando	0.8	6.67E-06	6.62E-06	5.90E-06	1.02E-08
15	NW	H. Long	0.8	6.44E-06	6.40E-06	5.69E-06	1.29E-08
16	NNW	G. John	0.6	5.83E-06	5.80E-06	5.26E-06	1.48E-08

NEAREST GARDEN WITHIN A 5-MILE RADIUS BY SECTOR

SECTOR NUMBER	AFFECTED SECTOR	NAME	MILES	X/Q	X/Q DEC	X/Q DEC+DEP	DEPOSITION
1	N	J. Wojcik	3.2	5.55E-07	5.46E-07	4.34E-07	1.31E-09
2	NNE	R. Chapin	2.3	1.01E-06	1.00E-06	8.24E-07	3.24E-09
3	NE	F. Kremski	2.6	6.25E-07	6.20E-07	5.04E-07	3.34E-09
4	ENE	G. Dennis	2.4	3.24E-07	3.21E-07	2.63E-07	2.30E-09
5	E	L. Kozlowski/ W. Witts	1.4	3.47E-07	3.45E-07	2.95E-07	2.39E-09
6	ESE	L. Travelpiece	2.5	9.17E-08	9.11E-08	7.42E-08	5.75E-10
7	SE	F. Scholl	0.6	1.78E-06	1.78E-06	1.61E-06	1.54E-08
8	SSE	H. Roinick	2.9	1.50E-07	1.49E-07	1.19E-07	9.80E-10
9	S	A. Kamir	1.2	1.27E-06	1.27E-06	1.09E-06	6.25E-09
10	SSW	S. Bodnar	1.2	2.47E-06	2.46E-06	2.13E-06	8.29E-09
11	SW	R. Broody	1.9	2.47E-06	2.44E-06	2.05E-06	4.20E-09
12	WSW	F. Michael	1.3	1.12E-05	1.11E-05	9.60E-06	1.30E-08
13	W	F. Hummel	1.2	5.59E-06	5.53E-06	4.80E-06	6.60E-09
14	WNW	P. Moskaluk	1.3	3.07E-06	3.04E-06	2.63E-06	4.19E-09
15	NW	D. Goff	1.8	1.80E-06	1.78E-06	1.50E-06	3.07E-09
16	NNW	P. Culver	4	3.34E-07	3.26E-07	2.54E-07	5.48E-10

TABLE 3-8
(continued)

NEAREST ANIMAL RAISED FOR MEAT CONSUMPTION WITHIN A 5-MILE RADIUS BY SECTOR

SECTOR NUMBER	AFFECTED SECTOR	NAME	MILES	X/Q	X/Q DEC	X/Q DEC+DEP	DEPOSITION
2	NNE	R.Chapin	2.3	1.01E-06	1.00E-06	8.24E-07	3.24E-09
4	ENE	G.Dennis	2.4	3.24E-07	3.21E-07	2.63E-07	2.30E-09
10	SSW	C. & K. Drasher	3.5	3.86E-07	3.80E-07	2.99E-07	1.08E-09
12	WSW	T. & M Berger	1.7	7.66E-06	7.57E-06	6.40E-06	8.50E-09

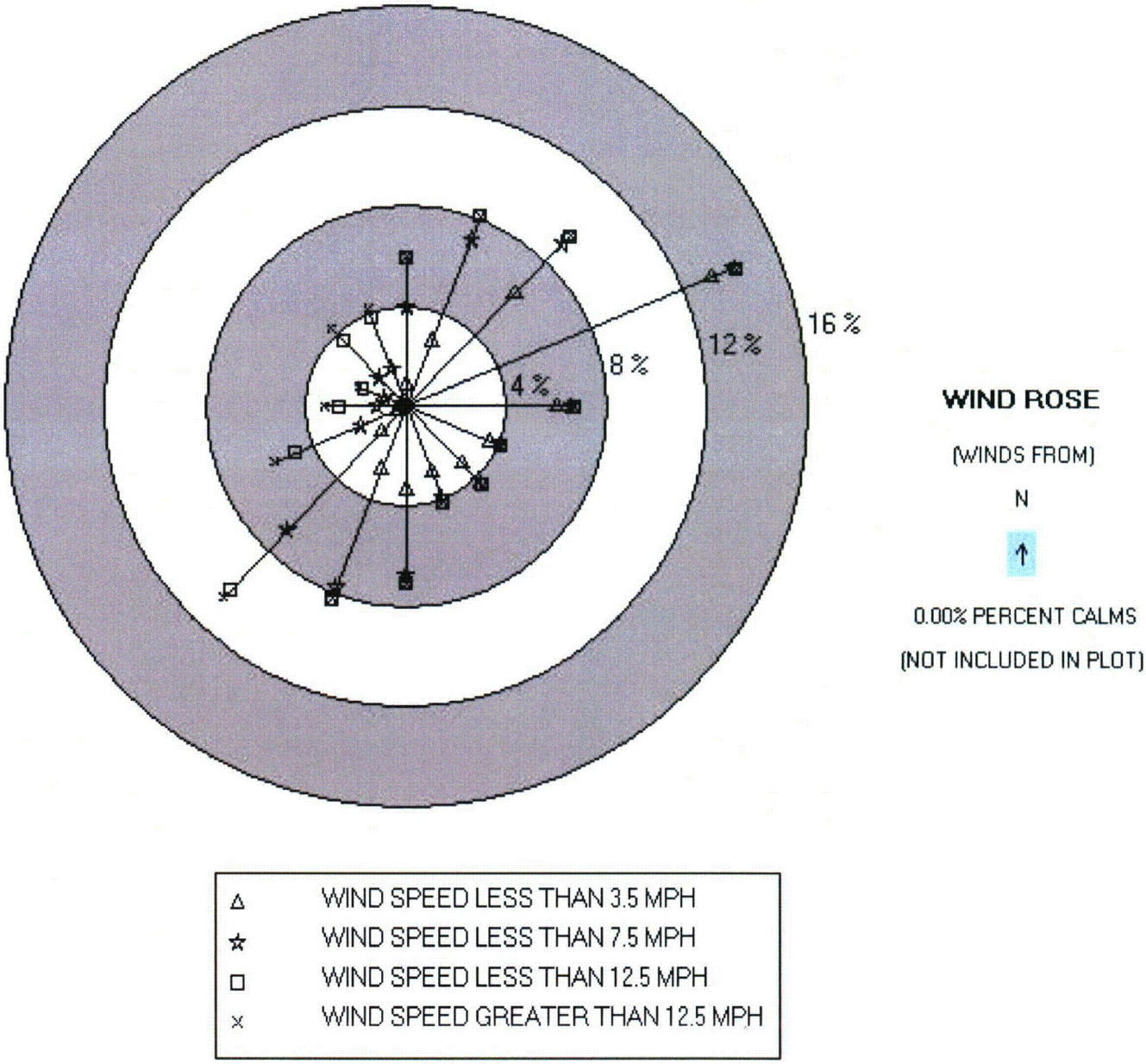
ALL DAIRY LOCATIONS

SECTOR NUMBER	AFFECTED SECTOR	NAME	MILES	X/Q	X/Q DEC	X/Q DEC+DEP	DEPOSITION
5	E	W.Bloss	4.5	4.73E-08	4.67E-08	3.55E-08	2.77E-10
6	ESE	F.Rinehimer	4.2	3.17E-08	3.13E-08	2.40E-08	1.72E-10
10	SSW	R. Ryman	3.1	5.13E-07	5.06E-07	4.03E-07	1.49E-09
10	SSW	C. & K. Drasher	3.5	3.86E-07	3.80E-07	2.99E-07	1.08E-09
10	SSW	K.Davis	14.01	3.06E-08	2.86E-08	1.90E-08	5.74E-11
12	WSW	T. & M. Berger	1.7	7.66E-06	7.57E-06	6.40E-06	8.50E-09
13	W	J. Dent	5	5.70E-07	4.87E-07	3.72E-07	3.81E-10

1	X/Q	RELATIVE CONCENTRATION (SEC/M^3)
2	X/Q DEC	DECAYED AND UNDEPLETED, HALF-LIFE 2.26 DAYS (SEC/M^3)
3	X/Q DEC+DEP	DECAYED AND DEPLETED, HALF-LIFE 8 DAYS (SEC/M^3)
4	DEPOSITION	RELATIVE DEPOSITION RATE (1/M^2)

FIGURE 3-1

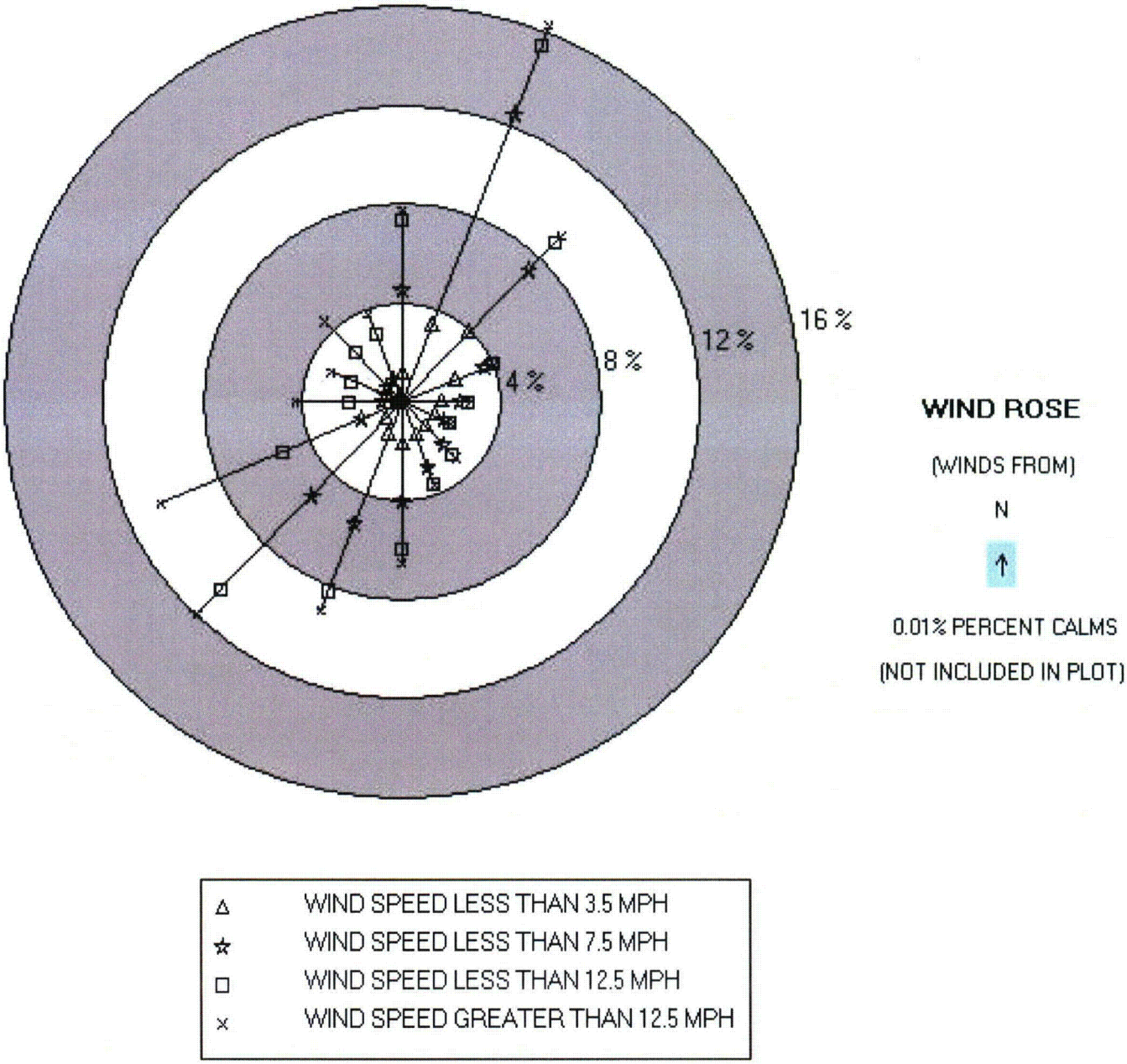
2007 ANNUAL WIND ROSE 10M LEVEL – PRIMARY TOWER



This wind rose displays the frequency of hourly average wind direction from a given sector. In 2007, the predominant wind direction occurred 14.1 % of the time from the ENE sector. The average wind speed was 4.8 mph and the average wind speed for the predominant sector (ENE) was 2.4 mph. The sector with the highest average wind speed was WSW (8.9 mph).

FIGURE 3-2

2007 ANNUAL WIND ROSE 60M LEVEL – PRIMARY TOWER

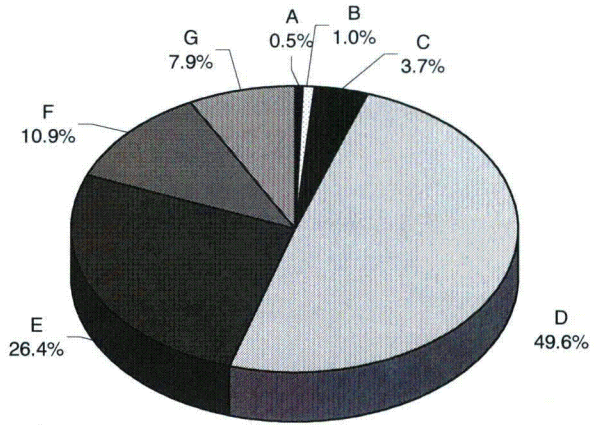


This wind rose displays the frequency of hourly average wind direction from a given sector. In 2007, the predominant wind direction occurred 14.6 % of the time from the NNE sector. The average wind speed was 7.6 mph and the average wind speed for the predominant sector (NNE) was 5.9 mph. The sector with the highest average wind speed was WSW (12.3 mph.).

FIGURE 3-3

PASQUIL STABILITY CLASS PREVALENCES DATA
Period: 2007

Joint Frequency Distributions at 10 Meters
Wind Speed and Direction 10M vs. Delta Temperature 60-10M
(Based on 8,692 Valid Hours)



SECTION 4

DOSE MEASUREMENTS AND ASSESSMENTS

Radiological Impact on Man

Sampling and analysis of airborne and waterborne effluents were performed in accordance with the frequencies, types of analysis, and Lower Limit of Detection (LLD) outlined in the PPL Susquehanna, LLC Technical Requirements Manual.

Radioactive material was detected in some of the airborne and waterborne effluent samples analyzed. Dose calculations using measured effluent activity levels, meteorological data from the current reporting period and average river flow dilution factors resulted in estimated doses to individuals at levels below 10 CFR 20 and 10 CFR 50, Appendix I limits. Direct radiation resulting from plant operation (reported in the 2007 Annual Radiological Environmental Operating Report) contributed a maximum of 3.21E-2 mrem (measured at TLD Location 9S2) at the Protected Area Boundary south of the plant. The maximum organ (including thyroid)/total body dose from all airborne effluent is 7.94E-1 mrem (CHILD, LUNG Table 4-4). The maximum organ/total body dose from all liquid effluent is 9.25E-4 mrem (CHILD LIVER Table 4-2). Conservatively adding the maximum organ (including thyroid)/total body dose from liquid and gaseous effluent and the maximum total body dose determined from direct radiation bounds the dose that any member of the public receives from station operations. The result (8.27E-1 mrem) is 3.3% of the 40CFR190 limit of 25 mrem to total body/organ (except thyroid) and 1.1% of the 40CFR190 limit of 75 mrem to the thyroid.

Doses to a maximally exposed member of the public from waterborne effluents are calculated for fish ingestion and shoreline exposure at the plant outfall, and drinking water ingestion at Danville, PA. Site specific parameters used in the calculations for the Danville receiver, specific for actual average blowdown and river level for the entire year are shown in Table 4-1.

TABLE 4-1

SITE-SPECIFIC PARAMETERS USED FOR RETDAS CALCULATIONS (DANVILLE RECEIVER) FOR 2007

PARAMETER	ENTIRE YEAR
Cooling Tower Blowdown (CFS)	20.5
Average Net River Level (ft.)	6.8
Dilution Factor at Danville[1]	413.2
Transit time to Danville (hr.)[1]	24.7

[1]From ODCM-QA-005, Att. E

Summaries of maximum individual doses resulting from airborne and waterborne radioactive effluent releases from each unit are given in Table 4-2. Meteorological data from Section 3 were used to calculate the dose from airborne effluents.

The Radioactive Effluent Release Report includes an assessment of the radiation dose from radioactive effluents to members of the public within the site boundary. Within the Site Boundary there are several areas frequented by members of the public. There are no significant exposure pathways from waterborne effluents in these areas. Doses from airborne effluent are calculated for members of the public for the following locations: Riverlands Energy Information Center, the Towers Club, and residence with the maximum X/Q value; the garden, dairy and meat producing farm with the maximum D/Q value; and the site boundary with the maximum X/Q value. Summaries of the calculated maximum doses within the site boundary and selected locations resulting from airborne effluents are presented in Table 4-4. The above referenced locations are shown on Figure 4-1.

In the area comprising the Riverlands recreation area, which surrounds the Energy Information Center, three pathways of radiation exposure can be identified: plume, ground, and inhalation. There are no significant exposure pathways from waterborne effluents in this area. There are approximately 100,000 visitors to the Riverlands/Energy Information Center complex each year. For dose calculations, it is assumed the visitor stays in the area for one hour. The calculated dose rate and collective dose for visitors to the Riverlands/Energy Information Center during 2007 are shown on Table 4-3.

Use of the RETDAS code yields calculated doses for the Riverlands area for the report period. These doses assume an occupancy factor of 100% for a member of the public during 2007. These calculated dose values are shown on Table 4-4.

Unit-2 High Offgas System Flow Event

Following the Unit-2 13th refuel/inspection outage during power ascension, offgas system flow was elevated (approx. 200 scfm). The elevated flow condition resulted in higher than normal Turbine building vent radiation monitor readings. Further investigation identified a percentage of offgas system flow was bypassing the offgas treatment system. Plant Chemistry sampled multiple locations in the effluent stream to support evaluation/quantification of the effluent release. The radionuclide distribution used in the quantification of the effluent release was based on a Unit-2 offgas pretreatment sample (while hydrogen water chemistry was in service). Offsite dose impact due to this event was minimal (<1% of the Gamma and Beta air dose limits).

TABLE 4-2

SUMMARY OF MAXIMUM INDIVIDUAL DOSES TO MEMBERS OF THE PUBLIC

DATA PERIOD: 1/1/07 TO 12/31/07

UNIT	EFFLUENT	AGE GROUP	APPLICABLE ORGAN	ESTIMATED MAXIMUM DOSE (MREM/MRAD)	LOCATION		PERCENT OF LIMIT	LIMIT (MREM/ MRAD)[2]
					DIST (MILES)	AFFECTED SECTOR		
1	Liquid[1]	Child	Total Body	9.05E-04	(3)		0.03	3
1	Liquid[1]	Child	Liver	9.25E-04	(3)		0.01	10
1	Noble Gas	N/A	Air Dose (Gamma-MRAD)	0.00E+00	0.5	WSW	0	10
1	Noble Gas	N/A	Air Dose (Beta-MRAD)	0.00E+00	0.5	WSW	0	20
1	Airborne Iodine, Tritium and Particulates	Child	Lung	3.88E-01	0.5	WSW	2.6	15
2	Liquid[1]	Child	Total Body	9.05E-04	(3)		0.03	3
2	Liquid[1]	Child	Liver	9.25E-04	(3)		0.01	10
2	Noble Gas	N/A	Air Dose (Gamma-MRAD)	1.81E-01	0.5	WSW	1.8	10
2	Noble Gas	N/A	Air Dose (Beta-MRAD)	8.73E-02	0.5	WSW	0.44	20
2	Airborne Iodine, Tritium and Particulates	Child	Lung	4.06E-01	0.5	WSW	2.7	15

[1] Estimated dose is based on a site total activity release equally divided between Unit 1 and Unit 2.

[2] 10 CFR 50, Appendix I limits are in terms of mrad or mrem/reactor-year for airborne and waterborne effluent from each unit.

[3] Doses from liquid effluent are estimated from fish ingestion and shoreline exposure at the site outfall and from the drinking water pathway at Danville, PA.

TABLE 4-3

CALCULATED COLLECTIVE DOSES TO MEMBERS OF THE PUBLIC WITHIN THE RIVERLANDS/ENERGY INFORMATION CENTER COMPLEX

DATA PERIOD: 1/1/07 TO 12/31/07

EFFLUENT	AGE GROUP	APPLICABLE ORGAN	DOSE RATE[1] (MREM/HR)	COLLECTIVE DOSE[2] (PERSON-REM)
Noble Gas	N/A	Total Body	2.24E-06	2.24E-04
Noble Gas	N/A	Skin	1.08E-06	1.08E-04
Iodine, Tritium and Particulates	Child	GI-LLI	1.09E-05	1.09E-03

[1]Estimated dose and dose rate is based on annual site total activity release.

[2]Collective dose is based on 100,000 person-hours.

TABLE 4-4

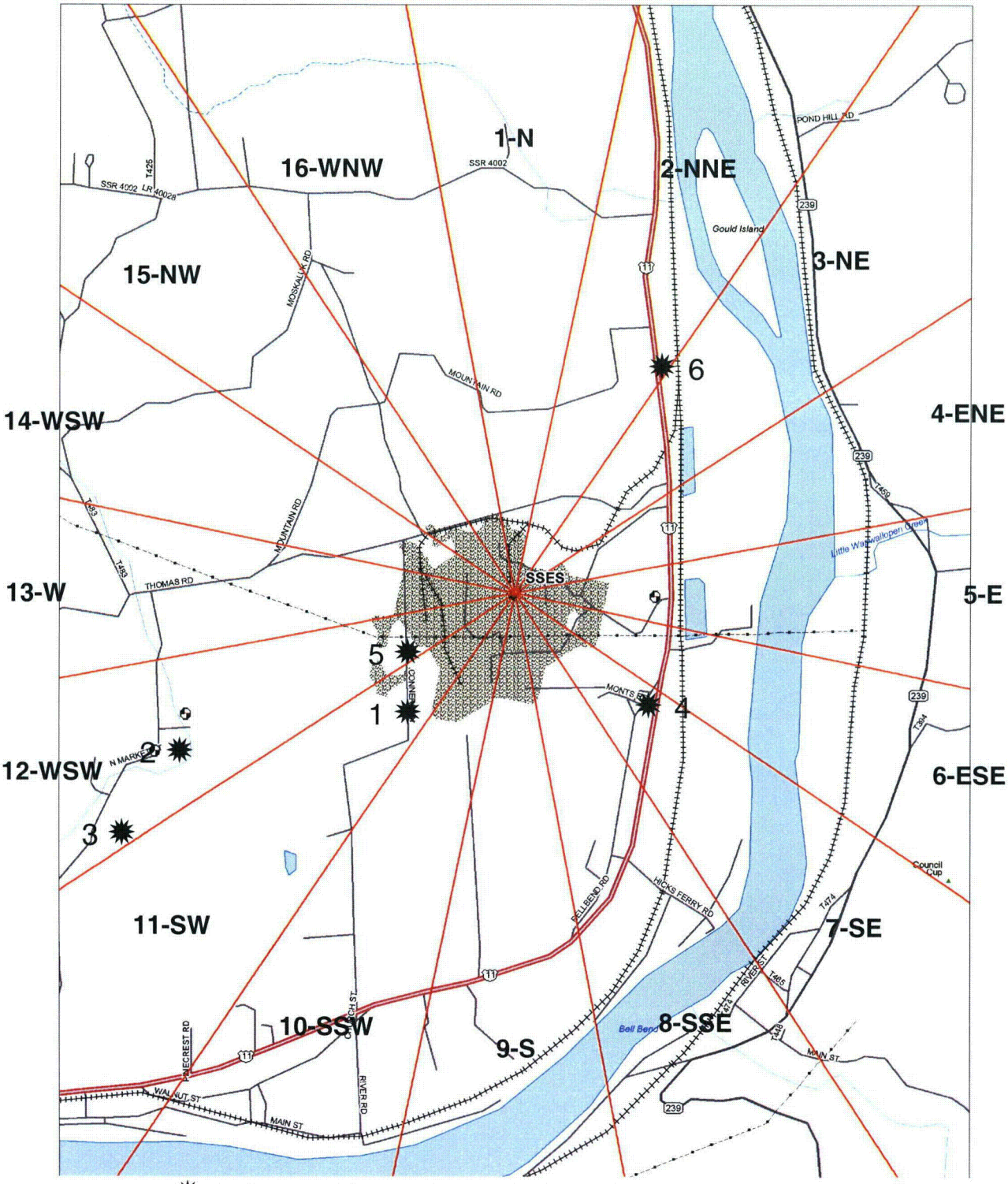
SUMMARY OF MAXIMUM INDIVIDUAL DOSES FROM AIRBORNE EFFLUENT

LOCATION	PATHWAY	MAXIMUM TOTAL BODY DOSE (MREM)		MAXIMUM ORGAN DOSE (MREM)		MAXIMUM THYROID DOSE (MREM)	
1. Maximum site boundary X/Q	Total (All)	2.73E-01	(CHILD)	2.74E-01	(CHILD, LUNG)	2.73E-01	(CHILD)
2. Maximum X/Q Residence	Total (All)	2.26E-01	(CHILD)	2.27E-01	(CHILD, LUNG)	2.25E-01	(CHILD)
3. Maximum D/Q Dairy + Maximum D/Q Meat	Total (All)	1.54E-01	(CHILD)	1.55E-01	(CHILD, LUNG)	1.54E-01	(CHILD)
4. Maximum D/Q Garden	Total (All)	4.16E-02	(CHILD)	4.20E-02	(CHILD, GI-LLI)	4.15E-02	(CHILD)
5. Tower's Club	Total (All)	7.91E-01	(CHILD)	7.94E-01	(CHILD, LUNG)	7.90E-01	(CHILD)
6. Riverland/EIC	Total (All)	9.52E-02	(CHILD)	9.59E-02	(CHILD,GI-LLI)	9.50E-02	(CHILD)

Note: The doses shown above are based on 100% occupancy at the indicated locations. They are based on a composite of all applicable pathways resulting in a total dose to the maximally exposed individual due to airborne effluents from both Unit-1 and Unit-2 operations.

FIGURE 4-1

AIRBORNE-DOSE CALCULATION LOCATIONS



✸ Indicates airborne-dose calculation location per Table 4-4

SECTION 5

CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL (ODCM), TECHNICAL REQUIREMENTS MANUAL (TRM) AND THE SOLID RADIOACTIVE WASTE PROCESS CONTROL PROGRAM

CHANGES TO THE OFFSITE DOSE CALCULATION MANUAL

The PPL Susquehanna, LLC ODCM consists of nine (9) individual procedures.

ODCM-QA-001, ODCM Introduction, was revised on November 15, 2007. The revision: 1) updated position titles; 2) updated references and a definition; 3) updated Attachments A and B to clarify the required information to be included in the Radioactive Effluent Release Report and the Annual Radiological Environmental Operating Report. Additionally, the changes to Attachments A and B provided reporting guidance in support of the NEI Groundwater Protection Initiative and clarified the procedure for generating the Annual Radiological Environmental Operating Report.

ODCM-QA-002, ODCM Review and Revision Control, was revised on June 14, 2007. The revision: 1) updated position titles; 2) updated procedural references and clarified the Technical Specification requirement for the ODCM.

ODCM-QA-003, Effluent Monitor Setpoints, was revised on August 9, 2007. The revision updated a reference and Attachment A to clarify the title and revision of a PPL calculation.

ODCM-QA-004, Airborne Effluent Dose Calculations, was revised on August 15, 2007. The revision updated a reference and Attachment A to clarify the title and revision of a PPL calculation. Additionally, minor typographical corrections were made to the procedure.

ODCM-QA-008, Radiological Environmental Monitoring Program, was revised on April 12 (revision 10) and June 7 (revision 11) 2007. The revisions made the following changes to Appendix G: 1) clarified which direct radiation sampling locations have an Emergency Plan TLD in addition to a REMP TLD; 2) updated locations for direct radiation, surface water and milk sampling. Additionally, the revisions: 1) incorporated guidance to consider additional radionuclide analyses if elevated levels of gamma emitting radionuclide's (which are the result of station operations) are identified in environmental samples; 2) added references and updated Attachments A, D, E and F to correspond with the changes made to Attachment G; 3) made minor typographical corrections throughout the procedure.

CHANGES TO THE TECHNICAL REQUIREMENTS MANUAL

Section 3.11 and 3.6.1 of the Unit-1 and Unit-2 Technical Requirements Manual (TRM) by reference are part of the ODCM. The following limits and requirements are contained in Section 3.11: liquid and gaseous effluent dose limits, liquid and gaseous effluent treatment system operability criteria (based on effluent dose), liquid and gaseous effluent radiation monitor operability criteria and the conduct of the Radiological Environmental Monitoring Program. Section 3.6.1 contains requirements for venting or purging of primary containment.

There were no changes to the Unit-1 or Unit-2 TRM Section 3.6.1 during 2007.

Unit-1 and Unit-2 TRM sections 3.11.1.5 and 3.11.2.6 were revised April 12, 2007 to add a note to clarify the applicability of TRO actions.

PROCESS CONTROL PROGRAM CHANGES

The following changes were made to the Process Control Program and implementing procedures during 2007. None of the changes reduce the overall conformance of the solidified waste product to existing criteria for solid wastes. All changes were reviewed and approved by PORC (as necessary) as documented on the attached summary of procedure changes. The following procedures were changed:

1. CH-RC-076, Gamma Spectral Analysis

2. CH-TP-055, Solid Radwaste 10CFR61 Correlation Factor Determination – Sample Collection and Preparation

3. WM-PS-120, Shipment of Radioactive Material by Air Carrier

4. WM-PS-210, Packaging and Loading of DAW and Radioactive Material

5. WM-PS-354, Use of the CNS 14-215H, 14-210L and 14-210H, Shipping Containers

6. WM-RP-012, Handling and use of Steel Liners and High Integrity Containers

7. ME-ORF-165, Fuel Pool Cleanout – Energy Solutions – Handling Procedure for 3-55 Cask C of C #5805 at PPL Susquehanna LLC

8. ME-ORF-167 Fuel Pool Cleanout – Processing of 3-55 Cask Liners 1 through 11

NDAP-QA-0646 continues to fully implement the requirements and intent of the following:

1. Sections 11.4 and 13.5 of the FSAR
2. Section 3.7.4 of the Technical Requirements Manual
3. 10 CFR 20, 10 CFR 61, 10 CFR 71, 49 CFR 100-177, and 40 CFR 261

Compliance with all applicable regulatory requirements listed above continues to be met as the result of these changes to the program. These changes to the Process Control Program will not reduce the overall conformance of the solidified waste product to existing criteria for solid wastes.

PROCEDURE REVISION SUMMARY
CH-RC-076, Revision 9

1. Added a step to request a peer check when adjusting the computer clock. This is an administrative correction.

2. Clarified step 7.1.2 to prevent contamination of the detector.

3. Added step 7.5.3.a to explain how to report peaks as "part of an undetermined solution".

4. Added references/instructions for the use of the Apex Productivity Suite.

5. Incorporated PCAF 2001-1941.

6. Added step for 511 peak.

7. Reformatted procedure.

8. Eliminated attachments.

PROCEDURE REVISION SUMMARY
CH-TP-055, Revision 5

1. Incorporated PCAF 2006-1241.

2. Changed "Vol." to "Grams" on Form CH-TP-055-1 to clarify amount of sample to be added to composite.

PROCEDURE REVISION SUMMARY
WM-PS-120, Revision 5

1. Incorporated changes in regulations including placement of the UN Number before the proper shipping name on shipping papers and an Excepted Materials Handling label. Incorporate other minor editorial changes.

PROCEDURE REVISION SUMMARY
WM-PS-210, Revision 9

1. Referenced CR 866828 and added requirements to load damp items in a leak resistant container with absorbent. Also added torque requirements for the new 5 and 10 gallon USA DOT 7A Type A pails to the Container Closure Torque Table (Attachment J).

2. Added CR #866828 and 860408 to the Reference Section.

3. Defined Routine and Non-Routine Radioactive Material Shipment.

4. Added requirement to have an engineered load securement plan for non-routine radioactive material shipments.

5. Added changes throughout the procedure clarifying load securement requirements.

6. Modified and added several forms to better document load securement.

7. Made miscellaneous administrative changes throughout the procedure.

PROCEDURE REVISION SUMMARY
WM-PS-354, Revision 5

1. Deleted prerequisite 5.5.

PROCEDURE REVISION SUMMARY
WM-RP-012, Revision 8

1. Added reference to CR 892792 and OE 21349.

2. Changed inspection for water in open top liners being returned from a waste processing vendor or received as new containers.

3. Updated FORM WM-RP-012-2 and FORM WM-RP-012-4.

4. Made various editorial changes.

PROCEDURE REVISION SUMMARY
ME-ORF-165, Revision 4

1. Reference new contractor Energy Solutions in title and appropriate steps.

2. Various administrative changes.

3. Incorporated PCAF 2006-5449

4. Added note after step 8.19.2.

5. Replaced "QA/QC" with "EnergySolutions" in "Test Conducted By" at the bottom of Attachment F.

6. Clarifications, notes and adjustments.

7. Added steps to notify Operations Unit Supervision that a Spent Fuel Pool skimmer surge tank level alarm may occur whenever the 3-55 cask bell section is lowered into or removed from the cask storage pit water.

PROCEDURE REVISION SUMMARY
ME-ORF-167

1. Deleted this procedure per AR/CPG 863208. This procedure is no longer required to perform fuel pool cleanout.

SECTION 6

MISCELLANEOUS TECHNICAL REQUIREMENTS MANUAL (TRM), FSAR, 40CFR190 AND NEI GROUNDWATER PROTECTION INITIATIVE REPORTING

1. TRM Action 3.11.1.4.F.2 requires the reporting of Liquid Radwaste Effluent Monitoring Instrumentation inoperability not corrected in a timely manner.

   None to report for 2007.

2. TRM Action 3.11.1.5.C.1 requires the reporting of Radioactive Liquid Process Effluent Monitoring Instrumentation inoperability not corrected in a timely manner.

   None to report for 2007.

3. TRM Action 3.11.2.6.K requires an explanation for Radioactive Gaseous Effluent Monitoring Instrumentation required actions and completion times not met.

   None to report for 2007.

4. TRM Action 3.11.4.1.F.2 requires reporting the cause of the unavailability of milk or fresh leafy vegetable samples and identify the new locations for obtaining replacements.

   5/14/07 – Milk sample unavailable from R&C Ryman Farm (location 10D1, 3 miles WSW) due to owners have discontinued dairy farming (dairy cows sold). Location 10D1 was an indicator milk sampling location as required by TRM Table 3.11.4.1-1. Location 10D1 was replaced by the C. K. Drasher Farm (location 10D3, 3.5 miles SSW) which is the dairy farm with the next highest dose potential who are willing to participate in the Radiological Environmental Monitoring Program (REMP) milk sampling program.

5. TRM Action 3.11.4.2.A requires reporting when land use census identifies a new location which yields a calculated dose or dose commitment greater than the values currently being calculated in Requirement 3.11.2.3 (Gaseous Effluent Dose due to Iodine, Tritium, and Radionuclides in Particulate Form).

   None to report for 2007.

6. TRM Action 3.11.4.2.B requires reporting when land use census identifies locations that yield a calculated dose or dose commitment (via the same exposure pathway) 20 percent greater than at a location from which samples are currently being obtained in accordance with Requirement 3.11.4.1 (Radiological Environmental Monitoring Program).

   None to report for 2007.

7. The 40CFR190.10 standard for normal operation for the uranium fuel cycle including annual dose equivalent and total quantities of radioactive material limits was not exceeded by Station operation. Refer to Page 4-2 for specific values.

8. FSAR Section 11.6.11 requires the reporting of airborne radioactivity detected in the Low Level Radwaste Holding Facility.

   No sampling for airborne radioactivity in the Low Level Radwaste Holding Facility was performed in 2007. Corrective Action Program item no. 971991 generated to investigate the condition.

9. The PPL Susquehanna station has implemented an Action Plan in response to the NEI Initiative on Groundwater Protection. Part of the Action Plan includes the assessment of the current groundwater monitoring program. Groundwater is sampled and analyzed quarterly as part of the Radiological Environmental Monitoring Program (REMP). REMP groundwater sampling locations are defined in ODCM-QA-008 Attachment G. In August 2006, additional groundwater sampling was initiated at locations which are not listed in the ODCM. The additional locations are three manholes which collect water from a perimeter drain system. The perimeter drain system consists of perforated piping installed just above the footing along the exterior base of the vertical walls of the reactor, turbine and radwaste buildings. In 2007 six new groundwater monitoring wells were installed at the PPL Susquehanna Station. Outlined in Table 6-1 are the tritium analysis results from sampling of the perimeter drain system and the six new groundwater monitoring wells. No gamma emitting radionuclides were identified above analysis MDC's for the perimeter drain or monitoring well samples. The six new groundwater monitoring wells were added to the ODCM in February 2008 and future results from these monitoring wells shall be reported in the Annual Radiological Environmental Operating Report. The tritium results reported in Table 6-1 did not exceed any Reporting Level thresholds in the PPL Susquehanna Technical Requirements Manual or any reporting criteria established in response to the NEI Groundwater Protection Initiative.

TABLE 6-1

NEI Ground Water Protection Initiative Reporting

Perimeter Drain Sampling Results: 2007

	Manhole FD-1 (7S9 - E of U2 CST)	Manhole FD-2 (16S3- NW corner of RW Bldg.)	Manhole FD-3 (9S3 - I/S RCA @ U2 HP Cont. Pt. Closet)
Date	Tritium (pCi/liter)	Tritium (pCi/liter)	Tritium (pCi/liter)
2/12/2007	450	334	261
5/14/2007	529	325	360
8/13/2007*	478	394	392
11/12/2007	475	159	195

* Ni-63, Fe-55 and Sr-89/90 analysis on August 2007 samples. Results < MDC for all manhole samples.

Ground Water Monitoring Well Sampling Results: 2007

Well	Tritium (pCi/Liter)	Date
MW-1 (100 ft. North of Radwaste Bldg. at grass median in road)	146	10/3/2007
	232	11/20/2007
MW-2 (SE of E Diesel Bldg. on West edge of Trailer Parking Lot)	298	10/3/2007
	268	11/19/2007
MW-3 (NW Corner of APF Parking Lot)	144	10/4/2007
	188	11/20/2007
MW-4 (East of Unit-2 CST in gravel area just off macadam walkway)	<125	10/22/2007
	140	11/20/2007
MW-5 (in woods along access road that goes from the salt dome to the S-2 Pond)	145	10/4/2007
	<129	11/21/2007
W-6 (in laydown area 200 ft. West of cooling towers),	<115	10/3/2007
	156	11/19/2007

SECTION 7

CORRECTIONS TO PREVIOUS RADIOACTIVE EFFLUENT RELEASE REPORTS

CORRECTIONS TO PREVIOUS
RADIOACTIVE EFFLUENT RELEASE REPORTS

Based on review/comparison of the 2007 atmospheric dispersion data (X/Q & D/Q values) with 2006 data, it was discovered that the values listed in Tables 3-4 thru 3-7 of the 2006 Radioactive Effluent Release Report did not include "recirculation/terrain correction factors" in the calculation of these values. This condition was identified by the PPL Susquehanna Meteorological Consultant (ABS Consulting) who is responsible for calculation of atmospheric dispersion values in support of the Radioactive Effluent Release Report. The incorrectly calculated X/Q and D/Q values were not used in the calculation of offsite dose from airborne radioactive effluents in 2006. Tables 3-4 thru 3-7 are supplementary meteorological data included (but not required per Regulatory Guide 1.21) in the PPL Susquehanna Radioactive Effluent Release Report. Corrected Tables 3-4 thru 3-7 for the 2006 Radioactive Effluent Release Report are included in this section.

TABLE 7-1

TABLE 3-4 (Revised)

2006 SSES ANNUAL RELATIVE CONCENTRATIONS
NO DECAY, UNDEPLETED X/Q (sec/m^3)

	MILES									
DIRECTION FROM	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 10	10 - 20	20 - 30	30 - 40	40 - 50
N	4.69E-06	8.92E-07	3.71E-07	1.95E-07	1.26E-07	4.69E-08	1.29E-08	6.30E-09	3.98E-09	2.83E-09
NNE	8.91E-06	1.80E-06	8.14E-07	4.39E-07	2.85E-07	1.07E-07	2.96E-08	1.47E-08	9.36E-09	6.72E-09
NE	2.17E-05	4.00E-06	1.85E-06	1.07E-06	7.11E-07	2.84E-07	8.76E-08	4.44E-08	2.87E-08	2.10E-08
ENE	4.63E-05	8.62E-06	4.22E-06	2.49E-06	1.67E-06	6.61E-07	1.93E-07	9.36E-08	6.07E-08	4.46E-08
E	1.79E-05	3.29E-06	1.46E-06	8.25E-07	5.52E-07	2.24E-07	7.11E-08	3.61E-08	2.33E-08	1.70E-08
ESE	1.13E-05	2.20E-06	9.89E-07	5.51E-07	3.65E-07	1.47E-07	4.08E-08	1.79E-08	1.15E-08	8.30E-09
SE	1.09E-05	2.17E-06	9.96E-07	5.61E-07	3.72E-07	1.52E-07	3.80E-08	1.41E-08	8.99E-09	6.48E-09
SSE	8.91E-06	1.77E-06	7.91E-07	4.45E-07	3.00E-07	1.30E-07	3.43E-08	1.23E-08	7.90E-09	5.69E-09
S	7.35E-06	1.58E-06	7.72E-07	4.48E-07	3.07E-07	1.43E-07	3.98E-08	1.37E-08	8.78E-09	6.31E-09
SSW	7.72E-06	1.58E-06	7.21E-07	4.05E-07	2.68E-07	1.11E-07	2.87E-08	1.09E-08	6.91E-09	4.92E-09
SW	5.26E-06	1.05E-06	4.98E-07	2.84E-07	1.91E-07	8.37E-08	2.16E-08	7.27E-09	4.59E-09	3.25E-09
WSW	2.48E-06	4.80E-07	2.24E-07	1.32E-07	9.01E-08	4.27E-08	1.34E-08	5.05E-09	2.59E-09	1.42E-09
W	1.50E-06	2.86E-07	1.23E-07	6.68E-08	4.37E-08	1.78E-08	4.76E-09	1.91E-09	1.18E-09	8.21E-10
WNW	1.73E-06	3.09E-07	1.23E-07	6.43E-08	4.08E-08	1.48E-08	3.94E-09	1.84E-09	1.12E-09	7.71E-10
NW	2.48E-06	4.57E-07	1.82E-07	9.29E-08	5.88E-08	2.10E-08	5.50E-09	2.58E-09	1.59E-09	1.10E-09
NNW	2.45E-06	4.55E-07	1.92E-07	1.02E-07	6.40E-08	2.22E-08	5.51E-09	2.61E-09	1.61E-09	1.12E-09

TABLE 7-2

TABLE 3-5 (Revised)

2006 SSES ANNUAL RELATIVE CONCENTRATIONS
2.26-DAY DECAY, UNDEPLETED X/Q (sec/m^3)

	MILES									
DIRECTION FROM	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 10	10 - 20	20 - 30	30 - 40	40 - 50
N	4.68E-06	8.87E-07	3.67E-07	1.92E-07	1.23E-07	4.54E-08	1.21E-08	5.66E-09	3.42E-09	2.33E-09
NNE	8.89E-06	1.79E-06	8.05E-07	4.32E-07	2.79E-07	1.03E-07	2.76E-08	1.30E-08	7.92E-09	5.43E-09
NE	2.16E-05	3.96E-06	1.82E-06	1.04E-06	6.92E-07	2.71E-07	8.00E-08	3.81E-08	2.32E-08	1.59E-08
ENE	4.61E-05	8.53E-06	4.15E-06	2.44E-06	1.62E-06	6.29E-07	1.74E-07	7.94E-08	4.82E-08	3.32E-08
E	1.78E-05	3.26E-06	1.43E-06	8.02E-07	5.32E-07	2.11E-07	6.31E-08	2.96E-08	1.77E-08	1.19E-08
ESE	1.13E-05	2.17E-06	9.70E-07	5.36E-07	3.53E-07	1.39E-07	3.64E-08	1.48E-08	8.80E-09	5.90E-09
SE	1.09E-05	2.15E-06	9.78E-07	5.47E-07	3.61E-07	1.44E-07	3.41E-08	1.18E-08	7.01E-09	4.70E-09
SSE	8.88E-06	1.75E-06	7.79E-07	4.36E-07	2.91E-07	1.24E-07	3.11E-08	1.05E-08	6.32E-09	4.28E-09
S	7.33E-06	1.57E-06	7.61E-07	4.39E-07	3.00E-07	1.37E-07	3.66E-08	1.20E-08	7.24E-09	4.92E-09
SSW	7.71E-06	1.57E-06	7.13E-07	3.99E-07	2.63E-07	1.08E-07	2.69E-08	9.79E-09	5.94E-09	4.06E-09
SW	5.25E-06	1.05E-06	4.94E-07	2.81E-07	1.88E-07	8.16E-08	2.05E-08	6.68E-09	4.08E-09	2.80E-09
WSW	2.48E-06	4.78E-07	2.22E-07	1.30E-07	8.90E-08	4.18E-08	1.28E-08	4.70E-09	2.34E-09	1.25E-09
W	1.50E-06	2.85E-07	1.22E-07	6.61E-08	4.31E-08	1.74E-08	4.55E-09	1.78E-09	1.07E-09	7.17E-10
WNW	1.73E-06	3.08E-07	1.22E-07	6.38E-08	4.04E-08	1.45E-08	3.80E-09	1.73E-09	1.03E-09	6.90E-10
NW	2.48E-06	4.55E-07	1.81E-07	9.21E-08	5.81E-08	2.06E-08	5.28E-09	2.41E-09	1.44E-09	9.65E-10
NNW	2.45E-06	4.54E-07	1.90E-07	1.01E-07	6.32E-08	2.17E-08	5.27E-09	2.42E-09	1.45E-09	9.79E-10

TABLE 7-3

TABLE 3-6 (REVISED)

2006 SSES ANNUAL RELATIVE CONCENTRATIONS
8-DAY DECAY, DEPLETED X/Q (sec/m^3)

	MILES									
DIRECTION FROM	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 10	10 - 20	20 - 30	30 - 40	40 - 50
N	4.29E-06	7.55E-07	3.00E-07	1.51E-07	9.41E-08	3.26E-08	7.96E-09	3.38E-09	1.91E-09	1.23E-09
NNE	8.14E-06	1.53E-06	6.58E-07	3.40E-07	2.13E-07	7.40E-08	1.82E-08	7.84E-09	4.47E-09	2.91E-09
NE	1.98E-05	3.38E-06	1.49E-06	8.24E-07	5.31E-07	1.97E-07	5.35E-08	2.35E-08	1.35E-08	8.92E-09
ENE	4.22E-05	7.29E-06	3.40E-06	1.93E-06	1.24E-06	4.57E-07	1.17E-07	4.94E-08	2.85E-08	1.88E-08
E	1.64E-05	2.79E-06	1.18E-06	6.37E-07	4.11E-07	1.55E-07	4.31E-08	1.88E-08	1.08E-08	7.07E-09
ESE	1.03E-05	1.86E-06	7.98E-07	4.25E-07	2.72E-07	1.02E-07	2.47E-08	9.37E-09	5.33E-09	3.46E-09
SE	9.95E-06	1.84E-06	8.03E-07	4.33E-07	2.78E-07	1.05E-07	2.31E-08	7.38E-09	4.19E-09	2.72E-09
SSE	8.14E-06	1.49E-06	6.38E-07	3.44E-07	2.24E-07	8.97E-08	2.09E-08	6.51E-09	3.71E-09	2.41E-09
S	6.71E-06	1.34E-06	6.23E-07	3.46E-07	2.30E-07	9.92E-08	2.44E-08	7.30E-09	4.16E-09	2.70E-09
SSW	7.06E-06	1.33E-06	5.83E-07	3.14E-07	2.01E-07	7.72E-08	1.77E-08	5.84E-09	3.31E-09	2.14E-09
SW	4.81E-06	8.92E-07	4.03E-07	2.20E-07	1.43E-07	5.83E-08	1.33E-08	3.92E-09	2.22E-09	1.43E-09
WSW	2.27E-06	4.07E-07	1.81E-07	1.02E-07	6.76E-08	2.97E-08	8.30E-09	2.73E-09	1.26E-09	6.29E-10
W	1.37E-06	2.42E-07	9.93E-08	5.18E-08	3.27E-08	1.24E-08	2.95E-09	1.04E-09	5.75E-10	3.63E-10
WNW	1.58E-06	2.62E-07	9.97E-08	4.99E-08	3.06E-08	1.03E-08	2.44E-09	9.98E-10	5.49E-10	3.43E-10
NW	2.27E-06	3.87E-07	1.47E-07	7.21E-08	4.41E-08	1.47E-08	3.40E-09	1.40E-09	7.74E-10	4.86E-10
NNW	2.24E-06	3.86E-07	1.55E-07	7.89E-08	4.80E-08	1.55E-08	3.41E-09	1.41E-09	7.83E-10	4.95E-10

TABLE 7-4

TABLE 3-7 (REVISED)

2006 SSES ANNUAL RELATIVE DEPOSITION
D/Q (meters-^{2})

	MILES									
DIRECTION FROM	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 10	10 - 20	20 - 30	30 - 40	40 - 50
N	2.76E-08	4.06E-09	1.67E-09	7.90E-10	4.67E-10	1.48E-10	3.54E-11	1.30E-11	6.95E-12	4.37E-12
NNE	3.70E-08	5.73E-09	2.49E-09	1.18E-09	6.96E-10	2.17E-10	5.06E-11	1.86E-11	9.94E-12	6.24E-12
NE	4.26E-08	6.42E-09	2.74E-09	1.33E-09	7.88E-10	2.54E-10	6.22E-11	2.29E-11	1.22E-11	7.68E-12
ENE	6.52E-08	1.01E-08	4.51E-09	2.21E-09	1.30E-09	4.12E-10	9.40E-11	3.29E-11	1.76E-11	1.10E-11
E	2.75E-08	4.02E-09	1.64E-09	7.81E-10	4.66E-10	1.54E-10	3.89E-11	1.43E-11	7.65E-12	4.80E-12
ESE	2.40E-08	3.63E-09	1.55E-09	7.47E-10	4.46E-10	1.48E-10	3.36E-11	1.09E-11	5.79E-12	3.64E-12
SE	2.82E-08	4.28E-09	1.87E-09	9.23E-10	5.54E-10	1.87E-10	3.90E-11	1.07E-11	5.69E-12	3.58E-12
SSE	2.41E-08	3.59E-09	1.53E-09	7.55E-10	4.60E-10	1.65E-10	3.61E-11	9.61E-12	5.13E-12	3.22E-12
S	2.53E-08	4.05E-09	1.90E-09	9.77E-10	6.09E-10	2.36E-10	5.50E-11	1.41E-11	7.53E-12	4.73E-12
SSW	3.70E-08	5.66E-09	2.54E-09	1.29E-09	7.78E-10	2.71E-10	6.03E-11	1.72E-11	9.18E-12	5.77E-12
SW	4.85E-08	7.70E-09	3.62E-09	1.87E-09	1.16E-09	4.35E-10	9.83E-11	2.50E-11	1.34E-11	8.40E-12
WSW	2.51E-08	3.87E-09	1.81E-09	9.67E-10	6.15E-10	2.53E-10	7.13E-11	2.06E-11	9.02E-12	4.43E-12
W	1.31E-08	1.97E-09	8.51E-10	4.25E-10	2.59E-10	9.27E-11	2.26E-11	7.08E-12	3.78E-12	2.38E-12
WNW	1.65E-08	2.38E-09	9.57E-10	4.57E-10	2.72E-10	8.80E-11	2.17E-11	8.01E-12	4.27E-12	2.68E-12
NW	2.27E-08	3.33E-09	1.33E-09	6.21E-10	3.67E-10	1.16E-10	2.79E-11	1.03E-11	5.49E-12	3.45E-12
NNW	2.29E-08	3.40E-09	1.44E-09	6.95E-10	4.07E-10	1.24E-10	2.79E-11	1.03E-11	5.49E-12	3.45E-12

SECTION 8

EFFLUENT FROM SYSTEMS CLASSIFIED AS INSIGNIFICANT EFFLUENT PATHWAYS

EFFLUENT FROM SYSTEMS CLASSIFIED AS INSIGNIFICANT EFFLUENT PATHWAYS

Insignificant Effluent Pathways are: 1) evaporation from the Unit 1 and Unit 2 Condensate Storage Tanks (CST's); 2) evaporation from the common Refueling Water Storage Tank (RWST); 3) gaseous effluent from the Hydrogen Seal Oil, Main Turbine and RFPT lubrication oil mist eliminators which vent to the turbine building roofs.

These pathways are not continuously monitored. The CSTs and RWST are sampled monthly to determine the concentration of radionuclides present in these tanks. Tritium analysis on these samples is performed quarterly. Airborne release to the environment from the tanks is estimated based on conservative estimates of the evaporation rates from each of the tanks using a modified method established within Chapter 7 of EPA AP-42. A conservative carry-over fraction of radionuclides from the water to the evaporated liquid is then assumed. Airborne release to the environment from the demisters conservatively assumes the maximum moisture (condensate) concentration of the lubrication oil as measured via sampling during 2007. The calculation also assumes immediate removal of 100% of the water by the oil mist eliminators as it passes through the turbines. The annual release of tritium, iodines and particulates with half-lives greater than 8 days was calculated based on these conservative assumptions. The calculated releases are shown in Table 8-1. All nuclides, except for tritium, released from insignificant effluent pathways are negligible compared to the airborne release data shown in Tables 2-1 and 2-2. The maximum dose to the public from a release of 2.57 Ci of tritium is calculated to be 2.22E-2 mrem (child). This is a small fraction of the maximum dose from airborne effluent reported in Section 4.

TABLE 8-1

ANNUAL RELEASE FROM SYSTEMS CLASSIFIED AS INSIGNIFICANT EFFLUENT PATHWAYS

Nuclide	RWST (Ci)	U1-CST and Main Turbine/RFPT Lube Oil Systems (Ci)	U2-CST and Main Turbine/RFPT Lube Oil Systems (Ci)	Total (Ci)
H-3	7.38E-02	1.17E+00	1.33E+00	2.57E+00
Mn-54	1.26E-08	2.24E-09	3.97E-08	5.45E-08
Co-60	8.62E-08	1.27E-08	1.46E-07	2.45E-07
Cs-137	3.09E-11	0.00E+00	0.00E+00	3.09E-11
Xe-135	7.01E-08	0.00E+00	3.51E-06	3.58E-06
Co-58	2.67E-09	7.75E-10	2.12E-08	2.46E-08
Zn-65	2.17E-09	0.00E+00	8.01E-09	1.02E-08
Cr-51	1.28E-08	5.10E-09	1.93E-09	1.98E-08
Fe-59	1.13E-09	0.00E+00	0.00E+00	1.13E-09
Ba-131	2.65E-09	2.79E-10	7.18E-08	7.48E-08
Nb-95	5.46E-10	0.00E+00	0.00E+00	5.46E-10