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DOMINION ENERGY KEWAUNEE, INC.
KEWAUNEE POWER STATION
2017 ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

Enclosed is the Kewaunee Power Station (KPS) 2017 Annual Radioactive Effluent Release Report for January through December 2017. This report is submitted to meet the requirements of KPS Technical Requirements Manual Section 10.3 and 10 CFR 50.36a.

If you have questions or require additional information, please feel free to contact Mr. William Zipp at 920-388-8842.

Sincerely,

Stewart J. Yuen
Plant Manager, Kewaunee Power Station

Commitments made by this letter: NONE

IE48
NRR

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2017 Annual Radioactive Effluent Release Report

Kewaunee Power Station

Dominion Energy Kewaunee, Inc.

DOCKET 50-305

KEWAUNEE POWER STATION

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

January 1 - December 31, 2017

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0.0 SUMMARY

On October 22, 2012, Dominion made known the decision to permanently shut down the Kewaunee Power Station (KPS). On February 25, 2013, Dominion Energy Kewaunee (DEK) submitted a certification of permanent cessation of power operations pursuant to 10 CFR 50.82(a)(1)(i), stating that DEK has decided to permanently cease power operation of KPS on May 7, 2013. On May 15, 2013 the NRC docketed the certification for permanent removal of fuel from the reactor vessel pursuant to 10 CFR 50.82(a)(1)(ii). Therefore the 10 CFR Part 50 license no longer authorizes KPS to operate the reactor or emplace or retain fuel in the reactor vessel, as specified in 10 CFR 50.82(a)(2).

On June 15, 2017, the transfer of all spent fuel from the KPS Spent Fuel Pool (SFP) to the Independent Spent Fuel Storage Installation (ISFSI) was completed. All remaining irradiated materials were removed from the SFP in October 2017.

During 2017 all solid, liquid, and gaseous radioactive effluents from the Kewaunee Power Station were well below regulatory limits. For individual effluent streams, the quarterly limit most closely approached was:

GASEOUS:	Ingestion Pathway-Organ	Total Body	
	Quarterly Limit (mRem)	7.5	
	Actual Dose (mRem)	2.99E-04	(1st Quarter)
	% of Specification	3.99E-03	
LIQUID:	Ingestion Pathway-Organ	Bone	
	Quarterly Limit (mRem)	5.0	
	Actual Dose (mRem)	1.42E+00	(3rd Quarter)
	% of Limit	2.84E+01	
SOLID:	No upper limit for solid radioactive waste applies.		
	Cubic Meters Shipped	2.16E+01 m^3 (7.64+02 ft^3)	

1.0 INTRODUCTION

This report is being submitted in accordance with the requirements of Kewaunee Technical Requirements Manual, Section 10.3.2 and the Offsite Dose Calculation Manual, Section 15.2. It includes data from all effluent releases made from January 1 - December 31, 2017. The report contains summaries of the gaseous and liquid releases made to the environment including the quantity, characterization, time duration and calculated radiation dose at the site boundary resulting from these releases. The report also includes a summation of solid radioactive waste disposal, revisions to the Process Control Program and the Offsite Dose Calculation Manual, major changes to the radioactive liquid and gaseous waste treatment systems, and addresses the cumulative meteorological data. Values indicated as 0 (zero) in this report refer to actual values less than the detection limits. A table of these less than detectable (LLD) values is identified in sections 2.1 and 3.1.

1.1 Effluent Dose Limits

Specifications are set to ensure that offsite doses are maintained as low as reasonably achievable while still allowing for practical and dependable evolutions at the Kewaunee Power Station.

The Kewaunee Offsite Dose Calculation Manual (ODCM) describes the methodology and parameters used in:

1.) The calculation of radioactive liquid and gaseous effluent monitoring instrumentation alarm/trip set points.

2.) The calculation of radioactive liquid and gaseous concentrations, dose rates and cumulative quarterly and annual doses. The ODCM methodology is acceptable for use in demonstrating compliance with 10 CFR 20.1301/1302; 10 CFR 50, Appendix I; and 40 CFR 190.

2.0 GASEOUS EFFLUENTS

2.1 Lower Limits of Detection (LLD) for Gaseous Effluents

Gaseous radioactive effluents are released in both the continuous mode and the batch mode. The auxiliary building stack is sampled continuously for particulates, halogens and Strontium by an "off-line" sample train. This stack is also grab-sampled weekly for gaseous gamma emitters and monthly for tritium. Batch releases are sampled prior to release for principal gaseous and particulate gamma emitters, halogens and tritium.

The LLD's for gaseous radio-analyses, as listed in Table 13.2.1-1 of the Kewaunee ODCM are:

Analysis	LLD (μCi/ml)
Gaseous Gamma Emitters	1.00E-04
Iodine 131	3.00E-12
Particulate Gamma Emitters	1.00E-11
Particulate Gross Alpha	1.00E-11
Strontium 89, 90	1.00E-11
Noble Gases, Gross Beta or Gamma	1.00E-06
Tritium (H-3)	1.00E-06

The nominal "a priori" LLD values are shown below.

Isotope	a priori LLD (μCi/ml)
a. Gaseous emissions:	
Kr-87	5.61E-08
Kr-88	1.02E-07
Xe-133	6.68E-08
Xe-133m	2.75E-07
Xe-135	2.99E-08
Xe-138	1.13E-07

b. Particulate emissions:

Mn-54	1.11E-13
Fe-59	2.27E-13
Co-58	2.28E-13
Co-60	3.57E-13
Zn-65	1.68E-13
Mo-99	2.73E-13
Cs-134	4.69E-13
Cs-137	1.68E-13
Ce-141	2.08E-13
Ce-144	1.24E-12

c. Other identifiable gamma emitters:

Ar-41	3.97E-10
Kr-85	8.63E-05
Kr-85m	4.62E-08
Kr-89	2.04E-06
Xe-127	4.20E-08
Xe-131m	1.82E-06
Xe-135m	1.90E-08
Xe-137	2.88E-07
I-131	1.32E-13

d. Composite particulate samples:

Sr-89	1.00E-14
Sr-90	1.00E-14
Gross Alpha	1.00E-14

These "a priori" LLDs represent the capabilities of the counting systems in use, not an after the fact "a posteriori" limit for a particular measurement.

2.2 Gaseous Batch Release Statistics

The following is a summation of all gaseous batch releases made during 2017.

Number of batch releases.....0

Total time for all batch releases (min).....0.0

Maximum time for a batch release (min).....0.0

Average time for a batch release (min).....0.0

Minimum time for a batch release (min).....0.0

2.3 Gaseous Effluent Data

Table 2.1 presents a quarterly summation of the total activity released and average release rates of gaseous effluents. Table 2.2 lists the quarterly sums of individual gaseous radionuclide released by continuous mode. Table 2.3 lists the quarterly sums of individual gaseous radionuclide released by batch mode. Table 2.4 presents the dose limits for gaseous effluents, and the calculated doses this year from gaseous effluents.

Table 2.1
Gaseous Effluents - Summation of all Releases

Fission and Activation Gases	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Average Release Rate (μCi/sec)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iodines					
Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Average Release Rate (μCi/sec)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Particulates					
Total Activity Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Average Release Rate (μCi/sec)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium					
Total Activity Released (Ci)	1.13E+01	6.49E+00	6.70E+00	1.77E+00	2.63E+01
Average Release Rate (μCi/sec)	1.45E+00	8.26E-01	8.43E-01	2.23E-01	8.33E-01
Gross Alpha Released (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon-14					
Total Annual Activity Released (Ci)					0.00E+00

Table 2.2
Gaseous Effluents - Ground Level - Nuclides Released (Ci)
Continuous Mode

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
Fission Gases					
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iodines					
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Particulates					
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gross Alpha	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium	1.13E+01	6.49E+00	6.70E+00	1.77E+00	2.63E+01

Table 2.3
Gaseous Effluents - Ground Level - Nuclides Released (Ci)
Batch Mode (1)

	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Total
Fission Gases					
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Iodines					
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Particulates					
Total	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gross Alpha	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

1 - There were no gaseous batch discharges in 2017.

Table 2.4
Dose from Gaseous Effluents

The offsite dose limits from radioactive materials in gaseous effluents are specified in Section 13.2.2 and 13.2.3 of the Kewaunee ODCM and can be summarized as follows:

Limit	Air Dose Gamma	Air Dose Beta	Organ
Quarterly	5.0 mrad	10.0 mrad	7.5 mrem
Annual	10.0 mrad	20.0 mrad	15.0 mrem

The total releases of gaseous effluents during 2017 for each quarter and for the year were within limits. The following offsite doses were calculated using equations 2.7, 2.8, and 2.11 from the Kewaunee ODCM. Calculated offsite doses versus quarterly and annual limits are shown below:

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annual
1. Gamma- Air Dose					
Specification (mrad)	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
Actual Dose (mrad)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Beta- Air Dose					
Specification (mrad)	1.00E+01	1.00E+01	1.00E+01	1.00E+01	2.00E+01
Actual Dose (mrad)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Organ Dose					
Specification (mrem)	7.50E+00	7.50E+00	7.50E+00	7.50E+00	1.50E+01
Total Body					
Actual Dose (mrem)	2.99E-04	1.72E-04	1.77E-04	4.68E-05	6.95E-04
% of Specification	3.99E-03	2.29E-03	2.37E-03	6.24E-04	4.64E-03
Bone					
Actual Dose (mrem)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Specification	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 2.4 (continued)
Dose from Gaseous Effluents

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annual
Liver					
Actual Dose (mrem)	2.99E-04	1.72E-04	1.77E-04	4.68E-05	6.95E-04
% of Specification	3.99E-03	2.29E-03	2.37E-03	6.24E-04	4.64E-03
Thyroid					
Actual Dose (mrem)	2.99E-04	1.72E-04	1.77E-04	4.68E-05	6.95E-04
% of Specification	3.99E-03	2.29E-03	2.37E-03	6.24E-04	4.64E-03
Kidney					
Actual Dose (mrem)	2.99E-04	1.72E-04	1.77E-04	4.68E-05	6.95E-04
% of Specification	3.99E-03	2.29E-03	2.37E-03	6.24E-04	4.64E-03
Lung					
Actual Dose (mrem)	2.99E-04	1.72E-04	1.77E-04	4.68E-05	6.95E-04
% of Specification	3.99E-03	2.29E-03	2.37E-03	6.24E-04	4.64E-03
GI-LLI					
Actual Dose (mrem)	2.99E-04	1.72E-04	1.77E-04	4.68E-05	6.95E-04
% of Specification	3.99E-03	2.29E-03	2.37E-03	6.24E-04	4.64E-03

2.4 Estimation of Carbon-14 in Gaseous Releases

Due to permanent plant shutdown on May 7, 2013, there were no releases of Carbon-14 from the site.

3.0 LIQUID EFFLUENTS

3.1 Lower Limits of Detection (LLD) for Liquid Effluents

Liquid radioactive effluents are released as both batch releases and continuous releases. Each batch is sampled prior to release and analyzed for gamma emitters and tritium. A fraction of each sample is retained for a monthly proportional composite which is then analyzed for Gross Alpha, Strontium 89, Strontium 90, Iron 55 and Nickel 63.

The LLD's for liquid batch release radio-analyses, as listed in Table 13.1.1-1 of the Kewaunee ODCM are:

Analysis	LLD (μCi/ml)
Principal Gamma Emitters	1.00 E-06
Iodine 131	1.00 E-06
Tritium (H-3)	1.00 E-05
Gross Alpha	5.00 E-07
Strontium 89, 90	5.00 E-08
Iron 55	1.00 E-06

The actual obtained "a priori" LLD values for batch releases are shown below.

Isotope	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Average a priori LLD (μCi/ml)
Mn-54	9.78E-08	1.57E-07	1.32E-07	1.74E-08	1.01E-07
Fe-59	2.21E-07	3.90E-08	2.89E-07	3.78E-08	1.47E-07
Co-58	9.58E-08	9.58E-08	1.71E-08	9.70E-08	7.64E-08
Co-60	1.47E-07	2.33E-08	2.26E-08	2.24E-08	5.38E-08
Zn-65	4.39E-08	3.33E-07	3.25E-07	3.23E-07	2.56E-07
Mo-99	1.23E-07	6.86E-07	1.24E-07	1.24E-07	2.64E-07
Cs-134	7.48E-08	7.48E-08	7.85E-08	7.40E-08	7.55E-08
Cs-137	1.65E-08	9.31E-08	9.64E-08	1.30E-07	8.40E-08
Ce-141	1.04E-07	1.36E-07	1.13E-07	1.35E-07	1.22E-07
Ce-144	6.10E-07	5.77E-07	4.47E-07	3.71E-07	5.01E-07
I-131	1.04E-07	1.03E-07	6.37E-08	1.47E-07	1.04E-07
H-3	3.12E-06	3.24E-06	2.96E-06	3.10E-06	3.11E-06
Sr-89	1.34E-08	1.71E-08	3.78E-08	1.10E-08	1.98E-08
Sr-90	7.47E-09	7.75E-09	1.14E-08	8.90E-09	8.88E-09
Gross Alpha	7.47E-09	9.61E-09	1.30E-08	9.22E-09	9.83E-09
Fe-55	7.77E-07	7.87E-07	7.91E-07	7.06E-07	7.65E-07
Ni-63	9.80E-08	6.01E-08	6.63E-08	7.08E-08	7.38E-08

Continuous liquid releases are grab-sampled weekly and analyzed for principal gamma emitters. A fraction of each weekly sample is retained for a monthly proportional composite which is then analyzed for Gross Alpha, Strontium 89, Strontium 90, Iron 55 and Nickel 63.

The LLD's for liquid continuous release radioanalyses, as listed in Table 13.1.1-1 of the Kewaunee ODCM are:

Analysis	LLD (µCi/ml)
Principal Gamma Emitters	5.00 E-07
Iodine 131	1.00 E-06
Tritium (H-3)	1.00 E-05
Gross Alpha	5.00 E-07
Strontium 89, 90	5.00 E-08
Iron 55	1.00 E-06

The actual obtained "a priori" LLD values for continuous releases are shown below.

Isotope	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	Average a priori LLD (µCi/ml)
Mn-54	1.11E-08	1.18E-08	1.05E-08	1.17E-08	1.13E-08
Fe-59	2.47E-08	1.58E-08	1.99E-08	1.33E-08	1.84E-08
Co-58	1.09E-08	8.80E-09	7.95E-09	4.34E-09	8.00E-09
Co-60	1.19E-08	1.07E-08	5.89E-09	1.20E-08	1.01E-08
Zn-65	2.03E-08	2.44E-08	2.03E-08	2.25E-08	2.19E-08
Mo-99	9.56E-08	7.43E-08	6.94E-08	6.88E-08	7.70E-08
Cs-134	7.66E-09	1.17E-08	8.75E-09	1.08E-08	9.73E-09
Cs-137	9.45E-09	1.40E-08	1.14E-08	1.39E-08	1.22E-08
Ce-141	1.57E-08	1.60E-08	1.77E-08	1.70E-08	1.66E-08
Ce-144	7.31E-08	6.94E-08	6.79E-08	7.01E-08	7.01E-08
I-131	1.02E-08	9.65E-09	9.37E-09	1.17E-08	1.02E-08
H-3	3.12E-06	3.24E-06	2.96E-06	3.10E-06	3.11E-06
Sr-89	1.18E-08	1.59E-08	1.54E-08	1.03E-08	1.34E-08
Sr-90	6.62E-09	6.70E-09	5.71E-09	8.87E-09	6.98E-09
Gross Alpha	5.53E-09	6.52E-09	5.94E-09	5.13E-09	5.78E-09
Fe-55	8.02E-07	7.50E-07	7.80E-07	6.88E-07	7.55E-07
Ni-63	9.41E-08	6.07E-08	6.63E-08	7.32E-08	7.36E-08

3.2 Liquid Batch Release Statistics

The following is a summation of all liquid batch releases during 2017.

Number of batch releases.....64

Total time for all batch releases (min).....7.69E+04

Maximum time for a batch release (min).....2,860

Minimum time for a batch release (min).....8

Average time for a batch release (min).....1200

3.3 Liquid Effluent Data

The following Table 3.1 presents a quarterly summation of the total activity released and average concentration for all liquid effluents. It also presents the gross alpha activity released, volume of waste released and volume of dilution water used. Table 3.2 contains the quantity of the individual isotopes released to the unrestricted area for batch releases. Table 3.3 contains the quantity of the individual isotopes released to the unrestricted area for continuous releases. Table 3.4 presents the doses from liquid effluents for each quarter and the calculated doses this year from liquid effluents.

Table 3.1
Liquid Effluents - Summation of all Releases

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Total
Fission and Activation Products					
Total Release (Ci)	1.01E-03	7.87E-03	1.76E-01	7.31E-02	2.58E-01
Average Concentration (µCi/ml)	2.32E-09	1.14E-08	6.07E-08	2.59E-08	3.77E-08
Tritium					
Total Release (Ci)	1.29E+00	5.36E+01	2.75E+02	2.14E+01	3.51E+02
Average Concentration (µCi/ml)	2.97E-06	7.76E-05	9.47E-05	7.58E-06	5.13E-05
% of Tech. Spec. Limit(3.0E-3 µCi/ml)	9.90E-02	2.59E+00	3.16E+00	2.53E-01	1.71E+00
Dissolved and Entrained Gases					
Total Release (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Average Concentration (µCi/ml)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
% of Tech. Spec. Limit(2.0E-4 µCi/ml)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Gross Alpha Activity					
Total Release (Ci)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Volume of Waste Released					
Total (liters)	2.13E+06	2.44E+06	2.97E+06	2.70E+06	1.02E+07
Volume of Dilution Water					
Total (liters)	4.35E+08	6.90E+08	2.90E+09	2.82E+09	6.85E+09

Table 3.2
Liquid Effluents – Nuclides Released (Ci)
Batch Mode

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Total
Fission and Activation Products					
Mn-54	0.00E+00	0.00E+00	0.00E+00	8.12E-05	8.12E-05
Fe-55	7.55E-04	5.97E-03	1.11E-01	8.10E-03	1.26E-01
Co-60	2.27E-04	1.05E-03	8.46E-05	3.58E-02	3.72E-02
Ni-63	2.49E-05	7.90E-04	6.41E-02	2.89E-02	9.38E-02
Ag-108m	0.00E+00	2.65E-05	0.00E+00	0.00E+00	2.65E-05
Ag-110m	0.00E+00	4.07E-05	0.00E+00	0.00E+00	4.07E-05
Sb-125	0.00E+00	0.00E+00	5.75E-04	2.03E-04	7.78E-04
Total Release	1.01E-03	7.87E-03	1.76E-01	7.31E-02	2.58E-01
Dissolved and Entrained Gases					
Total Release	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium					
Total Release	1.29E+00	5.36E+01	2.75E+02	2.14E+01	3.51E+02
Gross Alpha Activity					
Total Release	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 3.3
Liquid Effluents – Nuclides Released (Ci)
Continuous Mode

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Total
Fission and Activation Products					
Total Release	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Dissolved and Entrained Gases					
Total Release	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Tritium					
Total Release	0.00E+00	0.00E+00	1.08E-02	0.00E+00	1.08E-02
Gross Alpha Activity					
Total Release	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 3.4
Dose from Liquid Effluents

The dose to a member of the public from total liquid radioactive releases for each quarter was below the Kewaunee ODCM limits of 1.5 mrem to the total body and less than or equal to 5 mrem to any organ. Additionally, the dose to a member of the public from total liquid radioactive releases for the year was below the Kewaunee ODCM limits of 3 mrem to the total body and less than or equal to 10 mrem to any organ.

Instantaneous release concentrations are limited by the individual radionuclide concentrations established in 10 CFR 20, Appendix B, for unrestricted areas. During the report period, none of the isotopes released exceed the concentrations specified in Appendix B. The following offsite doses were calculated using equation 1.7 from the Kewaunee ODCM.

Due to the Ni-63 activity levels and the volume of water released to the environment in 2017 the dose due to liquid effluent releases exceeded 1% for both the quarterly and annual limits for multiple organs. The highest quarterly percentage was 28.4% and highest annual percentage was 20%. Neither of the dose limits was at risk of being exceeded based on close monitoring of dose projections, use of the radioactive waste treatment system, and procedural guidance. There was no adverse impact to the general public.

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annual
Total Body					
Specification (mrem)	1.50E+00	1.50E+00	1.50E+00	1.50E+00	3.00E+00
Actual Dose (mrem)	8.82E-04	2.12E-02	1.14E-01	3.55E-02	1.72E-01
% of Specification	5.88E-02	1.41E+00	7.60E+00	2.37E+00	5.73E+00
Organs					
Specification (mrem)	5.00E+00	5.00E+00	5.00E+00	5.00E+00	1.00E+01
Bone					
Actual Dose (mrem)	1.71E-03	3.09E-02	1.42E+00	5.50E-01	2.00E+00
% of Specification	3.42E-02	6.18E-01	2.84E+01	1.10E+01	2.00E+01
Liver					
Actual Dose (mrem)	1.18E-03	2.40E-02	1.90E-01	5.02E-02	2.65E-01
% of Specification	2.36E-02	4.80E-01	3.80E+00	1.00E+00	2.65E+00
Thyroid					
Actual Dose (mrem)	5.68E-04	1.89E-02	6.04E-02	4.25E-03	8.41E-02
% of Specification	1.14E-02	3.78E-01	1.21E+00	8.50E-02	8.41E-01

Table 3.4 (continued)
Dose from Liquid Effluents

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Annual
Kidney					
Actual Dose (mrem)	5.68E-04	1.89E-02	6.04E-02	4.31E-03	8.42E-02
% of Specification	1.14E-02	3.78E-01	1.21E+00	8.62E-02	8.42E-01
Lung					
Actual Dose (mrem)	8.25E-04	2.05E-02	7.98E-02	5.50E-03	1.07E-01
% of Specification	1.65E-02	5.00E-01	1.60E+00	1.10E-01	1.07E+00
GI-LLI					
Actual Dose (mrem)	2.32E-03	2.70E-02	1.00E-01	1.19E-01	2.49E-01
% of Specification	4.64E-02	5.40E-01	2.00E+00	3.98E+00	2.49E+00

3.4 Ground Water Monitoring

The Kewaunee Power Station has 14 wells used to sample for groundwater contamination. Eight of the wells are located to monitor for leakage from the auxiliary building. The other six wells are designated as monitoring wells and sample areas outside the Site Outside the Protected Area (SOPA) to identify any spread of contamination. As the data below indicates the only nuclide identified in the auxiliary wells is tritium, with results well below federal limits. The monitoring wells indicate no nuclide contamination. The source of the tritium is from rain washout and air diffusion from the plant auxiliary building vent due to spent fuel pool evaporation. The tritium levels have decreased in the auxiliary wells since the plant was permanently shut down in 2013, and based on the monitoring well results there has been no migration of tritium from the plant. There were no voluntary ground water communications, no spills, and no leaks in 2017.

Sample Point Sample Date	Tritium pCi/L	Total Gamma Activity µCi/ml
AB-707		
03/20/17	979	None Detected
06/08/17	954	None Detected
09/20/17	780	None Detected
11/16/17	715	None Detected
AB-708		
03/20/17	685	None Detected
06/08/17	704	None Detected
09/20/17	626	None Detected
11/16/17	579	None Detected
AB-709		
03/22/17	545	None Detected
06/15/17	654	None Detected
09/20/17	289	None Detected
11/20/17	355	None Detected
AB-710		
03/20/17	711	None Detected
06/08/17	969	None Detected
09/20/17	551	None Detected
11/16/17	794	None Detected
AB-711		
03/20/17	325	None Detected
06/08/17	465	None Detected
09/20/17	501	None Detected
11/16/17	366	None Detected
AB-712		
03/22/17	744	None Detected
06/15/17	646	None Detected
09/20/17	245	None Detected
11/20/17	370	None Detected

Sample Point Sample Date	Tritium pCi/L	Total Gamma Activity µCi/ml
AB-715		
03/22/17	322	None Detected
06/08/17	879	None Detected
09/20/17	< 239	None Detected
11/16/17	< 263	None Detected
AB-717		
03/21/17	<245	None Detected
06/15/17	<219	None Detected
09/22/17	<239	None Detected
11/20/17	<263	None Detected
MW-701		
03/22/17	<270	None Detected
06/08/17	<244	None Detected
09/22/17	<249	None Detected
11/29/17	<263	None Detected
MW-702		
03/23/17	<270	None Detected
06/15/17	<244	None Detected
09/08/17	<249	None Detected
11/30/17	<240	None Detected
MW-703		
03/23/17	<270	None Detected
06/15/17	<244	None Detected
09/04/17	<249	None Detected
11/30/17	<240	None Detected
MW-704		
03/23/17	<270	None Detected
06/15/17	<244	None Detected
09/04/17	<249	None Detected
11/30/17	<240	None Detected
MW-705		
03/22/17	<270	None Detected
06/15/17	<244	None Detected
09/26/17	<249	None Detected
11/30/17	<240	None Detected
MW-706		
03/22/17	<270	None Detected
06/15/17	<244	None Detected
09/26/17	<249	None Detected
11/30/17	<240	None Detected

4.0 METEOROLOGICAL DATA

See Appendix A for missing meteorological data and the joint frequency distribution tables for the report period.

5.0 SOLID WASTE DISPOSAL

Table 5.1 is a summation of solid radioactive waste shipped during 2017. Presented are the types of waste streams, waste classification, and major nuclides.

Table 5.1
Solid Waste and Irradiated Fuel Shipments

A. Solid Radioactive Waste Shipped Off-Site for Burial or Disposal

1. Type of Waste with Estimate of Major Nuclide Composition

Resins, Filters, and Evaporator Bottoms	Volume		Curies Shipped
Waste Class	ft^3	m^3	Curies
A	0.00E+00	0.00E+00	0.00E+00
B	0.00E+00	0.00E+00	0.00E+00
C	0.00E+00	0.00E+00	0.00E+00
All	0.00E+00	0.00E+00	0.00E+00

Major nuclides for the above table: NA

Dry Active Waste	Volume		Curies Shipped
Waste Class	ft^3	m^3	Curies
A	0.00E+00	0.00E+00	0.00E+00
B	0.00E+00	0.00E+00	0.00E+00
C	0.00E+00	0.00E+00	0.00E+00
All	0.00E+00	0.00E+00	0.00E+00

Major nuclides for the above table: NA

Table 5.1 (continued)
Solid Waste and Irradiated Fuel Shipments

Irradiated Components	Volume		Curies Shipped
Waste Class	ft^3	m^3	Curies
A	0.00E+00	0.00E+00	0.00E+00
B	0.00E+00	0.00E+00	0.00E+00
C	6.22E+00	1.76E-01	9.51E+02
All	6.22E+00	1.76E-01	9.51E+02

Major nuclides for the above table: H-3, C-14, Fe-55, Co-60, Ni-59, Ni-63, Sr-90, Nb-94, Tc-99, Ag-108m, I-129, Cs-137, Pu-238, Pu-239, Pu-240, Pu-241, Am-241

Other Waste (DAW-Asbestos)	Volume		Curies Shipped
Waste Class	ft^3	m^3	Curies
A	7.58E+02	2.15E+01	7.62E-01
B	0.00E+00	0.00E+00	0.00E+00
C	0.00E+00	0.00E+00	0.00E+00
All	7.58E+02	2.15E+01	7.62E-01

Major nuclides for the above table: H-3, C-14, Fe-55, Co-60, Ni-59, Ni-63, Nb-94, Tc-99, I-129, Cs-137, Ce-144, Pu-238, Pu-239, Pu-240, Pu-241, Am-241, Cm243, Cm-244

Sum of All Low-Level Waste	Volume		Curies Shipped
Waste Class	ft^3	m^3	Curies
A	7.58E+02	2.15E+01	7.62E-01
B	0.00E+00	0.00E+00	0.00E+00
C	6.22E+00	1.76E-01	9.51E+02
All	7.64E+02	2.16E+01	9.52E+02

Major nuclides for the above table: H-3, C-14, Fe-55, Co-60, Ni-59, Ni-63, Sr-90, Nb-94, Tc-99, Ag-108m, I-129, Cs-137, Ce-144, Pu-238, Pu-239, Pu-240, Pu-241, Am-241, Cm243, Cm-244

Table 5.1 (continued)
Solid Waste and Irradiated Fuel Shipments

B. Irradiated Fuel Shipments

Number of Shipments	Mode of Transportation	Destination
None	NA	NA

No irradiated fuel shipments were made from the Kewaunee Power Station during 2017.

6.0 SUPPLEMENTAL INFORMATION

6.1 Abnormal Releases or Abnormal Discharges

No abnormal releases or abnormal discharges were made from the Kewaunee Power Station during the report period.

6.2 Non-routine Planned Discharges

No non-routine planned discharges were made from the Kewaunee Power Station during the reporting period.

6.3 Program Revisions

In accordance with Technical Requirements Manual Section 10.3.2, the revisions to the Process Control Program, Offsite Dose Calculation Manual, Radiological Environmental Monitoring Program and radioactive waste treatment systems are listed below.

6.3.1 Process Control Program

There were no revisions made to the Process Control Program during this report period.

6.3.2 Offsite Dose Calculation Manual

The Kewaunee Power Station Offsite Dose Calculation Manual (ODCM) was not revised during this report period.

6.3.3 Radiological Environmental Monitoring Manual

The Kewaunee Power Station Radiological Environmental Monitoring Manual (REMM) was not revised during this report period.

6.4 Major Changes to the Radioactive Liquid, Gaseous and Solid Waste Treatment Systems

There were no changes made to the radioactive waste systems (liquid, gaseous or solids) during this report period.

6.5 Effluent Monitoring System Inoperability

6.5.1 There were no effluent radiation monitors inoperable for the consecutive time period listed in the ODCM for this report period.

6.6 Corrections to Previous Reports

6.6.1 None.

6.7 Other

6.7.1 Condition Report CR1593 was submitted on 1/25/2018.

KPS Did Not Meet Annual Availability of 90% for Meteorological Data in 2017.

Procedure RP-KW-001-025, Meteorological Monitoring, has an annual data availability goal of 90% as required by Regulatory Guide 1.23 for operating nuclear power plants. Kewaunee Power Station achieved 85% availability in 2017. The lower rate of availability was not due to instrument problems but due to loss of R-Time data archiving in the 2nd and 4th quarters of 2017. The data is not retrievable for these periods. The 90% availability goal is primarily associated with dose projection calculations for Emergency Planning. Going forward meteorological data monitoring and archiving will no longer be required at Kewaunee Power Station. Evaluations involving meteorological data such as effluent dispersion determinations will be based on historical data summaries rather than current meteorological data. RP-KW-001-025 will be deleted.

The following information is included in Appendix A of the Annual Radioactive Effluent Release Report along with the 2017 Site Meteorological data:

Missing Data

First Quarter: 14.25 hours
Second Quarter: 1031.75 hours
Third Quarter: 13.25 hours
Fourth Quarter: 282.75 hours

A total of 1342 hours of data is missing or otherwise unavailable. This represents an availability of 85% of the data for the year 2017.

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Appendix A

Kewaunee Power Station

2017 Meteorological Data

Missing Data

First Quarter: 14.25 hours
Second Quarter: 1031.75 hours
Third Quarter: 13.25 hours
Fourth Quarter: 282.75 hours

Note: A total of 1342.00 hours of data is missing or otherwise unavailable. This represents the availability of 84.68% of the data for the year.

First Quarter 2017

Stability Class A

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.5	0	1.5	0.5	0	0	2.5
NNE	0	0.5	3	4.75	3.5	0	0	11.75
NE	0	1	1.25	2	2.25	0	0	6.5
ENE	0	0.5	0.75	0.5	0	0	0	1.75
E	0	0.25	4.5	0	0	0	0	4.75
ESE	0	0.75	3.25	0	0	0	0	4
SE	0	0.5	1.25	1	0	0	0	2.75
SSE	0	0.5	0.5	1.5	0.75	0	0	3.25
S	0	0	2.25	5.25	0.25	0	0	7.75
SSW	0	0.5	3	2.5	0.75	0	0	6.75
SW	0	0.25	2.5	3.25	1.75	0.25	0.5	8.5
WSW	0	0.25	4	3.25	0	2.75	0	10.25
W	0	0.5	8	29	11.75	2.75	0	52
WNW	0	0.75	4.25	8.5	3.5	0	0	17
NW	0	0.25	3.75	16	3.5	0	0	23.5
NNW	0	0	4.25	6.75	5.25	0	0	16.25
TOTAL	0	7	46.5	85.75	33.75	5.75	0.5	179.25

Stability Class B

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	0.75	1.75	0	0	2.5
NNE	0	0	1.75	1.5	1	0	0	4.25
NE	0	0.25	0.25	1.75	0	0	0	2.25
ENE	0	0	0.25	0	0	0	0	0.25
E	0	0	1	0	0	0	0	1
ESE	0	0.5	0	0	0	0	0	0.5
SE	0	0.25	0.5	0	0	0	0	0.75
SSE	0	0	0.5	2	0	0	0	2.5
S	0	0	0.5	1	0	0	0	1.5
SSW	0	0.25	0.5	1.75	0	0	0	2.5
SW	0	0	0.5	0	0	0.25	0	0.75
WSW	0	0	2	0.25	0	1.5	0	3.75
W	0	0	3.75	8	1.25	0.5	0	13.5
WNW	0	0	1.5	3	1	0	0	5.5
NW	0	0	1.25	2.25	0	0	0	3.5
NNW	0	0	0.75	1.75	0	0	0	2.5
TOTAL	0	1.25	15	24	5	2.25	0	47.5

Stability Class C

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0.25	1.75	0.75	0	0	2.75
NNE	0	0	2.75	2.5	0	0	0	5.25
NE	0	0	2.5	1.25	0	0	0	3.75
ENE	0	0	0	1	0	0	0	1
E	0	0.5	0.5	0	0	0	0	1
ESE	0	0.75	1.25	0	0	0	0	2
SE	0	0.25	0.75	0.5	0	0	0	1.5
SSE	0	0	0	1.25	0	0.25	0	1.5
S	0	0.25	0.75	1.5	0.5	0	0	3
SSW	0	0	0.75	2.5	0.5	0	0	3.75
SW	0	0	2.75	2.5	1.25	0.5	0	7
WSW	0	0.25	2.25	1.5	0	0.5	0	4.5
W	0	0	3.25	10.25	1.5	0.25	0	15.25
WNW	0	0	3.5	5	1.75	0	0	10.25
NW	0	0	2.75	4	0.75	0	0	7.5
NNW	0	0	0.75	4.25	2.25	0	0	7.25
TOTAL	0	2	24.75	39.75	9.25	1.5	0	77.25

Stability Class D

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.5	2.5	5.5	4.75	0	0	13.25
NNE	0	0	7.75	18.75	13	10	2	51.5
NE	0	1.25	5.5	8.5	5	1.25	0	21.5
ENE	0	0.25	4.75	7.25	0	0.5	0	12.75
E	0	1.75	3.25	0.25	0	0	0	5.25
ESE	0	0.5	0.5	0	0	0	0	1
SE	0	1.5	2.75	3.25	6.25	0.5	0	14.25
SSE	0	0.5	2.75	7	10	5.75	7.75	33.75
S	0	0.5	2	6.25	7.5	3.25	0	19.5
SSW	0	0.25	3.75	3.75	1	0	0	8.75
SW	0	0.5	1.75	1	0.5	0.5	0	4.25
WSW	0	1.5	4.25	1.75	0.75	0.75	0	9
W	0	1	10.5	18	6.75	2	0	38.25
WNW	0	0.75	12	18	11.25	1.5	0	43.5
NW	0	0.25	13.5	24	2.5	0	0	40.25
NNW	0	0	4.75	11.5	3.5	0.25	0	20
TOTAL	0	11	82.25	134.75	72.75	26.25	9.75	336.75

Stability Class E

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	4.75	11.75	28.75	12.75	0	0.5	58.5
NNE	0	1.75	14.25	41	25.5	6.25	0.25	89
NE	0.25	2.75	17.5	21.5	1	0	0	43
ENE	0	3	15	3.75	0.5	0	0	22.25
E	0	0.75	8.25	6.25	0	0	0	15.25
ESE	0	0.5	3.5	1.25	0	0	0	5.25
SE	0	0.75	2.75	1	0.75	1.25	0	6.5
SSE	0	1.5	4	14.25	17.25	3.5	0	40.5
S	0	1.25	22.5	29.5	14.75	0.5	0	68.5
SSW	0	2.75	29.75	16.25	1	0	0	49.75
SW	0	2.75	10.75	13	6.25	1	0.25	34
WSW	0	2.25	16.75	13.25	3	2.75	0	38
W	0	5	17.5	52.25	15.5	7	0.25	97.5
WNW	0	3.5	33.5	61.75	17.25	0	0	116
NW	0	3.5	27.5	39.5	13.25	0.5	0	84.25
NNW	0	7.75	30.5	40.25	9.5	0	0	88
TOTAL	0.25	44.5	265.75	383.5	138.25	22.75	1.25	856.25

Stability Class F

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	3.5	6.25	0.5	0	0.25	0.75	11.25
NNE	0.25	3.25	5.75	6.25	0	0.25	0	15.75
NE	0.25	3.75	9.5	0.75	0	0	0	14.25
ENE	0	4.25	5.75	3.25	0.25	0	0	13.5
E	0.25	7.25	7.5	4.5	0	0	0	19.5
ESE	0.25	1.75	5.75	1.25	1.25	0	0	10.25
SE	0	2.5	2	1.25	0	0	0	5.75
SSE	0	4.25	5.75	4	3	0	0	17
S	0	3	10.25	7.25	6	1.25	0	27.75
SSW	0	5.75	15.5	4	0.5	0.5	0.25	26.5
SW	0	4.75	11.5	5.5	3.5	0.25	0	25.5
WSW	0	4	9	6.75	0.25	0.5	0	20.5
W	0	8.25	25	29	0	0	0	62.25
WNW	0.5	5.5	26.5	12.25	0.75	0	0	45.5
NW	0	7.25	14.25	9.75	1.5	0	0	32.75
NNW	0	4.25	7.25	6	0.25	0	0.25	18
TOTAL	1.5	73.25	167.5	102.25	17.25	3	1.25	366

Stability Class G

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	4.75	4.5	0	0	1.25	1.75	12.25
NNE	0	0.75	0.75	0	0	0	0	1.5
NE	0	1	2	0	0	0	0	3
ENE	0.25	1.75	3.25	0	0	0	0	5.25
E	0.25	3.25	1.75	0	0	0	0	5.25
ESE	0	1	2.5	0	0.75	0	0	4.25
SE	0	1	1	0	0	0	0	2
SSE	0	1	8.5	5	1.25	0.25	0	16
S	0.5	1.5	10.25	3.5	1.5	0.75	0	18
SSW	0	7	11	0.25	0.25	0	0	18.5
SW	0	6.75	10.25	1.25	0.25	0.25	0	18.75
WSW	0	8.25	42	4.5	0	0	0	54.75
W	0	6.75	40.5	8.5	0	0	0	55.75
WNW	0	4.5	26.5	6.25	0	0	0	37.25
NW	0	6	10	0.5	0	0.25	0	16.75
NNW	0.25	7.75	5.75	0	0	0	0	13.75
TOTAL	1.25	63	180.5	29.75	4	2.75	1.75	283

Second Quarter 2017

Stability Class A

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0.25	1.25	1	2.75	0	5.25
NNE	0	0	0.25	2	6.5	0.25	0	9
NE	0	0.25	0.75	7.5	0.75	0	0	9.25
ENE	0	0	1.75	0.75	0	0	0	2.5
E	0	0.25	0	0	0	0	0	0.25
ESE	0	0	1.25	0	0	0	0	1.25
SE	0	0.5	2.5	0.5	0.25	0	0	3.75
SSE	0	0	1	3	0	0	0	4
S	0	0	2.25	2.5	0	0	0	4.75
SSW	0	0	1.5	0.75	0.25	0	0	2.5
SW	0	0.25	1	0.25	0	0	0	1.5
WSW	0	0.25	4.5	6	1	0	0	11.75
W	0	0.25	9.5	13.5	2	0	0	25.25
WNW	0	0	14	15.75	3.25	0.5	0	33.5
NW	0	0	3.25	6.5	1.25	0	0	11
NNW	0	0	0	3.25	2	0.25	0	5.5
TOTAL	0	1.75	43.75	63.5	18.25	3.75	0	131

Stability Class B

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	1.25	0	1.25	0.25	2.75
NNE	0	0	0	0.25	1	0	0	1.25
NE	0	0.25	0.25	1.25	0	0	0	1.75
ENE	0	0	0.25	0	0	0	0	0.25
E	0	0.25	1	0	0	0	0	1.25
ESE	0	0.25	1.5	0	0	0	0	1.75
SE	0	0	0.5	0.25	0	0	0	0.75
SSE	0	0	0.25	0.25	0	0	0	0.5
S	0	0	0	0.75	0	0	0	0.75
SSW	0	0	0.5	0.5	0	0	0	1
SW	0	0	0.25	0.5	0	0	0	0.75
WSW	0	0.25	1	3.5	0.25	0	0	5
W	0	0	1.75	3.5	1.5	0	0	6.75
WNW	0	0	3.25	1.25	0.5	0	0	5
NW	0	0	2.5	2.25	0.25	0	0	5
NNW	0	0	0.25	0.75	0.5	0	0	1.5
TOTAL	0	1	13.25	16.25	4	1.25	0.25	36

Stability Class C

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	0	1.5	0.25	0	0	1.75
NNE	0	0	0.5	0.75	2.25	0	0	3.5
NE	0	0	1.25	4	1.5	0	0	6.75
ENE	0	0	1	0.75	0	0	0	1.75
E	0	0	1.25	0	0	0	0	1.25
ESE	0	0	1	0	0	0	0	1
SE	0	0	0.5	0.75	0	0	0	1.25
SSE	0	0.25	0.75	0.5	0.5	0	0	2
S	0	0	0.25	0.75	0	0	0	1
SSW	0	0	0.25	0.75	0	0	0	1
SW	0	0.25	0	1	0	0	0	1.25
WSW	0	0	0.5	4.25	3.25	0	0	8
W	0	0	1.25	1.75	1.5	0	0	4.5
WNW	0	0	1	1.5	0.75	0	0	3.25
NW	0	0	1.5	3.25	1.5	0	0	6.25
NNW	0	0	0	4.25	1.25	0	0	5.5
TOTAL	0	0.5	11	25.75	12.75	0	0	50

Stability Class D

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.25	0.5	2.75	3.5	1.5	0	8.5
NNE	0	0	3	22.5	14.5	3.25	0	43.25
NE	0	0	7.25	17.5	4.5	0	0	29.25
ENE	0	0	2.25	1.5	1.25	0	0	5
E	0	0.5	2.5	0.75	0.5	0	0	4.25
ESE	0	0	1.25	0	0	0	0	1.25
SE	0	0	4	0.75	0	0	0	4.75
SSE	0	0.25	1.5	2	2.75	0	0	6.5
S	0	0.25	2	1.5	0.25	0	0	4
SSW	0	0	1.25	1.75	0	0	0	3
SW	0	0.25	1.25	0	0	0	0	1.5
WSW	0	0	1.75	0.75	0	0	0	2.5
W	0	0.25	3	2.5	0	0	0	5.75
WNW	0	0.25	6.25	5.25	1.25	0	0	13
NW	0	0.25	3.75	3.5	3.5	0	0	11
NNW	0	0.5	2.5	5.5	2	0	0	10.5
TOTAL	0	2.75	44	68.5	34	4.75	0	154

Stability Class E

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	1	3.5	9.25	8	0.25	0	22
NNE	0	1.5	7.25	20.25	15.75	4.5	1.5	50.75
NE	0	0.75	5.5	17.75	5.25	0	0	29.25
ENE	0	1.25	4.25	2.25	1.5	0	0	9.25
E	0	1	1.25	0	1	0	0	3.25
ESE	0	0.5	1	0.25	0	0	0	1.75
SE	0	0.25	0.5	0.25	0	0	0	1
SSE	0	0	3.25	4.75	1	0	0	9
S	0	0.75	12.5	19.25	1	0	0	33.5
SSW	0	1.5	4.25	6.5	0	0	0	12.25
SW	0	1.25	3.25	0.25	0	0	0	4.75
WSW	0	1	5.5	5.25	0.75	0	0	12.5
W	0	1.25	8	8.5	0.25	0	0	18
WNW	0	2.5	11.5	7.75	1	0	0	22.75
NW	0	2.25	2.25	4.5	3.5	0	0	12.5
NNW	0	1	1.75	13.75	7.75	0	0	24.25
TOTAL	0	17.75	75.5	120.5	46.75	4.75	1.5	266.75

Stability Class F

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	2	1.75	0	0	0	0	3.75
NNE	0	1.25	4.75	1.25	0.75	0	0	8
NE	0	2	7.75	0.5	0	0	0	10.25
ENE	0	1	3	0	0	0	0	4
E	0	1	1.5	0	0	0	0	2.5
ESE	0	1.25	1.5	0	0	0	0	2.75
SE	0	0.75	2	0.5	0	0	0	3.25
SSE	0	0.5	5	5.5	3	0	0.5	14.5
S	0	2	17.5	11.25	0.5	0	0	31.25
SSW	0	1.25	9.75	2.75	0	0	0	13.75
SW	0	1.25	3.25	0.25	0	0	0	4.75
WSW	0	2	9.25	3.5	0	0	0	14.75
W	0	1.75	15	0.75	0	0	0	17.5
WNW	0	1.5	13.5	2.25	0	0	0	17.25
NW	0.25	1	0.75	0.75	0	0	0	2.75
NNW	0	0.5	0	2.25	0	0	0	2.75
TOTAL	0.25	21	96.25	31.5	4.25	0	0.5	153.75

Stability Class G

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	1.5	1.5	0	0	0	0	3
NNE	0	1.5	4.25	0.75	0	0	0	6.5
NE	0	1.25	8.75	0.5	0	0	0	10.5
ENE	0	4	1.25	0	0	0	0	5.25
E	0	4.75	0.25	0	0	0	0	5
ESE	0	2.75	1.75	0	0	0	0	4.5
SE	0.25	3.25	6.5	0	0	0	0	10
SSE	0.25	3.75	37.25	31	3	0	0	75.25
S	0	5.5	35	22.25	0.5	0	0	63.25
SSW	0	11.75	18.25	0.75	0	0	0	30.75
SW	0.5	8.75	14.5	2.25	0	0	0	26
WSW	0.5	7.5	24.75	5.5	0	0	0	38.25
W	0.25	8.75	42.25	1	0	0	0	52.25
WNW	0	3.25	15.25	0.5	0	0	0	19
NW	0	1.75	5	0.25	0	0	0	7
NNW	0	3.25	1	0	0	0	0	4.25
TOTAL	1.75	73.25	217.5	64.75	3.5	0	0	360.75

Third Quarter 2017

Stability Class A

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.75	2	0.25	0	0	0	3
NNE	0	0	7.25	14.5	2	0	0	23.75
NE	0	0.5	20.75	0.25	0	0	0	21.5
ENE	0	1.5	8.5	0	0	0	0	10
E	0.25	1.75	9.25	0	0	0	0	11.25
ESE	0	8.25	4	0	0	0	0	12.25
SE	0	0	12	0.75	0	0	0	12.75
SSE	0	0.25	8.5	4.75	1	0	0	14.5
S	0	0.25	3	4	0.25	0	0	7.5
SSW	0	0.75	3	2	0	0	0	5.75
SW	0	0	7.25	6.5	0	0	0	13.75
WSW	0	0.75	20.25	8.25	0.25	0	0	29.5
W	0	1.75	22.5	3.5	0	0	0	27.75
WNW	0	1	11.5	3.75	0	0	0	16.25
NW	0	0.5	3.5	4.5	0.5	0	0	9
NNW	0	0.25	5.75	4.25	0.5	0	0	10.75
TOTAL	0.25	18.25	149	57.25	4.5	0	0	229.25

Stability Class B

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.25	1.25	0.25	0.25	0	0	2
NNE	0	0.25	2.25	3.75	1.5	0	0	7.75
NE	0	0.75	8.75	0.25	0	0	0	9.75
ENE	0	0.5	4.75	0	0	0	0	5.25
E	0	1	4	0	0	0	0	5
ESE	0	1	0.5	0	0	0	0	1.5
SE	0	0.5	0.5	0.25	0	0	0	1.25
SSE	0	0.25	2.25	0.5	0	0	0	3
S	0	0	1.25	2.5	0.5	0	0	4.25
SSW	0	0	1.75	0	0	0	0	1.75
SW	0	0.75	0.25	1.25	0	0	0	2.25
WSW	0	1.5	1.75	2.5	0.5	0	0	6.25
W	0	0	3.25	2.25	0	0	0	5.5
WNW	0	0	3.5	2.75	0	0	0	6.25
NW	0	0	1.5	1.75	0.25	0	0	3.5
NNW	0	0	2.25	1.5	0	0	0	3.75
TOTAL	0	6.75	39.75	19.5	3	0	0	69

Stability Class C

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.25	1.25	1.75	0	0	0	3.25
NNE	0	0	6.25	5.5	1	0	0	12.75
NE	0	0.25	4.5	0.25	0	0	0	5
ENE	0	1.25	5	0	0	0	0	6.25
E	0	1	2.5	0	0	0	0	3.5
ESE	0	1	1.25	0	0	0	0	2.25
SE	0	1	3.25	0.75	0	0	0	5
SSE	0	0	4	3.5	0.75	0	0	8.25
S	0	0	3.75	1.25	1.25	0	0	6.25
SSW	0	0.25	1	0	0	0	0	1.25
SW	0	0	0.5	0	0	0	0	0.5
WSW	0	0.25	2	0.75	0.25	0	0	3.25
W	0	1.75	2.75	0.5	0	0	0	5
WNW	0	0	3.25	2.5	0	0	0	5.75
NW	0	0.25	3.75	3.25	1.25	0	0	8.5
NNW	0	0.25	4.75	2.5	1.25	0	0	8.75
TOTAL	0	7.5	49.75	22.5	5.75	0	0	85.5

Stability Class D

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.75	6.25	4	0.25	0	0	11.25
NNE	0	1	9	15.25	5.5	0	0	30.75
NE	0	1.25	7	0.5	0	0	0	8.75
ENE	0	1.75	7	1	0	0	0	9.75
E	0	1.25	1.75	0	0	0	0	3
ESE	0	0.5	1	0	0	0	0	1.5
SE	0	2.5	6	1.25	0	0	0	9.75
SSE	0	1	8.25	6.75	1.25	0	0	17.25
S	0	1	4.75	4	3.5	0	0	13.25
SSW	0	1.5	4	0	0	0	0	5.5
SW	0	0.75	1.25	0.75	0	0	0	2.75
WSW	0	1	5.5	2.25	0	0	0	8.75
W	0	1.25	7.75	1.5	0	0	0	10.5
WNW	0	0.25	4.75	2.25	0	0	0	7.25
NW	0	0.25	4	1	0.25	0	0	5.5
NNW	0	0.25	2	2.25	0	0	0	4.5
TOTAL	0	16.25	80.25	42.75	10.75	0	0	150

Stability Class E

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	1.25	10	5.75	0	0	0	17
NNE	0	0.75	9.75	13.75	1.25	0	0	25.5
NE	0	5.5	7.5	0.5	0	0	0	13.5
ENE	0	6.75	11.75	0	0	0	0	18.5
E	0	5	4.25	0	0	0	0	9.25
ESE	0	4	5.25	0.25	0	0	0	9.5
SE	0	2.25	6.75	6.5	0.5	0	0	16
SSE	0	3	11.75	16.25	7.5	0.25	0	38.75
S	0	3.75	26.25	11	1.5	0	0	42.5
SSW	0	4	21.75	2.5	0	0	0	28.25
SW	0	4.25	8.25	1.75	0	0	0	14.25
WSW	0	5.5	11.25	2.5	0	0	0	19.25
W	0.25	1.25	9.5	4.75	0	0	0	15.75
WNW	0	0.75	4.5	5.5	0	0	0	10.75
NW	0.25	1.5	5.25	3	0.75	0	0	10.75
NNW	0	2	18.25	0.75	0.25	0	0	21.25
TOTAL	0.5	51.5	172	74.75	11.75	0.25	0	310.75

Stability Class F

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.5	5.25	17.75	10	0	0	0	33.5
NNE	0.5	2.25	21	19.75	8.5	0	0	52
NE	0	10	15	2.25	0	0	0	27.25
ENE	0.75	7.75	11.25	4.75	0	0	0	24.5
E	0.25	11	13.5	1.25	0	0	0	26
ESE	1.25	12.25	9.25	4.5	0	0	0	27.25
SE	0.25	5.75	19.75	17.75	0.5	0	0	44
SSE	0.75	12.75	37.5	36.25	8.25	0	0	95.5
S	0.25	21.5	88.25	28.25	0.5	0	0	138.75
SSW	0.75	35.5	55	1.25	0	0	0	92.5
SW	0	26.75	15.25	0.75	0	0	0	42.75
WSW	0	27.25	23.25	7.5	0	0	0	58
W	1.5	21.25	47	2	0	0	0	71.75
WNW	0.5	18.75	62.75	14.25	0	0	0	96.25
NW	0.75	19.5	43.25	16	0	0	0	79.5
NNW	0.25	8.75	29.25	10.75	0	0	0	49
TOTAL	8.25	246.25	509	177.25	17.75	0	0	958.5

Stability Class G

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.25	6.75	7.25	0	0	0	0	14.25
NNE	0	2.25	1.75	1.25	0	0	0	5.25
NE	0	2.25	2.25	0.25	0	0	0	4.75
ENE	0	1	1.25	0	0	0	0	2.25
E	0	1	1	0	0	0	0	2
ESE	0.5	2.25	0.25	0	0	0	0	3
SE	0.25	5	3.25	0	0	0	0	8.5
SSE	0	4.5	16.25	6.75	0	0	0	27.5
S	0	3.75	19.25	5	0	0	0	28
SSW	0.25	15.25	8.75	0	0	0	0	24.25
SW	0.25	20	5.25	0.25	0	0	0	25.75
WSW	0.25	31.5	28.5	0.25	0.25	0	0	60.75
W	0.25	16	61.75	0	0	0	0	78
WNW	0.25	14	30.75	0	0	0	0	45
NW	0	17.25	21.25	0.25	0	0	0	38.75
NNW	0	13.25	10.25	0.25	0	0	0	23.75
TOTAL	2.25	156	219	14.25	0.25	0	0	391.75

Fourth Quarter 2017

Stability Class A

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0	1.75	0.75	0	0	0	2.5
NNE	0	0	0.25	0.25	0	0	0	0.5
NE	0	0	1.5	0	0	0	0	1.5
ENE	0	0	1	0	0	0	0	1
E	0	0.25	1	0	0	0	0	1.25
ESE	0	0	1	0	0	0	0	1
SE	0	0.25	2.75	0.75	0	0	0	3.75
SSE	0	0	0.75	1	0.75	0	0	2.5
S	0	0.75	0	0.75	0	0	0	1.5
SSW	0	0.75	1	0.25	0	0	0	2
SW	0	0.25	2.5	1.25	0	0	0	4
WSW	0	0.25	4	8	2	1.25	0	15.5
W	0	0.25	7.5	13.75	5.25	0.25	0	27
WNW	0	0	4	8	3.75	0	0	15.75
NW	0	0	3.75	2.25	1.5	0	0	7.5
NNW	0	0.25	2.25	2	0.25	0	0	4.75
TOTAL	0	3	35	39	13.5	1.5	0	92

Stability Class B

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.25	0.5	0.25	0	0	0	1
NNE	0	0	0.25	0	0	0	0	0.25
NE	0	0	0.75	0.75	0	0	0	1.5
ENE	0	0.25	0	0.25	0	0	0	0.5
E	0	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0	0
SSE	0	0	0.25	0	0	0	0	0.25
S	0	0	0.75	3.25	0	0	0	4
SSW	0	0.25	0.5	0	0	0	0	0.75
SW	0	0	0.75	0.25	0	0	0	1
WSW	0	0.25	1	1	0	0.25	0	2.5
W	0	0.5	2	4.75	1	0.25	0	8.5
WNW	0	0.25	3	1.75	2	0	0	7
NW	0	0	1.75	2.25	0	0	0	4
NNW	0	0.25	0.25	0	0	0	0	0.5
TOTAL	0	2	11.75	14.5	3	0.5	0	31.75

Stability Class C

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.75	0.25	0.25	0	0	0	1.25
NNE	0	0.25	0.5	1	0.25	0	0	2
NE	0	0	0.5	0.25	0	0	0	0.75
ENE	0	0.25	0.25	1.75	0	0	0	2.25
E	0	0	0.5	0	0	0	0	0.5
ESE	0	0	0	0	0	0	0	0
SE	0	0	0.25	0.25	0	0	0	0.5
SSE	0	0	0.75	2.25	0	0	0	3
S	0	0.75	1.5	2.75	0	0	0	5
SSW	0	0.5	0.75	0.75	0	0	0	2
SW	0	1	1	0.5	0	0	0	2.5
WSW	0	0.5	0.25	0.25	0.5	0.25	0	1.75
W	0	2.25	4.25	3.5	2	0	0	12
WNW	0	0.25	5	3.25	2	0	0	10.5
NW	0	0.5	1	3.75	4	0	0	9.25
NNW	0	0.5	0	0.75	0.25	0	0	1.5
TOTAL	0	7.5	16.75	21.25	9	0.25	0	54.75

Stability Class D

Wind Speed

Wind Direction	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	1	3.75	2.25	0.25	0	0	7.25
NNE	0	0.25	5.75	3.25	1.5	0	0	10.75
NE	0	0.5	2.75	0	0	0	0	3.25
ENE	0	0.25	2.75	0.5	0	0	0	3.5
E	0	0	6.25	0.5	0	0	0	6.75
ESE	0	0.25	2.25	1.25	0.25	0	0	4
SE	0	0.25	1.25	5	1.25	0	0	7.75
SSE	0	0.5	2.25	3.5	4.75	0.75	0	11.75
S	0	0.75	2	8.75	4.5	3.25	0	19.25
SSW	0	1.5	2.25	8.75	0	0	0	12.5
SW	0	2.25	3.75	3.5	0	0	0	9.5
WSW	0.25	2	10.5	7.75	1.25	3.5	0	25.25
W	0	3.5	10.5	11	7	0.25	0	32.25
WNW	0	2.75	8.25	8.75	5.75	0	0	25.5
NW	0	1.75	7.5	15	8	0	0	32.25
NNW	0	1	7.5	10.5	1.25	0	0	20.25
TOTAL	0.25	18.5	79.25	90.25	35.75	7.75	0	231.75

Stability Class E

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	0.5	14.5	1.75	0	0	0	16.75
NNE	0	1.25	8.5	0.25	0.25	0	0	10.25
NE	0	1.75	10.25	0	0	0	0	12
ENE	0	1	9.25	4	0	0	0	14.25
E	0	1.25	8	6	1.25	0	0	16.5
ESE	0	0.75	7	11.5	1.75	0.25	0	21.25
SE	0	0.75	4	9.75	6.5	0	0	21
SSE	0	0.5	2	2.5	4.75	0	0	9.75
S	0	0.5	12.5	23	8.5	2.5	0	47
SSW	0	3.75	44	25.25	0.75	0	0	73.75
SW	0	3.75	25.75	3.5	0	0.75	0	33.75
WSW	0.25	7.25	23.25	8.75	12.25	6.5	0.25	58.5
W	0	5.5	19.25	27.25	13.25	0	0	65.25
WNW	0.25	5.75	27	50	9.5	0	0	92.5
NW	0	2.75	14	30.5	8.5	0	0	55.75
NNW	0	2.75	20.5	23	5.5	0	0	51.75
TOTAL	0.5	39.75	249.75	227	72.75	10	0.25	600

Stability Class F

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0	1.75	14.25	1	0.25	0	0	17.25
NNE	0	1.25	7.25	16.75	4.5	0	0	29.75
NE	0.25	1	10.25	0	0	0	0	11.5
ENE	0	3	7	12.25	0	0	0	22.25
E	0	2.25	7.5	4.25	1.5	0	0	15.5
ESE	0	2.75	10.5	2.5	0	0	0	15.75
SE	0	2	4.25	7.25	4.25	0	0	17.75
SSE	0	0.5	12.25	13	22	0.25	0	48
S	0	3	28.25	53	8.25	0.25	0	92.75
SSW	0	9.25	82	34.25	0.5	0	0	126
SW	0.5	9	33.5	6.5	6.25	0.25	0	56
WSW	0	11.25	29.5	25	2.25	0	0.25	68.25
W	0	9.25	43	25.5	2	0	0	79.75
WNW	0.25	7.5	27.5	21.75	4	0	0	61
NW	0.25	5.25	10.5	14.75	3.75	0	0	34.5
NNW	0.25	7.25	9.25	12.75	4	0	0	33.5
TOTAL	1.5	76.25	336.75	250.5	63.5	0.75	0.25	729.5

Stability Class G

Wind Direction	Wind Speed							
	CALM	1-3	4-7	8-12	13-18	19-24	>24	TOTAL
N	0.25	1.75	4	0	0	0	0	6
NNE	0	0.25	0.25	0	0	0	0	0.5
NE	0	0.25	0	0	0	0	0	0.25
ENE	0	0.75	7.25	0	0	0	0	8
E	0	0.25	7.75	1.25	0	0	0	9.25
ESE	0	0.25	9	0	0	0	0	9.25
SE	0	0	0	1.25	0.5	0	0	1.75
SSE	0	0	1	0	0	0	0	1
S	0	1	2	0.25	0	0	0	3.25
SSW	0.25	4.25	7.75	0.25	0	0	0	12.5
SW	0	8	8.5	0.75	0.25	0	0	17.5
WSW	0.25	8.5	24	2.5	0	0	0	35.25
W	0	2	36	2.75	0	0	0	40.75
WNW	0	2.25	17.25	1	0	0	0	20.5
NW	0	3	11	0.5	0	0	0	14.5
NNW	0.25	1.5	3.5	0	0	0	0	5.25
TOTAL	1	34	139.25	10.5	0.75	0	0	185.5

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