

Robert L. Justice
General Manager, Nuclear Plant Operations
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April 25, 2018

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Sir / Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION UNIT 1
DOCKET NO. 50-395
OPERATING LICENSE NO. NPF-12
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

Enclosed is the South Carolina Electric & Gas Company Annual Radioactive Effluent Release Report as required by 10CFR50.36a, Section 6.9.1.8 of the Virgil C. Summer Nuclear Station Technical Specifications and Section 1.6.2 of the Offsite Dose Calculation Manual. This submittal covers the period of January 1 through December 31, 2017.

Should there be any questions, please contact Ms. Susan B. Reese at (803) 345-4591.

Very truly yours,

A handwritten signature in black ink, appearing to read "R. Justice", is written over a horizontal line.

Robert L. Justice

SBR/RLJ/rp
Enclosures

c: w/o enclosures unless noted

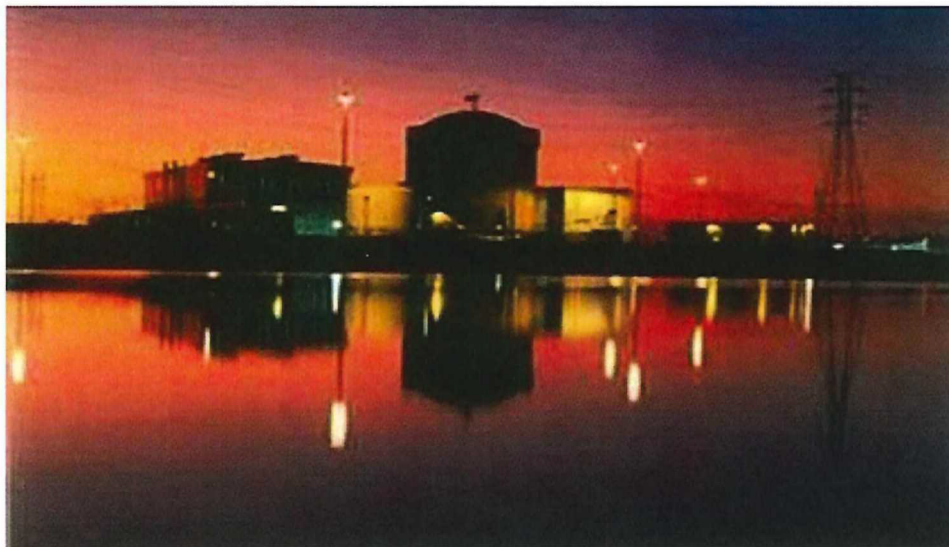
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ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT VIRGIL C. SUMMER NUCLEAR STATION UNIT 1

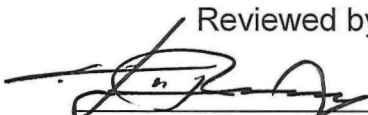
FOR THE OPERATING PERIOD
JANUARY 1, 2017 - DECEMBER 31, 2017



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ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY – DECEMBER, 2017

VIRGIL C. SUMMER NUCLEAR STATION SOUTH CAROLINA ELECTRIC & GAS

Introduction

This report is being submitted as a summary of quantities of radioactive liquid and gaseous effluents and solid waste released from the Virgil C. Summer Nuclear Station. This report is submitted in fulfillment of the requirements in the V. C. Summer Nuclear Station Operating License Technical Specifications Section 6.9.1.8, Offsite Dose Calculation Manual (ODCM) Section 1.6.2 and 10CFR50.36(a) and follows the reporting details specified in USNRC Regulatory guide 1.21⁽¹⁾.

Summary information of radioactive gaseous and liquid effluents is presented along with a summary of radioactive waste disposal as well as an evaluation of the radiological impact on man due to operation of the Virgil C. Summer Nuclear Station. Supplemental information including release limits also required by USNRC Regulatory Guide 1.21 is provided as Appendix A.

A. Supplemental Information

Regulatory limits for doses, dose rate and effluent concentration limits presented in Supplemental Information are from the Virgil C. Summer Nuclear Station ODCM and 40 CFR 190. Average energy (\bar{E}) is not applicable to the method for determining release rate limits for fission and activation gaseous effluents, therefore, it has been omitted. A compilation of required supplemental information is provided in Appendix A.

B. Gaseous Effluents

Gaseous effluents released from ground level are summarized in Tables 1 and 2. An elevated release pathway does not exist at Virgil C. Summer Nuclear Station. Cumulative doses are discussed in Section E.

The error for both liquid and gaseous release totals is estimated as twenty percent for radioactive radionuclides sampled and released in effluent pathways. Error was derived using root sum of squares methodology considering known sources of error including calibration of detectors and flow measurement equipment, sample preparation, and analysis counting error.

C. Liquid Effluents

Liquid effluents are summarized in Tables 3 and 4. Estimated total errors are expressed as in Section B above.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY – DECEMBER, 2017

VIRGIL C. SUMMER NUCLEAR STATION SOUTH CAROLINA ELECTRIC & GAS

D. Solid Waste Shipments

Solid waste shipments are summarized in Table 5. Curie content of radioactive waste packages is determined by dose rates and/or gamma spectroscopy analysis of samples. The total error for each type of curie content determination is conservatively estimated to be the sum of a 15% systematic error and a 20% photon response error for the detector used.

E. Radiological Impact on Man

Dose to the maximum exposed individual in the unrestricted area was calculated using measured plant gaseous effluents and meteorological data in accordance with the Offsite Dose Calculation Manual. The source term involved no Waste Gas Decay Tank (WGDT) releases, 8.44 days of 6-inch Reactor Building purge releases, 34.73 days of 36-inch Reactor Building purge releases and a continuous 12-month Main Plant vent release. Doses are summarized in Table 6. The total gaseous activities released are presented in Tables 1 and 2. The highest quarterly air doses at the station boundary resulting from the release of noble gases were $2.19\text{E-}04$ mrad for gamma during the second quarter and $7.71\text{E-}05$ mrad for beta during the second quarter. The maximum quarterly organ dose attributed to the releases, excluding Carbon-14, was $8.13\text{E-}04$ mrem. Cumulative annual dose was $2.31\text{E-}04$ mrad, $9.16\text{E-}05$ mrad and $8.60\text{E-}04$ mrem for gamma, beta, and organ dose, respectively. Discussion of the impact of Carbon-14 is included in Section K.

Measured plant liquid effluent data was used to calculate estimates of doses to individuals in accordance with the Offsite Dose Calculation Manual. The source term consisted of the isotopic contents of 230 Waste Monitor Tank batch releases, 27 Condensate Backwash Receiver Tank batch releases, 6 NaOH Sump batch releases, 0.80 days of Steam Generator Blowdown release and a continuous Turbine Building Sump release.

Doses are summarized in Table 6 and total liquid radioactivity released is described in Tables 3 and 4. The highest quarterly total body dose to the maximum exposed individual resulting from the release of radioactive liquid was $6.78\text{E-}03$ mrem during the first quarter. The highest organ dose was $6.79\text{E-}03$ mrem to the GI-LLI for the first quarter. Cumulative annual doses for the hypothetical maximum exposed individual were $9.99\text{E-}03$ mrem for the total body and $1.18\text{E-}2$ mrem for the GI-LLI, the maximum annual organ. The GI-LLI was the maximum exposed organ for all four quarters.

Dose rates and concentrations were below station limits as specified in Supplemental Information, Section II A, B, and C during all the effluent releases.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY – DECEMBER, 2017

VIRGIL C. SUMMER NUCLEAR STATION SOUTH CAROLINA ELECTRIC & GAS

Radiation exposure to members of the public within the site boundary was assessed through calculation of gamma and beta air dose at 0.25 miles of the gaseous effluent release point and direct measurement of exposure using thermoluminescent dosimeters. Onsite air dose for this reporting period was $7.52\text{E-}04$ mrad gamma and $2.98\text{E-}04$ mrad beta, well below levels that can be distinguished above background. Quarterly thermoluminescent dosimetry (TLD) data from four onsite monitoring locations within 0.2 miles of the Reactor Building and eight locations at the site boundary were analyzed and compared with respective pre-operational background and previous year history. Results showed that the 2017 quarterly dose rates did not differ significantly from the pre-operational or 2016 dose rates.

The impact of Independent Spent Fuel Storage Installation (ISFSI) operation which began cask storage on March 26, 2016 was assessed using six TLD locations monitoring the perimeter of the ISFSI site. The TLD locations were monitored for three quarters prior to fuel storage and continued to be monitored through 2017 during which fuel storage casks were stored. Analysis of monitoring results showed no statistically significant increase in perimeter dose as a result of ISFSI operation.

Based on review of gaseous effluent dose calculations and analysis of onsite TLD monitoring it was concluded that doses to members of the public inside the site boundary were indistinguishable from normal background dose.

Radiation doses from radioactive effluents to workers at the Fairfield Hydro Station for this reporting period were calculated to be $1.09\text{E-}05$ and $4.33\text{E-}06$ mrad for gamma and beta, respectively.

Radiation doses from radioactive effluents to workers at the New Nuclear Site for this reporting period were calculated to be $9.41\text{E-}05$ and $3.73\text{E-}05$ mrad for gamma and beta, respectively.

Radiation doses from nearby uranium fuel cycle sources were not assessed. The ODCM, Sections 1.3.1 and B/1.3 establish a five (5) mile limit beyond which doses from nearby plants are insignificant. There are no uranium fuel cycle plants within a five (5) mile radius of Virgil C. Summer Nuclear Station.

F. Abnormal Releases

None

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY – DECEMBER, 2017

VIRGIL C. SUMMER NUCLEAR STATION SOUTH CAROLINA ELECTRIC & GAS

G. Meteorology

The meteorological data for 2017 was collected and analyzed. An annual meteorological summary report of joint frequency distributions of wind direction and speed by atmospheric stability class for each quarter is included as Enclosure A.

The wind direction and wind speed data used were acquired from the 10-meter level of the primary monitoring tower. Stability was determined by the primary differential temperature (61 to 10 meter).

The combined annual data recovery for wind direction, wind speed and stability was 99.7%. Primary variable recovery rates were as follows: wind direction (10 m) – 99.7%, wind speed (10 m) – 99.7%, and differential temperature (61 - 10 m) – 99.7%.

H. Offsite Dose Calculation Manual

The Virgil C. Summer Nuclear Station ODCM was not revised in 2017.

I. Offsite Dose Calculation Manual Reportable Incidents

ODCM Table 1.1-1 requires a flow rate measuring device for the Nuclear Blowdown Effluent Line. Station procedures identify flow Transmitter IFT04811 as the flow measuring device. Although a computer monitoring point is included as a system output and is calibrated along with the flow transmitter, recorder IFR04811 is used exclusively to verify system operability during performance of operational tests. From May 29, 2017 until November 14, 2017, the recorder IFR04811 was out of service preventing performance of operability tests and therefore the flow rate measurement device was considered inoperable during this period. System restoration delays resulted from troubleshooting and replacement of an obsolete recorder with a new recorder design through the engineering design change process.

At Summer Station, the Nuclear Blowdown Effluent Line is not used for making radioactive effluent releases and no releases were made through this pathway during 2017.

J. Major Changes to Radioactive Waste Treatment Systems

During 2017, there were no major changes to the Radioactive Waste Treatment System.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY – DECEMBER, 2017

VIRGIL C. SUMMER NUCLEAR STATION SOUTH CAROLINA ELECTRIC & GAS

K. Carbon-14 Gaseous Effluents

Carbon-14 production and release estimates were calculated using EPRI Report 1021106⁽²⁾, "Estimation of Carbon-14 in Nuclear Plant Gaseous Effluents". This calculation uses active core coolant mass, average neutron flux by energy and reactor coolant nitrogen concentrations to determine Carbon-14 generation based upon an effective full power year. The estimated generation for VC Summer Nuclear station for 2017 was 8.15 curies.

Public dose estimates were performed using Regulatory Guide 1.109⁽³⁾ methodology. Carbon dioxide is assumed to make up 20% of the Carbon-14 gaseous emissions from the station based upon available references and on-site testing. Carbon-14 is the highest dose contributor of all radionuclides released in gaseous effluents. Annual dose resulting from Carbon-14 releases in gaseous effluents is estimated to be 1.33E-01 mrem total body and 6.66E-01 mrem to the maximum organ (bone).

References

1. Regulatory Guide 1.21, "*Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents From Light Water Cooled Nuclear Power Plants*", Revision 1, US Nuclear Regulatory Commission, Washington D.C., 1974.
2. EPRI Report 1021106, "*Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents*", Electric Power Research Institute, Palo Alto, CA, 2010.
3. Regulatory Guide 1.109, "*Calculation of Annual Doses to Man from Routine Releases of Reactor effluents for the Purpose of Demonstrating compliance with 10 CFR50, Appendix I*", US Nuclear Regulatory Commission, Washington D.C., 1976.

APPENDIX A
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT

JANUARY – DECEMBER, 2017

VIRGIL C. SUMMER NUCLEAR STATION
SOUTH CAROLINA ELECTRIC & GAS

SUPPLEMENTAL INFORMATION

I. Regulatory Dose Limits:

A. Fission and Activation Gases:

The air dose to an individual due to noble gases released in gaseous effluents shall be limited to less than or equal to 5 mrad for gamma radiation and 10 mrad for beta radiation during any calendar quarter and 10 mrad for gamma radiation and 20 mrad for beta radiation during any calendar year (ODCM, Section 1.2.3.1).

B. Iodines, Particulates (half-lives > 8 days) and Tritium:

The dose to an individual from radioidines, tritium and radioactive materials in particulate form with half-lives greater than 8 days in gaseous effluents shall be limited to less than or equal to 7.5 mrem to any organ during any calendar quarter and 15 mrem to any organ during any calendar year (ODCM, Section 1.2.4.1).

C. Liquid Effluents:

The dose or dose commitment to an individual from radioactive materials in liquid effluents released shall be limited to less than or equal to 1.5 mrem to the total body and 5 mrem to any organ during any calendar quarter and 3 mrem to the total body and 10 mrem to any organ during any calendar year (ODCM, Section 1.1.3.1).

D. All Sources:

The annual dose equivalent shall not exceed 25 mrem to the whole body, 75 mrem to the thyroid and 25 mrem to any other organ (40 CFR 190).

II. Dose Rate and Effluent Concentration Limits:

A. Fission and Activation Gases

The dose rate in unrestricted areas due to radioactive materials released in gaseous effluents shall be limited to less than or equal to 500 mrem/year to the total body and less than or equal to 3000 mrem/year to the skin (ODCM, Section 1.2.2.1).

**APPENDIX A
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT**

JANUARY – DECEMBER, 2017

**VIRGIL C. SUMMER NUCLEAR STATION
SOUTH CAROLINA ELECTRIC & GAS**

B. Iodines, Particulates (half-lives > 8 days) and Tritium:

The dose rate in unrestricted areas due to radioactive materials in effluents shall be limited to less than or equal to 1500 mrem/year to any organ (ODCM, Section 1.2.2.1).

C. Liquid Effluents:

The concentration of radioactive materials released from the site shall be limited to 10 times the concentrations specified in 10 CFR 20, Appendix B, Table 2, Column 2 for radionuclides other than dissolved or entrained noble gases. For dissolved or entrained noble gases, the concentration shall be limited to 2E-04 $\mu\text{Ci/ml}$ total activity (ODCM, Section 1.1.2.1).

III. Average Energy:

Not Applicable

IV. Measurements and Approximations of Total Radioactivity:

A. Fission and activation gases: Gamma spectrometry (HPGe)

B. Iodines: Gamma spectrometry (HPGe)

C. Particulates: Gamma spectrometry (HPGe), beta proportional counting, alpha proportional counting

D. Tritium: Liquid scintillation

E. Liquid effluents: Gamma spectrometry (HPGe), liquid scintillation (H-3), beta proportional counting, alpha proportional counting.

APPENDIX A
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY – DECEMBER, 2017
VIRGIL C. SUMMER NUCLEAR STATION
SOUTH CAROLINA ELECTRIC & GAS

V. Batch Releases:

A. Gaseous:

1. Number of batch releases: 0
2. Total time period for batch releases: 0
3. Maximum time period for a batch release: 0
4. Average time period for a batch release: 0
5. Minimum time period for a batch release: 0

B. Liquid:

1. Number of batch releases:

74	For first quarter, 2017
115	For second quarter, 2017
42	For third quarter, 2017
32	For fourth quarter, 2017

2. Total time period for batch releases:

5.20E+03	min. for first quarter, 2017
7.70E+03	min. for second quarter, 2017
2.92E+03	min. for third quarter, 2017
2.36E+03	min. for fourth quarter 2017

3. Maximum time period for a batch release:

7.80E+01	min. for second quarter, 2017
1.00E+02	min. for second quarter, 2017
8.50E+01	min. for third quarter, 2017
8.40E+01	min. for fourth quarter, 2017

**APPENDIX A
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT**

JANUARY – DECEMBER, 2017

**VIRGIL C. SUMMER NUCLEAR STATION
SOUTH CAROLINA ELECTRIC & GAS**

4. Average time period for batch releases:

6.75E+01 min. for first quarter, 2017
5.79E+01 min. for second quarter, 2017
6.22E+01 min. for third quarter, 2017
7.16E+01 min. for fourth quarter, 2017
5. Minimum time period for a batch release:

1.00E+00 min. for first quarter, 2017*
1.00E+00 min. for second quarter, 2017*
1.00E+00 min. for third quarter, 2017*
1.00E+01 min. for fourth quarter, 2017*
* NaOH sump release
6. Average stream flow during periods of release of effluent into a flowing stream:

4.35E+06 gpm for first quarter, 2017
4.06E+06 gpm for second quarter, 2017
7.25E+06 gpm for third quarter, 2017
3.45E+06 gpm for fourth quarter, 2017

VI. Abnormal Releases:

A. Gaseous:

1. Number of releases: 0
2. Total activity released: 0

B. Liquid:

1. Number of releases: 0
2. Total activity released: 0

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY - DECEMBER, 2017
Virgil C. Summer Nuclear Station, Unit 1

TABLE 1
Gaseous Effluents-Summation of All Releases

Type of Effluent	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Error %
A. Fission & Activation Gases						
1. Total Release	Curies	7.71E-04	1.18E-01	0.00E+00	2.85E-02	2.00E+01
2. Average Release Rate for Period	µCi/sec	9.91E-05	1.50E-02	0.00E+00	3.59E-03	
3. Percent of Applicable Limit	%	2.86E-05	4.37E-03	0.00E+00	2.19E-04	
B. Iodines						
1. Total Iodine-131	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Average Release Rate for Period	µCi/sec	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
3. Percent of Applicable Limit	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
C. Particulates						
1. Total Particulates (Half-lives > 8 days)	Curies	0.00E+00	0.00E+00	0.00E+00	4.12E-06	2.00E+01
2. Average Release Rate for Period	µCi/sec	0.00E+00	0.00E+00	0.00E+00	5.18E-07	
3. Percent of Applicable Limit	%	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
4. Gross Alpha Activity	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
D. Tritium						
1. Total Release	Curies	7.20E-03	1.43E+00	7.51E-02	0.00E+00	2.00E+01
2. Average Release Rate for Period	µCi/sec	9.26E-04	1.82E-01	9.45E-03	0.00E+00	
3. Percent of Applicable Limit	%	5.47E-05	1.08E-02	5.70E-04	0.00E+00	
E. Carbon-14						
1. Total Release	Curies	2.03E+00	2.00E+00	2.05E+00	2.05E+00	N/A
2. Average Release Rate for Period	µCi/sec	2.58E-01	2.58E-01	2.58E-01	2.58E-01	

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY - DECEMBER, 2017
Virgil C. Summer Nuclear Station, Unit 1

TABLE 2

Gaseous Effluents—Ground Level Releases

Nuclides Released	Units	Continuous Mode				Batch Mode			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
1. Fission and Activation Gases									
Ar-41	Curies	7.71E-04	1.18E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Xe-135	Curies	0.00E+00	0.00E+00	0.00E+00	2.85E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for Period	Curies	7.71E-04	1.18E-01	0.00E+00	2.85E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
2. Iodines									
Total for Period	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
3. Particulates									
Be-7	Curies	0.00E+00	0.00E+00	0.00E+00	4.12E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Br-82	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total for Period	Curies	0.00E+00	0.00E+00	0.00E+00	4.12E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00
4. Tritium									
H-3	Curies	7.20E-03	1.43E+00	7.51E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY - DECEMBER, 2017
Virgil C. Summer Nuclear Station, Unit 1

TABLE 3

Liquid Effluents - Summation of All Releases

Type of Effluent	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Error %
<u>A. Fission & Activation Products</u>						
1. Total Release (not including Tritium, Gases, and Alpha)	Curies	4.35E-03	8.94E-03	1.04E-03	1.19E-03	2.00E+01
2. Average Diluted Concentration During Period	µCi/ml	5.06E-11	8.38E-11	1.35E-11	3.45E-11	
3. Percent of Applicable Limit	%	8.70E-02	1.79E-01	2.09E-02	2.38E-02	
<u>B. Tritium</u>						
1. Total Release	Curies	5.58E+02	7.20E+01	8.01E+01	9.20E+01	2.00E+01
2. Average Diluted Concentration During Period	µCi/ml	6.49E-06	6.74E-07	1.03E-06	2.67E-06	
3. Percent of Applicable Limit	%	6.49E-01	6.74E-02	1.03E-01	2.67E-01	
<u>C. Dissolved and Entrained Gases</u>						
1. Total Release	Curies	5.01E-04	2.24E-03	7.38E-04	2.17E-04	2.00E+01
2. Average Diluted Concentration During Period	µCi/ses	5.83E-12	2.09E-11	9.51E-12	6.31E-12	
3. Percent of Applicable Limit	%	2.91E-06	1.05E-05	4.76E-06	3.15E-06	
<u>D. Gross Alpha Radioactivity</u>						
1. Total Release	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
<u>E. Waste Volume Released (Pre-Dilution)</u>						
	Liters	1.03E+07	6.82E+07	1.62E+07	1.99E+07	3.00E+00
<u>F. Volume of Dilution Water Used</u>						
	Liters	8.59E+10	1.07E+11	7.76E+10	3.45E+10	4.30E+00

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY - DECEMBER, 2017
Virgil C. Summer Nuclear Station, Unit 1

TABLE 4

Liquid Effluents

Nuclides Released	Units	Continuous Mode				Batch Mode			
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4
Ag-110m	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.19E-06
Ar-41	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E-05	5.51E-05	0.00E+00
As-76	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.55E-06	2.34E-06	0.00E+00
Ba-140	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.89E-06	0.00E+00	0.00E+00
Co-58	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.37E-04	8.69E-05	1.26E-04
Co-60	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.82E-03	3.41E-03	2.75E-04	4.00E-04
Cr-51	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.21E-03	1.00E-05	0.00E+00
Cs-137	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.00E-05	0.00E+00	0.00E+00	4.16E-05
Fe-55	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.03E-04	8.87E-04	2.83E-04	2.58E-04
Fe-59	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.46E-05	0.00E+00	0.00E+00
H-3	Curies	2.41E-03	0.00E+00	6.54E-03	0.00E+00	5.58E+02	7.20E+01	8.01E+01	9.20E+01
Kr-85M	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.42E-06	0.00E+00
Mn-54	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.35E-04	2.51E-04	9.91E-06	3.53E-05
Na-24	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.12E-05	0.00E+00	0.00E+00	9.71E-06
Nb-94	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.37E-06	0.00E+00	0.00E+00	0.00E+00
Nb-95	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.77E-04	8.32E-05	5.60E-05
Ni-63	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.06E-04	6.70E-04	2.25E-04	1.50E-04
Sb-124	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.11E-06	0.00E+00	0.00E+00
Sb-125	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.25E-04	5.00E-05	3.74E-05	8.75E-05
Sn-113	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.60E-06	0.00E+00	0.00E+00
Te-123M	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.99E-05	6.29E-06	0.00E+00
Te-125m	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.34E-04	0.00E+00	0.00E+00
Xe-133	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.01E-04	2.14E-03	5.62E-04	2.17E-04
Xe-133m	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.51E-05	0.00E+00	0.00E+00
Xe-135	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	5.51E-05	1.16E-04	8.57E-07
Zn-65	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.15E-06	0.00E+00	1.06E-05
Zr-95	Curies	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.37E-04	2.52E-05	1.16E-05
Total for Period	Curies	2.41E-03	0.00E+00	6.54E-03	0.00E+00	5.58E+02	7.20E+01	8.01E+01	9.20E+01

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY - DECEMBER, 2017
Virgil C. Summer Nuclear Station, Unit 1

TABLE 5
Solid Waste Shipments

1. Solid Waste Shipped Offsite for Burial or Disposal (Not irradiated fuel).

Type of Waste	Unit	2017 Total	Est. Total Error, %
a. Spent resins, filters, sludge, evaporator bottoms, etc.	m ³ Ci	5.88E+01 1.53E+02	2.5E+01
b. Dry compressible waste, Metals, Contaminated equipment, etc.	m ³ Ci	4.85E+02 1.99E-01	2.5E+01
c. Irradiated components, control rods, etc.	m ³ Ci	0.00E+00 0.00E+00	N/A
d. Other waste, Oil, etc.	m ³ Ci	1.07E+02 1.76E+01	2.5E+01

2. Estimate of major nuclide composition for the year (by type of waste) for concentrations above 1.0%.

a.

Ni-63	73.89 %	1.13E+02 Ci
Co-60	13.36 %	2.04E+01 Ci
Fe-55	3.60 %	5.48E+00 Ci
H-3	3.26 %	4.97E+00 Ci
Mn-54	2.66 %	4.05E+00 Ci
Sb-125	1.07 %	1.63E+00 Ci

b.

Ni-63	36.92 %	7.36E-02 Ci
Co-60	24.93 %	4.97E-02 Ci
Fe-55	24.17 %	4.82E-02 Ci
Nb-95	4.28 %	8.53E-03 Ci
Zr-95	2.31 %	4.61E-03 Ci
Co-58	1.87 %	3.73E-03 Ci
Cr-51	1.53 %	3.06E-03 Ci
Mn-54	1.19 %	2.38E-03 Ci
Sb-125	1.04 %	2.07E-03 Ci

c.

None		
------	--	--

d.

Cr-51	22.95 %	4.03E+00 Ci
Co-58	20.67 %	3.63E+00 Ci
Co-60	18.68 %	3.28E+00 Ci
Nb-95	13.44 %	2.36E+00 Ci
Fe-55	9.17 %	1.61E+00 Ci
Zr-95	7.52 %	1.32E+00 Ci
Mn-54	3.55 %	6.23E-01 Ci
Ni-63	1.99 %	3.50E-01 Ci
Fe-59	1.03 %	1.80E-01 Ci

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY - DECEMBER, 2017
Virgil C. Summer Nuclear Station, Unit 1

TABLE 5
Solid Waste Shipments

3. Solid Waste Disposition

Numbers of Shipments	Mode of Transportation	Destination
4	Hittman	Energy Solutions Processing/Disposal Facility Barnwell, SC
2	Landstar	Alaron - Wampum, PA
10	PGT Trucking	Alaron - Wampum, PA
1	Edwards Moving & Rigging, Inc.	Energy Solutions, LLC. Barnwell Disposal Facility Barnwell, SC
1	Cast Transportation	UniTech Services Group, Inc. Oakridge, TN
1	Federal Express	Alaron - Wampum, PA

Notes:

- Four** shipments by Hittman containing (1) 10-160 High Integrity Container of Dewatered Primary Resin; (1) 8-120 High Integrity Container of Dewatered Mixed Bed Resin; (1) 8-120 High Integrity Container of Dewatered Primary Resin; and (1) 8-120 High Integrity Container of Dewatered Mixed Bed Resin/Charcoal were shipped to the Barnwell Processing/Disposal Facility for burial.
- Two** shipments by Landstar containing (1) Sealand of Dry Active Waste; (1) B-25 Box of Metal Waste; (6) B-25 Boxes of Dry Active Waste; (2) B-25 Boxes of Wood; (2) B-25 Boxes of Duratek Resin; and (7) B-25 Boxes of Nuclear Blowdown Resin were shipped to Alaron in Wampum, PA for processing.
- Ten** shipments by PGT Trucking containing (7) Sealands of Dry Active Waste; (3) Sealands of OREX Waste; (8) B-25 Boxes of Metal Waste; (1) B-25 Boxes of Dry Active Waste; (2) B-25 Boxes of Wood; (2) B-25 Boxes of Duratek Resin; (3) Overpack Bags of Dry Active Waste; and (3) B-25 Boxes of Nuclear Blowdown Resin were shipped to Alaron in Wampum, PA for processing.
- One** shipment by Edwards Moving & Rigging, Inc. containing (1) Original Reactor Vessel Closure Head was shipped to the Barnwell Processing/Disposal Facility for burial.
- One** shipment by Cast Transportation containing (1) Sealand of Green is Clean Waste; (1) B-25 Box of Sheet Rock as Dry Active Waste; (4) B-25 Boxes of Component Cooling Water Resin was shipped to Oakridge, TN for processing.
- One** shipment by Federal Express containing (1) Alloy Analyzer was shipped to Alaron in Wampum, PA for processing.

ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT
JANUARY - DECEMBER, 2017
Virgil C. Summer Nuclear Station, Unit 1

TABLE 6

Gaseous Effluents

	Parameter	Location	Dose	Dose Limit	% of Limit
<u>Qtr 1</u>	Gamma Air Dose (mrad)	1.61 km ENE	1.43E-06	5.00E+00	0.00
	Beta Air Dose (mrad)	1.61 km ENE	5.05E-07	1.00E+01	0.00
	Total Body Dose (mrem)	1.61 km ENE	1.36E-06	5.00E+00	0.00
	Skin Dose (mrem)	1.61 km ENE	1.99E-06	7.50E+00	0.00
	Max Organ Dose (mrem)	1.77 km E	4.10E-06	7.50E+00	0.00
	Child - Liver				
<u>Qtr 2</u>	Gamma Air Dose (mrad)	1.61 km ENE	2.19E-04	5.00E+00	0.00
	Beta Air Dose (mrad)	1.61 km ENE	7.71E-05	1.00E+01	0.00
	Total Body Dose (mrem)	1.61 km ENE	2.08E-04	5.00E+00	0.00
	Skin Dose (mrem)	1.61 km ENE	3.04E-04	7.50E+00	0.00
	Max Organ Dose (mrem)	1.77 km E	8.13E-04	7.50E+00	0.01
	Child - Liver				
<u>Qtr 3</u>	Gamma Air Dose (mrad)	1.61 km ENE	0.00E+00	5.00E+00	0.00
	Beta Air Dose (mrad)	1.61 km ENE	0.00E+00	1.00E+01	0.00
	Total Body Dose (mrem)	1.61 km ENE	0.00E+00	5.00E+00	0.00
	Skin Dose (mrem)	1.61 km ENE	0.00E+00	7.50E+00	0.00
	Max Organ Dose (mrem)	1.77 km E	4.28E-05	7.50E+00	0.00
	Child - Liver				
<u>Qtr 4</u>	Gamma Air Dose (mrad)	1.61 km ENE	1.09E-05	5.00E+00	0.00
	Beta Air Dose (mrad)	1.61 km ENE	1.40E-05	1.00E+01	0.00
	Total Body Dose (mrem)	1.61 km ENE	1.03E-05	5.00E+00	0.00
	Skin Dose (mrem)	1.61 km ENE	2.26E-05	7.50E+00	0.00
	Max Organ Dose (mrem)	1.77 km E	0.00E+00	7.50E+00	0.00
	None - None				
<u>Year</u>	Gamma Air Dose (mrad)	1.61 km ENE	2.31E-04	1.00E+01	0.00
	Beta Air Dose (mrad)	1.61 km ENE	9.16E-05	2.00E+01	0.00
	Total Body Dose (mrem)	1.61 km ENE	2.19E-04	1.00E+01	0.00
	Skin Dose (mrem)	1.61 km ENE	3.28E-04	1.50E+01	0.00
	Max Organ Dose (mrem)*	1.77 km E	8.60E-04	1.50E+01	0.01
	Child - Liver				

(* Includes dose from all nuclides excluding Carbon-14. See Section K for C-14.)

Liquid Effluents

	Parameter	Max Receptor	Dose	Dose Limit	% of Limit
<u>Qtr 1</u>	Max Organ Dose (mrem)	Adult - Gi-LLi	6.79E-03	5.00E+00	0.14
	Total Body Dose (mrem)	Adult - Total Body	6.78E-03	1.50E+00	0.45
<u>Qtr 2</u>	Max Organ Dose (mrem)	Adult - Gi-LLi	2.71E-03	5.00E+00	0.05
	Total Body Dose (mrem)	Adult - Total Body	1.12E-03	1.50E+00	0.07
<u>Qtr 3</u>	Max Organ Dose (mrem)	Adult - Gi-LLi	6.95E-04	5.00E+00	0.01
	Total Body Dose (mrem)	Adult - Total Body	6.07E-04	1.50E+00	0.04
<u>Qtr 4</u>	Max Organ Dose (mrem)	Adult - Gi-LLi	1.58E-03	5.00E+00	0.03
	Total Body Dose (mrem)	Adult - Total Body	1.48E-03	1.50E+00	0.10
<u>Year</u>	Max Organ Dose (mrem)	Adult - Gi-LLi	1.18E-02	1.00E+01	0.12
	Total Body Dose (mrem)	Adult - Total Body	9.99E-03	3.00E+00	0.33

NOTE: See Section E for max organ for each quarter

**ENCLOSURE A
ANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT**

JANUARY – DECEMBER, 2017

**VIRGIL C. SUMMER NUCLEAR STATION
SOUTH CAROLINA ELECTRIC & GAS**

**METEOROLOGICAL DATA
JOINT FREQUENCY DISTRIBUTION
BY QUARTER FOR 2017**

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record = 01/01/2017 01:00 - 04/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: A Delta Temperature Extremely Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	0	2	0	1	1	0	4
NNE	0	0	0	0	0	0	0
NE	0	6	5	0	0	0	11
ENE	0	2	2	0	0	0	4
E	0	1	0	0	0	0	1
ESE	0	1	0	0	0	0	1
SE	0	0	2	0	0	0	2
SSE	0	0	0	0	0	0	0
S	0	0	1	0	0	0	1
SSW	0	1	2	3	0	0	6
SW	0	4	6	0	0	0	10
WSW	0	11	14	1	0	0	26
W	0	6	5	0	0	0	11
WNW	0	5	3	0	0	0	8
NW	0	2	5	3	0	0	10
NNW	2	0	2	1	0	0	5
Total	2	41	47	9	1	0	100
<hr/>							
Calm Hours not Included above for:	Total Period		All Hours		0		
Variable Direction Hours for:	Total Period		All Hours		0		
Invalid Hours for:	Total Period		All Hours		13		
Number of Valid Hours for this Table:	Total Period		All Hours		100		
Total Hours for the Period:					2160		

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record = 01/01/2017 01:00 - 04/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: B Delta Temperature Moderately Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	0	3	1	3	2	2	11
NNE	0	2	1	2	0	0	5
NE	0	3	4	4	0	0	11
ENE	0	3	2	0	0	0	5
E	0	0	0	0	0	0	0
ESE	0	1	1	0	0	0	2
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	3	0	0	0	3
SSW	0	1	7	1	0	0	9
SW	0	9	8	0	0	0	17
WSW	1	12	10	0	0	0	23
W	0	7	12	0	0	0	19
WNW	1	12	3	0	0	0	16
NW	0	2	5	7	0	0	14
NNW	0	2	1	3	0	0	6
Total	2	57	58	20	2	2	141

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	13
Number of Valid Hours for this Table:	Total Period	All Hours	141
Total Hours for the Period:			2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours****Period of Record =** 01/01/2017 01:00 - 04/01/2017 00:00**Elevation:** Speed: SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1**Stability Class:** C **Delta Temperature** Slightly Unstable**Wind Speed (mph)**

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	1	4	3	8	1	1	18
NNE	1	4	4	11	0	0	20
NE	3	5	7	3	0	0	18
ENE	2	4	2	0	0	0	8
E	1	2	0	0	0	0	3
ESE	0	1	3	0	0	0	4
SE	0	1	1	0	0	0	2
SSE	0	0	4	0	0	0	4
S	1	5	9	1	0	0	16
SSW	0	10	4	0	0	0	14
SW	1	16	7	0	0	0	24
WSW	3	12	8	0	0	0	23
W	2	11	4	0	0	0	17
WNW	0	7	2	0	0	0	9
NW	2	3	10	1	0	0	16
NNW	2	1	3	2	1	0	9
Total	19	86	71	26	2	1	205

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	13
Number of Valid Hours for this Table:	Total Period	All Hours	205
Total Hours for the Period:			2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record = 01/01/2017 01:00 - 04/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: D Delta Temperature Neutral

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	4	20	11	13	1	1	50
NNE	5	15	16	15	0	0	51
NE	8	21	20	5	0	0	54
ENE	4	31	22	1	0	0	58
E	11	40	3	0	0	0	54
ESE	5	28	4	0	0	0	37
SE	10	28	14	0	0	0	52
SSE	11	20	19	0	0	0	50
S	4	38	19	0	0	0	61
SSW	9	26	17	0	0	0	52
SW	7	45	12	0	0	0	64
WSW	12	40	8	0	0	0	60
W	13	31	6	1	0	0	51
WNW	7	20	2	0	0	0	29
NW	0	27	12	1	0	0	40
NNW	8	13	19	12	2	1	55
Total	118	443	204	48	3	2	818

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	13
Number of Valid Hours for this Table:	Total Period	All Hours	818
Total Hours for the Period:			2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 01/01/2017 01:00 - 04/01/2017 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: E **Delta Temperature** Slightly Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	8	11	2	0	0	0	21
NNE	5	13	0	0	0	0	18
NE	4	8	0	0	0	0	12
ENE	2	8	2	0	0	0	12
E	7	5	0	0	0	0	12
ESE	5	19	0	0	0	0	24
SE	6	41	5	0	0	0	52
SSE	14	27	1	0	0	0	42
S	5	38	6	0	0	0	49
SSW	14	45	8	0	0	0	67
SW	29	54	3	0	0	0	86
WSW	15	46	0	0	0	0	61
W	13	15	0	0	0	0	28
WNW	20	13	0	0	0	0	33
NW	5	11	5	0	0	0	21
NNW	4	4	5	0	1	0	14
Total	156	358	37	0	1	0	552

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	13
Number of Valid Hours for this Table:	Total Period	All Hours	552
Total Hours for the Period:			2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period **All Hours**
 Period of Record = 01/01/2017 01:00 - 04/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: F Delta Temperature Moderately Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	3	2	0	0	0	0	5
NNE	2	1	0	0	0	0	3
NE	1	0	0	0	0	0	1
ENE	3	2	0	0	0	0	5
E	3	0	0	0	0	0	3
ESE	3	1	0	0	0	0	4
SE	1	19	0	0	0	0	20
SSE	9	19	1	0	0	0	29
S	8	23	0	0	0	0	31
SSW	17	18	0	0	0	0	35
SW	22	12	0	0	0	0	34
WSW	17	4	0	0	0	0	21
W	9	1	0	0	0	0	10
WNW	7	0	0	0	0	0	7
NW	5	0	0	0	0	0	5
NNW	5	1	0	0	0	0	6
Total	115	103	1	0	0	0	219

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	13
Number of Valid Hours for this Table:	Total Period	All Hours	219
Total Hours for the Period:			2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record = 01/01/2017 01:00 - 04/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: G Delta Temperature Extremely Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	1	0	0	0	0	0	1
NNE	0	0	0	0	0	0	0
NE	1	0	0	0	0	0	1
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	2	0	0	0	0	0	2
SE	2	4	0	0	0	0	6
SSE	2	8	0	0	0	0	10
S	7	1	0	0	0	0	8
SSW	7	4	0	0	0	0	11
SW	17	3	0	0	0	0	20
WSW	12	7	0	0	0	0	19
W	15	0	0	0	0	0	15
WNW	11	0	0	0	0	0	11
NW	5	0	0	0	0	0	5
NNW	3	0	0	0	0	0	3
Total	85	27	0	0	0	0	112

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	13
Number of Valid Hours for this Table:	Total Period	All Hours	112
Total Hours for the Period:			2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record = 01/01/2017 01:00 - 04/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: ALL Delta Temperature

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	17	42	17	25	5	4	110
NNE	13	35	21	28	0	0	97
NE	17	43	36	12	0	0	108
ENE	11	50	30	1	0	0	92
E	22	48	3	0	0	0	73
ESE	15	51	8	0	0	0	74
SE	19	93	22	0	0	0	134
SSE	36	74	25	0	0	0	135
S	25	105	38	1	0	0	169
SSW	47	105	38	4	0	0	194
SW	76	143	36	0	0	0	255
WSW	60	132	40	1	0	0	233
W	52	71	27	1	0	0	151
WNW	46	57	10	0	0	0	113
NW	17	45	37	12	0	0	111
NNW	24	21	30	18	4	1	98
Total	497	1115	418	103	9	5	2147

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	13
Number of Valid Hours for this Table:	Total Period	All Hours	2147
Total Hours for the Period:			2160

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record = 04/01/2017 01:00 - 07/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: A Delta Temperature Extremely Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	6	2	0	0	0	0	8
NNE	1	1	1	3	0	0	6
NE	0	6	2	2	0	0	10
ENE	0	5	5	1	0	0	11
E	0	2	4	0	0	0	6
ESE	0	0	0	0	0	0	0
SE	0	0	2	0	0	0	2
SSE	0	0	0	0	0	0	0
S	0	1	3	0	0	0	4
SSW	0	0	7	1	0	0	8
SW	3	33	7	0	0	0	43
WSW	3	24	13	3	0	0	43
W	1	22	3	0	0	0	26
WNW	1	3	3	0	0	0	7
NW	0	0	1	0	0	0	1
NNW	3	2	0	0	0	0	5
Total	18	101	51	10	0	0	180
Calm Hours not Included above for:	Total Period		All Hours		0		
Variable Direction Hours for:	Total Period		All Hours		0		
Invalid Hours for:	Total Period		All Hours		7		
Number of Valid Hours for this Table:	Total Period		All Hours		180		
Total Hours for the Period:					2184		

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record = 04/01/2017 01:00 - 07/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: B Delta Temperature Moderately Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	2	6	0	0	0	0	8
NNE	2	7	3	0	0	0	12
NE	0	3	7	2	0	0	12
ENE	0	3	6	1	0	0	10
E	0	2	1	0	0	0	3
ESE	0	0	0	0	0	0	0
SE	0	1	3	0	0	0	4
SSE	0	0	2	0	0	0	2
S	0	6	10	0	0	0	16
SSW	0	12	8	0	0	0	20
SW	5	24	8	0	0	0	37
WSW	3	15	3	1	0	0	22
W	5	9	2	2	0	0	18
WNW	2	5	4	0	0	0	11
NW	1	1	2	0	0	0	4
NNW	2	1	0	0	0	0	3
Total	22	95	59	6	0	0	182

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	7
Number of Valid Hours for this Table:	Total Period	All Hours	182
Total Hours for the Period:			2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period **All Hours**
 Period of Record = 04/01/2017 01:00 - 07/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: C Delta Temperature Slightly Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	2	5	3	5	1	0	16
NNE	3	3	8	10	0	0	24
NE	1	6	9	4	0	0	20
ENE	1	2	3	1	0	0	7
E	0	1	1	0	0	0	2
ESE	1	2	0	0	0	0	3
SE	0	2	6	0	0	0	8
SSE	2	3	7	1	0	0	13
S	1	11	12	0	0	0	24
SSW	1	28	11	1	0	0	41
SW	6	24	0	0	0	0	30
WSW	3	18	2	1	0	0	24
W	5	7	0	2	0	0	14
WNW	1	3	1	0	0	0	5
NW	1	3	0	0	0	0	4
NNW	0	4	5	2	0	0	11
Total	28	122	68	27	1	0	246

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	7
Number of Valid Hours for this Table:	Total Period	All Hours	246
Total Hours for the Period:			2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours****Period of Record =** 04/01/2017 01:00 - 07/01/2017 00:00**Elevation:** Speed: SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1**Stability Class:** D **Delta Temperature** Neutral**Wind Speed (mph)**

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	9	20	16	9	1	0	55
NNE	6	24	14	9	1	0	54
NE	5	9	19	1	0	0	34
ENE	5	3	10	0	0	0	18
E	3	13	6	0	0	0	22
ESE	4	15	4	0	0	0	23
SE	11	28	9	0	0	0	48
SSE	15	55	14	0	0	0	84
S	11	67	43	4	0	0	125
SSW	25	88	24	1	0	0	138
SW	36	60	7	0	0	0	103
WSW	27	32	5	0	0	0	64
W	21	19	6	1	0	0	47
WNW	10	12	1	0	0	0	23
NW	9	8	2	0	0	0	19
NNW	10	3	5	0	0	0	18
Total	207	456	185	25	2	0	875

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	7
Number of Valid Hours for this Table:	Total Period	All Hours	875
Total Hours for the Period:			2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record =

04/01/2017 01:00 - 07/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: E Delta Temperature Slightly Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	5	3	0	0	0	0	8
NNE	2	5	0	0	0	0	7
NE	4	2	1	0	0	0	7
ENE	0	2	1	0	0	0	3
E	2	1	1	0	0	0	4
ESE	1	4	1	0	0	0	6
SE	6	22	1	0	0	0	29
SSE	17	41	4	0	0	0	62
S	27	42	3	0	0	0	72
SSW	39	60	3	0	0	0	102
SW	31	14	1	0	0	0	46
WSW	22	23	0	0	0	0	45
W	24	20	0	0	0	0	44
WNW	9	2	1	0	0	0	12
NW	5	3	0	0	0	0	8
NNW	5	4	2	0	0	0	11
Total	199	248	19	0	0	0	466

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	7
Number of Valid Hours for this Table:	Total Period	All Hours	466
Total Hours for the Period:			2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record = 04/01/2017 01:00 - 07/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: F Delta Temperature Moderately Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	0	1	0	0	0	0	1
NNE	1	0	0	0	0	0	1
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	2	0	0	0	0	0	2
SE	5	19	0	0	0	0	24
SSE	16	22	0	0	0	0	38
S	6	8	0	0	0	0	14
SSW	13	10	0	0	0	0	23
SW	16	2	0	0	0	0	18
WSW	14	8	0	0	0	0	22
W	7	4	0	0	0	0	11
WNW	6	1	0	0	0	0	7
NW	2	3	0	0	0	0	5
NNW	0	0	0	0	0	0	0
Total	88	78	0	0	0	0	166

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	7
Number of Valid Hours for this Table:	Total Period	All Hours	166
Total Hours for the Period:			2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period **All Hours**
 Period of Record = 04/01/2017 01:00 - 07/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: G Delta Temperature Extremely Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	0	0	0	0	0	0	0
NNE	0	1	0	0	0	0	1
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	1	0	0	0	0	0	1
SE	1	1	0	0	0	0	2
SSE	3	1	0	0	0	0	4
S	5	0	0	0	0	0	5
SSW	10	0	0	0	0	0	10
SW	20	0	0	0	0	0	20
WSW	13	0	0	0	0	0	13
W	3	0	0	0	0	0	3
WNW	1	0	0	0	0	0	1
NW	1	0	0	0	0	0	1
NNW	1	0	0	0	0	0	1
<hr/>							
Total	59	3	0	0	0	0	62

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	7
Number of Valid Hours for this Table:	Total Period	All Hours	62
Total Hours for the Period:			2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period **All Hours**
Period of Record = 04/01/2017 01:00 - 07/01/2017 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: ALL **Delta Temperature**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	24	37	19	14	2	0	96
NNE	15	41	26	22	1	0	105
NE	10	26	38	9	0	0	83
ENE	6	15	25	3	0	0	49
E	5	19	13	0	0	0	37
ESE	9	21	5	0	0	0	35
SE	23	73	21	0	0	0	117
SSE	53	122	27	1	0	0	203
S	50	135	71	4	0	0	260
SSW	88	198	53	3	0	0	342
SW	117	157	23	0	0	0	297
WSW	85	120	23	5	0	0	233
W	66	81	11	5	0	0	163
WNW	30	26	10	0	0	0	66
NW	19	18	5	0	0	0	42
NNW	21	14	12	2	0	0	49
Total	621	1103	382	68	3	0	2177

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	7
Number of Valid Hours for this Table:	Total Period	All Hours	2177
Total Hours for the Period:			2184

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record =

07/01/2017 01:00 - 10/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: A Delta Temperature Extremely Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	11	10	0	2	0	0	23
NNE	2	7	4	0	3	2	18
NE	1	12	7	9	0	0	29
ENE	0	5	6	2	0	0	13
E	0	1	2	0	0	0	3
ESE	0	0	1	0	0	0	1
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	2	0	0	2
SSW	0	2	2	0	0	0	4
SW	0	31	9	0	0	0	40
WSW	4	32	3	0	0	0	39
W	5	8	0	0	0	0	13
WNW	3	5	0	0	0	0	8
NW	0	2	1	0	0	0	3
NNW	10	11	3	0	0	0	24
Total	36	126	38	15	3	2	220
Calm Hours not Included above for:	Total Period		All Hours		0		
Variable Direction Hours for:	Total Period		All Hours		0		
Invalid Hours for:	Total Period		All Hours		0		
Number of Valid Hours for this Table:	Total Period		All Hours		220		
Total Hours for the Period:					2208		

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record = 07/01/2017 01:00 - 10/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: B Delta Temperature Moderately Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	6	11	3	2	1	0	23
NNE	4	15	8	4	0	0	31
NE	5	6	11	20	0	0	42
ENE	0	7	5	1	0	0	13
E	0	4	3	0	0	0	7
ESE	0	0	0	0	0	0	0
SE	1	0	1	0	0	0	2
SSE	0	0	0	0	0	0	0
S	0	1	1	0	0	0	2
SSW	2	7	5	0	0	0	14
SW	0	36	2	0	0	0	38
WSW	6	17	0	0	0	0	23
W	3	7	0	0	0	0	10
WNW	3	4	0	0	0	0	7
NW	3	1	0	0	0	0	4
NNW	4	5	2	0	0	0	11
Total	37	121	41	27	1	0	227

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	227
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 07/01/2017 01:00 - 10/01/2017 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: C **Delta Temperature** Slightly Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	9	14	4	9	1	0	37
NNE	6	10	12	16	2	0	46
NE	2	10	15	19	4	2	52
ENE	0	3	8	0	0	0	11
E	0	4	2	0	0	0	6
ESE	1	1	2	0	0	0	4
SE	0	0	3	0	0	0	3
SSE	0	3	4	0	0	0	7
S	2	7	6	2	0	0	17
SSW	0	9	8	0	0	0	17
SW	6	19	0	0	0	0	25
WSW	7	18	1	0	0	0	26
W	6	3	0	0	0	0	9
WNW	8	1	0	0	0	0	9
NW	4	6	0	0	0	0	10
NNW	7	5	3	0	0	0	15
Total	58	113	68	46	7	2	294

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	294
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record = 07/01/2017 01:00 - 10/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: D Delta Temperature Neutral

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	1	28	15	5	0	0	49
NNE	9	25	28	14	1	0	77
NE	3	19	54	11	0	5	92
ENE	3	26	27	1	3	4	64
E	3	22	13	1	0	0	39
ESE	2	14	2	0	0	0	18
SE	4	22	0	0	0	0	26
SSE	9	36	5	0	0	0	50
S	14	37	8	1	0	0	60
SSW	17	82	8	0	0	0	107
SW	38	45	0	0	0	0	83
WSW	28	22	2	0	0	0	52
W	13	9	0	0	0	0	22
WNW	11	4	0	0	0	0	15
NW	7	9	0	0	0	0	16
NNW	4	9	4	0	0	0	17
Total	166	409	166	33	4	9	787

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	787
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record = 07/01/2017 01:00 - 10/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: E Delta Temperature Slightly Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	7	2	1	0	0	0	10
NNE	5	4	0	0	0	0	9
NE	2	1	1	0	0	0	4
ENE	3	3	1	0	0	0	7
E	6	10	2	0	0	0	18
ESE	1	3	0	0	0	0	4
SE	13	31	0	0	0	0	44
SSE	25	23	0	0	0	0	48
S	27	13	1	0	0	0	41
SSW	46	36	1	0	0	0	83
SW	65	14	0	0	0	0	79
WSW	42	4	0	0	0	0	46
W	20	2	0	0	0	0	22
WNW	17	4	0	0	0	0	21
NW	11	5	1	0	0	0	17
NNW	2	7	2	0	0	0	11
Total	292	162	10	0	0	0	464

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	464
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** **All Hours**
 07/01/2017 01:00 - 10/01/2017 00:00

Elevation: **Speed:** SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1

Stability Class: F **Delta Temperature** **Moderately Stable**

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	4	2	0	0	0	0	6
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	1	0	0	0	0	0	1
E	0	0	0	0	0	0	0
ESE	1	0	0	0	0	0	1
SE	1	3	0	0	0	0	4
SSE	16	0	0	0	0	0	16
S	11	1	0	0	0	0	12
SSW	10	3	0	0	0	0	13
SW	15	2	0	0	0	0	17
WSW	20	0	0	0	0	0	20
W	19	0	0	0	0	0	19
WNW	22	0	0	0	0	0	22
NW	6	0	0	0	0	0	6
NNW	2	1	0	0	0	0	3
Total	128	12	0	0	0	0	140

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	140
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours****Period of Record =** 07/01/2017 01:00 - 10/01/2017 00:00**Elevation:** Speed: SP10T1 **Direction:** DR10T1 **Lapse:** DT61T1**Stability Class:** G **Delta Temperature** Extremely Stable**Wind Speed (mph)**

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	0	0	0	0	0	0	0
NNE	0	0	0	0	0	0	0
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	1	0	0	0	0	0	1
SSE	2	2	0	0	0	0	4
S	3	1	0	0	0	0	4
SSW	7	0	0	0	0	0	7
SW	18	0	0	0	0	0	18
WSW	15	1	0	0	0	0	16
W	14	1	0	0	0	0	15
WNW	10	0	0	0	0	0	10
NW	0	0	1	0	0	0	1
NNW	0	0	0	0	0	0	0
Total	70	5	1	0	0	0	76

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	76
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record = 07/01/2017 01:00 - 10/01/2017 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: ALL Delta Temperature

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	38	67	23	18	2	0	148
NNE	26	61	52	34	6	2	181
NE	13	48	88	59	4	7	219
ENE	7	44	47	4	3	4	109
E	9	41	22	1	0	0	73
ESE	5	18	5	0	0	0	28
SE	20	56	4	0	0	0	80
SSE	52	64	9	0	0	0	125
S	57	60	16	5	0	0	138
SSW	82	139	24	0	0	0	245
SW	142	147	11	0	0	0	300
WSW	122	94	6	0	0	0	222
W	80	30	0	0	0	0	110
WNW	74	18	0	0	0	0	92
NW	31	23	3	0	0	0	57
NNW	29	38	14	0	0	0	81
Total	787	948	324	121	15	13	2208

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	0
Number of Valid Hours for this Table:	Total Period	All Hours	2208
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record = 10/01/2017 01:00 - 01/01/2018 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: A Delta Temperature Extremely Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	0	4	0	0	0	0	4
NNE	0	2	1	1	0	0	4
NE	0	6	15	5	0	0	26
ENE	0	3	4	0	0	0	7
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0
SSW	0	0	1	0	0	0	1
SW	0	3	0	0	0	0	3
WSW	0	11	1	0	0	0	12
W	0	8	0	0	0	0	8
WNW	0	4	0	0	0	0	4
NW	2	2	4	0	0	0	8
NNW	1	2	0	0	0	0	3
Total	3	45	26	6	0	0	80
Calm Hours not Included above for:		Total Period			All Hours		0
Variable Direction Hours for:		Total Period			All Hours		0
Invalid Hours for:		Total Period			All Hours		5
Number of Valid Hours for this Table:		Total Period			All Hours		80
Total Hours for the Period:							2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period **All Hours**
 Period of Record = 10/01/2017 01:00 - 01/01/2018 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: B Delta Temperature Moderately Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	7	1	0	1	0	0	9
NNE	0	2	6	7	1	0	16
NE	0	7	18	11	0	0	36
ENE	0	6	6	2	0	0	14
E	0	3	2	0	0	0	5
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	0	0	1	0	0	0	1
S	0	0	2	0	0	0	2
SSW	0	3	7	0	0	0	10
SW	2	17	4	0	0	0	23
WSW	2	11	2	0	0	0	15
W	2	3	1	0	0	0	6
WNW	2	4	1	0	0	0	7
NW	3	1	1	0	0	0	5
NNW	6	6	1	0	0	0	13
Total	24	64	52	21	1	0	162

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	5
Number of Valid Hours for this Table:	Total Period	All Hours	162
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record =

10/01/2017 01:00 - 01/01/2018 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: C Delta Temperature Slightly Unstable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	4	9	6	2	1	0	22
NNE	5	14	10	22	1	0	52
NE	1	5	42	17	0	0	65
ENE	0	2	8	3	0	0	13
E	0	6	2	0	0	0	8
ESE	0	1	2	0	0	0	3
SE	0	0	0	0	0	0	0
SSE	0	0	1	1	0	0	2
S	0	2	4	0	0	0	6
SSW	0	16	2	0	0	0	18
SW	7	14	1	0	0	0	22
WSW	3	11	0	0	0	0	14
W	4	4	0	0	0	0	8
WNW	3	2	2	0	0	0	7
NW	3	5	1	0	0	0	9
NNW	4	7	0	1	0	0	12
Total	34	98	81	46	2	0	261

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	5
Number of Valid Hours for this Table:	Total Period	All Hours	261
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record = 10/01/2017 01:00 - 01/01/2018 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: D Delta Temperature Neutral

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	16	17	6	0	0	0	39
NNE	10	21	38	14	1	0	84
NE	7	36	65	9	0	0	117
ENE	4	40	46	6	0	0	96
E	3	44	12	1	0	0	60
ESE	5	24	3	0	0	0	32
SE	4	10	11	0	0	0	25
SSE	13	19	11	3	0	0	46
S	19	15	5	1	0	0	40
SSW	21	29	10	4	0	0	64
SW	15	23	8	0	0	0	46
WSW	23	27	3	0	0	0	53
W	24	23	6	0	0	0	53
WNW	19	14	3	0	0	0	36
NW	9	17	5	0	0	0	31
NNW	7	6	5	1	0	0	19
Total	199	365	237	39	1	0	841

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	5
Number of Valid Hours for this Table:	Total Period	All Hours	841
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Period of Record = **Total Period** 10/01/2017 01:00 - 01/01/2018 00:00 **All Hours**

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: E Delta Temperature Slightly Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	7	6	0	0	0	0	13
NNE	3	3	0	0	0	0	6
NE	5	2	0	0	0	0	7
ENE	4	2	4	0	0	0	10
E	4	20	3	0	0	0	27
ESE	9	8	0	0	0	0	17
SE	5	14	0	0	0	0	19
SSE	16	14	0	0	0	0	30
S	19	20	1	0	1	0	41
SSW	21	25	1	0	0	0	47
SW	38	28	2	0	0	0	68
WSW	28	32	0	0	0	0	60
W	25	22	0	0	0	0	47
WNW	22	4	0	0	0	0	26
NW	12	2	0	0	0	0	14
NNW	6	4	1	0	0	0	11
Total	224	206	12	0	1	0	443

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	5
Number of Valid Hours for this Table:	Total Period	All Hours	443
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record = 10/01/2017 01:00 - 01/01/2018 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: F Delta Temperature Moderately Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	1	1	0	0	0	0	2
NNE	6	0	0	0	0	0	6
NE	2	0	0	0	0	0	2
ENE	0	0	0	0	0	0	0
E	3	1	0	0	0	0	4
ESE	4	0	0	0	0	0	4
SE	0	6	0	0	0	0	6
SSE	17	14	0	0	0	0	31
S	10	4	0	0	0	0	14
SSW	19	8	0	0	0	0	27
SW	20	3	0	0	0	0	23
WSW	17	6	0	0	0	0	23
W	10	4	0	0	0	0	14
WNW	10	1	0	0	0	0	11
NW	0	0	0	0	0	0	0
NNW	1	1	0	0	0	0	2
Total	120	49	0	0	0	0	169

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	5
Number of Valid Hours for this Table:	Total Period	All Hours	169
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period **All Hours**
 Period of Record = 10/01/2017 01:00 - 01/01/2018 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: G Delta Temperature Extremely Stable

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	0	0	0	0	0	0	0
NNE	1	0	0	0	0	0	1
NE	0	0	0	0	0	0	0
ENE	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0
ESE	0	0	0	0	0	0	0
SE	0	0	0	0	0	0	0
SSE	7	29	0	0	0	0	36
S	11	6	0	0	0	0	17
SSW	30	0	0	0	0	0	30
SW	40	1	0	0	0	0	41
WSW	50	2	0	0	0	0	52
W	38	1	0	0	0	0	39
WNW	18	3	0	0	0	0	21
NW	6	2	0	0	0	0	8
NNW	2	0	0	0	0	0	2
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Total	203	44	0	0	0	0	247

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	5
Number of Valid Hours for this Table:	Total Period	All Hours	247
Total Hours for the Period:			2208

Joint Frequency Distribution

Hours at Each Wind Speed and Direction

Total Period**All Hours**

Period of Record = 10/01/2017 01:00 - 01/01/2018 00:00

Elevation: Speed: SP10T1 Direction: DR10T1 Lapse: DT61T1

Stability Class: ALL Delta Temperature

Wind Speed (mph)

Wind Direction	0.8-3.9	4.0-7.9	8.0-12.9	13.0-18.9	19.0-23.9	> 24.0	Total
N	35	38	12	3	1	0	89
NNE	25	42	55	44	3	0	169
NE	15	56	140	42	0	0	253
ENE	8	53	68	11	0	0	140
E	10	74	19	1	0	0	104
ESE	18	33	5	0	0	0	56
SE	9	30	11	0	0	0	50
SSE	53	76	13	4	0	0	146
S	59	47	12	1	1	0	120
SSW	91	81	21	4	0	0	197
SW	122	89	15	0	0	0	226
WSW	123	100	6	0	0	0	229
W	103	65	7	0	0	0	175
WNW	74	32	6	0	0	0	112
NW	35	29	11	0	0	0	75
NNW	27	26	7	2	0	0	62
Total	807	871	408	112	5	0	2203

Calm Hours not Included above for:	Total Period	All Hours	0
Variable Direction Hours for:	Total Period	All Hours	0
Invalid Hours for:	Total Period	All Hours	5
Number of Valid Hours for this Table:	Total Period	All Hours	2203
Total Hours for the Period:			2208