



2014 Meteorology Summary

New Jersey Department of Environmental Protection

AIR POLLUTION AND METEOROLOGY

Meteorology plays an important role in the distribution of pollution throughout the troposphere, the layer of the atmosphere closest to the earth's surface. Atmospheric processes such as wind speed and wind direction affect the transport and dispersion of air pollution. Precipitation, solar radiation, and other weather phenomena influence chemical reactions and atmospheric transformations. By studying meteorological and air pollution data together, scientists and mathematicians have developed reasonably accurate models for predicting the fate of pollutants as they go through the stages of transport, dispersion, transformation, and removal.

Scientists, engineers, and policy makers can use air pollution models as a screening tool, for comparing predicted pollutant concentrations to National Ambient Air Quality Standards (NAAQS), to determine the impacts of new and existing air pollution sources, and to design ambient air monitoring networks. The meteorological data collected by the New Jersey Department of Environmental Protection (NJDEP) can assist planners in preparing State Implementation Plans (SIPs) to reduce pollutant emissions, engineers in designing or evaluating air pollution permit applications, and scientists in siting air monitoring stations.

Figure 1
New Jersey Climate Zones

CLIMATOLOGY IN NEW JERSEY

New Jersey is located about halfway between the Equator and the North Pole, on the eastern coast of the United States. Its geographic location results in the state being influenced by different air streams at different times (wet, dry, hot, cold), making for daily weather that is highly variable.

Although New Jersey is one of the smallest states in the Union, with a land area of 7,836 square miles, it has five distinct climate zones, which are classified as the Northern, Central, Pine Barrens, Southwest, and Coastal Zones. The topography of the different zones, their distance from the Atlantic Ocean, and the prevailing atmospheric flow patterns affecting them produce distinct variations in the daily weather. These climate zones are shown in Figure 1.



Source: Office of the New Jersey State Climatologist

MONITORING LOCATIONS

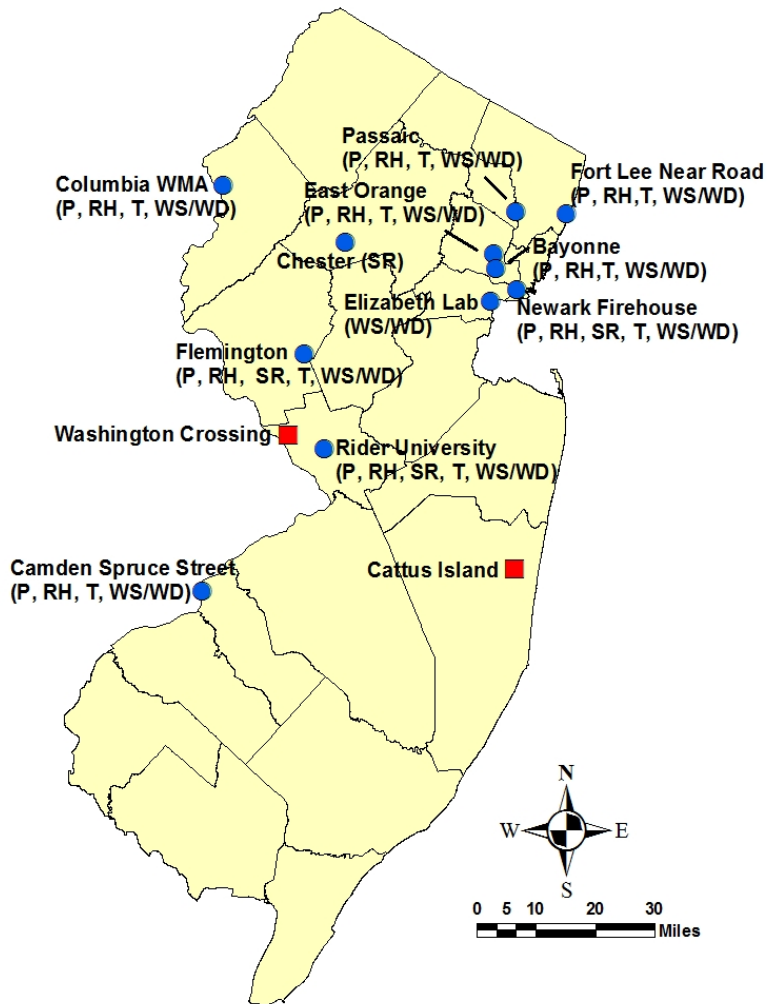
NJDEP maintains a network of eleven meteorological monitoring locations. In addition, total weekly precipitation is measured in Washington Crossing State Park and Cattus Island County Park. Not all meteorological parameters are measured at each site. Table 1 lists the meteorological parameters measured at each site, and Figure 2 shows the 2014 Meteorological Monitoring Network. In Table 2, the 2014 meteorological data is summarized alphabetically by site. Figure 3 shows the average monthly temperatures of the Northern Region monitoring stations (Bayonne, Columbia, East Orange, Fort Lee Near Road, and Newark Firehouse) versus the 30-year average monthly temperatures measured by the Northern Office of the State Climatologist. Figure 4 shows the average monthly temperatures of the Southern Region monitoring stations (Camden Spruce Street, Flemington, and Rider University) versus the 30-year average monthly temperatures measured by the Southern Office of the State Climatologist.

Figures 5 through 14 depict annual wind roses for Bayonne, Camden Spruce Street, Columbia WMA, East Orange, Elizabeth Trailer, Flemington, Fort Lee Near Road, Newark Firehouse, Passaic and Rider University, respectively. Presented in a circular format, a wind rose shows the frequency of winds blowing *from* particular directions over a specified period. The length of each "spoke" around the circle is related to the frequency that the wind blows from a particular direction per unit time. Each concentric circle represents a different frequency, starting with zero at the center and increasing frequencies at the outer circles. Each spoke is broken down into color-coded bands that show wind speed ranges.

Table 1
2014 New Jersey Meteorological Monitoring Network
Parameter Summary

Site Name	Temperature	Relative Humidity	Wind Speed	Wind Direction	Barometric Pressure	Solar Radiation	Precipitation
Bayonne	X	X	X	X	X		X
Camden Spruce Street	X	X	X	X	X		
Cattus Island							X
Chester						X	
Columbia WMA	X	X	X	X	X		
East Orange	X	X	X	X	X		
Elizabeth Lab			X	X			
Flemington	X	X	X	X	X	X	
Fort Lee Near Road	X	X	X	X	X		X
Newark Firehouse	X	X	X	X	X	X	
Passaic	X	X	X	X	X		
Rider University	X	X	X	X	X		
Washington Crossing							X

Figure 2
2014 Meteorological Monitoring Network



Legend



	Meteorological Site
P	Barometric Pressure
RH	Relative Humidity
SR	Solar Radiation
T	Temperature
WS/WD	Wind Speed/Wind Direction
	Deposition Site

Table 2
Summary of Meteorological Monitoring Data - 2014

MONITORING SITES		<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUNE</u>	<u>JULY</u>	<u>AUG</u>	<u>SEP</u>	<u>OCT</u>	<u>NOV</u>	<u>DEC</u>	<u>YEAR</u>
Bayonne														
Temperature (°F)	Mean	No Data ⁴	No Data ⁴	38	50	63	71	74	72	67	57	43	38	57
	Mean ¹	--	--	39	50	60	69	76	72	65	53	44	34	52
	Min	No Data ⁴	No Data ⁴	32	42	57	64	68	66	61	51	37	34	32
	Max	No Data ⁴	No Data ⁴	45	57	69	78	82	79	75	64	49	43	82
Relative Humidity (%)	Mean	No Data ⁴	No Data ⁴	52.9	58.1	64.5	63.1	63.0	61.3	64.9	64.8	58.3	66.5	61.7
	Min	No Data ⁴	No Data ⁴	38.0	38.0	49.9	46.2	45.1	44.7	46.0	48.7	43.5	56.0	38.0
	Max	No Data ⁴	No Data ⁴	67.3	76.1	78.3	79.1	79.7	77.5	80.0	78.9	73.3	78.0	80.0
Barometric Pressure (in of Hg)	Mean	No Data ⁴	No Data ⁴	29.93	30.01	30.02	29.95	29.95	29.98	30.07	29.89	30.02	30.09	29.99
	Min	No Data ⁴	No Data ⁴	29.76	29.85	29.97	29.87	29.87	29.92	30.00	29.80	29.89	29.97	29.76
	Max	No Data ⁴	No Data ⁴	30.07	30.14	30.08	30.03	30.01	30.04	30.15	29.98	30.13	30.20	30.20
Precipitation (inches)	Historical ²	3.49	2.90	4.12	4.31	4.37	4.51	4.78	4.13	4.49	4.36	3.90	4.00	49.37
	Observed	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	2.27	2.38	1.15	2.88	2.65	2.83	No Data ³
Camden Spruce Street														
Temperature (°F)	Mean	29	31	39	53	65	74/	76	74	69	59	44	40	54
	Mean ⁵	33	35	42	52	62	71	76	74	67	56	47	37	54
	Min	20	25	30	44	57	65	69	66	62	52	38	35	20
	Max	37	39	46	62	73	82	85	82	78	66	51	46	85
Relative Humidity (%)	Mean	58.7	57.9	50.9	53.2	56.5	59.7	59.1	59.1	63.1	61.4	54.8	62.4	58.0
	Min	40.8	40.7	35.1	34.9	39.9	39.7	40.6	40.9	43.1	42.0	36.6	49.7	34.9
	Max	76.2	78.4	70.4	75.8	77.2	80.0	78.3	79.0	81.3	78.1	73.8	77.1	81.3
Barometric Pressure (in of Hg)	Mean	30.03	30.04	29.99	30.01	30.01	29.96	29.96	29.99	30.07	29.91	30.05	30.10	30.01
	Min	29.82	29.88	29.83	29.85	29.92	29.87	29.87	29.93	29.99	29.80	29.88	29.98	29.80
	Max	30.20	30.20	30.14	30.15	30.07	30.04	30.02	30.05	30.15	30.00	30.16	30.23	30.23
Precipitation (inches)	Historical ⁶	3.47	2.85	4.35	3.95	3.82	3.79	4.39	4.30	3.87	3.70	3.50	3.88	45.85
	Observed	No Data ⁷	No Data ⁷	No Data ⁷	6.597	2.59	4.15	3.68	1.39	3.30	3.01	3.05	1.39	No Data ⁷

1) Office of the New Jersey State Climatologist 30-year mean Northern NJ temperature data.
2) Office of the New Jersey State Climatologist 30-year Northern NJ mean precipitation data.
3) Commenced data collection July 2014.
4) Commenced data collection March 2014.
5) Office of the New Jersey State Climatologist 30-year mean Southern NJ temperature data.
6) Office of the New Jersey State Climatologist 30-year Southern NJ mean precipitation data.
7) Commenced data collection, April 2014.

Table 2, Continued
Summary of Meteorological Monitoring Data – 2014

MONITORING SITES		JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR
Chester														
Solar Radiation (Langleys)	Mean	0.085	0.123	0.216	0.266	0.320	0.367	0.360	0.313	0.235	0.155	0.100	0.064	0.217
	Max	0.458	0.573	0.886	1.003	1.104	1.216	1.243	1.145	1.044	0.746	0.523	0.339	1.243
Columbia WMA														
Temperature (°F)	Mean	22	25	33	49	61	69	70	68	62	53	38	34	48
	Mean ¹	29	32	39	50	60	69	74	72	65	53	44	34	52
	Min	12	14	23	37	50	57	60	57	52	44	29	29	12
	Max	30	34	41	59	71	79	82	79	76	63	47	41	82
Relative Humidity (%)	Mean	63.1	61.4	51.8	57.6	63.4	69.9	72.7	72.0	73.2	69.8	61.6	67.6	65.3
	Min	46.6	40.9	34.1	34.4	39.5	45.0	44.8	44.9	44.9	46.9	42.6	53.8	34.1
	Max	78.0	79.6	71.3	81.9	86.6	90.3	91.1	90.3	90.6	88.4	80.3	81.1	91.1
Barometric Pressure (in of Hg)	Mean	29.48	29.51	29.47	29.49	29.50	29.47	29.47	29.50	29.59	29.40	29.51	29.58	29.49
	Min	29.29	29.34	29.31	29.36	29.42	29.39	29.38	29.45	29.52	29.30	29.38	29.45	29.29
	Max	29.64	29.66	29.61	29.64	29.56	29.55	29.53	29.57	29.67	29.49	29.63	29.70	29.60
Precipitation (inches)	Historical ²	3.49	2.90	4.12	4.31	4.37	4.51	4.78	4.13	4.49	4.36	3.90	4.00	49.37
	Observed	No Data ³	No Data ³	No Data ³	5.759	1.529	4.117	4.39	1.63	1.13	2.50	0.99	1.97	No Data ³
East Orange														
Temperature (°F)	Mean	26	28	36	50	62	71	74	72	67	56	42	37	51
	Mean ¹	29	32	39	50	60	69	74	72	65	53	44	34	52
	Min	20	23	28	41	55	63	66	64	59	50	35	33	20
	Max	32	35	43	59	70	79	82	79	75	64	49	43	82
Relative Humidity (%)	Mean	59.2	58.0	47.0	53.7	54.6	59.7	60.4	58.1	62.3	63.0	54.1	63.1	57.7
	Min	44.4	42.0	31.8	33.9	39.3	40.7	41.9	40.6	43.2	44.8	38.1	50.4	31.8
	Max	72.7	74.3	62.3	73.4	74.8	76.6	78.4	76.4	79.9	79.0	70.8	76.0	79.9
Barometric Pressure (in of Hg)	Mean	29.80	29.85	29.81	29.84	29.82	29.79	29.78	29.82	29.91	29.73	29.85	29.92	29.82
	Min	29.68	29.73	29.64	29.69	29.76	29.72	29.70	29.77	29.84	29.64	29.73	29.81	29.64
	Max	29.97	29.99	29.95	29.97	29.87	29.87	29.84	29.88	29.99	29.82	29.96	30.03	30.03

1) Office of the New Jersey State Climatologist 30-year mean Northern NJ temperature data.

2) Office of the New Jersey State Climatologist 30-year Northern NJ mean precipitation data.

3) Commenced data collection April 2014.

Table 2, Continued
Summary of Meteorological Monitoring Data - 2014

MONITORING SITES		JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR	
Flemington															
Temperature (°F)	Mean	24	27	35	49	60	69	71	69	63	54	39	36	49	
	Mean ⁴	33	35	42	52	62	71	76	74	67	56	47	37	54	
	Min	15	17	26	37	50	59	62	58	52	45	30	30	15	
	Max	31	34	42	59	69	79	81	79	75	63	48	43	81	
Relative Humidity (%)	Mean	63.70	64.00	52.40	58.40	63.50	67.10	68.90	68.40	70.30	68.30	61.10	67.10	64.40	
	Min	47.90	42.30	36.60	37.90	46.00	45.90	45.40	44.90	44.60	45.70	41.20	52.00	36.60	
	Max	79.60	82.30	73.60	81.70	85.20	89.40	89.90	89.60	89.60	87.40	80.80	82.00	89.90	
Solar Radiation (Langleys)	Mean	0.112	0.169	0.229	0.301	0.287	0.359	0.359	0.309	0.250	0.166	0.122	0.077	0.228	
	Max	0.512	0.720	0.891	1.021	0.970	1.154	1.161	1.049	0.957	0.717	0.534	0.386	1.161	
Barometric Pressure (in of Hg)	Mean	29.84	29.85	29.81	29.84	29.83	29.79	29.79	29.82	29.91	29.73	29.86	29.92	29.83	
	Min	29.69	29.74	29.64	29.68	29.76	29.72	29.72	29.77	29.84	29.65	29.73	29.80	29.64	
	Max	30.00	30.00	29.96	29.97	29.88	29.87	29.85	29.88	29.99	29.82	29.97	30.04	30.04	
Fort Lee Near Road															
Temperature (°F)	Mean	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	74	72	67	57	42	37	58
	Mean ¹	--	--	--	--	--	--	--	74	72	65	53	44	34	52
	Min	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	68	65	60	51	36	33	33
	Max	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	81	80	75	63	48	42	81
Relative Humidity (%)	Mean	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	60.3	60.3	63.8	64.0	55.9	66.7	61.8
	Min	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	33.8	39.9	45.6	47.0	39.6	53.7	33.8
	Max	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	68.5	79.9	81.6	80.3	73.3	80.0	81.6
Barometric Pressure (in of Hg)	Mean	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	29.78	29.68	29.77	29.58	29.71	29.76	29.71
	Min	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	29.74	29.63	29.69	29.48	29.56	29.64	29.48
	Max	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	29.77	29.74	29.85	29.67	29.82	29.88	29.88
Precipitation (inches)	Historical ²	3.49	2.90	4.12	4.31	4.37	4.51	4.78	4.13	4.49	4.36	3.90	4.00	49.37	
	Observed	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	0.10	2.52	0.79	4.29	2.76	4.97	No Data ³

1) Office of the New Jersey State Climatologist 30-year mean Northern NJ temperature data.

2) Office of the New Jersey State Climatologist 30-year Northern NJ mean precipitation data.

3) Commenced data collection July 2014.

4) Office of the New Jersey State Climatologist 30-year mean Southern NJ temperature data.

Table 2, Continued
Summary of Meteorological Monitoring Data - 2014

MONITORING SITES		JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	YEAR
Newark Firehouse														
Temperature (°F)	Mean	27	29	37	52	63	73	75	74	68	58	43	38	53
	Mean ¹	29	32	39	50	60	69	74	72	65	53	44	34	52
	Min	20	24	29	43	56	65	68	66	61	51	35	34	20
	Max	33	36	44	60	71	80	83	81	76	65	50	44	83
Relative Humidity (%)	Mean	57.3	56.9	45.0	52.6	55.7	57.7	58.8	56.2	60.4	61.5	53.0	62.4	56.4
	Min	41.0	39.5	28.4	32.3	39.3	38.7	39.3	38.4	40.7	42.2	35.1	49.7	28.4
	Max	71.4	74.6	61.9	73.5	75.6	75.7	77.0	74.8	77.4	78.4	71.2	76.5	78.4
Solar Radiation (Langleys)	Mean	0.090	0.155	0.205	0.291	0.301	0.353	0.335	0.304	0.228	0.148	0.101	0.066	0.214
	Max	0.457	0.646	0.812	1.024	1.036	1.153	1.164	1.078	0.914	0.664	0.483	0.357	1.164
Barometric Pressure (in of Hg)	Mean	29.89	29.91	29.87	29.90	29.89	29.85	29.84	29.88	29.97	29.80	29.91	29.98	29.89
	Min	29.76	29.76	29.71	29.76	29.82	29.77	29.78	29.83	29.90	29.71	29.79	29.86	29.71
	Max	30.05	30.06	30.01	30.04	29.95	29.93	29.91	29.94	30.06	29.89	30.03	30.09	30.09
Passaic														
Temperature (°F)	Mean	26	29	36	51	63	72	75	73	67	57	43	37	52
	Mean ¹	29	32	39	50	60	69	74	72	65	53	44	34	52
	Min	20	22	27	37	54	64	67	64	59	50	35	33	20
	Max	32	36	43	70	71	80	83	81	76	64	49	43	83
Relative Humidity (%)	Mean	58.9	59.1	47.1	48.0	55.3	58.6	59.2	57.5	61.0	62.5	53.8	62.9	57.4
	Min	42.8	41.3	31.4	15.8	37.4	41.1	39.1	38.6	41.7	43.8	35.5	51.0	31.4
	Max	72.8	75.7	62.7	89.4	75.2	75.2	77.0	77.0	78.3	79.1	70.6	76.0	79.1
Barometric Pressure (in of Hg)	Mean	29.94	29.96	29.91	30.15	29.93	29.89	29.87	29.92	30.01	29.83	29.95	30.03	29.93
	Min	29.79	29.82	29.74	29.55	29.86	29.82	29.81	29.87	29.93	29.73	29.83	29.91	29.73
	Max	30.09	30.11	30.06	30.59	29.99	29.97	29.94	29.98	30.09	29.92	30.07	30.14	30.14
Precipitation (inches)	Historical ²	3.49	2.90	4.12	4.31	4.37	4.51	4.78	4.13	4.49	4.36	3.90	4.00	49.37
	Observed	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	No Data ³	0.43	2.25	0.85	3.76	2.56	2.51	No Data ³

1) Office of the New Jersey State Climatologist 30-year mean Northern NJ temperature data.
 2) Office of the New Jersey State Climatologist 30-year Northern NJ mean precipitation data.
 3) Commenced data collection July 2014.

Table 2, Continued
Summary of Meteorological Monitoring Data - 2014

MONITORING
SITES

JAN FEB MAR APR MAY JUNE JULY AUG SEP OCT NOV DEC YEAR

Rider University														
Temperature (F°)	Mean	26	27	36	51	62	70	73	70	65	55	41	37	51
	Mean ¹	33	35	42	52	62	71	76	74	67	56	47	37	54
	Min	16	19	27	39	52	61	64	60	56	46	32	31	16
	Max	34	35	44	60	71	80	82	79	76	64	49	44	82
Relative Humidity (%)	Mean	66.1	67.7	54.5	60.2	66.3	70.0	70.1	72.3	75.5	74.2	65.3	71.7	67.8
	Min	45.6	43.1	36.4	36.0	44.1	45.5	45.2	45.7	46.7	48.3	41.1	56.5	36.0
	Max	84.9	90.3	77.1	86.7	89.0	94.8	92.8	95.2	95.3	94.6	86.4	88.9	95.3
Solar Radiation (Langleys)	Mean	0.099	0.149	0.195	0.281	0.289	0.347	0.339	0.295	0.232	0.149	0.101	0.067	0.211
	Max	0.460	0.630	0.750	0.945	0.985	1.114	1.115	1.016	0.913	0.651	0.462	0.333	1.115
Barometric Pressure (in of Hg)	Mean	30.25	30.28	30.23	30.26	30.25	30.20	30.20	30.23	30.32	30.14	30.29	30.34	30.24
	Min	30.11	30.14	30.05	30.12	30.18	30.12	30.13	30.18	30.25	30.04	30.15	30.22	30.04
	Max	30.42	30.43	30.38	30.40	30.31	30.29	30.27	30.30	30.40	30.23	30.39	30.46	30.46

1) Office of the New Jersey State Climatologist 30-year mean Southern NJ temperature data.

Figure 3
2014 Northern Region Average Monthly
Temperatures vs. North Jersey Office of the
Climatologist 30-Year Mean

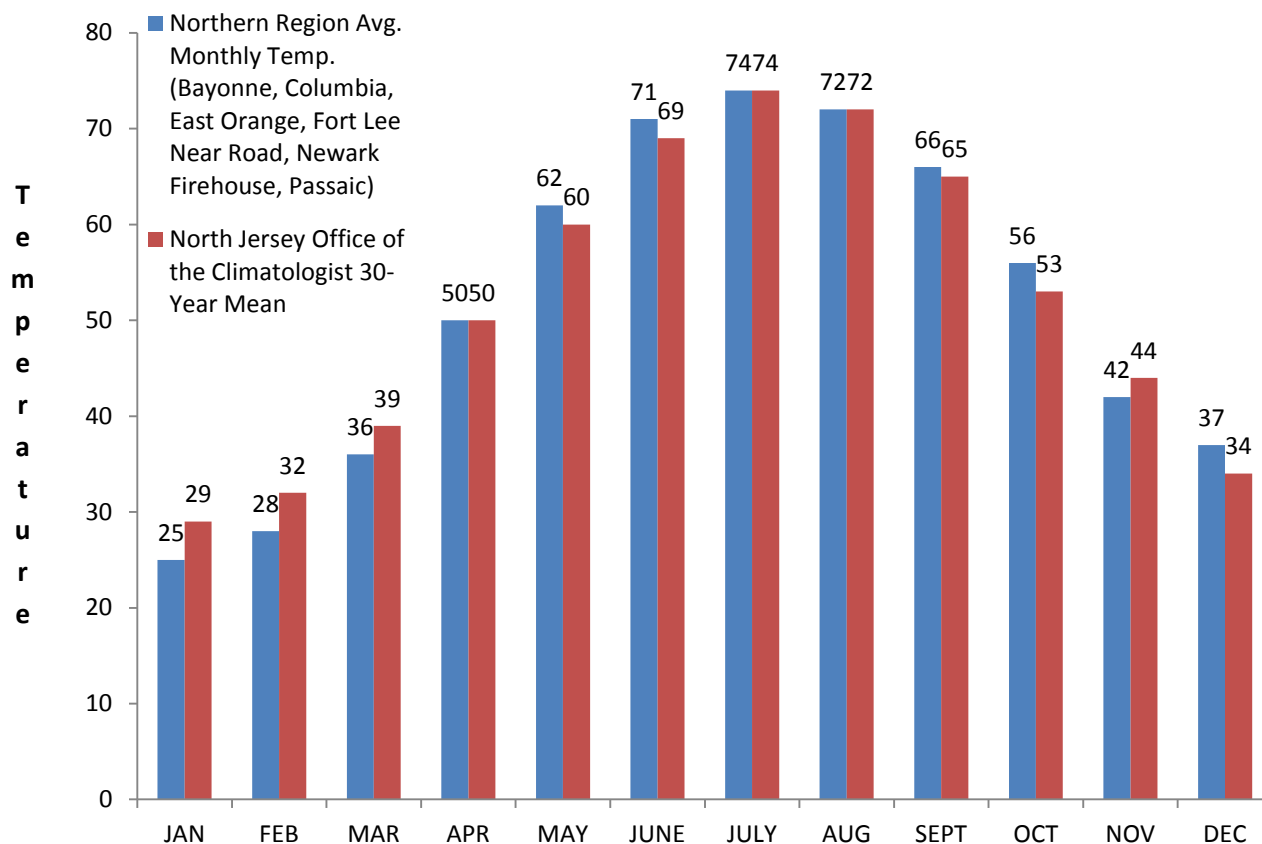


Figure 4
2014 Southern Region Average Monthly
Temperatures vs. South Jersey Office of the
Climatologist 30-Year Mean

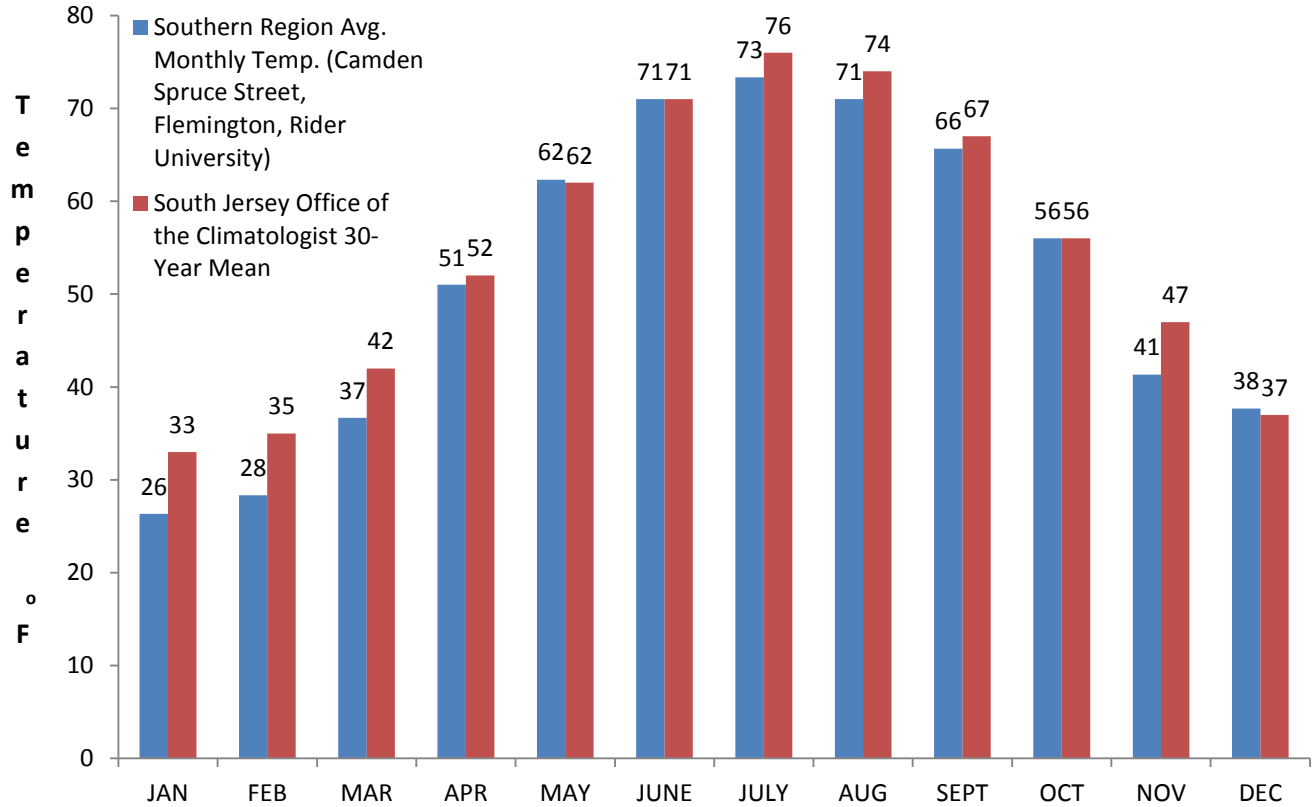


Figure 5
 2014 Wind Rose for Bayonne
 Displaying Distribution of Wind Speed & Wind Direction

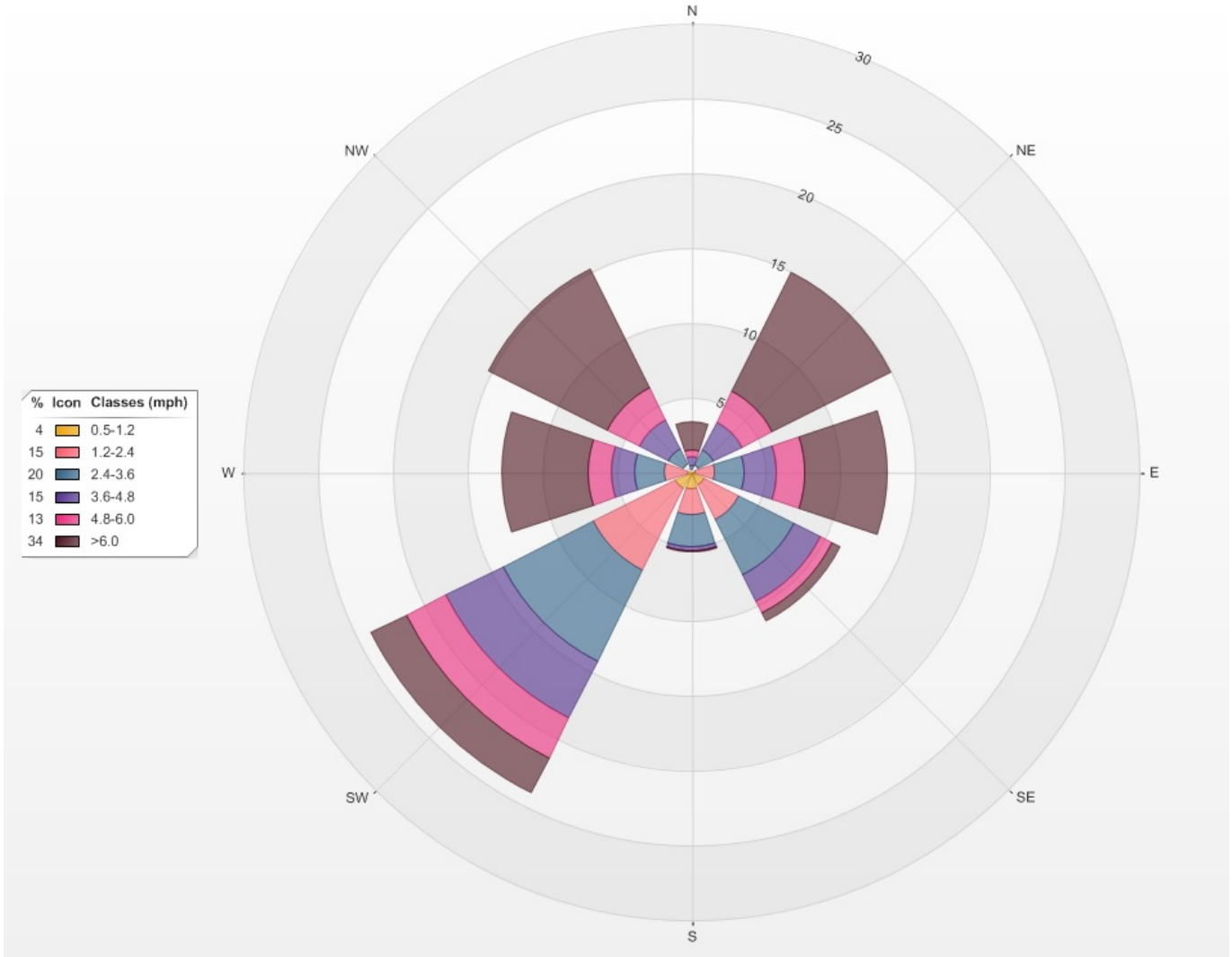


Figure 6
 2014 Wind Rose for Camden Spruce Street
 Displaying Distribution of Wind Speed & Wind Direction

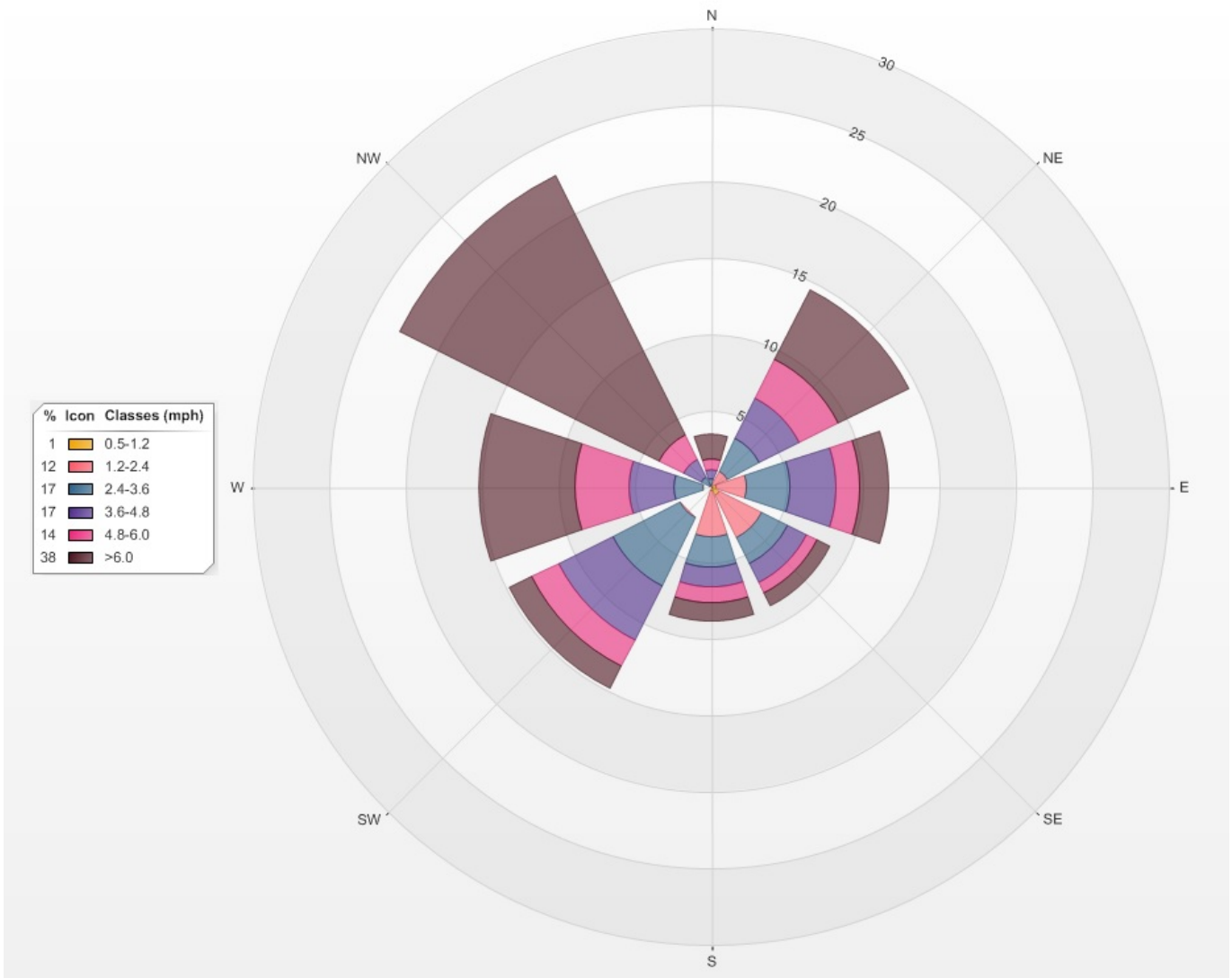


Figure 7
 2014 Wind Rose for Columbia WMA
 Displaying Distribution of Wind Speed & Wind Direction

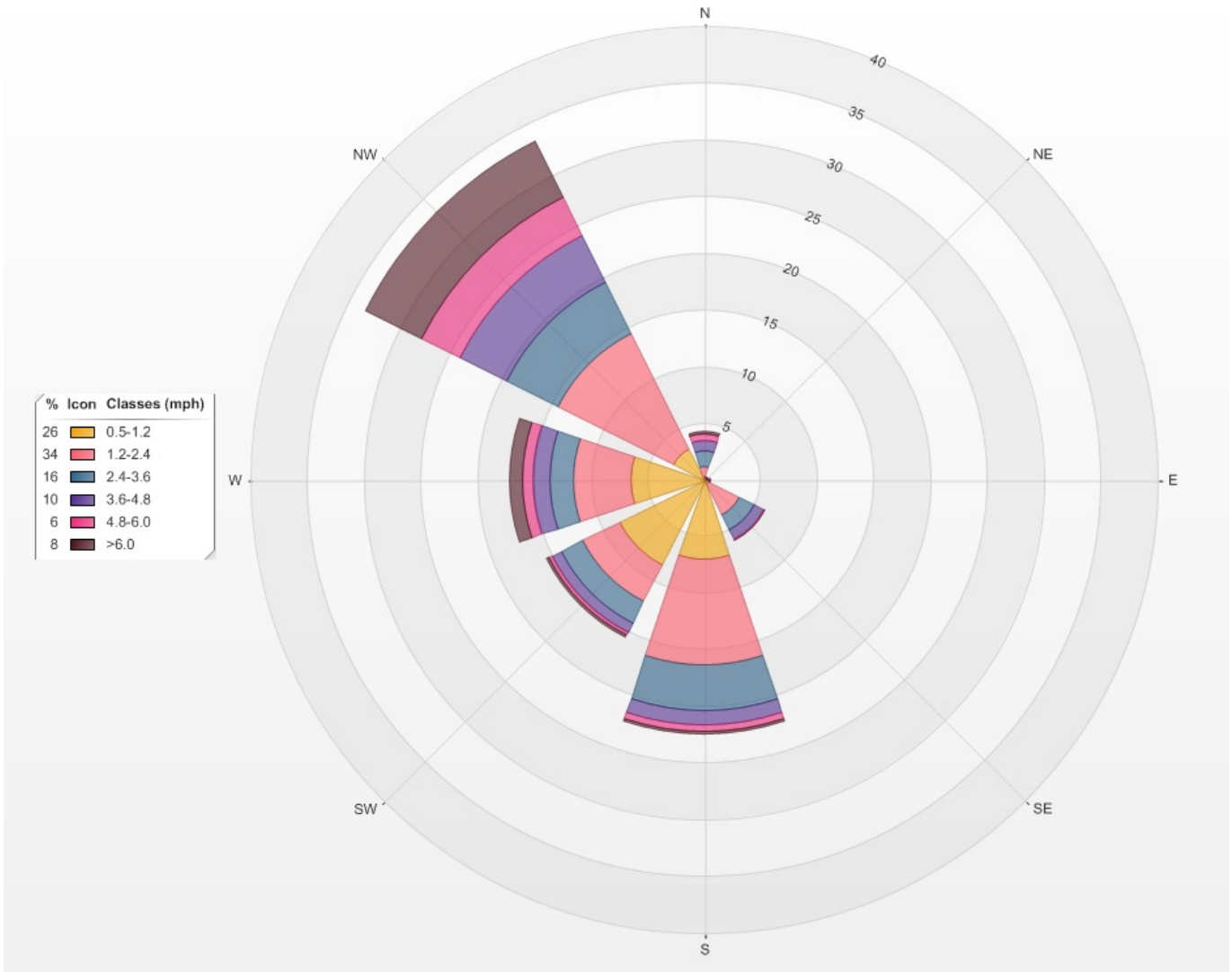


Figure 8
 2014 Wind Rose for East Orange
 Displaying Distribution of Wind Speed & Wind Direction

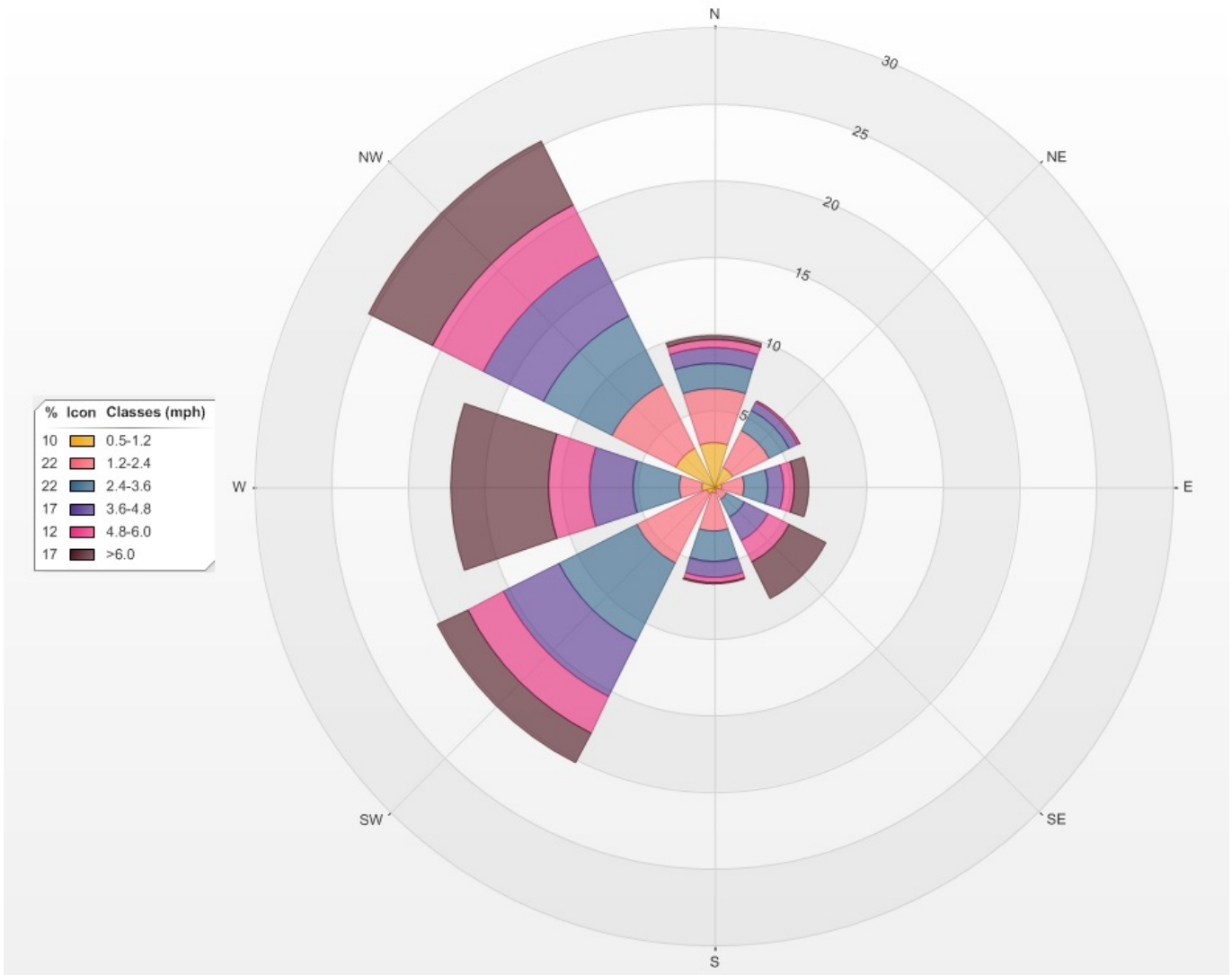


Figure 9
 2014 Wind Rose for Elizabeth Lab
 Displaying Distribution of Wind Speed & Wind Direction

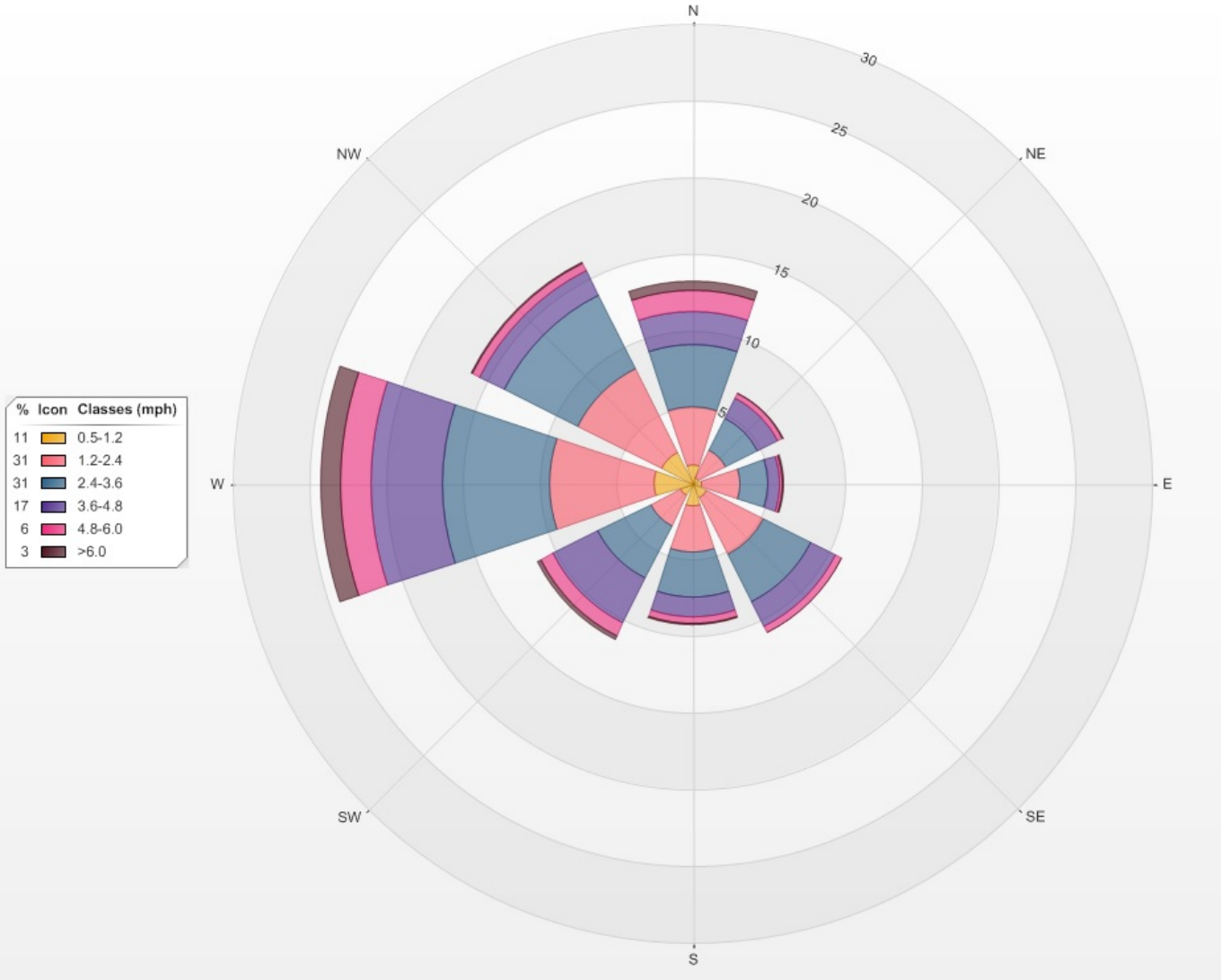


Figure 10
 2014 Wind Rose for Flemington
 Displaying Distribution of Wind Speed & Wind Direction

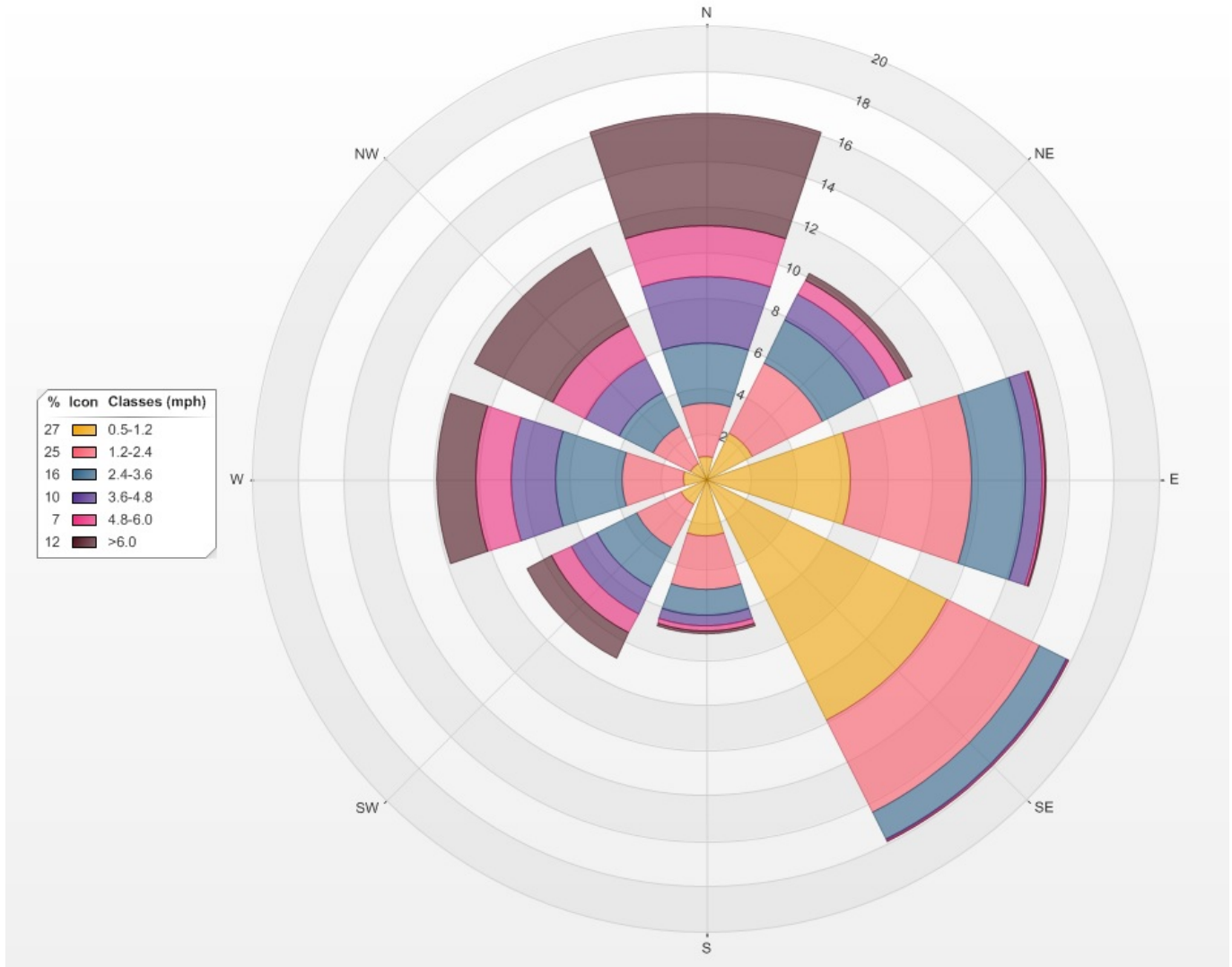


Figure 11
 2014 Wind Rose for Fort Lee Near Road
 Displaying Distribution of Wind Speed & Wind Direction

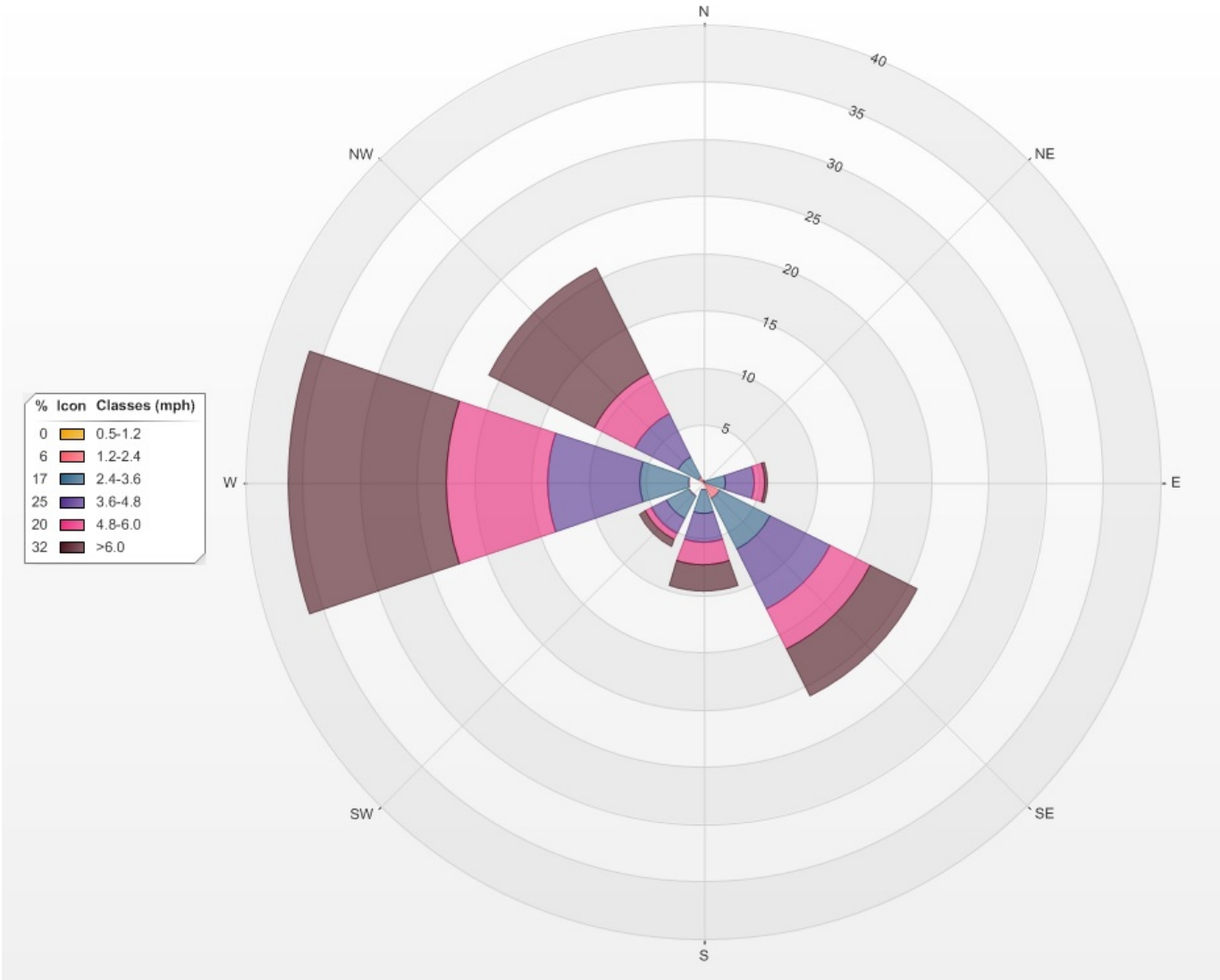


Figure 12
 2014 Wind Rose for Newark Firehouse
 Displaying Distribution of Wind Speed & Wind Direction

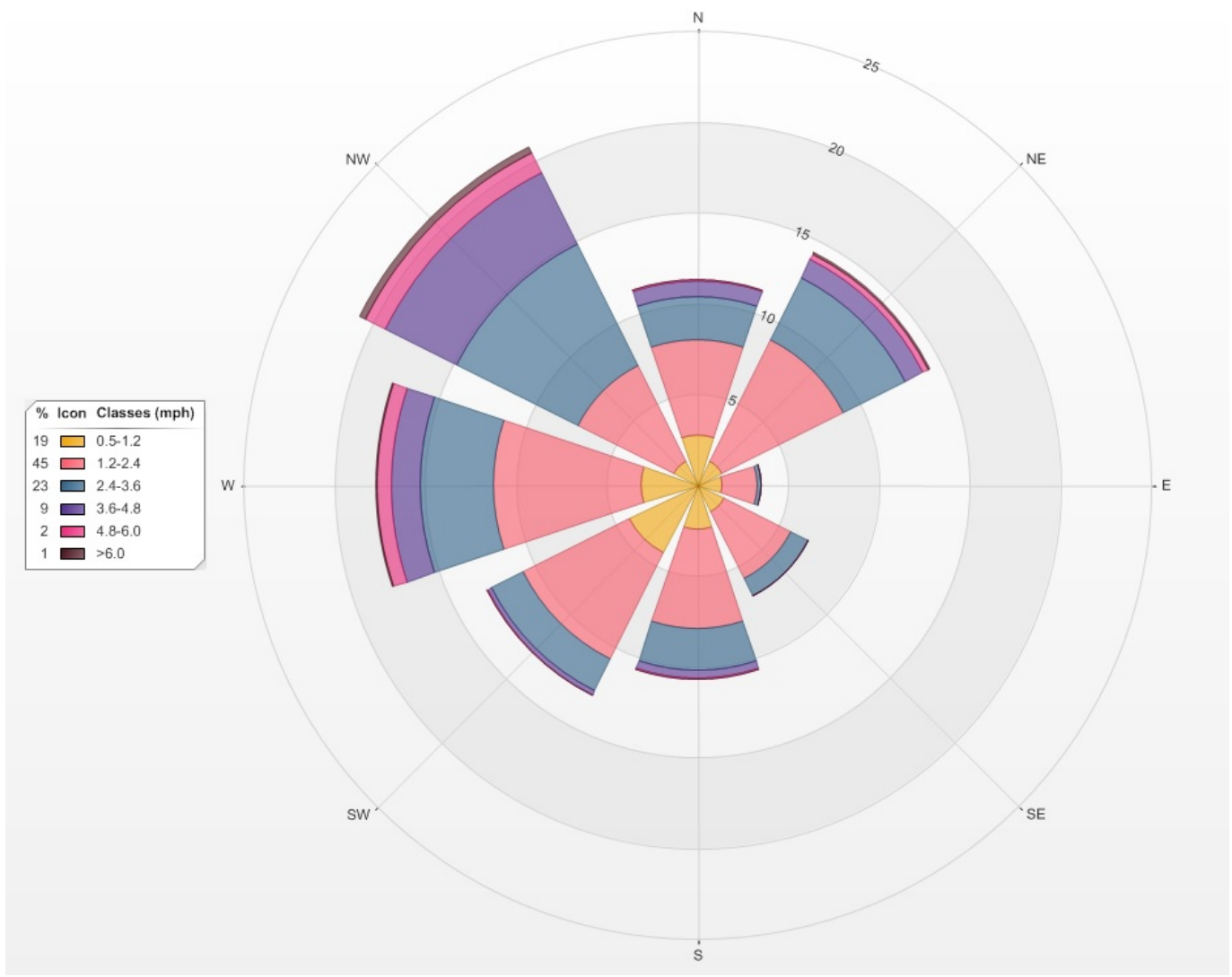


Figure 13
 2014 Wind Rose for Passaic
 Displaying Distribution of Wind Speed & Wind Direction

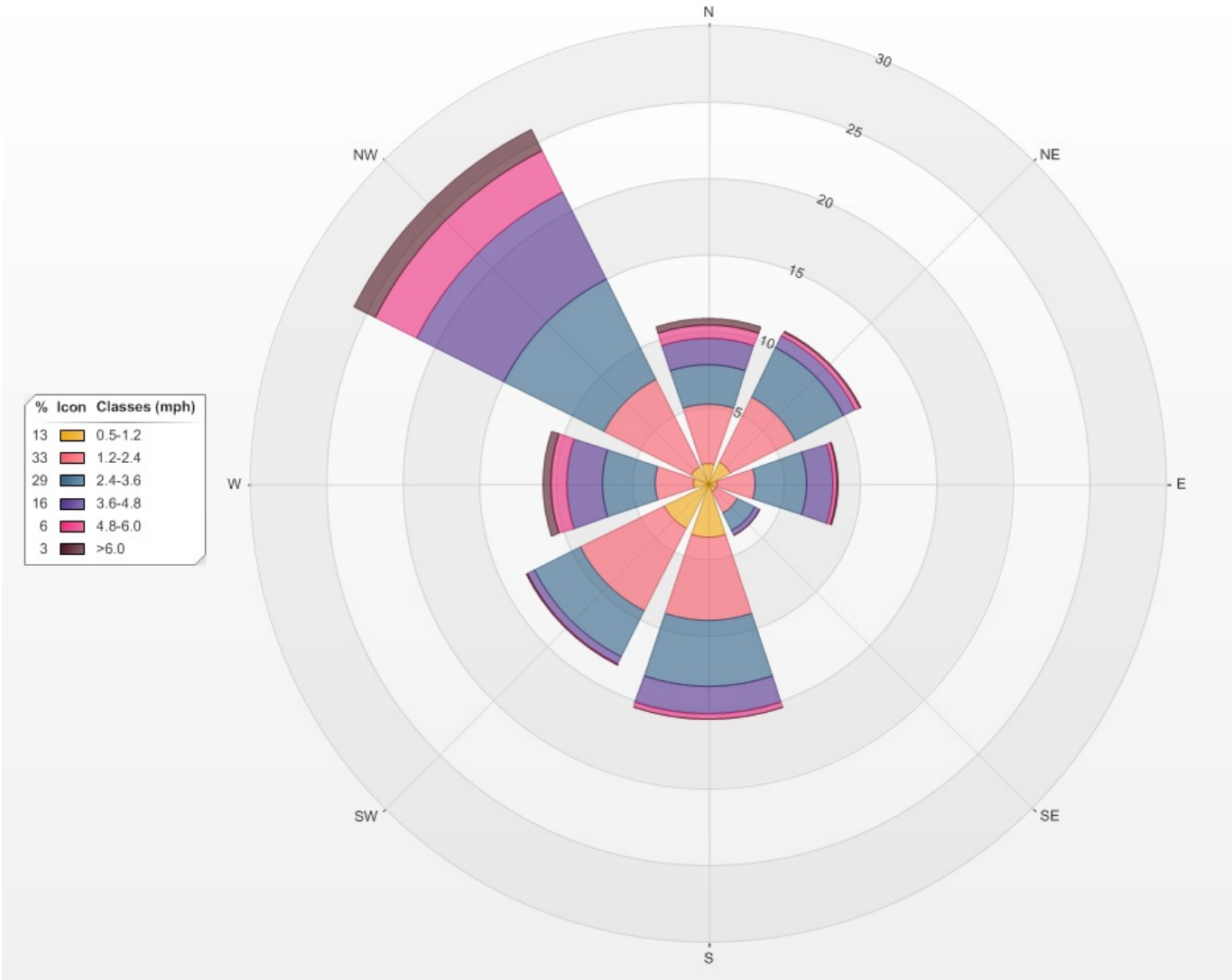
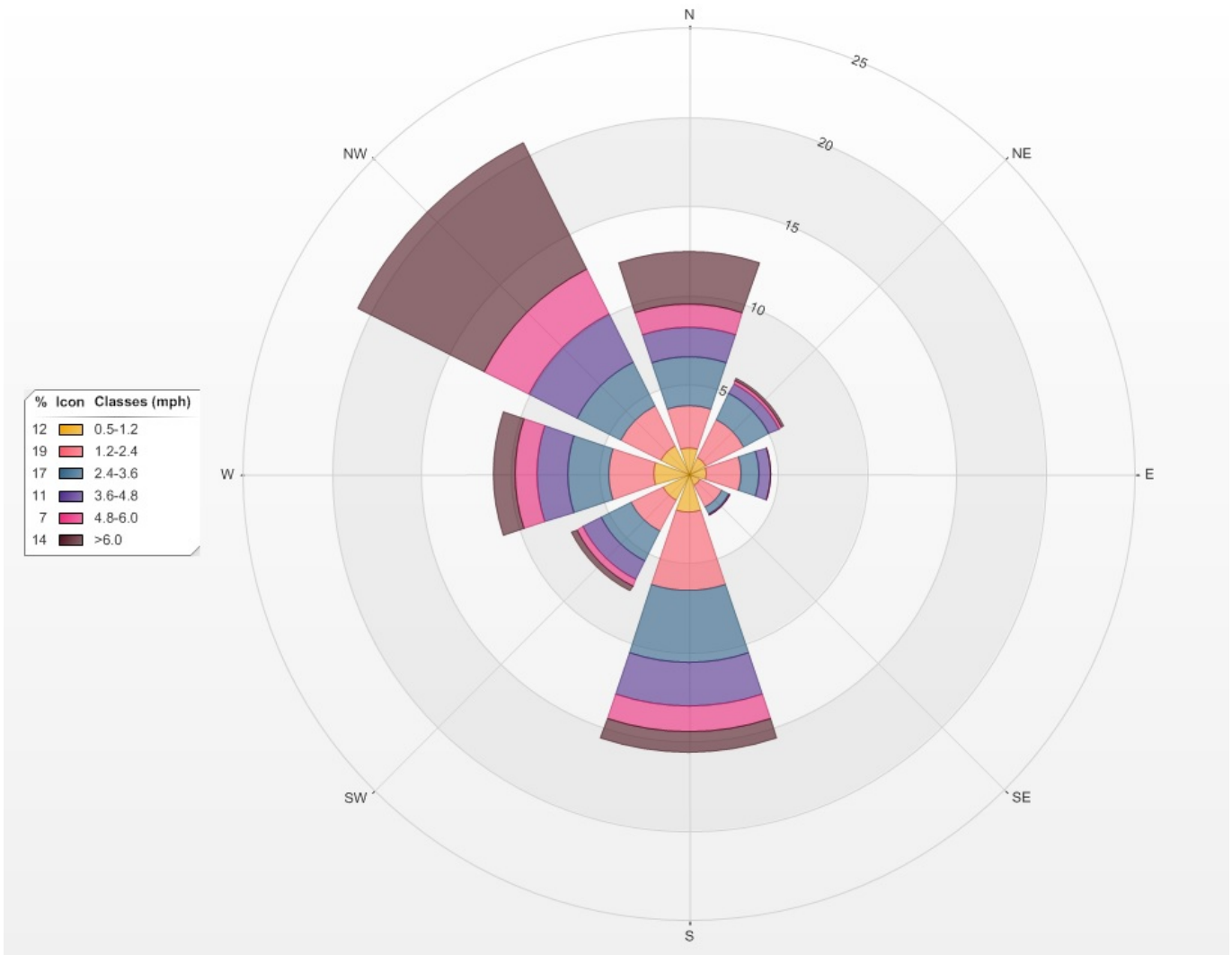


Figure 14
 2014 Wind Rose for Rider University
 Displaying Distribution of Wind Speed & Wind Direction



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