2015 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.

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.

Figure 1
New Jersey Climate Zones

Source: Office of the New Jersey State Climatologist

MONITORING LOCATIONS

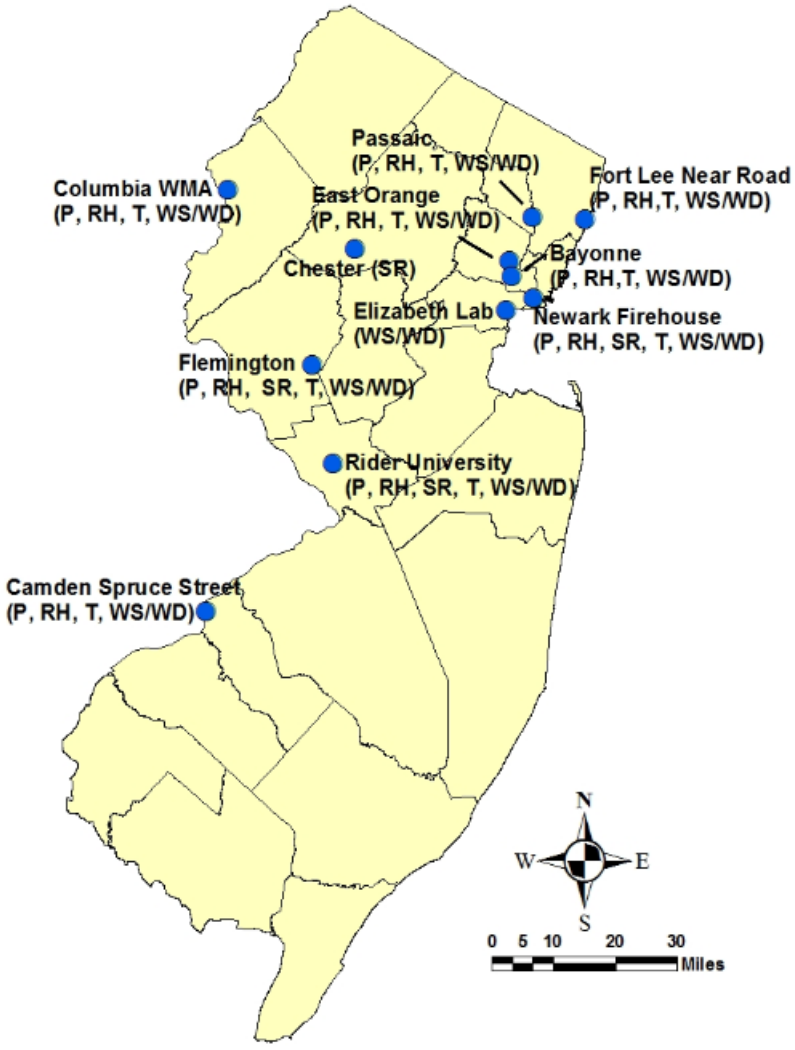
NJDEP collects meteorological data at eleven stations in its monitoring network. Not all meteorological parameters are measured at each site. Table 1 lists the parameters monitored at a given station, and Figure 2 is a map of the 2015 meteorological monitoring network. In Tables 2 through 6, the 2015 meteorological data is summarized for temperature, precipitation, relative humidity, solar radiation, and barometric pressure. Figure 3 presents the average temperature for each monitoring site compared with the statewide 30-year average. Figure 4 shows the monthly precipitation at each site, as well as the statewide 30-year average. (Newark Firehouse is not included because it only began collecting rainfall data in November.)

Figures 5 through 14 present annual wind roses for Bayonne, Camden Spruce Street, Columbia, 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* a specific direction for 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
2015 New Jersey Meteorological Monitoring Network
Parameter Summary

	Site Name	Temperature	Relative Humidity	Wind Speed	Wind Direction	Barometric Pressure	Solar Radiation	Precipitation
1	Bayonne	X	X	X	X	X		X
2	Camden Spruce Street	X	X	X	X	X		X
3	Chester						X	
4	Columbia	X	X	X	X	X		X
5	East Orange	X	X	X	X	X		
6	Elizabeth Lab			X	X			
7	Flemington	X	X	X	X	X	X	
8	Fort Lee Near Road	X	X	X	X	X		X
9	Newark Firehouse	X	X	X	X	X	X	X
10	Passaic	X	X	X	X	X		
11	Rider University	X	X	X	X	X	X	

Figure 2
2015 Meteorological Monitoring Network



Legend

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

Table 2
2015 Summary of Temperature Data (in Degrees Fahrenheit)
from NJ's Air Monitoring Sites

SITE		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Bayonne	Mean	28	23	36	51	65	69	76	76	71	55	51	48	54
	Minimum	8	2	13	33	46	50	64	64	55	35	30	33	2
	Maximum	53	40	61	74	88	87	93	93	94	77	71	68	94
Camden Spruce St	Mean	30	25	38	54	68	72	77	77	72	57	52	50	56
	Minimum	10	2	12	35	47	51	64	64	57	36	32	32	2
	Maximum	57	47	65	79	88	92	93	92	92	77	77	70	93
Columbia	Mean	23	18	32	49	63	67	71	68	65	50	46	43	50
	Minimum	3	-7	5	24	38	43	54	51	46	26	22	26	-7
	Maximum	39	41	58	78	86	88	90	86	91	75	73	68	91
East Orange	Mean	27	22	35	52	65	69	76	76	71	54	50	48	54
	Minimum	6	0	10	32	45	49	61	60	53	32	28	32	0
	Maximum	53	41	59	80	87	88	94	93	93	76	75	69	94
Flemington	Mean	26	20	34	50	64	68	73	72	68	52	47	45	52
	Minimum	3	-4	0	26	38	45	56	51	45	25	20	24	-4
	Maximum	50	42	63	78	86	90	91	89	92	76	74	69	92
Fort Lee Near Road	Mean	26	21	35	51	64	68	76	75	70	54	50	47	53
	Minimum	5	0	11	31	46	47	62	61	53	32	30	32	0
	Maximum	53	39	58	78	85	89	92	89	91	74	71	68	92
Newark Firehouse	Mean	28	22	36	53	ND	ND	ND	ND	ND	ND	49	48	*
	Minimum	6	0	11	33	ND	ND	ND	ND	ND	ND	29	33	*
	Maximum	54	41	63	80	ND	ND	ND	ND	ND	ND	72	69	*
Passaic	Mean	28	22	36	52	67	72	78	77	72	55	50	47	55
	Minimum	7	1	12	32	45	49	62	61	52	31	28	32	1
	Maximum	53	41	59	80	90	91	97	95	96	77	74	69	97
Rider University	Mean	27	21	35	52	65	70	74	73	69	53	49	47	53
	Minimum	7	0	3	28	39	49	58	55	49	28	23	26	0
	Maximum	55	44	64	79	88	91	92	91	92	77	74	71	92

ND = no data
*Not enough data to determine an annual statistic.

Table 3
2015 Total Monthly Precipitation Data (Inches) from NJ's Air Monitoring Sites

SITE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL TOTAL
Bayonne	2.614	1.075	2.843	1.35	2.047	4.21	2.553	1.728	2.401	1.979	0.636	2.978	26.41
Camden Spruce St	3.372	1.048	4.716	2.6	0.963	8.486	4.385	1.828	5.064	3.411	1.162	4.326	41.36
Columbia	0.814	0.37	2.73	1.796	1.973	7.372	4.286	0.159	5.391	1.742	1.015	3.659	31.31
Fort Lee Near Road	2.886	1.827	3.283	2.444	2.013	4.835	2.136	1.802	2.74	2.843	1.368	4.07	32.25
Newark Firehouse	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.534	4.45	*
Passaic	2.109	0.533	1.61	0.306	0.619	2.431	1.434	0.684	2.237	2.678	0.454	1.878	16.97

ND = no data
*Not enough data to determine an annual statistic.

Table 4

2015 Summary of Relative Humidity Data (%) from NJ's Air Monitoring Sites

SITE		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Bayonne	Mean	58.6	58.2	57.8	53.2	58.5	66.1	59.6	56.1	62.3	60.3	61.7	70	60.2
	Minimum	29.2	26.7	21.5	18.9	20.9	24	27.1	28	26.2	29.8	29	37.3	18.9
	Maximum	90.9	90.2	90.4	91	90.9	90.5	89.2	87.9	90	89	90.3	90.8	91.0
Camden Spruce St	Mean	56.4	51.4	53.6	49.3	55.4	64	59.5	53.4	60.9	59.2	60.4	69.2	57.7
	Minimum	26.3	22	14.4	13.8	19.1	32.6	24	23.6	23.9	25.2	24.1	33.7	13.8
	Maximum	91.1	90.6	91.1	90.6	90	90.1	88.8	88.3	90.8	88	91.1	91.6	91.6
Columbia	Mean	56.9	56.4	57.6	54.4	61.8	74.2	73.3	73.6	75	69	66.2	74.4	66.1
	Minimum	25.2	27.3	15.2	14.2	17.9	36.9	31.5	36.4	33.4	27.7	24.5	30.6	14.2
	Maximum	89	87.3	90.4	90.8	91.6	92.4	92.4	91.9	92.2	91.4	91.6	92.2	92.4
East Orange	Mean	54.1	53.6	53.1	48.8	55	64.1	56.5	53.4	59.3	58.4	59.1	67.4	56.9
	Minimum	25.2	24.9	14.4	12.7	17.4	16.8	24.6	25	22.7	26.5	22.4	31.6	12.7
	Maximum	91	90.7	89.9	91.4	90.8	90.7	89.5	88.4	90.1	89.6	90	91.3	91.4
Flemington	Mean	59.5	57.5	58.4	53.9	60.9	71.4	68.3	64.4	67.6	66	64.2	73.1	63.8
	Minimum	26.3	24.3	16.4	14.3	20.2	27.8	30.3	30.5	27.1	27.2	24.9	35.3	14.3
	Maximum	92.6	91.7	92.1	92.3	92.4	92.9	92.7	91.4	92.6	92.3	91.6	93.4	93.4
Fort Lee Near Road	Mean	57.4	57	55.9	51.1	57.2	65	58.8	54.1	60.9	57.7	59.8	68.7	58.6
	Minimum	28.9	26.1	13.8	13.1	17.1	21.6	25.5	25.8	23.7	26.9	24.1	34.1	13.1
	Maximum	93.8	92.9	92.8	94	92.7	94.1	91.4	89.1	91.6	91.1	91.2	93.1	94.1
Newark Firehouse	Mean	53	52.7	51.9	50.7	ND	ND	ND	ND	ND	ND	59	70.4	*
	Minimum	22.7	21.4	10.6	10	ND	ND	ND	ND	ND	ND	22.9	33.4	*
	Maximum	92.5	91.9	92.1	92.6	ND	ND	ND	ND	ND	ND	93.5	94	*
Passaic	Mean	53.9	54.5	51.3	47.1	51.9	58.2	54.6	50.6	58.2	57.6	59.2	65.9	55.3
	Minimum	26.2	26.5	13.7	12.1	17.1	16.2	24.8	23.1	16.9	26.5	23.7	32.3	12.1
	Maximum	91.7	89.5	89.8	88.6	90	91.9	87.5	88.8	90.7	90.6	90.5	90.9	91.9
Rider University	Mean	64.4	61	62	56.3	63.5	74.2	71.5	67.5	72.3	72.9	70.7	78.9	67.9
	Minimum	25	23.8	15.1	13.7	18.4	24.2	29.2	23.3	24	26.8	23.3	35.3	13.7
	Maximum	99.7	99.1	98.8	97.8	98.5	97.8	98.5	98.3	98.4	98.9	99.5	99.6	99.7

ND = no data

*Not enough data to determine an annual statistic.

Table 5

2015 Summary of Solar Radiation Data (in Langleys) from NJ's Air Monitoring Sites

SITE		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Chester	Mean	0.092	0.172	0.214	0.300	0.346	0.281	0.374	0.346	0.258	0.178	0.100	0.061	0.227
	Maximum	0.924	1.157	1.402	1.562	1.610	1.611	1.576	1.645	1.328	1.132	0.953	0.590	1.645
Flemington	Mean	0.111	0.185	0.208	0.289	0.337	0.298	0.354	0.349	0.266	0.195	ND	0.071	0.242
	Maximum	0.875	1.106	1.287	1.438	1.419	1.346	1.360	1.321	1.198	1.059	ND	0.661	1.438
Newark Firehouse	Mean	0.096	0.150	0.204	0.288	0.345	0.313	0.359	0.363	0.270	0.185	0.115	0.069	0.230
	Maximum	0.748	0.964	1.221	1.345	1.441	1.428	1.443	1.424	1.225	1.017	0.787	0.621	1.443
Rider University	Mean	0.093	0.156	0.190	0.273	0.333	0.303	0.340	0.335	0.251	0.169	0.107	0.068	0.218
	Maximum	0.708	0.921	1.131	1.328	1.331	1.325	1.389	1.241	1.127	0.954	0.725	0.568	1.389

ND = no data

Table 6
2015 Summary of Barometric Pressure Data (in inches of Hg)
from NJ's Air Monitoring Sites

SITE		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Bayonne	Mean	30.08	30.04	30.08	29.95	30.10	29.94	29.88	29.95	30.04	30.06	30.16	30.07	30.03
	Minimum	29.26	29.37	29.53	29.44	29.73	29.61	29.53	29.70	29.62	29.50	29.51	29.35	29.26
	Maximum	30.66	30.80	30.69	30.46	30.40	30.26	30.14	30.20	30.45	30.55	30.79	30.66	30.80
Camden Spruce St.	Mean	30.10	30.06	30.09	29.96	30.10	29.93	29.89	29.96	30.04	30.07	30.17	30.08	30.04
	Minimum	29.31	29.39	29.56	29.50	29.77	29.60	29.52	29.71	29.61	29.51	29.53	29.40	29.31
	Maximum	30.69	30.82	30.70	30.43	30.42	30.22	30.13	30.20	30.42	30.52	30.78	30.68	30.82
Columbia	Mean	29.55	29.51	29.56	29.45	29.59	29.45	29.41	29.49	29.56	29.56	29.65	29.56	29.53
	Minimum	28.79	28.87	29.08	28.99	29.25	29.14	29.05	29.27	29.12	29.02	29.02	28.89	28.79
	Maximum	30.09	30.25	30.15	29.94	29.90	29.75	29.65	29.71	29.94	30.04	30.26	30.15	30.26
East Orange	Mean	29.91	29.87	29.91	29.79	29.93	29.78	29.72	29.79	29.88	29.90	29.99	29.90	29.86
	Minimum	29.10	29.21	29.37	29.28	29.57	29.46	29.37	29.54	29.45	29.34	29.35	29.19	29.10
	Maximum	30.48	30.62	30.51	30.29	30.23	30.09	29.98	30.03	30.28	30.38	30.62	30.49	30.62
Flemington	Mean	29.92	29.88	29.91	29.79	29.93	29.77	29.73	29.80	29.87	29.90	29.99	29.90	29.87
	Minimum	29.13	29.21	29.39	29.29	29.58	29.47	29.36	29.55	29.44	29.35	29.35	29.21	29.13
	Maximum	30.48	30.63	30.52	30.28	30.25	30.08	29.97	30.03	30.27	30.37	30.61	30.50	30.63
Fort Lee Near Road	Mean	29.75	29.71	29.75	29.64	29.79	29.64	29.58	29.65	29.74	29.76	29.84	29.75	29.72
	Minimum	28.94	29.05	29.22	29.14	29.43	29.31	29.24	29.40	29.32	29.20	29.20	29.04	28.94
	Maximum	30.32	30.46	30.36	30.15	30.08	29.95	29.84	29.89	30.14	30.23	30.46	30.34	30.46
Newark Firehouse	Mean	29.97	29.93	29.96	29.85	29.99	29.83	29.77	29.84	29.94	29.96	30.05	29.96	29.92
	Minimum	29.15	29.26	29.43	29.35	29.62	29.50	29.42	29.59	29.51	29.39	29.40	29.24	29.15
	Maximum	30.53	30.67	30.57	30.35	30.30	30.15	30.03	30.09	30.35	30.44	30.68	30.55	30.68
Passaic	Mean	30.02	29.97	30.02	29.92	30.03	29.87	29.82	29.89	29.98	30.00	30.10	30.03	29.97
	Minimum	29.20	29.32	29.46	29.37	29.66	29.55	29.47	29.67	29.55	29.44	29.45	29.28	29.20
	Maximum	30.59	30.73	30.63	30.40	30.33	30.20	30.07	30.13	30.39	30.49	30.73	30.60	30.73
Rider University	Mean	30.34	30.30	30.34	30.20	30.35	30.19	30.13	30.21	30.29	30.32	30.43	30.33	30.29
	Minimum	29.50	29.58	29.79	29.69	29.98	29.85	29.74	29.95	29.84	29.73	29.74	29.60	29.50
	Maximum	30.93	31.10	30.99	30.72	30.69	30.51	30.39	30.46	30.71	30.81	31.07	30.96	31.10

Figure 3
2015 Average Temperatures at NJDEP Air Monitoring Sites
Compared to the Statewide 30-Year Average

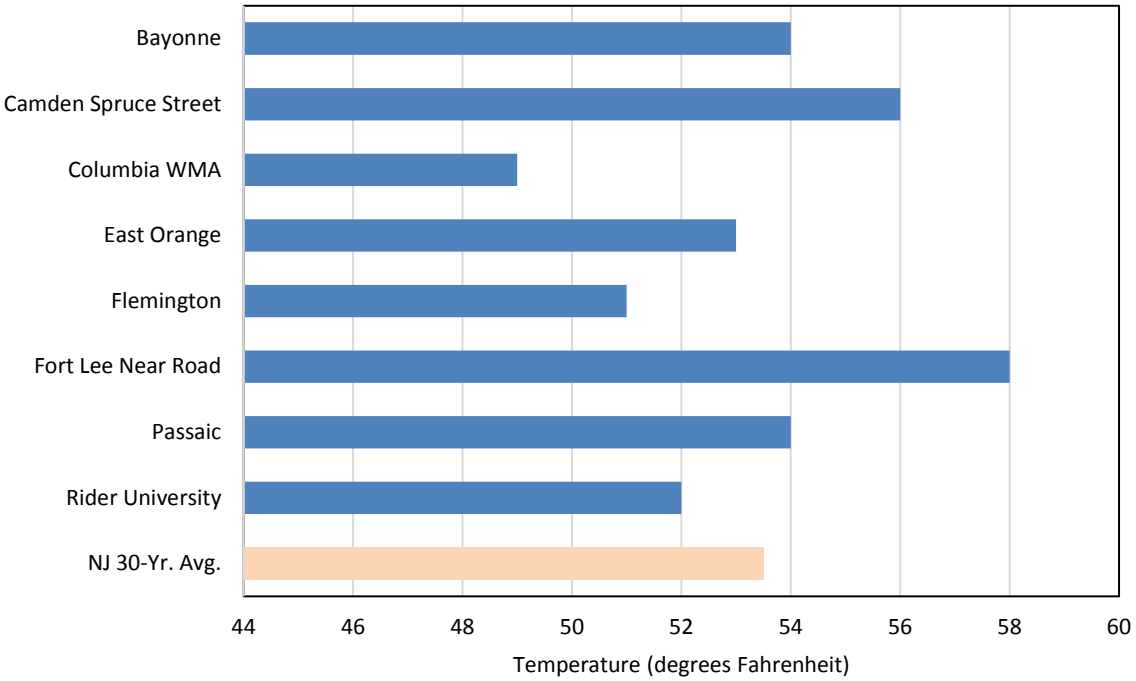


Figure 4
2015 Total Rainfall at NJDEP Air Monitoring Sites
Compared to the Statewide 30-Year Average

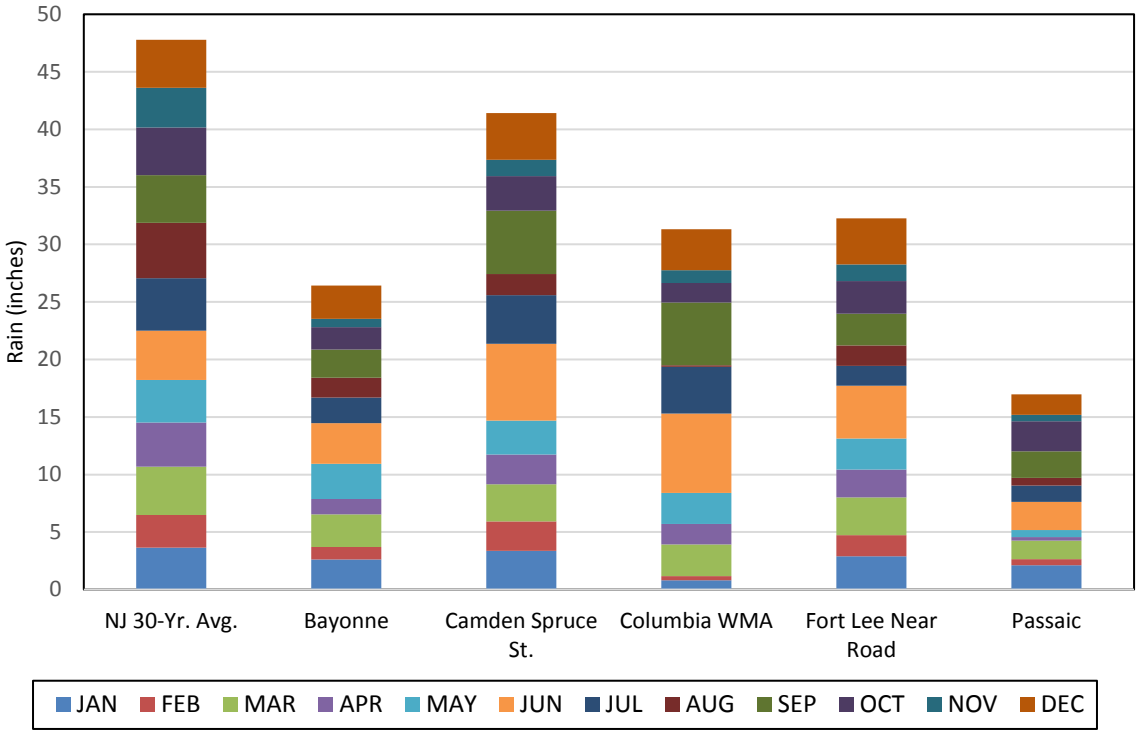
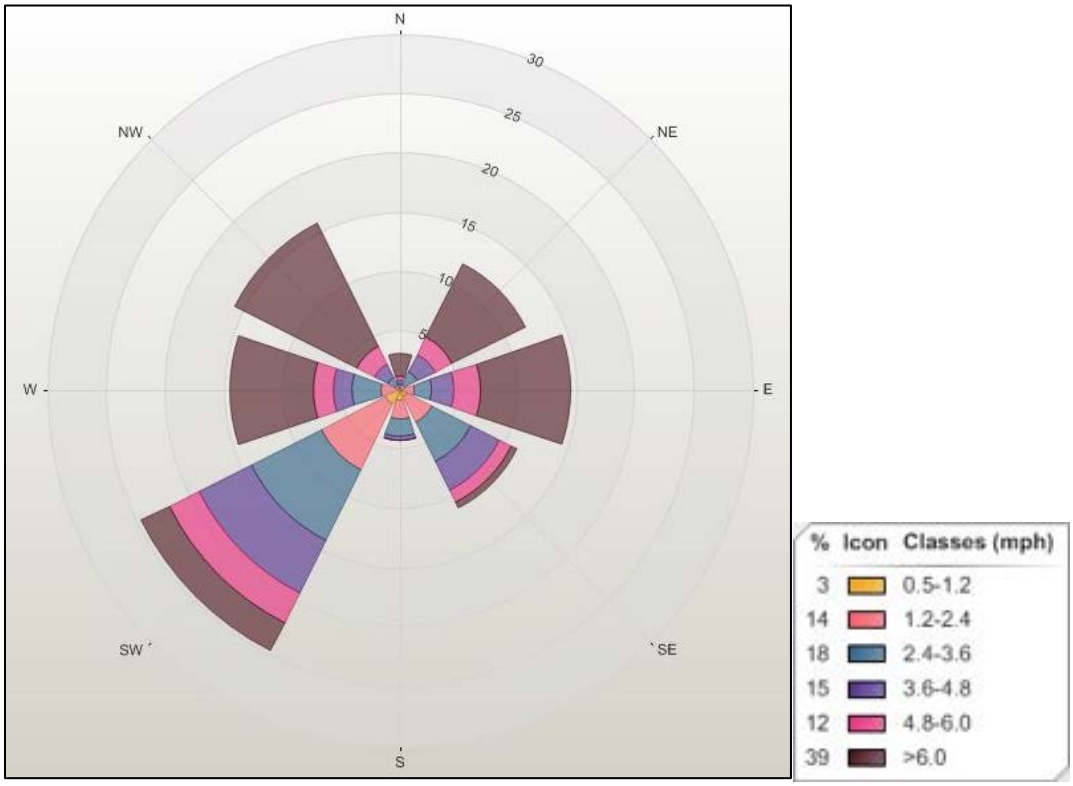
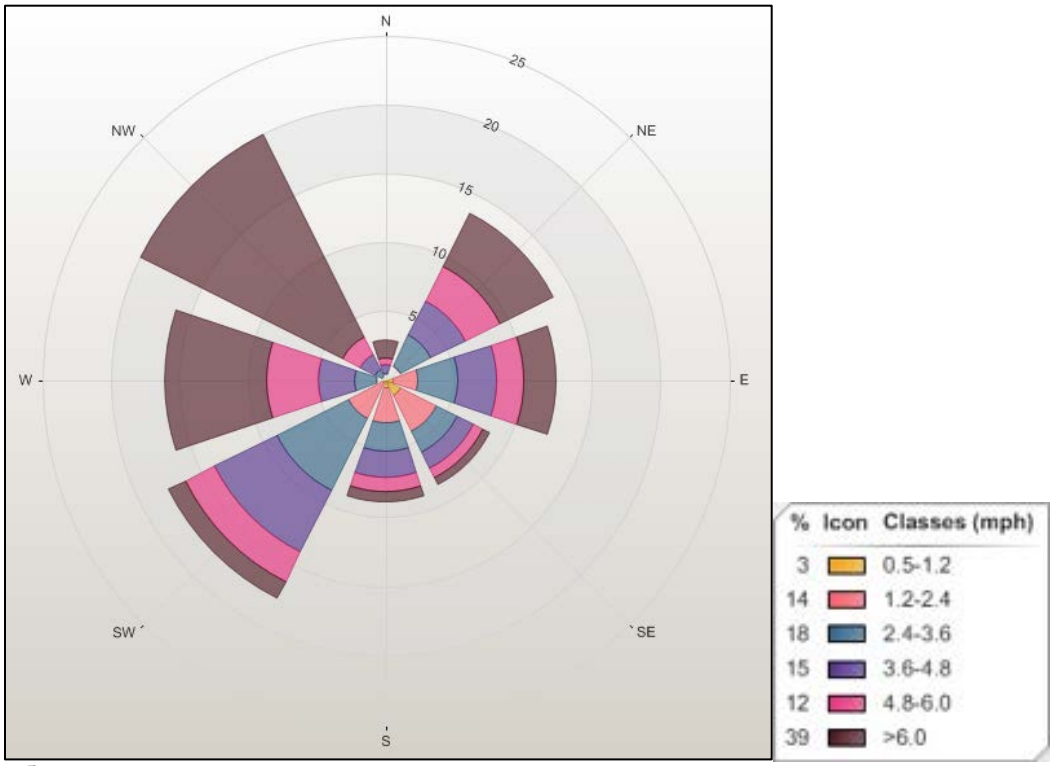


Figure 5. 2015 Wind Rose for Bayonne



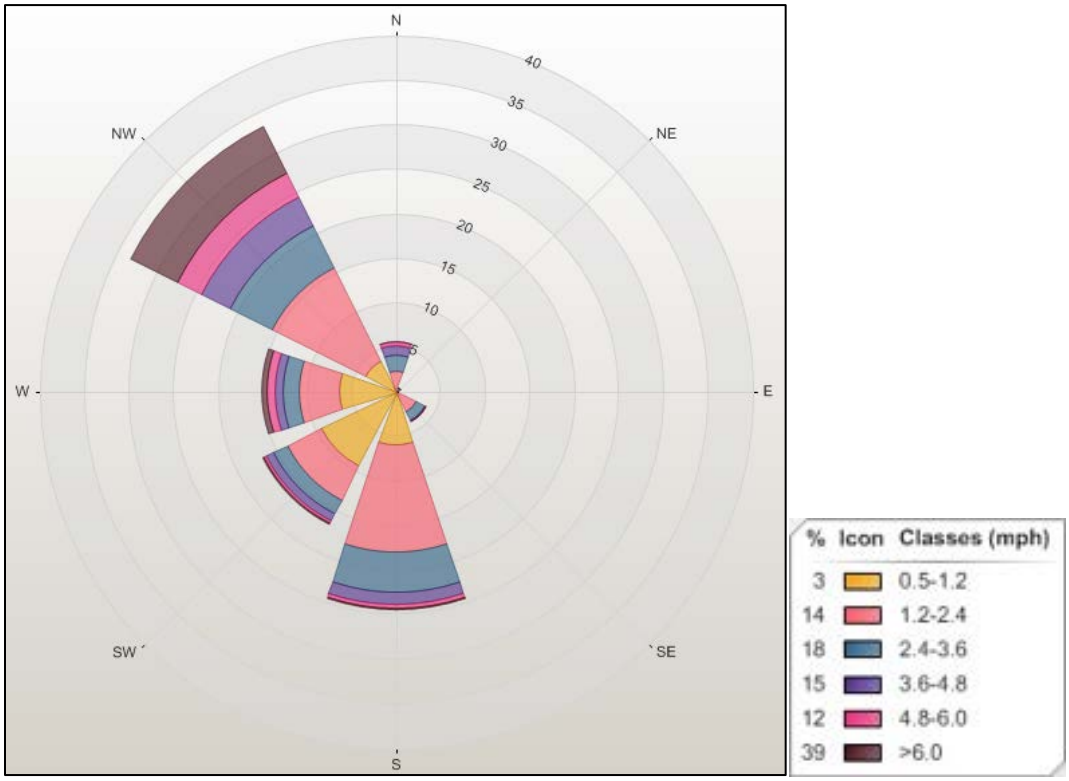
Bayonne 1/1/2015 12:00 AM - 12/31/2015 11:59 PM Calm: 0.03% Calm Wind Avg Speed: 0.41(mph)

Figure 6. 2015 Wind Rose for Camden Spruce Street



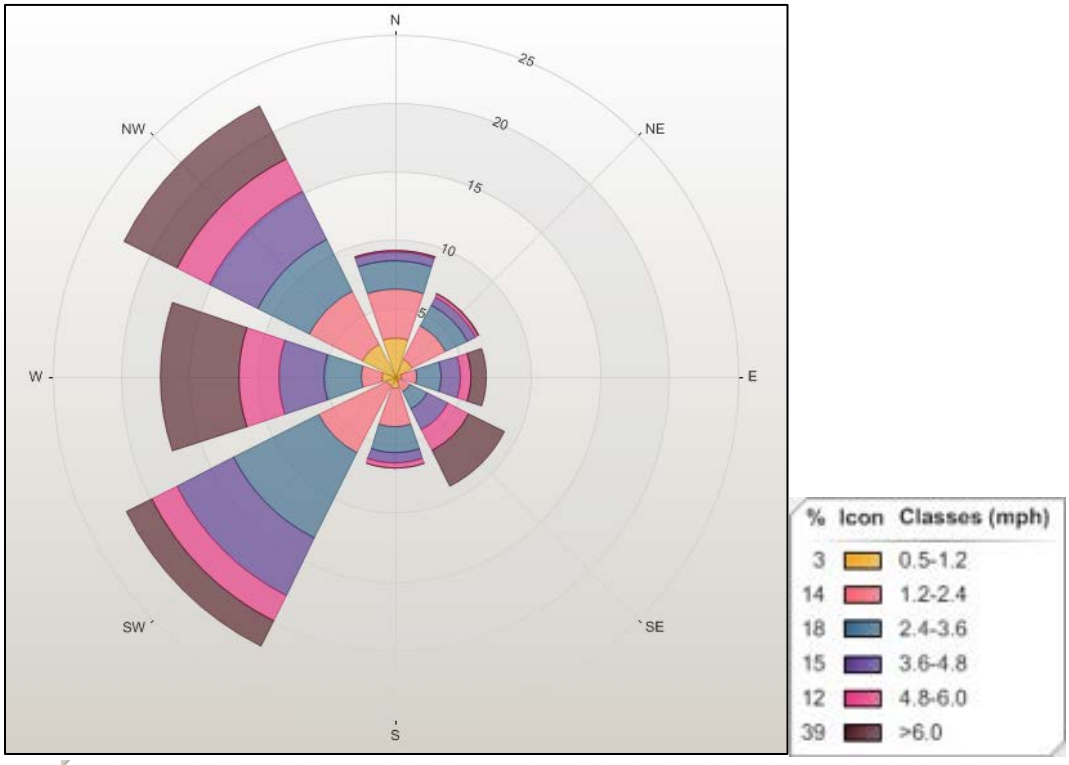
Camden Spruce St 1/1/2015 12:00 AM - 12/31/2015 11:59 PM Calm: 0.01% Calm Wind Avg Speed: 0.30(mph)

Figure 7. 2015 Wind Rose for Columbia



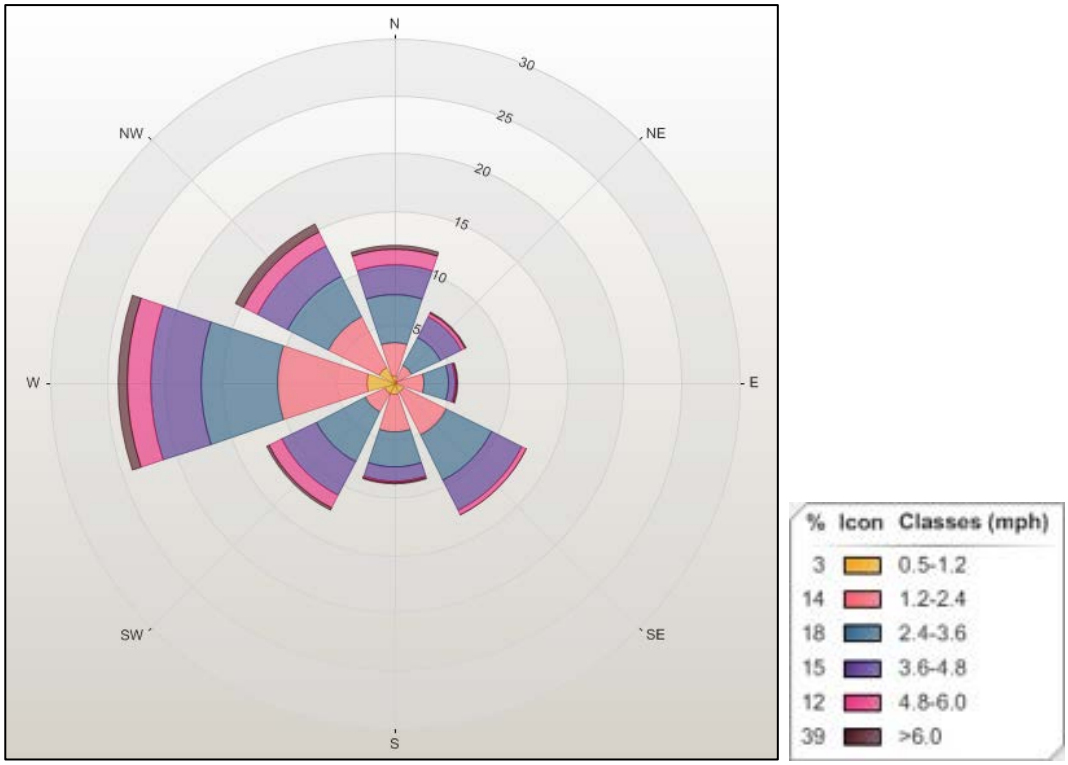
Columbia 1/1/2015 12:00 AM - 12/31/2015 11:59 PM Calm: 0.10% Calm Wind Avg Speed: 0.44(mph)

Figure 8. 2015 Wind Rose for East Orange



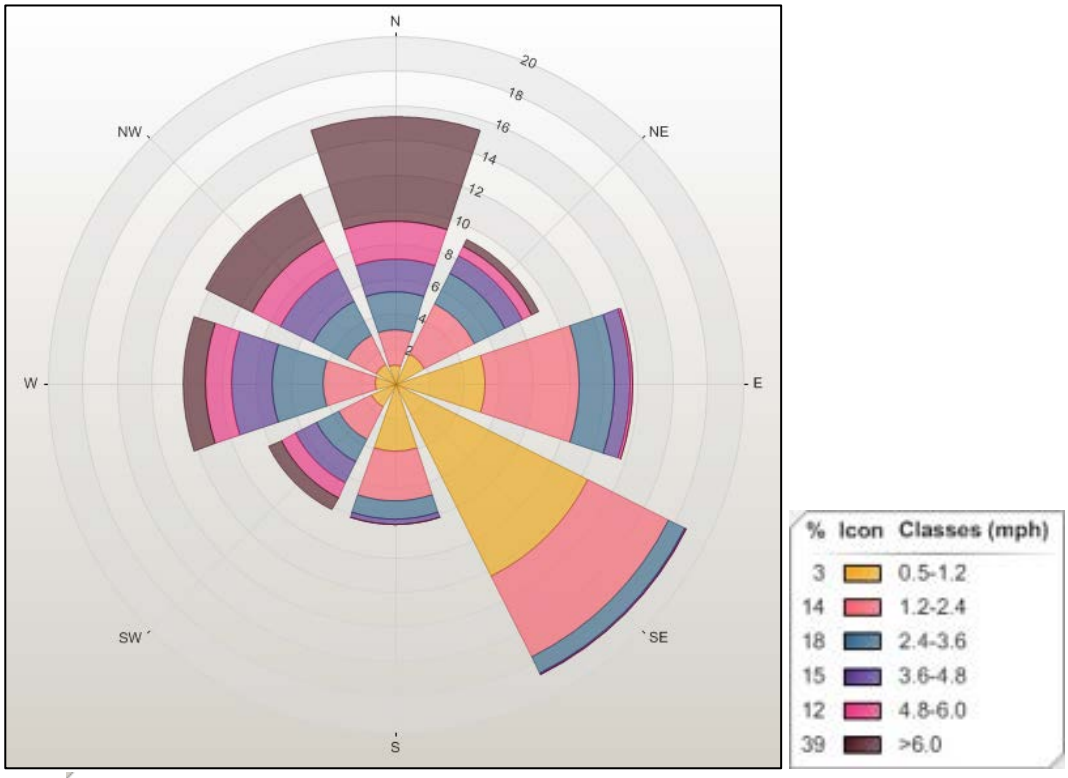
East Orange 1/1/2015 12:00 AM - 12/31/2015 11:59 PM Calm: 0.43% Calm Wind Avg Speed: 0.39(mph)

Figure 9. 2015 Wind Rose for Elizabeth Trailer



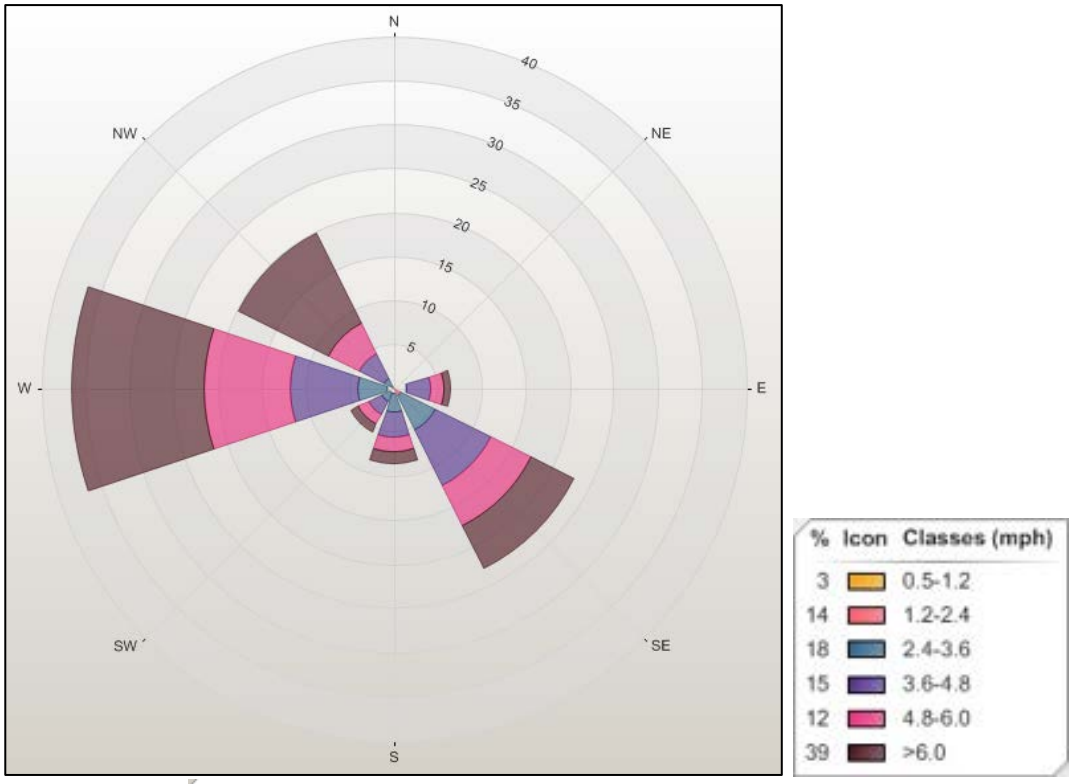
Elizabeth Trailer 1/1/2015 12:00 AM - 12/31/2015 11:59 PM Calm: 1.87% Calm Wind Avg Speed: 0.27(mph)

Figure 10. 2015 Wind Rose for Flemington



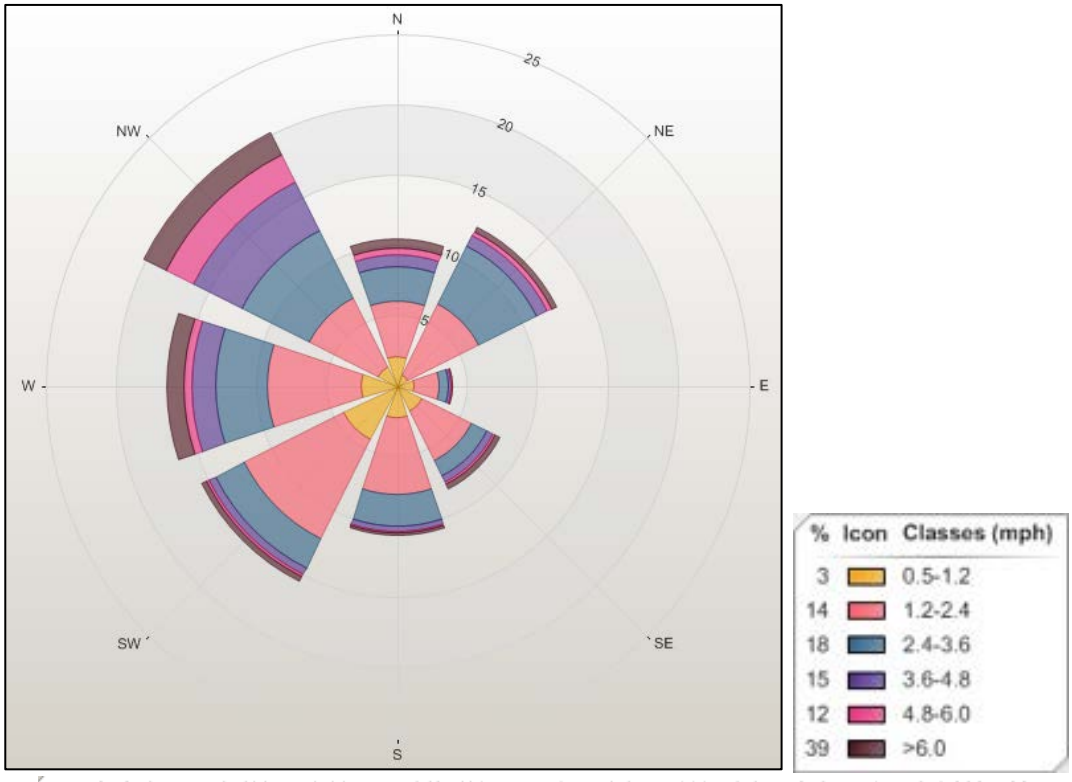
Flemington 1/1/2015 12:00 AM - 12/31/2015 11:59 PM Calm: 2.28% Calm Wind Avg Speed: 0.39(mph)

Figure 11. 2015 Wind Rose for Fort Lee Near Road



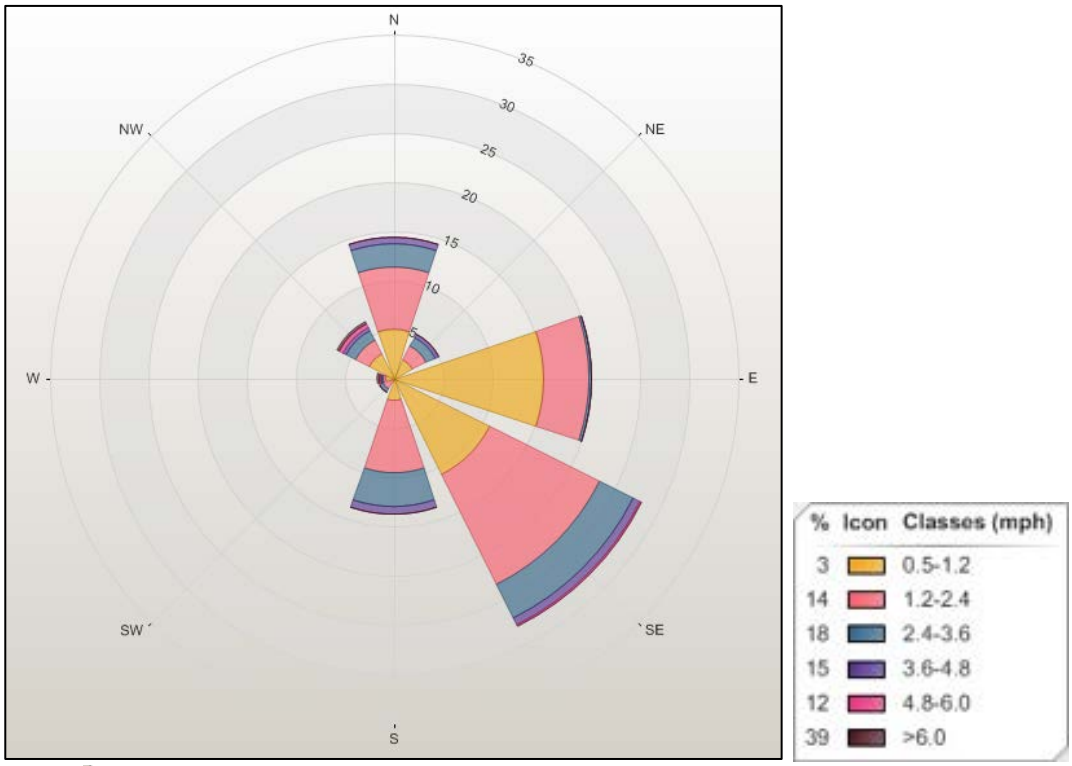
Fort Lee Near Road 1/1/2015 12:00 AM - 12/31/2015 11:59 PM Calm: 0.00%

Figure 12. 2015 Wind Rose for Newark Firehouse



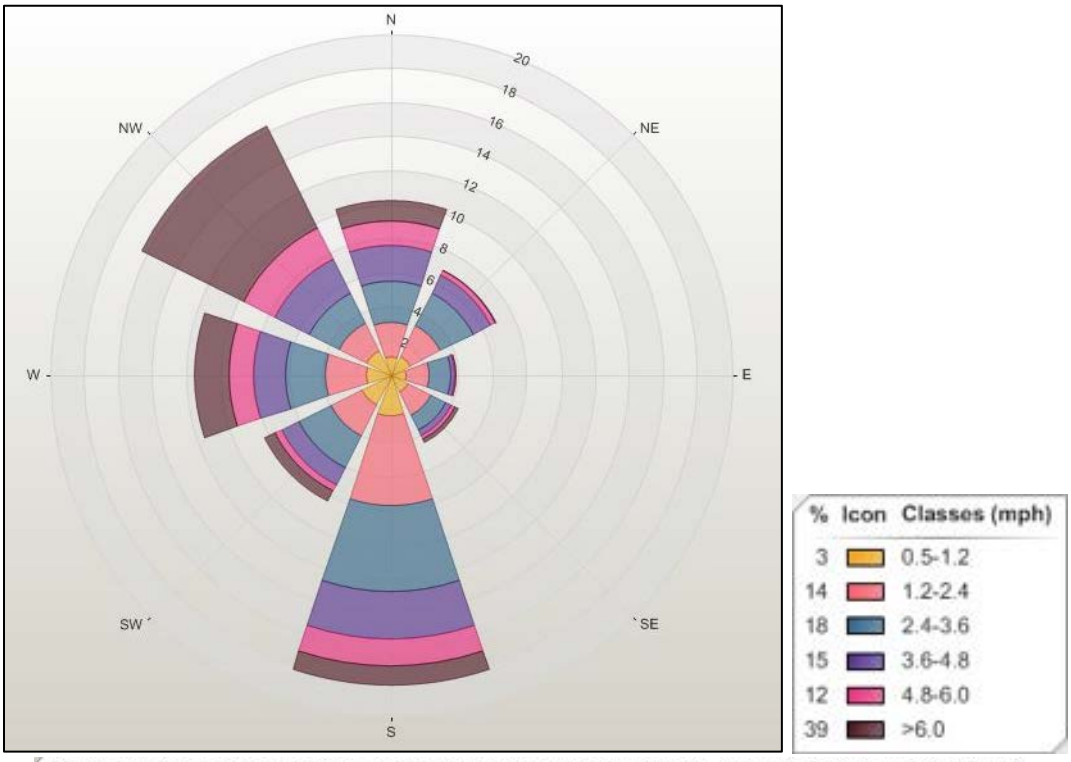
Newark Firehouse 1/1/2015 12:00 AM - 12/31/2015 11:59 PM Calm: 1.99% Calm Wind Avg Speed: 0.38(mph)

Figure 13. 2015 Wind Rose for Passaic



Passaic 1/1/2015 12:00 AM - 12/31/2015 11:59 PM Calm: 8.63% Calm Wind Avg Speed: 0.37(mph)

Figure 14: 2015 Wind Rose for Rider University



Rider University 1/1/2015 12:00 AM - 12/31/2015 11:59 PM Calm: 20.15% Calm Wind Avg Speed: 0.13(mph)

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