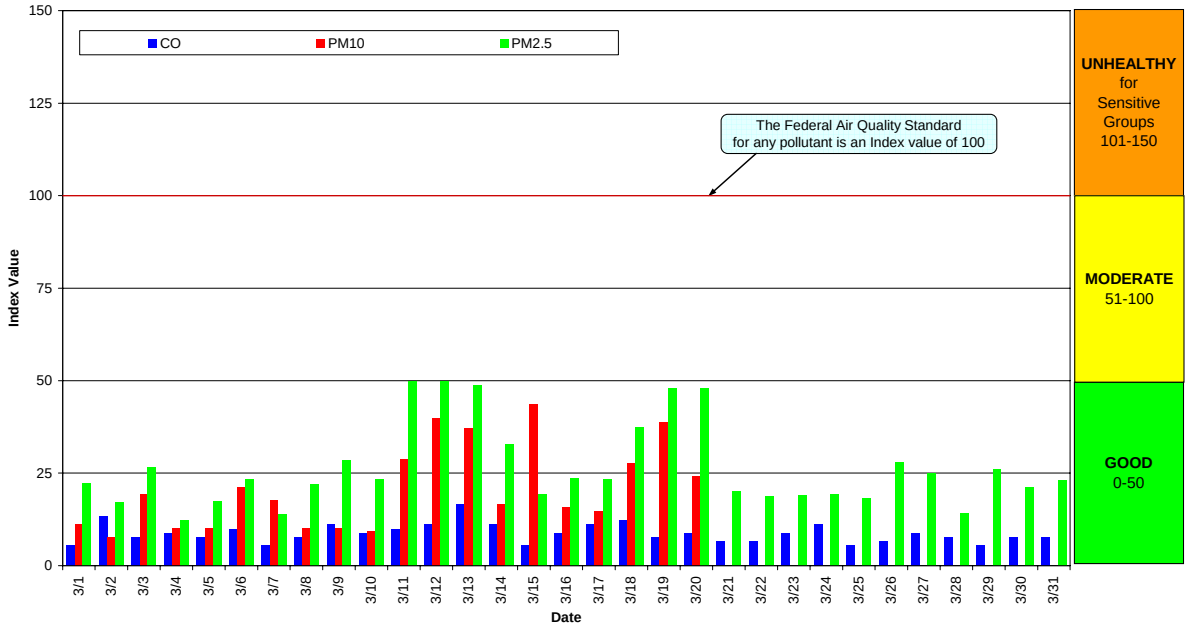
Spokane Regional Clean Air Agency
Air Quality Report - March 2009

The Clean Air Act requires EPA to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants, carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), ground-level ozone (O_3) and sulfur dioxide (SO_2). These are known as "criteria" pollutants because EPA established regulatory limits to concentrations in ambient air using human health or environmentally based criteria. See Table A-1 (p. 10) for a summary of the NAAQS. Carbon monoxide, particulate matter and ozone are monitored in Spokane County by the Spokane Regional Clean Air Agency (SRCAA) and the Washington State Department of Ecology (Ecology). The SRCAA will monitor ozone, nitrogen oxides and hydrocarbons at its new facility on Augusta Ave, near the intersection of Greene St and Mission Ave in Spokane, starting in May 2009. Ozone monitoring at Ecology-operated stations at Greenbluff and Turnbull National Wildlife Refuge near Cheney ended September 30, 2008 and will resume May 1, 2009. Air quality information is updated hourly on the Spokane Regional Clean Air Agency (SRCAA) web page (http://www.spokanecleanair.org/air_quality.asp).

Figure 1 shows the daily maximum Air Quality Index (AQI) for each pollutant for March 2009. The AQI is EPA's color-coded tool for communicating daily air quality to the public and can be calculated for any of the criteria pollutants except lead, provided monitoring data are available. An index value above 100 indicates that the concentration of at least one of these criteria pollutants exceeded the limit established in the NAAQS. Categories of the AQI are "good" (green, 0-50), "moderate" (yellow, 51-100), "unhealthy for sensitive groups" (orange, 101-150), "unhealthy" (red, 151-200), "very unhealthy" (purple, 201-300) and "hazardous" (maroon, 301-500). The Spokane area experiences air quality in the good and moderate categories and, very rarely, in the unhealthy for sensitive groups category. For more information about the AQI, see EPA's AirNow AQI web page (http://airnow.gov/index.cfm?action=static.aqi).

Figure 1: Air Quality Index (AQI) values for March 2009



The data used for calculating the AQIs are obtained using continuous monitors. Continuous monitors are automated methods that provide "real time" data, which the SRCAA uses in its day-to-day programs, e.g., air quality forecasting and burning curtailment. For measurement of particulate matter concentrations, the SRCAA operates a network of continuous particulate matter monitors consisting of Tapered Element Oscillating Microbalances (TEOM) and nephelometers. There were no PM_{10} data after March 20 because the PM_{10} TEOM at Freya & Ferry malfunctioned and was shut down. The instrument was scheduled to be permanently retired when the Freya & Ferry station was dismantled. The $PM_{2.5}$ TEOM underwent final quality control checks on March 25 and was removed from the Freya & Ferry station when the site was dismantled and permanently shut down on March 27. The Department of Ecology operates the CO monitor near the the intersection of 3rd & Washington in downtown Spokane.

The AQI for $PM_{2.5}$ approached (but did not exceed) the moderate threshold March 11 through 13 and March 19, days characterized by high barometric pressure and light winds. A Pacific frontal system moved through the region on March 15, bringing strong, gusty winds and some blowing dust, mostly from paved roads. The effects of wind on air quality in March will be discussed further on pages 6, 7 and 8 of this report.

Tables 1 and 2 contain the maximum AQI values for each pollutant for the month and for the year to date. Table 3 summarizes the year to date daily AQIs by category and compares them to last year's AQIs.

Table 1: Maximum AQI values and pollutant concentrations for this reporting period

Pollutant	AQI/Concentration	Location	Date
CO	17/1.5 ppm	3rd & Washington	3/13/09
PM_{10}	44/47 µg/m^3	Freya & Ferry	3/15/09
$PM_{2.5}$	50/15.5 µg/m^3	Freya & Ferry	3/11 and 3/12/09

Table 2: Maximum AQI values and pollutant concentrations this year to date

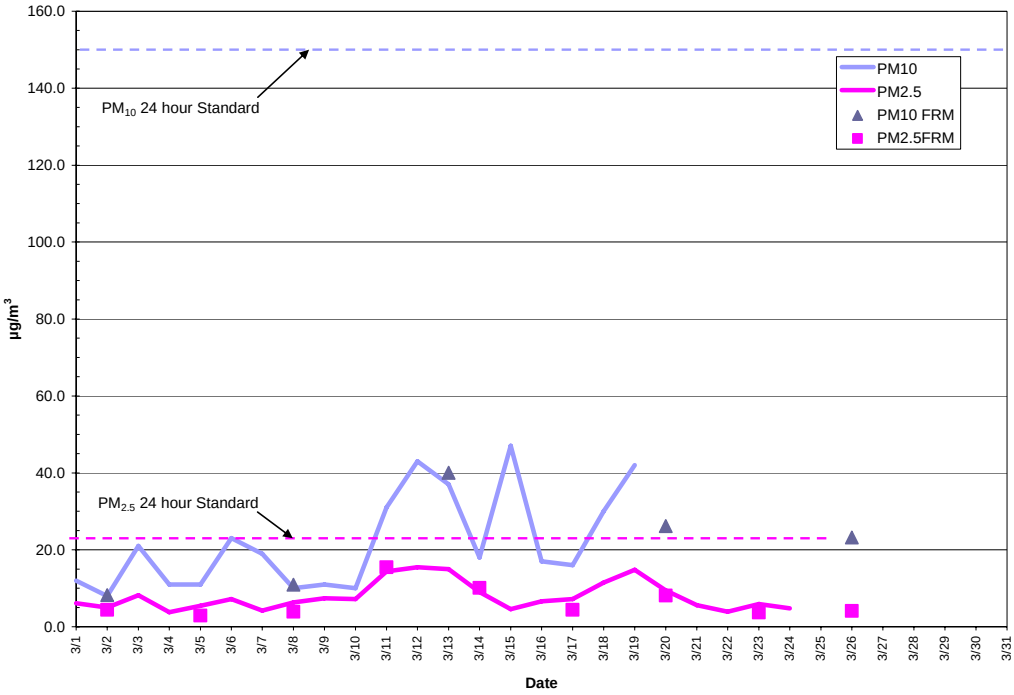
Pollutant	AQI/Concentration	Location	Date
CO	26/2.3 ppm	3rd & Washington	1/12/09
PM_{10}	44/47 µg/m^3	Freya & Ferry	3/15/09
$PM_{2.5}$	67/23.9 µg/m^3	Freya & Ferry	1/28/09

Table 3: AQI summary as of March 31, 2009

Category	Number of Days This Year	Last Year to Date
Good (0-50)	86	73
Moderate (51-100)	4	18
Unhealthy for Sensitive Groups (101-150)	0	0
Unhealthy (151-200)	0	0
Very Unhealthy (201-300)	0	0
Hazardous (>300)	0	0

Figures 2, 3 and 4 compare the mass concentrations of PM_{10} and $PM_{2.5}$ measured at the Freya & Ferry monitoring station. The site is located in a commercial/light industrial area on the eastern side of the City of Spokane. The manually-operated Federal Reference Method (FRM) is the "gold-standard" for measurement of the 24-hour average particulate matter concentration and meets the requirements for demonstrating attainment of federal air quality standards. The accuracy of the TEOM sample data can be verified by comparison with co-located FRM data. Figure 2 shows this relationship as a time-series with manually collected FRM data plotted along the 24 hour average data stream generated from the TEOMs.

Figure 2: Freya & Ferry 24 hour average particulate matter



The correlation coefficient (R^2) for the $PM_{2.5}$ TEOM and FRM data was 0.93 for the month of March and for the first quarter of the year (Figure 3). The trend for the quarter was for the TEOM to over-report slightly compared to the FRM at lower concentrations, below about 9 µg/m^3, and under-report at concentrations above 9 µg/m^3. For the PM_{10} TEOM and FRM data, R^2 was 0.96 for the first quarter of the year (Figure 4). There were only three days of co-located PM_{10} TEOM and FRM data for the month of March.

Figure 3: Comparison between Freya & Ferry $PM_{2.5}$ TEOM and FRM data for January through March 2009. The March data are circled.

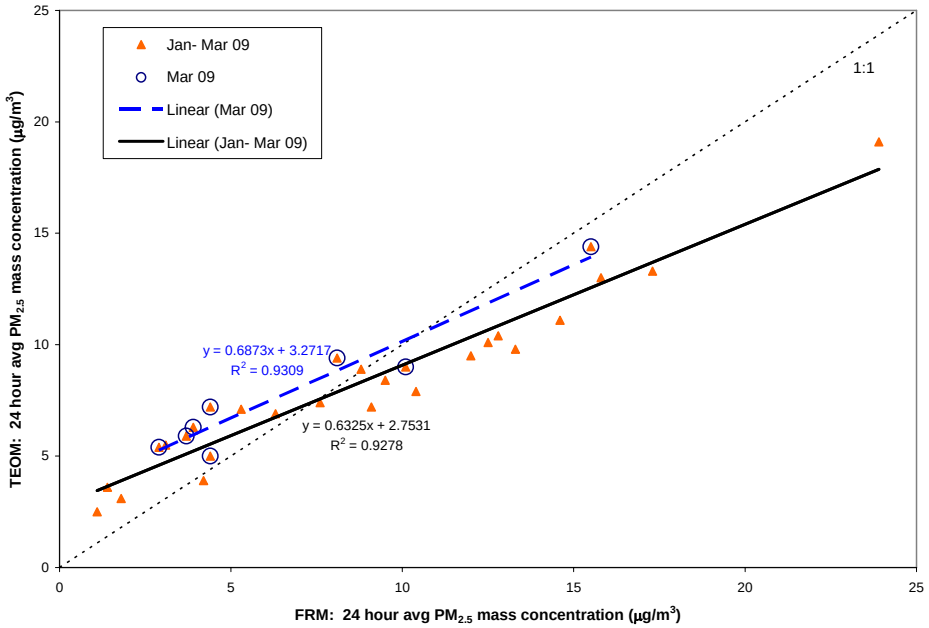


Figure 4: Comparison between Freya & Ferry PM_{10} TEOM and FRM data for January through March 2009. The March data are circled.

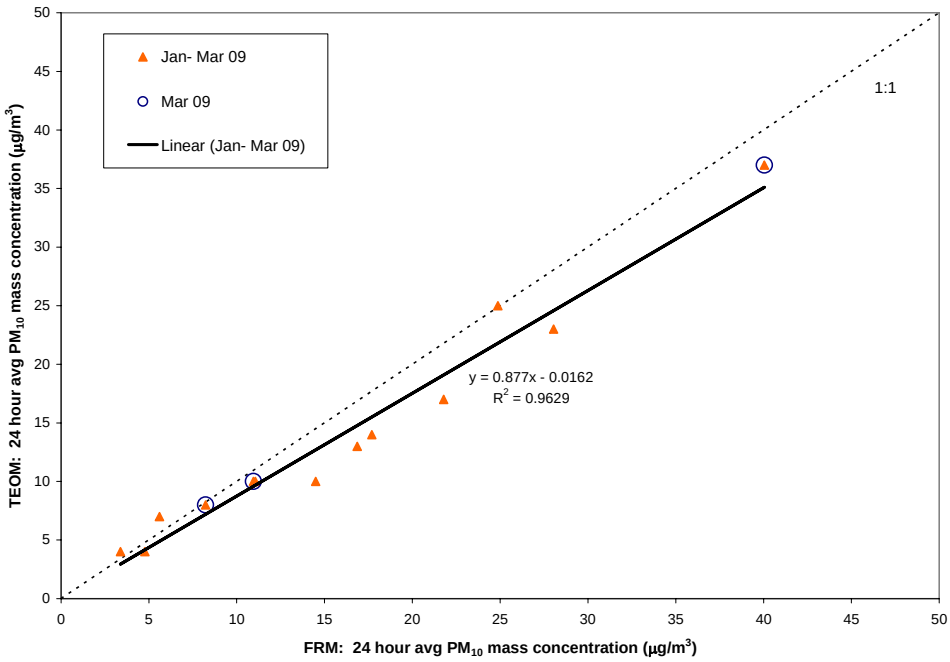
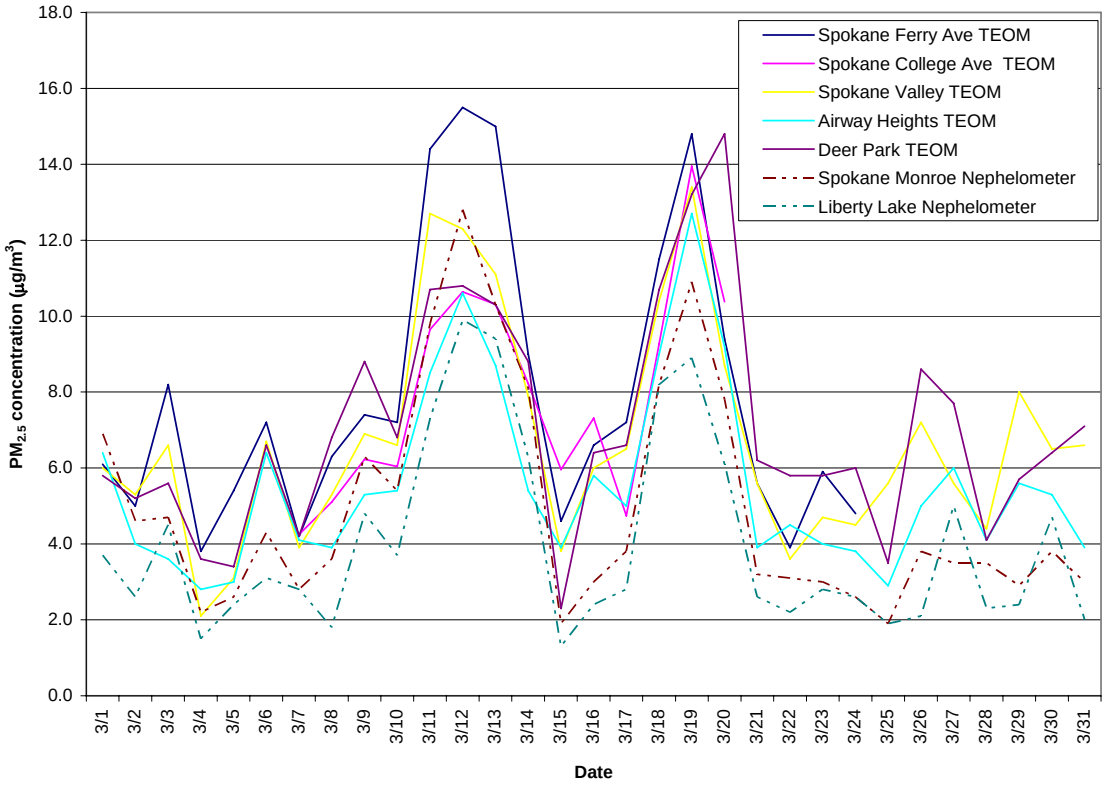


Figure 5 shows the 24 hour average $PM_{2.5}$ concentrations across the monitoring network as they as they change through the month. All $PM_{2.5}$ monitoring stations show the same pattern, with higher concentrations during high pressure on March 11 through 13 and March 19. The $PM_{2.5}$ concentrations were relatively low for the month.

Figure 5: $PM_{2.5}$ multi-station time series for March 2009



The following pollution rose and wind rose charts illustrate the effect of wind speed and direction on ambient $PM_{2.5}$ and PM_{10} concentrations at the Freya & Ferry air monitoring station in March. The pollution rose below (Figure 6) summarizes hourly average $PM_{2.5}$ concentrations ($\mu g/m^3$) and hourly average wind directions (degrees) measured at the Freya & Ferry site in March. Maximum $PM_{2.5}$ concentrations were measured when winds were light and variable under an upper atmospheric high pressure ridge.

Figure 6: Freya & Ferry $PM_{2.5}$ pollution rose for March 2009

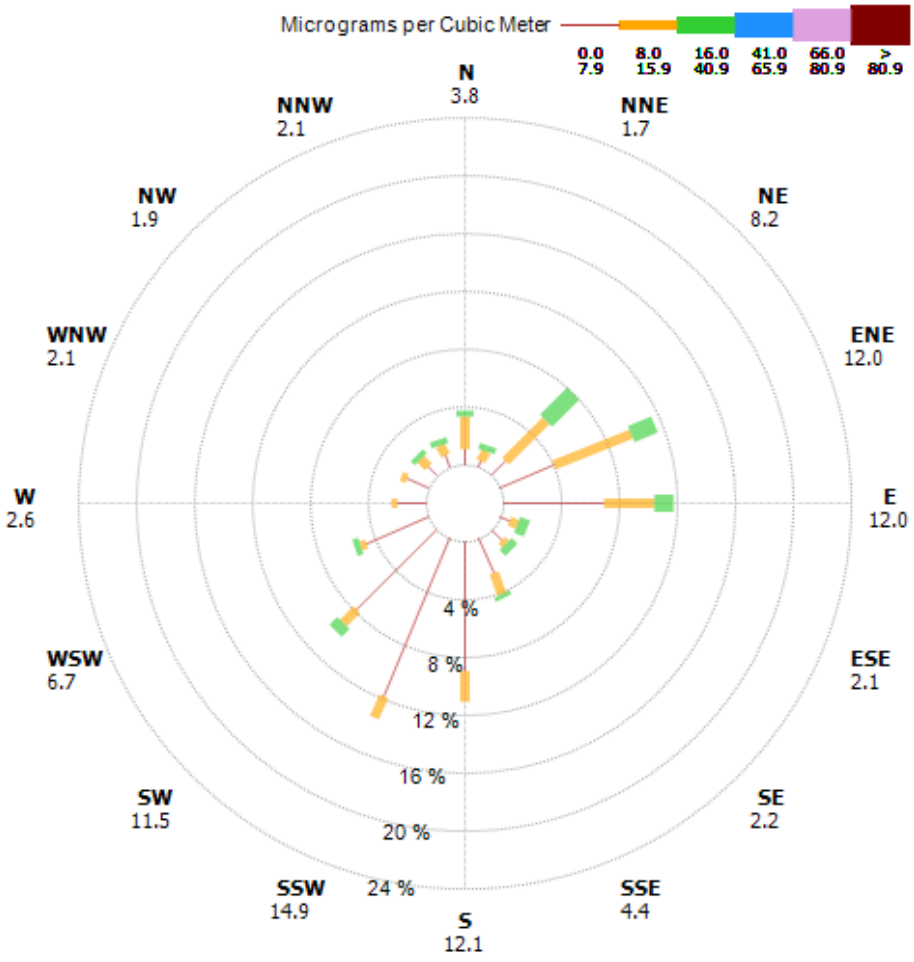


Figure 7 summarizes hourly average PM_{10} concentrations ($\mu g/m^3$) and hourly average wind directions (degrees) measured at the Freya & Ferry site in March. The highest PM_{10} concentrations were measured on the afternoon of March 15 under strong southwesterly to west-southwesterly winds. There were occasional high nighttime levels of PM_{10} when the region was under a high pressure upper atmospheric ridge and winds were light.

Figure 7: Freya & Ferry PM_{10} pollution rose, March 2009

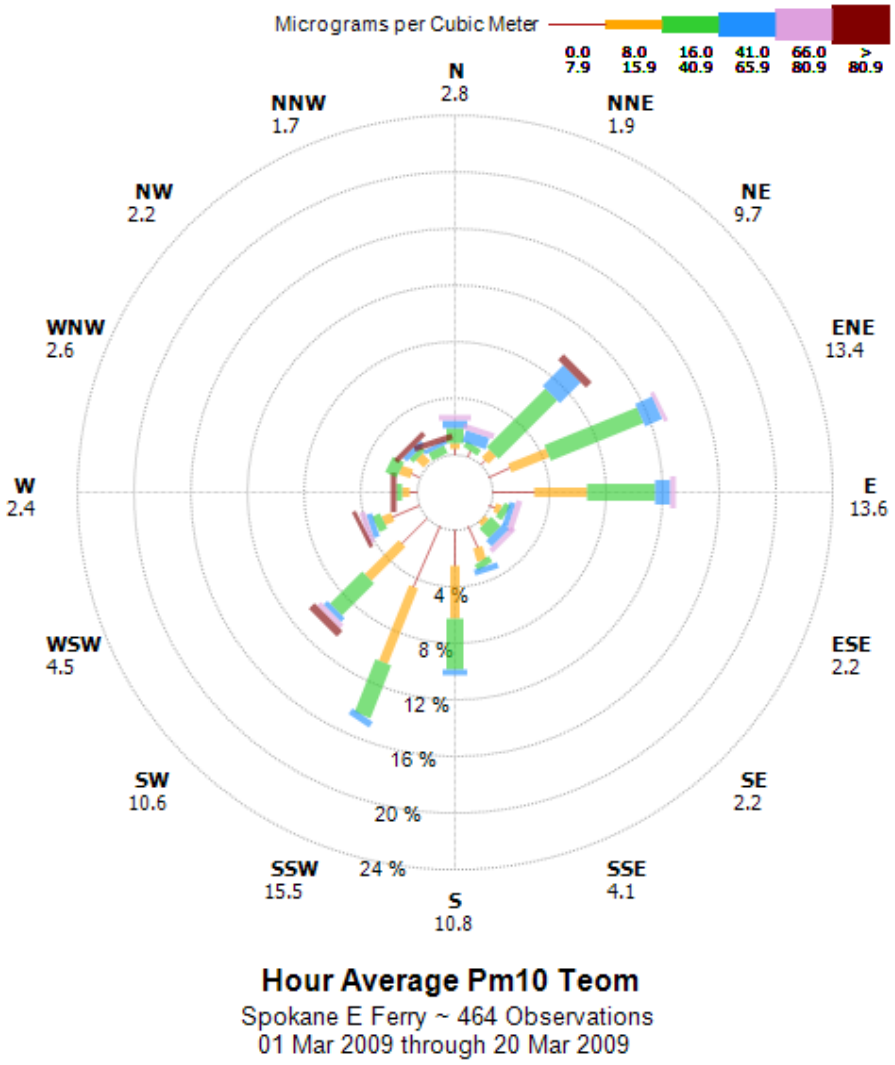


Figure 8 summarizes the percent time during the month the wind blew from a particular direction and in what speed range. The data are hourly averages. The strongest winds occurred on March 15 and blew from southerly to west-southwesterly directions. As usual, the secondary wind regime blew from easterly to east-northeasterly directions.

Figure 8: Freya & Ferry wind rose for March 2009

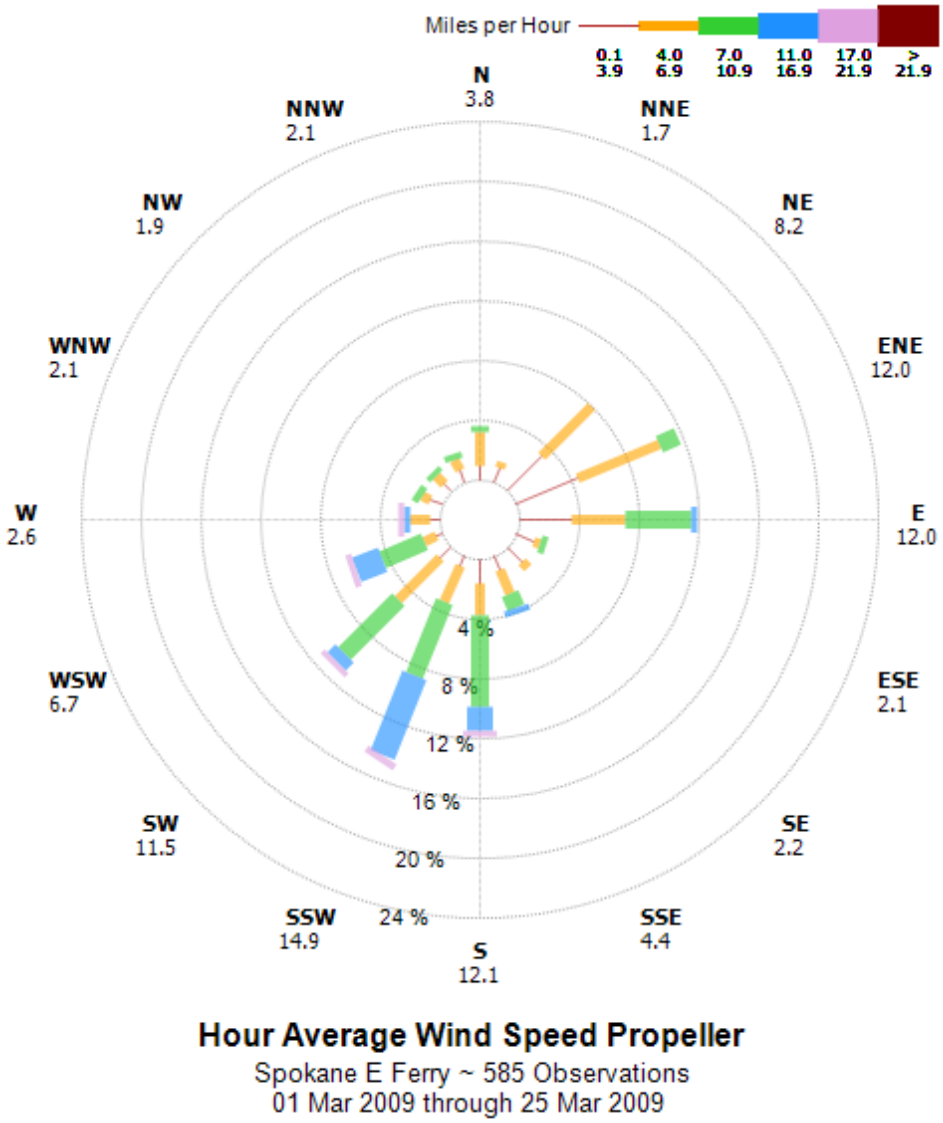


Table 4 summarizes the air quality data measured throughout the monitoring network in March. Some PM2.5 and PM10 TEOM data are missing from the Freya & Ferry and Monroe & College sites because of monitor malfunctions, data transmission errors and shutting down the Freya & Ferry station.

Table 4: The table below summarizes the air quality data for March from all of the analyzers operated in Spokane County. The CO and data are 8-hour maximums in parts per million (ppm) and the PM data are 24-hour averages in micrograms per cubic meter of air (µg/m^3).

Date	CO 3rd & Washington (ppm)	PM10 Freya & Ferry TEOM (µg/m3)	PM10 Freya & Ferry FRM (µg/m3)	PM2.5 Freya & Ferry TEOM (µg/m3)	PM2.5 Freya & Ferry FRM (µg/m3)	PM2.5 Monroe & College TEOM (µg/m3)	PM2.5 Monroe & Wellesley Nephelometer (µg/m3)	PM10 Turnbull Wildlife Refuge FRM (µg/m3)	PM2.5 Turnbull Wildlife Refuge (µg/m3)	PM10 Liberty Lake (µg/m3)	PM10-2.5 Liberty Lake (µg/m3)	PM2.5 Liberty Lake (µg/m3)	PM2.5 Deer Park TEOM (µg/m3)	PM2.5 Spokane Valley TEOM (µg/m3)	PM2.5 Airway Heights TEOM (µg/m3)
3/1	0.5	12.0		6.1			6.9						5.8	6	6.4
3/2	1.2	8.0	8	5.0	4.4		4.6	3	1.9	3.5	1.1	2.4	5.2	5.3	4
3/3	0.7	21.0		8.2			4.7						5.6	6.6	3.6
3/4	0.8	11.0		3.8			2.2						3.6	2.1	2.8
3/5	0.7	11.0		5.4	2.9		2.6						3.4	3.1	3
3/6	0.9	23.0		7.2			4.3						6.6	6.7	6.4
3/7	0.5	19.0		4.2		4.25	2.8						4.2	3.9	4.1
3/8	0.7	10.0	11	6.3	3.9	5.1	3.6	3	1.3	3.8	1.9	1.9	6.8	5.3	3.9
3/9	1	11.0		7.4		6.23	6.3						8.8	6.9	5.3
3/10	0.8	10.0		7.2		6.04	5.4						6.8	6.6	5.4
3/11	0.9	31.0		14.4	15.5	9.65	9.8						10.7	12.7	8.5
3/12	1	43.0		15.5		10.64	12.8						10.8	12.3	10.6
3/13	1.5	37.0	40	15.0		10.31	10.3						10.3	11.1	8.7
3/14	1	18.0		9.0	10.1	8.22	8.1	7	3.4	10.1	4.2	6.0	8.8	7.9	5.4
3/15	0.5	47.0		4.6		5.96	1.9						2.3	3.8	3.9
3/16	0.8	17.0		6.6		7.31	3						6.4	6	5.8
3/17	1	16.0		7.2	4.4	4.74	3.8						6.6	6.5	5
3/18	1.1	30.0		11.5		9.27	8.2						10.7	10.4	9
3/19	0.7	42.0		14.8		13.95	10.9						13.2	13.4	12.7
3/20	0.8		26	9.4	8.1	10.38	7.8	8	4.1	13.1	8.1	5.1	14.8	8.7	9.2
3/21	0.6			5.6			3.2						6.2	5.6	3.9
3/22	0.6			3.9			3.1						5.8	3.6	4.5
3/23	0.8			5.9	3.7	4.32	3						5.8	4.7	4
3/24	1			4.8			2.6						6	4.5	3.8
3/25	0.5						1.9						3.5	5.6	2.9
3/26	0.6		23		4.1		3.8	4	1.3	7.8	5.9	1.9	8.6	7.2	5
3/27	0.8					5.68	3.5						7.7	5.6	6
3/28	0.7						3.5						4.1	4.4	4.1
3/29	0.5						2.9						5.7	8	5.6
3/30	0.7						3.8						6.4	6.5	5.3
3/31	0.7						3						7.1	6.6	3.9
Maximum	1.5	47	40	15.5	15.5	13.95	12.8	8	4.1	13.1	8.1	6	14.8	13.4	12.7
Average	0.8	21.9	21.6	7.9	6.3	7.6	5.0	5.0	2.4	7.7	4.2	3.5	7.0	6.7	5.6

Appendix

Table A-1: National Ambient Air Quality Standards

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour [1]	None	
	35 ppm (40 mg/m^3)	1-hour [1]		
Lead	0.15 $\mu g/m^3$ [2]	Rolling 3-Month Average	Same as Primary	
	1.5 $\mu g/m^3$	Quarterly Average	Same as Primary	
Nitrogen Dioxide	0.053 ppm (100 $\mu g/m^3$)	Annual (Arithmetic Mean)	Same as Primary	
Particulate Matter (PM_{10})	150 $\mu g/m^3$	24-hour [3]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 $\mu g/m^3$	Annual [4] (Arithmetic Mean)	Same as Primary	
	35 $\mu g/m^3$	24-hour [5]	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour [6]	Same as Primary	
	0.08 ppm (1997 std)	8-hour [7]	Same as Primary	
	0.12 ppm	1-hour [8] (Applies only in limited areas)	Same as Primary	
Sulfur Dioxide	0.03 ppm	Annual (Arithmetic Mean)	0.5 ppm (1300 $\mu g/m^3$)	3-hour [1]
	0.14 ppm	24-hour [1]		

[1] Not to be exceeded more than once per year.

[2] Final rule signed October 15, 2008.

[3] Not to be exceeded more than once per year on average over 3 years.

[4] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 $\mu g/m^3$.

[5] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population oriented monitor within an area must not exceed 35 $\mu g/m^3$ (effective December 17, 2006).

[6] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)

[7] (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.

[8] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is $\leq$ 1.
(b) As of June 15, 2005 EPA revoked the 1-hour ozone standard in all areas except the 8-hour ozone nonattainment Early Action Compact (EAC) Areas.