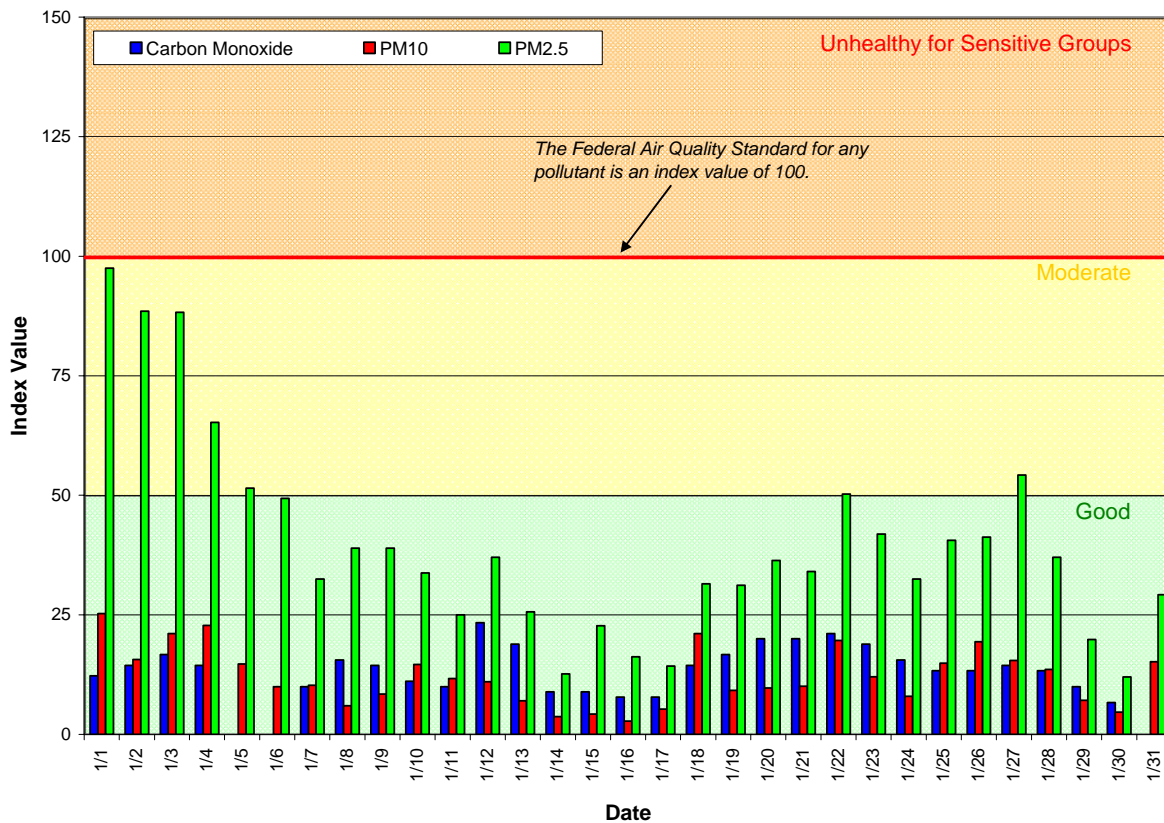


# Spokane Regional Clean Air Agency Air Quality Report - January 2011

January started with some of the highest fine particulate matter (PM<sub>2.5</sub>) ambient concentrations the Inland Northwest has had this winter. An Arctic high pressure air mass moved into the region on December 30 (Thursday). Light winds and mostly clear skies allowed much radiational cooling of the air at ground-level each night, resulting in strong surface temperature inversions. This effect was enhanced by fresh snow cover deposited during the storm that preceded the cold air mass. The Spokane Regional Clean Air Agency's automated PM<sub>2.5</sub> monitors were reading fast-rising PM<sub>2.5</sub> concentrations the evening of December 30. The PM<sub>2.5</sub> concentrations continued to rise into the high moderate range of the Air Quality Index (AQI) on December 31. A higher PM<sub>2.5</sub> mass concentration of 36.3 µg/m<sup>3</sup> (AQI: Unhealthy for Sensitive Groups) was recorded at the Augusta & Fiske station on December 31 using the federal reference method (FRM) sampler. A PM<sub>2.5</sub> 24-hour (midnight to midnight) average mass concentration of 35.4 µg/m<sup>3</sup>, which corresponds to an AQI of 100, is the allowable limit defined by the National Ambient Air Quality Standards (NAAQS). Anything above this level is an exceedance of the NAAQS. Mass concentration data from the FRM are not complete until several weeks after the sample run and are not available for AQI reporting. See appendices 1 and 2 for descriptions of the NAAQS and AQI, respectively.

On January 1, the East Broadway Ave (Spokane Valley) monitoring station reported a 24-hour average concentration of 34.5 µg/m<sup>3</sup> (AQI = 98, moderate; Figures 1 and 2). The PM<sub>2.5</sub> concentrations remained at similar levels until January 4 (Tuesday) when cloud cover increased ahead of an approaching storm system, inhibiting the nighttime radiational cooling. Air quality continued to improve as the high pressure ridge broke down and the storm system moved into the region.

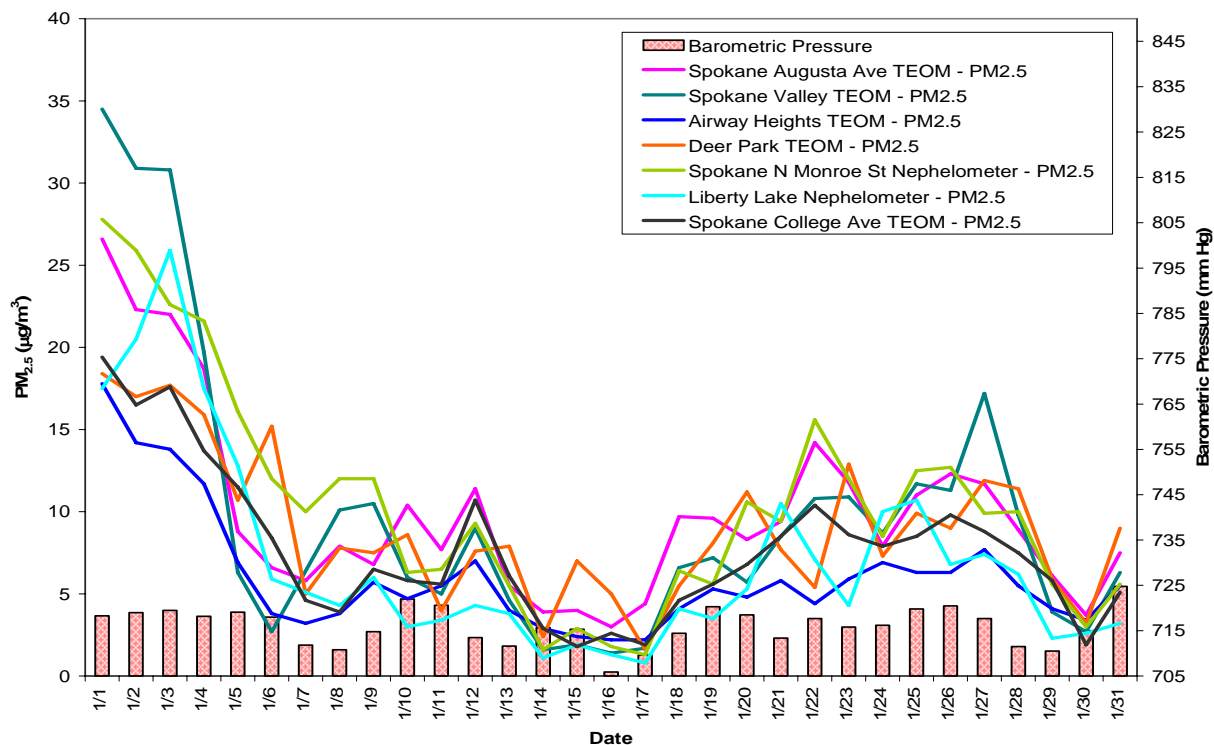
**Figure 1: Air Quality Index (AQI) values for January 2011**



The SRCAA declared a stage 2 burn ban on January 3 because of the high levels of PM<sub>2.5</sub> and predictions by the National Weather Service and by meteorological models that the conditions producing the poor ventilation would persist until January 6. The burn ban was lifted on January 5.

The PM<sub>2.5</sub> data used to determine the AQI and for other day-to-day operations are obtained using a network of automated particulate matter monitors consisting of Tapered Element Oscillating Microbalances (TEOM) and nephelometers. Daily mass concentrations of PM<sub>2.5</sub> monitored throughout the network in January are shown in figure 2.

**Figure 2: PM<sub>2.5</sub> multi-station time series for January 2011**



The January daily air quality data for all monitoring stations in the Spokane region are provided in Appendix 3. Current and historical air quality data can be obtained electronically from Ecology via their air monitoring data website, <https://fortress.wa.gov/ecy/enviwa/Default.htm>. It can also be accessed through the SRCAA’s webpage, [http://spokanecleanair.org/air\\_quality.asp](http://spokanecleanair.org/air_quality.asp). Select the link, “State Wide Air Monitoring Data.” The Washington Air Quality Advisory (WAQA) on Ecology’s webpage is similar to the AQI, which the SRCAA uses, but shows higher index values (increased health effects) at lower measured air pollution concentrations than the AQI.

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

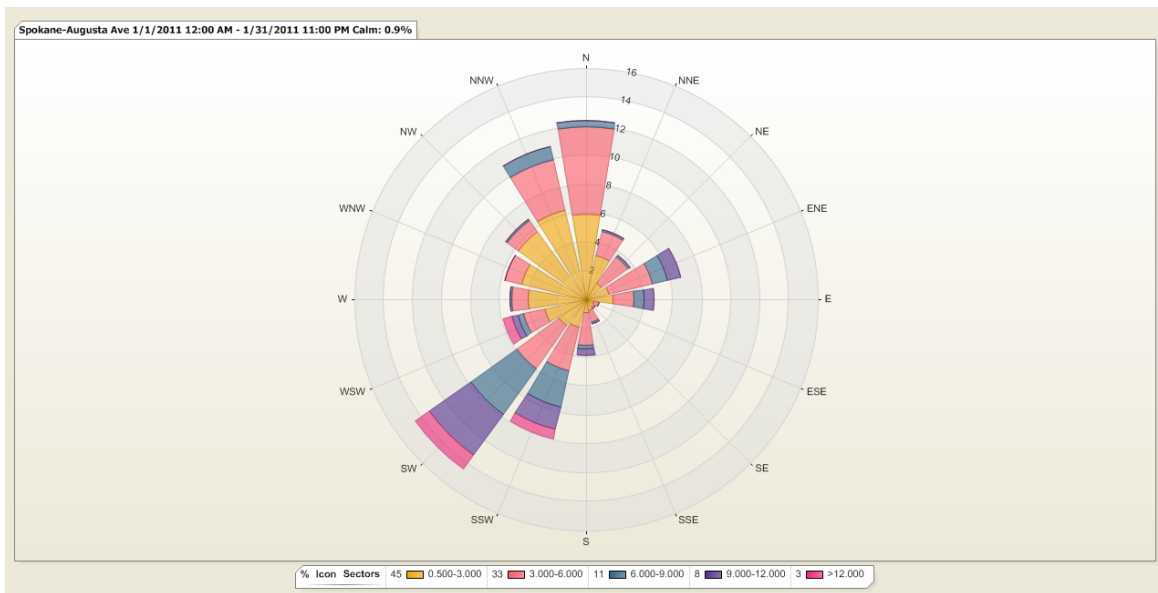
**Table 1: Maximum AQI values and pollutant concentrations for this reporting period**

Pollutant	AQI/Concentration	Location	Date
CO	23/2.1 ppm (8 hour)	Spokane, 3 <sup>rd</sup> & Washington	1/12
PM <sub>10</sub>	25/27.3 µg/m <sup>3</sup>	Spokane, Augusta & Fiske	1/1
PM <sub>2.5</sub>	98/34.5 µg/m <sup>3</sup>	Spokane Valley, E. Broadway	1/1

**Table 2: AQI summary as of January 31, 2011**

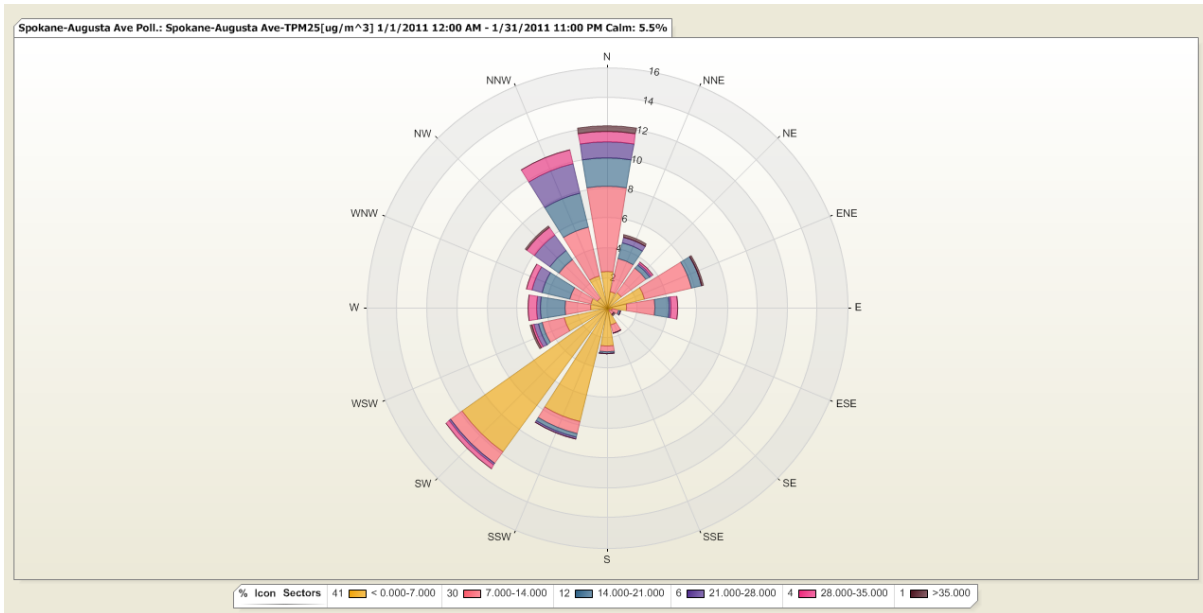
Category	Number of Days This Year	Last Year to Date
Good (0-50)	24	28
Moderate (51-100)	7	3
Unhealthy for Sensitive Groups (101-150)	0	0
Unhealthy (151-200)	0	0
Very Unhealthy (201-300)	0	0
Hazardous (>300)	0	0

The lightest (< 3 mph) winds occurred with northerly (N) to westerly (W) air flow (Figure 3). It was under those light N to W winds that PM<sub>2.5</sub> mass concentrations reached their highest levels in January (Figure 4), especially during the period of January 1 through 4. Storm system brought mostly stronger southwesterly (SW) and south-southwesterly (SSW) winds and lower PM<sub>2.5</sub> concentrations.



**Figure 3: The wind rose depicts the variation of hourly average wind speed (mph) with the direction from which the wind was blowing in January.**

**Figure 4:** The PM<sub>2.5</sub> pollution rose depicts the variation of hourly average PM<sub>2.5</sub> ( $\mu\text{g}/\text{m}^3$ ) with the direction from which the wind was blowing in January.



## Appendix 1 – National Ambient Air Quality Standards

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<sub>2</sub>), particulate matter (PM<sub>10</sub> and PM<sub>2.5</sub>), ground-level ozone (O<sub>3</sub>) and sulfur dioxide (SO<sub>2</sub>; Table A-1). These are known as “criteria” pollutants because the US EPA established regulatory limits to concentrations in ambient air using human health or environmentally based criteria. 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).

**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 <sup>3</sup> )	8-hour <sup>(1)</sup>	None	
	35 ppm (40 mg/m <sup>3</sup> )	1-hour <sup>(1)</sup>		
Lead	0.15 µg/m <sup>3</sup> <sup>(2)</sup>	Rolling 3-Month Average	Same as Primary	
	1.5 µg/m <sup>3</sup>	Quarterly Average	Same as Primary	
Nitrogen Dioxide	53 ppb <sup>(3)</sup>	Annual (Arithmetic Average)	Same as Primary	
	100 ppb	1-hour <sup>(4)</sup>	None	
Particulate Matter (PM <sub>10</sub> )	150 µg/m <sup>3</sup>	24-hour <sup>(5)</sup>	Same as Primary	
Particulate Matter (PM <sub>2.5</sub> )	15.0 µg/m <sup>3</sup>	Annual <sup>(6)</sup> (Arithmetic Average)	Same as Primary	
	35 µg/m <sup>3</sup>	24-hour <sup>(7)</sup>	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour <sup>(8)</sup>	Same as Primary	
	0.08 ppm (1997 std)	8-hour <sup>(9)</sup>	Same as Primary	
	0.12 ppm	1-hour <sup>(10)</sup>	Same as Primary	
Sulfur Dioxide	0.03 ppm	Annual (Arithmetic Average)	0.5 ppm	3-hour <sup>(1)</sup>
	0.14 ppm	24-hour <sup>(1)</sup>		
	75 ppb <sup>(11)</sup>	1-hour	None	

<sup>(1)</sup> Not to be exceeded more than once per year.

<sup>(2)</sup> Final rule signed October 15, 2008.

<sup>(3)</sup> The official level of the annual NO<sub>2</sub> standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard

<sup>(4)</sup> To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).

<sup>(5)</sup> Not to be exceeded more than once per year on average over 3 years.

<sup>(6)</sup> To attain this standard, the 3-year average of the weighted annual mean PM<sub>2.5</sub> concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m<sup>3</sup>.

<sup>(7)</sup> 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 µg/m<sup>3</sup> (effective December 17, 2006).

<sup>(8)</sup> 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)

<sup>(9)</sup> (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.

(c) EPA is in the process of reconsidering these standards (set in March 2008).

<sup>(10)</sup> EPA revoked the [1-hour ozone standard](#) in all areas, although some areas have continuing obligations under that standard (“anti-backsliding”).

(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is ≤ 1.

<sup>(11)</sup> (a) Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

## Appendix 2 – Air Quality Index

The Air Quality Index (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 a criteria pollutant 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; Table A-2).

**Table A-2: Air pollutant breakpoints for the Air Quality Index.**

Air Quality Index Levels of Health Concern	Color Code	Index Numerical Value	Breakpoints					Health Effects
			O <sub>3</sub> (ppm) 8-hour	O <sub>3</sub> (ppm) 1-hour <sup>(1)</sup>	PM <sub>2.5</sub> (µg/m <sup>3</sup> ) 24-hour	PM <sub>10</sub> (µg/m <sup>3</sup> ) 24-hour	CO (ppm) 8-hour	
<b>Good</b>	Green	0-50	0.000-0.059	<sup>(3)</sup>	0.0-15.4	0-54	0.0-4.4	Air quality is considered satisfactory and air pollution poses little or no risk.
<b>Moderate</b>	Yellow	51-100	0.060-0.075	<sup>(3)</sup>	15.5-35.4	55-154	4.5-9.4	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
<b>Unhealthy for Sensitive Groups</b>	Orange	101-150	0.076-0.095	0.125-0.164	35.5-65.4	155-254	9.5-12.4	People especially sensitive to air pollution may experience health effects. The general public is not likely to be affected. An AQI in this category or above indicates that air pollution exceeds levels acceptable under federal air quality standards.
<b>Unhealthy</b>	Red	151-200	0.096-0.115	0.165-0.204	65.5-150.4	255-354	12.5-15.4	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
<b>Very Unhealthy</b>	Purple	201-300	0.116-0.374	0.205-0.404	150.5-250.4	355-424	15.5-30.4	Health alert: everyone may experience more serious health effects.
<b>Hazardous</b>	Maroon	>300	<sup>(2)</sup>	0.405+	250.5+	425+	30.5+	Health warnings of emergency conditions. The entire population is more likely to be affected.

<sup>1</sup>Areas are generally required to report the AQI based on 8-hour ozone values. However, there are a small number of areas where an AQI based on 1-hour ozone values would be more precautionary. In these cases, in addition to calculating the 8-hour ozone index value, the 1-hour ozone index value may be calculated, and the maximum of the two values reported.

<sup>2</sup>8-hour O<sub>3</sub> values do not define higher AQI values (≥ 301). AQI values of 301 or greater are calculated with 1-hour O<sub>3</sub> concentrations.

<sup>3</sup>There is no AQI for 1-hour O<sub>3</sub> concentrations below the Unhealthy for Sensitive Groups level.

## Appendix 3

**Table A-3: Summary air quality data for January for air monitoring stations in Spokane County.** The carbon monoxide and ozone 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 ( $\mu\text{g}/\text{m}^3$ ).

Date	CO 3rd & Washington (ppm)	PM2.5 Augusta & Fiske TEOM ( $\mu\text{g}/\text{m}^3$ )	PM2.5 Augusta & Fiske TEOM 1405-DF ( $\mu\text{g}/\text{m}^3$ )	PMcoarse Augusta & Fiske TEOM 1405-DF ( $\mu\text{g}/\text{m}^3$ )	PM10 Augusta & Fiske TEOM 1405-DF ( $\mu\text{g}/\text{m}^3$ )	PM2.5 Spokane College Ave TEOM ( $\mu\text{g}/\text{m}^3$ )	PM2.5 Monroe & Wellesley nephelometer ( $\mu\text{g}/\text{m}^3$ )	PM2.5 Deer Park TEOM ( $\mu\text{g}/\text{m}^3$ )	PM2.5 Spokane Valley TEOM ( $\mu\text{g}/\text{m}^3$ )	PM2.5 Airway Heights TEOM ( $\mu\text{g}/\text{m}^3$ )	PM2.5 Liberty Lake nephelometer ( $\mu\text{g}/\text{m}^3$ )	PM10 Turnbull Wildlife Refuge TEOM ( $\mu\text{g}/\text{m}^3$ )
1/1	1.1	26.6	26	26	27.3	19.4	27.8	18.4	34.5	17.8	17.5	11
1/2	1.3	22.3	15.3	15.3	16.9	16.5	25.9	17	30.9	14.2	20.5	14
1/3	1.5	22	20.4	20.4	22.8	17.6	22.6	17.7	30.8	13.8	25.9	10
1/4	1.3	18.7	22.2	22.2	24.6	13.7	21.6	15.9	19.7	11.7	17.5	7
1/5		8.8	13.8	13.8	15.9	11.5	16.1	10.7	6.3	6.9	12.8	6
1/6		6.6	8.3	8.3	10.8	8.4	12	15.2	2.7	3.8	5.9	4
1/7	0.9	5.8	9.2	9.2	11.1	4.6	10	5	6.4	3.2	5.1	3
1/8	1.4	7.9	5.7	5.7	6.5	3.9	12	7.8	10.1	3.8	4.3	3
1/9	1.3	6.8	8.2	8.2	9.1	6.5	12	7.5	10.5	5.7	6	5
1/10	1	10.4	7.3	7.3	15.8	5.8	6.3	8.6	6	4.7	3	5
1/11	0.9	7.7	7	7	12.6	5.6	6.5	4	5	5.5	3.4	6
1/12	2.1	11.4	8.7	8.7	11.9	10.7	9.3	7.6	9	7	4.3	6
1/13	1.7	5.5	6.5	6.5	7.6	6.1	5.5	7.9	4.6	4	3.8	3
1/14	0.8	3.9	2.1	2.1	2.8	2.9	1.6	2.4	1.6	2.9	1.1	4
1/15	0.8	4	2.4	2.4	4.6	1.8	2.9	7	1.9	2.4	1.9	3
1/16	0.7	3	1.4	1.4	2.1	2.6	1.8	5	1.4	2.2	1.3	3
1/17	0.7	4.4	1.6	1.6	5.7	1.9	1.3	1.6	1.7	2.2	0.8	4
1/18	1.3	9.7	6.9	6.9	22.8	4.6	6.4	5.5	6.6	4.1	4.1	3
1/19	1.5	9.6	7.4	7.4	9.9	5.6	5.6	8.1	7.2	5.3	3.5	4
1/20	1.8	8.3	7.7	7.7	10.5	6.8	10.6	11.2	5.7	4.8	5.3	3
1/21	1.8	9.4	10	10	10.9	8.5	9.4	7.7	8.5	5.8	10.5	4
1/22	1.9	14.2	18.7	18.7	21.2	10.4	15.6	5.4	10.8	4.4	7.1	4
1/23	1.7	11.8	9.8	9.8	13	8.6	12	12.9	10.9	5.9	4.3	4
1/24	1.4	7.9	7.4	7.4	8.6	7.9	8.5	7.3	8.7	6.9	10	5
1/25	1.2	11	11.6	11.6	16.1	8.5	12.5	9.9	11.7	6.3	10.7	4
1/26	1.2	12.3	13	13	20.9	9.8	12.7	9	11.3	6.3	6.8	4
1/27	1.3	11.7	12.1	12.1	16.7	8.8	9.9	11.9	17.2	7.7	7.4	4
1/28	1.2	8.9	9.3	9.3	14.7	7.5	10	11.4	9.8	5.5	6.2	5
1/29	0.9	6.1	6	6	7.7	5.8	5.6	5.9	3.9	4.1	2.3	3
1/30	0.6	3.7	3.1	3.1	5	1.9	3	3.2	2.7	3.4	2.6	3
1/31		7.5	4.4	4.4	16.4	5.1	5.6	9	6.3	5.5	3.2	9
AVG	1.3	9.9	9.5	9.5	13.0	7.7	10.4	9.0	9.8	6.1	7.1	5
MAX	2.1	26.6	26.0	26.0	27.3	19.4	27.8	18.4	34.5	17.8	25.9	14