

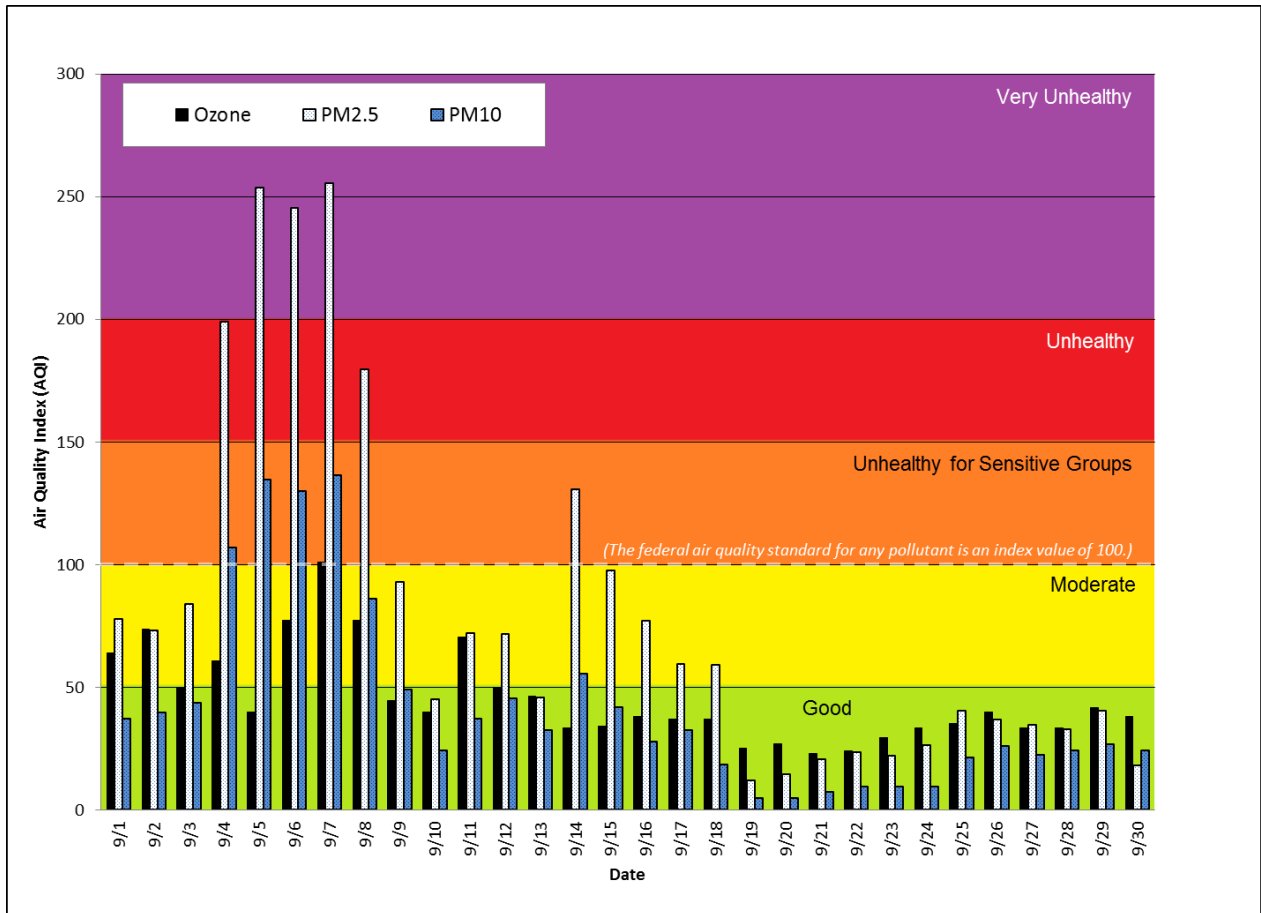
Spokane Regional Clean Air Agency Air Quality Report - September 2017

Northeasterly winds carried heavy smoke from wildfires in Montana and British Columbia into the Spokane area the week of September 4th. The winds developed under a high pressure ridge and associated subsidence inversion, which restricted dispersion of the smoke. This resulted in some of the worst air quality on record for the region with the Air Quality Index (AQI) reaching the Unhealthy (red) category on the 4th and 8th and the Very Unhealthy (purple) category on the 5th, 6th, and 7th (Figure 1).

Smoke from Montana wildfires was transported into the Spokane area again on the 14th. Although the smoke problem continued, a cooler air mass meant less active fire activity and less smoke than earlier in the month. The smoke lingered until the 19th, when a cold upper-level trough (low pressure) brought cool and wet conditions to the region, ending the wildfire smoke problem for the season.

Federal air quality standards correspond to an AQI value of 100, i.e., an AQI value of 101 or above exceeds air quality standards. That is the level of the threshold between the Moderate and Unhealthy for Sensitive Groups categories. Fine particulate matter (PM_{2.5}) exceeded federal air quality standards on the six above-mentioned days and particulate matter (PM₁₀) also exceeded the federal standard on the 4th, 5th, 6th, and 7th. There was one exceedance of the ground-level ozone standard when the 8-hour average ozone concentration reached 0.71 ppm (AQI = 101, Unhealthy) at Spokane-Greenbluff on the 7th.

Figure 1: Air Quality Index (AQI) values for September 2017. The data represent the maximum AQI values across all monitoring stations within Spokane County.



The Air Quality Index (AQI), based on the maximum 24-hour average (midnight-to-midnight) PM_{2.5} mass concentration was in the Unhealthy for Sensitive Groups category on one day in September, the Unhealthy category on two days, and the Very Unhealthy category on three days. The maximum AQI value for the month was 256, based on PM_{2.5} levels on the 7th (24-hour mass concentration = 205.5 µg/m³). Smoke pushed particulate matter (PM₁₀; 24-hour) into the Unhealthy for Sensitive Groups category on four days. Ozone, based on the maximum 8-hour running average concentration, was in the Unhealthy for Sensitive Groups category on one day.

Tables 1 and 2 summarize 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. See Appendix 1 of this report for information about federal air quality standards or Appendix 2 for a description of the AQI.

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

Pollutant	AQI/Concentration	Location	Date
O ₃	101/0.071 ppm (8 hour)	Spokane, Greenbluff	9/7
PM ₁₀	137/227 µg/m ³	Spokane, E. Augusta Ave (Augusta & Fiske)	9/7
PM _{2.5}	256/205.5 µg/m ³	Spokane Valley, E. Broadway Ave (near Broadway and University)	9/7

Table 2: Maximum AQI values and pollutant concentrations for calendar year 2017

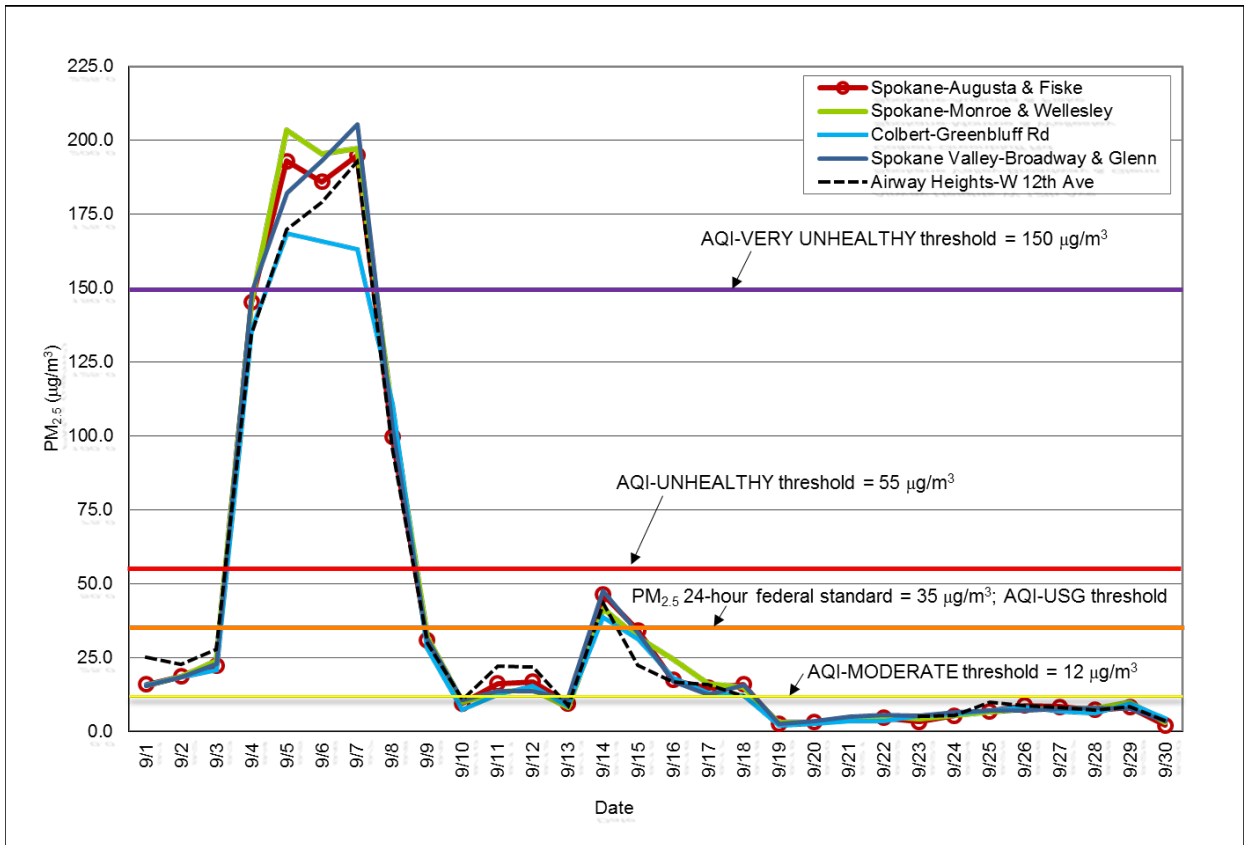
Pollutant	AQI/Concentration	Location	Date
O ₃	105/0.072 ppm (8 hour)	Spokane, Greenbluff	8/4
PM ₁₀	137/227 µg/m ³	Spokane, E. Augusta Ave (Augusta & Fiske)	9/7
PM _{2.5}	256/205.5 µg/m ³	Spokane Valley, E. Broadway Ave (near Broadway and University)	9/7

Table 3: AQI summary as of September 30, 2017.

Category	Number of Days This Year
Good (0-50)	176
Moderate (51-100)	79
Unhealthy for Sensitive Groups (101-150)	11
Unhealthy (151-200)	4
Very Unhealthy (201-300)	3
Hazardous (>300)	0

Daily mass concentrations of PM_{2.5} monitored in September throughout the network are shown in Figure 2. Daily air quality data for September at all monitoring stations in the Spokane region are provided in Appendix 3. Current and historical air quality data can be obtained electronically from Ecology’s air monitoring data website, <https://fortress.wa.gov/ecy/enviwa/Default.htm>.

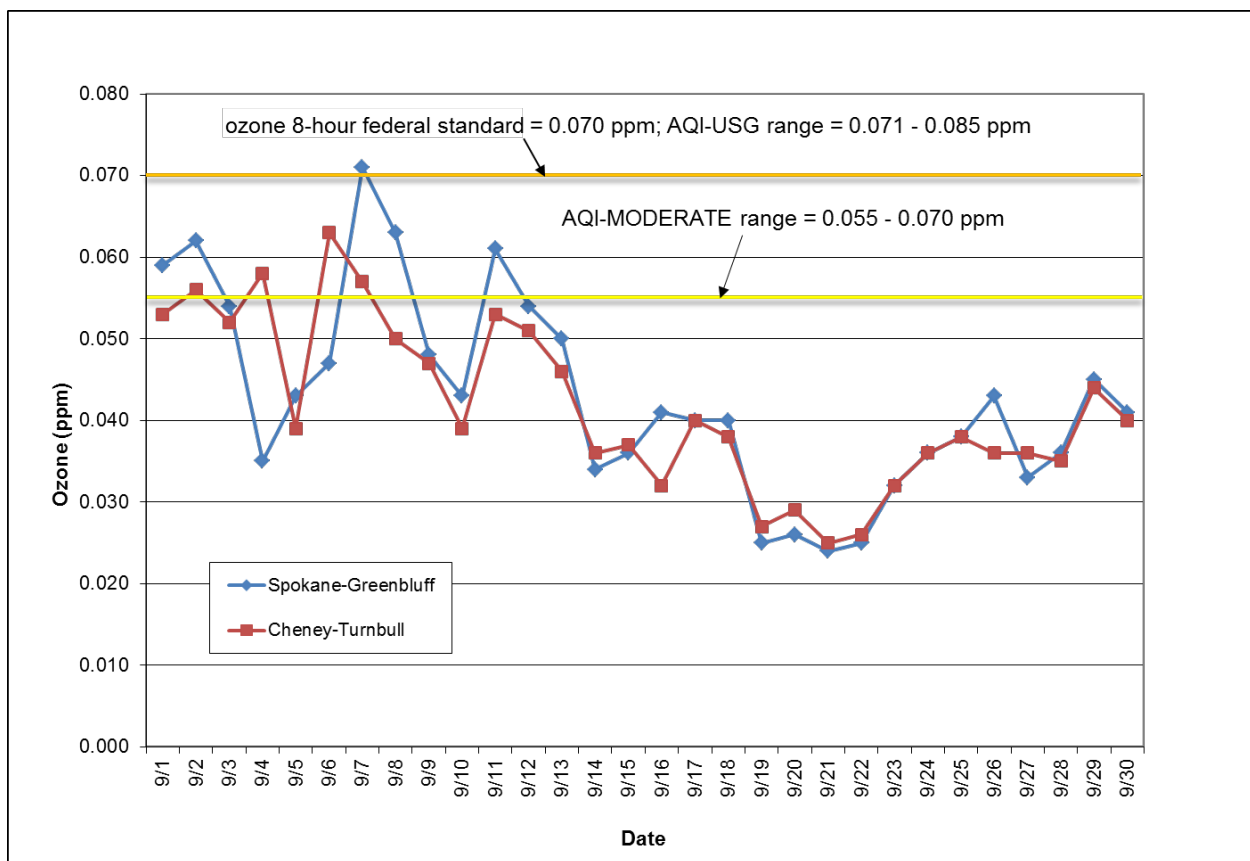
Figure 2: Multi-station 24-hour average PM_{2.5} for September 2017; Spokane County.



Ground-level ozone is formed when nitrogen oxides and volatile organic compounds chemically react in the presence of sunlight. It is measured in units of parts per million (ppm) in ambient air. Ozone is a strong oxidizer and can damage lung tissue, thereby impairing respiratory function. The main sources of ozone precursors are motor vehicle emissions and refueling, gasoline storage and transport, paints, solvents and industry.

The maximum 8-hour running average ozone concentration for the month was 0.071 ppm measured at Greenbluff on the 7th (Figure 3). Eight hour average ozone concentrations in the range 0.055 to 0.070 ppm are in the “Moderate” air quality category the AQI and 0.071 to 0.085 ppm are in the “Unhealthy for Sensitive Groups” category. When concentrations are below 0.055 ppm, air quality is “good” with respect to ground-level ozone.

Figure 3: Eight hour maximum ozone concentrations for the Spokane region in September. An ozone measurement above 0.070 ppm, averaged over eight hours, exceeds the federal ozone standard. However, it is not a violation of the standard to exceed this level on a given day because determination of attainment status is based on averaging data over a period of years. See Appendix 1 for more detailed information about attainment of federal air quality standards.



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 (NO₂), particulate matter (PM₁₀ and PM_{2.5}), ground-level ozone (O₃) and sulfur dioxide (SO₂; 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 [links to historical tables of NAAQS reviews]	Primary/ Secondary	Averaging Time	Level	Form	
Carbon Monoxide (CO)	primary	8 hours	9 ppm	Not to be exceeded more than once per year	
		1 hour	35 ppm		
Lead (Pb)	primary and secondary	Rolling 3 month period	0.15 µg/m ³ ⁽¹⁾	Not to be exceeded	
Nitrogen Dioxide (NO₂)	primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years	
	primary and secondary	1 year	53 ppb ⁽²⁾	Annual Mean	
Ozone (O₃)	primary and secondary	8 hours	0.070 ppm ⁽³⁾	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years	
Particle Pollution (PM)	PM _{2.5}	primary	1 year	12.0 µg/m ³	annual mean, averaged over 3 years
		secondary	1 year	15.0 µg/m ³	annual mean, averaged over 3 years
		primary and secondary	24 hours	35 µg/m ³	98th percentile, averaged over 3 years
	PM ₁₀	primary and secondary	24 hours	150 µg/m ³	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO₂)	primary	1 hour	75 ppb ⁽⁴⁾	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years	
	secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year	

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m³ as a calendar quarter average) also remain in effect.

(2) The level of the annual NO₂ standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O₃ standards additionally remain in effect in some areas. Revocation of the previous (2008) O₃ standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

(4) The previous SO₂ standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous SO₂ standards or is not meeting the requirements of a SIP call under the previous SO₂ standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the require NAAQS.

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 ₃ (ppm) 8-hour	PM _{2.5} (µg/m ³) 24-hour	PM ₁₀ (µg/m ³) 24-hour	CO (ppm) 8-hour	
Good	Green	0-50	0.000-0.054	0.0-12.0	0-54	0.0-4.4	Air quality is considered satisfactory and air pollution poses little or no risk.
Moderate	Yellow	51-100	0.055-0.070	12.1-35.4	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.
Unhealthy for Sensitive Groups	Orange	101-150	0.071-0.085	35.5-55.4	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.
Unhealthy	Red	151-200	0.086-0.105	55.5-150.4	255-354	12.5-15.4	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	Purple	201-300	0.106-0.200	150.5-250.4	355-424	15.5-30.4	Health alert: everyone may experience more serious health effects.
Hazardous	Maroon	>300	0.201 to the Significant Harm Level* (0.600 ppm, 2 hour average)	250.5+	425+	30.5+	Health warnings of emergency conditions. The entire population is more likely to be affected.

*The significant harm level (SHL) is set at a level that represents imminent and substantial endangerment to public health.

Appendix 3

Table A-3: Summary air quality data for September for air monitoring stations in Spokane County. The ground-level ozone data are maximum 8-hour running averages in parts per million (ppm) and the PM data are 24-hour averages in micrograms per cubic meter of air ($\mu\text{g}/\text{m}^3$). There are no data for Augusta & Fiske because of a sample tape error (broken tape) or Airway Heights for the 19th through the 22nd because of failure of the data logging system to restart after a power outage. Turnbull PM₁₀ is not reported elsewhere in this document because readings were affected by road dust as fire crews traveled on gravel roads close to the monitor.

Date	Ozone Greenbluff (8 hour max, ppm)	Ozone Turnbull NWR (8 hour max, ppm)	PM _{2.5} Augusta & Fiske BAM (24 hour avg, $\mu\text{g}/\text{m}^3$)	PM _{2.5} Broadway & University BAM (24 hour avg, $\mu\text{g}/\text{m}^3$)	PM _{2.5} Colbert TEOM (24 hour avg, $\mu\text{g}/\text{m}^3$)	PM _{2.5} Airway Heights TEOM (24 hour avg, $\mu\text{g}/\text{m}^3$)	PM _{2.5} Monroe & Wellesley nephelometer (24 hour avg, $\mu\text{g}/\text{m}^3$)	PM ₁₀ Augusta & Fiske TEOM (24 hour avg, $\mu\text{g}/\text{m}^3$)	PM ₁₀ Turnbull NWR BAM (24 hour avg, $\mu\text{g}/\text{m}^3$)
9/1	0.059	0.053	15.9	15.3	15.6	24.9	15.4	40	38
9/2	0.062	0.056	18.5	18.2	18.4	22.6	18.6	43	37
9/3	0.054	0.052	22.1	22.7	20.6	27.7	23.8	47	46
9/4	0.035	0.058	145.1	148.6	135.9	134.2	145.0	168	183
9/5	0.043	0.039	193.0	182.2	168.4	169.9	203.5	223	227
9/6	0.047	0.063	186.0	193.1	165.9	179.1	195.4	214	232
9/7	0.071	0.057	194.9	205.5	163.2	192.7	197.2	227	214
9/8	0.063	0.050	99.7	102.3	110.6	95.9	108.1	126	113
9/9	0.048	0.047	30.7	31.5	28.2	29.8	32.0	53	63
9/10	0.043	0.039	9.4	10.5	7.2	10.8	9.9	26	26
9/11	0.061	0.053	16.2	13.6	12.3	22.1	13.4	40	41
9/12	0.054	0.051	16.7	13.6	15.5	21.9	14.0	49	46
9/13	0.050	0.046	9.4	11.0	8.5	8.8	8.0	35	40
9/14	0.034	0.036	46.2	47.5	38.5	43.2	41.4	65	69
9/15	0.036	0.037	34.2	33.2	31.2	22.5	31.9	45	52
9/16	0.041	0.032	17.3	16.8	18.0	16.6	24.4	30	51
9/17	0.040	0.040	14.7	12.4	12.9	15.9	16.1	35	40
9/18	0.040	0.038	15.9	15.8	12.2	11.9	14.9	20	24
9/19	0.025	0.027	2.5	2.6	1.9		2.9	5	5
9/20	0.026	0.029	3.1	3.5	2.6		3.0	5	2
9/21	0.024	0.025		4.9	3.5		4.4	8	5
9/22	0.025	0.026	4.6	5.6	3.5		5.1	10	6
9/23	0.032	0.032	3.2	5.2	5.3	5.0	4.1	10	6
9/24	0.036	0.036	5.3	6.3	5.7	5.4	5.3	10	7
9/25	0.038	0.038	6.8	7.1	6.9	9.7	6.6	23	12
9/26	0.043	0.036	8.8	7.1	8.1	8.7	7.4	28	15
9/27	0.033	0.036	8.3	7.5	6.6	8.0	7.6	24	18
9/28	0.036	0.035	7.2	7.8	6.2	7.3	7.9	26	25
9/29	0.045	0.044	8.2	7.5	9.3	8.4	9.7	29	26
9/30	0.041	0.040	2.0	3.4	4.3	3.5	2.9	26	27
AVG	0.043	0.042	39.5	38.7	34.9	42.6	39.3	56	57
MAX	0.071	0.063	194.9	205.5	168.4	192.7	203.5	227	232