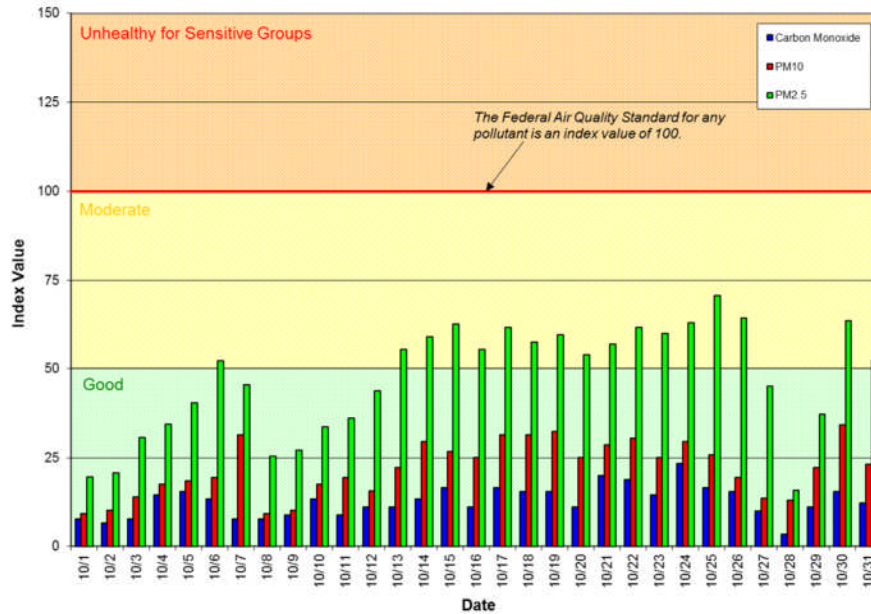


# Spokane Regional Clean Air Agency Air Quality Report - October 2013

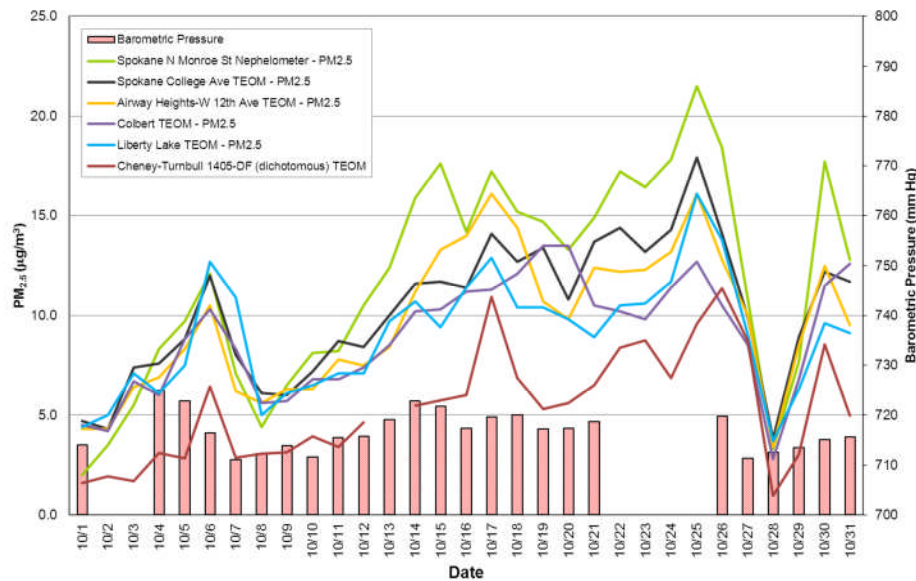
High atmospheric pressure led to a period of fine particulate matter (PM<sub>2.5</sub>) in the moderate range of the Air Quality Index (AQI) lasting from the 14<sup>th</sup> until the 26<sup>th</sup>. Carbon monoxide and particulate matter (PM<sub>10</sub>) remained well within the good range of the AQI throughout the month. See Appendix 1 of this report for information about federal air quality standards or Appendix 2 for a description of the AQI.

**Figure 1: Air Quality Index (AQI) values for October 2013**



The particulate matter 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 in October throughout the network are shown in Figure 2.

**Figure 2: PM<sub>2.5</sub> multi-station time series for October 2013**



The October 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/enwiwa/Default.htm>.

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                | 23/2.1 ppm (8 hour)       | Spokane, 3 <sup>rd</sup> & Washington | 10/24 |
| PM <sub>10</sub>  | 34/37 µg/m <sup>3</sup>   | Spokane, Augusta & Fiske              | 10/30 |
| PM <sub>2.5</sub> | 74/21.5 µg/m <sup>3</sup> | Spokane, Monroe & Wellesley           | 10/25 |

**Table 2: Maximum AQI values and pollutant concentrations for year-to-date**

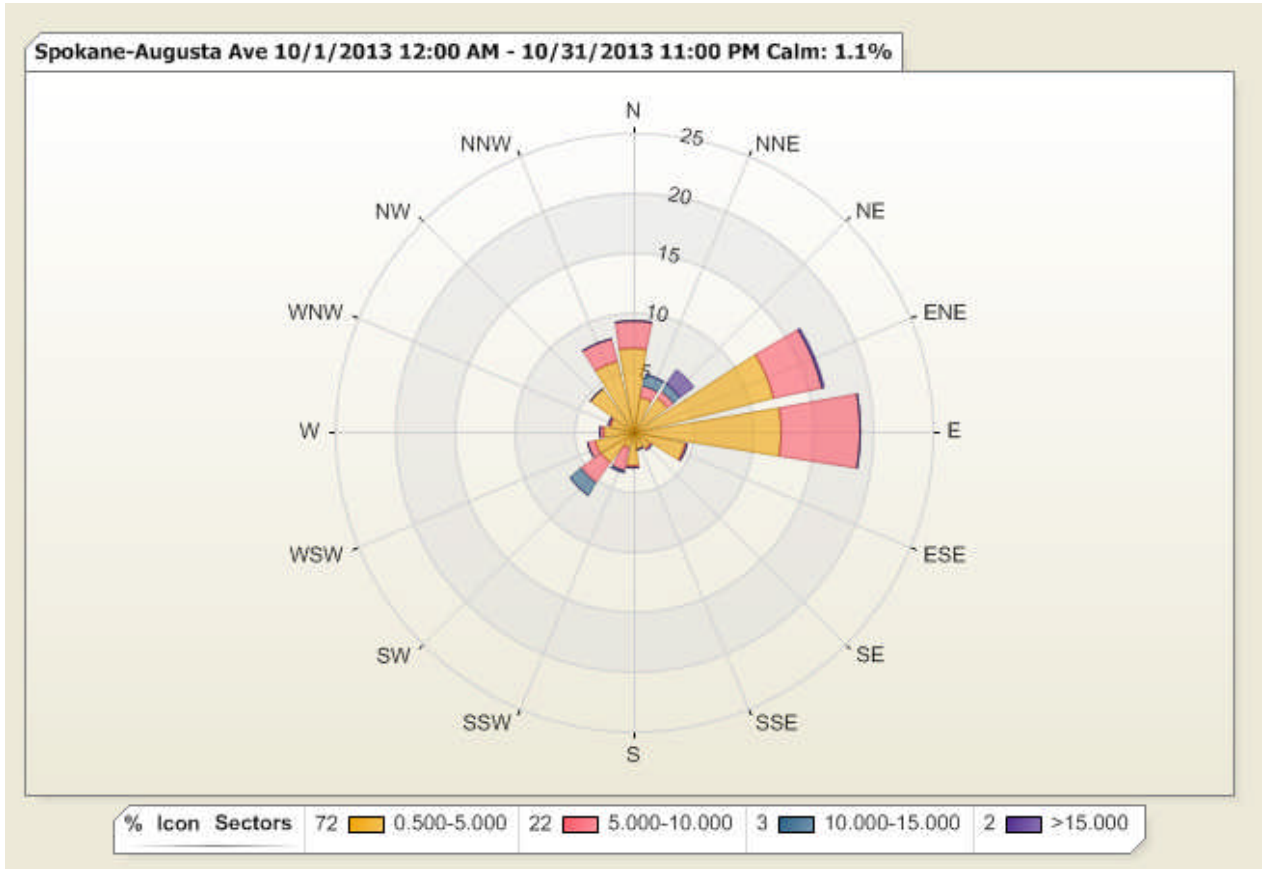
| Pollutant         | AQI/Concentration          | Location                              | Date |
|-------------------|----------------------------|---------------------------------------|------|
| CO                | 27/2.4 ppm (8 hour)        | Spokane, 3 <sup>rd</sup> & Washington | 1/25 |
| O <sub>3</sub>    | 88/0.071 ppm (8 hour)      | Spokane, Augusta & Fiske              | 8/12 |
| PM <sub>10</sub>  | 58/69 µg/m <sup>3</sup>    | Spokane, Augusta & Fiske              | 2/15 |
| PM <sub>2.5</sub> | 102/36.6 µg/m <sup>3</sup> | Spokane Valley, E. Broadway Ave       | 1/18 |

**Table 3: AQI summary as of October 31, 2013. The numbers in parentheses are the number of days that would have fallen into each category had the AQI good-to-moderate breakpoint for PM<sub>2.5</sub> not been reduced on March 18, 2013 (see Appendix 2). Otherwise the numbers here depict the number of days in each category as they were originally reported.**

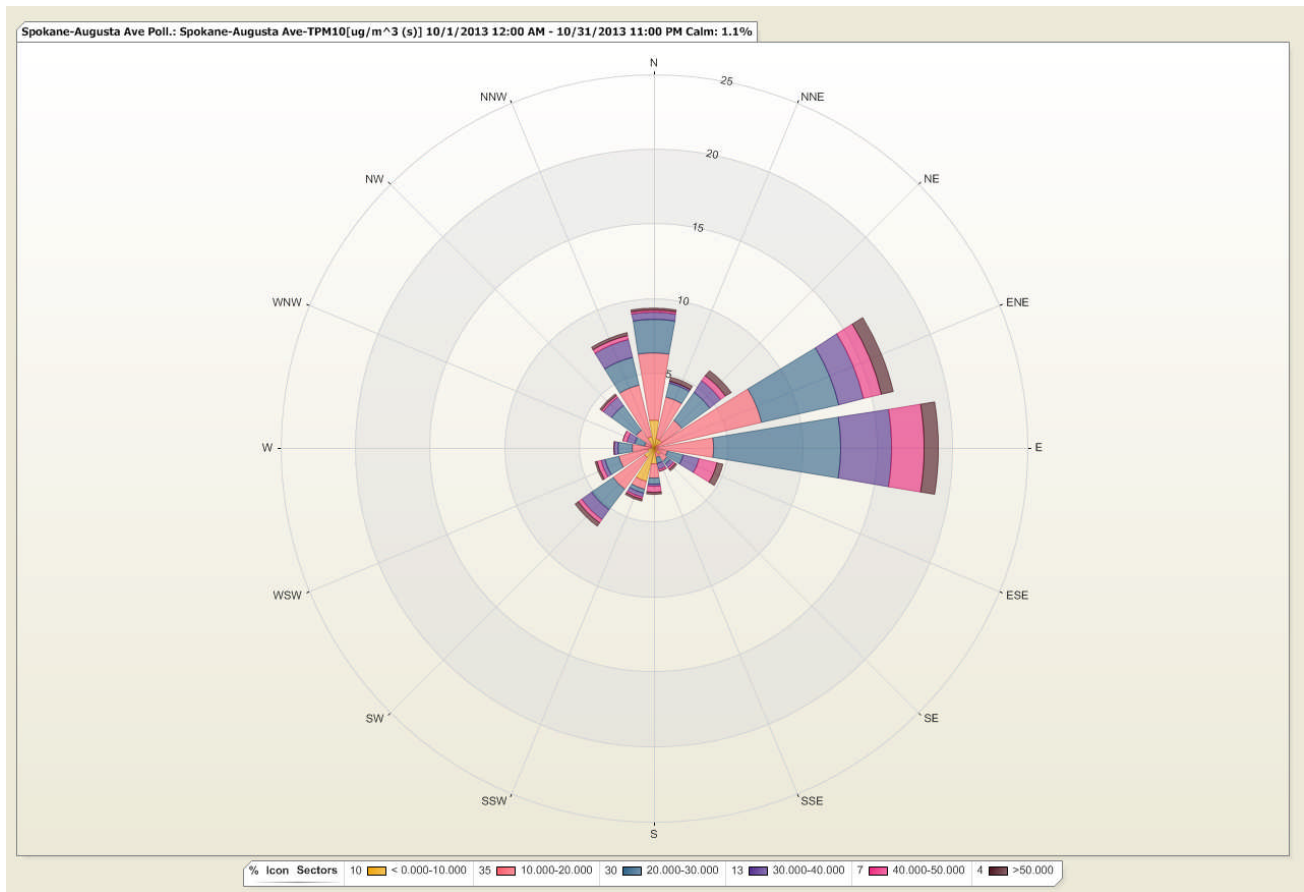
| Category                                 | Number of Days This Year | Last Year to Date |
|--|--------------------------|-------------------|
| Good (0-50)                              | 231 (237)                | 259               |
| Moderate (51-100)                        | 72 (66)                  | 43                |
| Unhealthy for Sensitive Groups (101-150) | 1 (1)                    | 3                 |
| Unhealthy (151-200)                      | 1 (1)                    | 0                 |
| Very Unhealthy (201-300)                 | 0                        | 0                 |
| Hazardous (>300)                         | 0                        | 0                 |

In the Spokane area, southerly (S) to southwesterly (SW) winds, especially those associated with storm systems, are usually stronger and promote better air quality than light winds from northerly or easterly directions. Light northerly or easterly winds are often terrain driven under a high atmospheric pressure ridge and atmospheric ventilation is poor (Figures 3 and 4).

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



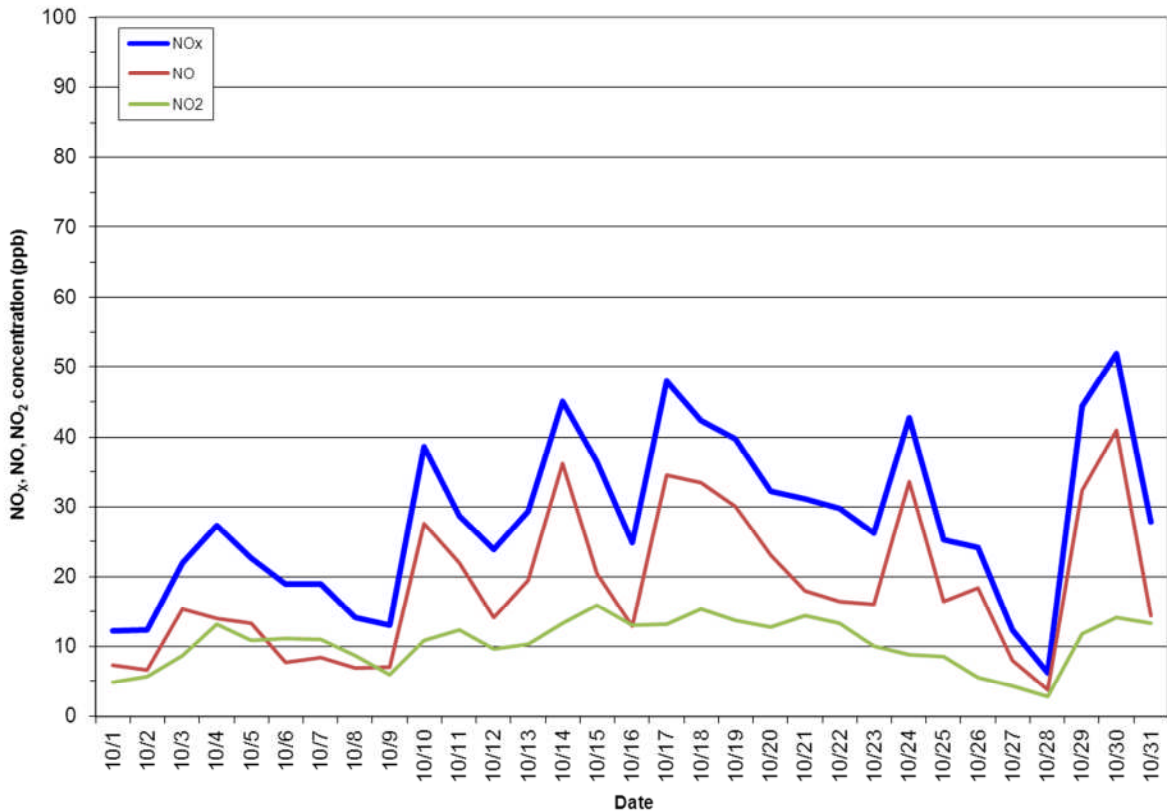
**Figure 4:** The PM<sub>10</sub> pollution rose depicts the variation of hourly average PM<sub>10</sub> ( $\mu\text{g}/\text{m}^3$ ) with the direction from which the wind was blowing in October.



Nitrogen oxides (NO<sub>x</sub>) are a group of highly reactive gases that contain nitrogen and oxygen. In ambient air, they consist primarily of nitric oxide (NO) and nitrogen dioxide (NO<sub>2</sub>). The 2005 emissions inventory estimated that, on an annual basis, 59% of NO<sub>x</sub> emissions in Spokane County are from on-road mobile sources, cars and trucks, and 24% are from non-road mobile sources, e.g., construction heavy equipment. The remaining 17% comes from a variety of sources, such as natural emissions from soil and vegetation (6%), industrial, commercial and institutional point sources (5%), residential fuel use (4%), e.g., natural gas and oil for heating and cooking, wood stoves and fireplaces (1%) and open burning, wildfires and structure and vehicle fires (1%). Nitrogen oxides react with volatile organic compounds (VOCs) in the presence of sunlight to form ozone.

The SRCAA monitors nitrogen oxides at the Spokane Augusta & Fiske monitoring station. Nitrogen dioxide is a criteria air pollutant defined in the NAAQS (see Appendix 1 of this report), but is not a significant problem in the Spokane area. The one-hour maximum concentrations of the nitrogen oxides monitored in October at the Augusta & Fiske monitoring station are shown in figure 5.

**Figure 5: One hour maximum concentrations of nitrogen oxides and hydrocarbons for Spokane Augusta Ave monitoring station in October. The federal standard daily 1-hour maximum for nitrogen dioxide (NO<sub>2</sub>) is 100 ppb. The NAAQS does not set limits on the other air pollutants shown here.**



## 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        |
| <a href="#">Carbon Monoxide</a>                       | 9 ppm<br>(10 mg/m <sup>3</sup> )      | 8-hour <sup>(1)</sup>                            | None                |                       |
|   | 35 ppm<br>(40 mg/m <sup>3</sup> )     | 1-hour <sup>(1)</sup>                            |                     |                       |
| <a href="#">Lead</a>                                  | 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     |                       |
| <a href="#">Nitrogen Dioxide</a>                      | 53 ppb <sup>(3)</sup>                 | Annual<br>(Arithmetic Average)                   | Same as Primary     |                       |
|   | 100 ppb                               | 1-hour <sup>(4)</sup>                            | None                |                       |
| <a href="#">Particulate Matter (PM<sub>10</sub>)</a>  | 150 µg/m <sup>3</sup>                 | 24-hour <sup>(5)</sup>                           | Same as Primary     |                       |
| <a href="#">Particulate Matter (PM<sub>2.5</sub>)</a> | 12.0 µg/m <sup>3</sup>                | Annual <sup>(6,12)</sup><br>(Arithmetic Average) | Same as Primary     |                       |
|   | 35 µg/m <sup>3</sup>                  | 24-hour <sup>(7)</sup>                           | Same as Primary     |                       |
| <a href="#">Ozone</a>                                 | 0.075 ppm<br>(2008 std)               | 8-hour <sup>(8)</sup>                            | Same as Primary     |                       |
|   | 0.08 ppm<br>(1997 std)                | 8-hour <sup>(9)</sup>                            | Same as Primary     |                       |
|   | 0.12 ppm                              | 1-hour <sup>(10)</sup>                           | Same as Primary     |                       |
| <a href="#">Sulfur Dioxide</a>                        | 0.03 ppm                              | Annual<br>(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 12.0 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> (a) 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.

<sup>(12)</sup> EPA revised the annual PM<sub>2.5</sub> standard from 15 to 12 µg/m<sup>3</sup>, effective March 18, 2013.

## 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). The breakpoint between the good and moderate categories for the AQI for PM<sub>2.5</sub> was changed from 15 to 12 µg m<sup>-3</sup>, effective March 18, 2013.

**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>                             | 0.0-12.0                                       | 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>                             | 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.  |
| <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 October for air monitoring stations in Spokane County.** The carbon monoxide 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 ( $\mu\text{g}/\text{m}^3$ ). Missing  $\text{PM}_{2.5}$  data for the Spokane Valley – E Broadway and Augusta & Fiske stations resulted from monitor malfunctions. The cells are shaded because the data quality from these stations was questionable and the data are not shown elsewhere in this report.

| Date  | CO 3rd & Washington (8 hour max, ppm) | PM2.5 Augusta & Fiske FRM ( $\mu\text{g}/\text{m}^3$ ) | PM2.5 Augusta & Fiske TEOM ( $\mu\text{g}/\text{m}^3$ ) | PM2.5 College Ave TEOM ( $\mu\text{g}/\text{m}^3$ ) | PM2.5 Colbert TEOM ( $\mu\text{g}/\text{m}^3$ ) | PM2.5 Spokane Valley - E Broadway TEOM ( $\mu\text{g}/\text{m}^3$ ) | PM2.5 Airway Heights TEOM ( $\mu\text{g}/\text{m}^3$ ) | PM2.5 Tumbull NWR TEOM ( $\mu\text{g}/\text{m}^3$ ) | PM2.5 Monroe & Wellesley nephelometer ( $\mu\text{g}/\text{m}^3$ ) | PM2.5 Liberty Lake TEOM ( $\mu\text{g}/\text{m}^3$ ) | PM10 Augusta & Fiske TEOM ( $\mu\text{g}/\text{m}^3$ ) | PM10 Tumbull NWR TEOM ( $\mu\text{g}/\text{m}^3$ ) |
|-------|---------------------------------------|--|---|---|---|---|--|---|--|--|--|--|
| 10/1  | 0.7                                   | 2.1  | 2.8   | 4.7   | 4.5   |   | 4.3  | 1.6   | 2.0  | 4.4  | 10   | 3  |
| 10/2  | 0.6                                   |  | 3.8   | 4.3   | 4.2   |   | 4.3  | 1.9   | 3.5  | 5.0  | 11   | 3  |
| 10/3  | 0.7                                   |  | 7.7   | 7.4   | 6.7   |   | 6.4  | 1.7   | 5.5  | 7.1  | 15   | 4  |
| 10/4  | 1.3                                   |  | 14.0  | 7.6   | 6.0   |   | 6.9  | 3.1   | 8.3  | 6.1  | 19   | 5  |
| 10/5  | 1.4                                   |  | 19.8  | 8.8   | 8.8   |   | 8.3  | 2.8   | 9.7  | 7.5  | 20   | 7  |
| 10/6  | 1.2                                   |  | 24.2  | 12.0  | 10.3  |   | 10.5   | 6.4   | 12.1   | 12.7   | 21   | 12   |
| 10/7  | 0.7                                   | 7.5  | 9.9   | 8.0   | 8.3   |   | 6.2  | 2.9   | 7.1  | 10.9   | 34   | 16   |
| 10/8  | 0.7                                   |  |   | 6.1   | 5.6   |   | 5.6  | 3.1   | 4.4  | 5.0  | 10   | 5  |
| 10/9  | 0.8                                   |  |   | 6.0   | 5.7   |   | 6.3  | 3.1   | 6.5  | 6.1  | 11   | 4  |
| 10/10 | 1.2                                   |  |   | 7.2   | 6.8   |   | 6.3  | 3.9   | 8.1  | 6.5  | 19   | 6  |
| 10/11 | 0.8                                   |  |   | 8.7   | 6.8   |   | 7.8  | 3.4   | 8.2  | 7.1  | 21   | 7  |
| 10/12 | 1                                     |  | 12.3  | 8.4   | 7.4   |   | 7.5  | 4.6   | 10.5   | 7.1  | 17   | 7  |
| 10/13 | 1                                     | 14.2   | 13.3  | 10.0  | 8.5   |   | 8.4  |   | 12.4   | 9.7  | 24   | 2  |
| 10/14 | 1.2                                   |  | 17.3  | 11.6  | 10.2  |   | 11.2   | 5.5   | 15.9   | 10.7   | 32   | 10   |
| 10/15 | 1.5                                   |  | 15.2  | 11.7  | 10.3  |   | 13.3   | 5.7   | 17.6   | 9.4  | 29   | 9  |
| 10/16 | 1                                     |  | 17.2  | 11.4  | 11.2  |   | 14.0   | 6.0   | 14.2   | 11.4   | 27   | 13   |
| 10/17 | 1.5                                   |  | 21.8  | 14.1  | 11.3  |   | 16.1   | 10.9  | 17.2   | 12.9   | 34   | 18   |
| 10/18 | 1.4                                   |  | 19.3  | 12.7  | 12.1  |   | 14.4   | 6.9   | 15.2   | 10.4   | 34   | 12   |
| 10/19 | 1.4                                   | 16.2   | 19.0  | 13.4  | 13.5  |   | 10.7   | 5.3   | 14.7   | 10.4   | 35   | 11   |
| 10/20 | 1.0                                   |  | 20.4  | 10.8  | 13.5  |   | 9.8  | 5.6   | 13.3   | 9.8  | 27   | 12   |
| 10/21 | 1.8                                   |  | 11.9  | 13.7  | 10.5  |   | 12.4   | 6.5   | 14.9   | 8.9  | 31   | 15   |
| 10/22 | 1.7                                   |  | 17.7  | 14.4  | 10.2  |   | 12.2   | 8.4   | 17.2   | 10.5   | 33   | 21   |
| 10/23 | 1.3                                   |  | 13.4  | 13.2  | 9.8   |   | 12.3   | 8.8   | 16.4   | 10.6   | 27   | 17   |
| 10/24 | 2.1                                   |  | 14.0  | 14.3  | 11.4  |   | 13.2   | 6.8   | 17.8   | 11.7   | 32   | 14   |
| 10/25 | 1.5                                   | 19   | 18.9  | 17.9  | 12.7  |   | 16.1   | 9.6   | 21.5   | 16.1   | 28   | 19   |
| 10/26 | 1.4                                   |  | 20.1  | 14.1  | 10.5  |   | 12.8   | 11.4  | 18.4   | 13.8   | 21   | 17   |
| 10/27 | 0.9                                   |  | 9.1   | 9.9   | 8.5   |   | 10.0   | 8.7   | 10.8   | 9.0  | 14   | 15   |
| 10/28 | 0.3                                   |  | 4.4   | 3.8   | 2.8   |   | 3.4  | 1.0   | 3.3  | 3.7  | 14   | 6  |
| 10/29 | 1                                     |  | 8.6   | 8.9   | 6.8   |   | 8.5  | 3.1   | 7.7  | 6.3  | 24   | 9  |
| 10/30 | 1.4                                   | 18.1   | 16.0  | 12.2  | 11.5  |   | 12.5   | 8.5   | 17.7   | 9.6  | 37   | 14   |
| 10/31 | 1.1                                   | 11.0   | 11.2  | 11.7  | 12.6  |   | 9.5  | 5.0   | 12.8   | 9.1  | 25   | 9  |
| AVG   | 1.1                                   | 12.6   | 14.2  | 10.3  | 9.0   |   | 9.7  | 5.4   | 11.8   | 9.0  | 24   | 10   |
| MAX   | 2.1                                   | 19.0   | 24.2  | 17.9  | 13.5  |   | 16.1   | 11.4  | 21.5   | 16.1   | 37   | 21   |