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Pinal County Air Quality Control District

Evaluation of Cowtown Road Replacement Sites

Final Report
August 2015

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Section 1 Description of Request

Pinal County Air Quality Control District (PCAQCD) is requesting approval from U.S. EPA to move our air monitoring station known as Cowtown Road (AQS # 04-021-3013), based on 40 CFR Part 58.14 (c)(6): *A SLAMS monitor not eligible for removal under any of the criteria in paragraphs (c)(1) through (c)(5) of this section may be moved to a nearby location with the same scale of representation if logistical problems beyond the State's control make it impossible to continue operation at its current site.* In June of 2015 Pinal County Air Quality Control concluded a year-long project to evaluate potential replacement sites and select a final replacement for the Cowtown Road site. Results of that study and evaluation are included in this document.

Section 2 Background

During the fall of 2013 Pinal County was notified by the landowners of the Cowtown Road site that they would not allow Pinal County to continue its use of the property. Pinal County negotiated a two year extension on the lease so that the Cowtown Road site can be relocated following EPA guidelines. The lease agreement allows Pinal County to use the Cowtown Road site property through January 20, 2016. The current Cowtown Road monitoring equipment consists of one continuous Federal Equivalent Method (FEM) PM_{10} analyzer, two filter-based Federal Reference Method (FRM) $PM_{2.5}$ samplers, a meteorology system, and visual monitoring equipment.

EPA provided Pinal County with guidance regarding relocation of the Cowtown Road monitors. This guidance suggested for both PM_{10} and $PM_{2.5}$ an appropriate nearby location for the replacement site would include areas within the West Pinal Moderate PM_{10} and West Central $PM_{2.5}$ nonattainment areas. EPA also described the spatial scale of representativeness in terms of the physical dimensions of an air parcel throughout which actual pollutant concentrations are reasonably similar. This homogeneity refers to the PM concentrations, as well as the land use and land surface characteristics. Therefore, the replacement site must be a middle scale site that measures similar concentrations from similar sources to those measured at the existing Cowtown Road site. Middle scale refers to an area with dimensions ranging from about 100 to 500 meters (m). The replacement site does not have to be explicitly within 500 m of a given source, but rather the concentrations measured at a replacement site should represent an area consistent with the middle scale dimensions. Since the Cowtown Road site is primarily influenced by emissions from feedlots for both PM_{10} and $PM_{2.5}$, the replacement site should also similarly represent emissions from feedlots. Secondary emissions from other sources, such as agricultural operations, disturbed vacant lots, paved and unpaved roads, and railroads should also be considered.

Selection of potential evaluation sites began in early 2014. The site selection process was driven by several primary factors including; 1) guidance from the Pinal County Board of Supervisors to locate the future site on publicly owned property thereby ensuring longevity of the site, 2) EPA relocation guidance suggesting locations of similar concentration, scale of representation, land use and emission characteristics, and 3) general site access, security and infrastructure.

The site selection process resulted in two potential evaluation sites, the Hidden Valley (HV) site located approximately 7 kilometers km (4.4 miles) west of the community of Stanfield on Pinal County property, and the White and Parker (W&P) site located approximately 6.5 km (4 miles) southeast of the City of Maricopa on City owned property. A more detailed description of each site is provided in a future section of this document. Pinal County established use agreements for both evaluation sites, Hidden Valley and White and Parker. Both site are located within the boundaries of the West Pinal PM10 Non-attainment Area and the West Central PM2.5 Non-attainment Area.

Ambient monitoring was conducted between June 13, 2014 and June 14, 2015. Each site in the evaluation study was equipped with portable PM_{10} and $PM_{2.5}$ Met One E-BAM monitors, which were loaned to Pinal County by the Arizona Department of Environmental Quality (ADEQ) and Maricopa County Air Quality Department (MCAQD). The E-BAM monitors were operated according to the Met One manual and Pinal County Standard Operating Procedures (SOPs), including monthly quality assurance (QA) testing. The Cowtown Road E-BAM monitors operated on line power, while the two evaluation sites relied on solar panels and batteries. See Figure 3.1 for site locations and distance.

Section 3 Site Descriptions

3.1 Cowtown Road Site (CWTN)

The CWTN site was installed and data recording began in November of 2001. The site first consisted of a TEOM that collected continuous PM_{10} data, a wind system, and a temperature and relative humidity sensor. When originally established, the site scale classification was determined to be micro scale.

Anderson filter based PM_{10} and $PM_{2.5}$ samplers were installed at this site in August of 2005. The units were both operated on a 1-in-6 day schedule.

On January 15, 2009 the PM_{10} and $PM_{2.5}$ Anderson samplers were replaced with newer Thermo PM_{10} and $PM_{2.5}$ Partisol 2000h samplers which also hold an EPA FRM designation. Both the PM_{10} and $PM_{2.5}$ monitors operated on a 1-in-6 day schedule.

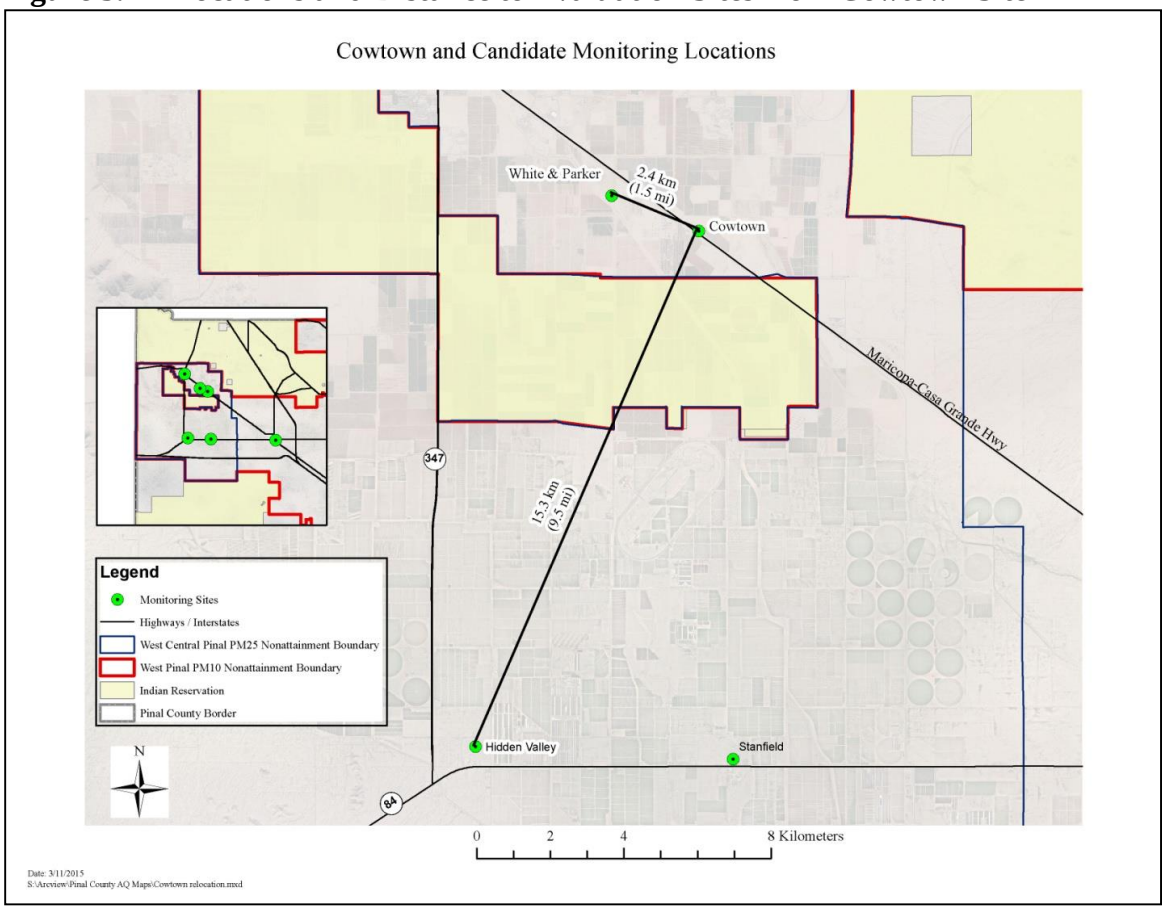
The 2011 Network Review proposed to revise the scale classification of the Cowtown Road site from micro scale to middle scale. An evaluation of the site characteristics, specifically removal of cattle and related facilities adjacent to the site, necessitated this proposed change. This change was approved by EPA.

On December 31, 2011 the filter based PM_{10} 2000h monitor at the site was discontinued in order to allow collection of more frequent $PM_{2.5}$ samples using two units. $PM_{2.5}$ sample frequency changed to 1-in-3 days effective January 1, 2012. In response to EPA comments on the 2011 network plan, Pinal County changed the Cowtown Road $PM_{2.5}$ monitors from SPM to SLAMS. The PM_{10} TEOM remains a SPM.

In August 2014, the two $PM_{2.5}$ 2000h monitors were replaced with two $PM_{2.5}$ 2025i sequential monitors to allow collection of daily samples and to meet method collocation requirements.

The Cowtown Road site is located approximately 6 km southeast of the City of Maricopa. The site lies within an irrigated agricultural plain, with active and retired agricultural operations to the north, northwest and east. Feedlots, a grain processing complex, an ethanol plant, and a commercial composting facility operate to the west, south, southwest and southeast. The site is also in proximity to an unpaved agricultural road, the Union Pacific Railroad tracks and the Maricopa-Casa Grande Highway, a paved two lane roadway, situated to the south of the monitoring site. This site has historically recorded the highest PM_{10} and $PM_{2.5}$ concentrations in the Pinal County network, as summarized in the most recent 2014 Ambient Monitoring Network Plan and Data Summary[1]. The Cowtown Site is located approximately 0.25 km (0.16mi) ENE from the nearest point of the feedlot. The location of the Cowtown Road site in proximity to the White and Park and Hidden Valley sites are shown in Figure 3.1. Figure 3.2 illustrates the surrounding area with indicated land use.

Figure 3.1 – Locations and Distance to Evaluation Sites from Cowtown Site



[1] http://www.pinalcountyaz.gov/AirQuality/Pages/MonitoringNetwork.aspx

The Cowtown monitor is located on what is classified as desert shrubland (approximately 93 acres). The monitor is adjacent (approximately 0.1 miles to the east-northeast) to a large feedlot complex that is approximately 230 acres in size and houses nearly 100,000 cattle. There is a large parcel (59 acres) to the east of the Cowtown monitor that is agricultural cropland. Another agricultural cropland parcel (33 acres) is located across the Maricopa/Casa Grande Highway and to the south of the monitor. The other large land uses within a mile radius of the Cowtown monitor are agricultural croplands, desert shrubland and unpaved roads (public, private and agricultural). Figure 5.22 illustrates land use surrounding the Cowtown site. The Cowtown Road site is impacted by emission sources including feedlots, agricultural operations, an ethanol plant, the railroad, a grain processing facility, a commercial composting facility, and paved and unpaved roads. Paved road impacts include the Maricopa-Casa Grande highway with an average annual daily traffic of 4,534 (2013, ADOT). A more detailed discussion of area land use and emissions is included in Section 5.5.

Figure 3.2 – Site Locations with Land Use

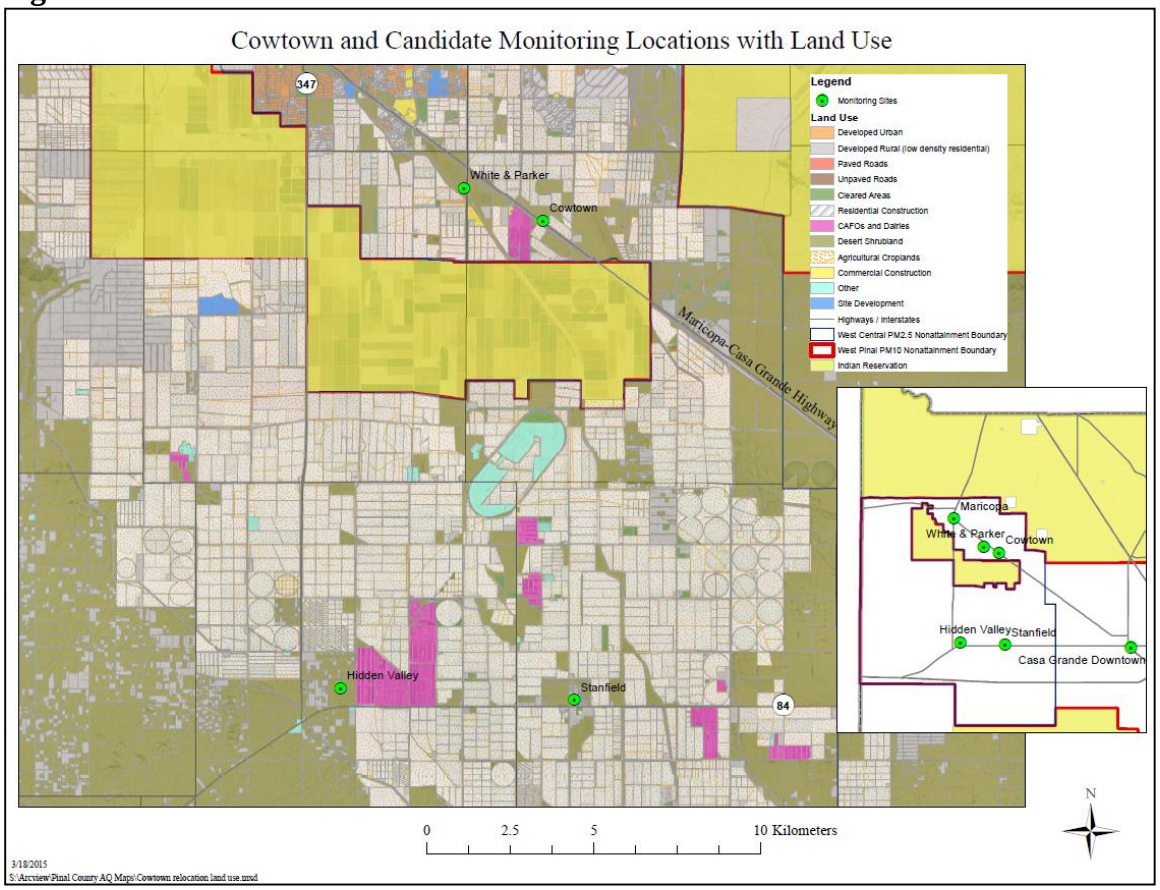
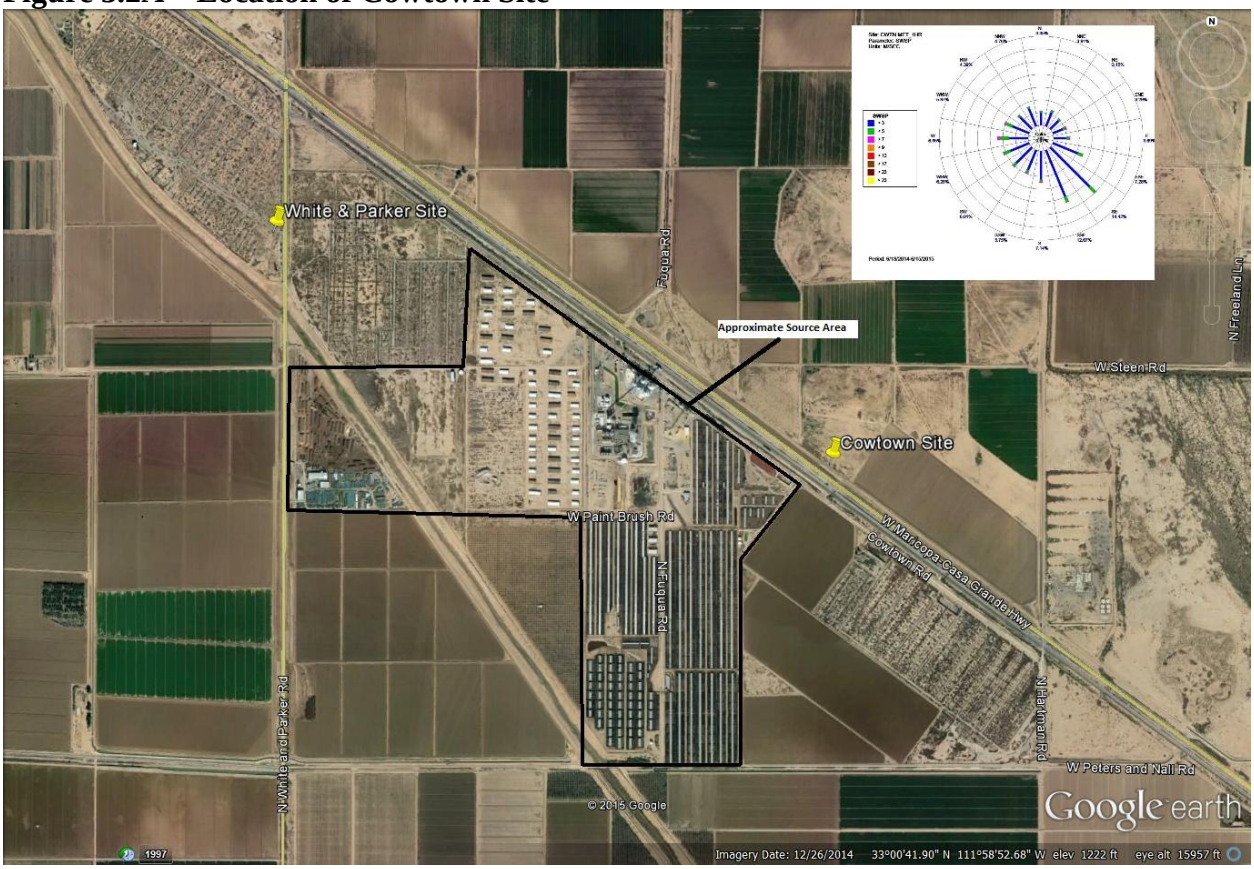


Figure 3.2A illustrates the location of the Cowtown site relative to the approximate source area that contributes to measured particulate matter. Additionally, the figure includes an annualized wind rose which indicates typical winds throughout the year.

Figure 3.2A – Location of Cowtown Site



3.2 Hidden Valley Site (HV)

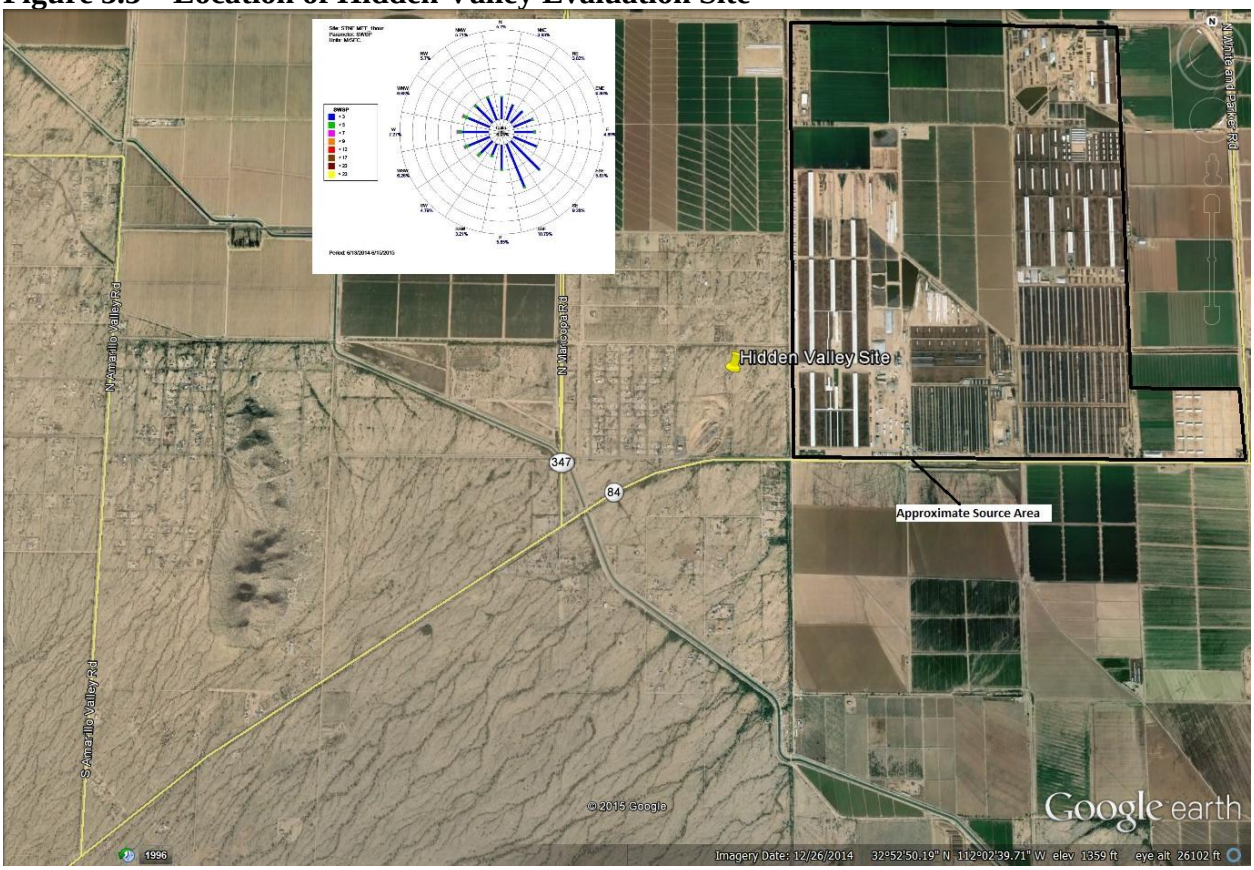
In early June 2014, the Hidden Valley site was established, consisting of a PM_{10} E-BAM and $PM_{2.5}$ E-BAM. Because of the temporary nature of the site and electrical installation costs, the site was configured with a solar and battery system. The equipment was protected with a chain link security fence. Access to the site was gained through the Pinal County Public Works yard to the south. The primary access road was stabilized with asphalt millings to reduce particulate contributions from operator visits to the site.

The site is located approximately 7 km (4.4 miles) west of Stanfield, Arizona and 15.3 km (9.3 miles) southwest of the Cowtown Road site (see Figure 3.1). The estimated distance from the HV monitors to the dairy and feedlot source area is approximately 0.5 km. The property is owned by Pinal County, under the control of the Pinal County Public Works Department, and includes an office building, shop building and a road materials pit. The property consists of two parcels (north and south) totaling approximately 40 acres each. The majority of the activity at

the site is concentrated on the southern parcel. The northern parcel, which is currently unused, is the land utilized for the monitoring study site. The location of the site can be seen in Figure 3.3.

The Hidden Valley monitor is located approximately 0.5 km (0.31 miles) to the west of a dairy and feedlot respectively. The monitor is on a large parcel (158 acres) of desert shrubland that is surrounded on three sides (north, west and south) by low density residential. Large areas of agricultural cropland mostly surround the Hidden Valley monitor outside of the immediate desert shrubland and low density residential land uses. However, southwest of the monitor there is no agricultural cropland, due to the mountainous terrain – Table Top Mountain. Unpaved roads (public, private, agricultural) also surround the Hidden Valley monitor. Figure 5.23 illustrates land use surrounding the Hidden Valley site. The Hidden Valley site is impacted by emission sources including dairies, feedlots, agricultural operations, county material pit operations, and paved and unpaved roads. A more detailed discussion of area land use and emissions in included in Section 5.5.

Figure 3.3 – Location of Hidden Valley Evaluation Site



3.3 White and Parker Site (W&P)

In early June 2014, the White and Parker site was established, consisting of a PM_{10} E-BAM and $PM_{2.5}$ E-BAM. Because of the temporary nature of the site and electrical installation costs, the site was configured with a solar and battery system. The equipment was protected with a chain

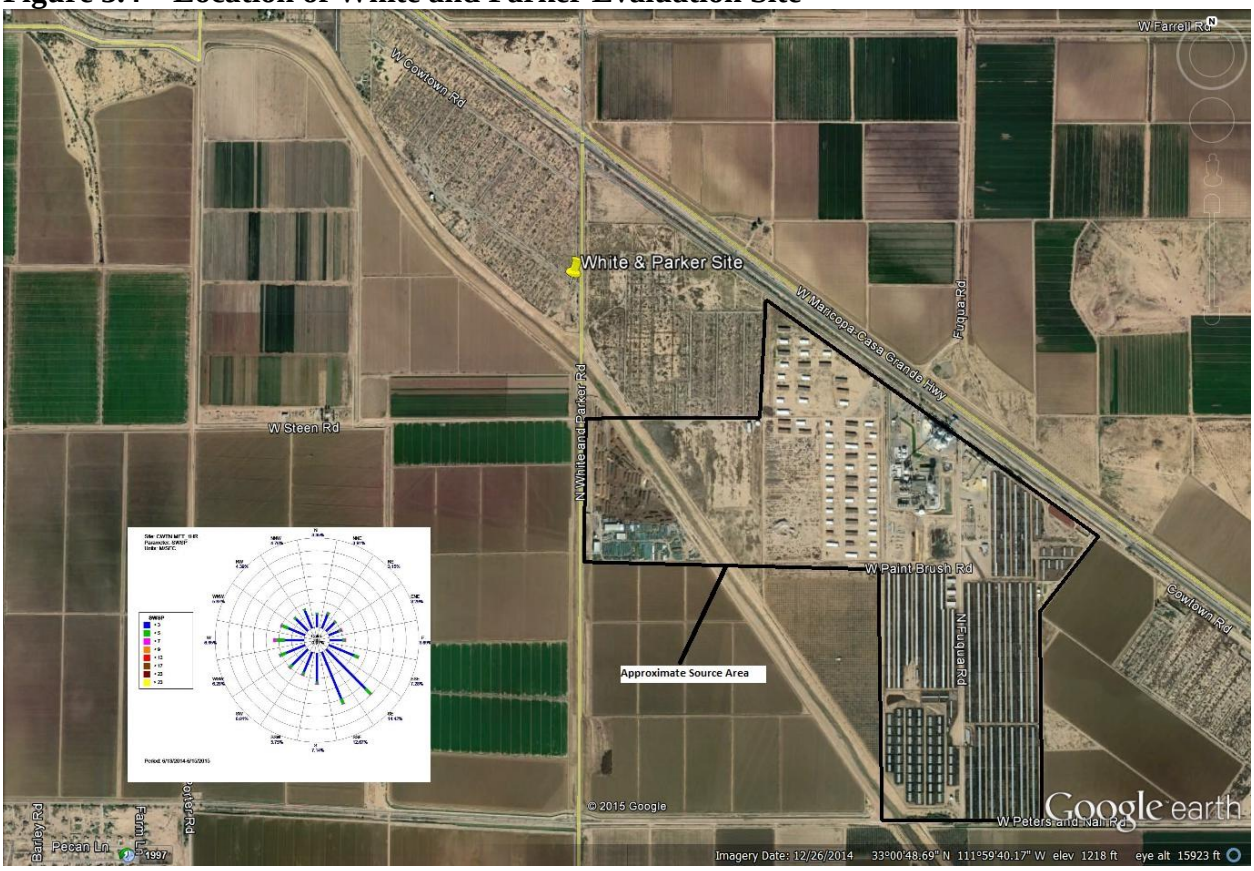
link security fence. Access to the site was gained via a graveled road on the west side of White and Parker Road.

The site is on City of Maricopa vacant land along White and Parker Road approximately 6.5 km southeast of Maricopa, Arizona and 2.4 km northwest of the Cowtown Road site. The estimated distance from the W&P monitors to the source area that impacts the Cowtown Road site ranges from approximately 0.4 to 0.8 km, depending on the source. The site is separated from the nearest active feedlot pens by approximately 1.75 km (1.1mi) and 0.84 km (0.52mi) from the nearest feedlot processing area. The portion of the property used for the monitoring site borders the west edge of White & Parker Road approximately 0.6 km south of the Maricopa- Casa Grande Highway. The location of the site can be seen in Figure 3.4.

The relatively close proximity of the White and Parker monitoring site to the Cowtown monitoring site (2.5 km or 1.6 miles WNW) means both monitoring sites are surrounded by similar land uses such as desert shrubland, agricultural croplands, feedlots and unpaved roads. The site is separated from the nearest active feedlot pens by approximately 1.75Km (1.1mi) and 0.84Km (0.52mi) from the nearest feedlot processing area. Other land uses within a mile or so of the White and Parker monitor are commercial construction and cleared areas. The White and Parker monitor along with the Cowtown monitor have residential development within two miles of their respective monitors. The residential development near the White & Parker site is located to the northwest while the residential development near the Cowtown monitor is north of the monitor. Figure 5.24 illustrates land use surrounding the White and Parker site.

The White and Parker site due to its proximity to the Cowtown Road site is impacted by similar emission sources, including the feedlots, agricultural operations, an ethanol plant, the railroad, a grain processing facility, a commercial composting facility, and paved and unpaved roads. Paved road impacts include the Maricopa-Casa Grande highway with an average annual daily traffic of 4,534 (2013, ADOT). A more detailed discussion of area land use and emissions is included in Section 5.5.

Figure 3.4 – Location of White and Parker Evaluation Site



Section 4 Monitoring Methods and Data Processing

Prior to the start of data collection an evaluation was conducted to determine the best type of instrument to meet the required sampling needs that would also work with the site conditions. Specific criteria evaluated were continuous sampling ability, PM_{10} and $PM_{2.5}$ capable, portability and the ability to run on solar power. After the evaluation was conducted, the Met One E-BAM was the selected instrument. Both ADEQ and Maricopa County Air Quality have used the E-BAM as a portable, PM_{10} and $PM_{2.5}$ monitor and have run the instrument off of solar power. While the E-BAM does not maintain a FRM or FEM designation there was a FEM TEOM and a FRM 2025i Partisol at the Cowtown site which the E-BAM data could be compared against. In addition, all of the E-BAM units ran side-by-side for 30 days at the Pinal County housing site prior to being deployed to help determine the comparability of instrument-to instrument data. From the initial side-by-side testing it was determined that the PM_{10} was very similar instrument-to-instrument but was significantly lower than TEOM data collected at the site. It was determined that a correction would need to be made to the E-BAM data so that it correlated with the FEM TEOM. There were no FRM or FEM $PM_{2.5}$ methods at the Pinal County Housing site to compare the E-BAM data to during the initial testing. The initial testing showed that the instrument-to-instrument data was very poorly correlated. After some evaluation it was determined that converting negative hourly concentration values to zero values provided the best correlation. It was also determined that the same analysis would be performed at the conclusion

of the data collection when the number of samples was much more significant. Routine analysis of the monitoring data was conducted on a monthly basis, including linear regression analysis, monthly and seasonal analysis, meteorological analysis, comparison of diurnal patterns and comparison of high concentration episodes at the three sites. The data evaluation was periodically communicated to EPA Region 9 during monthly project update calls. A discussion below describes the methodology used during the analysis to correct for the deficiencies listed above.

A pair of E-BAM instruments (one PM_{10} and one $PM_{2.5}$) were installed at the Cowtown site as well as the Hidden Valley and White and Parker sites. The Cowtown site had line power which was used while the other two sites relied on solar power for operation. The monitors were installed on June 9, 2014 and were calibrated and allowed to run for a few days to verify functionality. Data collection began on June 13, 2014 at all three sites and was complete June 14, 2015. SOP's were developed per manufacturer recommendations and in collaboration with ADEQ and Maricopa County Air Quality. All QA and maintenance procedures were performed per the SOP's and all documentation was stored per PCAQCD data retention policy. Each instrument was connected to a wireless modem which allowed for data collection and monitoring of instrument function. Data was collected every morning and imported into the Agilaire Airvision software that maintains all of PCAQCD's data. The data QA protocols outlined in the PCAQCD QMP/QAPP were followed for all of the E-BAM data.

The solar systems were designed per specifications listed in the Met One E-BAM manual. Even with this configuration the instruments started to shut down overnight in October 2014. Over the next few weeks more solar panels and batteries were added in an attempt to keep the instruments running. The system was able to run one unit continuously but not both. In November 2014 it was decided to shut off the $PM_{2.5}$ instrument until the spring of 2015 when more sunlight was available to charge the batteries. The White and Parker $PM_{2.5}$ monitor was re-started on February 11, 2015 and the Hidden Valley $PM_{2.5}$ Monitor was re-started on March 11, 2015. Because of the amount of missing data, PCAQCD proposed, and received approval, to estimate the missing data. The data was estimated by using the ratio of $PM_{2.5}$/ PM_{10} and applying that to the PM_{10} data from the E-BAMs at each of the White and Parker and Hidden Valley sites.

The relationship (ratio) between the filter measurements collected with the Cowtown FRM and the collocated $PM_{2.5}$ E-BAM were found to vary significantly from day to day indicating operational differences in the two methods (filter & continuous non-FRM). Due to this variation, a correction to the $PM_{2.5}$ E-BAM data was necessary. Two approaches were developed to estimate a correction factor for the $PM_{2.5}$ E-BAMS. The first used daily values based upon concurrent $PM_{2.5}$ and PM_{10} measurements. Because the filter samples are not all collected at a daily frequency, interim days are assumed to be equal to the most recent available value. The second used an annual average of all available $PM_{2.5}/PM_{10}$ ratios. The annual average approach provided less sample-to-sample variation and was chosen as the preferred method.

Section 5 Evaluation Criteria

In order to compare each study site to the existing site at Cowtown, Pinal County developed the evaluation criteria shown in Table 5.1. These criteria were developed using guidance provided by EPA Region IX and by Stakeholders. The evaluation provides both qualitative and quantitative assessments of each site and will provide information needed to justify the site selected. A summary of the selected site is provided in the Section 6 Conclusion. Results and discussion are organized by subsection.

Table 5.1 – Evaluation Criteria

Criteria	Description	Subsection
Comparability of measurement (PM_{10} and $PM_{2.5}$)	Compare evaluation site to Cowtown Site: 1. Evaluation of Recorded Exceedances a. Period of Record b. High Wind Exceedances c. Stagnation Exceedances 2. Evaluation of Highest Concentration Days 3. Comparison for Period of Record 4. Seasonal Analysis 5. Temporal Variation	5.1
Representation of Population	Estimate the population base the site represent currently and in future years	5.2
Longevity of Site	Estimate the anticipated timeframe the proposed site will be available for use; land ownership, and potential changes in the future	5.3
Scale of Representation	Evaluate scale of representation for sites	5.4
Area Land use	Compare the proposed site land use to the Cowtown site (mapping)	5.5
Area Emissions	Compare emissions sources near the proposed site to the Cowtown site (Mapping/Qualitative)	5.6
Cost of Site Development	Compare cost of developing each site (power, access, security, etc.)	5.7

5.1 Comparability of Measurements (PM_{10} and $PM_{2.5}$)

The comparability of measurements section is broken into 7 sections. Each will address the listed portion of the evaluation criteria.

5.1.1 Evaluation of Record of Exceedances

This subsection evaluates the occurrence of PM_{10} and $PM_{2.5}$ exceedances at each monitoring site and differentiates between stagnant and high wind conditions. This differentiation is provided because emissions inventory and modeling *(citation - SIP EI and Modeling)* results have shown that the sources of particulate matter differ under stagnation and high wind conditions. Although both lead to exceedances of the respective NAAQS, it is valuable data to include in the evaluation.

Table 5.2 summarizes PM_{10} data collected at each site in the study. The data presented includes the number of recorded exceedances of the NAAQS, the annual average, and the maximum value

recorded. The Cowtown PM_{10} data shows a greater number of exceedance during the monitoring period, at 35, than Hidden Valley or White and Parker. A similar trend is evident with annual average concentrations at Cowtown being higher than the other sites by approximately 22%. White and Parker recorded the least number of exceedance, 8 which is still in excess of the PM_{10} NAAQS. Hidden Valley recoded 15 exceedances, also above the PM_{10} NAAQS. The maximum concentration recorded at the White and Parker site is greater than Hidden Valley but less than the maximum recorded at Cowtown. Note that the Maximum values at Cowtown and Hidden Valley were associated with a high wind event while the maximum value at White and Parker was recorded during a stagnation event. This topic is covered in more detail in Section 5.1.2.

Classification of PM10 exceedances related to high winds are reviewed by a staff meteorologist/forecaster through a qualitative process. The analysis of whether PM10 exceedances are related to high winds includes identification of a causal relationship between elevated winds and elevated PM10. Setting a specific minimum wind speed in order to classify the PM10 exceedance as high wind is problematic for the following reasons: 1) strong outflow winds associated with storms a long distance away that generate dust storms can result in elevated PM10 concentrations at a site where local winds are low, 2) we have a limited meteorological monitoring network in Pinal County restricting our ability to identify wind characteristics, and 3) monsoon storm development and movement of cells can be complex in nature sometimes leading to very localized impacts. Examples include instances where we have measured sustained winds over 25 mph and had no PM10 exceedances due to recent precipitation event(s) and other instances where we have had PM10 exceedances with wind speeds just barely over 10 mph where outflow from distant storm cells have impacted a monitor.

Stagnation events, are generally identified as winds less than 5 mph. In most cases the hours of the day when elevated PM10 concentrations occur the average wind speeds are typically calm to 2 or 3 mph range.

Combination days are identified as any day in which there are hours of elevated PM10 concentrations (150+ ug/m3) that are associated with light or no winds and hours of elevated PM10 concentrations that are associated with elevated winds.

Table 5.2 – PM_{10} Summary Data (All Data/Excluding High Winds)

	CWTN PM10	HV PM10	W&P PM10
# Exceedances	35/32	15/13	8/4
Annual Average	73.9/71.9	58.5/57.5	58.4/56.2
Max Value	540.8/357.0	278.2/234.6	364.4/364.4

Table 5.3 presents a summary of design concentration (according to EPA guidance document PM_{10} SIP Development Guideline EPA-450/2-86-001 June 1987) and the estimated annual expected exceedance rate calculated according to 40 CFR Part 58 Appendix K. The design

concentration is based upon the number of samples collected during the evaluation period. Depending on that number, the selected value can vary from highest to second highest with one year of data. If this evaluation included 3 years of data the value could potentially be the 3rd of 4th high. In the case of Cowtown the second highest value is selected while the highest value is appropriate for Hidden Valley and White and Parker due to more recorded samples at Cowtown than the other two sites. As evident in the table, the design value excluding high wind events, for White and Parker is the highest among the three sites, with Hidden Valley being the lowest. The results differ if high wind events are included with Hidden Valley having the highest design value and Cowtown the lowest. Expected exceedance is the methodology to compare ambient PM_{10} data to the NAAQS and is the form of the standard. The computational method was performed on all data and data excluding potential wind-blown exceedance days. The results indicate Cowtown has the highest expected exceedance rate of the three site while White and Parker has the lowest. This conforms to the data presented in Table 5.2 describing number of recorded exceedances during the period. Although 3 years of data are necessary to assess the data according to the PM_{10} NAAQS, all indicate a potential violation of the standard.

Table 5.3 - PM_{10} Design Day & Expected Exceedances

Site	Sample Count	Design Concentration Value Rank	Design Concentration (All Data/No-Wind)	Expected Exceedance (All Data/No-Wind)
Cowtown	362	Second High	357/272	35.5/32.7
Hidden Valley	311	Highest Value	278.2/234.6	17.7/15.4
White & Parker	299	Highest Value	364.4/364.4	9.8/5.0

Table 5.4 presents recorded exceedance days at each site identifying the meteorological condition associated with the measured PM_{10} value. The color coding for the table is as follows: red indicates high wind, blue indicates stagnation, and yellow indicates a combination high wind and stagnation (for example, stagnant conditions during the morning hours and high winds in the afternoon). At Cowtown and Hidden Valley the stagnation conditions present the most common cause of exceedances while White and Parker is evenly distributed between high wind and stagnation conditions.

Table 5.4 – PM_{10} Exceedance Days with Meteorological Classification ($\mu g/m^3$)
(Red – High Wind, Blue - Stagnation, Yellow – Combination High Wind and stagnation)

DATE	CWTN TEOM PM10	DATE	HV PM10	DATE	W&P PM10
7/3/2014	**540.8**	**7/3/2014**	**278.2**	**6/25/2014**	**364.4**
6/18/2014	357.0	6/21/2014	234.6	6/24/2014	289.2
4/18/2015	272	6/24/2014	220.7	9/4/2014	253.9
11/28/2014	271.9	7/23/2014	200.4	5/2/2015	242.2
6/23/2014	268.4	7/1/2014	189.6	7/3/2014	217.5
4/5/2015	266.9	6/16/2014	189.3	9/6/2014	169.4
11/9/2014	265.7	4/18/2015	178.7	9/27/2014	165.8

4/27/2015	243.7	6/26/2014	176.7	11/20/2014	161.1
4/16/2015	237.5	6/2/2015	176.5		
6/17/2014	235.5	8/7/2014	173.1		
7/25/2014	234.8	11/25/2014	168.6		
11/11/2014	208.8	7/2/2014	166.9		
11/7/2014	198.4	6/30/2014	165.5		
6/26/2014	196.9	8/11/2014	157.2		
4/13/2015	192.6	7/12/2014	155.7		
3/16/2015	186.8				
11/25/2014	180.6				
5/10/2015	178.7				
11/19/2014	177.2				
8/9/2014	176.8				
4/14/2015	176.5				
3/25/2015	176.1				
6/14/2014	174.2				
6/15/2014	170.5				
11/20/2014	170.1				
10/19/2014	169.2				
6/13/2014	167.3				
4/19/2015	167				
6/21/2014	166.8				
4/22/2015	165				
11/3/2014	160.0				
11/18/2014	159.1				
8/29/2014	158.9				
7/8/2014	158.7				
6/16/2014	157.4				
	Sum/%		Sum/%		Sum/%
Combination	8/22.9		3/20.0		0/0.0
High Wind	3/8.6		2/13.3		4/50.0
Stagnation	24/68.6		10/66.7		4/40.0

Table 5.5 summarizes $PM_{2.5}$ data collected at each site in the study. The data presented includes the number of recorded exceedances of the NAAQS, the annual average, the maximum value recorded, and the 98th percentile value for comparison to the 24-Hour NAAQS. $PM_{2.5}$ filter data are included in the table to illustrate the general agreement between the filter data and the Cowtown $PM_{2.5}$ E-BAM. In this case annual averages and maximum values are very similar. The Hidden Valley $PM_{2.5}$ data show a greater number of exceedances during the monitoring period, at three, than the White and Parker and Cowtown sites, both with one. The annual average concentrations vary by approximately 2µg/m^3 between the three sites with Cowtown being the highest and White and Parker the lowest. The 98th percentile value is similar between sites with Hidden Valley being the highest and White and Parker the lowest with a range of approximately 4µg/m^3. All three sites show compliance with the current annual NAAQS.

Table 5.5 – $PM_{2.5}$ Summary Data

	CWTN EBAM $PM_{2.5}$	HV $PM_{2.5}$	W&P $PM_{2.5}$	CWTN Filter $PM_{2.5}$
# Exceedances	1	3	1	1
Average (µg/m^3)	11.0	10.0	9.1	11.8
Max Value (µg/m^3)	44.8	48.7	50.9	48.7
98th Percentile	29.0	30.6	24.9	28.5

Table 5.6 presents recorded exceedance days at each site identifying the meteorological condition associated with the measured $PM_{2.5}$ value. The color coding for the table is as follows: red indicates high wind, blue indicates stagnation, and yellow indicates a combination high wind and stagnation. Stagnation conditions led to the majority of exceedances recorded for $PM_{2.5}$. The magnitude of the maximum value for each site is generally similar indicating similar exposure for each location.

Table 5.6 – $PM_{2.5}$ Exceedance Day with Meteorological Classification (µg/m^3)

DATE	CWTN EBAM $PM_{2.5}$	DATE	HV $PM_{2.5}$	DATE	W&P $PM_{2.5}$	DATE	CWTN Filter $PM_{2.5}$
4/27/2015	44.8	7/3/2014	48.7	7/3/2014	50.9	11/28/2014	48.7
		4/16/2015	39.5				
		11/25/2014	39.5				
	Sum by Type		Sum by Type		Sum by Type		Sum by Type
Combination	0		0				
High Wind	0		1		1		
Stagnation	1		2				1

(Red – High Wind, Blue - Stagnation, Yellow – Combination High Wind and stagnation)

5.1.2 Evaluation of Highest Concentration Days

A summary of the 10 highest PM_{10} values recorded at each site is presented in Table 5.7. The table provides a summary including all data and a summary excluding exceedances resulting from potential high-wind exceptional events. Cowtown and Hidden Valley recorded exceedances on each of the top 10 days while White and Parker recorded 8. The average at Cowtown was the highest among the three sites at 295.9µg/m^3 with White and Parker second highest at 214.8µg/m^3. Hidden Valley showed the lowest average at 201.8µg/m^3. Cowtown also shows the highest maximum value at 540.8µg/m^3 with White and Parker second highest at 364.4µg/m^3. The maximum values at Cowtown and Hidden Valley were recorded on high wind days while the maximum value at White and Parker was recorded during stagnation conditions. A comparison of the maximum concentrations on stagnant days shows that White and Parker recorded the highest maximum concentration relative to other sites (White and Parker 364.4 µg/m^3 Cowtown 357 µg/m^3 and Hidden Valley 234.6 µg/m^3). This illustrates that although White and Parker generally had less exceedances during the period, the magnitude of those exceedances is slightly greater than Cowtown. Table 5.8 illustrates measured concentrations and meteorological conditions on the highest 10 days at each site.

Table 5.7 - PM_{10} Summary of 10 Highest Values (All Data/Excluding Wind Days)

Highest 10 Values	CWTN PM_{10}	HV PM_{10}	W&P PM_{10}
# Exceed	10/9	10/9	8/4
Average (µg/m^3)	295.9/223.4	201.8/190.8	214.8/185.2
Max Value (µg/m^3)	540.8/357.0	278.2/234.6	364.4/364.4

Table 5.8 – PM_{10} Meteorological Conditions Highest 10 Days (µg/m^3)

DATE	CWTN PM_{10}	DATE	HV PM_{10}	DATE	W&P PM_{10}
7/3/2014	540.8	7/3/2014	278.2	6/25/2014	364.4
6/18/2014	357.0	6/21/2014	234.6	6/24/2014	289.2
4/18/2015	272	6/24/2014	220.7	9/4/2014	253.9
11/28/2014	271.9	7/23/2014	200.4	5/2/2015	242.2
6/23/2014	268.4	7/1/2014	189.6	7/3/2014	217.5
4/5/2015	266.9	6/16/2014	189.3	9/6/2014	169.4
11/9/2014	265.7	4/18/2015	178.7	9/27/2014	165.8
4/27/2015	243.7	6/26/2014	176.7	11/20/2014	161.1
4/16/2015	237.5	6/2/2015	176.5	11/19/2014	142.8
6/17/2014	235.5	8/7/2014	173.1	6/26/2014	141.7

(Red – High Wind, Blue – Stagnation, Yellow – Combination High Wind and stagnation)

Pinal County generated pollution rose plots for the top three exceedance days for each site. Wind and PM_{10} data were retrieved from the County data collection system. Wind data collected at the Cowtown site were used for Cowtown and White and Parker analysis. Considering the

sites are separated by only 2.4 km, wind at Cowtown should closely represent White and Parker. Wind data collected at the County's Stanfield site was used to represent Hidden Valley. Although the sites are separated by approximately 7 km the sites are located in similar drainages and similar terrain and the winds at Stanfield are expected to adequately represent Hidden Valley.

Figures 5.1 through 5.3 depict a Cowtown PM_{10} frequency distribution relative to wind direction on an exceedance day. July 3, 2014 was characterized by high winds and shows variation in the direction of primary contribution. The plots for June 18, 2014 and April 18, 2015 illustrate directional contribution on exceedance days characterized as stagnant. The June 18, 2014 plot illustrates a typical situation with contributions from the south to south east which reflects impacts from the nearby source area. Additionally, the plot shows contributions from the north east indicating other local activity not associated with the source area to the south. The April 18, 2015 plot illustrates a stagnation exceedance day with typical south to south east contribution.

Figure 5.1 Cowtown 07/03/2014

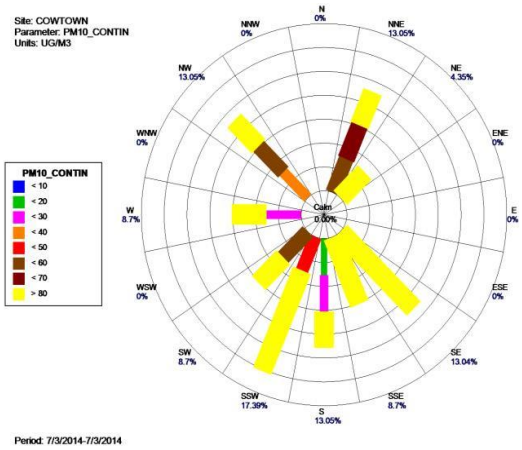


Figure 5.2 Cowtown 06/18/2014

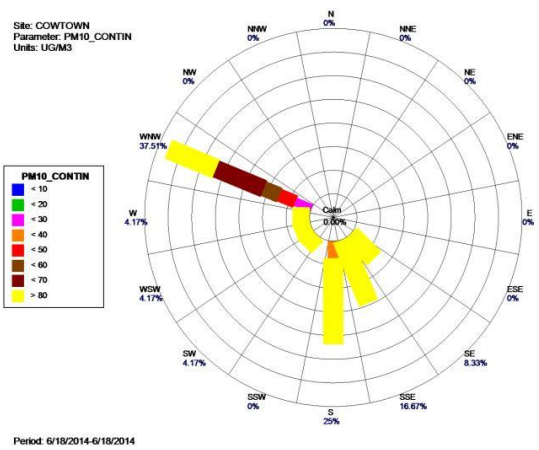
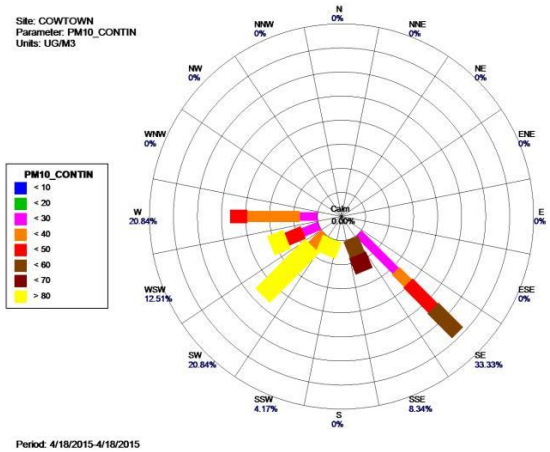


Figure 5.3 Cowtown 04/18/2015



Figures 5.4 through 5.6 depict similar plots for Hidden Valley PM_{10}. July 3, 2014 was characterized by high winds and shows variation in the direction of primary contribution. The plots for June 21 and June 24, 2014 illustrate directional contribution on stagnation exceedance days. Both plots indicate variability in the direction of contribution but with a primary influence from the east (varying from north east to south east). This can be explained by the location of the site and its proximity to the source area directly to the east. The source area is elongated, running north to south, and extends 1500 meters north and 600 meters south of the site. This configuration is best shown in Figure 3.3.

Figure 5.4 Hidden Valley 07/03/2014

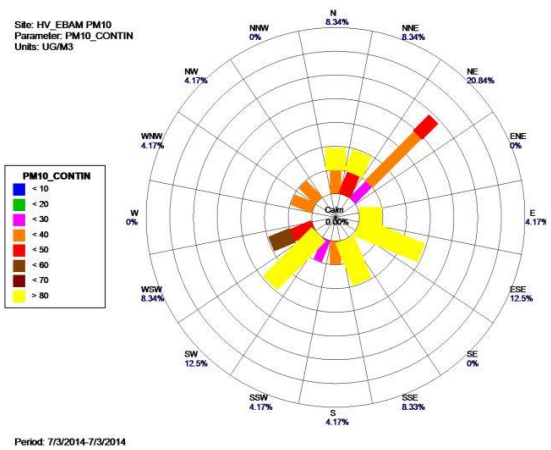


Figure 5.5 Hidden Valley 06/21/2014

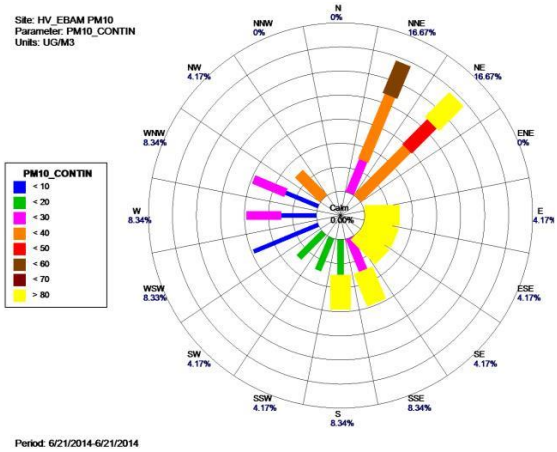
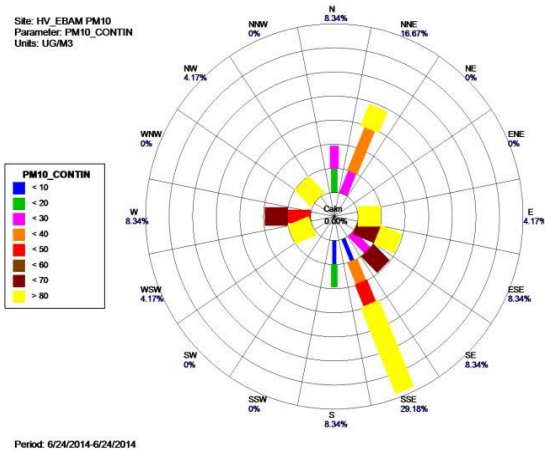


Figure 5.6 Hidden Valley 06/24/2014



Figures 5.7 through 5.10 depict similar plots for White and Parker PM_{10} with the addition of a fourth plot showing July 3, 2014. July 3, 2014 was characterized by high winds and shows variation in the direction of primary contributions with greater influence from the south west. The plots for June 25, 2014 and June 24, 2014 illustrate directional contribution on stagnation exceedance days. Both plots indicate strong contribution from the south east indicating the

Cowtown source area influence. September 9, 2014 also shows contribution from the south east but indicates additional contribution from the south suggesting the effect of other local activity.

Figure 5.7 White & Parker 06/25/2014

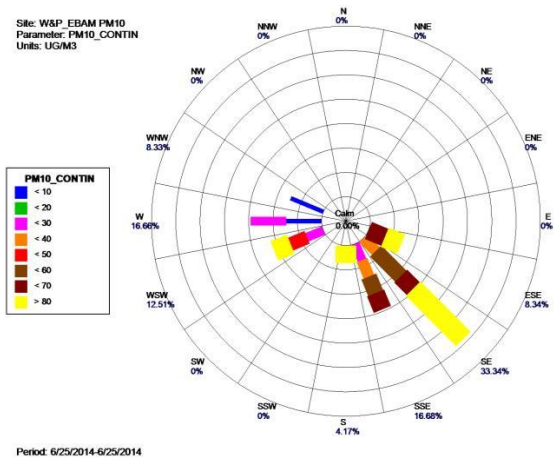


Figure 5.8 White & Parker 06/24/2014

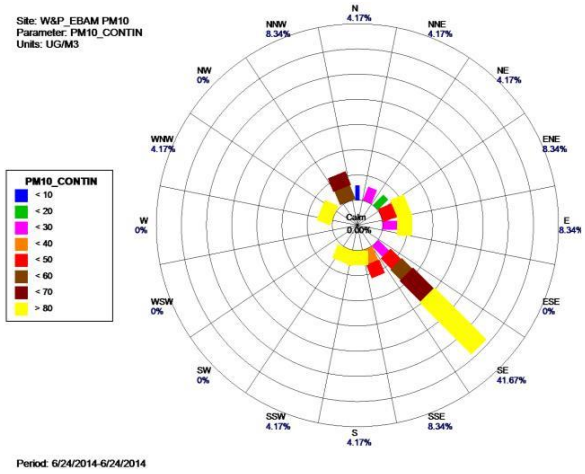


Figure 5.9 White & Parker 09/04/2014

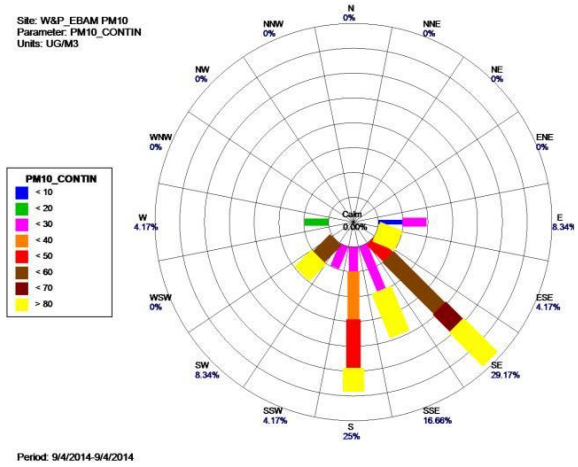
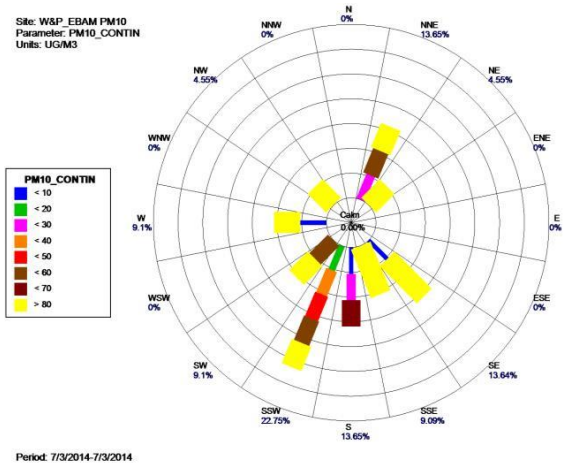


Figure 5.10 White & Parker 07/03/2014



A summary of the 10 highest $PM_{2.5}$ values recorded at each site is presented in Table 5.9. Cowtown and White and Parker recorded exceedances on one of the top 10 days while Hidden Valley recorded 3. The average at Hidden Valley was the highest among the three sites at 33.3µg/m^3 with Cowtown (E-BAM) and Cowtown (Filter) second highest with average concentrations of 31.1µg/m^3 and 30.7 µg/m^3, respectively. White and Parker showed the lowest average at 27.6µg/m^3. White and Parker recorded the highest maximum value at 50.9µg/m^3 with Hidden Valley and Cowtown (filter) second highest at 44.8µg/m^3. The maximum values at

White and Parker and Hidden Valley were recorded on high wind days while the maximum values at Cowtown were recorded during stagnation conditions. Table 5.10 illustrates the measured concentration and meteorological conditions on the highest 10 days at each site.

Table 5.9 – $PM_{2.5}$ Summary of 10 Highest Values (µg/m^3)

Highest 10 Values	CWTN EBAM $PM_{2.5}$	HV $PM_{2.5}$	W&P $PM_{2.5}$	CWTN Filter $PM_{2.5}$
# Exceed	1	3	1	1
Average	31.1	33.3	27.6	30.7
Max Value	44.8	48.7	50.9	48.7

Table 5.10 – $PM_{2.5}$ Meteorological Conditions Highest 10 days (µg/m^3)

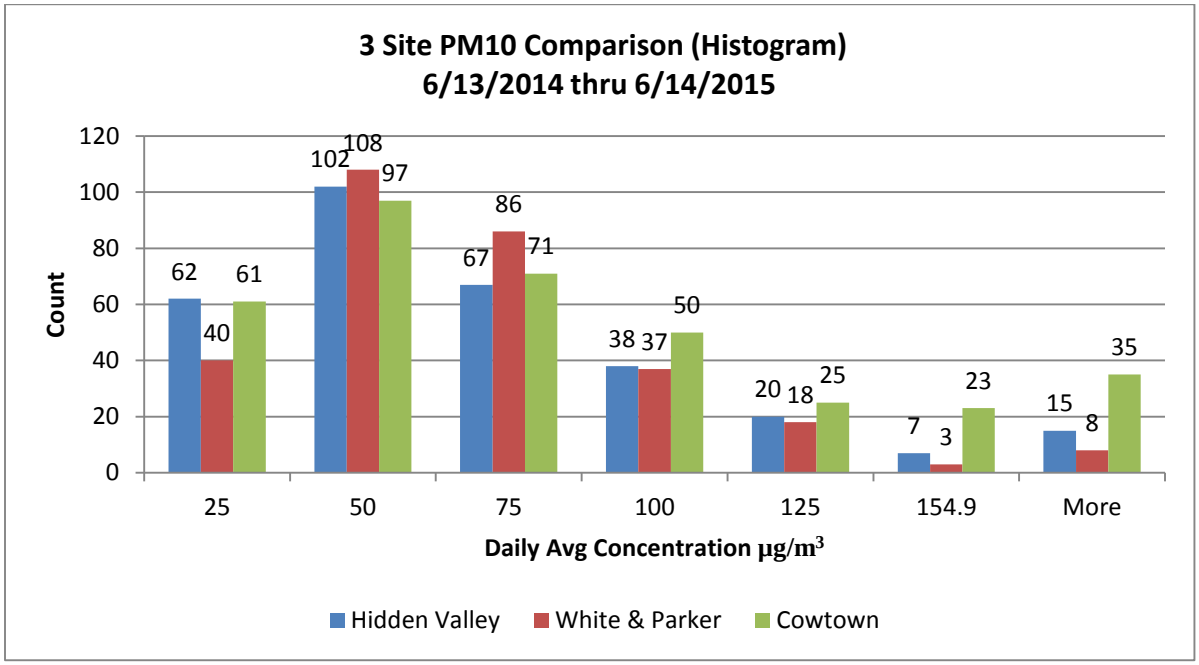
DATE	CWTN EBAM $PM_{2.5}$	DATE	HV $PM_{2.5}$	DATE	W&P $PM_{2.5}$	DATE	CWTN Filter $PM_{2.5}$
4/27/2015	44.8	7/3/2014	48.7	7/3/2014	50.9	11/28/2014	48.7
2/3/2015	35.3	4/16/2015	39.5	12/2/2014	32.5	8/9/2014	33.4
6/18/2014	34.3	11/25/2014	39.5	11/28/2014	27.1	11/29/2014	30.5
7/3/2014	31.9	6/24/2014	32.5	6/23/2014	25.8	11/9/2014	28.6
12/5/2014	30.9	10/24/2014	31.0	6/4/2015	25.7	11/7/2014	28.5
2/4/2015	29.0	11/26/2014	30.6	7/17/2014	24.9	11/18/2014	28.3
12/9/2014	27.9	4/14/2015	30.5	10/29/2014	22.8	11/20/2014	28.1
2/5/2015	25.8	10/30/2014	27.2	10/28/2014	22.2	8/11/2014	27.4
4/19/2015	25.7	4/10/2015	26.8	6/24/2014	22.1	11/25/2014	27.3
4/5/2015	25.1	11/8/2014	26.5	7/25/2014	22.1	11/27/2014	26.5

5.1.3 Comparison for Period of Record

The histograms presented in Figures 5.11 and 5.12 display the distribution by concentration range for PM_{10} and $PM_{2.5}$. Both figures include data collected during the year-long study. These figures provide the distribution of particulate concentrations over defined ranges thereby allowing for a review of the entire range of daily measurements collected.

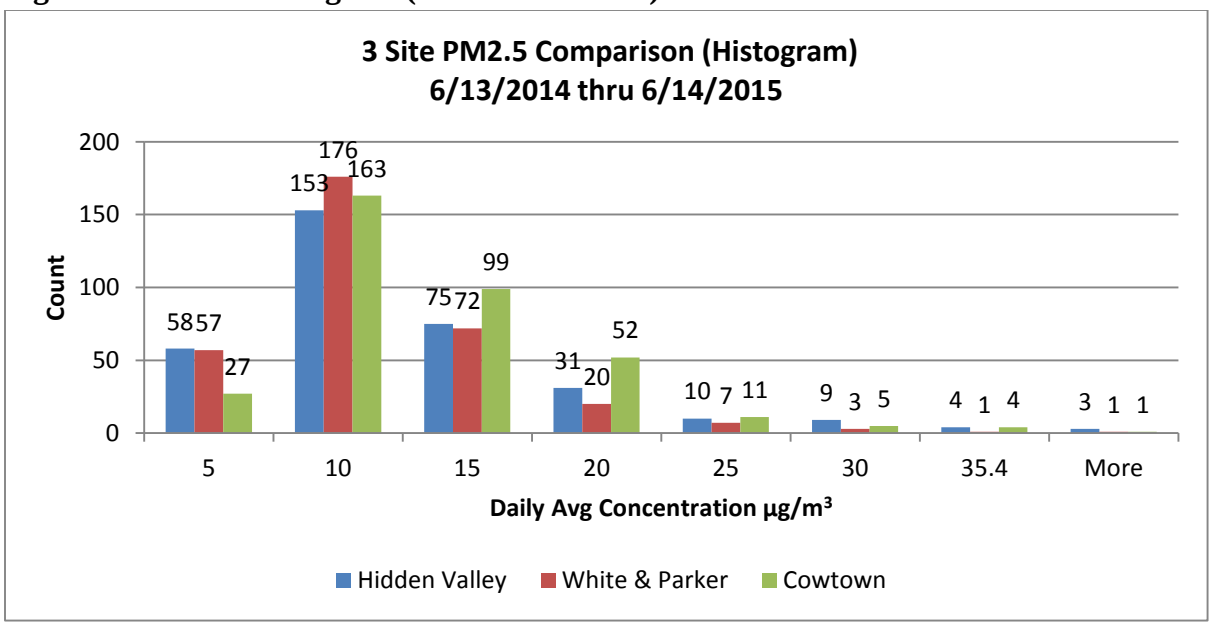
As discussed in section 5.1.1 Cowtown PM_{10} shows the greatest number of exceedances, 35, while Hidden Valley and White and Parker are 15 and 8, respectively. The distribution of measurements is similar below 100µg/m^3, with White and Parker having the most (234) and Hidden Valley (231) and Cowtown (229) following behind. The Cowtown site has the most measurements over 100µg/m^3 with 133, followed by Hidden Valley (80) and White and Parker (66). These results follow what was seen with the number of violating measurements.

Figure 5.11 PM_{10} Histogram (Period of Record)



Similarly to what was seen with the $PM_{2.5}$ exceedances, the Hidden Valley site had the most measurements that exceeded 25µg/m^3 with 26. The Cowtown site and White and Parker site had 21 and 12 measurements respectively. Cowtown had the most measurements under 25µg/m^3 with 341, followed by White and Parker (325) and Hidden Valley (317).

Figure 5.12 $PM_{2.5}$ Histogram (Period of Record)



5.1.4 Seasonal Analysis

Table 5.11 displays the monthly PM_{10} exceedances for the Cowtown, Hidden Valley and White and Parker sites. A monthly pattern is not readily apparent in the data, except all three sites show an elevated number of exceedances in June, which is typically the driest month of the year. Seasonal average concentration comparisons are explored further below.

Table 5.11 PM_{10} Exceedances by Month

Month	CWTN PM_{10} # Exceed	HV PM_{10} # Exceed	W&P PM_{10} #exceed
Jan	0	0	0
Feb	0	0	0
Mar	2	0	0
Apr	8	1	0
May	1	0	1
Jun	9	6	2
Jul	3	5	1
Aug	2	2	0
Sep	0	0	3
Oct	1	0	0
Nov	9	1	1
Dec	0	0	0
Sum	35	15	8

Table 5.12 displays the seasonal average PM_{10} concentrations for the Cowtown, Hidden Valley and White and Parker sites. The dry season time frame, October thru November and March thru June was chosen to reflect the months with least amount of rain. The winter season time frame, December thru February, is dominated by inversion conditions and the lowest annual temperatures. The monsoon season, July thru September, is dominated by high winds from localized thunderstorms and the highest annual temperatures. All three sites demonstrate similar seasonal variation.

Table 5.12 PM_{10} Seasonal Averages by Site

Seasonal Averages	CWTN PM_{10} (ug/m^3)	HV PM_{10} (ug/m^3)	W&P PM_{10} (ug/m^3)
Dry Season(Oct-Nov & March-June)	68.5	63.7	66.0
Winter (Dec-Feb)	34.2	34.8	38.1
Monsoon (July-Sept)	73.8	79.0	60.5

Table 5.13 displays the monthly $PM_{2.5}$ exceedances for the Cowtown, Hidden Valley and White and Parker sites. A monthly pattern is not readily apparent in the data. Seasonal average concentration comparisons are explored further below.

Table 5.13 $PM_{2.5}$ Exceedances by Month

Month	CWTN EBAM $P_{2.5}$	HV $PM_{2.5}$	W&P $PM_{2.5}$	CWTN Filter $PM_{2.5}$
Jan	0	0	0	0
Feb	0	0	0	0
Mar	0	0	0	0
Apr	1	1	0	0
May	0	0	0	0
Jun	0	0	0	0
Jul	0	1	1	0
Aug	0	0	0	0
Sep	0	0	0	0
Oct	0	0	0	0
Nov	0	1	0	1
Dec	0	0	0	0
Sum	1	3	1	1

Table 5.14 displays the seasonal average $PM_{2.5}$ concentrations for the Cowtown, Hidden Valley and White and Parker sites. The dry season time frame, October thru November and March thru June was chosen to reflect the months with least amount of rain. The winter season time frame, December thru February, is dominated by inversion conditions and the lowest annual temperatures. The monsoon season, July thru September, is dominated by high winds from localized thunderstorms and the highest annual temperatures. Given the fairly small numerical differences from season to season it is difficult to distinguish patterns. Still the average concentrations for the monsoon season are relatively consistent across all three sites and as with the PM_{10} data the winter season generally has the lowest seasonal average.

Table 5.14 $PM_{2.5}$ Seasonal Average by Site

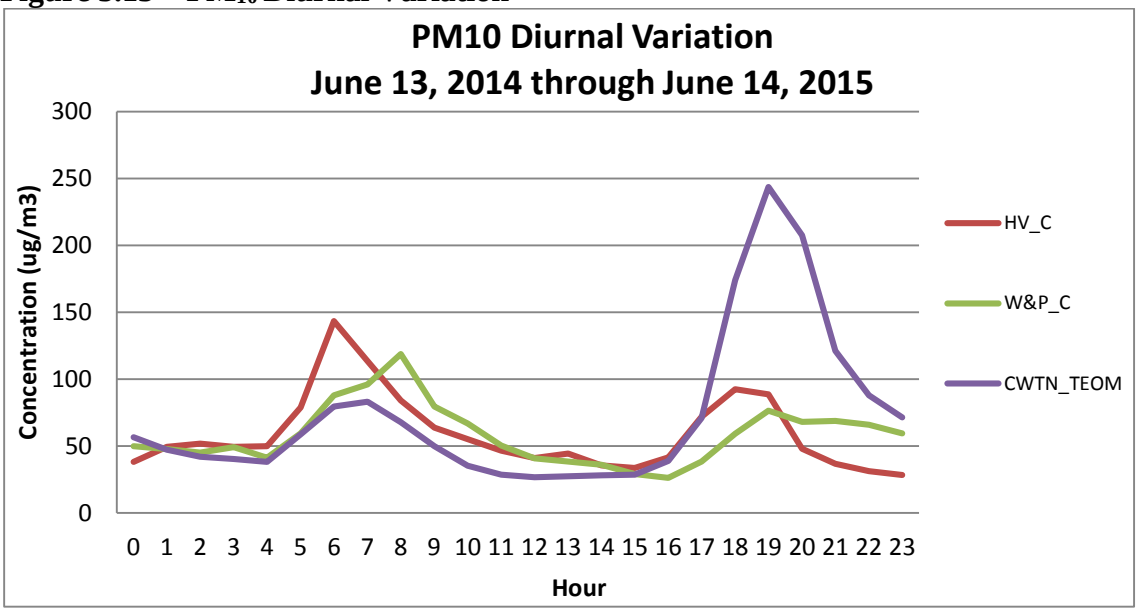
Seasonal Averages	CWTN EBAM $PM_{2.5}$ ($\mu g/m^3$)	HV $PM_{2.5}$ ($\mu g/m^3$)	W&P $PM_{2.5}$ ($\mu g/m^3$)	CWTN Filter $PM_{2.5}$ ($\mu g/m^3$)
Dry Season(Oct-Nov & March-June)	12.4	10.7	8.6	13.6
Winter (Dec-Feb)	11.4	8.2	7.8	10.3
Monsoon (July-Sept)	7.6	9.3	10.1	9.9

5.1.5 Temporal Variation

Figure 5.13 depicts PM_{10} temporal variation at Hidden Valley, White and Parker and Cowtown. The sunrise spike is distinguishable at all three sites and tapers off by mid-morning at all three sites. While the evening spike is not as significant at Hidden Valley and White Parker when compared to Cowtown, the increase is distinguishable at all three sites and occurs at approximately the same time of day.

As mentioned previously in this document, solar system operation lead to numerous missing data points as power production during the fall and winter months was inadequate to run both PM_{10} and $PM_{2.5}$ samplers. In those cases the PM_{10} sampler was maintained. Therefore, temporal variation PM2.5 is not presented in this section as the analysis relies on a complete set of hourly averaged data. It is expected that $PM_{2.5}$ would follow a similar trend.

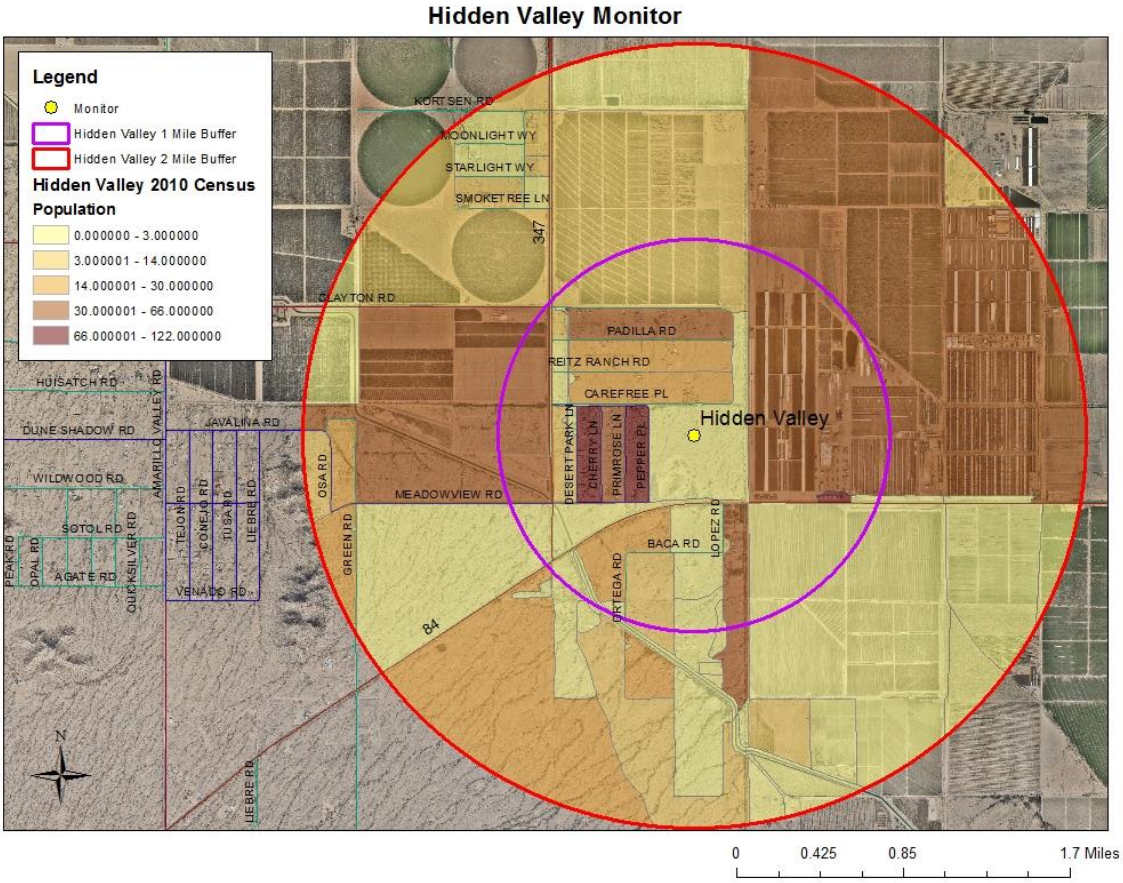
Figure 5.13 – PM_{10} Diurnal Variation



5.2 Representation of Population

One consideration of all monitoring sites is the population that it represents. It is important to consider both the current population and the potential population over the long-term existence of the site. Figures 5.14, 5.15 and 5.16 illustrate the population around each of the Cowtown, Hidden Valley and White and Parker sites. The data comes from the 2010 census and has both one and two mile radius designations.

Figure 5.14 – Hidden Valley Population

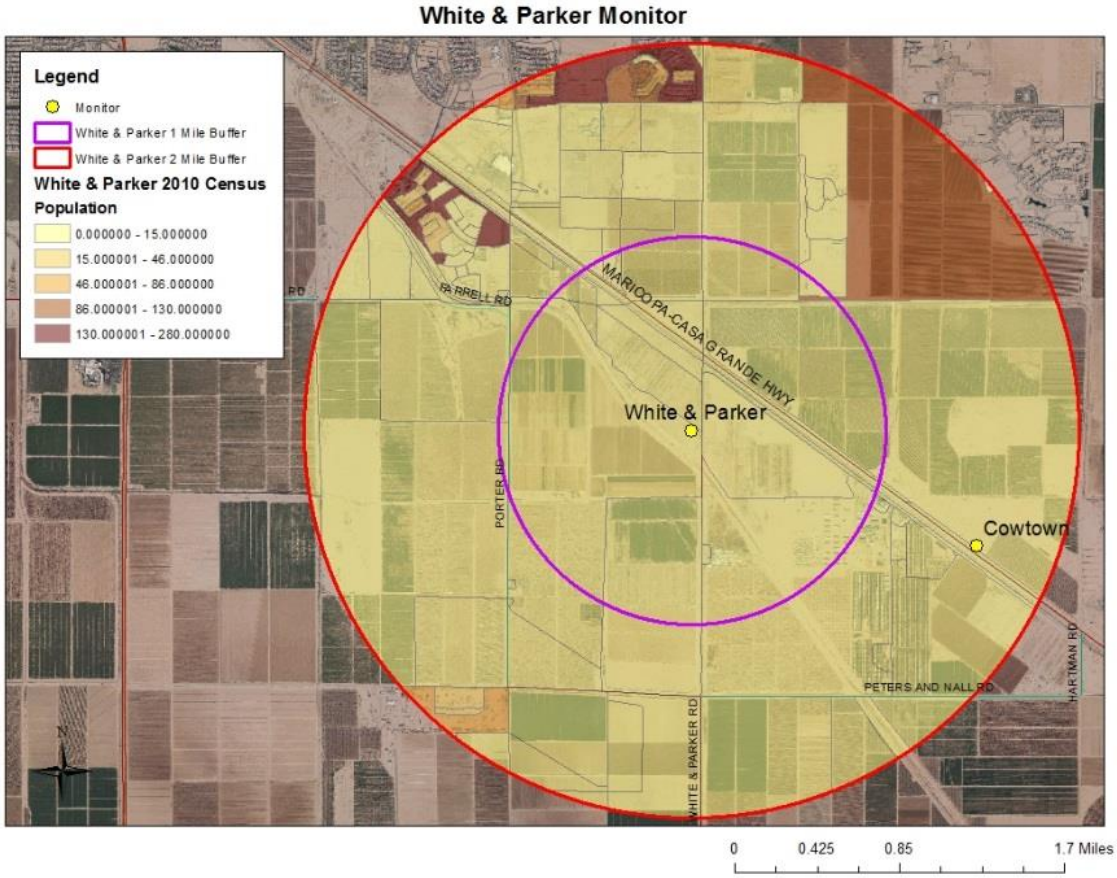


The Hidden valley site has a small population (747 people) located within the one mile radius of the site. There is a residential area to the West and North West of the site that constitutes the majority of the population. Expanding the radius to the two mile mark only adds an additional 126 people. These small population values make the Hidden Valley site representative of the smallest current population of the three sites.

Given that this area saw very little to no growth in the most recent construction boom (~2000 to 2006) it is unlikely that significant population changes will occur in the area in the near future.

Section 5.5 discussed potential future land use changes near the monitoring site.

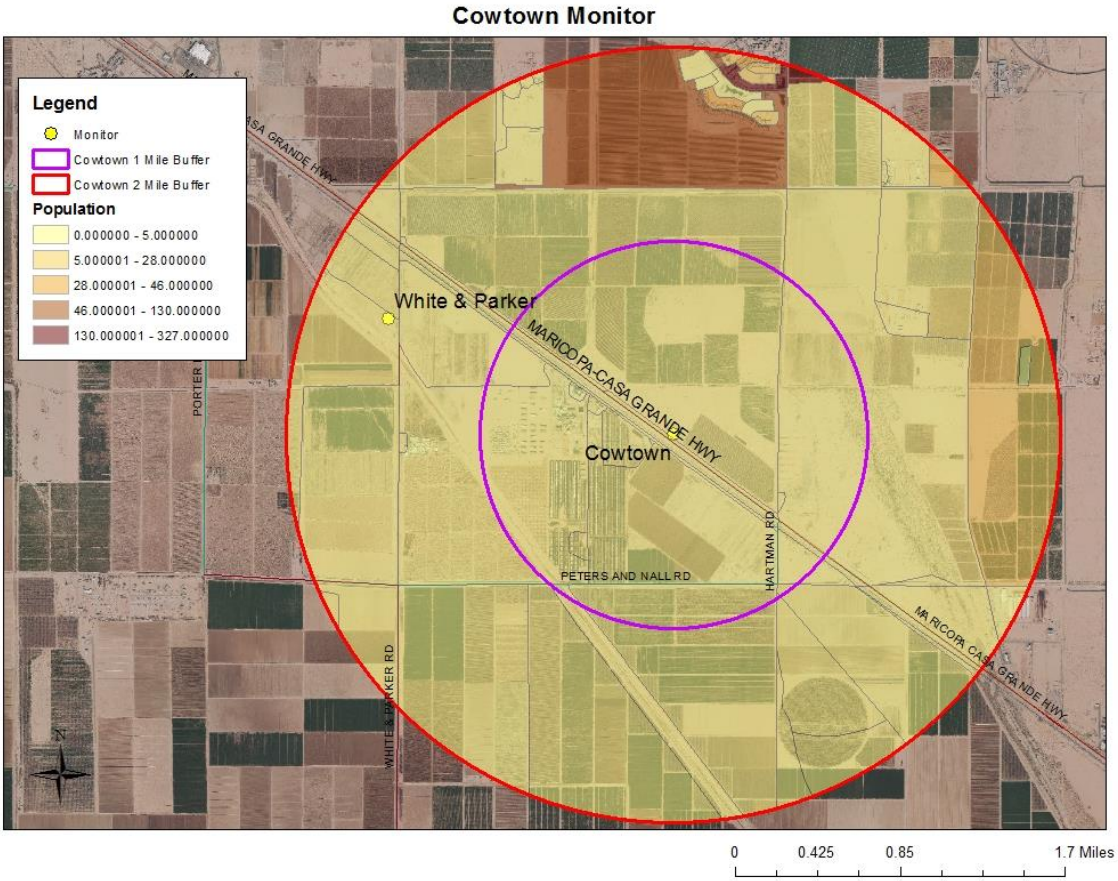
Figure 5.15 – White and Parker Population



Relative to the Hidden Valley site, the White and Parker site has a very small population (142 people) within the first mile radius. Within the second mile radius of the site is an additional 1757 people which makes the total population within two miles of the White and parker site larger than the Hidden Valley and Cowtown sites. Most of the population is located in subdivisions to the North and North East of the site. These subdivisions are not yet completed and it is expected that population increase will be seen in future years.

In addition to those subdivisions already being constructed, the City of Maricopa has approved and planned for three additional housing developments within the two mile radius of the White and Parker site. These new developments will have a combined 11,142 lots. While not all of the lots will fall within the 2 mile radius of the White and Parker site, a significant portion will. These new lots will add to the already larger population base and make the White and Parker site representative of a significantly larger population.

Figure 5.16 – Cowtown Population



The Cowtown site is very similar to the White and Parker site in terms of representing a population. In fact, because the sites are so close to each other, most of the population in the White and Parker two mile radius is also included in the Cowtown two mile radius. There is currently no population within one mile of the Cowtown site.

The future of the Cowtown site should mirror that of the White and Parker site. The same three subdivisions that will be built around White and Parker will be around Cowtown as well. As with the White and Parker site, the future population of the Cowtown site should greatly exceed that of the Hidden Valley site.

Table 5.15 is a simple summary of the current populations within both a one and two mile radius of each site. As discussed above, both White and Parker and Cowtown have very low populations in the first mile but significantly more in the second mile. The Hidden Valley site has the bulk of its population within the first mile.

Table 5.15 – Population within 1 and 2 Miles

Monitor Locations	2 Mile Buffer Population	1 Mile Buffer Population
Hidden Valley	873	747
White & Parker	1899	142
Cowtown	1049	0

5.3 Longevity of Site

The Hidden Valley property is owned by the County and offers marginal security and potential for long term use. Because the property boundary is not controlled, general access to the area is possible and likely. Security fencing was used during the evaluation study to mitigate risk of vandalism. The County property to the south is used as a highway vehicle storage yard, maintenance shop and office building. Also on the property approximately 0.1 miles south is the County's raw materials pit where road materials are extracted and stored. Long term plans for the property include northern expansion of the pit as material needs progress. This expansion is not expected to affect the site for many years.

The White and Parker property is owned by the City of Maricopa and the site offers long term stability. The City has described limited potential for development of the property in future years even considering the projected growth for the City of Maricopa. Future plans for the area include a road interchange with the Casa Grande-Maricopa Highway that does not affect the site location. Security at the location is marginal as the property boundary is not controlled and general access to the area is possible and likely. Security fencing was used during the evaluation study to mitigate risk of vandalism.

5.4 Scale of Representation

The following evaluation provides a justification to classify the White and Parker and Hidden Valley site as middle scale impact site for the purpose of monitoring PM_{10} and $PM_{2.5}$ concentrations.

40 CFR Part 58 Appendix D defines monitoring objectives and spatial scales for PM_{10} and $PM_{2.5}$ monitoring sites. The appendix describes several monitoring objectives including highest concentration, high population density, impact of significant source categories, general background, pollution transport, and impacts on visibility. The spatial scale of representativeness correlate with the objective and are "described in terms of the physical dimension of the air parcel nearest to a monitoring site throughout which actual pollutant concentrations are reasonably similar". These scales include micro scale, middle scale, neighborhood scale, urban scale, regional scale, and national and global scale. This evaluation looks specifically at characteristics of the neighborhood and middle scale.

In addition to the discussion above, 40 CFR 58.30(a) states that "$PM_{2.5}$ measurement data from all eligible monitors are comparable to the 24-hour $PM_{2.5}$ NAAQS. $PM_{2.5}$ measurement data from all eligible monitors that are representative of area-wide air quality are comparable to the annual

$PM_{2.5}$ NAAQS. Consistent with appendix D to this part, section 4.7.1, when micro- or middle-scale $PM_{2.5}$ monitoring sites collectively identify a larger region of localized high ambient $PM_{2.5}$ concentrations, such sites would be considered representative of an area-wide location and, therefore, eligible for comparison to the annual $PM_{2.5}$ NAAQS. $PM_{2.5}$ measurement data from monitors that are not representative of area-wide air quality but rather of relatively unique micro-scale, or localized hot spot, or unique middle-scale impact sites are not eligible for comparison to the annual $PM_{2.5}$ NAAQS. $PM_{2.5}$ measurement data from these monitors are eligible for comparison to the 24-hour $PM_{2.5}$ NAAQS.

For example, if the $PM_{2.5}$ monitoring site is adjacent to a unique dominating local $PM_{2.5}$ source or can be shown to have unique annual average concentrations representative of a smaller than neighborhood spatial scale, then data from a monitor at the site would only be eligible for comparison to the 24hour $PM_{2.5}$ NAAQS (*citation 40CFR 58.30(a).* However, if there are potentially many such small scale impacts throughout the monitoring region, then the established monitoring site may be judged to be representative of communitywide exposure and eligible for comparison to the annual standard.

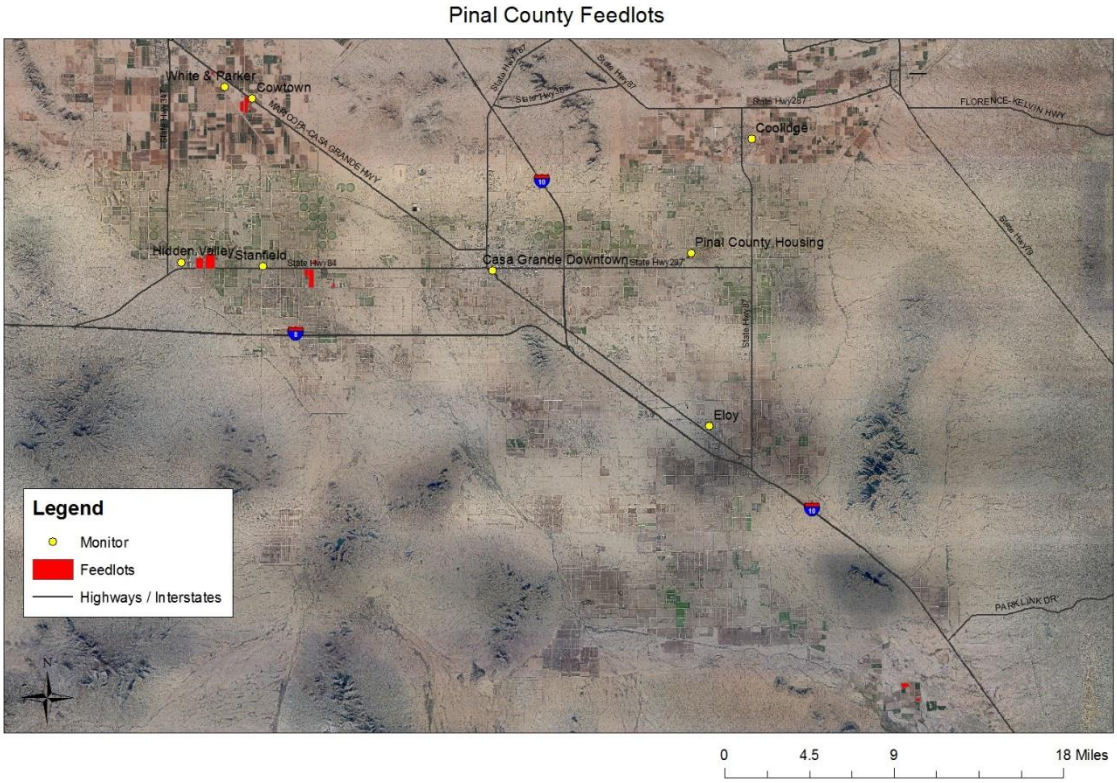
Pinal County has evaluated the comparability of PM_{10} and $PM_{2.5}$ data and site characteristics of the White and Parker and Hidden Valley Sites on four criteria: the characterization of area-wide monitoring, the spatial scale, localized hot spot conditions, and the uniqueness of the site.

5.4.1 White and Parker

Area-Wide Monitoring

40 CFR 58.1 defines area-wide as "all monitors sited at neighborhood, urban, and regional scales, as well as those monitors sited at either micro- or middle-scale that are representative of many such locations in the same CBSA". In the vicinity of the White and Parker site various PM_{10} and $PM_{2.5}$ sources exist, including, a feedlot, an ethanol/ grain processing facility, a commercial composting facility, agricultural fields, and paved and unpaved roads. The White and Parker site is representative of a unique mix of sources not found elsewhere in the CBSA, Pinal County, or $PM_{2.5}$ non-attainment area As with the Cowtown site, the dominate PM_{10} and $PM_{2.5}$ source in the area is the feed lot operation. Several other feed lots operate in Pinal County as identified in Figure 5.17. From the figure, 4 general areas in the county have operational feed lots. None of these areas include the additional sources discussed above nor do those 4 areas with feedlots constitute "many such locations in the same CBSA".

Figure 5.17 – Feedlots Located in Pinal County



Spatial Scale

40 CFR Part 58, Appendix D 4.6 (b) (1) and 4.7.1(c) (3)) describe spatial scales for both PM_{10} and $PM_{2.5}$. Neighborhood scale sites should generally characterize pollutant measurements that would represent "conditions throughout some reasonably homogenous urban sub region with dimensions of a few kilometers" Based on a review of land use and emission sources in the immediate area around the site, the District believes that the area of reasonably homogenous concentrations around this monitor is considerably smaller than a few kilometers in diameter or width. Moreover, the area around the monitor, even extending out several kilometers, is definitely not associated with communitywide exposure. This is further evident by the significant reduction in measured PM_{10} between the White and Parker site and the Maricopa site located some 6 km (4 miles) to the north east as shown in Table 5.17 below.

Table 5.17 – PM_{10} White and Parker/Maricopa

	WP PM_{10}	MCPA PM_{10}
# Exceed	8	1
Average ($\mu g/m^3$)	58.2	38.0
Max Value ($\mu g/m^3$)	364.4	170.2

The nearest $PM_{2.5}$ monitoring site is Casa Grande Downtown located in an urbanized area some 27 km (17 miles) to the south east. A comparison of these data is provided in Table 5.18 below. The values clearly indicate a unique situation at White and Parker compared to a general neighborhood scale urban monitoring site.

Table 5.18 – $PM_{2.5}$ CG and W&P

	CGDT $PM_{2.5}$	WP EB $PM_{2.5}$
# Exceed	0	1
Average (µg/m^3)	6.7	9.0
Max Value (µg/m^3)	13.9	50.9

The White and Parker site is within close proximity (0.3 to 1 km) to the various sources identified above and does not represent the conditions expected in urban subregions or communitywide population PM_{10} or $PM_{2.5}$ exposure. Furthermore, the 40 CFR Part 58 Appendix D (1.2) (d) provides the following example of a neighborhood scale site: "to determine $PM_{2.5}$ concentrations which are typical over a geographic area having relatively high $PM_{2.5}$ concentrations, a neighborhood scale site is more appropriate. Such a site would likely be located in a residential or commercial area having a high overall $PM_{2.5}$ emission density but not in the immediate vicinity of any single dominant source." It is very clear that the White and Parker site is located in the vicinity of a dominant source and does not meet this definition of neighborhood scale and communitywide exposure.

When determining the appropriate spatial scale for a particular site, the homogeneity of the particulate matter concentrations, land use, and land surface characteristics must also be considered. The White and Parker site is located near a number of particulate sources that have been shown to contribute to elevated PM_{10} and $PM_{2.5}$ concentrations at the site under stagnant or low wind conditions from the south east. Analysis of wind and pollution roses during exceedance days also shows that impact. The figures below illustrate impact on June 24th and June 25th 2015, both days identified as showing stagnant conditions with measured PM_{10} concentration of 364µg/m^3 and 289 µg/m^3. The White and Parker site is significantly influenced by the source region located upwind.

Figure 5.18 W&P Pollution Rose 6/24/2014

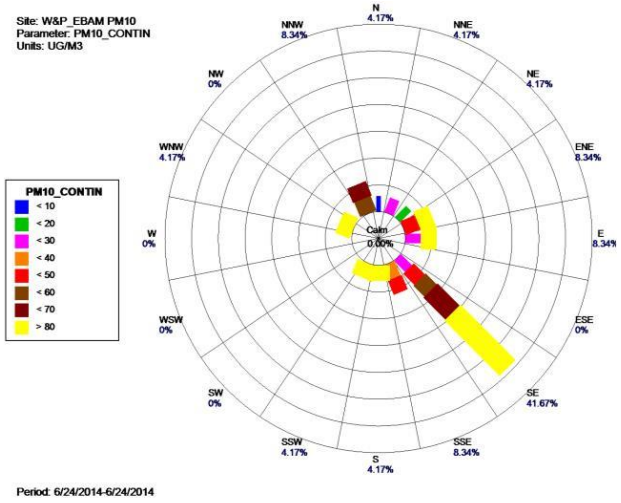
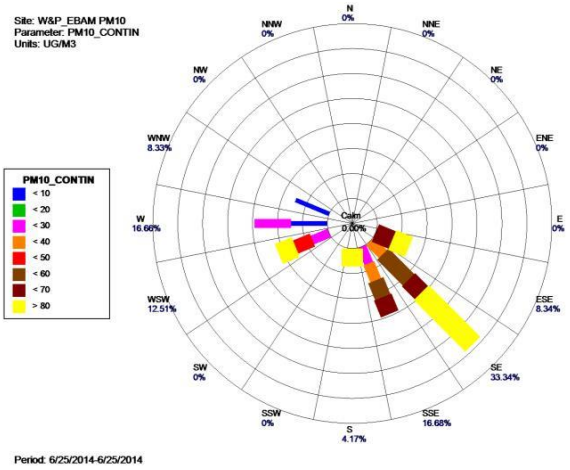


Figure 5.19 W&P Pollution Rose 6/25/2014



Due to the close proximity of known sources, the PM_{10} and $PM_{2.5}$ concentrations measured at the White and Parker site are higher in magnitude than surrounding areas and do not represent homogenous particulate concentrations in an area of a few kilometers as shown in Table 5.2 Based on this information, the White and Parker site can be considered to be representative of an area smaller than a neighborhood spatial scale and does not represent communitywide exposure. White and Parker is representative of a middle scale environment.

Localized Hot Spot

The monitoring regulations have limited discussion about "hotspots". The term is generally associated with areas of highest concentrations whether it be from mobile or multiple stationary sources. Micro scale and middle scale monitors are mentioned[2]. For the purpose of this discussion, hotspot will be treated as synonymous with monitoring locations representing either a micro or middle scale environment.

Uniqueness

PM_{10} and $PM_{2.5}$ concentrations recorded at the White and Parker site are consistently higher in magnitude than other sites in the county and are comparable in day-to-day magnitude to the Cowtown monitoring site. Table 5.19 below compares PM_{10} at White and Parker and Cowtown to illustrate the general similarity in concentration magnitude recorded at each site, note the 7/3/2014 exceedance at Cowtown was a wind driven event. Because the source contribution can differ between wind days and stagnation days it is appropriate for this analysis to compare values during similar conditions. Therefore the maximum PM_{10} value at White and Parker and the second maximum at Cowtown are used and demonstrates similar concentrations during stagnation conditions.

[2] . Federal Register / Vol. 78, No. 10 / Tuesday, January 17, 2013 / Rules and Regulations

Table 5.19 – PM_{10} Highest 10 Values; CWTN W&P (µg/m^3)

DATE	CWTN TEOM PM_{10}	DATE	WP EB PM_{10}
7/3/2014	540.8	6/25/2014	364.4
6/18/2014	357.0	6/24/2014	289.2
4/18/2015	272	9/4/2014	253.9
11/28/2014	271.9	5/2/2015	242.2
6/23/2014	268.4	7/3/2014	217.5
4/5/2015	266.9	9/6/2014	169.4
11/9/2014	265.7	9/27/2014	165.8
4/27/2015	243.7	11/20/2014	161.1
4/16/2015	237.5	11/19/2014	142.8
6/17/2014	235.5	6/26/2014	141.7

Table 5.20 below provides a like comparison for $PM_{2.5}$. The maximum values are similar but occur during different conditions. The July 3, 2014 value at White and Parker was associated with a wind event while the maximum value at Cowtown occurred on a stagnant day. In order to compare similar conditions the second high value at White and Parker, a stagnation day, is compared to the high and second high value at Cowtown. With the exception of the Cowtown maximum value, the concentrations are comparable.

Table 5.20 $PM_{2.5}$ Highest 10 Values; CWTN W&P (µg/m^3)

DATE	CWTN Filter $PM_{2.5}$	DATE	WP EB $PM_{2.5}$
11/28/2014	48.7	7/3/2014	50.9
8/9/2014	33.4	12/2/2014	32.5
11/29/2014	30.5	11/28/2014	27.1
11/9/2014	28.6	6/23/2014	25.8
11/7/2014	28.5	6/4/2015	25.7
11/18/2014	28.3	7/17/2014	24.9
11/20/2014	28.1	10/29/2014	22.8
8/11/2014	27.4	10/28/2014	22.2
11/25/2014	27.3	6/24/2014	22.1
11/27/2014	26.5	7/25/2014	22.1

The White and Parker site is representative of a relatively unique source of emissions. The monitor is immediately downwind of the "Cowtown Complex" which consists of a feed lot facility, ethanol/grain processing facility, agricultural land, unpaved roads, and a commercial composting facility located within a very localized area. This source mix represents a relatively unique situation in Pinal County. While there are other feedlots within Pinal County, it appears that the White and Parker site represents a relatively unique monitoring location due to the size, composition, and proximity of the nearby sources.

Conclusion

Based on the analysis above, the White and Parker site should be considered a relatively unique, population oriented, middle scale site.

5.4.2 Hidden Valley

Area-Wide Monitoring

40 CFR 58.1 defines area-wide as "all monitors sited at neighborhood, urban, and regional scales, as well as those monitors sited at either micro- or middle-scale that are representative of many such locations in the same CBSA". In the vicinity of the Hidden Valley site various PM_{10} and $PM_{2.5}$ sources exist, including, a dairy, feedlot, agricultural fields, and paved and unpaved roads. The Hidden Valley site is representative of a mix of sources not commonly found elsewhere in the CBSA, Pinal County, or $PM_{2.5}$ non-attainment area. Several other feed lots operate in Pinal County as shown in Figure # above. Those 4 areas with feedlot do not constitute "many such locations in the same CBSA".

Spatial Scale

The preamble to the 2006 monitoring regulations states: "In practice, the majority of $PM_{2.5}$ monitors are deployed at neighborhood scale and larger, meaning that they are located far enough from large emission sources that they represent the fairly uniform air quality across an area with dimensions of at least a few kilometers and thus can be considered community oriented" (*citation 61264 Federal Register / Vol. 71, No. 200 / Tuesday, October 17, 2006 / Rules and Regulations*). In addition, the CFR states, specifically for PM_{10} and $PM_{2.5}$, that a neighborhood scale site would represent "conditions throughout some reasonably homogenous urban sub region with dimensions of a few kilometers" *(citation CFR App. D 4.7.1 (c) (3)).* Based on a review of land use and emission sources in the immediate area around the site, the District believes that the area of reasonably homogenous concentrations around this monitor is considerably smaller than a few kilometers in diameter or width. Moreover, the area around the monitor, even extending out several kilometers, is definitely not associated with communitywide exposure. This is further evident by the significant difference in measured PM_{10} exceedances between the Hidden Valley site and the Stanfield site located some 7 km (4.3 miles) to the east as shown in Table 5.21 below.

Table 5.21 PM_{10} Hidden Valley/Stanfield

	HV PM_{10}	STNF PM_{10}
# Exceed	15	4
Average ($\mu g/m^3$)	58.5	47.8
Max Value ($\mu g/m^3$)	278.2	343.1

The Hidden Valley site is within close proximity (0.5 km to 1 km) to the various sources identified above and does not represent the conditions expected in urban sub regions or communitywide population PM_{10} or $PM_{2.5}$ exposure. Furthermore, the CFR gives an example of

a neighborhood scale site: “such a site would likely be located in a residential or commercial area having a high overall $PM_{2.5}$ emission density but not in the vicinity of any single dominant source” (*citation CFR App. D 1.2 (d))* The preamble also states “The EPA is presently aware of fewer than ten PM2.5 monitors that are sited in relatively unique population oriented micro scale areas, localized hot spots, or unique population oriented middle scale areas. Such sites may have higher concentrations than neighborhood scale sites on at least some days because they may be close to and downwind of large emission sources, but the number of people exposed to such concentrations is not large relative to the surrounding communities”. It is very clear that the Hidden Valley site is located in the vicinity of a dominant source and does not meet this definition of neighborhood scale and communitywide exposure.

When determining the appropriate spatial scale for a particular site, the homogeneity of the particulate matter concentrations, land use, and land surface characteristics must also be considered. The Hidden Valley site is located near a number of particulate sources that have been shown to contribute to elevated PM_{10} and $PM_{2.5}$ concentrations at the site under stagnant or low wind conditions generally from the north east to south east. Analysis of wind and pollution roses, shown below, during exceedance days on June 21 and June 24, 2014 also shows that impact. The Hidden Valley site is significantly influenced by the source region located upwind.

Figure 5.20 HV Pollution Rose 6/21/2014

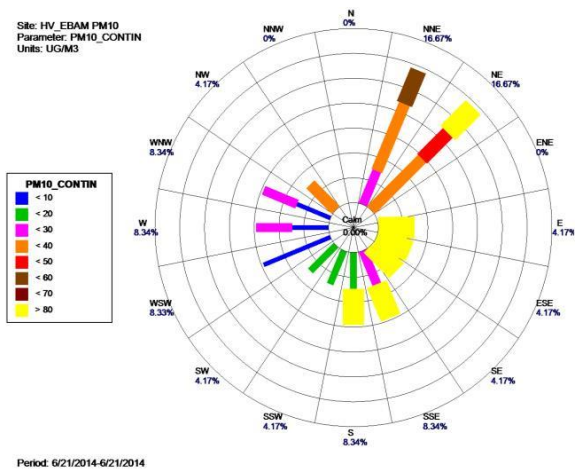
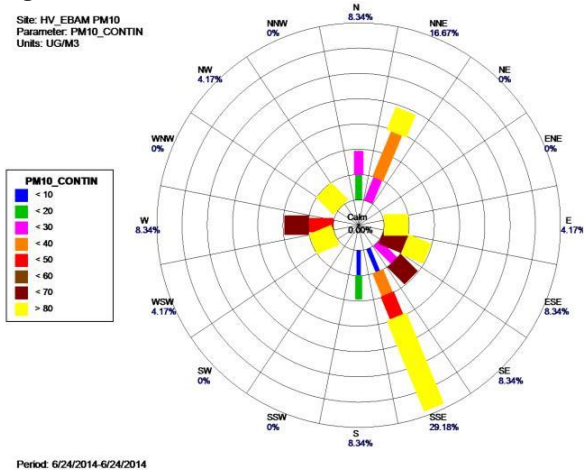


Figure 5.21 HV Pollution Rose 6/21/2014



Due to the close proximity of a known source, the PM_{10} and $PM_{2.5}$ concentrations measured at the Hidden Valley site are higher in magnitude than surrounding areas and do not represent homogenous particulate concentrations in an area of a few kilometers as shown in Table 5.8. Based on this information, the Hidden Valley site can be considered to be representative of an area smaller than a neighborhood spatial scale and does not represent communitywide exposure. Hidden Valley is representative of a middle scale environment.

Localized Hot Spot

The monitoring regulations have limited discussion about “hotspots”. The term is generally associated with areas of highest concentrations whether it be from mobile or multiple stationary

sources. Micro scale and middle scale monitors are mentioned[3]. For the purpose of this discussion, hotspot will be treated as synonymous with monitoring locations representing either a micro or middle scale environment.

Uniqueness

PM_{10} and $PM_{2.5}$ concentrations recorded at this site are consistently higher in the number of measured exceedances than other sites in the county and comparable in day-to-day magnitude to the Cowtown monitoring site. The table 5.22 below compares PM_{10} at Hidden Valley to Cowtown and illustrates the similarity in measured concentration magnitude recorded at each site, note the 7/3/2014 exceedance at Cowtown was a wind driven event. This data indicates that the Cowtown second highest value is approximately 25% higher than Hidden Valley on the maximum concentration day which was identified as having stagnant conditions.

Table 5.22 PM_{10} Highest 10 Values; CWTN HV (µg/m^3)

DATE	CWTN TEOM PM_{10}	DATE	HV EB PM_{10}
7/3/2014	540.8	7/3/2014	278.2
6/18/2014	357.0	6/21/2014	234.6
4/18/2015	272	6/24/2014	220.7
11/28/2014	271.9	7/23/2014	200.4
6/23/2014	268.4	7/1/2014	189.6
4/5/2015	266.9	6/16/2014	189.3
11/9/2014	265.7	4/18/2015	178.7
4/27/2015	243.7	6/26/2014	176.7
4/16/2015	237.5	6/2/2015	176.5
6/17/2014	235.5	8/7/2014	173.1

Table 5.23 provides a like comparison for $PM_{2.5}$. The maximum values are similar but occur during different conditions. The July 3, 2014 value at Hidden Valley was associated with a wind event while the maximum value at Cowtown occurred on a stagnant day. In order to compare similar conditions the second high value at Hidden Valley, a stagnation day, is compared to the high and second high value at Cowtown. With the exception of the Cowtown maximum value, the concentrations are comparable.

[3] Federal Register / Vol. 71, No. 200 / Tuesday, October 17, 2006 / Rules and Regulations

Table 5.23 $PM_{2.5}$ Highest 10 Values; CWTN HV (µg/m^3)

DATE	CWTN Filter $PM_{2.5}$	DATE	HV EB $PM_{2.5}$
11/28/2014	48.7	7/3/2014	48.7
8/9/2014	33.4	4/16/2015	39.5
11/29/2014	30.5	11/25/2014	39.5
11/9/2014	28.6	6/24/2014	32.5
11/7/2014	28.5	10/24/2014	31.0
11/18/2014	28.3	11/26/2014	30.6
11/20/2014	28.1	4/14/2015	30.5
8/11/2014	27.4	10/30/2014	27.2
11/25/2014	27.3	4/10/2015	26.8
11/27/2014	26.5	11/8/2014	26.5

Table 5.24 below compares Hidden Valley PM_{10} to the Stanfield site, 7 km to the east, and illustrates similarity in average and maximum concentrations but a significant difference in the number of recorded exceedances.

Table 5.24 PM_{10} Comparison HV to Stanfield

	HV PM_{10}	STNF PM_{10}
# Exceed	15	4
Average (µg/m^3)	58.5	47.8
Max Value (µg/m^3)	278.2	343.1

The nearest $PM_{2.5}$ monitoring site is Casa Grande Downtown located in an urbanized area some 27 km (17 miles) to the south east. A comparison of these data is provided in Table 5.25 below. The values clearly indicate a unique situation at Hidden Valley compared to a general neighborhood scale urban monitoring site.

Table 5.25 $PM_{2.5}$ Comparison HV to Casa Grande

	CGDT $PM_{2.5}$	HV EB $PM_{2.5}$
# Exceed	0	3
Average (µg/m^3)	6.6	9.9
Max Value (µg/m^3)	13.9	48.7

The Hidden Valley site is representative of a relatively unique source of emissions. The monitor is immediately downwind of dairy and feed operations as well as agricultural and earth moving activity. This source mix represents a relatively unique situation in Pinal County. While there are other dairies and feedlots within Pinal County, it appears that the Hidden Valley site represents a relatively unique monitoring location due to the size, composition, ands proximity of the nearby sources.

Conclusion

Based on the analysis above, the Hidden Valley site should be considered a relatively unique, population oriented, middle scale site.

5.5 Area Land Use and Emissions

Cowtown

The Cowtown monitor is located on what is classified as desert shrubland (approximately 93 acres). The monitor is adjacent (approximately 0.1 miles to the east-northeast) to a large feedlot complex that is approximately 230 acres in size and houses nearly 100,000 cattle. There is a large parcel (59 acres) to the east of the Cowtown monitor that is agricultural cropland. Another agricultural cropland parcel (33 acres) is located across the Maricopa/Casa Grande Highway and to the south of the monitor. The other large land uses within a mile radius of the Cowtown monitor are agricultural croplands, desert shrubland and unpaved roads (public, private and agricultural). Figure 5.22 illustrates land use surrounding the Cowtown site.

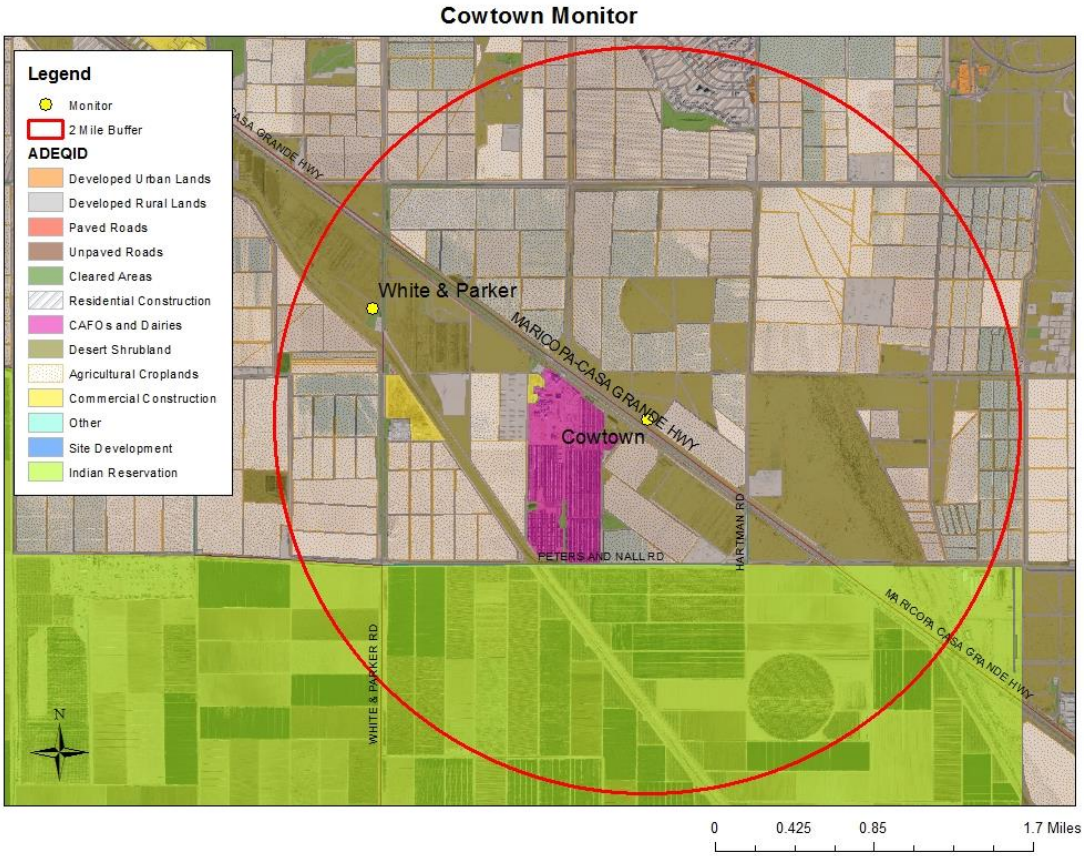
The City of Maricopa general plan[4] has a thin stretch (approx. 350 feet across) of park/open space land use planned for the area where the Cowtown monitor currently resides with another similarly sized thin stretch of employment/industrial adjacent to the north of the park/open space land use. The thin stretches of land uses are oriented northwest to southeast along the Maricopa/Casa Grande Highway. A large swath (approximately 540 acres) of land to the north of the Cowtown monitor is zoned for Master Planned Community. To the south of the Maricopa/Casa Grande Highway a large portion of what's currently the northern half of the feedlots are zoned for Employment/Industrial. The central and southern portions of the feedlots are zoned master planned community and park/open space. A medium sized parcel (75 acres) of land to the east of the Cowtown monitor is zoned medium residential.

If the future planned land uses come to fruition, the area around what's currently Cowtown is going to change significantly with the eventual replacement of the feedlots with residential, park/open space and some employment/industrial land uses.

The Cowtown Road site is impacted by emission sources including feedlots, agricultural operations, an ethanol plant, the railroad, a grain processing facility, a commercial composting facility, and paved and unpaved roads. Paved road impacts include the Maricopa-Casa Grande highway with an average annual daily traffic of 4,534 (2013, ADOT).

[4] http://www.maricopa.gov/planning/Resources/Plans/ComprehensivePlan.aspx

Figure 5.22 – Cowtown Land Use 2 km



Hidden Valley

The Hidden Valley monitor is located approximately 0.5 miles and 1.4 miles to the west of a dairy and feedlot respectively. The monitor is on a large parcel (158 acres) of desert shrubland that is surrounded on three sides (north, west and south) by low density residential. Large areas of agricultural cropland mostly surround the Hidden Valley monitor outside of the immediate desert shrubland and low density residential land uses. However southwest of the monitor there is no agricultural cropland, due to the mountainous terrain – Table Top Mountain. Unpaved roads (public, private, agricultural) also surround the Hidden Valley monitor. Figure 5.23 illustrates land use surrounding the Hidden Valley site.

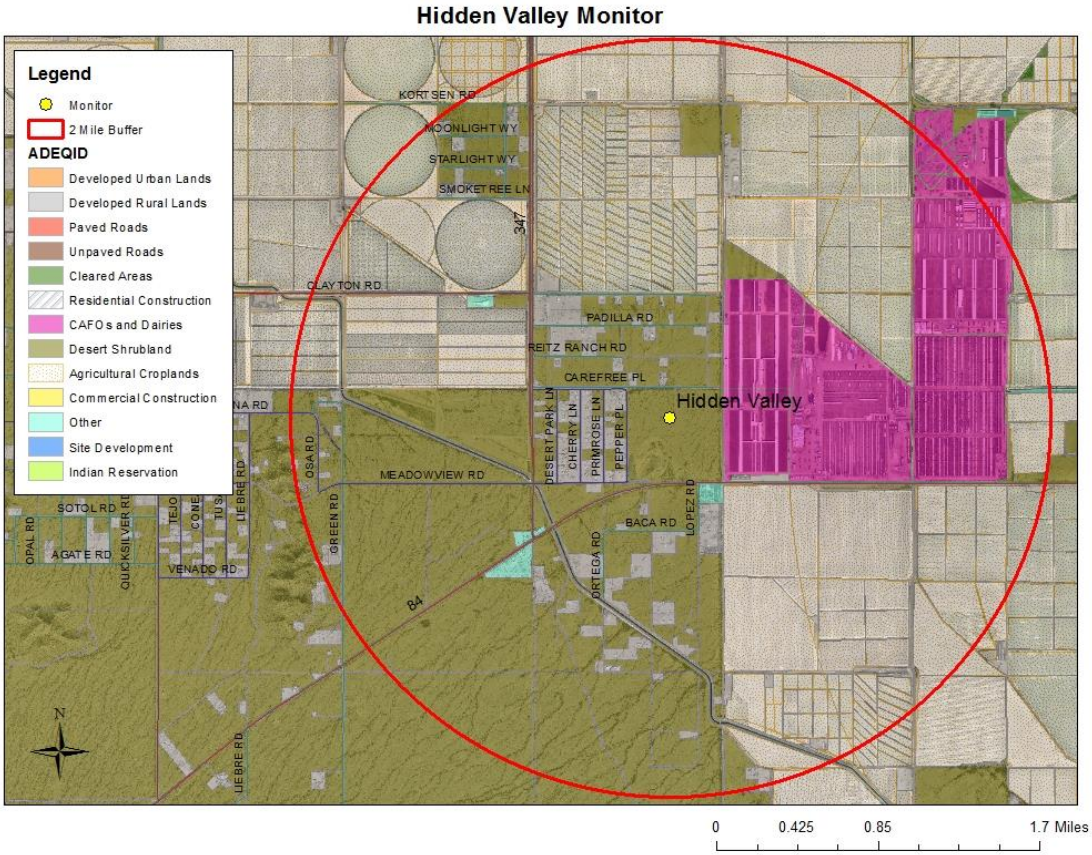
The Hidden Valley monitor is located in unincorporated Pinal County and as such is under the County's zoning. The 2009 Pinal County Comprehensive Plan[5] has the Hidden Valley area mainly zoned as moderate low density residential (1-3.5 dwelling units/acre). Future plans for the local

[5] The Pinal County Comprehensive Plan isn't a regulatory document. It's a future growth plan that is designed to assist and guide the County's Planning and Zoning Commission and Board of Supervisors to pursue coordinated development of the unincorporated areas of the County.

area include a possible mid intensity activity center[6] approximately 0.5 miles west-southwest of the monitoring location. A high intensity activity center[7] is possible for an area approximately 1.5 miles to the east of the monitor (covering the eastern portion of the feedlot that's currently there). An employment zone is planned approximately 3 miles to the northeast of the Hidden Valley monitor. The employment zone extends north and northwestward several miles.

The Hidden Valley site is impacted by emission sources including dairies, feedlots, agricultural operations, county material pit operations, and paved and unpaved roads.

Figure 5.23 Hidden Valley Land Use 2 Miles



White and Parker

The relatively close proximity of the White and Parker monitoring site to the Cowtown monitoring site (2.5 km or 1.6 miles WNW) means both monitoring sites are surrounded by similar land uses such as desert shrubland, agricultural croplands, feedlots and unpaved roads. The site is separated from the nearest active feedlot pens by approximately 1.75 km (1.1mi) and 0.84 km (0.52mi) from

[6] Mid Intensity Activity Center are approximately 500 acres with a mix of clustered professional office, commercial, tourism and hospitality uses, medical, and medium to high density residential.
[7] High Intensity Activity Centers are approximately 1,000 or more acres with a mix of professional office, business parks, and industrial often in a campus-like setting, as well as high and medium density residential.

the nearest feedlot processing area. Other land uses within a mile or so of the White and Parker monitor are commercial construction and cleared areas. The White and Parker monitor along with the Cowtown monitor have residential development within two miles of their respective monitors. The residential development near the White & Parker site is located to the northwest while the residential development near the Cowtown monitor is north of the monitor. Figure 5.24 illustrates land use surrounding the White and Parker site.

The City of Maricopa general plan has the planned land use for the White and Parker monitor location on the border of park/open space (along the Santa Cruz Wash) and employment/industrial. Adjacent to those planned land uses are medium density residential, master planned community, commercial, mixed use, public/institutional, site development and developed urban.

The City of Maricopa has identified the following developments in proximity to the area of the White and Parker monitoring site (within 1-2 miles). The city has approved plans (zoning, pre-plat etc.) for the projects but the lands are currently undeveloped/vacant lands, and most likely under farming and agricultural uses:

- The City Council approved Daltessa Heights a 290 acre subdivision with 932 lots. The site is generally located south of Steen Road, west of White & Parker Road, north of Peters & Nall Road and approximately one-half mile east of Porter Road; adjacent to the northern boundary of the Ak-Chin Reservation within the incorporated limits of the City of Maricopa.

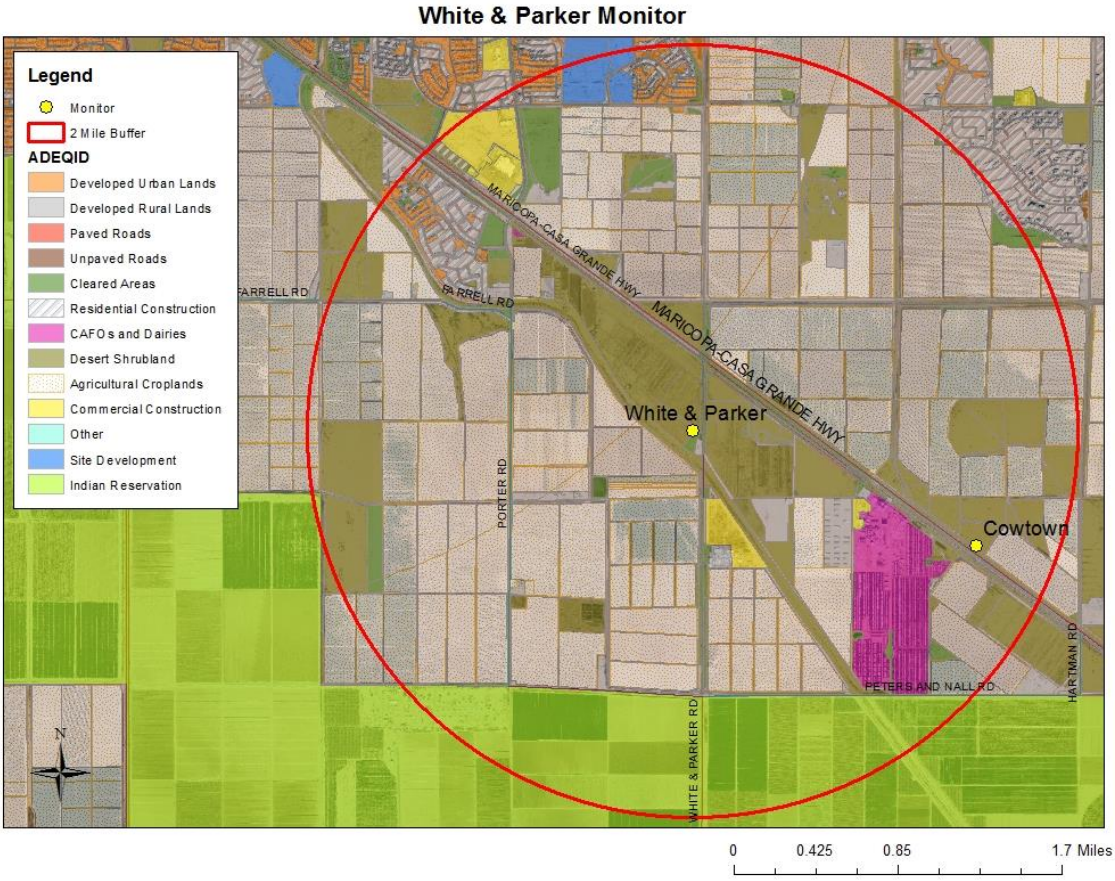
- The City Council approved Avalea a 2,179 acres master planned community with 7452 lots. The site is generally located south of Farrell Road, east of SR-347, north of Peters & Nall Road and bounded partially to the east by Porter Road.

- The City Council approved Eagle Wing a 908 acre master planned development with 2,758 lots. The site is generally located on the south side of the Maricopa-Casa Grande Highway, Cowtown Road and Union Pacific Railroad, west of Hartman Road and the Santa Rosa Wash alignment borders the project to the south and also partially by Peters and Nall Road. White and Parker Road breaks up the master planned community on the west side of the Road (temporary air quality monitor location).

- At near build-out (2040), it is expected there will be significant growth and vitality in the White and Parker/Casa Grande Maricopa Highway Corridor.

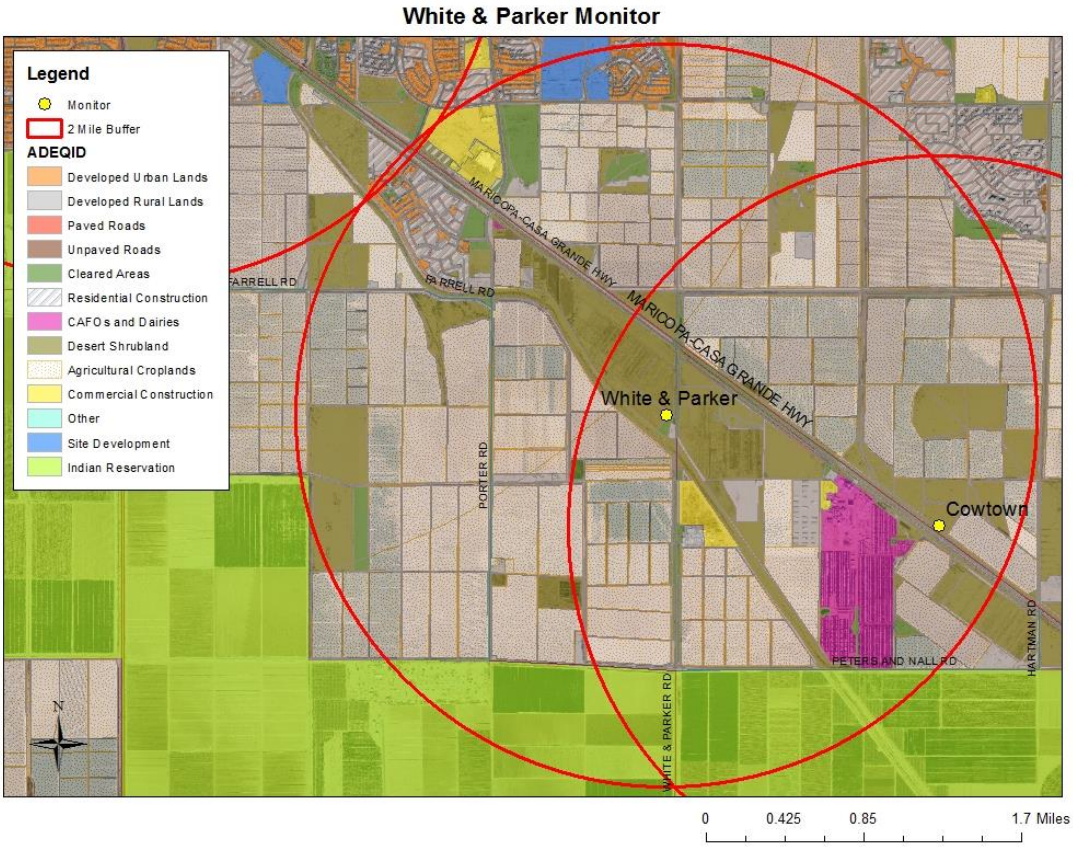
The White and Parker site, due to its proximity to the Cowtown Road site, is impacted by similar emission sources, including the feedlots, agricultural operations, an ethanol plant, the railroad, a grain processing facility, a commercial composting facility, and paved and unpaved roads. Paved road impacts include the Maricopa-Casa Grande highway with an average annual daily traffic of 4,534 (2013, ADOT).

Figure 5.24 – White and Parker Land Use 2 Miles



Because of the close proximity to the Cowtown site, the White and Parker site shares much of the same land use. Figure 5.25 shows both sites and the commonality of land use represented within a 2 mile radius around the monitoring sites.

Figure 5.25 – White and Parker with Cowtown



5.6 Cost of Site Development

Establishing both the White and Parker site and the Hidden Valley site will incur cost to the District. Those costs are reflected in the descriptions below. In order to minimize relocation costs, the shelter and monitors at the current Cowtown site will be moved to the selected site in late December 2015. This process saves the cost of purchasing duplicate equipment but results in a brief loss of data during transition. The District estimates that transition can be accomplished in several days, thereby minimizing data loss.

The Hidden Valley site sits approximately 0.25 miles from the nearest power source located to the north of the monitoring site. The site is located upon County owned property. Extending power to the site would constitute the highest item cost to establishing this site. The local power provider has estimated the cost of extending power lines to the site at approximately $11,400. This figure excludes normal cost associated with meter installation and power connection which

must be done by a licensed electrician. The total cost for relocation is estimated to be approximately $15,000-$16,000.

The White and Parker site sits near the Santa Cruz / Santa Rosa Wash and is located within the defined 100 year floodplain. Because of the floodplain designation the site will require permitting through the County Flood Control District along with an approved, engineered design bringing the base of the monitoring site above flood stage. This level has been estimated to be approximately 2 feet. An exact estimate of this design and build is not yet available but the District anticipates a cost of less than $3,000. The site is located within the City of Maricopa upon City owned property. Permitting through the City will be required and the District has begun discussions regarding that process. Permit fees are minimal, in the range of $300. The local power provider has estimated the cost of extending power lines to the site at approximately $3,000. This figure excludes normal cost associated with meter installation and power connection which must be done by a licensed electrician. The total cost for relocation is estimated to be approximately $9,000-$10,000.

Section 6 Conclusion

This section recommends a replacement for the Cowtown site based upon the criteria described in Table 5.1 as well as guidance provided by EPA. Each subsection provides Pinal's conclusion regarding the site best suited to replace the Cowtown site. The final recommendation is based upon an overall comparison of the criteria described herein.

EPA's guidance suggested for both PM_{10} and $PM_{2.5}$ an appropriate nearby location for the replacement site would include areas within the PM_{10} and $PM_{2.5}$ nonattainment area. EPA also described the spatial scale of representativeness in terms of the physical dimensions of an air parcel throughout which actual pollutant concentrations are reasonably similar. This homogeneity refers to the PM concentrations, as well as the land use and land surface characteristics. Therefore, the replacement site must be a middle scale site that measures similar concentrations from similar sources to those measured at the existing Cowtown Road site. The replacement site does not have to be explicitly within 500 meters of a given source, but rather the concentrations measured at a replacement site should represent an area consistent with the middle scale dimensions. Since the Cowtown Road site is primarily influenced by emissions from feedlots for both PM_{10} and $PM_{2.5}$, the replacement site should also similarly represent emissions from feedlots. Secondary emissions from other sources, such as agricultural operations, disturbed vacant lots, paved and unpaved roads, and railroads should also be considered.

6.1 Comparability of Measurement

Section 5.1 reviewed and analyzed various aspects of the PM_{10} and $PM_{2.5}$ data collected. The following items summarized notable characteristics of the analysis.

1. $PM_{2.5}$ data collected indicate that all sites met annual and 24-hour NAAQS during study period considering a 98th percentile approach. The Hidden Valley site recorded three exceedances of the 24-hour NAAQS and had a 98th percentile value of 30.6. White and Parker recorded 1 exceedance of the 24-Hour NAAQS and had a 98th percentile value of 24.9. The Hidden Valley exceedances were more frequent but of lesser magnitude that White and Parker.
2. $PM_{2.5}$ annual average concentrations measured at the White and Parker site was 9.1, while Hidden Valley was 10.0. Both less than Cowtown which recorded 11.8.
3. PM_{10} measured at the Cowtown site showed 35 exceedances of the 24-hour NAAQS with Hidden Valley recording 15 and White and Parker recording 8. Each study site recorded more exceedances during the period than other sites in the Pinal County network indicating an appropriate replacement for Cowtown which is the maximum concentration site in the network.
4. PM_{10} Measured at the Cowtown site resulted in and annual expected exceedance rate of 35.5 with Hidden Valley at 17.7 and White and Parker at 9.8.
5. White and Parker is the closest site geographically (1.5mi) to the Cowtown site.

6. The White and Parker site shows PM_{10} concentrations similar in magnitude to the Cowtown site demonstrating that achieving future compliance with the NAAQS will require equal emission reductions. Hidden Valley recorded more exceedances but the magnitude of those exceedance was less than White and Parker.
7. PM_{10} values recorded on the 10 highest day indicates similarity between all sites. White and Parker recoded a maximum value more similar to Cowtown than Hidden Valley; CWTN 540.8µg/m^3 wind 357µg/m^3 stagnation, HV 278.2µg/m^3 wind 234.6µg/m^3 stagnation, W&P 253.9µg/m^3 wind, 364.4µg/m^3 stagnation.
8. PM_{10} seasonal analysis shows dry season similarity at three sites with White and Parker closest to Cowtown (66µg/m^3 vs 68.5µg/m^3) and a higher in concentration than Hidden Valley. White and Parker also recorded the highest average winter season concentration among the three sites.
9. $PM_{2.5}$ seasonal analysis during dry season shows that Hidden Valley recoded concentrations closest to Cowtown (13.6 µg/m^3 vs 8.6 µg/m^3). White and Parker recorded the highest $PM_{2.5}$ concentrations during monsoon season as a result of a wind event.
10. Temporal variation at the three sites is similar during morning hours, while the magnitude of evening peak is less pronounced at Hidden Valley and White and Parker.

Based upon the points described above, the analysis presented in this document, and considering EPA guidance suggesting the critical importance of comparability to the NAAQS (i.e. number of exceedances, expected exceedance rate, 98th percentile value, and annual average) we conclude that the Hidden Valley data are more similar to Cowtown than White and Parker.

6.2 Representation of Population

Section 5.2 reviewed the population currently represented by the monitoring sites and assesses the potential future population in the respective areas. The following items summarized notable characteristics of the review.

1. Both sites currently represent greater population than Cowtown.
2. The current population within one mile at Hidden Valley and White and Parker are low but similar in number. Extending that range to two miles shows that White and Parker represents a greater population than Hidden Valley.
3. Future growth projections show over the long term that the White and Parker site will represent a greater population while Hidden Valley is expected to have less growth.

Based upon the points described above and the analysis presented in this document, White and Parker best represents current and future population.

6.3 Longevity of Site

Section 5.3 reviewed the ability to utilize the monitoring site over time as well as addressing access and security. The following items summarized notable characteristics of the review.

1. Because both site are government owned, they an offer equal term of use.

2. After the conclusion of the monitoring study the Hidden Valley site was vandalized. This indicates some concern for future security at this location.

Based upon the points described above and the review presented in this document, Hidden Valley and White and Parker can both provide equal terms of use but security at Hidden Valley may pose a potential risk in the future.

6.4 Scale of Representation

Cowtown is currently designated as a middle scale monitoring site and EPA guidance suggested a replacement site should be of similar scale. Section 5.4 reviewed scale of representation for Hidden Valley and White and Parker. The following items summarized notable characteristic of the review.

1. Both Hidden Valley and White and Parker can be classified as middle scale monitoring sites for both PM_{10} and $PM_{2.5}$ and, therefore, not comparable to the annual $PM_{2.5}$ NAAQS.

Based upon the points described above and the review presented in this document, Hidden Valley and White and Parker can both represent middle scale monitoring and are suitable replacement for the Cowtown site.

6.5 Area Land Use and Emissions

Section 5.5 reviewed the land use surrounding the sites as well as emission characteristic of the respective areas. The following items summarized notable characteristic of the review.

1. The current land use and emission source mix near White and Parker are similar to Cowtown. Sources represented at Cowtown are in close proximity to the White and Parker site.
2. Future changes to land use around White and Parker indicate business development, commercial development and residential growth.
3. Emission sources at Hidden Valley are similar but lack the industrial and rail emissions which currently exist at Cowtown and White and Parker.
4. Emissions and land use near Hidden Valley do not appear to change significantly over time.

Based upon the points described above and the review presented in this document, White and Parker best duplicates Cowtown land use and emission mix currently and in the future.

6.6 Cost of Site Development

Section 5.6 reviewed the cost of developing the new site and considered installation of line power, site improvements, and permitting costs. The following items summarized notable characteristics of the review.

1. The cost to develop Hidden Valley is estimated to be approximately $15,000 to $16,000 whereas White and Parker is estimated to be $9,000 to $10,000. The higher cost at hidden Valley is due to the cost of bringing power to the site from a greater distance.

Based upon the points described above and the review presented in this document, White and Parker provides the most economical site to develop.

6.7 Recommended Site

Considering the information provided in this review, Pinal County recommends Hidden Valley as the most appropriate and most similar site to replace PM_{10} and $PM_{2.5}$ monitoring at Cowtown.

Appendix A

PM10 and PM2.5 Annual Data Summary

Table 1 - PM10 Annual Data Summary (µg/m^3)

DATE	CWTN PM10	HV PM10	WP PM10
6/13/2014	167.3	63.3	72.4
6/14/2014	174.2	73.1	
6/15/2014	170.5	97.6	
6/16/2014	157.4	189.3	
6/17/2014	235.5	103.9	54.2
6/18/2014	357.0	114.6	76.8
6/19/2014	75.2	106.0	65.1
6/20/2014	146.4	75.4	101.4
6/21/2014	166.8	234.6	58.1
6/22/2014	98.0	96.4	48.9
6/23/2014	268.4	93.4	110.3
6/24/2014	117.0	220.7	289.2
6/25/2014	111.0	81.0	364.4
6/26/2014	196.9	176.7	141.7
6/27/2014	101.2	75.9	84.9
6/28/2014	102.4	81.9	74.9
6/29/2014	107.9	89.7	
6/30/2014	118.0	165.5	
7/1/2014	140.8	189.6	94.1
7/2/2014	122.5	166.9	77.7
7/3/2014	540.8	278.2	217.5
7/4/2014	43.9	39.1	47.7
7/5/2014	86.4	58.0	39.4
7/6/2014		59.8	
7/7/2014	85.5	76.9	
7/8/2014	158.7	72.4	
7/9/2014	29.4		60.3
7/10/2014	77.5	27.8	34.5
7/11/2014	49.2	54.4	40.7
7/12/2014	73.3	155.7	81.9
7/13/2014	131.2	130.2	
7/14/2014	46.0		46.4
7/15/2014	55.4	65.3	52.4
7/16/2014	55.1	64.8	73.4
7/17/2014	121.9	96.1	106.5
7/18/2014	75.6	119.0	82.1
7/19/2014	56.0	120.4	55.9
7/20/2014	53.1	105.0	87.5
7/21/2014	67.4	147.6	63.6
7/22/2014	151.8	57.7	72.3
7/23/2014	113.5	200.4	123.8
7/24/2014	57.2	150.6	57.8
7/25/2014	234.8		
7/26/2014			
7/27/2014			
7/28/2014	70.5	64.3	
7/29/2014	56.9	87.5	51.4
7/30/2014	96.0	79.4	68.5
7/31/2014	67.0	102.8	
8/1/2014	29.2	27.3	31.4
8/2/2014	21.8	26.5	23.1
8/3/2014	25.3	32.6	84.3
8/4/2014	35.2	26.1	27.8
8/5/2014	49.2	53.1	
8/6/2014	67.3	87.7	59.4
8/7/2014	54.2	173.1	
8/8/2014	149.6	97.5	58.1
8/9/2014	176.8	50.6	48.8
8/10/2014	150.0	81.6	83.5
8/11/2014	123.9	157.2	73.2
8/12/2014	46.3	40.8	60.6
8/13/2014	15.1	22.8	22.3

8/14/2014	34.1	29.2	40.1
8/15/2014	44.0	27.1	27.9
8/16/2014	70.8	17.8	31.5
8/17/2014	127.7	21.9	70.3
8/18/2014	26.9		26.2
8/19/2014	27.4	26.5	25.1
8/20/2014	35.3		
8/21/2014	55.6	81.8	
8/22/2014	17.6		
8/23/2014	23.6	32.6	
8/24/2014	52.7	55.6	
8/25/2014	132.8	114.9	
8/26/2014	20.9		
8/27/2014	47.4	60.8	
8/28/2014	98.2	18.3	
8/29/2014	158.9	80.5	
8/30/2014	55.9	95.2	
8/31/2014	82.5	49.9	
9/1/2014	74.0	73.8	
9/2/2014	83.1	116.2	
9/3/2014	61.1	72.3	
9/4/2014	96.7		253.9
9/5/2014	48.0		45.8
9/6/2014	154.1	148.2	169.4
9/7/2014	47.1	36.2	22.5
9/8/2014			11.9
9/9/2014			17.7
9/10/2014	36.4		27.1
9/11/2014	37.6		32.8
9/12/2014	45.6		41.8
9/13/2014	79.4		88.5
9/14/2014	42.8		19.4
9/15/2014	46.4		30.1
9/16/2014	32.2		23.4
9/17/2014	15.5		23.4
9/18/2014	14.7		66.1
9/19/2014	38.3		41.9
9/20/2014	39.3		77.3
9/21/2014	21.3	-0.4	29.6
9/22/2014	51.7	7.7	41.2
9/23/2014	69.3	24.2	47.7
9/24/2014	49.0	58.4	49.9
9/25/2014	76.2	59.7	108.1
9/26/2014	68.8	112.7	59.8
9/27/2014	33.9		165.8
9/28/2014	21.1		
9/29/2014	27.2		25.7
9/30/2014	40.4	66.1	46.1
10/1/2014	43.8	46.6	35.6
10/2/2014	43.3	34.0	36.5
10/3/2014	52.9	30.3	69.6
10/4/2014	62.9	47.8	51.9
10/5/2014	56.4		35.4
10/6/2014	80.6		90.5
10/7/2014	77.3		62.6
10/8/2014	21.6		
10/9/2014	11.3		
10/10/2014	18.3		
10/11/2014	25.7		
10/12/2014	32.9		
10/13/2014	48.8		48.3
10/14/2014	97.3		57.5
10/15/2014	67.4	75.4	56.7
10/16/2014	49.2	28.7	50.5
10/17/2014	89.4	56.9	77.7
10/18/2014	60.0	52.0	46.6

10/19/2014	169.2	66.8	81.3
10/20/2014	61.3	27.1	54.1
10/21/2014	83.7	53.9	79.4
10/22/2014	125.5	59.4	73.2
10/23/2014	108.4	96.9	74.0
10/24/2014	102.2	132.7	76.9
10/25/2014	89.0	90.5	59.2
10/26/2014	39.3	53.6	38.0
10/27/2014	67.4	35.9	43.2
10/28/2014	71.3	77.7	95.0
10/29/2014	132.1	62.0	97.5
10/30/2014	103.8	116.2	92.5
10/31/2014	64.2	74.6	81.6
11/1/2014	67.8	47.4	53.9
11/2/2014	88.8	19.4	32.1
11/3/2014	160.0	32.3	64.0
11/4/2014	65.6	52.0	39.6
11/5/2014	127.9	71.2	52.8
11/6/2014	87.8	109.9	53.4
11/7/2014	198.4	49.1	
11/8/2014	90.0	113.1	
11/9/2014	265.7	53.6	
11/10/2014	93.8	67.1	
11/11/2014	208.8	41.0	
11/12/2014	54.1	42.4	
11/13/2014	53.6	68.2	
11/14/2014	48.3		48.3
11/15/2014	43.1		57.8
11/16/2014	59.4		66.8
11/17/2014	113.7		63.3
11/18/2014	159.1		108.8
11/19/2014	177.2		142.8
11/20/2014	170.1		161.1
11/21/2014	128.9		110.3
11/22/2014	75.4		90.5
11/23/2014	51.8		56.7
11/24/2014	109.0		106.4
11/25/2014	180.6	168.6	124.4
11/26/2014	97.1	130.8	
11/27/2014	105.2	61.1	78.3
11/28/2014	271.9	78.5	115.7
11/29/2014	92.2	80.4	
11/30/2014	89.0	39.8	
12/1/2014	77.3	69.6	74.3
12/2/2014	124.3	107.3	138.7
12/3/2014	32.4	35.1	
12/4/2014	19.1	22.3	
12/5/2014	18.0	32.8	
12/6/2014	19.2	42.9	
12/7/2014	19.5	24.0	
12/8/2014	26.9	23.9	
12/9/2014	27.8	25.0	
12/10/2014	31.9	43.8	
12/11/2014	33.6	43.3	52.0
12/12/2014	34.7	23.3	37.0
12/13/2014	12.0	6.5	4.1
12/14/2014	12.2	12.5	6.9
12/15/2014	22.8	33.1	25.0
12/16/2014	24.4	42.6	34.0
12/17/2014	9.3	13.6	10.7
12/18/2014	6.3	67.9	14.5
12/19/2014	14.3	23.3	22.8
12/20/2014	17.6	28.5	34.0
12/21/2014	14.7	26.4	23.9
12/22/2014	21.9	27.0	25.6
12/23/2014	22.3	30.4	22.6

12/24/2014	26.0	26.5	19.5
12/25/2014	25.4	19.5	18.6
12/26/2014	33.1	10.2	19.7
12/27/2014	26.8	17.3	22.9
12/28/2014	29.7	51.3	
12/29/2014	30.7	70.3	
12/30/2014	41.9	41.5	43.5
12/31/2014	17.5	14.5	
1/1/2015	8.7	15.2	
1/2/2015	12.8	13.9	
1/3/2015	11.1	23.4	20.9
1/4/2015	16.4	20.9	27.5
1/5/2015	25.4	24.7	28.4
1/6/2015	34.0	27.5	54.7
1/7/2015	36.7	48.8	
1/8/2015	37.3	77.4	39.3
1/9/2015	23.3	50.2	23.7
1/10/2015	16.7	67.0	16.6
1/11/2015	21.1	31.2	28.5
1/12/2015	13.1	22.0	
1/13/2015	14.4	21.4	
1/14/2015	13.9	16.4	59.7
1/15/2015	26.1	42.6	
1/16/2015	34.5	30.4	22.5
1/17/2015	42.8	46.4	50.5
1/18/2015	35.9	29.6	34.8
1/19/2015	41.1	46.4	48.3
1/20/2015	60.2	66.4	60.8
1/21/2015	36.8	30.0	31.0
1/22/2015	85.1	33.7	30.9
1/23/2015	51.8	27.5	26.8
1/24/2015	128.5	49.9	37.7
1/25/2015	137.7	19.8	47.2
1/26/2015	80.1	49.9	84.0
1/27/2015	18.6	22.9	30.1
1/28/2015	16.8	20.5	32.0
1/29/2015	16.2	18.1	31.8
1/30/2015	5.4	11.1	71.2
1/31/2015	4.8	105.9	63.7
2/1/2015	9.0	26.4	48.8
2/2/2015	15.9	26.8	33.2
2/3/2015	18.4	43.2	50.5
2/4/2015	17.8	41.8	42.7
2/5/2015	24.6	52.0	
2/6/2015	26.4	33.2	45.7
2/7/2015	21.8	41.9	37.9
2/8/2015	30.4	25.7	39.0
2/9/2015	37.3	33.7	40.7
2/10/2015	36.6	37.9	36.3
2/11/2015	27.9	32.1	30.3
2/12/2015	24.7	74.5	27.5
2/13/2015	31.8	34.2	27.0
2/14/2015	44.1	31.4	39.9
2/15/2015	23.7	27.5	28.1
2/16/2015	22.6	14.5	21.7
2/17/2015	37.0	23.7	37.3
2/18/2015	78.0	59.1	64.8
2/19/2015	74.4	64.7	79.9
2/20/2015	99.6	59.4	81.0
2/21/2015	68.4	33.4	39.6
2/22/2015	30.8	15.5	22.2
2/23/2015	28.6	18.6	25.3
2/24/2015	52.3	8.9	21.7
2/25/2015	71.5	20.8	33.4
2/26/2015	40.7	33.4	43.5
2/27/2015	70.9	39.9	55.5

2/28/2015	35.4	15.0	
3/1/2015	56.5	15.5	
3/2/2015	26.8	21.4	
3/3/2015	7.8	55.9	32.0
3/4/2015	17.2	5.7	8.5
3/5/2015	30.3	21.4	25.1
3/6/2015	59.5	78.0	39.1
3/7/2015	41.2	28.5	29.3
3/8/2015	41.3	29.6	32.6
3/9/2015	74.1	68.1	52.2
3/10/2015	59.5	86.3	91.3
3/11/2015	57.4	96.4	73.1
3/12/2015	63	46.6	58.3
3/13/2015	41.1	33.2	37.6
3/14/2015	81	60.3	73.8
3/15/2015	114.5	62.9	43.8
3/16/2015	186.8	34.0	64.0
3/17/2015	101.8	48.2	54.4
3/18/2015	70	40.4	46.6
3/19/2015	9.6	14.2	14.7
3/20/2015	19.9	23.6	18.6
3/21/2015	51.6	26.2	39.6
3/22/2015	37.4	32.9	36.2
3/23/2015	38.8		45.8
3/24/2015	67.2		57.7
3/25/2015	176.1		69.9
3/26/2015	152.9		51.6
3/27/2015	67.5		67.5
3/28/2015	68		67.1
3/29/2015	73.8		55.8
3/30/2015	88.8		74.8
3/31/2015	105.5	36.0	67.5
4/1/2015	81.5	65.4	63.7
4/2/2015	67.1	86.3	61.9
4/3/2015	108.9	66.8	70.7
4/4/2015	95.5	106.8	80.7
4/5/2015	266.9	37.1	80.4
4/6/2015	140	51.4	76.6
4/7/2015	88.9	97.5	76.2
4/8/2015	96.9	25.6	31.4
4/9/2015	72.3	50.6	108.8
4/10/2015	94.7	114.6	109.9
4/11/2015	68.8	66.1	87.1
4/12/2015	90.8	44.4	91.6
4/13/2015	192.6	39.0	70.7
4/14/2015	176.5	130.2	71.5
4/15/2015	152.4	71.8	103.2
4/16/2015	237.5	18.7	48.5
4/17/2015	87.1	39.0	102.8
4/18/2015	272	178.7	79.9
4/19/2015	167	81.0	60.8
4/20/2015	86.2	101.8	86.0
4/21/2015	86.2	120.2	102.9
4/22/2015	165	84.9	68.2
4/23/2015	130.4	65.4	74.9
4/24/2015	41.1	35.6	37.0
4/25/2015	86.8	70.7	60.8
4/26/2015	36.3	17.5	17.5
4/27/2015	243.7	15.2	34.8
4/28/2015	71.3	88.2	43.5
4/29/2015	135.7	91.3	41.5
4/30/2015	130	81.9	124.1
5/1/2015	97	52.5	100.0
5/2/2015	86.7	73.2	242.2
5/3/2015	76	50.5	55.3
5/4/2015	36	14.5	25.9

5/5/2015	15.4	26.1	17.0
5/6/2015	92.3	23.6	34.0
5/7/2015	73.3	19.8	40.7
5/8/2015	57.4	30.3	46.4
5/9/2015	107.8	20.6	32.1
5/10/2015	178.7	22.0	51.9
5/11/2015	104.8	51.7	41.8
5/12/2015	154	32.6	88.2
5/13/2015	68.3	21.9	50.0
5/14/2015	148.2	28.9	63.9
5/15/2015	35.9	14.5	34.0
5/16/2015	7.9	22.6	9.6
5/17/2015	12.6	48.6	21.2
5/18/2015	32.3	34.5	24.2
5/19/2015	35	34.3	27.5
5/20/2015	34.9	26.8	32.6
5/21/2015	54.8	31.2	44.9
5/22/2015	59.3	22.0	45.8
5/23/2015	63.3	43.0	44.3
5/24/2015	34.7	31.8	25.0
5/25/2015	51	45.0	33.7
5/26/2015	45.3	62.6	41.2
5/27/2015	56.6	41.5	74.0
5/28/2015	60.3	73.1	51.3
5/29/2015	79.1	48.2	58.9
5/30/2015	69.1	60.9	54.5
5/31/2015	116.6	53.6	50.6
6/1/2015	67	91.7	117.9
6/2/2015	48.6	176.5	72.6
6/3/2015	69.1	100.8	99.8
6/4/2015	105	91.3	109.6
6/5/2015	22.2	39.4	28.7
6/6/2015	22.4	24.5	20.5
6/7/2015	25.8	39.9	19.1
6/8/2015	45.9	50.5	69.2
6/9/2015	34.1	24.0	28.2
6/10/2015	27.6	16.7	20.0
6/11/2015	41.7	40.1	27.9
6/12/2015	78.8	56.9	52.4
6/13/2015	41.4	90.8	45.2
6/14/2015	41.4	39.6	50.3

Table 2 - PM2.5 Annual Data Summary (µg/m^3)

DATE	CWTN Filter PM2.5	HV PM2.5	WP PM2.5
6/13/2014	19.3	11.1	12.2
6/14/2014		25.3	14.1
6/15/2014		18.5	9.2
6/16/2014	19.2	25.2	11.4
6/17/2014		16.0	11.1
6/18/2014		15.7	12.9
6/19/2014	16.9	11.1	10.1
6/20/2014		9.0	15.9
6/21/2014		26.1	13.6
6/22/2014	12.4	11.6	11.5
6/23/2014		21.9	25.8
6/24/2014		32.5	22.1
6/25/2014	25.6	19.8	16.8
6/26/2014		18.5	16.6
6/27/2014		6.5	19.9
6/28/2014	11.1	10.2	11.6
6/29/2014		9.7	11.2
6/30/2014		17.7	
7/1/2014	10.4	22.5	22.0
7/2/2014		25.4	18.2
7/3/2014		48.7	50.9
7/4/2014	10.4	10.6	11.2
7/5/2014		9.3	9.2
7/6/2014		7.5	
7/7/2014	14.8	8.5	
7/8/2014		7.1	
7/9/2014		5.6	14.1
7/10/2014	8.9	4.7	8.1
7/11/2014		7.5	9.5
7/12/2014		11.3	19.2
7/13/2014	14.8	13.0	
7/14/2014		4.2	10.9
7/15/2014		15.3	9.6
7/16/2014	9.1	15.2	6.3
7/17/2014		11.6	24.9
7/18/2014		12.2	19.2
7/19/2014	8.5	14.4	8.7
7/20/2014		11.8	6.4
7/21/2014		21.8	17.4
7/22/2014	23.5	8.0	10.5
7/23/2014		22.5	11.5
7/24/2014		13.3	10.4
7/25/2014		11.1	22.1
7/26/2014		4.5	9.5
7/27/2014		7.2	12.1
7/28/2014		7.0	5.9
7/29/2014	17.0	5.1	9.4
7/30/2014		7.4	8.6
7/31/2014	11.8	7.7	
8/1/2014	7.2	3.9	7.3
8/2/2014	7.9	3.9	7.4
8/3/2014	5.7	6.1	19.7
8/4/2014	7.4	3.9	6.5
8/5/2014	7.4	5.1	
8/6/2014	9.8	8.3	8.7
8/7/2014	7.5	18.5	7.4
8/8/2014	18.3	10.3	7.8
8/9/2014	33.4	5.7	9.5
8/10/2014	20.3	5.6	12.3
8/11/2014	27.4	11.6	14.5
8/12/2014	9.5	5.0	14.2
8/13/2014	6.0	6.1	5.2
8/14/2014	9.5	6.7	13.8
8/15/2014	11.1	4.5	9.4

8/16/2014	8.6	4.1	9.2
8/17/2014	13.0	10.4	13.8
8/18/2014	7.4	3.5	6.5
8/19/2014		3.6	10.1
8/20/2014	6.5	4.4	7.6
8/21/2014	8.4	7.2	8.9
8/22/2014	3.3	4.4	6.5
8/23/2014	4.8	3.5	7.3
8/24/2014	5.4	5.6	8.2
8/25/2014	11.1	5.6	8.9
8/26/2014	3.9	3.6	8.4
8/27/2014	6.9	6.9	9.9
8/28/2014	15.0	5.7	10.7
8/29/2014	19.0	14.3	8.4
8/30/2014	11.4	13.5	7.2
8/31/2014	11.8	11.5	5.9
9/1/2014	11.7	6.4	6.8
9/2/2014	11.3	17.3	10.5
9/3/2014	12.4	10.2	10.3
9/4/2014	8.1	10.9	13.0
9/5/2014	12.7	4.7	5.9
9/6/2014	7.2	9.6	15.1
9/7/2014	3.3	6.8	5.2
9/8/2014	4.1	1.1	4.2
9/9/2014	8.6		5.5
9/10/2014	8.6	13.4	9.1
9/11/2014	4.8	11.1	10.9
9/12/2014		10.7	9.5
9/13/2014		12.4	8.5
9/14/2014	8.5	6.4	3.4
9/15/2014	7.1	8.5	4.8
9/16/2014	3.9		4.3
9/17/2014	3.4		4.8
9/18/2014	3.7	9.1	4.7
9/19/2014	11.5	8.3	6.0
9/20/2014	6.9	12.2	8.9
9/21/2014	4.4	4.6	4.0
9/22/2014	8.9	7.2	6.1
9/23/2014	9.0	5.3	6.1
9/24/2014	9.5	8.4	9.1
9/25/2014	12.2	10.3	8.9
9/26/2014	10.8	12.0	7.7
9/27/2014	5.5	5.0	4.8
9/28/2014	5.4	5.2	5.3
9/29/2014	6.1	5.5	5.2
9/30/2014	9.3	14.6	10.1
10/1/2014	8.0	7.1	7.1
10/2/2014	7.5	6.0	7.4
10/3/2014	8.9	7.8	9.3
10/4/2014	12.0	6.8	9.6
10/5/2014	10.0	9.4	7.2
10/6/2014	14.6	10.3	13.8
10/7/2014	13.0	7.4	9.5
10/8/2014	6.7		6.1
10/9/2014	5.4		6.0
10/10/2014	6.7		8.9
10/11/2014	10.6		14.4
10/12/2014	7.4	6.0	7.5
10/13/2014	7.2	6.2	5.3
10/14/2014	12.8		11.1
10/15/2014		17.6	10.7
10/16/2014	7.7	6.7	10.0
10/17/2014	14.6	13.3	14.0
10/18/2014	11.5	12.2	11.0
10/19/2014	13.1	15.6	12.3
10/20/2014	10.1	6.4	12.7

10/21/2014	12.5	12.6	16.9
10/22/2014	18.0	13.9	18.7
10/23/2014	21.1	22.7	17.3
10/24/2014	21.0	31.0	14.7
10/25/2014	20.6	21.2	13.9
10/26/2014	8.4	12.5	8.9
10/27/2014	12.0	8.4	10.1
10/28/2014	14.1	18.2	22.2
10/29/2014	9.3	14.5	22.8
10/30/2014	17.3	27.2	21.7
10/31/2014	10.9	17.5	19.1
11/1/2014		11.1	12.6
11/2/2014	6.0	4.5	7.5
11/3/2014	12.0	7.6	15.0
11/4/2014	7.9	12.2	9.3
11/5/2014		16.7	12.4
11/6/2014	20.5	25.7	12.5
11/7/2014	28.5	11.5	
11/8/2014	18.8	26.5	
11/9/2014	28.6	12.5	
11/10/2014	12.8	15.7	
11/11/2014	16.1	9.6	
11/12/2014	7.9	9.9	
11/13/2014	8.5	16.0	
11/14/2014	20.0		9.0
11/15/2014	7.5		11.6
11/16/2014	5.4		5.6
11/17/2014	13.8		7.5
11/18/2014	28.3		13.0
11/19/2014			17.0
11/20/2014	28.1		17.0
11/21/2014	19.8	7.9	12.2
11/22/2014	21.6	10.5	12.4
11/23/2014	14.0	9.3	7.7
11/24/2014	21.3		12.5
11/25/2014	27.3	39.5	14.4
11/26/2014	24.0	30.6	
11/27/2014	26.5	14.3	18.3
11/28/2014	48.7	18.4	27.1
11/29/2014	30.5	18.8	
11/30/2014	18.0	9.3	
12/1/2014	21.6	16.3	17.4
12/2/2014	18.1	25.1	32.5
12/3/2014	10.1	8.2	
12/4/2014	8.1	5.2	
12/5/2014	12.9	7.7	
12/6/2014	19.7	10.0	
12/7/2014	13.7	5.6	
12/8/2014	13.8	5.6	
12/9/2014	12.4	5.8	
12/10/2014	19.9	10.3	
12/11/2014	14.2	10.1	12.2
12/12/2014	6.6	5.4	8.6
12/13/2014	2.0	1.5	1.0
12/14/2014	3.3	2.9	1.6
12/15/2014	8.9	7.7	5.8
12/16/2014		10.0	8.0
12/17/2014	6.4	3.2	2.5
12/18/2014	5.8	15.9	3.4
12/19/2014	9.2	5.4	5.3
12/20/2014	13.6	6.7	8.0
12/21/2014	12.8	6.2	5.6
12/22/2014		6.3	6.0
12/23/2014	7.5	7.1	5.3
12/24/2014	6.0	6.2	4.9
12/25/2014		4.6	4.8

12/26/2014		2.4	1.8
12/27/2014	5.2	4.1	3.0
12/28/2014	9.0	12.0	8.4
12/29/2014	10.4	16.4	12.6
12/30/2014	10.9	9.7	7.7
12/31/2014	8.1	3.4	
1/1/2015		3.5	3.3
1/2/2015		3.3	3.1
1/3/2015		5.5	4.9
1/4/2015		4.9	6.4
1/5/2015		5.8	6.6
1/6/2015	8.2	6.4	12.8
1/7/2015		11.4	6.4
1/8/2015		18.1	4.7
1/9/2015	6.7	11.7	4.6
1/10/2015		15.7	4.3
1/11/2015		7.3	6.7
1/12/2015	7.3	5.2	
1/13/2015		5.0	
1/14/2015		3.8	14.0
1/15/2015	5.8	10.0	
1/16/2015		7.1	5.3
1/17/2015		10.9	11.8
1/18/2015	9.5	6.9	8.1
1/19/2015		10.9	11.3
1/20/2015		15.5	14.2
1/21/2015	7.1	7.0	7.3
1/22/2015		7.9	7.2
1/23/2015		6.4	6.3
1/24/2015	10.9	11.7	8.8
1/25/2015		4.6	11.1
1/26/2015		11.7	19.6
1/27/2015	10.3	5.4	7.0
1/28/2015		4.8	7.5
1/29/2015		4.2	7.4
1/30/2015	5.2	2.6	16.7
1/31/2015		24.8	14.9
2/1/2015		6.2	11.4
2/2/2015	22.4	6.3	7.8
2/3/2015		10.1	11.8
2/4/2015		9.8	10.0
2/5/2015	16.5	12.2	
2/6/2015		7.8	10.7
2/7/2015		9.8	8.9
2/8/2015	14.3	6.0	9.1
2/9/2015		7.9	9.5
2/10/2015		8.9	8.5
2/11/2015	4.9	7.5	4.1
2/12/2015		17.4	2.7
2/13/2015		8.0	5.3
2/14/2015	10.2	7.3	6.9
2/15/2015		6.4	6.6
2/16/2015		3.4	5.1
2/17/2015	6.3	5.6	8.7
2/18/2015		13.8	8.0
2/19/2015		15.1	10.8
2/20/2015	14.1	13.9	11.6
2/21/2015		7.8	4.9
2/22/2015		3.6	5.1
2/23/2015	5.0	4.4	3.4
2/24/2015		2.1	3.1
2/25/2015		4.9	4.5
2/26/2015	6.5	7.8	4.7
2/27/2015		9.3	4.2
2/28/2015		3.5	6.0
3/1/2015	5.7	3.6	5.1

3/2/2015		5.0	3.7
3/3/2015		13.1	2.9
3/4/2015	3.5	1.3	2.1
3/5/2015		5.0	4.5
3/6/2015		18.3	4.1
3/7/2015	5.5	6.7	3.2
3/8/2015		6.9	3.9
3/9/2015		15.9	5.2
3/10/2015	11.0	20.2	8.8
3/11/2015		11.1	8.6
3/12/2015		6.8	7.4
3/13/2015	6.5	4.8	5.9
3/14/2015		10.3	10.4
3/15/2015		6.3	5.3
3/16/2015	14.0	5.3	7.6
3/17/2015		8.1	7.5
3/18/2015		11.4	5.9
3/19/2015	4.5	7.1	4.5
3/20/2015		5.5	4.1
3/21/2015		5.8	9.3
3/22/2015	6.0	5.7	8.5
3/23/2015			10.7
3/24/2015			6.8
3/25/2015	14.5		7.9
3/26/2015			5.7
3/27/2015			8.2
3/28/2015	12.5		8.1
3/29/2015			7.8
3/30/2015			8.2
3/31/2015	12.1	8.4	6.6
4/1/2015		11.7	7.4
4/2/2015		11.7	7.5
4/3/2015	17.0	9.7	11.8
4/4/2015		16.6	11.0
4/5/2015		9.4	7.7
4/6/2015	16.3	8.8	8.9
4/7/2015		14.2	6.3
4/8/2015		3.9	3.6
4/9/2015	11.8	11.9	6.0
4/10/2015		26.8	9.6
4/11/2015		11.8	8.7
4/12/2015	11.8	10.4	9.1
4/13/2015		9.1	9.2
4/14/2015		30.5	6.9
4/15/2015	19.0	16.8	9.7
4/16/2015		39.5	5.5
4/17/2015		4.4	7.4
4/18/2015	20.8	6.5	7.6
4/19/2015		10.0	6.1
4/20/2015		23.8	7.1
4/21/2015	16.1	7.6	8.5
4/22/2015		11.4	6.0
4/23/2015		8.9	6.5
4/24/2015	7.2	6.5	7.2
4/25/2015		8.4	8.2
4/26/2015		4.6	3.1
4/27/2015	15.0	4.8	6.2
4/28/2015		6.4	4.5
4/29/2015		4.2	5.4
4/30/2015	18.8	10.8	8.9
5/1/2015		5.5	8.2
5/2/2015		7.2	6.9
5/3/2015	8.4	5.3	6.2
5/4/2015		7.3	6.1
5/5/2015		6.5	5.3
5/6/2015	7.7	3.8	4.6

5/7/2015		4.6	3.8
5/8/2015		5.3	7.2
5/9/2015	9.0	4.1	4.2
5/10/2015		4.2	5.5
5/11/2015		6.8	5.6
5/12/2015	11.6	4.1	5.9
5/13/2015		2.6	4.1
5/14/2015		4.8	7.9
5/15/2015	7.7	6.1	5.8
5/16/2015		5.8	3.7
5/17/2015		6.7	5.5
5/18/2015	6.0	6.2	4.6
5/19/2015		5.9	4.9
5/20/2015		4.1	4.3
5/21/2015	7.7	5.8	5.0
5/22/2015		4.6	6.3
5/23/2015		7.3	7.7
5/24/2015	7.0	6.1	4.5
5/25/2015		6.6	6.0
5/26/2015		7.7	4.8
5/27/2015	9.9	6.1	8.2
5/28/2015		10.1	5.2
5/29/2015		8.3	8.9
5/30/2015	11.1	8.8	6.8
5/31/2015		7.9	5.7
6/1/2015		11.7	10.3
6/2/2015	10.0	22.4	10.0
6/3/2015		14.3	12.2
6/4/2015		10.8	25.7
6/5/2015	6.5	12.7	7.3
6/6/2015		5.3	5.8
6/7/2015		4.7	4.5
6/8/2015	8.0	9.3	4.7
6/9/2015		8.1	5.3
6/10/2015		4.8	3.7
6/11/2015		7.7	6.1
6/12/2015		9.2	4.1
6/13/2015		11.8	6.6
6/14/2015		6.3	4.4

(Red – High Wind, Blue - Stagnation, Yellow – Combination High Wind and stagnation)

Appendix B

Time Series Plots PM10 and PM2.5

Figure 1 - Time Series Plot PM10

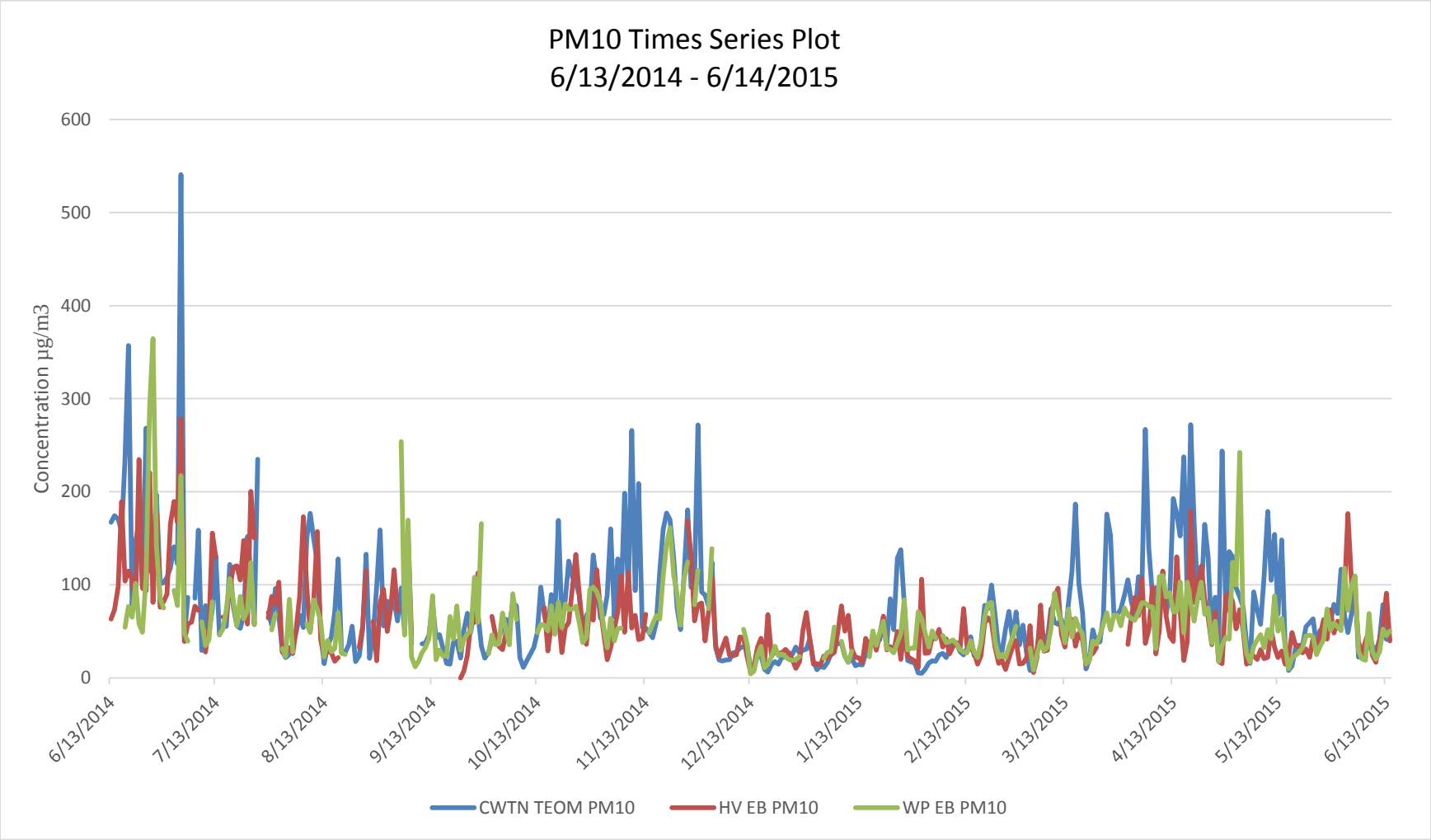
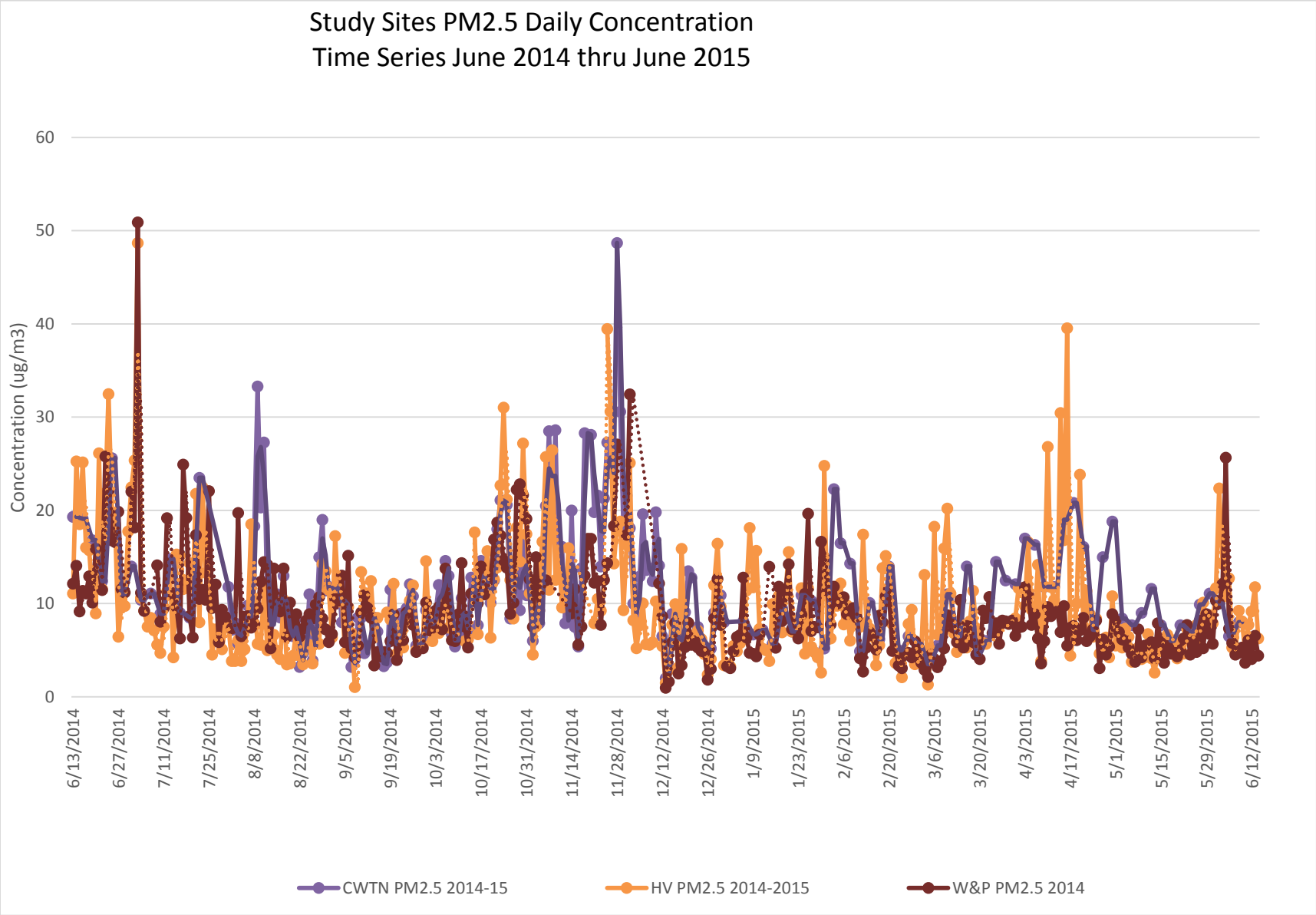



Figure 2 – Time Series Plot PM2.5