MAG 2012 FIVE PERCENT PLAN FOR PM-10 FOR THE MARICOPA COUNTY NONATTAINMENT AREA

APPENDICES

VOLUME TWO

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Technical Document in Support of the MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area. Maricopa Association of Governments

TECHNICAL DOCUMENT

IN SUPPORT OF THE

MAG 2012 FIVE PERCENT PLAN FOR PM-10 FOR THE MARICOPA COUNTY NONATTAINMENT AREA

May 2012

Maricopa Association of Governments
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I. INTRODUCTION

The Technical Document in Support of the MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area (TSD) describes the base case emission inventories, quantification of measures used to meet the five percent and contingency requirements, and the modeling that demonstrates attainment in the PM-10 nonattainment area.

The U.S. Environmental Protection Agency (EPA) published a final notice on June 6, 2007 that the Maricopa County PM-10 Nonattainment Area had failed to attain the 24-hour PM-10 standard by December 31, 2006. Section 189(d) of the Clean Air Act requires Serious nonattainment areas that do not meet the applicable attainment date to prepare a plan that reduces PM-10 emissions by at least five percent per year until the standard is attained at all monitors. The Clean Air Act specifies that the plan must be based on the most recent emissions inventory for the area, meet contingency requirements, and include a modeling demonstration of attainment.

The 2008 PM-10 Periodic Emission Inventory for the Maricopa County, Arizona, Nonattainment Area, revised in June 2011 (PEI), is the most recent emissions inventory for the area (Appendix A, Exhibit 1). This inventory has been used as the basis for the five percent and contingency reductions and the attainment modeling required by the Clean Air Act. Chapter II of the TSD describes the development of the 2007-2012 base case emission inventories that were derived from the 2008 PEI.

Chapter III discusses the methods used to quantify rule effectiveness for Maricopa County Rules 310, 310.01 and 316. As described in the Plan, the increases in rule effectiveness between 2007 and 2012 are sufficient to meet the annual five percent reduction requirements (Chapter Five) and demonstrate modeled attainment (Chapter Six).

Chapter IV describes the technical assumptions used to meet contingency requirements of the Clean Air Act. The requirement is met by quantifying the PM-10 emission reductions due to numerous projects completed in the nonattainment area in 2008-2011. These projects include PM-10 certified street sweeping; paving and stabilizing unpaved roads, alleys and shoulders; reducing speed limits on unpaved roads and alleys, and overlaying payment with rubberized asphalt. As discussed in Chapter Six of the Plan, cumulatively, these reductions are sufficient to meet EPA's contingency guideline of one year of reasonable further progress (RFP).

Chapter V documents the technical assumptions underlying the rollback modeling used to demonstrate attainment by 2012. As discussed in Chapter Six of the Plan, the modeling concludes that the PM-10 standard will be attained on high wind days at the West 43rd Avenue monitor and throughout the PM-10 nonattainment area by December 31, 2012.

II. BASE CASE PM-10 EMISSIONS

Section 189(d) of the Clean Air Act requires that the plan provide an annual reduction in PM-10 emissions of not less than five percent of the emissions in the most recent inventory prepared for the area. The MAG 2012 Five Percent Plan for PM-10 provides reductions of five percent per year from the 2007 base year until the attainment year of 2012. This chapter describes the development of the base case emissions for 2007 through 2012. "Base case" emissions do not include reductions due to measures quantified in either the MAG 2007 Five Percent Plan or the MAG 2012 Five Percent Plan.

In June 2011, the Maricopa County Air Quality Department finalized the latest version of the 2008 PM-10 Periodic Emissions Inventory (PEI). The 2007-2012 base case emissions are derived from the 2008 PEI (Appendix A, Exhibit 1). Growth factors have been applied to the 2008 PEI emissions to estimate 2007 and 2009-2012 base case emissions. For most source categories, the growth factors are derived from projections for the Phoenix-Mesa metropolitan area released in August 2011 by Marshall Vest of the University of Arizona, Economic and Business Research Center. These projections are based on the 2010 U.S. Census and the latest economic forecasts for the Phoenix metropolitan area. Since the economic outlook for the United States and Arizona remains extremely volatile, the actual population and employment levels in 2011 and 2012 may differ from the projections. However, the University of Arizona growth factors represent the most reliable data currently available. Table II-1 summarizes the annual projection factors, relative to 2008, for population, construction employment and manufacturing employment.

The remainder of this chapter documents the derivation of the 2007-2012 base case emissions in Table II-2. The discussion is organized by major source category, i.e., point, area, nonroad mobile and onroad mobile. The order of the subcategories is consistent with the source category sequence in Table II-2. All tonnage estimates referred to below represent annual PM-10 emissions in the Maricopa County PM-10 nonattainment area.

POINT SOURCES

Point sources of PM-10 emissions are those permitted sources that emit more than five tons per year of PM-10. The 2008 PEI estimate of 149.84 tons from point sources is back-cast to 2007 and projected to 2009-2012 using the manufacturing employment growth factors shown in Table II-1.

AREA SOURCES

Area sources of PM-10 emissions include fuel combustion, wildfires, agriculture, construction, travel on unpaved parking lots, off-road recreational vehicles, leaf blowers, windblown dust, and industrial processes that are not large enough to qualify as point sources. The derivation of 2007-2012 base case emissions for each of these area sources is discussed below. As noted previously, the source subcategories are organized in the same sequence as Table II-2.

Table II-1
Growth Factors for the PM-10 Nonattainment Area

	Factors Relative to 2008					
	2007	**2008**	**2009**	**2010**	**2011**	**2012**
Population	0.981	1.000	1.005	1.008	1.012	1.021
Construction Employment	1.216	1.000	0.689	0.588	0.569	0.578
Manufacturing Employment	1.058	1.000	0.886	0.849	0.852	0.898

Note: The growth factors above are based on the 3rd Quarter 2011 baseline projections for the Phoenix-Mesa metropolitan area published by Marshall Vest, Economic and Business Research Center, University of Arizona. The Phoenix-Mesa metropolitan area includes all of Maricopa and Pinal Counties. The table below shows the Marshall Vest annual projections and percentage changes relative to each previous year, beginning in 2009. For 2007, the percent change is shown relative to 2008, since 2008 is the year for the latest PM-10 emissions inventory (Appendix A, Exhibit 1).

Year	Population	%	Construction Employment	%	Manufacturing Employment	%
2007	4,087,390	-1.9%	169,392	21.6%	137,242	5.8%
2008	4,167,019		139,358		129,683	
2009	4,186,131	0.5%	96,008	-31.1%	114,883	-11.4%
2010	4,200,427	0.3%	82,021	-14.6%	110,047	-4.2%
2011	4,215,500	0.4%	79,283	-3.3%	110,444	0.4%
2012	4,251,802	0.9%	80,580	1.6%	116,448	5.4%

Table II-2
2007-2012 Base Case Emissions in the PM-10 Nonattainment Area

	tons/year					
Source Category	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
POINT	158.53	149.84	132.76	127.18	127.69	134.59
AREA						
Fuel combustion	1,275.94	1,300.65	1,307.15	1,311.07	1,316.32	1,328.17
Commercial cooking	974.17	993.04	998.01	1,001.00	1,005.00	1,014.05
Construction (includes windblown dust)	16,671.97	13,811.01	9,691.77	8,359.38	8,102.20	8,222.78
Tilling, harvesting and cotton ginning	936.27	893.20	893.20	893.20	893.20	893.20
Travel on unpaved farm roads	768.69	731.03	731.03	731.03	731.03	731.03
Livestock	260.95	260.95	260.95	260.95	260.95	260.95
Travel on unpaved parking lots	2,375.50	2,421.51	2,433.62	2,440.92	2,450.68	2,472.74
Offroad recreational vehicles	2,138.74	2,180.16	2,191.06	2,197.63	2,206.42	2,226.28
Leaf blowers	877.98	894.98	899.45	902.15	905.76	913.91
Windblown agriculture	447.85	447.85	447.85	447.85	447.85	447.85
Other windblown sources	5,430.01	5,430.01	5,430.01	5,430.01	5,430.01	5,430.01
Fires	496.71	496.71	496.71	496.71	496.71	496.71
Mining/quarrying (includes windblown dust)	752.18	721.38	660.84	641.08	642.89	667.32
Travel on industrial paved/unpaved roads	770.71	728.46	645.41	618.31	620.78	654.30
Other industrial sources	1,032.62	976.01	864.74	828.43	831.74	876.65
NONROAD						
Aircraft	193.54	183.80	151.52	141.54	143.44	145.50
Airport ground support equipment	28.64	26.99	23.32	20.94	20.11	19.90
Locomotives	34.16	34.16	34.16	34.16	34.16	34.16
Other nonroad equipment	1,709.76	1,682.91	1,660.64	1,640.88	1,595.22	1,513.25
ONROAD						
Exhaust	2,943.36	2,835.65	2,647.20	2,371.05	1,843.23	1,407.06
Tire wear	245.80	255.82	256.50	257.23	257.94	261.41
Brake wear	727.66	758.17	767.49	770.58	772.79	787.25
Paved roads	7,749.01	8,154.57	8,213.92	8,289.47	8,322.90	8,421.72
Unpaved roads and alleys	10,217.66	10,312.22	10,284.04	10,284.04	10,284.04	10,312.22
TOTALS	**59,218.38**	**56,681.08**	**52,123.36**	**50,496.80**	**49,743.06**	**49,673.01**

Fuel Combustion

This category includes residential, commercial and industrial gas, wood and oil burning. The 2008 PEI estimate of 1,300.65 tons from fuel combustion is back-cast to 2007 and projected to 2009-2012 using the population growth factors shown in Table II-1.

Commercial Cooking

This category includes restaurant cooking with five types of equipment: chain-driven charbroilers, under-fired charbroilers, deep-fat fryers, flat griddles and clamshell griddles. The 2008 PEI estimate of 993.04 tons for commercial cooking is back-cast to 2007 and projected to 2009-2012 using the population growth factors in Table II-1.

Construction

The 2008 PEI estimates of annual PM-10 emissions from construction are 1,692.38 tons for residential construction, 4,057.29 tons for commercial construction, 2,051.78 tons for road construction, and 162.41 tons for other land clearing. The other land clearing category includes site preparation, weed control and trenching.

Rule Effectiveness (RE) rates for earth-moving activities permitted under Maricopa County Rule 310 have been calculated by the Maricopa County Air Quality Department using actual earthmoving inspection data for the years 2007-2010. The methodology used in calculating the RE rates was developed in consultation with the Environmental Protection Agency. The RE rate for Rule 310 in 2007 was 76 percent and in 2008, 90 percent. This major increase in rule effectiveness is attributable to strengthened and increased enforcement of Rule 310.

The 2008 PEI estimate of 7,963.86 tons for construction emissions was adjusted to account for the decrease in RE from 90 percent to 76 percent, resulting in non-windblown construction emissions of 13,245.15 tons. These 2008 emissions were back-cast to 2007 and projected to 2009-2012 using the construction employment growth factors in Table II-1. The addition of the windblown construction emissions of 565.86 tons, discussed in the Windblown Dust section below, produced the total 2008 base case construction emissions of 13,811.01 tons shown in Table II-2.

Agriculture

The 2008 PEI estimates of PM-10 emissions from agriculture include tilling and harvesting (888.34 tons), travel on unpaved farm roads (731.03 tons), cotton ginning (4.86 tons), and livestock (260.95 tons). The factor to back-cast agricultural activity from 2008 to 2007 was derived from the trends in Arizona Agricultural Statistics Bulletins for Maricopa County between 2000 and 2004. (Complete data on crop acreage in Maricopa County was not available after 2004). Based on these trends, tilling and harvesting acreage was expected to decline by 4.6 percent between 2007 and 2008. This 4.6 percent decline between 2007

and 2008 translates into a 4.8 percent increase between 2008 and 2007. The agricultural emissions for 2009-2012 are held constant at 2008 PEI levels, due to reductions in agricultural product demand associated with the economic recession that began in 2008.

Travel on Unpaved Parking Lots

The 2008 PEI estimate of 2,365.07 tons of PM-10 emissions generated by vehicles traveling on unpaved parking lots was back-cast to 2007 and projected to 2009-2012 based on the population growth factors in Table II-1.

Off-Road Recreational Vehicles

The PEI estimate of 2,014.17 tons of PM-10 generated off-road recreational vehicles was back-cast to 2007 and projected to 2009-2012 based on the population growth factors in Table II-1.

Leaf Blower Fugitive Dust

The PEI estimate of 894.98 tons of PM-10 produced by leaf blowers was back-cast to 2007 and projected to 2009-2012 based on the population growth factors in Table II-1.

Windblown Dust

The 2008 PEI estimate for windblown dust from all sources is 4,814.80 tons. This includes windblown dust from construction (391.00 tons), mining/quarrying (131.57 tons), agriculture (354.24 tons) and vacant land and other sources (3,937.99 tons) including open space, landfills and test tracks. Details concerning the methodology and data used to estimate the 2008 windblown dust emissions are provided in Appendix 4 of the 2008 PEI.

To obtain base case emissions for windblown sources, the rule effectiveness (RE) rates for each category in 2008 have been adjusted to the appropriate 2007 RE. Between 2007 and 2008, RE rates for construction increased from 76 to 90 percent; mining/quarrying increased from 40 to 65 percent; and vacant land increased from 85 to 95 percent. Adjusting the 2008 PEI emissions to these 2007 RE rates results in 565.86 tons for windblown construction, 190.36 tons for mining/quarrying, 5,430.01 tons for vacant land and other sources, and 447.85 tons for agriculture. In the case of windblown agricultural, the non-cropland portions of windblown agriculture emissions are assumed to have the same RE rates as vacant lands in the 2008 PEI and are thus affected by changes in RE rates from 2007 to 2008. The cropland portion of windblown agricultural emissions are calculated using a separate methodology in the 2008 PEI and are held constant between 2008 and 2007.

The 2007 base case emissions for all windblown categories are held constant from 2008 through 2012. Windblown construction and mining/quarrying emissions are added to the corresponding non-windblown categories in Table II-1, while windblown agriculture and

other windblown sources are shown as separate categories.

Fires

This category include wildfires, prescribed fires, structure fires and vehicle fires. The 2008 PEI estimate for this category is 469.03 tons. This 2008 estimate is held constant in 2007 and 2009-2012 because the biggest contributor to this category is wildfires (90 percent), which are not possible to predict or control.

Non-Metallic Mineral Processing and Mining/Quarrying

Non-metallic mineral processing includes concrete batch plants, ceramic clay and tile manufacturing, brick manufacturing and gypsum mining. The Mining/Quarrying category includes sand and gravel operations and other types of mining. The 2008 PEI estimates are 187.73 tons for non-metallic mineral processing and 156.60 tons for mining/quarrying.

Rule Effectiveness (RE) rates for non-metallic mineral processing and sand and gravel operations permitted under Maricopa County Rule 316 have been calculated by the Maricopa County Air Quality Department using actual inspection data for the years 2007-2010. The methodology used in calculating the RE rates was developed in consultation with the Environmental Protection Agency. The RE rate for Rule 316 was 40 percent in 2007 and 65 percent in 2008. This major increase in rule effectiveness is attributable to strengthened enforcement and increased compliance with Rule 316.

The 2008 PEI emissions for non-metallic mineral processing and mining/quarrying were adjusted to account for the decrease in RE from 65 percent to 40 percent, resulting in total non-windblown emissions of 531.01 tons. These 2008 emissions were back-cast to 2007 and projected to 2009-2012 based on the manufacturing employment growth factors in Table II-1. The addition of the windblown mining/quarrying emissions of 190.36 tons, discussed in the Windblown Dust section above, produced base case non-metallic mineral processing and mining/quarrying emissions of 721.38 tons. These two categories are combined and denoted as “mining/quarrying” in Table II-2.

Travel on Industrial Roads

Travel on Industrial Roads includes emissions from motor vehicles traveling on paved and unpaved roads within the boundaries of a facility that is permitted by Maricopa County. The 2008 PEI emissions for this category are 472.36 tons. The 2008 PEI estimate was adjusted to account for the decrease in rule effectiveness for Rule 316, as discussed in the previous section. Decreasing the RE from 65 percent to 40 percent produced 2008 base case emissions for travel on industrial roads of 728.46 tons. The base case 2008 emissions were back-cast to 2007 and projected to 2009-2012 based on the manufacturing employment growth factors in Table II-1.

Other Industrial Sources

This category includes manufacturing and other industrial activities that do not individually produce enough emissions to qualify as point sources and are not addressed in any of the other Area Source categories above. The 2008 PEI estimate of PM-10 emitted by these other industrial sources is 976.01 tons. The other industrial source emissions were back-cast to 2007 and projected to 2009-2012 using the manufacturing employment growth factors in Table II-1.

NONROAD MOBILE SOURCES

Nonroad mobile sources are those that move or are movable within a 12-month period and are not licensed or certified as highway vehicles. This category includes exhaust emissions from equipment used in agriculture, construction, mining, landscaping, commerce, industry and recreation. The category also includes aircraft, airport equipment and locomotives. The growth factors vary by equipment type.

The 2008 PEI estimate of PM-10 emissions from all nonroad mobile sources is 1,927.89 tons per year for the PM-10 nonattainment area. The major source categories and emission estimates for 2007-2012 are discussed in the sections that follow.

Aircraft and Airport Ground Support Equipment

The 2008 PEI estimate of PM-10 emissions from aircraft is 183.80 tons, while airport ground support equipment (GSE) emissions, which include emissions from auxiliary power units (APUs), are 26.99 tons. These 2008 estimates were back-cast to 2007 and grown to 2009-2012 based on the growth factors shown in Table II-3. The aircraft growth factors were derived from estimates of landings and takeoffs (LTO) obtained from the Federal Aviation Administration (FAA). The growth factors for GSE were estimated using the FAA Emissions Dispersion Modeling System (EDMS), version 5.1.3.

Locomotive Emissions

The 2008 PEI PM-10 emissions estimate of 34.16 tons for locomotives was derived from surveys of the three railroad companies that have operations in Maricopa County (Burlington Northern Santa Fe, Union Pacific and Amtrak). The 2008 locomotive emissions are held constant in 2007-2012.

Other Nonroad Mobile Source Equipment

The 2008 PEI estimate for other nonroad sources besides aircraft, airport GSE and locomotives is 1,682.94 tons. MAG ran the EPA NONROAD2008 model to estimate 2007-2012 PM-10 emissions by source type using the same inputs assumed in the 2008 PEI (Appendix A, Exhibit 1). The 2007-2012 emissions by source type for other nonroad mobile source equipment and the corresponding growth factors are shown in Table II-4. The

Table II-3
Growth Factors for Aircraft and Ground Support Equipment

PM-10 Annual Emissions from Aviation Sources in PM-10 NAA (metric tons)							Growth Factors Relative to 2008					
Source Type	**2007** [1]	**2008**	**2009** [2]	**2010**	**2011**	**2012**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Aircraft [3]	254.80	241.98	199.49	186.34	188.84	191.56	1.053	1.000	0.824	0.770	0.780	0.792
GSE+APUs[4]	30.74	28.97	25.03	22.48	21.59	21.36	1.061	1.000	0.864	0.776	0.745	0.737
Total	285.54	270.95	224.52	208.82	210.43	212.92	1.054	1.000	0.829	0.771	0.777	0.786

[1]Landings and takeoffs (LTOs) for the years 2007, 2008, and 2009 are extracted from the FAA website (http://aspm.faa.gov/opsnet/sys/Airport.asp); LTOs for years 2010-2013 are extracted from the FAA Terminal Area Forecast (TAF) (http://aspm.faa.gov/main/taf.asp).
[2]LTOs for military aircraft in all airports, except Luke Air Force Base, are assumed to remain constant from 2009 -2012.
[3]PM-10 emissions from aircrafts are calculated by using emission factors from EPA's guidance, *Documentation for the NONROAD Model Criteria Air Pollutant Component of the National Emissions Inventory (NEI) for Base Years 1970–2001.* Report prepared by E.H. Pechan & Associates for U.S. EPA Office of Air Quality Planning and Standards, Sept. 2003.
[4]PM-10 emissions from Ground Support Equipment (GSE) and Auxiliary Power Units (APUs) are calculated using EDMS 5.1.3.

Table II-4
Growth Factors for Other Nonroad Mobile Sources

NONROAD2008 Annual PM-10 Emissions by Source Type for Maricopa County							Growth Factors Relative to 2008					
Source Type	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Agricultural Equipment	35.86	34.27	32.74	31.25	29.44	27.28	1.047	1.000	0.955	0.912	0.859	0.796
Commercial Equipment	118.35	117.97	117.32	116.26	114.80	111.38	1.003	1.000	0.995	0.985	0.973	0.944
Construction and Mining Equipment	1,286.45	1,260.98	1,240.09	1,222.25	1,178.71	1,105.11	1.020	1.000	0.983	0.969	0.935	0.876
Industrial Equipment	105.13	102.60	100.81	99.24	97.06	90.98	1.025	1.000	0.983	0.967	0.946	0.887
Lawn and Garden Equipment	179.69	182.19	184.91	187.72	190.75	192.37	0.986	1.000	1.015	1.030	1.047	1.056
Logging Equipment	0.00	0.00	0.00	0.00	0.00	0.00	1.000	1.000	1.000	1.000	1.000	1.000
Pleasure Craft	9.79	9.19	8.61	7.81	7.06	6.37	1.066	1.000	0.937	0.850	0.768	0.693
Railroad Equipment	1.15	1.13	1.10	1.07	1.03	0.99	1.023	1.000	0.976	0.950	0.917	0.877
Recreational Equipment	45.44	45.58	45.12	44.49	43.65	42.59	0.997	1.000	0.990	0.976	0.958	0.934
Total (tons/year)	**1,781.87**	**1,753.90**	**1,730.69**	**1,710.09**	**1,662.50**	**1,577.08**	**1.016**	**1.000**	**0.987**	**0.975**	**0.948**	**0.899**

growth factors for total other nonroad mobile source equipment shown at the bottom of the table were used to back-cast 2008 emissions to 2007 and project 2008 emissions to 2009-2012.

ONROAD MOBILE SOURCES

There are three categories of PM-10 emissions from onroad mobile sources: exhaust, tire wear and brake wear; reentrained dust from paved roads; and travel on unpaved roads and alleys. Each of these categories is discussed in a separate section below.

Exhaust, Tire Wear and Brake Wear Emissions

The 2008 PEI estimate of PM-10 emissions from exhaust, tire wear and brake wear is 3,144.17 tons. The 2008 PEI emissions were estimated by MAG using the new EPA MOVES2010a model. The MOVES input assumptions are detailed in Chapter Five of the 2008 PEI (Appendix A, Exhibit 1).

MAG re-estimated onroad mobile source emissions using the MOVES2010a model and the latest planning assumptions available in August 2011. The latest planning assumptions included July 1, 2011 vehicle registration data provided by the Arizona Department of Transportation. Due to the recession, the 2011 vehicle registrations contain a larger proportion of older vehicles than the 2010 vehicle registrations used in estimating mobile source emissions for the 2008 PEI. In addition, the vehicle miles of travel (VMT) and link-level speeds were based on the latest MAG transportation models, which incorporate a new truck model and updated volume/delay functions. The traffic assignments produced by the MAG transportation models in August 2011 had also been validated against the most recent (2008-2010) traffic counts. Due to these changes in vehicle registrations and transportation modeling and the use of updated factors to convert from weekday to annual average daily traffic, the exhaust, tire wear and brake wear emissions estimated with MOVES2010a for the 2008 base case PM-10 emissions are 3,849.64 tons, which is 22.4 percent higher than the 2008 PEI.

The emission rates produced by MOVES for 2007-2012 were applied to VMT estimates for the PM-10 nonattainment area. For 2008, the MOVES emission rates were applied to VMTs produced by the 2008 MAG traffic assignment. The 2007 VMT was derived from the 2008 VMT, using historical, pre-recession trends in VMT growth produced by MAG traffic assignments. The traffic counts MAG has conducted since 2008 indicate that traffic volumes have not increased at their historical rate. Therefore, for 2009-2012, the MOVES emission rates were applied to VMT estimates based on the population growth factors in Table II-1, rather than VMTs output by the MAG traffic assignments. The population projections shown in Table II-1 take into account the 2010 U.S. Census, as well as the economic downturn after 2007. In contrast, the MAG traffic assignments utilize the official population projections adopted by the MAG Regional Council in May 2007. The adopted projections, which are based on the 2005 Special Census for Maricopa County, significantly overstate the socioeconomic growth in the area since 2008. MAG is working on new

population and employment projections by traffic analysis zone that are consistent with the 2010 U.S. Census, but these will not be available to use as input to the transportation models until early 2013. In the meantime, the VMT estimates during the recession years of 2009-2012 are based on the best available population projections for the area shown in Table II-1. The base case exhaust, tire wear and brake wear emissions for 2007-2012 and the growth factors, relative to 2008, are shown in Table II-5.

Reentrained Dust from Paved Roads

The 2008 PEI estimate of PM-10 emissions from dust reentrained by vehicles traveling on paved roads is 6,694.22 tons. The estimate is based on the new AP-42 equation for paved roads that was revised by EPA in January 2011. The PEI emissions include a reduction of 1,172.8 tons for PM-10 certified street sweepers purchased by December 31, 2006 with Congestion Mitigation and Air Quality Improvement (CMAQ) funds. The PEI estimate also includes reductions of 996.0 tons for five measures in the MAG 2007 Five Percent Plan that were implemented in 2008.

The 2008 base case PM-10 emissions for the MAG 2012 Five Percent Plan were developed using the assumptions in the 2008 PEI, with one exception; the average vehicle weights for freeways and arterials have been re-estimated using July 1, 2011 vehicle registrations and the EPA default vehicle weight of 3.18 tons, while the 2008 PEI used July 1, 2010 vehicle registrations and an average vehicle weight of 3 tons. The new vehicle weights for freeways (3.91 tons) and arterials (2.73 tons) were derived from July 1, 2011 vehicle registrations and a 2008 traffic assignment. When weighted by VMT, these freeway and arterial weights average 3.18 tons.

Other AP-42 input assumptions used in calculating paved road emissions are consistent with the 2008 PEI. The silt loadings in grams per square meter are 0.02 for freeways, 0.067 for high traffic arterials ($\geq$10,000 average daily traffic (ADT)), and 0.23 for low traffic arterials (<10,000 ADT). The number of “wet” days per year is 39, while the annual number of days in the leap year of 2008 was 366.

Applying these inputs to the AP-42 equation produces paved road emission rates of 0.11 grams per VMT for freeways, 0.23 grams per VMT for high traffic arterials, and 0.71 grams per VMT for low traffic arterials. These emission rates are multiplied by the 2008 annual average daily VMTs used in the PEI, which are 30,835,329 for freeways, 42,498,543 for high traffic arterials, and 13,819,127 for low traffic arterials. The resultant uncontrolled paved road emissions for 2008 are 9,270.34 tons, which is five percent higher than the 2008 PEI estimate without benefits for street sweepers and the five other measures in the 2007 Plan.

The uncontrolled paved road emissions do not include credit for PM-10 certified street sweepers that were purchased in 2001 through 2006. During this six year period, MAG member agencies purchased 94 PM-10 certified street sweepers to replace conventional (non-certified) sweepers, increase the frequency of sweeping, and expand the area swept

Table II-5
2007-2012 PM-10 Emissions from Exhaust, Tire Wear and Brake Wear

	PM-10 Emissions (tons/year)						Growth Factors Relative to 2008					
	2007	2008	2009	2010	2011	2012	2007	2008	2009	2010	2011	2012
Exhaust	2,943.36	2,835.65	2,647.20	2,371.05	1,843.23	1,407.06	1.038	1.000	0.934	0.836	0.650	0.496
Tire Wear	245.80	255.82	256.50	257.23	257.94	261.41	0.961	1.000	1.003	1.005	1.008	1.022
Brake Wear	727.66	758.17	767.49	770.58	772.79	787.25	0.960	1.000	1.012	1.016	1.019	1.038
Total	3,916.81	3,849.64	3,671.19	3,398.86	2,873.96	2,455.72	1.017	1.000	0.954	0.883	0.747	0.638

in the PM-10 nonattainment area. The agencies purchased the sweepers with Congestion Mitigation and Air Quality Improvement (CMAQ) funds and paid a minimum local match of 5.7 percent of the cost of each sweeper. As part of the funding request, the agencies provided MAG with data on the lane miles to be swept, the traffic volume per lane swept and the sweeping cycle length. These data have been used to quantify the PM-10 emission reductions attributable to the PM-10 certified sweepers purchased with CMAQ funds in 2001-2006.

There were 94 PM-10 certified sweepers purchased with CMAQ funds between January 1, 2001 and December 31, 2006. An ADOT street sweeper inventory dated April 2, 2010 indicated that only 72 of these sweepers were still in service as of December 31, 2009. To be conservative in estimating the emissions reduced by PM-10 certified sweepers, the benefits of the sweepers that were not in service as of December 31, 2009 have been removed. In addition, no credit is taken for the one sweeper purchased to replace an older PM-10 certified sweeper during this period. The sweeper-specific assumptions are shown in Appendix B, Exhibit 2.

The equations used to quantify the benefit of the PM-10 certified sweepers are documented in the CMAQ Methodologies (MAG, 2011). The average unswept emission factors used in calculating the sweeper benefits for non-freeways is 0.35 grams per vehicle mile of travel (VMT). This represents a 2008 VMT-weighted average of 0.71 grams per VMT for low traffic arterials and 0.23 grams per VMT for high traffic arterials. Table II-6 shows the emission rates for sweeping freeways, non-freeways and streets in the Salt River Area with PM-10 certified and conventional sweepers for sweeping cycle lengths of one to thirty days.

In converting from daily to annual reductions, it was assumed that a new PM-10 certified unit would sweep 95 percent of the days during the first year, with the remainder of the time devoted to routine maintenance and holiday downtime. It was also assumed that the rate of utilization (and attendant emission reductions) would decline according to the usage factors shown in Table II-7 due to the need for increased maintenance as the equipment ages. The usage factors are based on maintenance data provided by agencies requesting CMAQ funding for a new PM-10 certified sweeper to replace an older PM-10 certified sweeper.

The total PM-10 emissions reduction attributable to PM-10 certified street sweepers purchased in 2001 through 2006 and still in service as of December 31, 2009 is 1,115.77 tons in 2008. The uncontrolled paved road emissions estimate of 9,270.34 tons is reduced by the benefit of the CMAQ-funded street sweepers, resulting in 2008 base case paved road emissions of 8,154.57 tons.

For 2007, 2009, and 2010, the reductions due to the sweepers purchased in 2001-2006 vary slightly, because the aging of the sweepers and increased downtime reduces the benefits over time. As a result, the reduction in 2007 is slightly higher than 2008: 1,153.93 tons, while the reductions in 2009 and 2010 are slightly lower: 1,077.32 tons and 1,029.63 tons, respectively. The 2008 uncontrolled base case paved road emissions are back-cast

Table II-6
PM-10 Emission Rates for PM-10 Certified and Conventional Sweepers

Cycle Length (days)	Composite Emission Rates (g/VMT) - PM-10 Certified Sweeper			Composite Emission Rates (g/VMT) - Conventional Sweeper		
	Freeway	Non-Freeway	Salt River	Freeway	Non-Freeway	Salt River
1	0.031	0.098	0.364	0.065	0.208	0.778
2	0.037	0.118	0.441	0.070	0.223	0.832
3	0.043	0.137	0.510	0.074	0.237	0.884
4	0.048	0.154	0.574	0.079	0.250	0.934
5	0.053	0.170	0.634	0.083	0.263	0.983
6	0.058	0.185	0.692	0.087	0.276	1.029
7	0.063	0.200	0.746	0.090	0.286	1.069
8	0.067	0.214	0.799	0.092	0.294	1.099
9	0.072	0.228	0.850	0.094	0.300	1.122
10	0.075	0.240	0.895	0.096	0.305	1.141
11	0.079	0.250	0.933	0.097	0.309	1.156
12	0.081	0.258	0.964	0.098	0.313	1.168
13	0.083	0.265	0.990	0.099	0.316	1.179
14	0.085	0.271	1.013	0.100	0.318	1.188
15	0.087	0.277	1.033	0.101	0.320	1.196
16	0.088	0.281	1.050	0.101	0.322	1.203
17	0.090	0.285	1.065	0.102	0.324	1.209
18	0.091	0.289	1.078	0.102	0.325	1.215
19	0.092	0.292	1.091	0.103	0.327	1.220
20	0.093	0.295	1.101	0.103	0.328	1.224
21	0.094	0.298	1.111	0.103	0.329	1.228
22	0.094	0.300	1.120	0.104	0.330	1.231
23	0.095	0.302	1.128	0.104	0.331	1.235
24	0.096	0.304	1.136	0.104	0.331	1.238
25	0.096	0.306	1.143	0.104	0.332	1.241
26	0.097	0.308	1.149	0.105	0.333	1.243
27	0.097	0.309	1.155	0.105	0.333	1.245
28	0.098	0.311	1.160	0.105	0.334	1.248
29	0.098	0.312	1.165	0.105	0.335	1.250
30	0.098	0.313	1.170	0.105	0.335	1.252

Table II-7
Usage Factors for PM-10 Certified Street Sweepers

Usage Factor Table	
Year of Use	**Usage Factor**
1st	0.950
2nd	0.919
3rd	0.888
4th	0.857
5th	0.826
6th	0.795
7th	0.764
8th	0.734
9th	0.703
10th+	0

to 2007 based on the vehicle miles of travel (VMT) estimated by the MAG transportation models for 2008 versus 2007. The reduction for sweepers purchased in 2001-2006 (1,153.93 tons) is then subtracted to derive 2007 base case paved road emissions. To account for the economic recession, the 2008 uncontrolled base case paved road emissions are projected to 2009 and 2010 using the Marshall Vest population projections in Table II-1. The reductions for sweepers purchased in 2001-2006 (1,077.32 tons in 2009 and 1,029.63 tons in 2010) are then applied to estimate 2009 and 2010 base case paved road emissions. The 2010 base case paved road emissions with street sweeper reductions are projected to 2011-2012 based on the population growth factors in Table II-1.

Travel on Unpaved Roads and Alleys

The 2008 PEI estimate of PM-10 emissions from vehicles traveling on unpaved roads and alleys is 11,710.70 tons. This estimate is based on the EPA AP-42 equation for unpaved roads (assuming a speed of 25 mph) and unpaved alleys (assuming a speed of 10 mph). The PEI estimate included a reduction of 2,065.4 tons for four measures in the MAG 2007 Five Percent Plan that were implemented in 2008. Assumptions for calculating base case unpaved road and alley emissions for the MAG 2012 Five Percent Plan are consistent with the 2008 PEI, with the exception of the average daily traffic (ADT) on unpaved alleys and the ADT, speeds, and miles assumed for private unpaved roads.

MAG conducted traffic counts on a statistically significant sample of unpaved alleys and private unpaved roads in the PM-10 nonattainment area in February 2011. The survey indicated that the ADT on unpaved alleys should be 4, rather than 10, and the ADT on private unpaved roads should be 26, rather than 28.

In August-September 2011, MAG conducted a private unpaved road inventory. The MAG contractor drove most of the private unpaved roads identified in the MAG 2009 Unpaved Road Inventory (URI) and collected data on the location, length, condition and function of each road. The 2009 URI estimate of 1,270.6 miles of private unpaved roads was based on a GIS analysis of aerial photographs, rather than actual field data. The 2011 field inventory concluded that there are 927.3 miles of private unpaved roads, which is 343.3 miles lower than estimated by the 2009 URI. The principal reason for this difference was the mis-classification of driveways, trails, utility and canal roads, barricaded routes, and inaccessible rights-of-way as private unpaved roads. The contractor also reported that the maximum speed that could be driven on the private unpaved roads was 15 to 20 miles per hour, rather than the 25 miles per hour assumed in the 2008 PEI. Unlike public unpaved roads, which typically carry higher traffic volumes and are better-maintained, private unpaved roads have rough surfaces and poor alignments, which reduces vehicle speeds. To be conservative, the speed used in quantifying the private unpaved road emissions for the MAG 2012 Five Percent Plan was assumed to be 20 mph, which is the higher end of the range.

Other inputs to the AP-42 equation for paved roads are consistent with the 2008 PEI. These include a silt content of 11.9 percent, a soil moisture content of 0.5 percent, and average

speeds of 25 mph on public unpaved roads and 10 mph on unpaved alleys. The average number of "wet" days in 2008 was 36, with the annual number of days in 2008, a leap year, of 366. The resultant emission factors for 2008 are 660.16 grams per VMT for public unpaved roads, 590.45 grams per VMT for private unpaved roads, and 417.45 grams per VMT for unpaved alleys. These factors are applied to annual average daily 2008 VMT estimates of 19,956 for public unpaved roads, 22,255 for private unpaved roads, and 2,600 for unpaved alleys in the PM-10 nonattainment area. Converting to annual emissions results in total 2008 base case emissions from public unpaved roads, private unpaved roads and unpaved alleys of10,312.22 tons.

Base case public unpaved road and alley emissions are held constant between 2008 and 2007. The 2008 private unpaved road emissions are back-cast to 2007 assuming a growth rate of 1.46 percent between 2007 and 2008. This growth rate is based on a longitudinal analysis of historical lot split data conducted by MAG that showed an average annual increase in private unpaved road mileage, prior to the recession, of 1.46 percent. Due to the economic downturn in 2008, base case emissions for public and private unpaved roads and alleys are held constant in 2008 through 2012.

SUMMARY OF BASE CASE EMISSIONS

Table II-2 summarizes the 2007-2012 base case PM-10 emissions by source category that were developed using the methods and assumptions described in this chapter. The base case emissions include no reduction credit for measures quantified in the MAG 2012 Five Percent Plan. Credit for rule effectiveness rates in 2007 has been applied to the base case emissions for construction, other windblown sources, mining/quarrying, and travel on industrial roads. In addition, reduction credit for PM-10 certified street sweepers purchased with CMAQ funds in 2001 through 2006 and still in service on December 31, 2009 was applied to the base case paved road emissions. The benefits quantified for increases in rule effectiveness and contingency projects in the MAG 2012 Five Percent Plan are discussed in the next two chapters of the TSD.

The total 2012 base case emissions are 49,673.01 tons, which is 9,545.37 tons (16.1 percent) lower than the 2007 emissions. Most of this decrease is due to reductions in construction activity between 2007 and 2012. The sources contributing the largest share of base case PM-10 emissions in 2012 are unpaved roads and alleys, paved roads, construction and other windblown sources (vacant lots).

The next chapter discusses the methods and assumptions used to quantify the increases in rule effectiveness for Maricopa County Rules 310, 310.01 and 316. These increases are sufficient to demonstrate annual five percent reductions in PM-10 emissions between the base year of 2007 and the attainment year of 2012. Credit for the increases in rule effectiveness is applied to the base case emissions in Table II-2 to meet the annual five percent reduction requirement of Clean Air Act Section 189(d).

REFERENCES

MAG, 2011. *Methodologies for Evaluating Congestion Mitigation and Air Quality Improvement Projects*. Maricopa Association of Governments. September 30, 2011.

III. EVALUATION OF RULE EFFECTIVENESS

This chapter describes the increases in rule effectiveness that have been quantified to meet the annual five percent reduction requirement in Section 189(d) of the Clean Air Act. The PM-10 emission reductions due to increased rule effectiveness are also used in demonstrating attainment, as discussed in Chapter V of the TSD.

Increases in rule effectiveness have been achieved due to strengthened enforcement and increased compliance with Maricopa County Rules 310, 310.01 and 316 in 2008-2010. Rule effectiveness rates are held constant from 2010 forward except for a 1% increase in 2012 on Rule 310.01 windblown dust sources due to the new Dust Action General Permit measure.

In 2009 EPA approved Rule 316, which controls emissions from permitted sources of non-metallic mineral processing and mining and quarrying operations, as part of the State Implementation Plan for the Maricopa County PM-10 Nonattainment Area (SIP) (EPA, 2009). In 2010 EPA approved Rule 310, which controls emissions from permitted earthmoving sources, and Rule 310.01, which controls sources such as vacant lots and public unpaved roads, as part of the SIP (EPA, 2010).

The benefit of increased compliance with these rules has been quantified, using actual inspection data and a methodology developed by the Maricopa County Air Quality Department, in consultation with EPA. The methodology for quantifying rule effectiveness (RE) is described in the 2008 PEI (Appendix A, Exhibit 1). The RE rates calculated for 2007 through 2010 using this EPA-approved methodology are shown in Table III-1.

Table III-1 also includes base case emissions (with 2007 RE rates), controlled emissions (with increased RE rates), and emission reductions (obtained by subtracting controlled emissions from base case emissions) for each subcategory. The derivation of the base case emissions is discussed in Chapter II of the TSD. For all years, the base case emissions assume the 2007 RE rates of 76 percent for Rule 310, 85 percent for Rule 310.01, and 40 percent for Rule 316, while the controlled emissions incorporate the actual RE rate calculated for each year (2008-2010). The RE rates used in calculating controlled emissions are held constant after 2010.

As shown in Table III-1, the rule effectiveness (RE) rates increased dramatically between 2007 and 2008. Since 2008, the RE rates have continued to increase on an annual basis. Between 2007 and 2010, Rule 310 RE increased from 76 to 94 percent; Rule 310.01 RE increased from 85 to 96 percent; and Rule 316 RE increased from 40 to 73 percent.

In addition to the increases in rule effectiveness discussed above, the 2012 Plan takes credit for one new measure, the Dust Action General Permit, which were passed by the Arizona Legislature in April 2011. This new measure is expected to increase rule effectiveness for Rule 310.01 by one percent during high wind hours, resulting in the 2012 RE rate of 97 percent for windblown vacant land, open space, landfills and test tracks, as

Table III-1
Impact of Increased Rule Effectiveness on 2008-2012 PM-10 Emissions

Categories Affected by Rule Effectiveness	Base Case Emissions (tons/year)						Rule Effectiveness Rates				
	2007	2008	2009	2010	2011	2012	2007	2008	2009	2010 -2011	2012
Residential Construction	3,423	2,815	1,939	1,656	1,602	1,627	76%	90%	92%	94%	94%
Commercial Construction	8,205	6,748	4,649	3,971	3,839	3,901	76%	90%	92%	94%	94%
Road Construction	4,150	3,412	2,351	2,008	1,942	1,973	76%	90%	92%	94%	94%
All Other Earthmoving	328	270	186	159	154	156	76%	90%	92%	94%	94%
Non-metallic mineral mining	306	290	257	246	247	260	40%	65%	69%	73%	73%
Mining & Quarrying	256	242	214	205	206	217	40%	65%	69%	73%	73%
Industrial paved/unpaved road travel	771	728	645	618	621	654	40%	65%	69%	73%	73%
Windblown Agriculture	448	448	448	448	448	448	n/a	n/a	n/a	n/a	n/a
Windblown Construction	566	566	566	566	566	566	76%	90%	92%	94%	94%
Windblown Vacant, Open, Landfill, Test Tracks	5,430	5,430	5,430	5,430	5,430	5,430	85%	95%	96%	96%	97%
Windblown Sand & Gravel, Mining	190	190	190	190	190	190	40%	65%	69%	73%	73%
TOTALS:	24,073	21,139	16,876	15,497	15,244	15,422					

Categories Affected by Rule Effectivenss	Controlled Emissions (tons/year)						Benefits from RE Increases (tons/year)				
	2007	2008	2009	2010	2011	2012	2008	2009	2010	2011	2012
Residential Construction	3,423	1,692	1,056	807	780	793	1,122	884	849	821	834
Commercial Construction	8,205	4,057	2,531	1,935	1,871	1,901	2,691	2,119	2,036	1,968	2,000
Road Construction	4,150	2,052	1,280	979	946	961	1,361	1,071	1,029	995	1,011
All Other Earthmoving	328	162	101	77	75	76	108	85	81	79	80
Non-metallic mineral mining	306	188	152	132	132	139	102	105	114	114	121
Mining & Quarrying	256	157	127	110	110	116	85	87	95	96	101
Industrial paved/unpaved road travel	771	472	382	331	333	351	256	263	287	288	304
Windblown Agriculture	448	448	448	448	448	448	0	0	0	0	0
Windblown Construction	566	391	366	341	341	341	175	200	225	225	225
Windblown Vacant, Open, Landfill, Test Tracks	5,430	3,938	3,788	3,788	3,788	3,639	1,492	1,642	1,642	1,642	1,791
Windblown Sand & Gravel, Mining	190	132	123	113	113	113	58	68	77	77	77
TOTALS:	24,073	13,689	10,353	9,062	8,939	8,879	7,450	6,523	6,435	6,305	6,543

shown in Table III-1.

EPA allows an emission reduction to be taken for the new Dust Action General Permit, as an emerging measure (EPA, 2004). According to EPA guidance, emerging measures do not have the same high level of certainty as traditional measures for quantification purposes in a State Implementation Plan. The PM-10 emission reduction increment necessary to demonstrate attainment in 2012, (i.e., total 2012 base case emissions in Table II-2 of 49,673 tons minus total 2012 emissions with increased rule effectiveness in Table III-2 of 43,130 tons), is 6,543 tons. EPA allows up to six percent of this increment, in this case, a maximum of 393 tons, to be credited to emerging and voluntary measures in the SIP. The one percent increase in RE for Rule 310.01 during high wind hours will reduce PM-10 emissions by 149.27 tons in 2012. Since this reduction is less than 393 tons, benefit for this new measure may be used in meeting the annual five percent reduction requirement and demonstrating attainment in this Plan.

As required by EPA's emerging and voluntary measure guidance, Maricopa County has made a commitment to retrospectively assess the performance of the Dust Action General Permit. MCAQD will evaluate the effectiveness of Rules 310, 310.01 and 316 to ensure that this measure achieves at least a 149 ton reduction during calendar year 2012. The County's commitment and the method to be used in calculating rule effectiveness are described in Chapter Four and Appendix C, Exhibit 2.

As discussed above, increases in Rule Effectiveness (RE) for Rules 310, 310.01 and 316 have been quantified to meet the annual five percent reductions required in Section 189(d) of the Clean Air Act. The annual five percent reduction target was calculated by multiplying the total 2007 PM-10 emissions in Table II-2 (59,218.38 tons) by five percent, which results in 2,960.92 tons. To meet the 189(d) requirement, the 2008 emissions with increased rule effectiveness must be at least 2,961 tons less than the 2007 base case emissions. Each year after 2008 imposes yet another 2,961 ton reduction requirement. Thus, the cumulative reduction requirements (relative to 2007 base case emissions) are at least 5,922 tons in 2009, 8,883 tons in 2010, 11,844 tons in 2011, and 14,805 tons in 2012.

Table III-2 shows the impact of the increases in rule effectiveness on PM-10 emissions in 2008 through 2012. A comparison of the five percent reduction requirements with reductions actually achieved by increased rule effectiveness is provided at the bottom of the table. The actual reductions represent the difference between the total 2007 base case emissions in Table II-2 minus the total emissions with increased rule effectiveness in Table III-2 for 2008-2012. The total reduction in PM-10 emission between 2007 and 2012 with the increases in RE is 16,088.55 tons, which represents a 27.2 percent reduction in 2007 base case emissions.

Table III-3 confirms that the annual five percent reduction targets are met in 2008-2012 and there is a surplus margin of benefit in each year. The total surplus in 2012 is 1,284 tons. This surplus is needed to model attainment at all monitors in the PM-10 nonattainment area. The rollback modeling that demonstrates attainment with the

Table III-2
2008-2012 PM-10 Emissions with Increased Rule Effectiveness

Source Category	2008	2009	2010	2011	2012
	(tons/year)				
POINT	149.84	132.76	127.18	127.69	134.59
AREA					
Fuel combustion	1,300.65	1,307.15	1,311.07	1,316.32	1,328.17
Commercial cooking	993.04	998.01	1,001.00	1,005.00	1,014.05
Construction (includes windblown dust)	8,354.86	5,333.29	4,139.15	4,013.81	4,072.58
Tilling, harvesting and cotton ginning	893.20	893.20	893.20	893.20	893.20
Travel on unpaved farm roads	731.03	731.03	731.03	731.03	731.03
Livestock	260.95	260.95	260.95	260.95	260.95
Travel on unpaved parking lots	2,421.51	2,433.62	2,440.92	2,450.68	2,472.74
Offroad recreational vehicles	2,180.16	2,191.06	2,197.63	2,206.42	2,226.28
Leaf blowers	894.98	899.45	902.15	905.76	913.91
Windblown agriculture	447.85	447.85	447.85	447.85	447.85
Other windblown sources	3,937.57	3,788.33	3,788.33	3,788.33	3,639.06
Fires	496.71	496.71	496.71	496.71	496.71
Mining/quarrying (includes windblown dust)	476.33	401.27	354.88	355.85	368.94
Travel on industrial paved/unpaved roads	472.36	382.21	331.37	332.70	350.67
Other industrial sources	976.01	864.74	828.43	831.74	876.65
NONROAD					
Aircraft	183.80	151.52	141.54	143.44	145.50
Airport ground support equipment	26.99	23.32	20.94	20.11	19.90
Locomotives	34.16	34.16	34.16	34.16	34.16
Other nonroad equipment	1,682.91	1,660.64	1,640.88	1,595.22	1,513.25
ONROAD					
Exhaust	2,835.65	2,647.20	2,371.05	1,843.23	1,407.06
Tire wear	255.82	256.50	257.23	257.94	261.41
Brake wear	758.17	767.49	770.58	772.79	787.25
Paved roads	8,154.57	8,213.92	8,289.47	8,322.90	8,421.72
Unpaved roads and alleys	10,312.22	10,284.04	10,284.04	10,284.04	10,312.22
Totals	**49,231.34**	**45,600.42**	**44,061.75**	**43,437.87**	**43,129.84**
5% Reduction Targets (tons/year)	**2,961.00**	**5,922.00**	**8,883.00**	**11,844.00**	**14,805.00**
Actual Plan Reductions (tons/year)	**9,987.05**	**13,617.97**	**15,156.64**	**15,780.51**	**16,088.55**

Table III-3
PM-10 Emission Reductions and Five Percent Reduction Requirements

Year	5% Reduction Requirement (tons/year)	Total PM-10 Emission Reductions due to Increases in Rule Effectiveness (tons/year)	Excess Benefit = Total PM-10 Emission Reductions minus 5% Reduction Requirement (tons/year)	(%)
2008	2,961	9,987	7,026	237%
2009	5,922	13,618	7,696	130%
2010	8,883	15,157	6,274	71%
2011	11,844	15,781	3,937	33%
2012	14,805	16,089	1,284	9%

increased rule effectiveness quantified in this chapter is described in Chapter V.

The annual incremental reductions that demonstrate reasonable further progress (RFP) between 2007 and 2012 are graphed in Figure III-1. After 2007, the RFP line represents total emissions in the PM-10 nonattainment area after credit is applied for the increases in rule effectiveness quantified in this chapter. The RFP requirement is met by showing incremental emission reductions sufficient to maintain linear progress towards attainment. The annual emissions in Figure III-1 show a downward linear trend. The slope of the line becomes less steep after 2008, because most of the measures in the MAG 2007 Five Percent Plan that increased compliance with Rules 310, 310.01 and 316 were implemented in 2008. Figure III-1 demonstrates that RFP will be achieved between 2007 and the attainment date of 2012.

This chapter has quantified the increases in rule effectiveness between 2008 and 2012 in order to meet the five percent reduction and reasonable further progress requirements of the Clean Air Act. Chapter V shows how these increases in rule effectiveness are also sufficient to demonstrate attainment by 2012 through rollback modeling. The next chapter discusses the quantification of additional PM-10 emission reductions needed to meet the contingency requirements of the Clean Air Act.

Figure III-1
Demonstration of Reasonable Further Progress

REFERENCES

EPA, 2004. *Incorporating Emerging and Voluntary Measures in a State Implementation Plan.* EPA Office of Air Quality Standards. September 2004.

IV. EVALUATION OF CONTINGENCY PROJECTS

The increases in rule effectiveness due to measures in the MAG 2007 Five Percent Plan were quantified in Chapter III to demonstrate annual five percent reductions and reasonable further progress (RFP). The PM-10 emission reductions attributable to increased rule effectiveness are also used to model attainment, as discussed in Chapter V. This chapter discusses emission reductions above and beyond the increases in rule effectiveness that meet the contingency requirements of the Clean Air Act.

Section 172(c)(9) of the Clean Air Act requires that nonattainment plans contain contingency measures. Such measures are to be undertaken without further action by the State or the EPA Administrator if the area fails to make reasonable further progress or meet the standard by the attainment date.

The contingency measures must achieve emission reductions above and beyond those relied upon for progress (five percent reductions, milestones, and reasonable further progress) and the modeled attainment demonstration. The benefits of the contingency measures must not be required to show attainment and can not hasten attainment. Although there is no mandated emissions reduction level, EPA has recommended that contingency measures provide the emissions reduction equivalent of one year's average increment of RFP. EPA encourages early implementation of contingency measures, so that emissions are reduced as expeditiously as practicable (EPA, 1993). The contingency requirement is met in the MAG 2012 Five Percent Plan by quantifying the benefits of PM-10 reduction projects that were implemented in 2008-2011.

A large number of PM-10 reduction projects have been implemented in the nonattainment area since the MAG 2007 Five Percent Plan was submitted to EPA in December 2007. As required for contingency measures, the emission reductions attributable to these projects are above and beyond the credit taken for the measures in Chapter Five. In the Fall of 2011, MAG updated the inventory of PM-10 reduction projects in the nonattainment area that were completed in 2008-2011 by the cities, towns, Maricopa County, Pinal County, the Arizona Department of Transportation (ADOT) and the Indian communities. These projects included paving and stabilizing unpaved roads, alleys and shoulders; reducing speed limits on unpaved roads and alleys; and overlaying state highways with rubberized asphalt. In addition, MAG quantified the benefit for the freeways being swept by an ADOT contractor with PM-10 certified street sweepers and the arterials being swept by local jurisdictions with PM-10 certified street sweepers purchased with Congestion Mitigation and Air Quality Improvement (CMAQ) funds between January 1, 2007 and December 31, 2009.

The RFP graph shown in Figure III-1 indicates that total PM-10 emissions, after reductions due to increased rule effectiveness in 2008-2012, are 43,129.84 tons in 2012. Subtracting these 2012 emissions from the total 2007 emissions of 59,218.38 tons and dividing by five years produces a contingency target of 3,218 tons. Therefore, completed projects that reduce total PM-10 emissions by at least 3,218 tons in 2012 must be quantified to meet the contingency requirement.

The emission reductions for all projects quantified to meet the contingency requirement are summarized in Table IV-1. This table includes the benefits of PM-10 certified street sweeping on freeways and arterials and PM-10 reduction projects completed in 2008-2011 that paved and stabilized unpaved roads, alleys and shoulders; reduced speed limits; and overlaid highways with rubberized asphalt.

These projects were implemented in the PM-10 nonattainment area by twenty-one cities and towns, Maricopa County, Pinal County, ADOT and the Gila River Indian Community. All of the projects for which credit was taken were open to traffic between January 1, 2008 and September 30, 2011. The assumptions used in quantifying the PM-10 reductions needed to meet the contingency target are discussed below for each of the five project categories shown in Table IV-1.

PM-10 CERTIFIED STREET SWEEPING

PM-10 certified street sweepers meet the certification criteria specified in South Coast Air Quality Management District Rule 1186. PM-10 certified street sweepers reduce the silt loadings on paved roads, relative to the use of conventional sweepers. The reentrainment of dust by vehicles traveling on the roads is reduced, which, in turn, decreases emissions and ambient concentrations of PM-10.

ADOT Contracted Sweeping

A new contract awarded by the Arizona Department of Transportation (ADOT), effective February 20, 2010, requires freeways, ramps and frontage roads in the PM-10 nonattainment area to be swept with PM-10 certified street sweepers. The ADOT contract also requires sweeping frequencies of every seven days for freeways and every fourteen days for ramps and frontage roads.

A map of the specific highways being swept with PM-10 certified units by the ADOT contractor is provided in Figure IV-1. The emission reduction calculations are shown in Table IV-2.

The vehicle miles of travel (VMT) for freeways and ramps/frontage roads being swept in 2010 was estimated by summing the traffic volumes and link lengths from a 2010 traffic assignment for the routes identified in Figure IV-1. In 2010, the freeways being swept with PM-10 certified sweepers by the ADOT contractor carry nearly 30 million VMT per day, which is 86 percent of the total daily freeway VMT in the PM-10 nonattainment area. All of the freeways and ramps/frontage roads being swept by the ADOT contractor carry about 35 percent of the total daily VMT in the nonattainment area.

The PM-10 emission reductions were derived by subtracting the emission rate for PM-10 certified sweepers from the emission rate for conventional (non-certified) sweepers and

Table IV-1
2008-2012 PM-10 Emission Reductions for Contingency Projects

Completed Projects	Implementing Entities	2008	2009	2010	2011	2012
		(tons/year)				
Sweep streets with PM-10 certified sweepers						
Contracted sweeping of freeways, ramps and frontage roads-100% compliant, effective 2/20/10	ADOT	0	0	293.59	341.57	344.24
25 PM-10 certified sweepers purchased with CMAQ funds: 1/1/07-12/31/09	Cities, towns	59.04	115.60	153.20	153.82	155.22
	Total for Street Sweeping	**59.04**	**115.60**	**446.79**	**495.39**	**499.46**
Pave or stabilize existing public dirt roads and alleys						
Paving/stabilization projects completed in 2008-2011	Cities, towns, Maricopa and Pinal County, and Gila River Indian Community	461.30	1,351.81	2,124.38	2,662.09	2,625.41
	Total for Road/Alley Paving/Stabilization	**461.30**	**1,351.81**	**2,124.38**	**2,662.09**	**2,625.41**
Lower speed limits on dirt roads and alleys						
Speed limits lowered in 2008-2011	Cities, towns, Maricopa County	3.61	78.42	160.97	160.97	161.41
	Total for Lower Speed Limits	**3.61**	**78.42**	**160.97**	**160.97**	**161.41**
Pave or stabilize unpaved shoulders						
Paving/stabilization projects completed in 2008-2011	Cities, towns, Maricopa County	173.31	241.75	264.70	293.34	150.01
	Total for Shoulder Paving/Stabilizing	**173.31**	**241.75**	**264.70**	**293.34**	**150.01**
Repave or overlay paved roads with rubberized asphalt						
Rubberized asphalt overlays completed in 2008-2011	ADOT	0	2.61	2.61	2.61	2.61
	Total for Overlays	**0**	**2.61**	**2.61**	**2.61**	**2.61**
	Total for Completed Projects	**697.25**	**1,790.19**	**2,999.45**	**3,614.40**	**3,438.90**

Figure IV-1
Map of Highways in the PM-10 Nonattainment Area Swept by ADOT

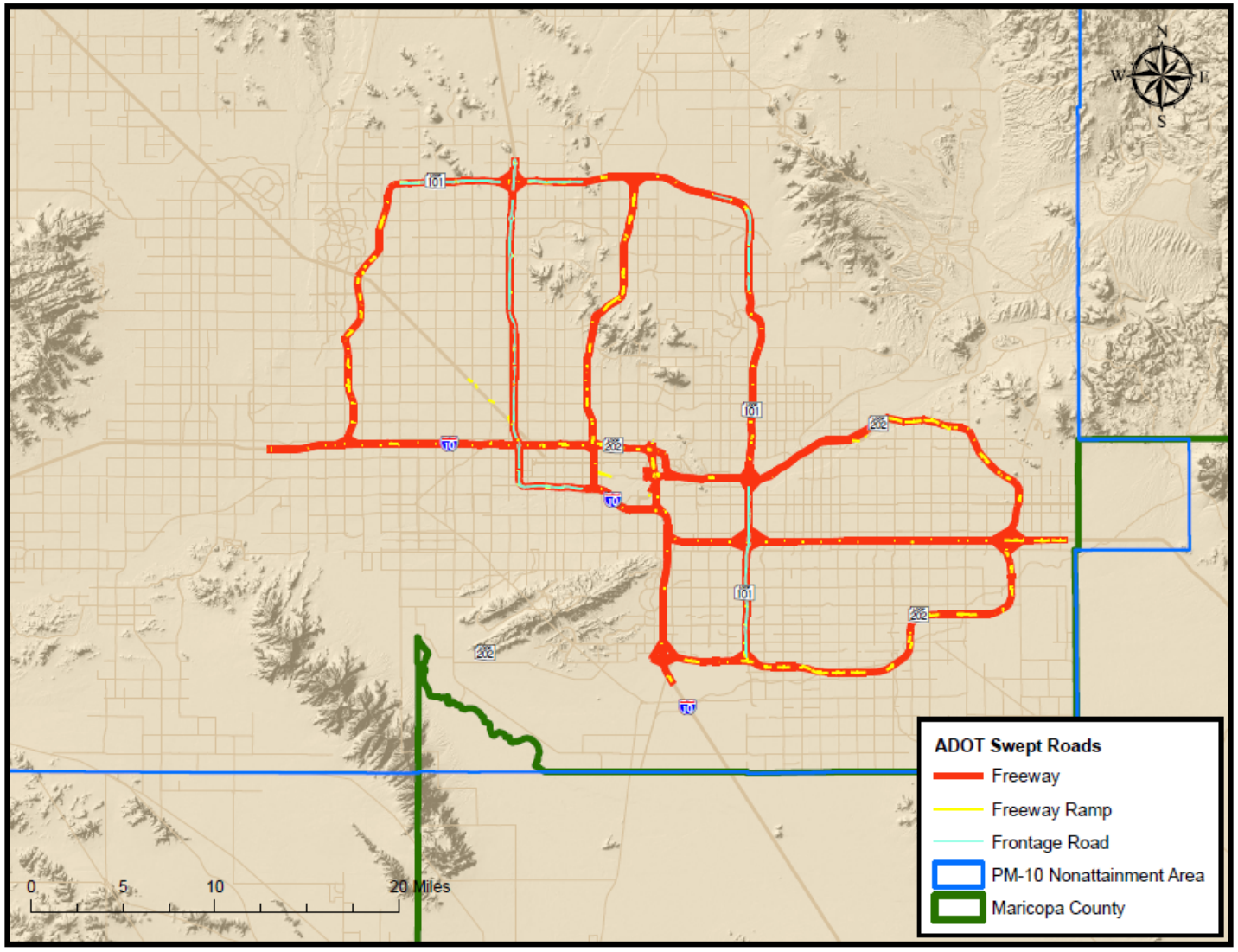


Table IV-2
PM-10 Emission Reductions for ADOT Sweeping

Facilities Swept in the PM-10Nonattainment Area	VMT Swept in 2010	PM-10 reduction in tons/year				
		2008	2009	2010*	2011**	2012**
Freeways	29,964,835	0.00	0.00	282.58	328.76	331.33
Ramps/Frontage Roads	2,153,217	0.00	0.00	11.01	12.81	12.91
Total	32,118,052	0.00	0.00	293.59	341.57	344.24

*2010 reductions are multiplied by 0.863 to reflect the start date of the new ADOT contract - 2/20/10
**2011-2012 emission reductions are grown from 2010, based on 3rd quarter 2011 population projections published by Marshall vest, University of Arizona, for the Phoenix-Mesa metro area (See Table II-1)

Contract Requires Sweeping Cycle of 7 Days			
PM-10 EFs (g/mi)	Non PM-10	PM-10	Difference in g/mi
Freeways	0.090	0.063	0.027
Contract Requires Sweeping Cycle of 14 Days			
PM-10 EFs (g/mi)	Non PM-10	PM-10	Difference in g/mi
Ramps/Frontage Roads	0.100	0.085	0.015

multiplying this difference by the VMT (i.e., for freeways or ramps/frontage roads). The emission rates for sweeping cycle lengths of one to thirty days on freeways, non-freeways, and all roads in the Salt River Area are shown in Table II-6. The unswept emission factor based on the new EPA AP-42 emissions equation for paved roads is 0.11 grams per VMT for freeways and 0.35 grams per VMT for ramps/frontage roads. Other assumptions used in developing the street sweeping emission rates in Table IV-2 are detailed in the Methodologies for Evaluating Congestion Mitigation and Air Quality Improvement Projects (MAG, 2011).

PM-10 Certified Street Sweepers Purchased with CMAQ Funds

PM-10 certified street sweepers reduce PM-10 emissions generated by vehicles traveling on paved roads. Therefore, purchase of these sweepers is eligible for federal Congestion Mitigation and Air Quality Improvement (CMAQ) funding. Since 2001, more than 150 PM-10 certified sweepers have been purchased with CMAQ funds by MAG member agencies. When purchasing a sweeper with CMAQ funds, the agency must provide a local match of at least 5.7 percent of the cost of the sweeper.

PM-10 certified sweepers are eligible for MAG CMAQ funds if they replace a conventional sweeper, replace a PM-10 certified unit that is at least eight years old, increase the sweeping frequency, expand the area that is swept, or a combination of these functions. The equations used to calculate the benefits of the CMAQ-funded sweepers are described in the CMAQ Methodologies (MAG, 2011).

Data on sweeping frequency, lane miles swept and average weekday traffic per lane mile swept is provided to MAG by the agency requesting funds to purchase the sweeper. The agency also identifies the functions to be performed by the new sweeper. If the sweeping frequency or area is to be increased, the agency provides the frequencies or lane miles to be swept before and after deployment of the new sweeper.

Data provided by the requesting agencies is applied to calculate the PM-10 emission reductions associated with each purchased sweeper. The detailed assumptions used to calculate the emission reductions for the sweepers purchased between January 1, 2001 and December 31, 2006 are discussed in Chapter II under Reentrained Dust from Paved Roads. These reductions were applied to the 2007-2012 base case emissions.

Contingency reduction credit is taken for 25 PM-10 certified sweepers purchased with CMAQ funds between January 1, 2007 and December 31, 2009. There were 28 sweepers purchased during this period, but no credit is taken for the three sweepers that replaced older PM-10 certified units. The methods used to calculate the benefit of these sweepers is consistent with those described in Chapter II. The sweeper-specific assumptions are shown in Appendix B, Exhibit 2. The total emission reductions attributable to these 25 sweepers is 153.20 tons in 2010. The 2010 credit is projected to 2011 and 2012 based on the population growth factors in Table II-1.

PAVING AND STABILIZING UNPAVED ROADS AND ALLEYS

In September 2011, MAG contacted its member agencies to request detailed information on paving and stabilization of unpaved road and alley projects that had been implemented in January 2008- September 2011. The information collected included the location of the projects, the year of completion, the length in miles, average daily traffic before paving, whether the unpaved surface was stabilized prior to paving, and the funding source. This section describes the paving and stabilization projects that were completed and open to traffic in 2008 through 2011 and the associated PM-10 emission reductions. The assumptions used in calculating the emission rates for unpaved roads and alleys are consistent with those described under Travel on Unpaved Roads and Alleys in Chapter II. A map showing the location of the road and alley paving projects completed between January 2008- September 2011 is presented in Figure IV-2.

The benefits of paving a public unpaved road is 660.16 minus 1.47 grams per VMT or 658.69 grams per VMT paved. The benefits of paving an unpaved alley is 417.45 minus 1.47 grams per VMT or 415.98 grams per VMT paved. The 1.47 grams per VMT represents the average emission rate for a paved road or alley without paved shoulders or curb and gutter. These emission rates are multiplied by the estimated VMT on each road before it is paved. If the unpaved road was stabilized prior to paving, the reduction credit is reduced by 50 percent. Credit for paving projects is only taken in the years after the project was completed. For example, credit for a paving project completed in 2009 is taken in 2010 through 2012; no credit is taken in 2009.

The benefit of projects that stabilize unpaved roads and alleys is calculated using the same paving factors, but the benefit is reduced by 50 percent. Credit for stabilization projects is only taken in the single year that the project was completed. For example, credit for a stabilization project completed in 2009 is taken only in 2009.

Table IV-3 shows the miles and PM-10 benefits of paving and stabilizing unpaved roads and alleys in the PM-10 nonattainment area by jurisdiction. A summary of the paving and stabilization project mileage and PM-10 reductions is shown at the bottom of the table. Twenty cities and towns, Maricopa and Pinal Counties, and the Gila River Indian Community reported information on paving and stabilization projects completed in January 2008-September 2011. During this period, 83.21 miles of unpaved roads and 133.69 miles of unpaved alleys were paved. Another 144.75 miles of unpaved roads and 500.66 miles of unpaved alleys were stabilized. The total PM-10 emissions reduced by the paving and stabilization of unpaved roads and alleys is 2,625.41 tons in 2012.

It is important to note that no credit is taken for stabilization projects in 2012, because these projects have not yet been implemented. It is clear, however, based on the stabilization projects that were implemented in 2008-2011, that some jurisdictions will be stabilizing unpaved roads and alleys in 2012 and therefore, the reduction credit calculated for paving unpaved roads and alleys in 2012 is conservative.

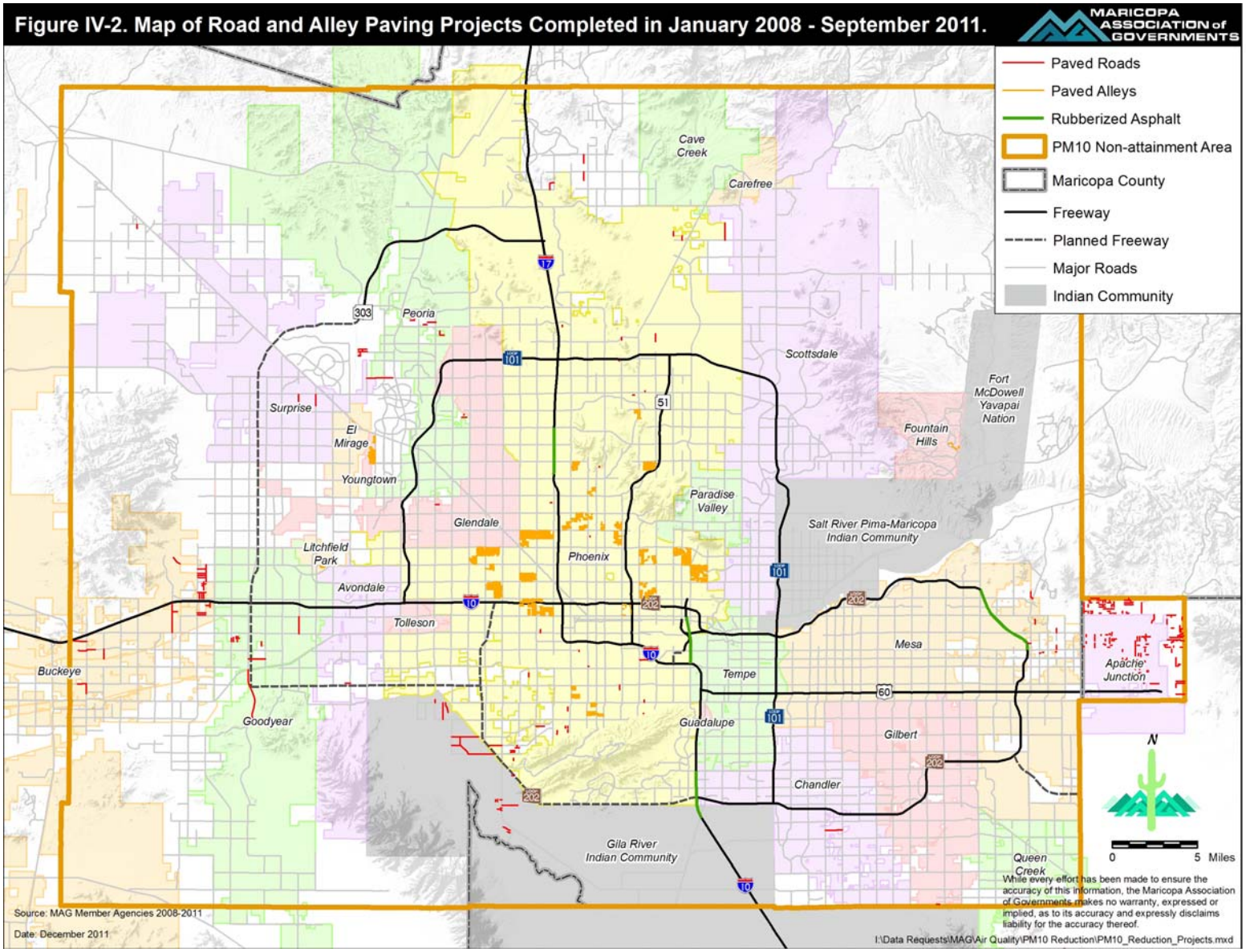


Figure IV-2. Map of Road and Alley Paving Projects Completed in January 2008 - September 2011.
MARICOPA ASSOCIATION of GOVERNMENTS
Paved Roads
Paved Alleys
Rubberized Asphalt
PM10 Non-attainment Area
Maricopa County
Freeway
Planned Freeway
Major Roads
Indian Community
Cave Creek
Carefree
Peoria
Scottsdale
Fort McDowell Yavapai Nation
Surprise
El Mirage
Youngtown
Fountain Hills
Paradise Valley
Glendale
Salt River Pima-Maricopa Indian Community
Litchfield Park
Phoenix
Avondale
Tolleson
Mesa
Buckeye
Tempe
Apache Junction
Goodyear
Guadalupe
Gilbert
Chandler
Gila River Indian Community
Queen Creek
N
0 5 Miles
Source: MAG Member Agencies 2008-2011
Date: December 2011
While every effort has been made to ensure the accuracy of this information, the Maricopa Association of Governments makes no warranty, expressed or implied, as to its accuracy and expressly disclaims liability for the accuracy thereof.
I:\Data Requests\MAG\Air Quality\PM10 Reduction\PM10_Reduction_Projects.mxd

Table IV-3
PM-10 Reductions for Paving and Stabilizing Unpaved Roads/Alleys

Jurisdiction	2008	2009	2010	2011	2012	Total Miles Paved/Stabilized
Apache Junction						
Miles of roads paved	8.72	2.00	0.77			11.49
Miles of roads stabilized	0.25					0.25
Miles of alleys stabilized	4.00	0.04				4.04
Total miles of paved/stabilized	12.97	2.04	0.77	0.00	0.00	15.78
PM-10 reductions (tons/year)	1.94	41.61	50.23	53.90	54.05	
Avondale						
Miles of roads stabilized			0.22			0.22
Miles of alleys stabilized		5.50		2.79		8.29
Total miles of paved/stabilized	0.00	5.50	0.22	2.79	0.00	8.51
PM-10 reductions (tons/year)	0.00	1.84	1.05	4.45	0.00	
Buckeye						
Miles of roads paved	2.50	1.66	1.30	0.30		5.76
Miles of roads stabilized	0.63					0.63
Miles of alleys paved		0.07				0.07
Miles of alleys stabilized	0.86					0.86
Total miles of paved/stabilized	3.99	1.73	1.30	0.30	0.00	7.32
PM-10 reductions (tons/year)	3.30	283.57	407.10	425.06	427.66	
Cave Creek						
Miles of roads stabilized	10.00	10.00	10.00	10.80		40.80
Miles of alleys stabilized	2.00	2.00	2.00	2.00		8.00
Total miles of paved/stabilized	12.00	12.00	12.00	12.80	0.00	48.80
PM-10 reductions (tons/year)	48.51	48.37	48.37	52.19	0.00	
Chandler						
Miles of roads paved	1.00					1.00
Miles of alleys stabilized	10.64	15.80	13.40			39.84
Total miles of paved/stabilized	11.64	15.80	13.40	0.00	0.00	40.84
PM-10 reductions (tons/year)	3.57	29.67	28.87	24.38	24.45	
El Mirage						
Miles of roads stabilized	3.40					3.40
Miles of alleys paved	0.50					0.50
Miles of alleys stabilized	0.50					0.50
Total miles of paved/stabilized	4.40					4.40
PM-10 reductions (tons/year)	15.53	0.33	0.33	0.33	0.34	
Fountain Hills						
Miles of alleys paved	0.19	0.25	0.45			0.89
PM-10 reductions (tons/year)	0.00	0.59	4.40	15.06	15.10	

Jurisdiction	2008	2009	2010	2011	2012	Total Miles Paved/Stabilized
Gilbert						
Miles of roads stabilized	3.62	3.62	3.62	0.75		11.61
Miles of alleys stabilized		3.00				3.00
Total miles of paved/stabilized	3.62	6.62	3.62	0.75	0.00	14.61
PM-10 reductions (tons/year)	17.32	18.27	17.27	3.58	0.00	
Glendale						
Miles of alleys stabilized	0.25					0.25
PM-10 reductions (tons/year)	0.08	0.00	0.00	0.00	0.00	
Goodyear						
Miles of roads paved	3.40	1.25				4.65
PM-10 reductions (tons/year)	0.00	184.13	214.61	214.61	215.20	
Gila River Indian Community						
Miles of roads paved	3.40	5.00	1.00			9.40
PM-10 reductions (tons/year)	0.00	156.63	278.53	302.91	303.74	
Litchfield Park						
Miles of alleys paved	1.60					1.60
PM-10 reductions (tons/year)	0.00	0.54	0.54	0.54	0.54	
Maricopa County						
Miles of roads paved	1.05	4.38	2.00	10.68		18.11
Miles of roads stabilized				0.86		0.86
Total miles of paved/stabilized	1.05	4.38	2.00	11.54	0.00	18.97
PM-10 reductions (tons/year)	0.00	38.13	155.98	238.79	461.56	
Mesa						
Miles of alleys stabilized	1.50	0.26	0.20			1.96
PM-10 reductions (tons/year)	0.50	0.09	0.07	0.00	0.00	
Peoria						
Miles of roads stabilized	1.00	1.00	1.00	6.10		9.10
PM-10 reductions (tons/year)	4.78	4.77	4.77	29.10	0.00	
Phoenix						
Miles of roads paved	5.70	1.54		3.16		10.40
Miles of alleys stabilized	66.81	40.30	25.70	13.25		146.06
Miles of alleys paved	60.53			63.30		123.83
Total miles of paved/stabilized	133.04	41.84	25.70	79.71	0.00	280.29
PM-10 reductions (tons/year)	22.36	106.88	116.28	112.13	198.09	
Pinal County						
Miles of roads paved	15.22	2.30	1.53	1.95		21.00
PM-10 reductions (tons/year)	0.00	100.02	129.84	143.04	172.91	

Jurisdiction	2008	2009	2010	2011	2012	Total Miles Paved/Stabilized
Queen Creek						
Miles of roads stabilized		1.00				1.00
PM-10 reductions (tons/year)	0.00	2.34	0.00	0.00	0.00	
Scottsdale						
Miles of roads stabilized	16.68	16.80	17.36	12.02		62.86
Miles of alleys stabilized	36.00	16.00	80.00	85.00		217.00
Total miles of paved/stabilized	52.68	32.80	97.36	97.02		279.86
PM-10 reductions (tons/year)	297.99	285.85	316.62	291.26	0.00	
Surprise						
Miles of roads paved		0.30	1.10			1.40
Miles of roads stabilized	3.49	6.30	4.00			13.79
Miles of alleys stabilized		3.69				3.69
Total miles of paved/stabilized	3.49	10.29	5.10	0.00	0.00	18.88
PM-10 reductions (tons/year)	16.69	30.05	337.46	738.60	740.63	
Tempe						
Miles of roads stabilized	0.15					0.15
Miles of alleys stabilized	34.20	19.02	2.80	3.10		59.12
Total miles of paved/stabilized	34.35	19.02	2.80	3.10		59.27
PM-10 reductions (tons/year)	12.20	6.37	0.94	1.04	0.00	
Tolleson						
Miles of alleys stabilized	0.50	0.75				1.25
PM-10 reductions (tons/year)	0.17	0.25	0.00	0.00	0.00	
Youngtown						
Miles of roads stabilized		0.08				0.08
Miles of alleys paved	3.10	3.70				6.80
Miles of alleys stabilized	6.80					6.80
Total miles of paved/stabilized	9.90	3.78	0.00	0.00	0.00	13.68
PM-10 reductions (tons/year)	16.35	11.50	11.12	11.12	11.15	

Total Miles	2008	2009	2010	2011	2008-2011
Miles of dirt roads paved	40.99	18.43	7.70	16.09	83.21
Miles of dirt roads stabilized	39.22	38.80	36.20	30.53	144.75
Miles of dirt alleys paved	65.92	4.02	0.45	63.30	133.69
Miles of dirt alleys stabilized	164.06	106.36	124.10	106.14	500.66
Total miles paved/stabilized	310.19	167.61	168.45	216.06	862.31

Total PM-10 Emissions Reduced (Tons/Year)					
	2008	2009	2010	2011	2012
Projects that paved or stabilized public dirt roads and alleys	461.30	1,351.81	2,124.38	2,662.09	2,625.41

PAVING AND STABILIZING UNPAVED SHOULDERS

In September 2011, MAG contacted its member agencies to request detailed information on paving and stabilization of unpaved shoulder projects that had been implemented in 2008- September 2011. The information collected included the location of the projects, the year of completion, the length in curb miles, average daily traffic on the adjacent road, whether the unpaved surface was stabilized prior to paving, whether curb and gutter was also constructed and the funding source. This section describes the shoulder paving and stabilization projects that were completed in 2008 through 2011 and the associated PM-10 emission reductions. The emission rates for unpaved shoulders are described in the CMAQ Methodologies (MAG, 2011).

The emission reductions associated with paving an unpaved shoulder without curb and gutter are 0.29 grams per VMT on low traffic arterials, 0.20 grams per VMT on high traffic arterials and 0.49 grams per VMT in the Salt River Area. If adding curb and gutter, the emission rates are 0.38 grams per VMT for low traffic arterials, 0.27 grams per VMT for high traffic arterials, and 0.66 grams per VMT in the Salt River Area. These emission rates are multiplied by the estimated VMT on the road adjacent to the paving or stabilization project. If the shoulders were stabilized prior to paving, the benefit is reduced by 50 percent. Credit for paving shoulders is taken in the years after the project was completed.

The benefit of projects that stabilize unpaved shoulders is calculated using the paving emission factors, but the benefit is reduced by 50 percent. Credit for stabilization projects is taken only in the year the project was completed.

Table IV-4 shows the curb miles and PM-10 benefits of paving and stabilizing unpaved shoulders in the PM-10 nonattainment area by jurisdiction. A summary of the paving and stabilization project mileage and PM-10 reductions is shown at the bottom of the table. Seventeen cities and towns, Maricopa County and ADOT reported information on paving and stabilization projects completed in 2008-September 2011. During this period, 232.73 miles of unpaved shoulders and 19.26 miles of curb and gutter were paved. Another 906.32 miles of unpaved shoulders were stabilized. The total PM-10 emissions reduced by the paving and stabilization of unpaved shoulders is 150.01 tons in 2012.

It is important to note that no credit is taken for shoulder stabilization projects in 2012, because these projects have not yet been implemented. It is clear, however, based on the projects implemented in 2008-2011, that some jurisdictions will be stabilizing unpaved shoulders in 2012 and therefore, the reduction credit calculated for paving unpaved shoulders in 2012 is conservative.

REDUCED SPEED LIMITS ON UNPAVED ROADS AND ALLEYS

In September 2011, MAG contacted its member agencies to request detailed information on reduced speed limits on unpaved roads and alleys that had been implemented in 2008-September 2011. The information collected included the location of the projects, the year

Table IV-4
PM-10 Reductions for Paving and Stabilizing Unpaved Shoulders

Jurisdiction	2008	2009	2010	2011	2012	Total Curb Miles Paved/Stabilized
ADOT						
Curb miles of shoulders paved	49.47	77.00				126.47
Curb miles of curb and gutter paved	19.26					19.26
Total miles paved & stabilized	68.73	77.00				145.73
PM-10 reductions (tons/year)	0.00	21.03	49.84	49.84	49.98	
Apache Junction						
Curb miles of shoulders stabilized	6.26	6.26	1.50			14.02
PM-10 reductions (tons/year)	0.77	0.77	0.14	0.00	0.00	
Avondale						
Curb miles of shoulders stabilized		6.05	6.05			12.10
PM-10 reductions (tons/year)	0.00	1.31	1.31	0.00	0.00	
Buckeye						
Curb miles of shoulders paved	4.65	1.16	9.30			15.11
Curb miles of shoulders stabilized			8.10			8.10
Total miles paved & stabilized	4.65	1.16	17.40			23.21
PM-10 reductions (tons/year)	0.00	0.77	2.14	3.36	3.37	
Chandler						
Curb miles of shoulders paved			3.30			3.30
Curb miles of shoulders stabilized	7.30	2.00				9.30
Total miles paved & stabilized	7.30	2.00	3.30	0.00	0.00	12.60
PM-10 reductions (tons/year)	8.22	2.25	0.00	7.41	7.43	
El Mirage						
Curb miles of shoulders paved			1.62			1.62
Curb miles of shoulders stabilized	16.00	0.25				16.25
Total miles paved & stabilized	16.00	0.25	1.62			17.87
PM-10 reductions (tons/year)	5.52	0.03	0.00	0.63	0.63	
Gilbert						
Curb miles of shoulders stabilized	15.88	15.88	15.88	15.88		63.52
PM-10 reductions (tons/year)	6.25	6.23	6.23	6.23	0.00	
Glendale						
Curb miles of shoulders paved	2.46					2.46
Curb miles of shoulders stabilized			6.40	6.61		13.01
Total miles paved & stabilized	2.46	0.00	6.40	6.61	0.00	15.48
PM-10 reductions (tons/year)	0.00	3.35	5.13	6.65	3.36	
Guadalupe						
Curb miles of shoulders paved	1.60	1.60	1.60	0.50		5.30
PM-10 reductions (tons/year)	0.00	0.45	0.91	1.36	1.51	

Jurisdiction	2008	2009	2010	2011	2012	Total Curb Miles Paved/Stabilized
Maricopa County						
Curb miles of shoulders paved			13.17			13.17
PM-10 reductions (tons/year)	0.00	0.00	0.00	14.89	14.93	
Mesa						
Curb miles of shoulders paved	5.31	23.70	12.11			41.12
Curb miles of shoulders stabilized			0.75			0.75
Total miles paved & stabilized	5.31	23.70	12.86	0.00	0.00	41.87
PM-10 reductions (tons/year)	0.00	41.01	41.35	41.01	41.12	
Peoria						
Curb miles of shoulders stabilized	43.13	43.13	43.13	43.13		172.52
PM-10 reductions (tons/year)	8.96	8.94	8.94	8.94	0.00	
Phoenix						
Curb miles of shoulders paved	3.85	3.56	1.29	3.90		12.60
PM-10 reductions (tons/year)	0.00	0.97	1.99	2.35	3.21	
Queen Creek						
Curb miles of shoulders paved	1.85					1.85
Curb miles of shoulders stabilized	9.03	25.02	26.94			60.99
Total miles paved & stabilized	10.88	25.02	26.94	0.00	0.00	62.84
PM-10 reductions (tons/year)	6.48	18.44	17.32	0.53	0.53	
Scottsdale						
Curb miles of shoulders paved			4.00	2.00		6.00
Curb miles of shoulders stabilized	131.60	132.20	123.80	134.60		522.20
Total miles paved & stabilized	131.60	132.20	127.80	136.60	0.00	528.20
PM-10 reductions (tons/year)	136.47	135.48	128.65	147.83	21.64	
Surprise						
Curb miles of shoulders paved			2.67			2.67
Curb miles of shoulders stabilized	2.82	2.74	3.50			9.06
Total miles paved & stabilized	2.82	2.74	6.17	0.00	0.00	11.73
PM-10 reductions (tons/year)	0.36	0.28	0.52	2.08	2.09	
Tempe						
Curb miles of shoulders paved		0.06				0.06
Curb miles of shoulders stabilized	0.50					0.50
Total miles paved & stabilized	0.50	0.06	0.00	0.00	0.00	0.56
PM-10 reductions (tons/year)	0.06	0.00	0.01	0.01	0.01	
Tolleson						
Curb miles of shoulders paved	1.00					1.00
PM-10 reductions (tons/year)	0.00	0.22	0.22	0.22	0.22	

Jurisdiction	2008	2009	2010	2011	2012	Total Curb Miles Paved/Stabilized
Youngtown						
Curb miles of shoulders stabilized	2.00	2.00				4.00
PM-10 reductions (tons/year)	0.22	0.22	0.00	0.00	0.00	
Total Curb Miles		**2008**	**2009**	**2010**	**2011**	**2008-2011**
Curb miles of dirt shoulders paved		70.19	107.08	49.06	6.40	232.73
Curb miles of curb and gutter paved		19.26	0.00	0.00	0.00	19.26
Curb miles of dirt shoulders stabilized		234.52	235.53	236.06	200.22	906.32
Total curb miles paved & stabilized		323.97	342.61	285.11	206.62	1,158.31
Total PM-10 Emissions Reduced (Tons/Year)						
		2008	**2009**	**2010**	**2011**	**2012**
Pave or stabilize unpaved shoulders		173.31	241.75	264.70	293.34	150.01

of completion, the length of the roads impacted by the reduced speed limits, and the average daily traffic on the unpaved road or alley. This section describes the reduced speed limit projects that were completed in 2008 through 2011 and the associated PM-10 emission reductions. Table IV-5 provides the miles of roads and alleys for which speed limits were reduced and the associated PM-10 reductions by jurisdiction.

Two towns and Maricopa County posted lower speed limits on unpaved roads and alleys in 2008-2009. Buckeye posted 15 mph signs on 5.4 miles of unpaved roads; the average speed prior to posting was assumed to be 25 mph, which is the ADOT Department of Motor Vehicles speed limit if there are no signs posted. Youngtown posted 10 mph speed limits on 6.8 miles of unpaved alleys; it was assumed that the average speed prior to posting was 15 mph. Maricopa County posted 15 mph speed limits on 6.42 miles and 25 mph speed limits on 1.74 miles of unpaved roads. It was assumed that the speeds on these County roads decreased by 10 mph as a result of the lower speed limits. It was also assumed that compliance with all of these new speed limits would be 70 percent. The unpaved road and alley emission rates used in calculating credit for these lower speed limits are consistent with those used in the 2008 PEI.

OVERLAYS WITH RUBBERIZED ASPHALT

In September 2011, MAG contacted the Arizona Department of Transportation (ADOT) to request detailed information on the state highways that had been overlaid with rubberized asphalt in 2008-September 2011. The information collected included the year of completion, route names, the start and end points, the number of lanes, and the average traffic volume per lane. Table IV-6 shows the assumptions used to calculate the PM-10 reductions in tire wear emissions for the highways that were overlaid with rubberized asphalt in 2008 by ADOT. The total PM-10 emission reductions associated with this project are 2.61 tons in 2009-2012.

DEMONSTRATION THAT THE PM-10 REDUCTION PROJECTS IMPLEMENTED IN 2008-2011 MEET CONTINGENCY REQUIREMENTS

As shown in Table IV-1, the total PM-10 emissions reduction in 2012 due to implementation of the projects described above is 3,439 tons. This reduction exceeds the contingency target of 3,218 tons by 221 tons. Therefore, the emission reductions from the projects described in this chapter meet the contingency requirements of the Clean Air Act.

As discussed previously, no credit has been taken for unpaved road, alley and shoulder stabilization projects in 2012, because these projects have not yet been implemented. It is clear, however, based on the projects implemented in 2008-2011, that some jurisdictions will be stabilizing unpaved roads, alleys and shoulders in 2012 and therefore, the contingency reduction credit calculated for 2012 is conservative.

The projects that have been quantified for contingency credit are not required to meet the five percent requirement, model attainment, or demonstrate reasonable further progress.

Table IV-5
PM-10 Reductions for Reduced Speed Limits on Unpaved Roads and Alleys

Jurisdiction	2008	2009	2010	2011	2012	Total Miles
Buckeye						
Miles of roads with lower speeds		2.50	2.90			5.40
PM-10 reductions (tons/year)	0.00	78.42	155.06	155.06	155.48	
Maricopa County						
Miles of roads with lower speeds		8.16				8.16
PM-10 reductions (tons/year)	0.00	0.00	5.91	5.91	5.93	
Youngtown						
Miles of alleys with lower speeds	6.80					6.80
PM-10 reductions (tons/year)	3.61	0.00	0.00	0.00	0.00	
Total Miles Impacted	**2008**	**2009**	**2010**	**2011**	**2008-2011**	
Miles of roads/alleys with lower speed limits	6.80	10.66	2.90	0.00		20.36
Total PM-10 Emissions Reduced (tons/year)	**2008**	**2009**	**2010**	**2011**	**2012**	
Lower speed limits on unpaved roads/alleys	3.61	78.42	160.97	160.97	161.41	

Table IV-6
PM-10 Reductions for ADOT Overlays with Rubberized Asphalt

Route	Start	End	Miles	Avg # of Lanes	Avg Vehicles Per Lane	Reduction* (tons/lanemile/ year)	PM-10 reduction (tons/year)				
							2008	2009	2010	2011	2012
Interstate 10	Ray Road	Wildhorse Pass	2.84	6.68	15,065	0.0301		0.57	0.57	0.57	0.57
Interstate 17	Arizona Canal	Thunderbird Rd	2.75	8.00	25,837	0.0517		1.14	1.14	1.14	1.14
State Route 143	Interstate 10	Van Buren St	2.80	5.73	18,443	0.0369		0.59	0.59	0.59	0.59
State Route 202L, Red Mtn Freeway	Power Road	University Dr	4.64	6.23	5,363	0.0107		0.31	0.31	0.31	0.31
Totals			**13.03**				**0.00**	**2.61**	**2.61**	**2.61**	**2.61**

*ADOT indicated in the MAG 2007 Five Percent Plan that an average of 17,000 vehicles per lane result in a PM-10 emission reduction of 0.034 tons/lanemile/year for rubberized asphalt overlays

In addition, these projects will not hasten attainment. As discussed in Chapter V, the earliest attainment date that can be demonstrated via modeling is December 31, 2012. This chapter demonstrates that PM-10 emissions will be reduced by 3,439 tons more than the reductions achieved by measures used to show progress and model attainment. The contingency projects implemented in 2008-2011 are assisting in producing the three years of clean data necessary to attain the standard at all monitors by December 31, 2012.

PM-10 EMISSION REDUCTIONS DUE TO ALL MEASURES AND PROJECTS IN THE FIVE PERCENT PLAN

Table IV-7 shows the PM-10 emissions for 2008-2012 by source category after increased rule effectiveness and contingency reductions are applied. The total reduction attributable to the rule effectiveness increases and contingency projects in the MAG 2012 Five Percent is 9,982 tons in 2012. This represents a 17 percent reduction, relative to 2007 emissions. Total PM-10 emissions with all measures and contingency projects decline by 19,527 tons or 33 percent between 2007 and 2012.

Table IV-7
2008-2012 PM-10 Emissions with All Plan Measures and Contingency Projects

Source Category	2008	2009	2010	2011	2012
POINT	150	133	127	128	135
AREA					
Fuel combustion	1,301	1,307	1,311	1,316	1,328
Commercial cooking	993	998	1,001	1,005	1,014
Construction (includes windblown dust)	8,355	5,333	4,139	4,014	4,073
Tilling, harvesting and cotton ginning	893	893	893	893	893
Travel on unpaved farm roads	731	731	731	731	731
Livestock	261	261	261	261	261
Travel on unpaved parking lots	2,422	2,434	2,441	2,451	2,473
Offroad recreational vehicles	2,180	2,191	2,198	2,206	2,226
Leaf blowers	895	899	902	906	914
Windblown agriculture	448	448	448	448	448
Other windblown sources	3,938	3,788	3,788	3,788	3,639
Fires	497	497	497	497	497
Mining/quarrying (includes windblown dust)	476	401	355	356	369
Travel on industrial paved/unpaved roads	472	382	331	333	351
Other industrial sources	976	865	828	832	877
NONROAD					
Aircraft	184	152	142	143	146
Airport ground support equipment	27	23	21	20	20
Locomotives	34	34	34	34	34
Other nonroad equipment	1,683	1,661	1,641	1,595	1,513
ONROAD					
Exhaust	2,836	2,647	2,371	1,843	1,407
Tire wear	256	254	255	255	259
Brake wear	758	767	771	773	787
Paved roads	7,922	7,857	7,578	7,534	7,772
Unpaved roads and alleys	9,847	8,854	7,999	7,461	7,525
Totals	**48,534**	**43,810**	**41,062**	**39,823**	**39,691**
Total PM-10 Emissions Reduction 2007-2012:					**19,527 tons, 33.0%**

REFERENCES

EPA, 1993. *Early Implementation of Contingency Measures for Ozone and Carbon Monoxide (CO) Nonattainment Areas.* August 1993.

MAG, 2011. *Methodologies for Evaluating Congestion Mitigation and Air Quality Improvement Projects*. Maricopa Association of Governments. September 30, 2011.

V. ATTAINMENT MODELING

INTRODUCTION

In order to show attainment with the 24-hour PM-10 National Ambient Air Quality Standard for the Maricopa County PM-10 nonattainment area under high wind conditions, modeling was performed for both the PM-10 nonattainment area and a subset of the nonattainment area known as the Salt River area. The sections in this chapter of the TSD provide a detailed discussion of the elements necessary to perform the attainment modeling and demonstrate that attainment is met in 2012; specifically including:

- The reasons for choosing distance-weighted rollback as a conceptual model for the attainment demonstration;
- An analysis of the insights gained through operation of a short-term PM-10 temporary monitor saturation study;
- The application of a PM-10 emissions source weighting factor based upon distance from the exceeding monitor;
- An analysis of the non-anthropogenic low and high wind background PM-10 concentrations in the Maricopa County nonattainment area;
- The process for selecting design days;
- The development of low and high wind modeling domains;
- The creation of model-ready low and high wind emissions inventories;
- Application of the benefits of the control measures; and
- A demonstration of attainment in 2012.

An overview of the attainment modeling can be found in Chapter Five of the main plan document.

CONCEPTUAL MODEL

In December 2007, the Maricopa Association of Governments (MAG) submitted the "MAG Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area" (Five Percent Plan) to the U.S. Environmental Protection Agency (EPA) in fulfillment of federal Clean Air Act requirements after a failure to attain the 24-hour PM-10 ambient air quality standard (standard) by the statutory deadline of December 31, 2006. The MAG 2007 Five Percent Plan for PM-10 included fifty-three control measures that demonstrated PM-10 emissions reductions of five percent per year and attainment of the PM-10 standard in 2010.

In 2008, there were a number of exceedances of the 24-hour PM-10 standard due to high winds in the Maricopa County nonattainment area. EPA indicated that it did not concur with four high wind exceptional events at the West 43rd Avenue monitor, which constituted a violation. The region then did not have the three years of clean data needed for attainment. In September 2010, EPA published a notice to propose a partial approval and disapproval of the MAG 2007 Five Percent Plan for PM-10. The two major reasons for the proposed disapproval were inaccuracies in the 2005 baseline emissions inventory and EPA's nonconcurrence with the four high wind exceptional events.

In January 2011, the Arizona Department of Environmental Quality (ADEQ) withdrew the MAG 2007 Five Percent Plan for PM-10 to address the technical approvability issues identified by EPA, and to include new information such as the new EPA equation for paved road dust emissions. EPA has indicated that the revised plan needs to show how high wind emissions will be adequately mitigated.

Presented below is a review of the issues considered in assessing available modeling concepts and the steps leading to the selection of distance-weighted rollback as the conceptual model.

Modeling Domain

Due to the uniform pattern and direction of wind flows upwind of the Salt River monitors during high wind events in the Spring, the use of modeling domains extending along wind back-trajectories from these monitors focuses the areal extent of these modeling domains to the areas of significant emission contribution. Past analyses of back-trajectories related to exceptional event evaluations in the Spring have shown that many are from the west/southwest and lie along the Salt River channel due to prevailing synoptic wind fields and the topographic influence of the Estrella Mountains lying directly south and running parallel to the river channel. Furthermore, past modeling analyses indicate that the lands significantly contributing to elevated PM-10 concentrations recorded at a monitoring site lie generally within a mile of either side of the back-trajectory path upwind of the monitor.

Since the areal extent impacting monitors is largely a function of wind speed, it necessary to divide selected design days into low and high wind hours. High wind hours need to represent sources located along back trajectories and low wind hours need to represent

sources within a modeling domain surrounding the selected monitoring site. A significant amount of work was devoted to developing the Salt River area modeling domain in the withdrawn Five Percent Plan which is employed to assess emissions impacting Salt River monitors during low wind hours. As part of a regional demonstration of attainment, other low wind modeling domains that represent similar distributions of land use around modeled monitors are developed as necessary. The basis for distinguishing between low and high wind hours is the 12 mph aerodynamic entrainment threshold (i.e., five-minute average) established in the 2008 PM-10 Periodic Emissions Inventory (Appendix A, Exhibit 1). Both, five-minute and hourly wind measurements at selected monitoring sites are available and can screen to determine which hours are "high wind" hours. The remaining hours are assumed to be "low wind" hours.

Modeling Inventory Development

The withdrawn Five Percent Plan expended considerable resources in collecting source-specific activity data (e.g., traffic counts, aggregate facility operating records, silt measurements, etc.) within the modeling domain to provide an accurate representation of emissions on the days selected for modeling. The focus of that effort, however, was on characterizing emissions under low wind stagnant conditions. While emission estimates were also prepared for a high wind day, the model performance resulting from that inventory was considerably poorer than for the inventories developed for days with stagnant conditions. Given that experience, it suggests a different emissions inventory methodology is needed (i.e., one along the lines of quantifying upwind emissions along a back trajectory during high wind hours and low wind emissions within a modeling domain surrounding the selected monitoring site). Due to the limited contribution of low wind hours to the 24-average values recorded on high wind days it is suggested that design-day specific low wind inventories are not necessary to characterize low wind hour emissions within the Salt River modeling domain and the PM-10 nonattainment area as a whole. Instead, it is planned that existing annual emission estimates be employed through allocation of those emissions to the land uses within each of the modeling domains.

For high wind hours, the methodology employed in the windblown dust emissions inventory developed for the 2008 PM-10 Periodic Emissions Inventory is used to quantify fugitive dust emissions at upwind sources located along back-trajectory domains from each of the modeled monitors. One question that had not been previously researched, was how far back along a back-trajectory line the modeling domain should extend. Insight into this question is provided in the discussion below of data collected at a temporary monitor upwind of the West 43rd Ave. monitoring site.

Temporary Monitoring Insights

An analysis of matched pair measurements between the West 43rd Ave. long-term monitor and 43rd Ave. & Broadway temporary monitor (a distance of 0.42 miles) was prepared for the period between April 2010 and March 2011. The data were organized into five-degree increments so concentration differences could be computed as a function of wind direction

and wind speed. Measurements were organized into three categories of wind speed: 2-6 mph, 6-12 mph, and >12 mph (both monitors had to have wind speeds falling into these categories to be included in the analysis). Tabulations of the results for these monitors and other temporary monitors are presented in the subsequent section entitled Temporary Monitoring Insights. The results for these monitors show that at 240°, the angular direction traveling southwest from the West 43rd Ave. monitor to the West 43rd Ave. & Broadway temporary monitor, average concentrations at the West 43rd monitor are consistently higher than at the temporary site:

- At 2-6 mph, the difference (West 43rd - West 43rd & Broadway/West 43rd) is 13.5% (6.38 μg/m^3);
- At 6-12 mph, the difference is 9% (3.2 μg/m^3); and
- At >12 mph, the difference is 37.3% (39.78 μg/m^3)

The >12 mph differences increase as the angular direction increases from 240° - 290°, suggesting that fugitive dust from land located between those sites disproportionately impacted concentrations at the West 43rd Ave. monitoring site (particularly since emissions impacting the monitor at that hour are coming from a minimum distance of 12 miles and the distance between the monitors is 0.42 miles). This finding suggests that that any modeling analysis prepared to support an attainment demonstration needs to account for the distance between the location where fugitive dust is emitted and the monitoring site impacted during high wind conditions (either through dispersion/deposition or some weighting function).

Available Modeling Concepts

Simple Rollback – Simple rollback analysis provides the least rigorous approach to determining the levels of emission control needed to reduce ambient PM-10 concentrations. A fundamental assumption underlying this method is that pollutant concentrations are directly proportional to total emissions over the area of interest. This assumption acquires some validity if emissions from significant source categories are uniformly distributed throughout the modeling domain, and if control measures will reduce emissions equally from each parcel in a particular source category. The benefits of using simple rollback include a quick turnaround in computing emission reductions necessary to meet a desired air quality improvement goal and the need for very limited emission inventory data to complete the calculation. The drawbacks of using this approach include the loss of accuracy in forecasting air quality improvements if sources are not uniformly distributed and if control measures produce varying benefits on a parcel-by-parcel basis. Simple rollback can be used with some success in modeling over microscale domains, but loses accuracy as the modeling domain grows because of the effects of particle dispersion and deposition over longer travel distances. Additionally, the microscale inventories surrounding each PM-10 monitoring site are different, and one microscale inventory cannot be used to assess inventory/air quality relationships at another site. Demonstrating that a control strategy is

effective at all sites recording exceedances requires the development of separate micro-inventories for each monitoring site. This approach would also suffer accuracy losses if the modeling domains extended more than about one-half mile from the monitoring site.

Weighted Rollback – A weighted rollback approach applies a distance reduction factor to emissions of each source in the modeling domain. The reduction factor is calculated on the basis of the distance between each source and the impacted monitoring site. This method requires the separate analysis of distance reduction factors in addition to the development of modeling domain emission inventories upwind of each impacted monitoring site. The selection of a mathematical form for the calculation of distance reduction factors, ranging from 1/distance to involved equation forms based on hourly meteorological data, requires testing to refine. Coordinates of the centroid of each parcel of land within each back-trajectory swath would need to be extracted from land use GIS files to facilitate the calculation of parcel-specific weighting factors. The benefits of using this method also include a relatively quick turnaround in computing emission reductions and, hence, air quality improvements after inventory data are compiled and distance reduction factors are computed. This approach also takes advantage of the limited-term saturation monitoring data collected in 2010 and early 2011 to inform the calculation of distance reduction factors at this site.

Principle Component Analysis – Principle Component Analysis (PCA) is a multivariate statistical technique that uses eigenvectors to represent varied inter-relationships present in datasets. The latent root regression form extracts relationships among variables that include a dependent variable (here, PM-10) and its predictors (e.g., wind speed, wind direction, soil moisture levels, emissions). PCA is an attractive alternative to photochemical and dispersion modeling when performance is poor due to problems with secondary chemistry and/or meteorological modeling. PCA also provides a framework for assessing the probability of attainment by contrasting meteorological conditions on design day(s) relative to an extended historical record. The downside of the methodology is that it requires assembly of relevant metrics for a long-term, multi-year meteorological record and preparation of an emissions inventory over multiple years so that vectors representing the bulk of the variance in the assembled dataset can be extracted.

AERMOD – The use of dispersion models like AERMOD to quantify the relationship between emissions and air quality can increase the accuracy of the reported results. Because of the complexities of the mathematical algorithms coded into the models to quantify a number of dispersion components, the output of dispersion models like AERMOD shows less linearity between emission strength and ambient pollutant concentration than is inherent in rollback models. These complexities require detailed assessments of the combinations of control measures converging to a solution that attains air quality targets and minimizes instabilities in the economies of regulated sources. Some sophisticated dispersion models, like ISCST3, contain particle deposition algorithms that can be toggled to simulate this ambient removal mechanism. AERMOD does not contain this capability, which is important in the modeling of windblown PM-10 emissions. An additional concern is that AERMOD provides no carryover of entrained emissions from one

hour to the next, which can lead to underestimates of concentrations under both stagnant and high wind conditions.

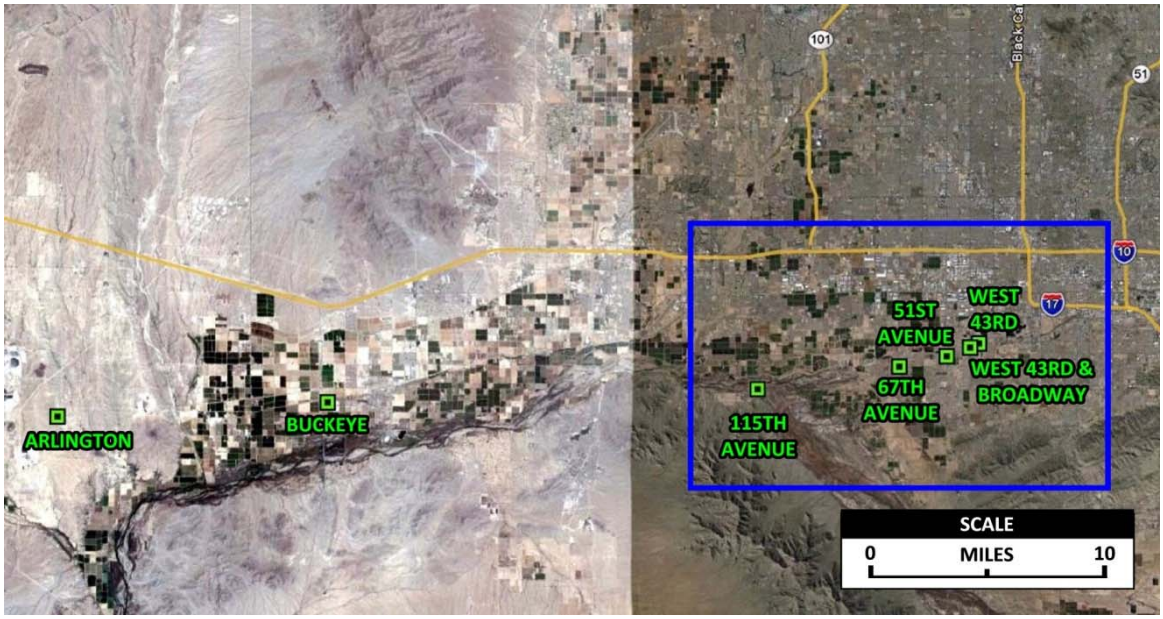
Conclusion

Since high wind AERMOD model performance was poor in the withdrawn Five Percent Plan, a weighted rollback approach was chosen to quantify the benefits of adopted controls on individual low and high wind hour concentrations for both the Salt River area domain and the regional nonattainment area demonstration. The 12 mph five-minute wind speed threshold was chosen to distinguish between low and high wind hours on selected design day(s). High wind hour emissions along the back trajectories are initially calculated based upon land use type at 2007 base levels and then calculated again with the benefits of the control measures through 2012 as identified in the new Five Percent Plan. The difference in high wind emissions will provide the expected reduction benefit of the controls included in the new Five Percent Plan. The aggregate weighted benefit computed for each high wind hour should be applied to the corresponding high wind hour recorded concentration. Since there have been no stagnation exceedances of the PM-10 standard since 2007, it is assumed that control measures implemented since 2007 have been successful in eliminating exceedances during stagnant conditions. The successful elimination of stagnation exceedances dictate that new low wind microscale, design day-specific inventories are not needed. As such, existing annual low wind emissions are allocated by land use in each of the low wind modeling domains as necessary. The 24-hour average of benefit-adjusted low and high wind concentrations in 2012 are lastly contrasted with the ambient 24-hour PM-10 standard to demonstrate attainment.

TEMPORARY MONITOR INSIGHTS

In an effort to better understand source contributions impacting the West 43rd Ave monitoring site during high wind events, Maricopa County, with support from the Arizona Department of Environmental Quality (ADEQ) and the Maricopa Association of Governments (MAG) deployed a series of temporary PM-10 monitors along the dominant upwind trajectory in the spring of 2010. A total of five temporary monitors were deployed at the following sites: Arlington, 115th Avenue, 67th Avenue, 51st Avenue, and West 43rd & Broadway. The locations of the five temporary monitors and two nearby long-term monitors, Buckeye and West 43rd Ave., are displayed in Figure V-1.

Figure V-1
Location of Temporary and Long-Term PM-10 Monitoring Sites



Monitor Placement

The location of each of the temporary monitors is identified below, along with a brief description of the insight that it was expected to provide.

West 43rd Avenue and Broadway (Temp #1) – The objective was to obtain measurements at the western-most edge of the industrialized area located between the West 43rd Ave. monitor and the river bed (roughly 0.4 miles west of the monitor). Differences between monitored values at this location and the West 43rd Ave monitor will provide a basis to assess contributions coming from nearby sources when the wind is from the west/southwest.

51st Avenue and W. Roeser Road (Temp #2) – The goal was to locate monitors on the eastern side of 51st Ave. Differences between measurements at this site and Temp #1 would provide insight into contributions from aggregate facilities located between 51st Ave. and 43rd Ave (a distance of roughly 1 mile).

67th Avenue and Southern Avenue (Temp #3) – The goal was to locate monitors on the eastern side of 67th Ave. between the river bed and Southern Ave. Differences between measurements at this site and Temp #2 would provide insight into emissions from facilities located within the 2 mile area located between 67th Ave. and 51st Ave.

115th Avenue – South side of PIR Bridge (Temp #4) – The purpose of this site was to obtain information on particulate mass being transported by drainage flow down the Agua Fria River during morning commutes. Concern had been expressed that drainage mass accumulates on the river bed and surrounding area over time and is subsequently reentrained under high wind conditions and impacting the West 43rd Ave. monitor. This location also has the advantage of providing a rough mid-point measurement of PM-10 concentrations between the Buckeye and West 43rd Ave. monitors (it is located roughly 10 miles southwest of the West 43rd Ave. monitor).

Arlington School (Temp #5) – The 5% Plan relied on measurements collected at Organ Pipe National Monument to obtain estimates of background concentrations being transported off the desert. The goal was to place a monitor beyond the western boundary of agricultural fields located to the west of the Buckeye monitor to gain a true measurement of background concentrations being transported off the desert into the Salt River area. Initially, it was thought that ADEQ could utilize the former monitoring site at Palo Verde; subsequent investigation, however, determined this site was not available.

Analysis

Presented below are comparisons of pairs of measurements collected between the fixed and temporary sites moving west from the West 43rd Ave. monitor, highlighted in the box displayed in Figure V-1. Comparisons between the Arlington and Buckeye sites are presented in a separate section addressing Background Conditions. To aid the comparison of site measurements, the data were organized into five-degree increments so concentration differences could be computed as a function of wind direction and wind speed. Comparisons between site measurements were adjusted to account for time it takes air mass to travel between the two sites. This was done by lagging the upwind measurement from the downwind measurement by the appropriate number of five-minute intervals (the increment in which the data were collected) needed to account for the time required for air mass to traverse the distance between the two sites along the angular increment between the two sites. Thus, if the angle between the two sites is 260 degrees, the average wind speed computed for that increment was used to adjust all of the angular increments between 180 and 360 degrees. The reason is that the most accurate comparison is along that angle connecting the two sites. Comparisons at other increments reflect the impact of sources not located directly along the line/angle between

the two sites. As the difference between the angular increment and the angle between the two sites grows, the effects of these sources and dispersion become greater. Similarly, as the distance between the two sites grows, the effects of nonaligned sources, dispersion, and deposition continue to grow and the comparisons provide less insight. Fortunately, the sites are located to the southwest of the West 43rd Avenue monitor, which is the dominant direction for high winds impacting that site. Comparisons along the arc between 230 to 290 degrees generally have the largest measurement count and provide the most relevant insight for the analysis. To simplify the presentation, comparisons of winds coming from the east (i.e., 0 to 175 degree increments) are not included for any of the lagged data sets for each site pair and wind speed category. All tables are presented at the end of this section for ease of review.

West 43rd Avenue versus West 43rd Avenue & Broadway (Temp #1) – An analysis of matched pair measurements between the West 43rd Ave. long-term monitor and 43rd Ave. & Broadway temporary monitor was prepared for the period between April 2010 and March 2011. The data were organized into five-degree increments so concentration differences could be computed as a function of wind direction and wind speed. Since the distance between the two sites is 0.4 miles, no lags were introduced into the data comparisons. With the comparisons all on a consistent time basis, results are presented for winds coming from all directions not just the west.

Measurements were organized into three categories of wind speed: 2-6 mph (Tables V-5 & V-6), 6-12 mph (Tables V-3 & V-4), and >12 mph (Tables V-1 & V-2). To ensure matched pair comparisons, both monitors had to have wind speeds falling into these categories to be included in the analysis. The results show that at 240 degrees, the angular direction traveling southwest from the West 43rd Ave. monitor to the West 43rd Ave. & Broadway temporary monitor, average concentrations at the West 43rd monitor are consistently higher than at the temporary site:

- At 2-6 mph, the difference (West 43rd - West 43rd & Broadway/West 43rd) is 13.5% (6.38 $\mu g/m^3$);
- At 6-12 mph, the difference is 9% (3.2 $\mu g/m^3$); and
- At >12 mph, the difference is 37.3% (39.78 $\mu g/m^3$).

The >12 mph differences increase as the angular direction increases from 240 – 290 degrees, suggesting that fugitive dust from land located between those sites disproportionately impacted concentrations at the West 43rd Ave. monitoring site (particularly since emissions impacting the monitor at that hour are coming from a minimum distance of 12 miles and the distance between the monitors is 0.4 miles). This finding suggests that any modeling analysis prepared to support an attainment demonstration needs to account for distance between the location where fugitive dust is emitted and the monitoring site impacted during high wind conditions (either through dispersion/deposition or some weighting function).

West 43rd Avenue & Broadway (Temp #1) versus 51st Avenue & W. Roeser Road (Temp #2) – An analysis of matched pair measurements between these sites was also prepared for the period between April 2010 and March 2011. Only the high wind category (>12 mph), was analyzed from this pair to get the insights of the emissions between these two monitors. Low wind conditions (< 12 mph) were excluded because of the relatively long distances of the sources to the West 43rd monitor and the great wind variability during low wind conditions. To account for the time it takes wind to travel the 1-mile distance between the two sites, the Temp #2 site measurement was lagged by five minutes relative to the Temp 1 measurement (for winds coming from the west). Tabulations of the high wind results are presented in Table V-7. The results show that at 250 degrees, the angular direction when wind is traveling from the southwest from Temp #2 to Temp #1, average concentrations at Temp #1 were consistently higher than at Temp #2:

- At >12 mph, 250 degrees, the difference is 33.8% (28.5 $\mu g/m^3$).

A similar relationship was observed between the two sites when the wind was coming from a broader arc from southwest (200 to 270 degrees), average concentrations at Temp #1 were consistently higher than they were at Temp #2. Wind directions between 270 and 300 degrees produced the opposite relationship, with Temp #2 concentrations consistently higher than Temp #1. This indicates that when the wind is coming from the southwest, fugitive dust from disturbed land located between the two monitors is contributing to elevated concentrations at West 43rd & Broadway and therefore impacting concentrations recorded at the West 43rd Avenue monitoring site. It also suggests that there is considerably less disturbed land located in the 270 and 300 degree arc between the two sites.

51st Avenue & W. Roeser Road (Temp #2) versus 67th Avenue & Southern Avenue (Temp #3) – Similar to the previous analysis, comparisons between the April 2010 and March 2011 data set were prepared only for high wind conditions. The data were lagged by ten minutes to account for the time required for air mass to transit the 2-mile distance between the two sites (i.e., Temp #3 measurements were lagged 10 minutes relative to Temp #2 measurements). A summary of the comparisons for winds coming from the west is presented in Table V-8.

The results show that at 255 degrees, the angular direction traveling southwest from the Temp 2 to Temp 3 monitor, average concentrations at the 51st Ave. monitor are lower than at the 67th Ave monitor:

- At >12 mph, 255 degrees, the difference is -7.4% (-4.6 $\mu g/m^3$).

This pattern of higher upwind values is seen consistently in an arc ranging from 240 to 300 degrees. It is also opposite of the patterns seen in the previous site comparisons. This suggests that upwind sources impacting the 67th Ave. monitor had a significantly greater impact than sources located between the two sites had on the 51st Ave monitor. Another factor to consider is that the greater distance between these sites also allows more

time/distance for dispersion and deposition relative to the previous site comparisons. Given the limitations of the data, it is not possible to know which effect is stronger (i.e., the influence of nearby upwind sources at both sites versus dispersion/deposition). Nevertheless, it suggests some form of distance weighting should be incorporated into the modeling because the greatest impacts at the West 43rd Avenue monitor appear to be coming from nearby upwind land.

67th Avenue & Southern (Temp#3) versus 115th Avenue (Temp #4) – Similar to the previous analysis, comparisons between the April 2010 and March 2011 data set were only prepared for high wind conditions. The data were lagged by 25 minutes to account for the time required for air mass to transit the 6-mile distance between the two sites (i.e., Temp #4 measurements were lagged 25 minutes relative to Temp #3 measurements). A summary of the comparisons for winds coming from the west is presented in Table V-9.

The results show that at 255 degrees, the angular direction traveling southwest from the Temp 2 to Temp 3 monitor, average concentrations at the 51st Ave. monitor are consistently lower than at the 67th Ave monitor:

- At >12 mph, 255 degrees, the difference is -48.0% (-33.1 $\mu g/m^3$).

This pattern is consistent with that observed in the previous comparison between Temp #2 and #3, but inconsistent with the pattern seen in the sites closer to the West 43rd Avenue monitor. The differences observed at 255 degrees between Temp #3 and #4, however, are not generally seen over the broader arc between 230 to 290 degrees. Generally, the pattern is the opposite—higher values are recorded at the 67th Avenue monitor, suggesting land located between the two sites, but not directly along the angle between them, is contributing to emissions impacting that site.

115th Avenue (Temp #4) versus Buckeye – Due to the 18-mile distance between the sites, no comparisons were prepared.

Summary

Analysis of data collected along a line of fixed and temporary PM-10 monitors located on a southwest trajectory from the West 43rd Avenue monitor between April 2010 and March 2011 shows a pattern of elevated impacts from nearby lands. Similar impacts were observed in comparisons between concentrations recorded at the next set of upwind sites. Subsequent site comparisons produced inconsistent and contradictory results, indicating a lessening impact of lands located between the monitored pairs. These findings suggest that lands with the greatest impacts on concentrations recorded at the West 43rd Avenue site are nearby and diminish with distance. The trajectory modeling used to estimate concentrations during high wind hours should incorporate a form of distance weighting or dispersion to account for this effect.

Table V-1
Angular Comparison of Matched Five-Minute PM-10 Concentrations Collected at West 43rd Ave/Broadway and West 43rd Monitors When Winds Exceeded 12 mph (0 - 175 degrees)

WD Sector (Degree)	Measurement Count	43rd & Broadway ($\mu g/m^3$)	West 43rd ($\mu g/m^3$)	Difference ($\mu g/m^3$)	Difference (Percent)
0	21	116.39	113.54	-2.85	-2.5%
5	40	80.27	89.04	8.77	9.8%
10	36	75.15	86.64	11.49	13.3%
15	38	52.07	41.29	-10.78	-26.1%
20	38	43.94	29.64	-14.31	-48.3%
25	38	58.74	27.68	-31.07	-112.3%
30	28	128.18	70.54	-57.64	-81.7%
35	11	167.49	72.14	-95.35	-132.2%
40	11	96.82	45.57	-51.25	-112.4%
45	8	122.26	50.31	-71.95	-143.0%
50	8	66.86	31.31	-35.55	-113.5%
55	1	94.40	47.90	-46.50	-97.1%
60	7	58.56	68.64	10.09	14.7%
65	8	52.56	40.15	-12.41	-30.9%
70	14	50.38	44.15	-6.23	-14.1%
75	27	50.50	46.56	-3.94	-8.5%
80	27	64.63	63.34	-1.29	-2.0%
85	25	56.80	50.55	-6.25	-12.4%
90	19	68.35	62.76	-5.58	-8.9%
95	22	49.96	50.95	0.98	1.9%
100	53	79.18	67.96	-11.22	-16.5%
105	35	141.95	101.19	-40.77	-40.3%
110	21	150.54	104.44	-46.10	-44.1%
115	12	22.78	40.67	17.89	44.0%
120	13	248.30	153.05	-95.25	-62.2%
125	15	166.12	87.01	-79.11	-90.9%
130	23	296.25	139.17	-157.07	-112.9%
135	15	418.20	318.69	-99.51	-31.2%
140	14	177.39	148.76	-28.62	-19.2%
145	12	123.76	118.34	-5.42	-4.6%
150	8	234.20	173.84	-60.36	-34.7%
155	6	796.67	1013.33	216.67	21.4%
160	8	529.34	601.58	72.24	12.0%
165	13	764.37	365.05	-399.32	-109.4%
170	4	273.75	398.73	124.98	31.3%
175	16	630.31	305.08	-325.24	-106.6%

Table V-2
Angular Comparison of Matched Five-Minute PM-10 Concentrations Collected at West 43rd Ave/Broadway and West 43rd Monitors When Winds Exceeded 12 mph (180 - 360 degrees)

WD Sector (Degree)	Measurement Count	43rd & Broadway ($\mu g/m^3$)	West 43rd ($\mu g/m^3$)	Difference ($\mu g/m^3$)	Difference (Percent)
180	15	720.92	320.11	-400.81	-125.2%
185	3	310.43	156.47	-153.97	-98.4%
190	3	46.30	38.80	-7.50	-19.3%
195	2	105.20	94.25	-10.95	-11.6%
200	5	147.90	152.32	4.42	2.9%
205	3	646.00	774.00	128.00	16.5%
210	14	144.09	266.19	122.10	45.9%
215	16	373.00	419.85	46.85	11.2%
220	34	130.21	150.99	20.79	13.8%
225	32	66.88	109.71	42.82	39.0%
230	57	69.08	103.92	34.84	33.5%
235	104	63.30	102.79	39.50	38.4%
240	**130**	**66.92**	**106.70**	**39.78**	**37.3%**
245	158	88.30	132.58	44.29	33.4%
250	153	78.77	134.13	55.36	41.3%
255	182	68.66	129.96	61.30	47.2%
260	246	68.12	130.17	62.05	47.7%
265	271	48.46	91.98	43.53	47.3%
270	205	51.11	110.52	59.40	53.7%
275	141	64.33	124.81	60.48	48.5%
280	94	62.54	150.43	87.89	58.4%
285	51	62.39	124.07	61.68	49.7%
290	20	85.40	195.19	109.79	56.2%
295	24	51.48	74.85	23.37	31.2%
300	7	87.66	164.27	76.61	46.6%
305	8	45.71	46.89	1.18	2.5%
310	12	53.38	64.98	11.61	17.9%
315	15	52.79	53.25	0.45	0.9%
320	13	67.18	84.66	17.48	20.6%
325	8	62.76	56.28	-6.49	-11.5%
330	14	32.36	24.97	-7.39	-29.6%
335	23	57.46	49.74	-7.72	-15.5%
340	41	81.66	79.40	-2.26	-2.8%
345	49	49.45	43.17	-6.28	-14.6%
350	20	141.52	142.74	1.22	0.9%
355	30	126.71	105.82	-20.89	-19.7%
360	3	20.53	25.37	4.83	19.1%

Table V-3
Angular Comparison of Matched Five-Minute PM-10 Concentrations Collected at West 43rd Ave/Broadway and West 43rd Monitors When Winds Are Between 6-12 mph (0 - 175 degrees)

WD Sector (Degree)	Measurement Count	43rd & Broadway ($\mu g/m^3$)	West 43rd ($\mu g/m^3$)	Difference ($\mu g/m^3$)	Difference (Percent)
0	61	20.32	16.66	-3.66	-22.0%
5	47	27.47	22.41	-5.06	-22.6%
10	45	31.10	26.73	-4.37	-16.3%
15	53	24.12	20.18	-3.94	-19.5%
20	55	20.65	20.55	-0.10	-0.5%
25	49	25.99	20.67	-5.33	-25.8%
30	41	29.32	22.95	-6.37	-27.8%
35	46	30.43	22.58	-7.85	-34.8%
40	57	27.96	20.81	-7.15	-34.3%
45	59	29.15	21.02	-8.13	-38.7%
50	66	28.94	21.84	-7.09	-32.5%
55	104	29.37	25.18	-4.19	-16.7%
60	141	36.94	29.59	-7.35	-24.8%
65	157	35.87	29.32	-6.55	-22.3%
70	264	37.52	59.90	22.38	37.4%
75	330	35.36	86.99	51.63	59.4%
80	279	36.85	64.04	27.18	42.5%
85	256	34.53	47.96	13.43	28.0%
90	319	30.11	31.37	1.26	4.0%
95	301	30.76	43.93	13.17	30.0%
100	275	32.54	34.14	1.59	4.7%
105	221	33.60	51.44	17.84	34.7%
110	206	26.63	24.19	-2.45	-10.1%
115	189	29.78	27.39	-2.39	-8.7%
120	156	30.39	26.72	-3.68	-13.8%
125	129	51.33	46.01	-5.33	-11.6%
130	125	30.62	24.80	-5.82	-23.5%
135	117	40.18	35.45	-4.73	-13.3%
140	110	39.70	39.48	-0.23	-0.6%
145	94	52.01	37.78	-14.24	-37.7%
150	109	56.90	59.36	2.47	4.2%
155	115	62.44	68.93	6.50	9.4%
160	105	49.32	41.58	-7.74	-18.6%
165	116	67.84	66.32	-1.53	-2.3%
170	82	50.22	66.74	16.52	24.8%
175	74	43.92	49.20	5.28	10.7%

Table V-4
Angular Comparison of Matched Five-Minute PM-10 Concentrations Collected at West 43rd Ave/Broadway and West 43rd Monitors When Winds are Between 6-12 mph (180 - 360 degrees)

WD Sector (Degree)	Measurement Count	43rd & Broadway ($\mu g/m^3$)	West 43rd ($\mu g/m^3$)	Difference ($\mu g/m^3$)	Difference (Percent)
180	63	35.47	51.12	15.65	30.6%
185	57	26.91	27.85	0.95	3.4%
190	50	26.95	25.52	-1.43	-5.6%
195	74	28.78	38.80	10.02	25.8%
200	54	26.78	28.81	2.03	7.1%
205	65	28.55	30.41	1.86	6.1%
210	78	29.71	32.21	2.50	7.8%
215	93	25.50	36.73	11.23	30.6%
220	133	29.03	33.54	4.51	13.4%
225	219	32.26	34.84	2.58	7.4%
230	375	30.65	33.38	2.73	8.2%
235	389	30.89	34.32	3.43	10.0%
240	**429**	**32.38**	**35.58**	**3.20**	**9.0%**
245	514	33.45	42.23	8.78	20.8%
250	478	33.18	42.14	8.96	21.3%
255	629	35.81	41.11	5.30	12.9%
260	880	33.41	38.89	5.48	14.1%
265	951	32.05	37.10	5.05	13.6%
270	838	32.56	36.81	4.25	11.6%
275	763	32.53	37.56	5.03	13.4%
280	651	30.68	35.33	4.65	13.1%
285	509	27.87	30.98	3.11	10.0%
290	390	27.76	28.06	0.29	1.0%
295	228	27.45	29.60	2.15	7.3%
300	149	27.40	24.79	-2.62	-10.6%
305	96	32.92	27.19	-5.73	-21.1%
310	70	22.01	19.45	-2.56	-13.2%
315	60	35.80	26.73	-9.07	-33.9%
320	60	26.63	22.79	-3.84	-16.8%
325	58	23.16	22.42	-0.74	-3.3%
330	64	23.18	22.59	-0.58	-2.6%
335	50	23.22	16.96	-6.26	-36.9%
340	45	22.04	15.34	-6.70	-43.7%
345	55	25.49	15.47	-10.02	-64.8%
350	70	18.35	14.71	-3.64	-24.8%
355	64	20.18	19.90	-0.28	-1.4%
360	7	20.13	17.17	-2.96	-17.2%

Table V-5
Angular Comparison of Matched Five-Minute PM-10 Concentrations Collected at West 43rd Ave/Broadway and West 43rd Monitors When Winds are Greater Than 2 mph, but do not Exceed 6 mph (0 - 175 degrees)

WD Sector (Degree)	Measurement Count	43rd & Broadway ($\mu g/m^3$)	West 43rd ($\mu g/m^3$)	Difference* ($\mu g/m^3$)	Difference (Percent)
0	518	46.53	40.66	-5.86	-14.4%
5	536	45.97	45.20	-0.77	-1.7%
10	601	52.61	50.22	-2.39	-4.8%
15	609	52.82	45.26	-7.56	-16.7%
20	638	47.23	43.22	-4.01	-9.3%
25	639	49.91	43.46	-6.45	-14.8%
30	636	51.64	42.89	-8.75	-20.4%
35	723	50.86	45.73	-5.13	-11.2%
40	708	48.95	41.29	-7.66	-18.6%
45	803	48.89	41.39	-7.50	-18.1%
50	859	46.98	41.00	-5.98	-14.6%
55	961	46.18	43.81	-2.38	-5.4%
60	1,113	47.28	43.02	-4.26	-9.9%
65	1,159	46.63	45.47	-1.16	-2.6%
70	1,373	44.75	50.10	5.35	10.7%
75	1,424	43.21	54.39	11.18	20.6%
80	1,316	43.92	49.60	5.68	11.5%
85	1,264	42.95	47.16	4.21	8.9%
90	1,341	40.62	42.41	1.78	4.2%
95	1,361	40.10	46.95	6.85	14.6%
100	1,340	41.59	40.95	-0.64	-1.6%
105	1,240	44.05	45.02	0.96	2.1%
110	1,078	43.69	40.22	-3.47	-8.6%
115	1,014	41.27	39.82	-1.45	-3.6%
120	978	45.21	42.08	-3.12	-7.4%
125	982	50.38	45.33	-5.04	-11.1%
130	958	52.45	48.14	-4.31	-8.9%
135	819	56.34	47.72	-8.63	-18.1%
140	874	54.13	47.03	-7.10	-15.1%
145	825	53.75	46.78	-6.97	-14.9%
150	796	55.61	48.67	-6.94	-14.3%
155	833	59.45	56.67	-2.78	-4.9%
160	790	57.46	52.65	-4.81	-9.1%
165	828	67.32	55.33	-11.99	-21.7%
170	841	52.88	51.87	-1.01	-1.9%
175	870	63.00	52.76	-10.24	-19.4%

Table V-6
Angular Comparison of Matched Five-Minute PM-10 Concentrations
Collected at West 43rd Ave/Broadway and West 43rd Monitors
When Winds are Greater Than 2 mph, but do not Exceed 6 mph
(180 - 360 degrees)

WD Sector (Degree)	Measurement Count	43rd & Broadway ($\mu g/m^3$)	West 43rd ($\mu g/m^3$)	Difference ($\mu g/m^3$)	Difference (Percent)
180	913	63.96	53.33	-10.64	-19.9%
185	952	52.75	48.40	-4.35	-9.0%
190	954	50.78	50.93	0.15	0.3%
195	1,014	54.49	56.53	2.04	3.6%
200	1,007	52.77	58.15	5.38	9.3%
205	1,035	48.48	50.77	2.28	4.5%
210	1,080	47.35	51.14	3.79	7.4%
215	1,043	49.25	57.43	8.18	14.3%
220	1,126	43.43	47.65	4.23	8.9%
225	1,234	40.96	46.57	5.62	12.1%
230	1,479	38.28	45.15	6.87	15.2%
235	1,564	39.60	46.77	7.17	15.3%
240	**1,733**	**40.90**	**47.28**	**6.38**	**13.5%**
245	2,115	42.33	51.05	8.72	17.1%
250	2,154	43.65	56.51	12.86	22.8%
255	2,514	43.70	48.68	4.99	10.2%
260	2,795	44.17	51.20	7.04	13.7%
265	2,907	41.10	49.44	8.33	16.9%
270	2,755	41.13	45.52	4.39	9.7%
275	2,646	41.49	45.26	3.76	8.3%
280	2,515	39.15	42.85	3.70	8.6%
285	2,360	37.96	43.91	5.94	13.5%
290	1,964	37.29	35.66	-1.63	-4.6%
295	1,542	37.81	41.53	3.72	9.0%
300	1,243	39.00	41.53	2.53	6.1%
305	1,012	39.05	35.26	-3.79	-10.7%
310	929	40.86	36.68	-4.18	-11.4%
315	823	42.02	36.28	-5.74	-15.8%
320	769	39.93	38.25	-1.68	-4.4%
325	726	41.51	36.75	-4.76	-13.0%
330	639	43.14	38.31	-4.83	-12.6%
335	644	45.94	37.05	-8.89	-24.0%
340	587	45.38	40.66	-4.73	-11.6%
345	626	43.47	39.32	-4.15	-10.6%
350	624	47.85	40.69	-7.17	-17.6%
355	617	46.02	41.83	-4.19	-10.0%
360	52	37.66	41.61	3.95	9.5

Table V-7
Angular Comparison of Matched Five-Minute PM-10 Concentrations Collected at 51st Avenue and West 43rd Ave/Broadway (lagged 5-minutes) Monitors When Winds Exceeded 12 mph (180 - 355 degrees)

WD Sector (Degree)	Measurement Count	51st Avenue ($\mu g/m^3$)	43rd & Broadway ($\mu g/m^3$)	Difference ($\mu g/m^3$)	Difference (Percent)
180	9	274.6	839.6	565.0	67.3%
185	14	171.2	442.3	271.1	61.3%
190	3	27.4	83.1	55.7	67.0%
195	2	38.2	102.5	64.3	62.8%
200	NA	NA	NA	NA	NA
205	1	32.3	82.3	50.0	60.8%
210	4	34.3	154.3	120.0	77.8%
215	6	59.6	294.4	234.9	79.8%
220	8	182.0	278.3	96.4	34.6%
225	8	197.8	428.8	231.0	53.9%
230	14	219.7	298.2	78.5	26.3%
235	11	135.9	132.7	-3.3	-2.5%
240	18	38.8	78.8	39.9	50.7%
245	24	48.3	64.7	16.5	25.4%
250	**34**	**55.7**	**84.2**	**28.5**	**33.8%**
255	45	60.0	85.0	25.0	29.4%
260	52	37.7	57.5	19.8	34.4%
265	68	61.8	72.8	10.9	15.0%
270	76	49.4	62.2	12.8	20.5%
275	95	51.8	52.0	0.2	0.4%
280	90	43.9	39.8	-4.1	-10.3%
285	62	49.9	36.6	-13.4	-36.6%
290	35	47.0	29.7	-17.3	-58.2%
295	12	35.6	26.7	-8.8	-33.1%
300	6	49.8	46.8	-3.1	-6.6%
305	4	47.4	58.7	11.4	19.3%
310	5	37.5	51.7	14.2	27.5%
315	10	36.5	40.2	3.7	9.2%
320	13	60.9	73.3	12.4	16.9%
325	11	88.7	91.9	3.3	3.6%
330	4	21.0	21.8	0.8	3.6%
335	9	186.6	118.6	-68.0	-57.3%
340	40	50.2	55.9	5.7	10.2%
345	32	73.9	55.1	-18.8	-34.2%
350	15	111.3	86.0	-25.3	-29.4%
355	18	286.0	231.6	-54.4	-23.5%

Table V-8
Angular Comparison of Matched Five-Minute PM-10 Concentrations Collected at 67th Avenue and 51st Avenue (lagged 10-minutes) Monitors When Winds Exceeded 12 mph (180 - 355 degrees)

WD Sector (Degree)	Measurement Count	67th Avenue ($\mu g/m^3$)	51st Avenue ($\mu g/m^3$)	Difference ($\mu g/m^3$)	Difference (Percent)
180	10	517.4	181.8	-335.5	-184.5%
185	15	402.3	132.5	-269.8	-203.6%
190	6	64.5	71.0	6.5	9.2%
195	3	29.0	38.8	9.9	25.4%
200	NA	NA	NA	NA	NA
205	1	93.4	15.7	-77.7	-494.9%
210	1	221.5	320.7	99.2	30.9%
215	4	59.0	144.7	85.7	59.2%
220	8	106.2	164.9	58.7	35.6%
225	7	124.4	131.8	7.4	5.6%
230	13	154.1	226.6	72.5	32.0%
235	9	102.3	191.1	88.8	46.5%
240	25	55.7	37.9	-17.8	-46.9%
245	24	99.1	68.1	-31.1	-45.7%
250	37	88.3	53.5	-34.8	-65.1%
255	**52**	**66.6**	**62.0**	**-4.6**	**-7.4%**
260	63	60.3	45.2	-15.0	-33.2%
265	88	80.8	62.7	-18.2	-29.0%
270	93	72.3	55.0	-17.3	-31.4%
275	106	62.1	55.9	-6.2	-11.0%
280	102	53.6	62.1	8.5	13.7%
285	84	62.9	44.9	-18.0	-40.0%
290	58	148.4	73.2	-75.2	-102.7%
295	18	184.1	95.7	-88.5	-92.5%
300	13	114.0	51.8	-62.2	-120.0%
305	9	69.6	40.4	-29.2	-72.2%
310	18	70.9	71.7	0.8	1.1%
315	23	34.3	17.8	-16.4	-92.0%
320	16	97.7	49.3	-48.4	-98.3%
325	12	164.6	74.9	-89.8	-119.9%
330	3	27.6	20.9	-6.7	-32.3%
335	11	109.9	92.8	-17.1	-18.4%
340	36	47.5	40.7	-6.8	-16.7%
345	28	50.0	70.7	20.7	29.3%
350	16	85.3	84.4	-1.0	-1.1%
355	12	114.2	208.8	94.6	45.3%

Table V-9
Angular Comparison of Five-Minute PM-10 Concentrations Collected at 115th Avenue and 67th Avenue (lagged 25-minutes) Monitors When Winds Exceeded 12 mph (180 - 355 degrees)

WD Sector (Degree)	Measurement Count	Avondale ($\mu g/m^3$)	67th Avenue ($\mu g/m^3$)	Difference ($\mu g/m^3$)	Difference (Percent)
180	NA	NA	NA	NA	NA
185	NA	NA	NA	NA	NA
190	2	59.7	499.5	439.9	88.1%
195	3	45.2	140.4	95.2	67.8%
200	3	27.7	303.8	276.1	90.9%
205	6	16.1	28.3	12.2	43.1%
210	11	56.3	58.4	2.1	3.6%
215	4	55.8	42.2	-13.6	-32.2%
220	11	125.2	164.7	39.5	24.0%
225	16	71.9	55.4	-16.5	-29.8%
230	22	68.5	158.7	90.2	56.8%
235	19	38.3	81.3	43.0	52.9%
240	33	50.8	56.5	5.8	10.2%
245	47	37.5	80.2	42.7	53.2%
250	84	42.4	113.7	71.3	62.7%
255	72	36.2	74.5	38.3	51.4%
260	**87**	**102.3**	**69.1**	**-33.1**	**-48.0%**
265	61	75.7	63.2	-12.5	-19.8%
270	86	38.2	44.2	5.9	13.4%
275	58	51.2	68.9	17.7	25.6%
280	56	50.5	88.3	37.8	42.8%
285	39	83.7	130.9	47.2	36.1%
290	30	112.5	177.6	65.1	36.7%
295	8	26.4	45.7	19.3	42.2%
300	4	25.9	81.5	55.7	68.3%
305	6	38.3	75.5	37.2	49.3%
310	2	25.4	66.0	40.7	61.6%
315	8	52.2	80.5	28.4	35.2%
320	25	36.8	66.3	29.5	44.5%
325	27	60.4	95.9	35.5	37.0%
330	5	140.7	35.9	-104.8	-291.8%
335	3	100.0	25.2	-74.8	-297.2%
340	19	25.9	37.6	11.7	31.1%
345	16	63.3	40.3	-23.0	-57.1%
350	9	173.8	79.1	-94.7	-119.6%
355	NA	NA	NA	NA	NA

SOURCE WEIGHTING ANALYSIS

A modified rollback analysis is used to assess the benefits of controls to reduce windblown dust emissions on disturbed soil areas. Although these benefits can be quantified in terms of emissions, the corresponding reductions in ambient PM-10 concentrations at fixed monitoring sites cannot be determined without additional analysis of the relationships between emissions reductions and reductions in downwind concentrations. This relationship is typically quantified through use of dispersion modeling, and dispersion modeling is used in a screening mode here to inform modifications to the basic rollback process.

Rollback analysis basically assumes a linear relationship between levels of pollutant emissions and levels of resulting pollutant concentrations in downwind ambient air. Under this approach, a fractional reduction in emissions is assumed to produce an equivalent reduction in downwind ambient concentrations after backing out the contribution of background air quality. In the case of entrained PM-10 generated by high wind events, however, we know that two primary factors invalidate this principle of linearity: (1) the settling and deposition from the airstream of entrained particulate with increasing time and distance from the point of entrainment, and (2) the dispersion of particulate both laterally and vertically within the airstream due to increased boundary layer turbulence at higher wind speeds. Both of these phenomena cause PM-10 concentrations to drop dramatically as air parcels holding these concentrations continue moving downwind from the soils generating windblown dust during high wind events.

Fortunately, quantitative estimates of the impacts of these two phenomena can be derived from the use of steady state, Gaussian-dispersion models configured to site-specific conditions found in the Salt River area. One of these models, AERMOD, was used to quantify source-receptor relationships in the previous version of the Maricopa Area Five Percent Plan. For this reason, AERMOD was used to generate PM-10 concentrations downwind of a hypothetical disturbed soil parcel producing windblown dust to assess the rate at which the combination of particle deposition and dispersion reduced concentrations at varying distances downwind of the source.

The hypothetical disturbed soil parcel was configured to represent such parcels typically found in the windblown dust corridor straddling the Salt River. The area of the parcel was specified to be 40 acres, representative of larger cultivated parcels in the area. The parcel was assumed to be square with sides oriented north-south and east-west and measuring 401.54 meters each. The plume release height was set at 0.5 meters, the ambient temperature at 297.9 °K (76.6 °F), and Monin-Obukhov lengths—relating to atmospheric stability—were set at -304.2 meters. These ambient conditions were the same as those that occurred at the W. 43rd monitoring station on the high wind hour of February 15, 2006, the single high wind day evaluated in the Technical Support Document to the initial Five Percent Plan. The urban dispersion toggle was set to represent albedo from a population center of 1.5 million. Both source and receptor elevations were set to zero to generally represent the topographical gradient along the Salt River. The surface

roughness was set at 0.04 meters based on Nickling and Gillies 1986 wind tunnel testing in the Salt River area. The particle size ranges of loose soil particles entrained by high wind conditions from this parcel were assumed to be the same as the size distribution used in the initial Five Percent Plan modeling of high wind conditions. This distribution, as adapted from ambient air monitoring conducted by T&B Systems in the Salt River area in 2006, is shown in Table V-10.

Table V-10
Particle Characteristics

Diameter (micron)	1.229	3.263	4.949	6.802	8.724
Mass Fraction	0.189	0.27	0.231	0.206	0.105
Density (g/cm^3)	2.5	2.5	2.5	2.5	2.5

The emission rate for the 40-acre parcel was set at 1,000 pounds of PM-10 per hour, or 7.815×10^{-4} g/sec-m^2, which is consistent with emission rates published in the 2008 Periodic Emissions Inventory for PM-10 (Appendix A, Exhibit 1).

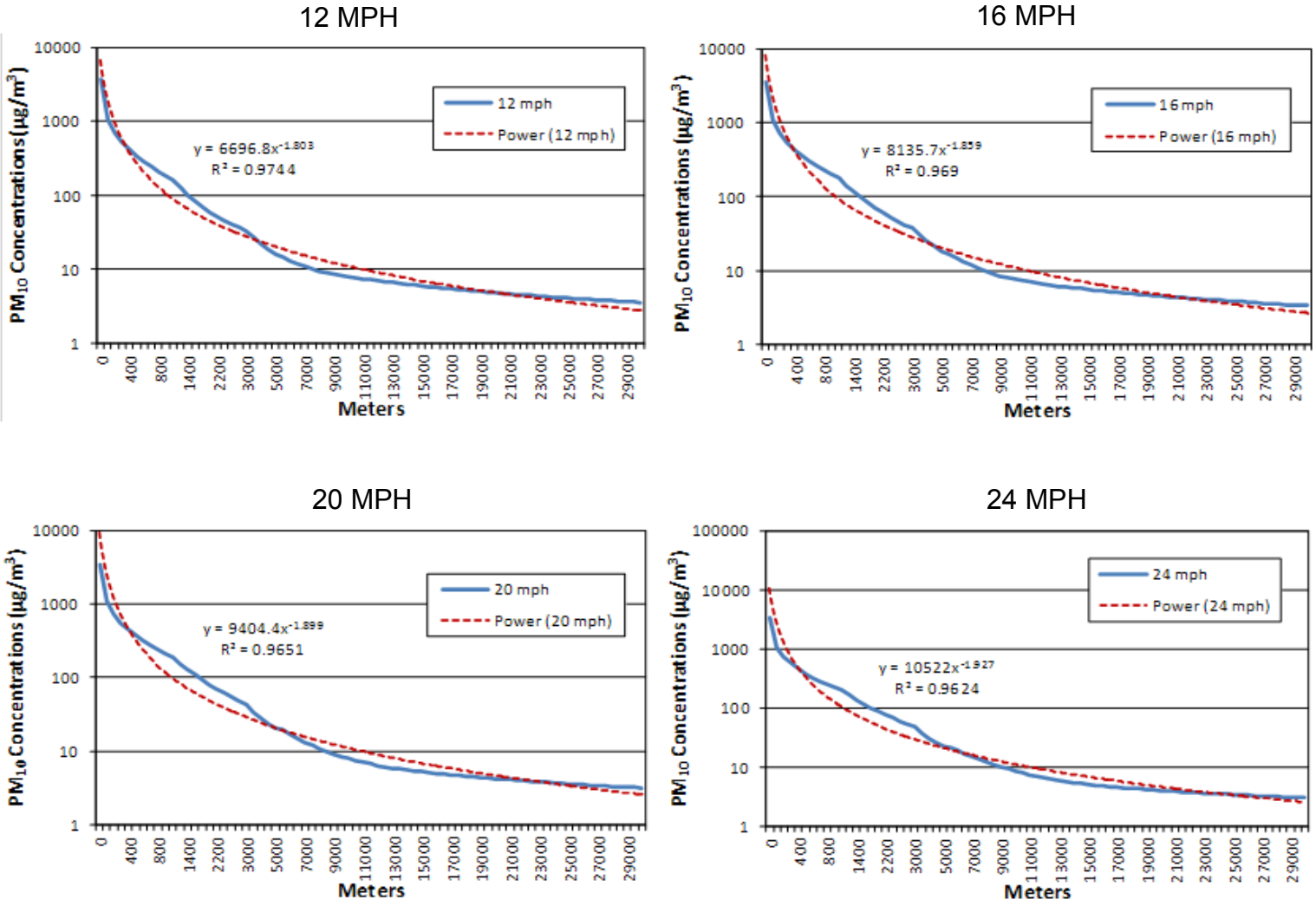
Receptor sites were located at regular intervals downwind of the trailing edge of the area source. Receptor spacing was set at 100 meters between 0 and 1,000 meters; at 200 meters between 1,000 and 3,000 meters; and then at 500 meters between 3,000 and 30,000 meters. All receptors were configured to lie on a radius pointing due east from the source.

Meteorological conditions for this screening run included winds blowing from due west at a series of elevated wind speeds. Hourly average wind velocities ranged from 12 to 24 mph in 1-mph increments.

The resulting hourly-average PM-10 concentrations reported by the AERMOD screening run are shown in Appendix A. These results show concentrations varying by three orders of magnitude over the downwind distance span of 0 to 30,000 meters. At the threshold of high wind conditions, 12 mph, concentrations drop by a factor of 10 between 0 and 500 meters, between 500 and 2,800 meters, and between 2,800 and 30,000 meters. In other words, emissions from sources proximate to or within 500 meters upwind of a monitoring station will overwhelm the emission contributions of sources more than 500 meters upwind.

The trends of modeling results were analyzed using the curve-fitting functions of Excel. In the first analytical series, plots of PM-10 concentrations vs. downwind distance were mapped for the wind speeds of 12, 16, 20, and 24 mph. These plots are shown in Figure V-2.

Figure V-2
Relationship Between PM-10 Concentration and Source Distance at Different Wind Speeds



This progression of plots includes the best fit curve statistics for each AERMOD wind speed. Because of the rapidity at which concentrations decline with increasing downwind distance, a power curve was found to provide the best equation fit to these data. From observation, the correlation coefficients (r^2) of these plots are very high—exceeding 0.96 in all cases. Similarly, the exponent of x in each best fit power curve hovers near -1.9, suggesting that concentrations roughly decline with downwind distances on a $1/x^2$ basis.

Further analysis of the modeling data, however, suggests a somewhat different picture. In each of the plots in Figure V-2, modeling results straddle the best fit curve in a sinusoidal fashion. The first plot in Figure V-2, that of the 12 mph modeling results, was disaggregated into separate sinusoid cycles to determine whether the power equation exponent remained constant over each block of downwind receptors contained within a cycle. The sinusoid cycles were chosen to encompass the receptor intervals of 0 to 1,000 meters; 1,000 to 3,000 meters; 3,000 to 15,000 meters; and 15,000 to 30,000 meters. The resulting plots of PM-10 concentration vs. distance are presented in Figure V-3.

The plots in Figure V-3 show similarly high r^2 values, but the power exponents vary substantially from -0.2 to -1.2. Also, the trend in power exponents is somewhat linear, starting at the high end of -1.233 for receptors in the 0 to 1,000 meter range, and steadily decreasing to -0.173 in the 15,000 to 30,000 meter range. These results point dramatically to a concentration-distance relationship much closer to 1/x than $1/x^2$, especially in the critical zone of nearest receptors, from 0 to 1,000 meters, in which source impacts significantly overwhelm the contributions of sources farther upwind of a receptor.

A similar, but less dramatic, result is seen when the modeling data are evaluated over different portions of the right tail (i.e., toward increasing distances) of these plots in Figure V-2. This analysis was conducted to determine the effect of removing the highest—and most dominant—concentrations reported for near-downwind receptors from the analysis in order to study that portion of the curve with the flatter gradient. In this analysis, power equation curves were fitted to the distributions of PM-10 concentrations (1) over the full range of receptors, (2) over the range of receptors equal to or greater than 500 meters downwind of the source, (3) equal to or greater than 1,000 meters downwind, (4) equal to or greater than 2,000 meters downwind, and (5) equal to or greater than 4,000 meters downwind. The plots of these ranges are shown in Figure V-4.

The power curve statistics of plots in Figure V-4, like those in Figure V-3, show a declining trend in negative power curve exponents with increasing distance, but also stable and very high values of r^2 with increasing distance. Over the full range of receptors, the power curve exponent is -1.803, again suggesting a roughly $1/x^2$ relationship of PM-10 concentration with increasing downwind distance. Excluding the receptors within 500 meters of the source, however, causes the exponent to decline to -1.391. Removing receptors within 1,000 meters, 2,000 meters, and 4,000 meters of the source causes the power curve exponent to drop to -1.098, -0.825, and -0.504, respectively. These exponents conversely suggest rough relationships between PM_{10} concentration and distance of 1/x to $1/\sqrt{x}$.

Figure V-3
Relationship between PM-10 Concentration and Source Distance Increments at 12 mph Wind Speed

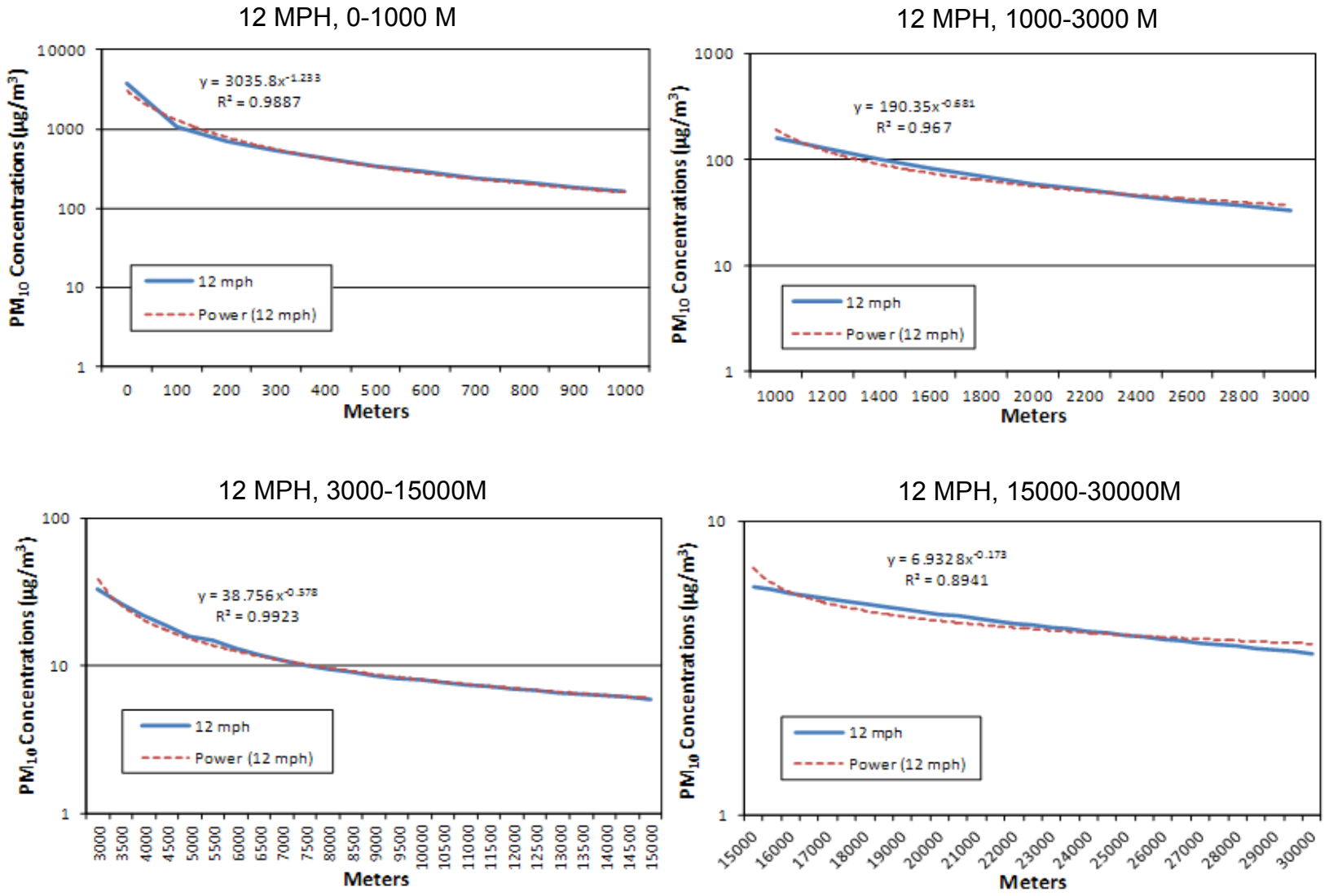
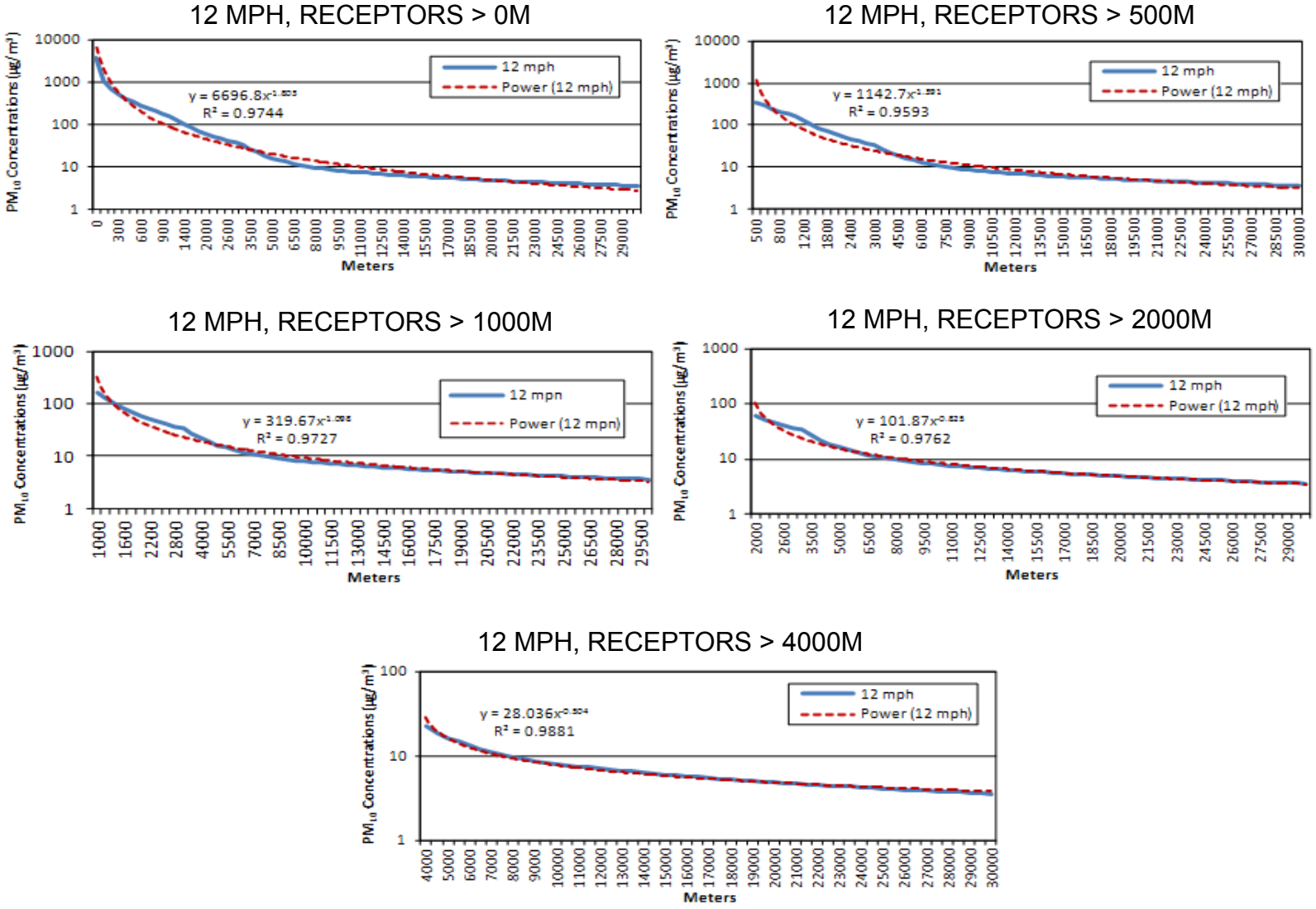


Figure V-4
Relationship between PM-10 Concentration and Increasing Source Distances at 12 mph Wind Speed

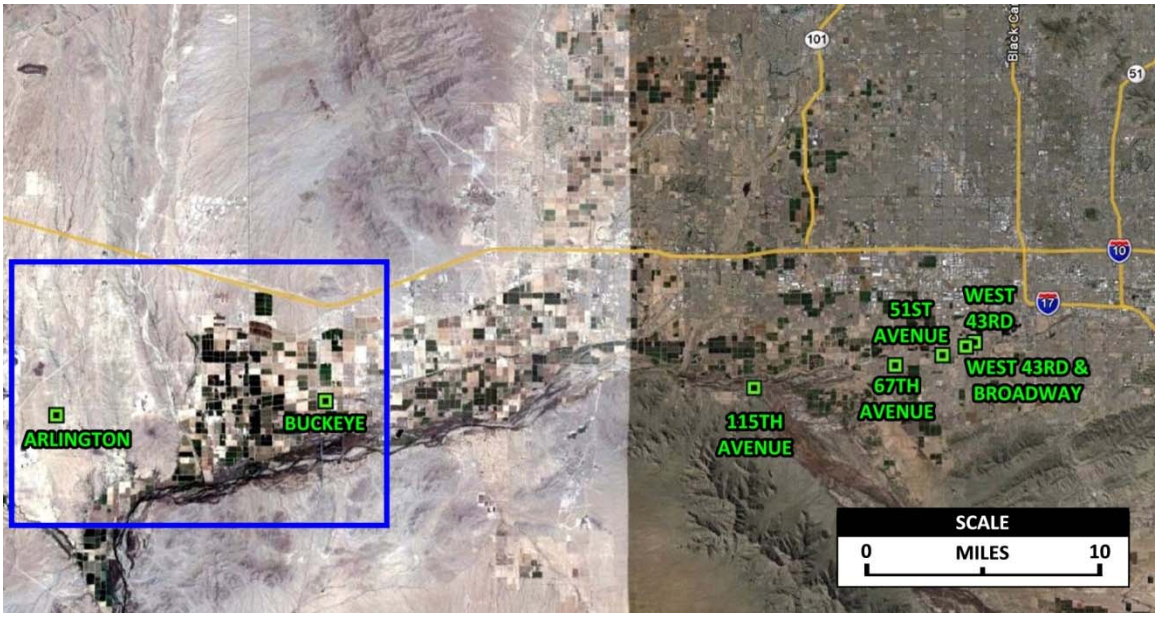


Without question, receptors close to an upwind source will be much more dramatically impacted by emissions from that source—emission rates being equal—than by similar sources at increasing distances upwind of receptors. As a result, the power curve exponents produced by the modeling of impacts in the near downwind field (0 to 1,000 meters) from this modeling analysis must be given greatest weight because of the exponentially smaller impacts at receptors at greater downwind distances. The first curve in Figure V-3 represents this receptor interval, and reports a power curve exponent of -1.233. Because the remainder of the plots report exponents straddling this value, this exponent represents the best singular value for the adjustment of downwind concentrations with increasing distance. Also, because of the range of exponents reported in these plots, an exponent of -1.0—equivalent to 1/x—is reasonably equivalent and should be used to adjust windblown dust emission impacts with increasing downwind distance in any modified rollback analysis in the Salt River area.

BACKGROUND CONDITIONS

As discussed in the section addressing Temporary Monitoring Insights, Maricopa County, with support from the Arizona Department of Environmental Quality (ADEQ) and the Maricopa Association of Governments (MAG), deployed a series of temporary PM-10 monitors along the dominant upwind trajectory in the spring of 2010. A total of five temporary monitors were deployed at the following sites: Arlington, 115th Avenue, 67th Avenue, 51st Avenue, and West 43rd & Broadway. The locations of the five temporary monitors and two nearby long-term monitors, Buckeye and West 43rd Avenue, are displayed in Figure V-5.

Figure V-5
Location of Temporary and Long-Term PM-10 Monitoring Sites



The Arlington monitor is located west of Buckeye, beyond the edge of active agricultural/irrigation land, both are highlighted in Figure 1. Data collected at the Arlington site are intended to provide insight into non-anthropogenic concentrations coming in from the desert. Despite its remote location, there are a number of sources located to the west of the site that impact monitored concentrations—examples include the Palo Verde Nuclear Generating Station, located three miles to the west/northwest; and the Mesquite Power Plant, located three miles to the southwest. All of the remaining monitors are directly impacted by emissions from upwind anthropogenic sources. Buckeye, located 11 miles east of Arlington, is the nearest monitor and is surrounded by agricultural lands.

Temporal Variations

Figures V-6 and V-7 compare wind speed, wind direction, and concentrations recorded at the Arlington, Buckeye, and West 43rd Ave. monitoring sites for two separate episodes that occurred on April 28-29, 2010, and May 22-23, 2010, respectively.

Because wind speed and wind direction were not recorded at the Arlington site, wind speed and wind direction data from the Buckeye and West 43rd monitors were used instead. Both low and high wind speeds were observed during these high wind events. During low winds, the wind direction showed considerable variation, coming from all directions; however, during high winds (wind speed > 12mph), constant west and southwest wind flow was observed. These wind flows represent the frontal winds coming from the west, the dominant direction for high wind events. During the high wind periods, PM-10 spikes were observed at all three sites, with much higher PM_{10} concentrations usually observed at the Buckeye and West 43rd monitors than at Arlington. Clearly, the lower values recorded at Arlington are more representative of PM-10 background concentrations transported by frontal winds coming in off the desert. Those values, however, may be impacted by upwind anthropogenic sources—additional analysis of concentrations as a function of wind direction is needed to assess their impacts.

Data Analysis

Differences between matched pair measurements from Arlington and Buckeye were calculated to provide insight into which upwind sources could be impacting Arlington concentrations. The data were organized into five-degree increments so the concentration differences could be computed as a function of wind direction and wind speed. Only measurements with wind speeds greater than 12 mph were used to represent the high wind events. The five-degree angular values for measurement count and average PM-10 and related standard deviations are presented in Table V-11. The angular direction traveling from the Arlington monitor to the Buckeye monitor is about 265°. The results show that average PM-10 concentrations at the Arlington monitor are consistently lower than the Buckeye monitor within an arc between 230° and 290°. This indicates that fugitive dust emissions east of Arlington are impacting the Buckeye monitor.

Figure V-6
Comparison of WD, WSPD and PM-10 Observations at Arlington, Buckeye and West 43rd Monitoring Sites During 4/28/2010 - 4/29/2010 High Winds Events

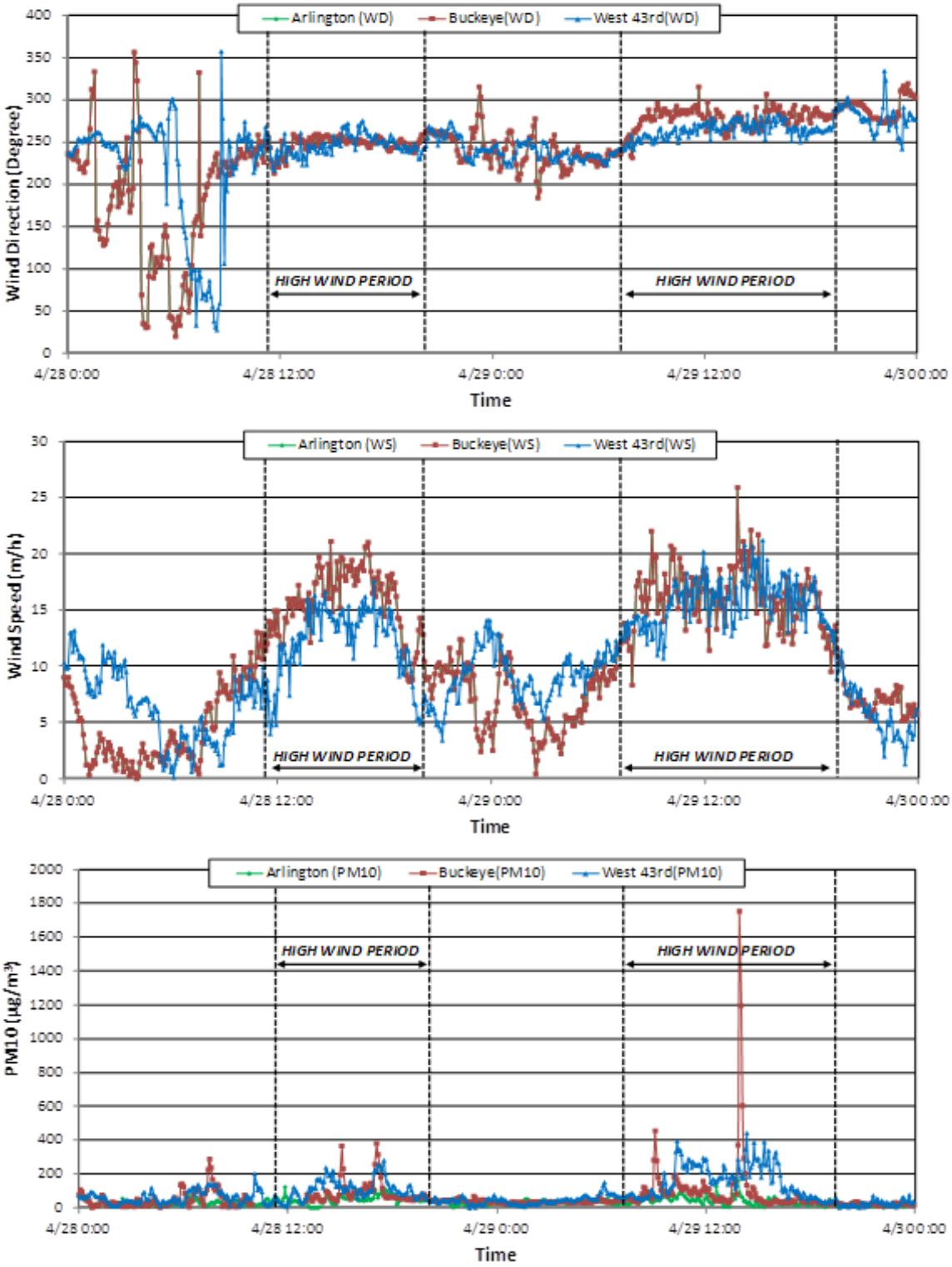
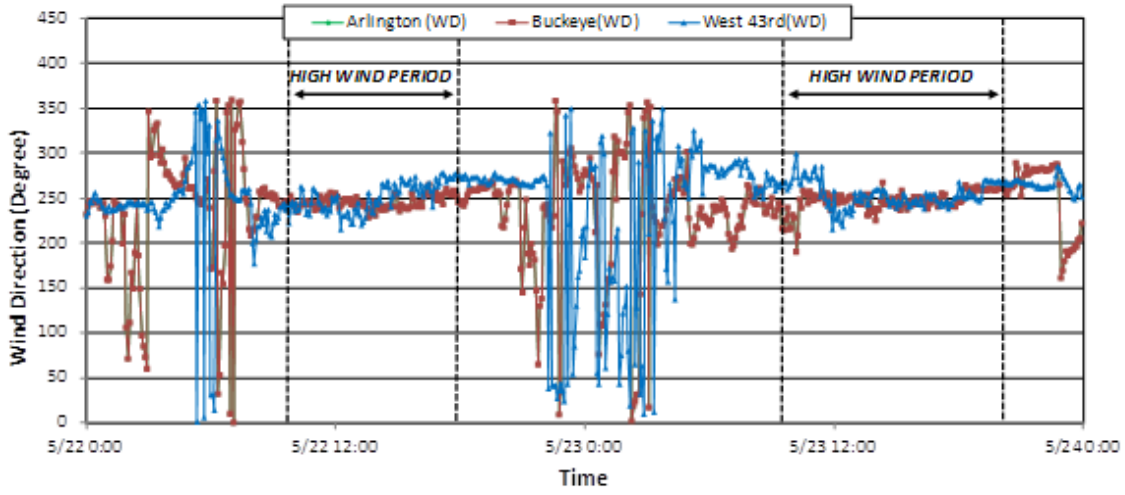
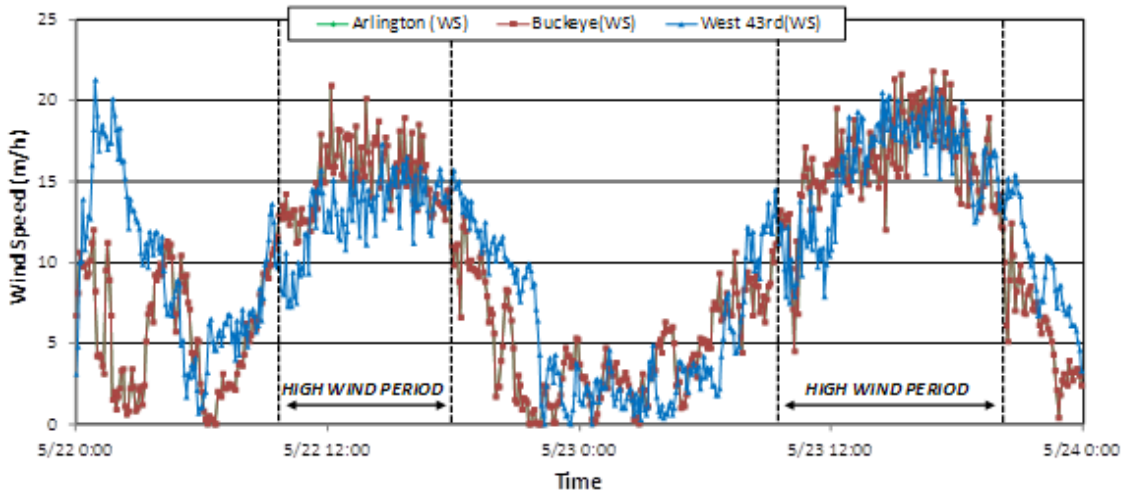
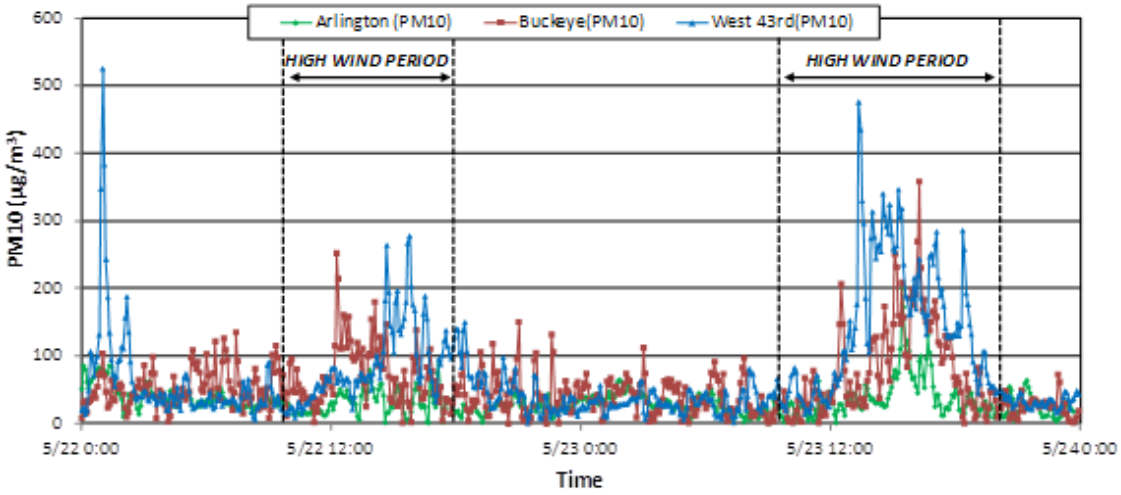


Figure V-7
Comparison of WD, WSPD and PM-10 Observations at Arlington, Buckeye and West 43rd Monitoring Sites During 5/22/2010 - 5/23/2010 High Winds Events







If a monitor is overwhelmed by emissions from nearby sources during high wind events, the variability of PM-10 over the shortest averaging periods (the five-minute data) should be greater (due to the equivalent variability of soil emissions forced by ground-level turbulence) than the corresponding variability computed at a station that is impacted by more distant sources (whose emissions disperse axially along the plume centerline, in addition to vertically and horizontally, thus reducing significant variations). Data for PM-10 at each five-degree angular direction (Table V-11) show that when the wind comes from Arlington to Buckeye (230° to 290°), the standard deviations for the Arlington monitor are usually, but not always, lower than the Buckeye monitor values.

Table V-11
Angular Comparison of Matched Five-Minute PM-10 Concentrations Collected at Arlington and Buckeye Monitors When Winds Are Greater Than 12 mph

WD Sector (Degree)	Measurement Count	Arlington ($\mu g/m^3$)	Buckeye ($\mu g/m^3$)	Difference ($\mu g/m^3$)	Standard Deviation (Arlington)	Standard Deviation (Buckeye)
0	2	233.7	314.1	80.4	31.3	427.6
10	1	18	19.9	1.9	N/A	N/A
20	2	41.6	30.4	-11.3	35.2	12
25	5	25.4	27.1	1.8	12.8	9.2
30	23	21.3	24	2.7	20.2	9
35	24	17.1	39.4	22.3	9.1	19.5
40	29	17.3	29.6	12.3	9.6	7.7
45	21	19.1	26.9	7.8	8.7	7.5
50	11	21.3	29.9	8.7	10.6	4
55	3	28.8	40.3	11.6	22.4	18.6
75	2	33.4	36.5	3.1	17.5	15.5
80	3	32.3	33.5	1.3	17.8	19.5
85	1	36.6	20.8	-15.8	N/A	N/A
90	1	19.9	29.5	9.6	N/A	N/A
140	1	88.1	107	18.9	N/A	N/A
155	1	122.8	563.2	440.4	N/A	N/A
185	7	40.4	27.7	-12.7	19	13.1
190	4	45.7	50.1	4.4	12.4	31.9
195	6	65.3	60.9	-4.5	74.2	61.9
200	16	55.4	118.6	63.2	67.5	178.5
205	24	55.4	85.4	30	79	136.7
210	26	33.6	80.4	46.8	28.6	190.7
215	36	42.8	60.8	17.9	71.1	54.8
220	36	68.8	84.4	15.7	119.5	67.5
225	32	49.2	44.3	-4.8	80.8	47.9
230	30	34.7	64.2	29.5	36.7	59.3
235	66	44.9	74	29.2	43.7	46.3
240	119	37.5	79.6	42.2	43.8	50.3
245	136	46.4	84.7	38.3	81.9	64.2

WD Sector (Degree)	Measurement Count	Arlington (µg/m^3)	Buckeye (µg/m^3)	Difference (µg/m^3)	Standard Deviation (Arlington)	Standard Deviation (Buckeye)
250	122	38.9	71.5	32.5	38.4	55.5
255	110	28.7	51	22.3	25.5	38.1
260	48	35.2	85.5	50.3	48.3	196.4
265	66	36.7	83.6	46.9	52.6	196.7
270	58	37.5	62.2	24.7	46	96.4
275	43	127.9	141.2	13.4	375.5	224.9
280	54	78.2	136.9	58.8	146.4	288.1
285	55	94.2	169	74.8	155.8	243.4
290	45	107.2	157.3	50.1	199.8	195.8
295	19	110.7	105.8	-4.9	174.5	151.2
300	8	298	191.2	-106.8	406.6	293.6
305	4	414.4	234.6	-179.8	321.5	193.4
310	5	217	240.8	23.8	286.5	319.5
315	14	347.7	270.6	-77.1	523.8	406.2
320	18	369.7	188.6	-181.1	653.1	288.7
325	27	473.6	184.1	-289.5	974.7	225
330	27	78.1	50.3	-27.8	180.2	95.8
335	16	26.8	35	8.1	21.5	30.5
340	20	24.6	54.6	30	30.6	131.1
345	11	30.4	36.5	6	21.7	36.8
350	1	16.6	25.1	8.5	N/A	N/A
355	4	149.4	67.9	-81.6	132.9	101.8

Calculation of High Wind Background Concentrations

As shown by the measurement count data in Table V-11, the most common direction of high winds was from the west and southwest (from 200° to 300°). Much lower PM-10 concentrations were observed at both sites when the wind came from the southwest (200° to 270°), whereas the opposite is true when the wind came from the northwest (270° to 300°). For Arlington, the Palo Verde Nuclear Generating Station, located to the northwest (270° to 325°), appears to be the source of elevated concentrations. Similarly, the Mesquite Power Plant located to the southwest (245° to 250°) appears to be the cause of the higher PM-10 standard deviation at the Arlington monitor relative to Buckeye.

Another consideration is that the distance from the Arlington site to the Buckeye site is roughly 11 miles. Any comparison between the two sites should be offset to account for the time it takes for the wind to travel between the two sites. The values presented in Table V-11 did not address this offset. Still another consideration is the magnitude of the concentrations recorded at the two sites. Given the differences in sources surrounding the two sites, the concentrations located at Arlington should always be lower than those recorded at Buckeye for individual matched/offset five-minute pairs since the wind should be picking up anthropogenic emission located between the two sites.

In light of these considerations, the following steps and criteria were used to select the data used to quantify high wind background concentrations:

- Wind speed greater than 12 mph at both the Arlington and Buckeye monitors;

- Consistent with the methodology employed in the temporary monitoring analysis, measurements at Arlington were lagged 45 minutes to account for the time it takes for air mass to travel the 11 miles to Buckeye along the 260 degree angle between the two sites (it takes 45 minutes to travel that distance with a wind speed of 15.2 mph, the value computed for winds in excess of 12 mph along that angle);

- 230° < WD < 245°, and 250°<WD<270° (Figure V-9) at the Arlington monitor and at the one-hour-lagged Buckeye monitor; and

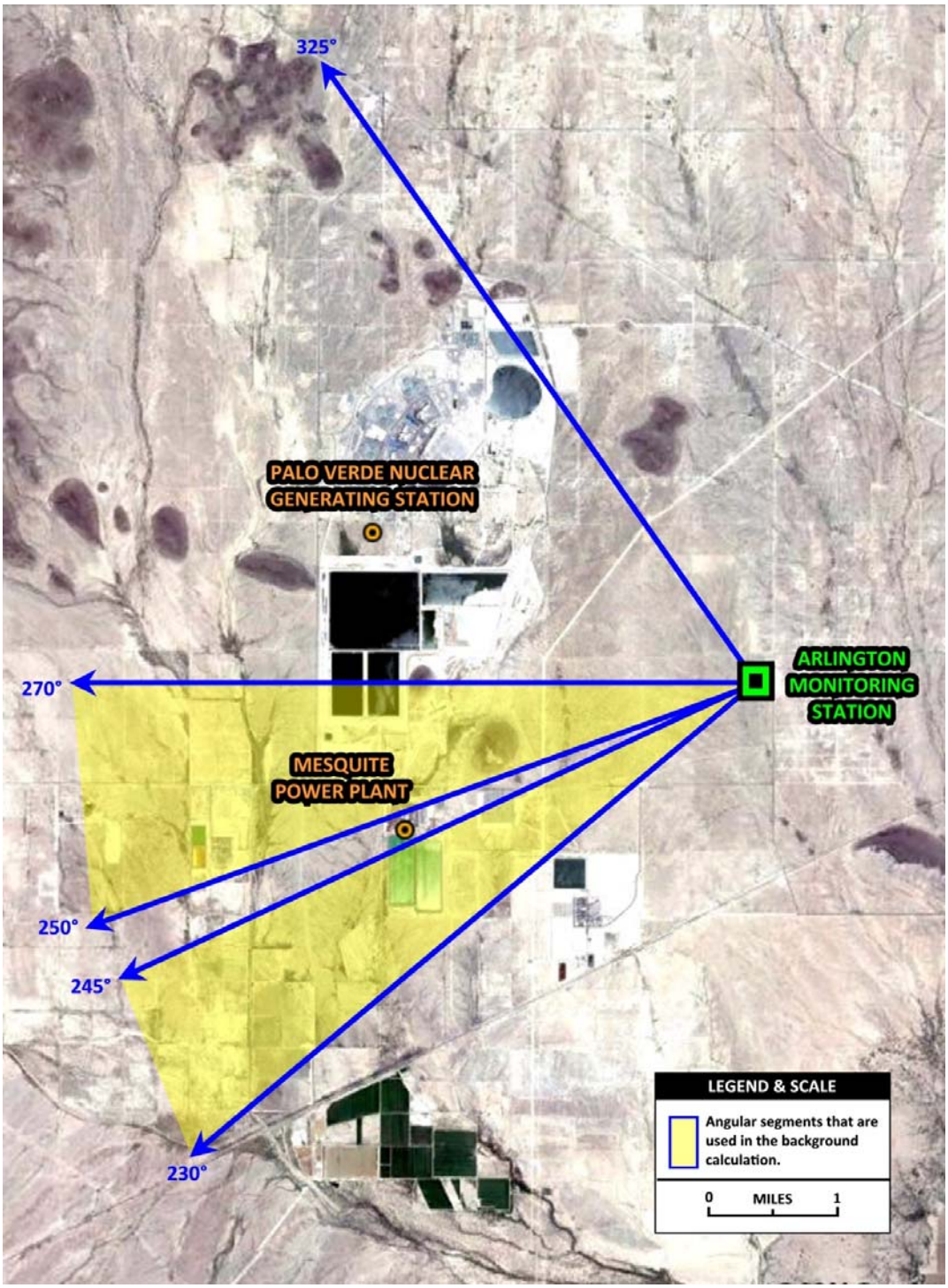
- Exclusions of data points where the concentration at Arlington was greater than that at the Buckeye monitor.

These criteria selected a total of 400 pairs of offset (i.e., lagged) five-minute data at the Arlington and Buckeye monitoring sites. The average concentration computed from the selected Arlington data was 27.8 $\mu g/m^3$; the median concentration was 21.9 $\mu g/m^3$. The difference between these values indicates that the distribution of concentrations (and related wind speeds) is not uniform above 12 mph. Since a higher proportion of the data is based on lower wind speeds which produce lower concentrations, the median value is considered to be a more representative measure of non-anthropogenic high wind background PM-10 concentrations impacting the MAG nonattainment area. A summary of the selected five-minute pairs at the two sites is presented in Table V-12. When contrasted with the values in Table V-11, it shows that the above criteria reduced both the counts of available data and the concentrations recorded at the Arlington site. Figure V-8 presents a plot of the angular segments included and excluded from the datasets included in Table V-12.

Table V-12
Data Used to Calculate High Wind PM-10 Background Concentrations

WD Sector (Degree)	Measurement Count	Arlington ($\mu g/m^3$)	Buckeye ($\mu g/m^3$)	Difference ($\mu g/m^3$)	Standard Deviation (Arlington)	Standard Deviation (Buckeye)
230	22	27.1	73.5	46.4	20.5	62.4
235	46	27.4	66.6	39.2	18.8	38.2
240	97	31.1	79.6	48.4	28.2	48.5
245	0	N/A	N/A	N/A	N/A	N/A
250	88	31.1	72.7	41.5	31.6	59.2
255	80	25.7	61.5	35.8	21.9	42.8
260	29	19.5	47.4	27.9	22.3	38.5
265	33	23.7	51.2	27.5	20.3	55.8
270	5	17.9	32.9	15.0	15.3	20.1
Total/Average	400	27.8	67.4	39.6	25.5	50.4
Median	N/A	21.9	55.6	33.7	N/A	N/A

Figure V-8
Close-In View of Arlington Temporary Monitor and Angular Segments Included and Excluded from the Background Calculations



Calculation of Low Wind Background Concentrations

The Arlington monitoring data can also be used to quantify non-anthropogenic concentrations coming in from the desert during low wind conditions. Table V-13 lists the five-degree angular values for measurement count, average PM-10, and related standard deviations for low wind conditions (wind speed <=12mph) at the Arlington and Buckeye monitoring sites. It shows that Arlington concentrations are consistently lower than Buckeye at any given five degree segment. The lowest Arlington values occur when wind is coming from the west and southwest (from 200° to 325°). As noted earlier, the upwind sources from this wind direction are mostly non-anthropogenic, except for the Palo Verde Nuclear Generating Station and the Mesquite Power Plant. Impacts from these facilities are much less evident in the data as there is no significant concentration increase; the same is true for standard deviations, with a few notable exceptions (e.g., 290º). It is also more difficult to relate the data at Arlington to Buckeye because the wind direction shifts more frequently, and it takes longer for air parcels to travel from Arlington to Buckeye at lower wind speeds. For this reason it was determined that the selection of Arlington values should not be conditioned on Buckeye measurements.

- Given these considerations, the following steps and criteria were used to select the data used to quantify low wind background concentrations:

- Wind speed less than or equal to 12 mph at Arlington monitor; and 230° < WD < 245°, and 250°<WD<270° (Figure V-8) at the Arlington monitor (to be consistent with high wind background calculation).

These criteria selected a total of 17,381 values at Arlington. The average concentration computed from the data was 18.2 $\mu g/m^3$; the median concentration was 14.9 $\mu g/m^3$. The difference between these values indicates that the distribution of concentrations is not uniform at wind speeds below 12 mph. Similar to the high wind analysis, the median value is considered to be a more representative measure of non-anthropogenic low wind background PM-10 concentrations impacting the MAG nonattainment area. A summary of the selected five-minute values is presented in Table V-14.

Table V-13
Angular Comparison of Matched Five-Minute PM-10 Concentrations Collected at Arlington and Buckeye Monitors When Winds Are Less Than 12 mph

WD Sector (Degree)	Measurement Count	Arlington (µg/m^3)	Buckeye (µg/m^3)	Difference (µg/m3)	Standard Deviation (Arlington)	Standard Deviation (Buckeye)
0	871	24.6	49.3	24.7	39.0	78.2
5	929	23.5	48.2	24.8	27.9	102.5
10	956	25.1	44.4	19.4	21.7	48.7
15	941	27.3	44.8	17.5	59.7	67.1
20	961	26.0	45.4	19.3	37.0	46.5
25	861	23.2	40.6	17.4	18.9	44.1
30	950	25.3	37.7	12.3	84.2	37.6
35	1035	25.5	40.7	15.2	29.9	60.2
40	1154	26.1	39.0	12.9	50.2	54.2
45	1366	27.6	40.5	12.9	113.2	57.0
50	1592	30.8	37.7	6.9	220.0	51.1
55	1924	33.1	36.3	3.2	152.4	44.7
60	2333	32.8	36.6	3.8	89.4	38.1
65	2423	32.1	36.7	4.6	118.1	36.9
70	2716	31.7	38.0	6.3	76.8	45.2
75	3066	31.5	40.4	9.0	67.5	36.4
80	3027	32.6	40.1	7.5	102.7	32.6
85	2433	30.5	42.2	11.8	26.5	39.0
90	1929	29.5	41.1	11.6	27.2	39.6
95	1682	29.5	42.1	12.6	26.0	45.3
100	1400	28.9	39.4	10.5	29.0	34.9
105	1158	32.9	40.0	7.1	125.3	30.8
110	950	26.7	40.5	13.8	22.1	34.2
115	739	24.5	40.8	16.3	20.4	42.4
120	587	25.4	39.8	14.3	20.8	32.2
125	553	25.7	42.5	16.8	19.7	38.7
130	475	28.0	42.9	14.9	83.9	81.5
135	480	22.6	37.2	14.6	17.5	35.9
140	475	22.3	36.3	14.1	19.5	34.4
145	480	23.2	38.5	15.3	20.8	36.6
150	473	21.5	41.9	20.4	15.9	81.1
155	520	22.0	42.2	20.1	19.4	52.8
160	475	21.8	39.1	17.3	29.2	62.3
165	458	20.5	36.2	15.7	16.8	36.1
170	466	21.3	36.0	14.7	15.0	32.0
175	470	20.8	33.5	12.7	19.7	34.8
180	465	21.1	34.6	13.5	15.9	32.3
185	508	32.3	33.8	1.5	222.4	31.8
190	507	20.2	32.8	12.7	14.9	37.3

WD Sector (Degree)	Measurement Count	Arlington (µg/m^3)	Buckeye (µg/m^3)	Difference (µg/m3)	Standard Deviation (Arlington)	Standard Deviation (Buckeye)
195	630	20.8	31.3	10.5	17.9	36.8
200	687	20.9	34.3	13.4	16.4	54.3
205	774	19.5	33.1	13.6	13.5	44.4
210	832	20.0	31.6	11.6	17.4	33.0
215	994	19.4	30.7	11.3	16.9	32.5
220	1249	18.1	29.0	10.9	14.2	28.3
225	1331	19.2	30.2	11.0	18.3	28.4
230	1539	18.8	33.9	15.0	22.6	32.3
235	2073	17.4	35.2	17.8	12.2	32.2
240	2434	19.1	36.7	17.7	33.4	37.7
245	2347	17.7	36.4	18.6	16.7	37.6
250	2547	18.3	37.6	19.3	24.4	46.4
255	2688	18.0	34.6	16.6	45.7	34.1
260	2489	17.7	32.2	14.4	20.2	33.3
265	1939	18.0	32.2	14.2	20.2	34.6
270	1672	18.3	32.5	14.2	17.5	32.3
275	1723	18.1	34.2	16.1	14.2	36.8
280	1543	18.8	32.3	13.5	17.1	28.7
285	1544	18.4	32.2	13.8	16.1	27.3
290	1405	21.6	35.2	13.6	100.7	61.7
295	1258	18.2	35.9	17.7	14.4	56.8
300	1132	19.6	34.7	15.1	25.9	35.7
305	1134	19.1	35.7	16.6	19.5	35.1
310	1138	19.1	40.1	21.0	15.8	49.7
315	1182	19.0	39.7	20.7	13.5	49.7
320	1291	18.4	37.0	18.5	14.3	41.1
325	1184	20.1	37.6	17.5	17.6	38.6
330	1268	19.9	40.4	20.5	16.2	71.8
335	1228	20.7	39.7	19.0	17.0	52.9
340	1216	20.2	42.9	22.7	14.9	67.3
345	1091	22.2	43.2	21.0	25.6	71.2
350	1037	21.7	43.9	22.3	20.2	51.1
355	868	21.6	42.1	20.5	18.3	48.6

Table V-14
Data Used to Calculate Low Wind PM-10 Background Concentrations

WD Sector (Degree)	Measurement Count	Arlington ($\mu g/m^3$)	Standard Deviation (Arlington)
230	1539	18.8	22.6
235	2073	17.4	12.2
240	2434	19.1	33.4
245	0	N/A	N/A
250	2547	18.3	24.4
255	2688	18	45.7
260	2489	17.7	20.2
265	1939	18	20.2
270	1672	18.3	17.5
Total /Average	17381	18.2	27.6
Median	N/A	14.9	N/A

DESIGN DAY SELECTION

This section describes the process used to select design days for the PM-10 attainment demonstration in the Maricopa nonattainment area. It identifies three wind speed regimes that are responsible for PM-10 exceedances in 2007, the year just prior to implementation of new control measures under the 2007 Five Percent Plan. Since exceedances under low wind or stagnant conditions have been curtailed by existing controls, the design day selection is only focused on high wind days. The analysis first eliminates exceedance days that do not qualify for consideration, then weights the remaining days according to 24-hour average PM-10 concentration, exceedance location, and the number of stations exceeding on each day. The end result is that June 6, 2007, is recommended as the design day for the Maricopa PM-10 nonattainment area, and May 4, 2007, is recommended as the design day for the Salt River modeling domain.

Introduction

An attainment demonstration requires a baseline, or design day, starting point. Selecting one or more design days for a PM-10 attainment demonstration in the Maricopa area is a non-trivial exercise, given the existence of high wind days— when some of the highest PM-10 concentrations are recorded—that may qualify for exceptional event status under EPA guidelines. This analysis examines all exceedances that were recorded in the Maricopa area in 2007 and evaluates which of these are best qualified for a high wind design day selection.

Exceedance Days

The selection of PM-10 design days was limited to exceedance days recorded in 2007. This year was selected because it was the last full year prior to the implementation of control measures under the MAG 2007 Five Percent Plan, which was adopted in December 2007. During 2007, exceedances of the 24-hour federal PM-10 ambient air quality standard were recorded at six monitoring sites in the Maricopa PM-10 nonattainment area. These sites included Coyote Lakes, Central Phoenix, Durango, Higley, South Phoenix, and West 43rd Avenue. The Buckeye station also exceeded the standard on two days in 2007, but this monitor is outside the nonattainment area and therefore was not modeled in this plan. A listing of exceedance days by monitoring site, together with 24-hour average concentrations and the general meteorological conditions, is presented in Table V-15.

Table V-15
24-Hour Average NAAQS Exceedance Dates, Measured Concentrations and Associated Meteorological Conditions in 2007

Monitor	Date	PM-10 Conc. ($\mu g/m^3$)	Meteorological Conditions
Buckeye	July 19	195.0	Low Winds
	November 15	166.2	Irregular Winds
Coyote Lakes	July 19	273.4	Thunderstorm Outflow
	October 21	312.9	Frontal System High Winds
Central Phoenix	July 19	267.8	Thunderstorm Outflow
Durango Complex	November 15	155.7	Irregular Winds
Higley	***June 6***	***181.0***	***Frontal System High Winds***
	July 19	199.5	Thunderstorm Outflow
	August 16	195.6	Thunderstorm Outflow
	August 23	230.4	Thunderstorm Outflow
	October 24	174.8	Frontal System High Winds
South Phoenix	April 12	171.1	Frontal System High Winds
	August 13	159.5	Thunderstorm Outflow
West 43rd Avenue	March 27	227.9	Frontal System High Winds
	April 12	202.7	Frontal System High Winds
	May 4	***197.3***	***Frontal System High Winds***
	June 6	***225.7***	***Frontal System High Winds***
	July 19	178.0	Thunderstorm Outflow
	August 16	215.1	Thunderstorm Outflow

Note: The selected design days are highlighted in bold italics and gray shading. The Buckeye monitor is located outside the PM-10 nonattainment area and is not part of this design day analysis. The Coyote Lakes monitor was a special purpose monitor that no longer operates and has since been replaced by the Zuni Hills monitor in late 2009. As such, the Coyote Lakes monitor is not a good candidate for the development of a design day.

Wind Regimes

All of the exceedances but one occurred on high wind days. The single exception was July 19, 2007, at the Buckeye station. A high wind day is defined as any day in which five-minute average wind speeds exceed 12 mph. This cut-point is based upon the work done in developing the windblown dust emissions inventory in the 2008 Periodic Emissions Inventory (Appenidx A, Exhibit 1) which shows that generation of windblown dust emissions on average (throughout the nonattainment area) occurs when five-minute wind speeds exceed 12 mph. Since not all of the monitoring stations have access to five minute data, days in which the hourly average wind speed is above 12 mph are thus qualified as high wind days, as a conservative metric. High wind conditions generally occur in the Maricopa area under one of two different meteorological regimes: frontal system passage and thunderstorm outflow. Frontal systems passing over the Maricopa area produce high winds because of the pressure differences across the front. Air masses move from areas of high pressure to areas of low pressure, generating winds whose strengths are

dependent on the differences in pressure. Because the leading edges of frontal systems extend for hundreds of miles, the movements of frontal systems produce high winds over large areas. In the Maricopa area, this phenomenon is characterized by rapid increases in wind speeds almost simultaneously at many monitoring stations, followed by elevated wind speeds for several hours afterward as fronts move slowly over the urban area. Depending on the strength of the winds associated with a frontal passage, such an event may overcome the capability of BACM to protect soil surfaces from dust entrainment. When this happens, the event may qualify as an exceptional event under EPA guidance.

Thunderstorm outflows, or monsoon winds, produce high velocity winds that are shorter lived and less geographically expansive than those produced by the passage of frontal systems. Thunderstorm outflows result from the strong downflows that occur when a thunderhead collapses. The downflows have sufficient velocity to cause sand saltation and dust entrainment in areas at the bases of thunderstorms and along the paths of travel as the downflows expend energy. Both undisturbed desert soils and disturbed soils controlled by BACM generate significant quantities of PM-10 emissions during these events. As a result, high PM-10 concentrations resulting from thunderstorm outflows may qualify for exceptional event status under EPA guidelines.

The July 19, 2007 exceedance at the Buckeye monitor occurred during a period of relatively low wind conditions at this site. The low hourly average wind speeds and peak gust velocities that occurred in the early morning hours of this day at Buckeye suggest that mechanical disturbance—such as by nighttime plowing of fields—was responsible for elevated PM-10 concentrations from midnight to 7:00 am, when the highest concentrations of the day were recorded. Meteorological conditions on days such as July 19, 2007, do not qualify as exceptional events but rather are candidates for design days at stations within the nonattainment area. Because the Buckeye station is outside the nonattainment area, July 19, 2007, is not a design day candidate.

The November 15, 2007 exceedance at the Buckeye and Durango monitors occurred under a mix of low and high wind speeds. Concentrations were elevated throughout the nonattainment area on this day, suggesting a mix of regional and local sources contributed to the exceedances. The exceedance at Buckeye is not a candidate for a design day as it is outside the nonattainment area. The exceedance at Durango barely exceeded the standard (155.7 $\mu g/m^3$), making it a poor candidate for a design day as even the slightest control measure would result in attainment of the standard. Given the rare mix of both low and high wind elevated concentrations, a day like this is unlikely to recur, and indeed has not been replicated since.

Monsoon Days

The days on which monsoon, or thunderstorm outflow, winds occurred are possible candidates for exceptional event status and not good candidates for design day status. These days are distinguished from frontal events that usually occur in spring or fall as a transport of dust from source regions outside the nonattainment area is clearly associated

with monsoon events. On these days, exceptionally high gust velocities occurred for brief durations— typically only an hour or two—that entrained dust from all types of exposed soils, including undisturbed desert soils. Additionally, the source area of the thunderstorm outflows on these days originated in the natural desert areas outside of the PM-10 nonattainment area, transporting large to massive amounts of dust into the PM-10 nonattainment area. The days on which these conditions occurred were July 19 and August 13, 16, and 23, 2007. On July 19 and August 16, 2007, peak gust velocities exceeded 40 mph for one or two hours and caused hourly PM-10 concentrations to rise to levels in the range of 1,700 to 4,000 $\mu g/m^3$ at the stations with meteorological towers that recorded exceedances (Central Phoenix, Higley, and West 43rd Avenue). Although these sharp rises in concentration occurred only for an hour or two, the magnitudes were sufficient to cause the 24-hour average on that day to exceed the standard. These days, at these stations, would not have been exceedances but for the contributions generated by thunderstorm outflow winds.

Peak gust velocities were lower on August 23, 2007, at the Higley monitor, but hourly PM-10 concentrations still rose and fell with the arrival of the dust front associated with a thunderstorm outflow that had begun to lose strength once encountering the urban edge of the nonattainment area.. The peak gust velocity ranged between 17 and 28 mph from 8:00 pm to 11:00 pm, as hourly PM-10 concentrations hovered between 900 and 1,800 $\mu g/m^3$. The pattern of average wind speed, peak gust velocity, and PM-10 concentration during these three hours strongly suggests the contribution of transported particulate to the monitor from outside the immediate area. These trends are displayed in Table V-16.

Table V-16
Hourly PM-10 Concentrations and Wind Speeds at the Higley Monitor at 8:00 – 11:00 PM on August 23, 2007

Hour	Hourly PM-10 $\mu g/m^3$	Avg. Hourly Wind Speed, mph	Peak Gust Speed, mph
7:00 PM	73.7	4.8	27.2
8:00 PM	1865.1	9.2	28.7
9:00 PM	916.9	2.2	9.9
10:00 PM	1065.8	4.3	17.1
11:00 PM	595.2	6.1	13.8

In the hour between 7:00 and 8:00 pm, wind gust speeds rose dramatically near the end of the hour, causing the peak to reach 27.2 mph while the hourly average wind speed remained relatively low at 4.8 mph. In the following hour, gust velocities remained elevated while the average wind speed climbed to 9.2 mph and the hourly PM-10 concentration climbed to 1,865 $\mu g/m^3$. Then, in the next hour, both gust speeds and the average hourly wind speed dropped dramatically while the hourly PM-10 concentration remained at a relatively high 920 $\mu g/m^3$. Between 10:00 and 11:00 pm, wind speeds rose again, doubling in magnitude, but the hourly PM-10 concentration rose by only 16%. In

the subsequent hour, the PM-10 concentration drops by 44% while the average hourly wind speed increases by 42%. This pattern is typical of thunderstorm outflows that dissipate in strength when reaching the increased surface roughness of the urban boundaries of the nonattainment area where the wind speeds and gust are typically low to moderate, but the associated transported dust remains in the air and can take several hours to deposit out of the atmosphere.

A similar, but shorter, episode occurred on August 13, 2007, at the South Phoenix monitor. On this day, the peak gust velocity rose to 24.9 mph between 11:00 pm and midnight, while the hourly PM-10 concentration rose to 2,600 $\mu g/m^3$. During the remainder of the day, PM-10 concentrations and wind speeds were typical of a light wind day. The contribution of this last hour of the day caused the 24-hour average PM-10 concentration to rise to 159.5 $\mu g/m^3$, resulting in an exceedance. The hourly PM-10 concentrations and wind speeds for this day are shown in Table V-17.

During the last hour of this day, the peak gust velocity exceeded the second highest value of the day by 40%, but the hourly average wind speed was greater than the second highest value in this column by only 4%. At the same time, the hourly PM-10 concentration was 2,639% higher than the second highest value of the day. Similar to the August 23rd event, the implication of these data is that the thunderstorm outflow that reached the South Phoenix monitor just before midnight transported significant PM-10 from upwind sources south of the monitor, which includes a limited fetch of urban area and a significant swath of undisturbed desert soils, even as the thunderstorm outflow itself had lost energy on arrival at the South Phoenix monitor.

The significant contribution of transported PM-10 on August 13 and 23, 2007, leads to the same result: further control of sources near this monitor will not eliminate this type of exceedance, and these episodes should be designated exceptional events under EPA guidance.

Table V-17
Hourly PM-10 Concentrations and Wind Speeds
at the South Phoenix Monitor on August 13, 2007

Hour	Hourly PM-10, $\mu g/m^3$	Avg. Hourly Wind Speed, mph	Peak Gust Speed, mph
0:00 AM	31.2	0.4	3.3
1:00 AM	32.9	1.2	4.4
2:00 AM	23.9	1.0	4.1
3:00 AM	30.9	0.4	1.9
4:00 AM	35.9	1.6	4.5
5:00 AM	46.9	1.3	3.5
6:00 AM	75.9	2.4	7.7
7:00 AM	64.8	6.1	12.2
8:00 AM	53.4	5.0	10.5
9:00 AM	47.9	5.1	12.3
10:00 AM	40.9	2.4	11.2
11:00 AM	42.1	3.0	12.2
12:00 PM	52.1	7.0	15.1
1:00 PM	98.5	6.5	16.4
2:00 PM	97.2	5.2	15.5
3:00 PM	87.5	5.0	15.2
4:00 PM	69.0	7.1	16.4
5:00 PM	51.3	6.6	15.4
6:00 PM	43.1	6.7	13.5
7:00 PM	51.4	4.9	12.0
8:00 PM	38.9	3.2	9.8
9:00 PM	41.6	4.4	10.8
10:00 PM	71.9	5.8	17.8
11:00 PM	2599.2	7.4	24.9

Frontal Wind Days

On frontal wind days, peak hourly PM-10 concentrations are lower than those occurring on monsoon days, high winds occur for longer durations, and peak gust speeds range a little lower than those recorded on monsoon days. Frontal wind days produced significantly more hours during 2007 in which PM-10 concentrations exceeded the level of the 24-hour standard than are produced on monsoon days. Table V-18 compares some of the totals in 2007 for PM-10 exceedance days and high wind hours as grouped by wind regime. A listing of the frontal wind days on which the 24-hour standard was exceeded in 2007 within the Maricopa nonattainment area is presented in Table V-19.

Table V-18
Comparison of PM-10 Concentrations During 2007 Exceedance Days Under Different Wind Regimes

Wind Regime	Average of Highest PM-10 Concentrations, µg/m^3	Annual Hours that Exceed the Standard	Percentage of Annual Hours that Exceed the Standard
Frontal	831.5	69	60.5%
Monsoon	2445.1	28	24.6%
Other[1]	355.5	17	14.9%

[1] Includes data from days with low and irregular winds.

Table V-19
Peak Hourly PM-10 Concentrations and Wind Speeds In the Maricopa Nonattainment Area During 2007

Site	Date	Hours Exceeding Standard	Highest PM	Max Wind Gust	High Wind Hours
Higley	6/6/2007	9	580.2	37.7	8
West 43rd	3/27/2007	11	794.4	44.6	11
West 43rd	4/12/2007	9	774.9	45.5	7
West 43rd	5/4/2007	11	570	35.2	10
West 43rd	6/6/2007	12	662.3	33.4	12
Coyote Lakes	10/21/2007	10	1569.2	NA	15
Higley	10/24/2007	7	869.8	33.2	4

Days on which the peak gust velocity were the highest may be flagged as exceptional events due to the capability of such winds to overcome BACM controls and the possible presence of transported PM-10 from sources both within and outside the nonattainment area. While the previous sections in this chapter describing the temporary monitoring insights and source weighting point to the importance of near-by sources during high wind events, long range transport can also occur on these days when wind speeds are unusually high. Evidence of such transport can be seen on days such as April 12, 2007, when the State Super Site monitor recorded hourly PM-10 concentrations as high as 337.9 µg/m^3 in the presence of minimal significant localized fugitive dust sources around the monitor. Such a designation as an exceptional event eliminates March 27 (one monitor exceeded) and April 12, 2007 (two monitors exceeded), because the exceedances on these days are associated with peak gust velocities that can easily generate PM-10 from controlled and natural surfaces. Several other monitors in nearby Arizona counties and eastern Californian desert counties also recorded exceedances on these days, suggesting the presence of regionally transported PM-10 along with the elevated wind speeds.

The exceedance recorded at Coyote Lakes on October 21, 2007, is also not considered in this analysis as this temporary installation was a special-purpose monitor that no longer operates and has since been replaced by the nearby (approximately 1.75 miles) Zuni Hills monitor in late 2009. No exceedances of the PM-10 standard were recorded at the Zuni Hills monitor in 2009 or 2010. As such, the Coyote lakes monitor is a poor candidate for the development of a design day.

Of the remaining days, June 6, 2007, is the only day on which more than one monitor exceeded the standard during the passage of a storm front. On this day, hourly average wind speeds began at moderate levels and rose during daylight hours to peak in the early afternoon. Wind speeds then dropped to the lowest levels of the day by midnight. Hourly PM-10 concentrations followed a similar trend with sharper increases when hourly wind speeds exceeded about 12 mph, with faster declines due to exhaustion of particulate entrainment from limited reservoir soils even as wind speeds remained steady for a few hours. Plots of hourly average wind speed and PM-10 concentrations for the West 43rd Avenue and Higley sites are presented in Figures V-9 and V-10, respectively.

The relationships between wind speeds and PM-10 concentrations at these two sites on June 6, 2007, suggest that local sources were primarily responsible for PM-10 impacting the monitors. As Figure V-9 indicates, elevated wind speeds above 12 mph (the speed at which wind entrainment of dust commences in the Maricopa area) were present at West 43rd Avenue for 12 hours, generating 73% of the 24-hour PM-10 concentration of 225.7 $\mu g/m^3$. The 24-hour concentration value at West 43rd Avenue is also the maximum concentration seen for an exceedance day that is not a clear candidate for an exceptional event. Elevated wind speeds above 12 mph were present for 8 hours on June 6 at the Higley site, accounting for 66% of the average 24-hour PM-10 concentration of 181.0 $\mu g/m^3$. In comparison to the Higley monitor, this day is also similar to the exceedance seen at the Higley monitor under frontal winds on October 24, 2007, implying that the controls that would bring attainment to Higley on June 6, 2007, would also provide attainment at Higley on October 24, 2007. On this basis, June 6, 2007, is the best design day for an attainment demonstration throughout the nonattainment area.

Figure V-9
Hourly Average Wind Speed and PM-10 Concentration at West 43rd Avenue Monitor on June 6, 2007

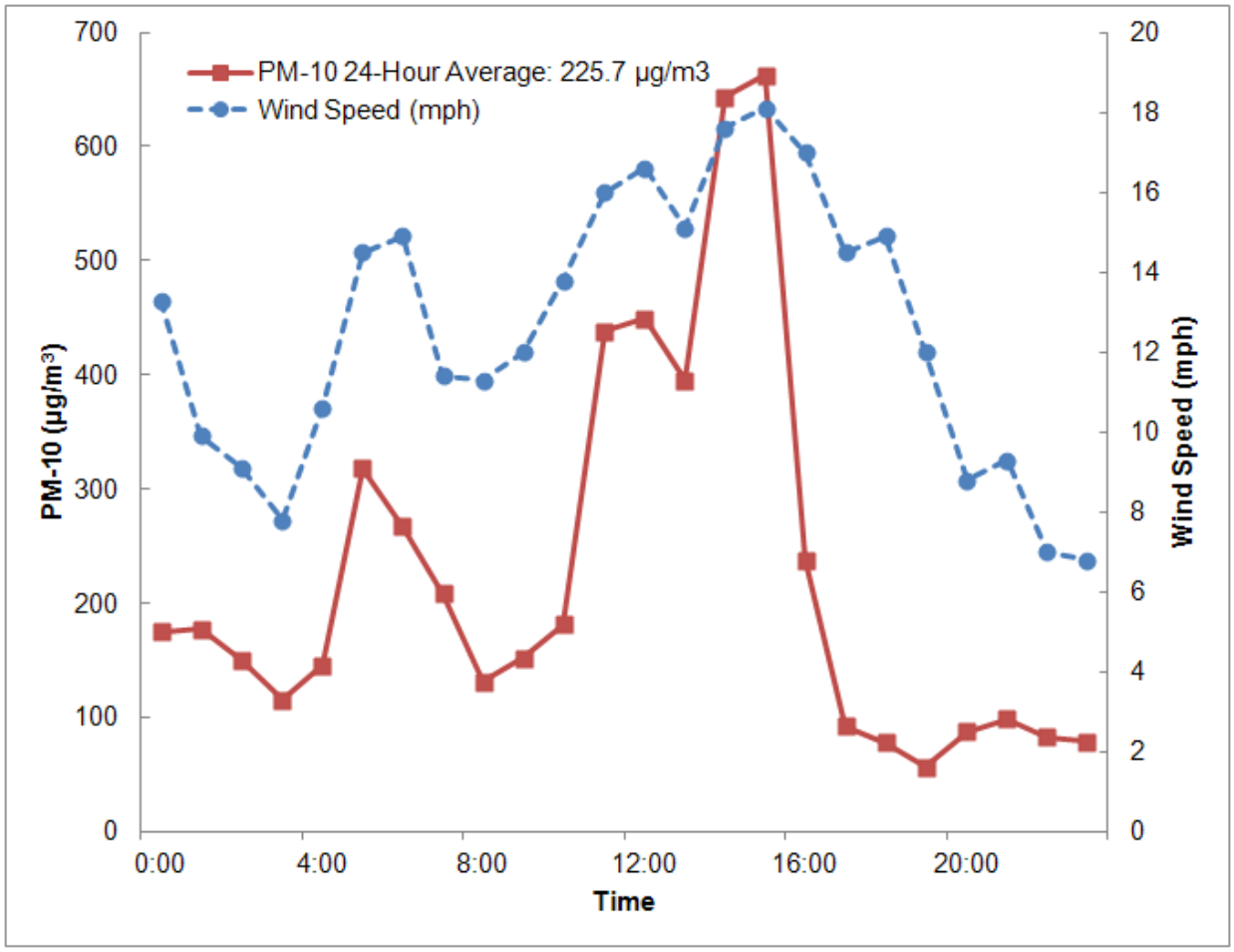
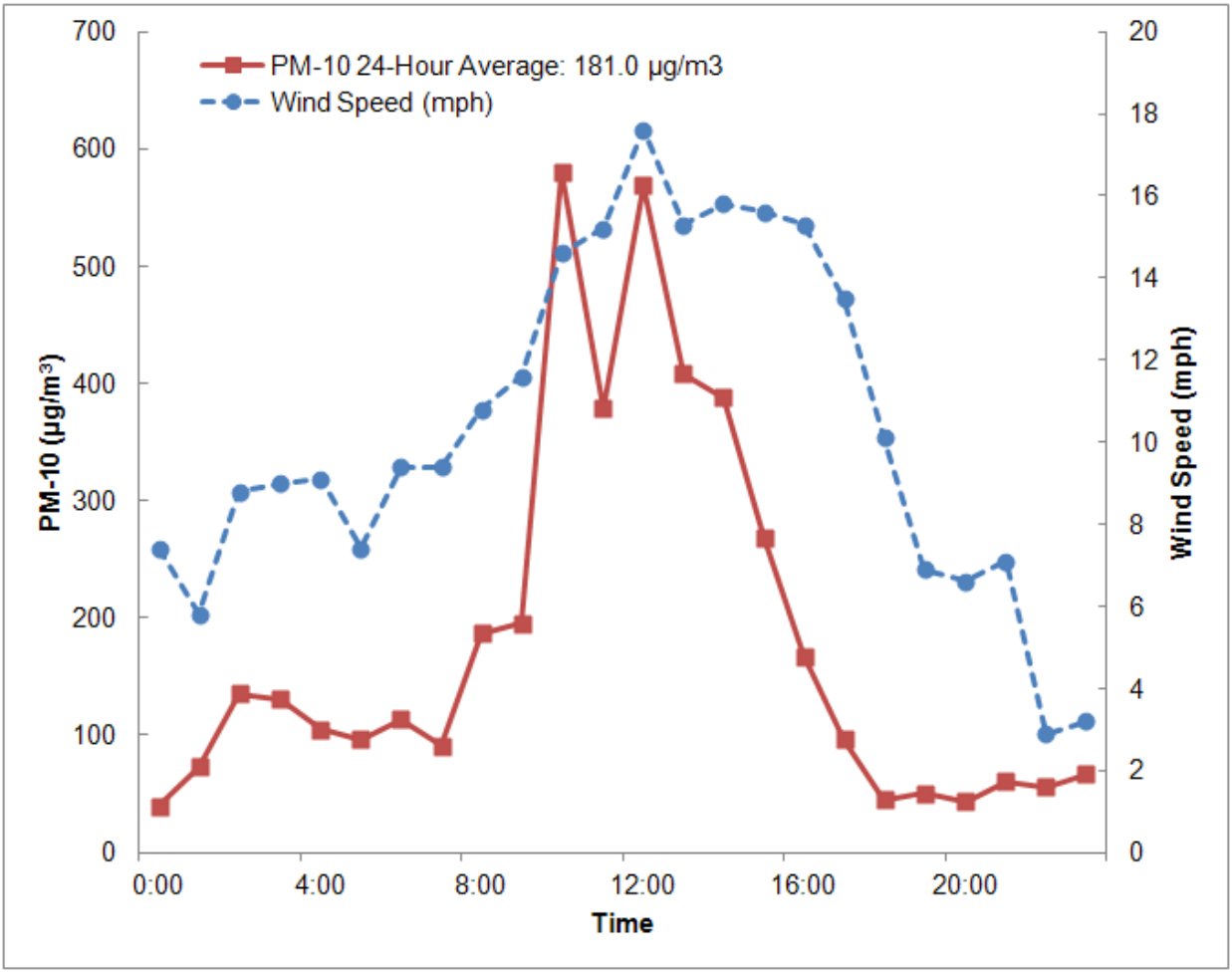
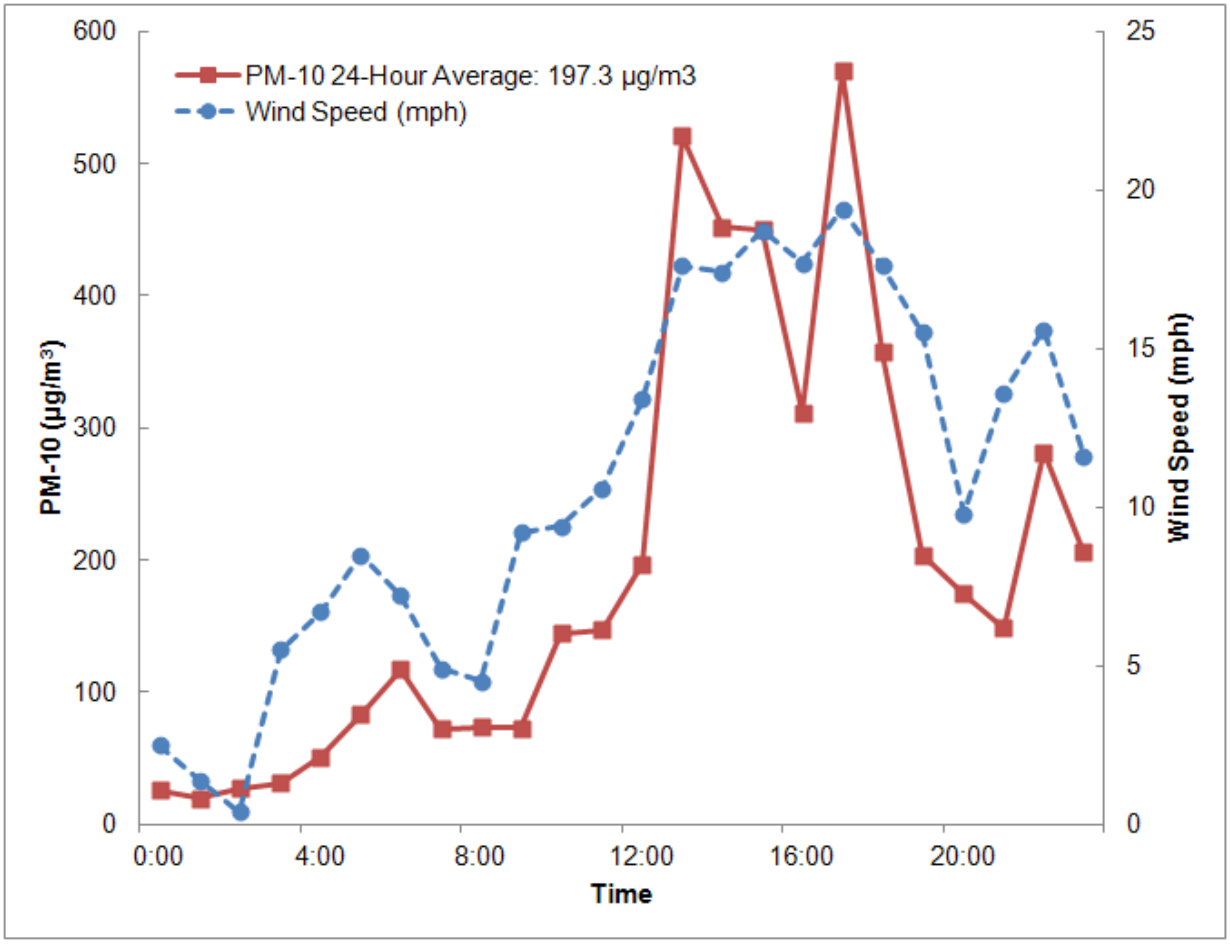


Figure V-10
Hourly Average Wind Speed and PM-10 Concentration
at Higley Monitor on June 6, 2007



Of the eight exceedance days that occurred in the Salt River area modeling domain (encompassing the Durango Complex, South Phoenix, and West 43rd Avenue monitors), only one exceedance day remains that has not been previously ruled out (November 15, 2007, at Durango) or modeled (June 6, 2007), or may be an exceptional event: May 4, 2007. A concentration of 197.3 µg/m^3 was measured at the West 43rd Avenue site on this day, which experienced 10 hours with average hourly wind speeds in excess of 12 mph. These high wind hours contributed 74% of the 24-hour average PM-10 concentration. The pattern of hourly wind speeds and PM-10 concentrations on this date suggests that local sources contributed the predominant fraction of PM-10 recorded at the West 43rd Avenue monitor, making this day the design day choice for the Salt River area modeling. A plot of hourly average wind speeds and PM-10 concentrations is included in Figure V-11.

Figure V-11
Hourly Average Wind Speed and PM-10 Concentration
at West 43rd Avenue Monitoring Station on May 4, 2007



Conclusions

In 2007, the 24-hour PM-10 standard was exceeded 19 times, on 11 unique days at the monitoring stations in the Maricopa County. Two of these exceedances were recorded at the Buckeye station, which is outside the PM-10 nonattainment area, and two were recorded at the Coyote Lakes site, which was a temporary special studies site no longer in operation. The Coyote Lakes monitor has since been replaced with the nearby Zuni Hills monitor in late 2009 which has not recorded an exceedance in 2009 or 2010. As such the Coyote Lakes monitor is a poor choice for development of a design day and these exceedances, along with those at the Buckeye monitor, have been excluded as candidates for design days within the nonattainment area. Of the remaining 15 exceedances, seven occurred on monsoon (thunderstorm outflow) days, which likely qualifies these exceedances for exceptional event status but not for consideration as design days. An additional three exceedances occurred during very strong synoptic frontal winds, which may also qualifies these exceedances for exceptional event status. Of the remaining five exceedances, two occurred on June 6, 2007, which is recommended to be the design day for the Maricopa nonattainment area. Of the further remaining three exceedances, one occurred at the Higley monitor (October 24, 2007) and is similar in nature to the modeled June 6, 2007 design day. The other two exceedances (May 4, 2007, and November 15, 2007) occurred within the Salt River modeling domain. November 15, 2007 was excluded as an outlier event and because its 24-hour value was barely over the standard (155.7 $\mu g/m^3$), leaving the exceedance of May 4, 2007 at the West 43rd Avenue monitor as the final choice to of a design day for the Salt River area domain.

MODELING DOMAINS

As explained earlier in the conceptual model section, separate modeling domains were developed for the high and low wind hours on each of the design days. Hourly high wind domains were developed using back trajectories calculated with wind speed and direction data from the modeled monitor. Domains for the low wind hours are represented by the sources and land uses surrounding each of the monitors. The basis for distinguishing between high and low wind hours is the 12 mph windblown dust threshold developed in the 2008 PM-10 Periodic Emissions Inventory (Appendix A, Exhibit 1). This section discusses in detail the development of the low and high wind domains. Table V-20 shows the breakout between high and low wind hours for each of the design day-modeled monitors.

Table V-20
Breakout of High and Low Wind Hours on Modeled Design Days at Each Monitor

	5/4/2007	6/6/2007						
	West 43rd	West 43rd	Central Phoenix	Durango	Greenwood	Higley	State SuperSite	West Phoenix
Hour	*(Hourly Average Wind Speed in mph)*							
0	2.5	***13.3***	***12.5***	8.9	8.1	7.4	7.6	7.1
1	1.4	9.9	***13.1***	6.3	5.7	5.8	6.3	7.8
2	0.4	9.1	8.6	5.0	4.9	8.8	5.4	8.4
3	5.5	7.8	8.0	1.0	2.9	9.0	5.4	4.2
4	6.7	10.6	10.9	2.6	2.1	9.1	6.7	5.1
5	8.5	***14.5***	10.3	7.3	5.4	7.4	7.2	6.1
6	7.2	***14.9***	***12.4***	9.1	6.7	9.4	7.2	8.5
7	4.9	11.4	***12.8***	8.7	7.7	9.4	6.5	10.3
8	4.5	11.3	11.1	10.5	8.3	10.8	7.2	8.7
9	9.2	12.0	11.3	11.2	10.0	11.6	6.7	8.6
10	9.4	***13.8***	***12.1***	11.9	11.0	***14.6***	6.9	8.8
11	10.6	***16.0***	***13.9***	***12.5***	10.8	***15.2***	9.4	***12.1***
12	***13.4***	***16.6***	***15.3***	***13.9***	***12.7***	***17.6***	8.9	***13.6***
13	***17.6***	***15.1***	***15.4***	***13.5***	***12.6***	***15.3***	9.8	***15.1***
14	***17.4***	***17.6***	***16.9***	***15.7***	***15.4***	***15.8***	10.5	***15.1***
15	***18.7***	***18.1***	***17.8***	***17.9***	***13.9***	***15.6***	11.4	***13.5***
16	***17.7***	***17.0***	***15.7***	***14.5***	11.9	***15.3***	10.1	12.0
17	***19.4***	***14.5***	***14.0***	***12.9***	11.7	***13.5***	9.2	11.7
18	***17.6***	***14.9***	***14.0***	10.3	11.4	10.1	11.2	10.0
19	***15.5***	12.0	11.9	8.9	8.7	6.9	9.6	9.3
20	9.8	8.8	11.1	6.4	7.4	6.6	7.8	9.1
21	***13.6***	9.3	11.7	7.5	7.0	7.1	6.3	6.8
22	***15.6***	7.0	8.8	6.3	5.1	2.9	3.8	5.3
23	11.6	6.8	8.5	5.2	4.0	3.2	3.6	4.8

Note: High wind hours are higlighted in bold italics.

<u>High Wind Domains</u>

High wind back trajectories are developed for any monitor-specific design-day hour with an average wind speed over 12 mph. When available, five-minute average wind speed and direction, as measured by the modeled monitor, was used to develop the back trajectories from which the modeling domains are developed. When five-minute data is unavailable, hourly wind speed and direction is used. The length of the back trajectory is

determined by the magnitude of the wind speed (e.g., an hourly average wind speed of 15 mph will produce a back trajectory 15 miles in length).

The back trajectory plots are generated based on either hourly or the five-minute surface wind speed (WS) and wind direction (WD) data. This back trajectory calculation only considers the horizontal air movement and ignores the vertical movement of the air. The trajectories are presented as a sequence of UTM coordinates for the endpoints of each specific time interval being simulated. Using five-minute data as an example, The X and Y of the UTM coordinates for each five minute interval are calculated as following:

X=X1+WS*0.447*60*5*SIN(WD*2*PI/360)
Y=Y1+WS*0.447*60*5*COS(WD*2*PI/360)

Where X and Y are the UTM coordinates of the current five minutes interval back trajectory endpoints; X1 and Y1 are the endpoints for the previous five minutes interval back trajectory; WS and WD are the wind speed (MPH) and Wind direction (degree) observation during the current five minutes. 0.447 ms^{-1}/mph is the WS unit conversion factor from MPH to m/s, 60 seconds/minute * 5 minute is the air traveling time (seconds) during the five minutes, and 2*PI/360 is the conversion factor from degrees to Radians. This process is completed and mapped for each high wind hour back trajectory in ArcGIS.

Establishing the Boundaries of a High Wind Domain - Once all of the back trajectories have been mapped, it is necessary to determine how far to extend the domain from either side of the back trajectory. This issue was explored in modeling efforts that focused on the West 43rd Avenue monitor in the Salt River area. A summary of those efforts are presented below and conclude that a one mile buffer on either side of the back trajectory is a conservative representation of the domain for high wind sources.

The analysis of emissions impacting the West 43rd Avenue monitoring station during high wind events included inventories of emissions in upwind areas. Defining the specific domain boundaries of upwind areas within which to focus emission data collection was both necessitated by the significance of source proximity to the monitor during high wind hours, and facilitated by the land use database maintained in GIS format by MAG.

Analysis of wind directions and speeds during hours when the West 43rd Avenue station exceeded 150 µg/m^3found that winds were primarily from the west-southwest along the Salt River, possibly influenced by orographic affects. Exceedance hours generally began when average hourly wind speeds exceeded 12 mph. At this speed, sources that may be located three hours upwind – a period of time during which the coarse fraction of wind-entrained dust will settle out of the air - would be located beyond the urban and agricultural boundaries to the west of the West 43rd Avenue station. Thus, the western boundary of each back-trajectory emission inventory domain was set at the edge of development (whether for agricultural or other use), typically just east of the Buckeye monitoring station. The eastern boundary was invariably set at the location of the West 43rd station.

Entrained dust plumes from disturbed lands spread horizontally and vertically as winds carry suspended particulate downwind. Analysis of in-plume concentrations predicted by a computer dispersion model (AERMOD) shows that the rate of spread decreases as wind speed increases. The modeling scenario used to determine the distance-related reduction factor to use in weighting emissions in a modified rollback analysis, as described in Source Weighting Analysis section, was also used to estimate the angular arc of a dust plume perpendicular to its centerline at different wind speeds.

Receptor sites lateral to the plume centerline were located at the same downwind distances from the hypothetical area source as those sited along the plume centerline. As in the weighting factor analysis, the AERMOD model was run at several different wind speeds ranging from 12 to 24 mph. The edge of each plume was identified in the output as the location of the lateral receptor closest downwind to the source that first registered a non-zero PM-10 concentration. A tabulation of the arcs subtended by plumes at increasing wind speeds, as reported by the modeling output data, is shown in Table V-21. At the minimum high wind speed of 12 mph, the arc subtended by a dust plume is estimated to be 34.2 degrees, or 17.1 degrees on each side of the downwind centerline.

Table V-21
Dust Plume Arc as a Function of Wind Speed

Hourly Average Wind Speed (mph)	Plume Arc (degrees)
12.0	34.2
15.0	33.1
18.0	28.8
21.0	25.9
24.0	22.7

The Estrella Mountains to the south of the Salt River have the potential to channelize high speed wind flows approaching from the west. This suggests that winds can be converging upwind of the West 43rd Avenue station in a manner that would not be detected by the wind instruments operating at the monitoring site. Such convergence would bring emissions from lands outside the 34.2 degree arc upwind of the station into the wind field bounded by the arc and impact the monitor. In order to account for this potential, and in an exercise of conservatism, the angle subtended by the modeled arc was doubled to assure that all upwind contributing sources were included within the high wind inventory domain. This assumption increased the upwind arc to a full angle of 68.4 degrees, or 34.2 degrees on each side of the back trajectory centerline.

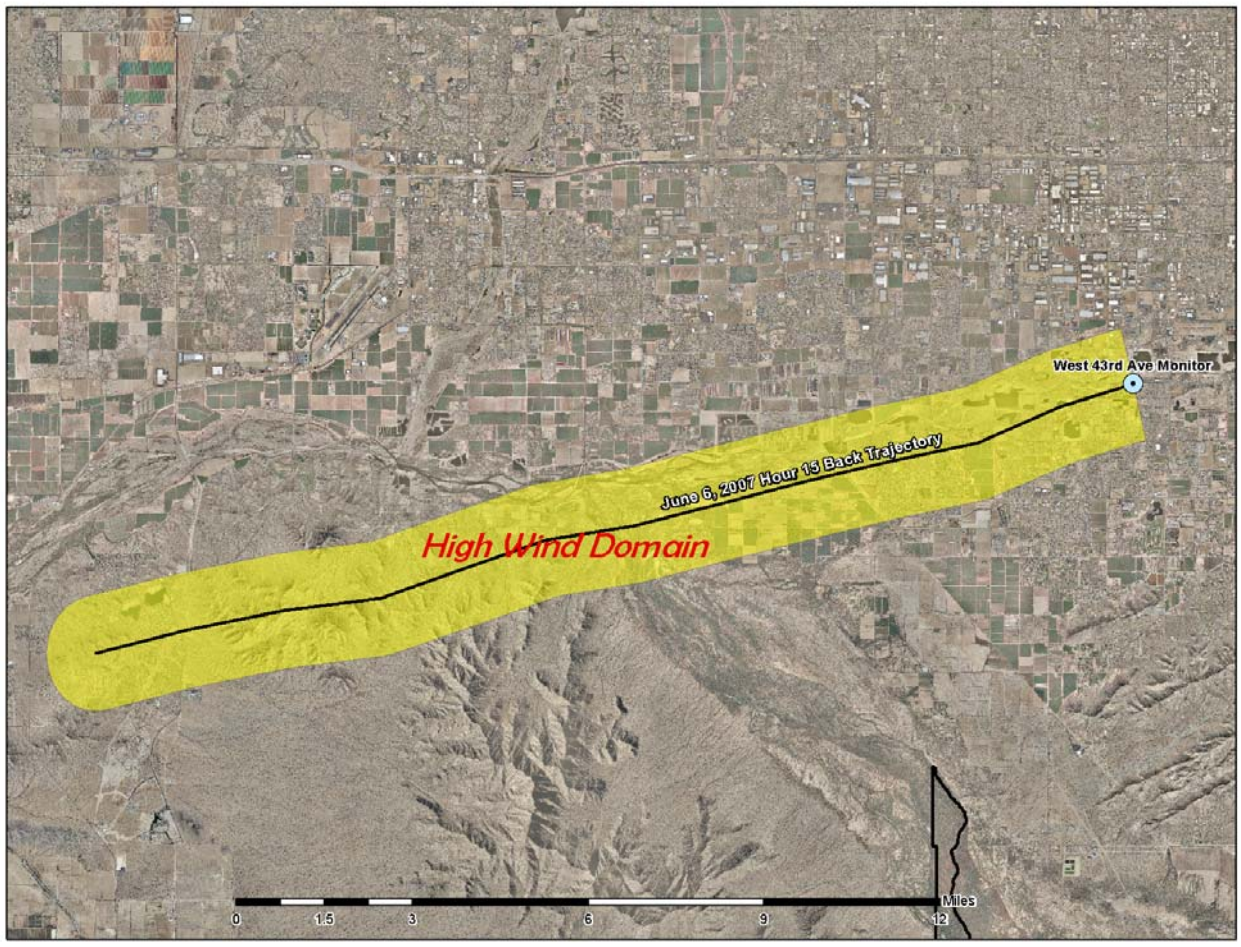
The emission weighting analysis demonstrated that PM10 concentrations drop dramatically with increasing distance downwind of an area source under high wind conditions. For example, under an hourly average wind speed of 12 mph, PM10 concentrations decline by two orders of magnitude, or 99%, between a fence line location

at the downwind edge of an area source and a plume centerline location 1.74 miles downwind. This reduction factor of 99% was considered to be significant and was used as a basis for the design of the emission inventory domain straddling the back trajectory centerline.

At a location 1.74 miles upwind of the West 43rd Avenue monitor, the width of a 68.4 degree arc would be 2.36 miles. Within this arc and downwind distance, sources contributing a significant majority of emissions impacting the monitor will be located – if the emission density of windblown PM10 is reasonably uniform within the upwind Salt River belt. A full arc width of 2.36 miles translates into an arc width on each side of the back trajectory centerline of 1.18 miles. This value was rounded downward to 1.0 miles to represent the width of the modeling domain on each side of the centerline.

In summary, all of the land uses within the resulting high wind domain that can generate windblown dust are included as emissions sources for the attainment modeling. Figure V-12 provides an example of a calculated high wind back trajectory and resulting domain.

Figure V-12
Example High Wind Back Trajectory and Resulting High Wind Domain
(Hour 15 from West 43rd Avenue Monitor on June 6, 2007)



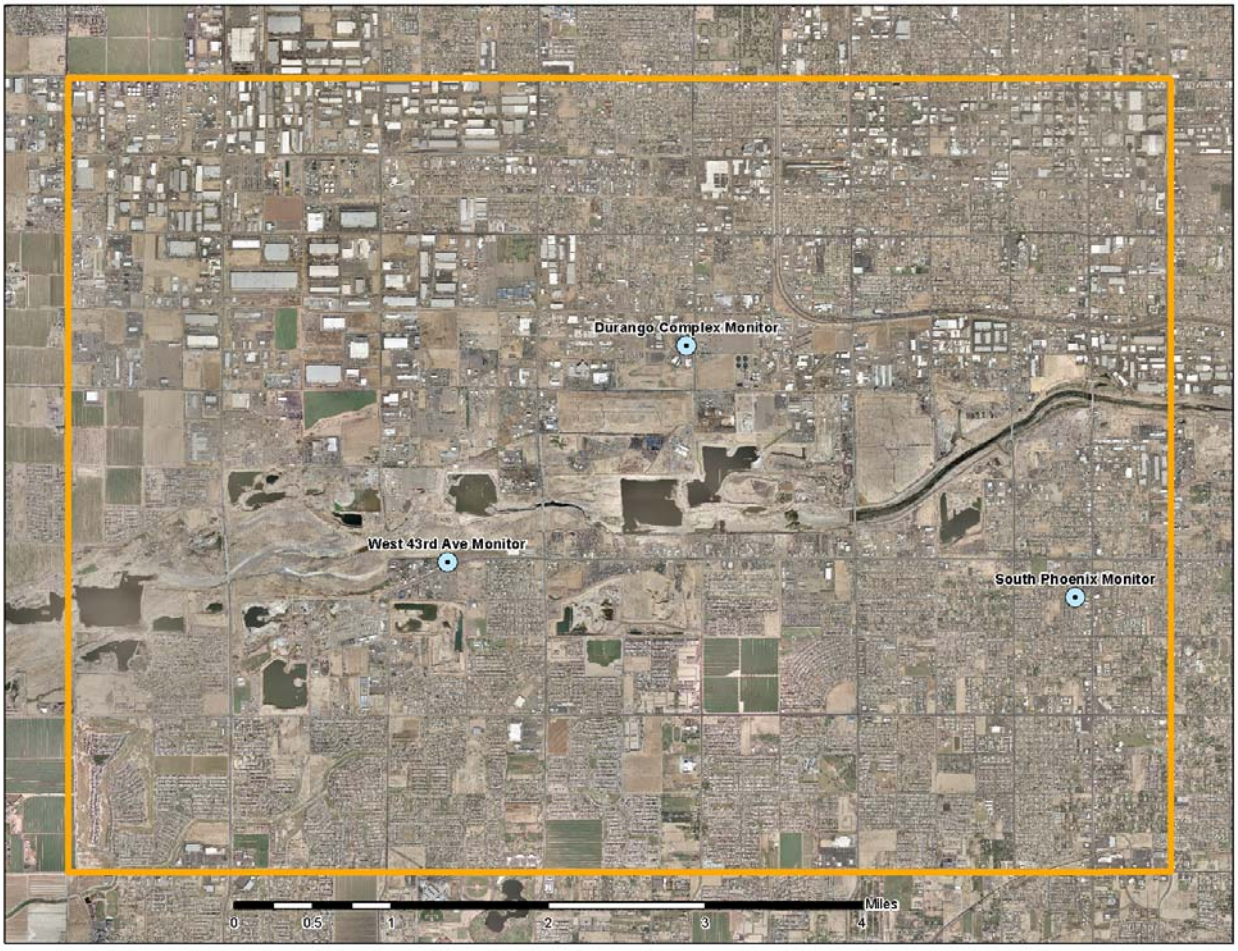
Low Wind Domains

Spatial domains for the low wind hours were developed based upon the predominant land uses surrounding each modeled monitor. The nonattainment area as a whole is too large to be representative of the PM-10 emissions around the modeled monitors. As such, smaller subsets of the nonattainment area are necessary in order to accurately represent the mix of sources around each modeled monitor. Three separate low wind modeling domains were developed as part of the attainment demonstration to aid in focusing on the low wind sources around each monitor.

Considerable effort has been expended in previous PM-10 air quality plans in developing the Salt River area domain. This area is modeled both on its own and as part of the

regional nonattainment area demonstration. This domain is considered to contain the worst-case representation of PM-10 sources in the nonattainment area and has the highest density of PM-10 emissions under low wind conditions. All major sources of PM-10 emissions, except unpaved roads, are represented in this area. These sources include light and heavy dust-generating industries, active agricultural land, active earthmoving sites, vacant lots and unpaved parking areas. There are three active PM-10 monitors that lie within the Salt River domain: West 43rd Avenue, South Phoenix and Durango Complex. This 36 square mile domain is bounded by Van Buren Street to the north, Baseline Road to the south, 59th Avenue to the west and 7th Street to the east. Figure V-13 displays the Salt River area low wind domain.

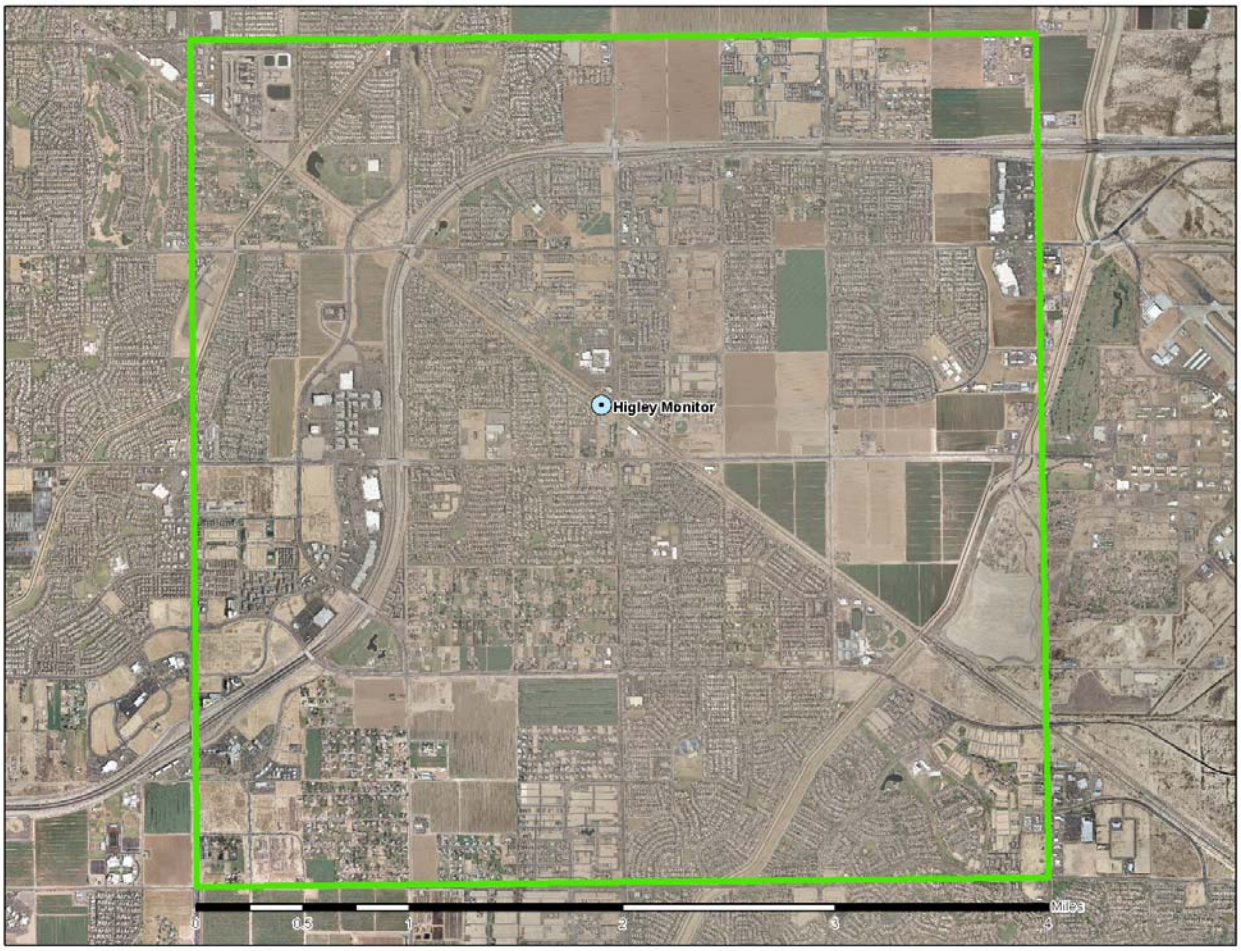
Figure V-13
Salt River Area Low Wind Domain



A second domain, located around the east valley Higley monitor was developed to represent the mix of sources in that area. This area is modeled as part of the regional attainment demonstration on June 6, 2007. Predominant PM-10 sources within the Higley domain include active agricultural fields, active earthmoving operations and a major

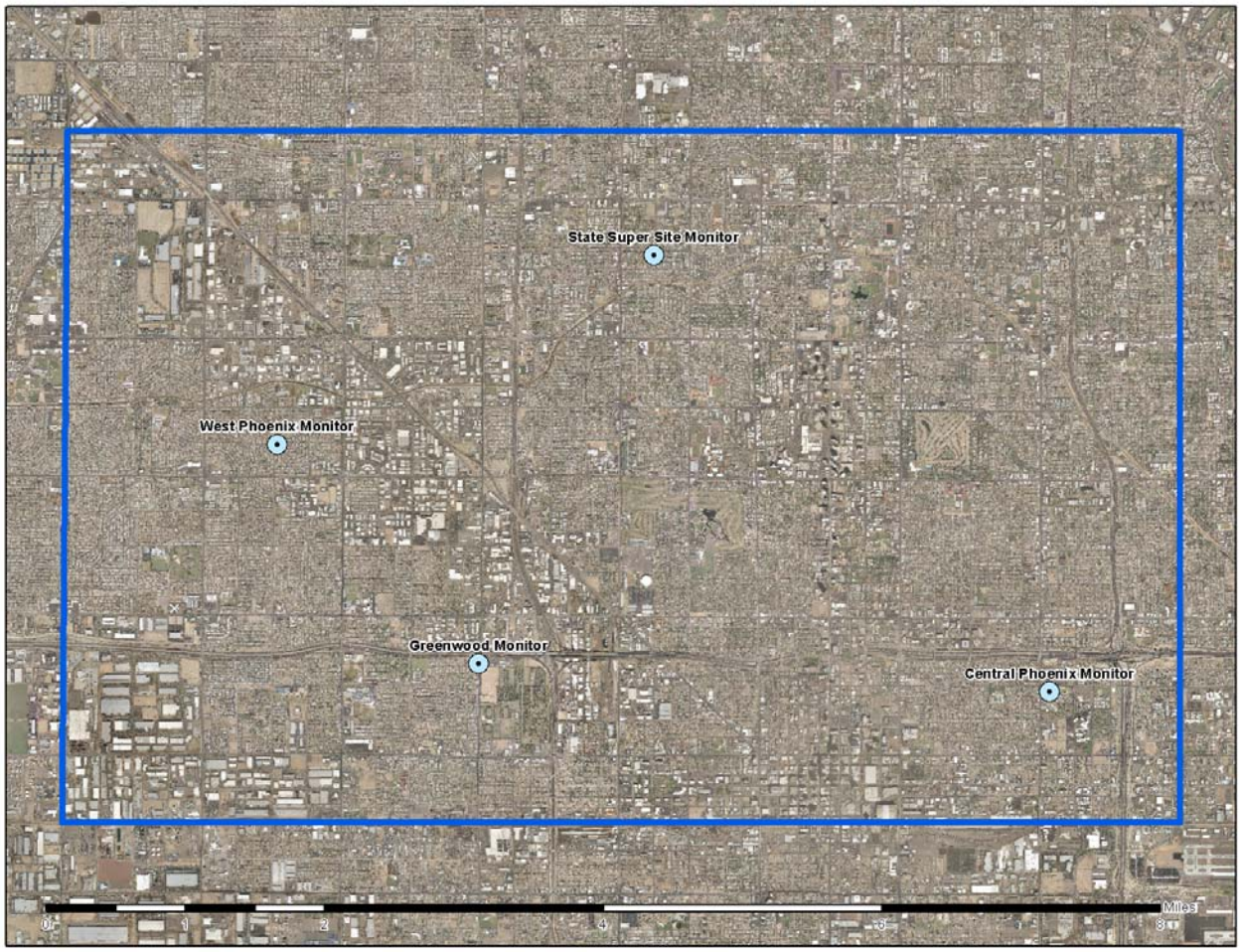
regional freeway. This 16 square mile domain is bounded by Warner Road to the north, Germann Road to the south, Val Vista Drive to the west and Power Road to the east. Figure V-14 displays the Higley low wind domain.

Figure V-14
Higley Low Wind Domain



The last low wind domain developed for the attainment demonstration contains four PM-10 monitors (modeled as part of the regional attainment demonstration) located in the center of the nonattainment area: Central Phoenix, Greenwood, State Super Site and West Phoenix. These monitors are all located in areas that have similar land uses of dense residential and light industrial/commercial/retail. In terms of PM-10 sources, the largest sources are light dust-generating industries, active earthmoving sites and major transportation corridors. This 40 square mile domain is bounded by Missouri Avenue to the north, Harrison Street to the south, 51st Avenue to the west and 24th Street to the east. Figure V-15 displays the Central City low wind domain.

Figure V-15
Central City Low Wind Domain



INVENTORY DEVELOPMENT

Under a rollback modeling scheme, reductions of emissions that impact the monitor are assumed to result in an equal reduction in monitor concentrations. As such, both base case (2007) low and high wind inventories must be developed along with control case (2012) low and high wind inventories. This following describes in detail how the 2007 base year and 2012 control/attainment year high and low wind inventories were developed. Details on how the base and attainment year inventories are developed for the entire nonattainment area are presented in Chapters II and III of this TSD.

High Wind Inventories

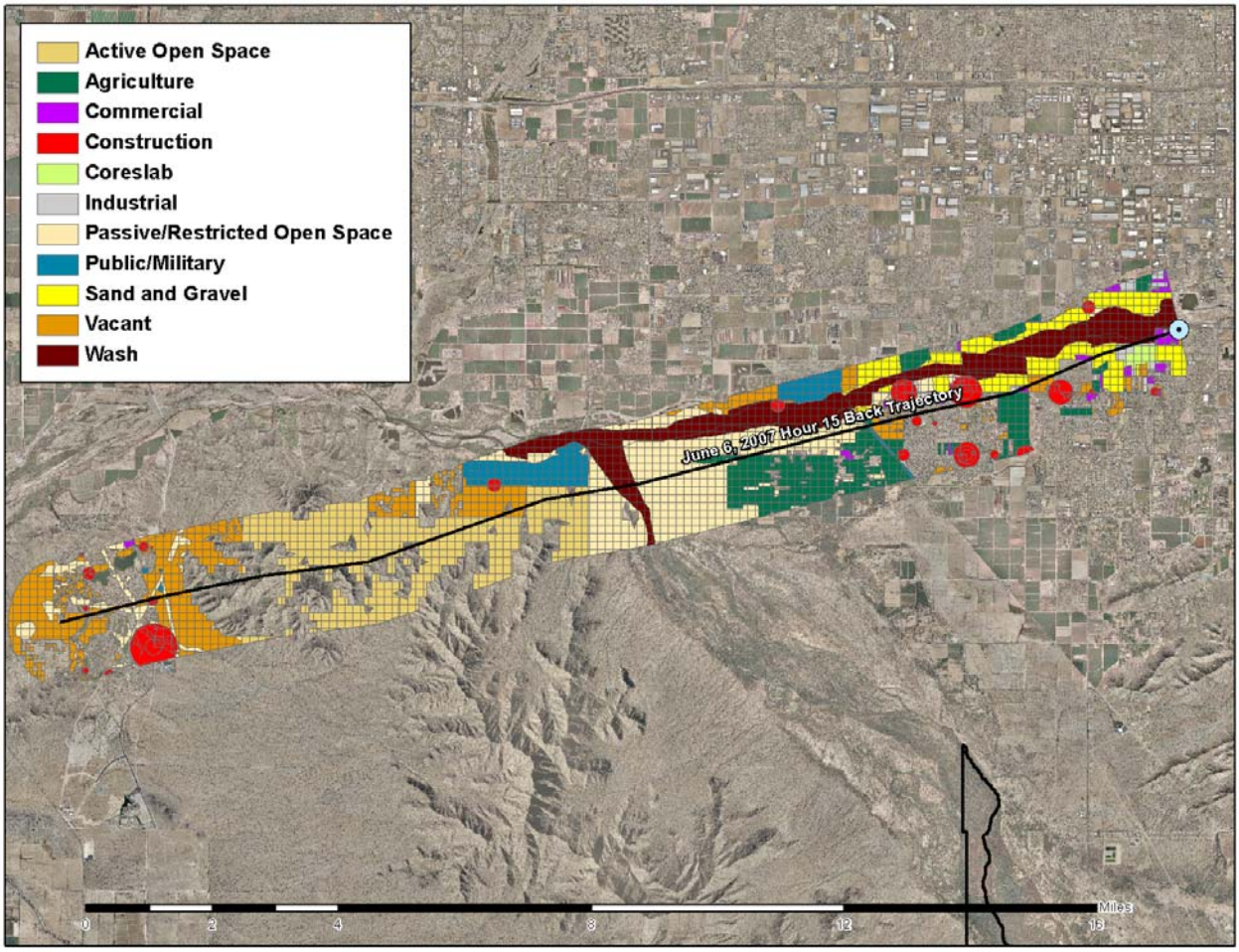
For the high wind hours, hourly windblown PM-10 emissions are calculated based upon the land uses that fall within each of the hourly high wind domains. Land use data, with the exception of construction data, comes from the MAG information services and represents land use patterns as of 2009. Land use is held constant between calculation of 2007 and 2012 year inventories. A detailed write-up of how the land use data is created is included in the 2008 PM-10 Periodic Emissions Inventory as an Appendix to the windblown dust section. Construction data was provided by the Maricopa County Air Quality Department for the year 2007. To be conservative this data is also held constant through 2012 even though there is substantially less construction occurring due to the economic recession. Windblown PM-10 emissions for the subject land uses are calculated per the methodology described in the 2008 PM-10 Periodic Emissions Inventory (Appendix A, Exhibit 1). As an example, emissions from the West 43rd Avenue monitor hour 15 high wind domain (June 6, 2007 design day) are explained below. All of the hourly high wind emissions are calculated in the same manner shown in this example.

Initially, through the use of ArcGIS, the land uses subject to windblown dust emissions within the high wind domain are identified. For the hour 15 example, 11 unique land uses within the high wind domain are subject to windblown dust as shown in Figure V-16. They include the land uses of Active Open Space (i.e., parks), Agriculture, Commercial, Construction, Coreslab (a large combination of sand and gravel and industrial facility), Industrial, Passive/Restricted Open Space (i.e., preserves), Public/Military Space (i.e., jails, bases), Sand and Gravel facilities, Vacant, and Dry Washes. These land uses are chosen because either all or some of their acreage is bare soil from which windblown dust can be generated. Land uses such as residential or golf courses are not included as land uses subject to windblown dust since none (or a very limited amount) of the acreage associated with these land uses is bare soil. Land uses on the steep slopes of mountain preserves are also excluded as the surface roughness of the slope severely limits the production of windblown dust.

After the land uses are identified, a 10-acre fishnet grid is applied to the land uses, so that no individual land use parcel is larger than ten acres. This allows for calculating the distance from each parcel boundary to the modeled monitor; which is West 43rd Avenue in this example. The distance of the parcel to the monitor is necessary in order to apply

the distance weighting factor to the calculated emissions as discussed earlier in this chapter.

Figure V-16
Land Uses Capable of Producing Windblown Dust Within the Hour 15, West 43rd Avenue Monitor, High Wind Domain (June 6, 2007)



To be conservative, all but four of the land uses shown above are assumed to have 100% of their acreage capable of emitting windblown dust. The land uses of Commercial, Coreslab, Industrial and Public/Military are exempted from this assumption because these land uses are known to have a mix of large buildings and paved parking lots/access roads in addition to areas of bare soil. Over 2500 aerial photographs of these types of parcels in the Salt River area were evaluated to determine the average percentage of bare soil present on each of these land uses. The results of that analysis are listed in Table V-22. To be conservative, the mean value was chosen to represent the average percentage of bare soil on these land uses, as this value was higher than the median in all cases. Note that Coreslab is considered an industrial parcel, and as such is assigned the average of 24% for the amount of bare soil present.

Table V-22
Results of Aerial Photography Analysis of Percentage of Bare Soil on Land Uses with Both Bare and Covered Surfaces

Land Use	Mean	Median	Std. Deviation
Commercial	26%	20%	23%
Industrial	24%	17%	21%
Public/Military	35%	21%	35%

After the land uses within the high wind domain have been classified and selected, the process for calculating windblown emissions from these land uses can begin. The 2008 PM-10 Periodic Emissions Inventory developed emission factors for two classes of bare soil: disturbed and stable. Disturbed soils emit at a much higher rate than stabilized soils because there is more loose soil available to be entrained by the wind. As wind speeds increase, both disturbed and stable soils emit at higher rates, as the extra energy from the wind entrains more material from both surfaces. Thus, the main elements needed to calculate windblown PM-10 emissions are the number of acres of bare soil, the wind speeds over that soil, and the percentage of the acres that are disturbed or stable.

Table V-23 displays the emission factors by wind speed bins as developed in the 2008 Periodic Emissions Inventory. These emission factors were developed based upon local testing of Arizona soils. The units of the emission factors are tons per acre per five-minute, as the input wind speed data for most of the high wind domains is a five-minute average wind speed.

Table V-23
Windblown PM-10 Emission Factors (tons /acre-five-minute) by 10-Meter Wind Speed Bin and Soil Stabilization

Soil Stabilization	Wind Speed 12-15 mph	Wind Speed 15-20 mph	Wind Speed 20-25 mph	Wind Speed 25-30 mph	Wind Speed 30-35 mph
Disturbed	5.44E-05	1.69E-04	5.14E-04	1.24E-03	2.57E-03
Stable	1.10E-05	2.93E-05	7.68E-05	1.64E-04	3.10E-04

Continuing with the use of the hour 15, West 43rd Avenue, high wind domain example, the hourly average wind speed for that hour was 18.1 mph. An examination of the five-minute wind speed data for that hour reveals that ten of the five minute periods had wind speeds between 15-20 mph and two of the five minute periods had wind speeds between 20-25 mph. This means that the emissions factors from only two wind speed bins (15-20 and 20-25) will be used to calculate emissions for this hour.

At this point, the amount of acreage by land use and the five minute wind speeds have been determined for the example high wind domain. The one variable that is left to be

determined is how much of the land use acreage is disturbed or stable. A direct measurement of this variable is not possible, as stabilization rates change over time with meteorological and anthropogenic activities unique to each individual parcel. Therefore, a surrogate variable is needed to assume an average disturbance level for each land use subject to producing windblown dust. As discussed in Chapter Five of the main plan and the 2008 PM-10 Periodic Emissions Inventory, rule effectiveness has been chosen as the surrogate for the disturbance levels of bare soils. As an example, a rule effectiveness of 80% would assume that 80% of the acreage is stable and 20% is disturbed. Maricopa County Air Quality Department performed rule effectiveness studies for three fugitive dust rules: Rule 310, earthmoving activities, Rule 310.01, open and vacant areas, and Rule 316, sand and gravel sites. These studies were done on an annual basis and are shown in Table V-24. The values for calendar years 2007, 2008 and 2010 were all derived per the methodology listed in the 2008 PM-10 Periodic Emissions Inventory. The increases in rule effectiveness through time is a direct result of the implementation of the control measures in this plan. The value for 2012 is the assumed value achieved as a result of the control measures in this plan projected out through 2012 (See Chapter Five of main plan for more explanation).

Table V-24
Calendar Year Rule Effectiveness Rates as Surrogates for Soil Disturbance Rates

Rule	2007	2008	2010	2012
310	76%	90%	94%	94%
310.01	85%	95%	96%	97%
316	40%	65%	73%	73%

The 11 land uses identified earlier in Figure V-16 are thus assigned disturbance rates based upon the rule effectiveness rates in Table V-24. Rule 310 serves as a surrogate value for construction land uses, Rule 316 serves as a surrogate for sand and gravel land uses, and Rule 310.01 serves as a surrogate for all remaining land uses. Rule 310.01 directly regulates all open areas and industrial/commercial areas that are permitted or un-permitted. The only land use under which Rule 310.01 does not regulate is agriculture. However, because there are no quantitative rule effectiveness or disturbance rates studies available that are applicable to agricultural land, Rule 310.01 disturbance rates are assumed to apply, as was assumed in the 2008 PM-10 Periodic Emissions Inventory. It is important to point out however, that because there are no benefits for agricultural land taken as part of the attainment demonstration or the five percent reductions, the assumed 2007 rule 310.01 effectiveness rate of 85% is held constant through 2012, meaning windblown dust emissions from agricultural lands in 2012 are the same as in 2007. All other land uses besides agriculture experience a reduction in emissions between 2007 and 2012 as a result of the benefit of increased rule effectiveness; which is pragmatically translating as an assumption of less disturbed soil in the windblown dust inventory.

Now that all of the required elements (acreage, percent disturbed, and wind speeds) have been determined, the elements are simply multiplied in order to obtain PM-10 windblown dust emissions for each land use within the high wind domain. An example equation using data from the hour 15 example high wind domain is shown below to detail how high wind emissions are calculated:

Example for calculating base year (2007) windblown dust emissions from Commercial land uses:

(1) Land use * % acreage * 15-20 mph wind * % Stable * Stable 15-20 mph = Stable Emissions
Acreage of bare soil speed periods emission factor
(250.2) * (26%) * (10) * (85%) * (2.93E-05) = 1.62E-02 Tons

+

(2) Land use * % acreage * 20-25 mph wind * % Stable * Stable 20-25 mph = Stable Emissions
Acreage of bare soil speed periods emission factor
(250.2) * (26%) * (2) * (85%) * (7.68E-05) = 8.49E-03 Tons

+

(3) Land use * % acreage * 15-20 mph wind * % Disturbed * Disturbed 15-20 mph = Disturbed Emissions
Acreage of bare soil speed periods emission factor
(250.2) * (26%) * (10) * (15%) * (1.69E-04) = 1.65E-02 Tons

+

(4) Land use * % acreage * 20-25 mph wind * % Disturbed * Disturbed 20-25 mph = Disturbed Emissions
Acreage of bare soil speed periods emission factor
(250.2) * (26%) * (2) * (15%) * (5.14E-04) = 1.00E-02 Tons

Sum of above equations (1 through 4) = 5.12E-02 Tons of PM-10 emissions from Commercial land uses.

This process is repeated for all land uses and then summed to calculate total PM-10 emissions from all land uses within the high wind domain. The only difference between 2007 and 2012 year emissions is that the disturbance rates change based upon gains in rule effectiveness, thus the reductions in emissions between 2007 and 2012 are solely attributable to increases in rule effectiveness.

The emissions that are calculated per the steps above, represent maximum potential PM-10 emissions from windblown dust. As explained in the 2008 PM-10 Periodic Emissions Inventory, a whole host of other factors including supply limitations, surface roughness, soil moisture content, vegetative cover, soil texture, etc. and would likely limit the PM-10 emissions from windblown dust to levels below what is calculated in each of the high wind domains. The 2008 PM-10 Emissions Inventory corrects for these limiters by standardizing PM-10 emissions as compared to concentrations seen at the monitor under high wind conditions. This helps to ensure the scale of the emissions estimate is not too

large. However, this step is not necessary for high wind emission inventories prepared for use in an attainment demonstration, as what is important in this rollback modeling is the difference between 2007 and 2012 emissions, not the scale of those emissions as compared to low wind emission sources. Since both 2007 and 2012 high wind emissions are calculated in the same way, the difference between the two inventories provides the reductions needed to model attainment at the monitors. The unit and scale of the inventories thus do not matter, only that the methodology is the same between the base and controlled inventories in order to claim the benefits of the measures in this plan as applied to the modeled concentrations.

Once high wind PM-10 emissions have been calculated for the land uses, one final step is required to prepare the emissions for attainment modeling. The calculated emissions for each land use parcel are divided by the distance (feet) from the modeled monitor. As discussed in an earlier section in this chapter, distance weighting is applied to this emissions in order to account for their diminishing impact on monitor concentrations with distance. The best weighting function was determined to be a simple inverse distance ratio (1/d) through analysis of dispersion behavior provided by sample AERMOD model runs (see earlier sections on source weighting and temporary monitor insights).

Tables V-25 through V-31 provide the results of the high wind emissions inventories for the high wind domains of each modeled monitor, based upon the process outlined above. They list both the calculated emissions and the inverse-distance weighted emissions for the base and controlled year inventories.

Table V-25
Base Case 2007 and Controlled 2012 High Wind PM-10 Emissions Inventories for May 4, 2007 Design Day at the West 43rd Avenue Monitor

High Wind Hour	Un-weighted Emissions (tons)		Distance-Weighted Emissions (tons/feet from monitor)		% Reduction of Weighted Emissions
	2007	2012	2007	2012	
12	3.05	2.09	2.872E-04	1.900E-04	33.8%
13	9.49	6.36	6.529E-04	4.245E-04	35.0%
14	9.94	6.67	6.866E-04	4.454E-04	35.1%
15	13.94	9.19	8.721E-04	5.581E-04	36.0%
16	13.36	8.81	8.921E-04	5.699E-04	36.1%
17	19.01	12.39	1.190E-03	7.505E-04	36.9%
18	11.84	7.86	7.837E-04	5.033E-04	35.8%
19	6.58	4.44	5.158E-04	3.364E-04	34.8%
21	4.02	2.72	3.236E-04	2.129E-04	34.2%
22	6.63	4.48	5.104E-04	3.330E-04	34.8%
Total	97.86	65.02	6.714E-03	4.324E-03	35.6%

Table V-26
Base Case 2007 and Controlled 2012 High Wind PM-10 Emissions Inventories for June 6, 2007 Design Day at the Central Phoenix Monitor

High Wind Hour	Un-weighted Emissions (tons)		Distance-Weighted Emissions (tons/feet from monitor)		% Reduction of Weighted Emissions
	2007	2012	2007	2012	
0	1.90	1.32	7.549E-05	5.230E-05	30.7%
1	0.99	0.74	5.184E-05	3.687E-05	28.9%
6	1.69	1.18	6.873E-05	4.797E-05	30.2%
7	0.99	0.74	5.254E-05	3.730E-05	29.0%
10	0.88	0.64	4.939E-05	3.485E-05	29.4%
11	2.01	1.41	7.319E-05	5.123E-05	30.0%
12	4.01	2.91	1.706E-04	1.166E-04	31.7%
13	7.52	5.04	2.448E-04	1.625E-04	33.6%
14	7.28	4.96	2.265E-04	1.520E-04	32.9%
15	4.33	3.04	1.657E-04	1.121E-04	32.3%
16	4.27	3.13	1.737E-04	1.192E-04	31.4%
17	2.29	1.60	8.494E-05	5.855E-05	31.1%
18	2.21	1.55	7.971E-05	5.545E-05	30.4%
Total	40.39	28.25	1.517E-03	1.037E-03	31.7%

Table V-27
Base Case 2007 and Controlled 2012 High Wind PM-10 Emissions Inventories for June 6, 2007 Design Day at the Durango Complex Monitor

High Wind Hour	Un-weighted Emissions (tons)		Distance-Weighted Emissions (tons/feet from monitor)		% Reduction of Weighted Emissions
	2007	2012	2007	2012	
11	1.99	1.37	1.340E-04	9.011E-05	32.8%
12	3.69	2.55	2.267E-04	1.543E-04	31.9%
13	3.12	2.15	1.876E-04	1.281E-04	31.7%
14	8.02	5.49	4.672E-04	3.093E-04	33.8%
15	9.84	7.07	4.992E-04	3.379E-04	32.3%
16	5.62	3.79	3.247E-04	2.160E-04	33.5%
17	2.47	1.72	1.619E-04	1.110E-04	31.4%
Total	34.74	24.13	2.001E-03	1.347E-03	32.7%

Table V-28
Base Case 2007 and Controlled 2012 High Wind PM-10 Emissions Inventories for June 6, 2007 Design Day at the Greenwood Monitor

High Wind Hour	Un-weighted Emissions (tons)		Distance-Weighted Emissions (tons/feet from monitor)		% Reduction of Weighted Emissions
	2007	2012	2007	2012	
12	1.05	0.77	5.872E-05	4.191E-05	28.6%
13	1.03	0.80	6.482E-05	4.701E-05	27.5%
14	3.03	2.16	1.618E-04	1.110E-04	31.4%
15	2.34	1.75	1.266E-04	8.868E-05	30.0%
Total	7.45	5.49	4.119E-04	2.886E-04	29.9%

Table V-29
Base Case 2007 and Controlled 2012 High Wind PM-10 Emissions Inventories for June 6, 2007 Design Day at the Higley Monitor

High Wind Hour	Un-weighted Emissions (tons)		Distance-Weighted Emissions (tons/feet from monitor)		% Reduction of Weighted Emissions
	2007	2012	2007	2012	
10	0.74	0.55	6.103E-05	4.481E-05	26.6%
11	3.00	2.05	1.944E-04	1.330E-04	31.6%
12	2.15	1.54	1.805E-04	1.270E-04	29.6%
13	2.41	1.69	1.824E-04	1.268E-04	30.4%
14	5.61	3.83	2.282E-04	1.553E-04	31.9%
15	5.70	3.98	2.113E-04	1.442E-04	31.8%
16	5.65	3.90	2.065E-04	1.403E-04	32.1%
17	1.50	1.11	6.687E-05	4.791E-05	28.4%
Total	26.76	18.64	1.331E-03	9.195E-04	30.9%

Table V-30
Base Case 2007 and Controlled 2012 High Wind PM-10 Emissions Inventories for June 6, 2007 Design Day at the West Phoenix Monitor

High Wind Hour	Un-weighted Emissions (tons)		Distance-Weighted Emissions (tons/feet from monitor)		% Reduction of Weighted Emissions
	2007	2012	2007	2012	
11	0.65	0.53	2.164E-05	1.680E-05	22.4%
12	1.78	1.33	5.329E-05	3.930E-05	26.2%
13	3.35	2.45	8.177E-05	5.933E-05	27.4%
14	4.27	3.08	1.123E-04	8.105E-05	27.8%
15	1.63	1.21	4.623E-05	3.396E-05	26.5%
Total	11.67	8.60	3.152E-04	2.304E-04	26.9%

Table V-31
Base Case 2007 and Controlled 2012 High Wind PM-10 Emissions Inventories for June 6, 2007 Design Day at the West 43rd Avenue Monitor

High Wind Hour	Un-weighted Emissions (tons)		Distance-Weighted Emissions (tons/feet from monitor)		% Reduction of Weighted Emissions
	2007	2012	2007	2012	
0	2.29	1.59	2.064E-04	1.388E-04	32.8%
5	3.31	2.29	2.894E-04	1.924E-04	33.5%
6	5.05	3.43	4.359E-04	2.860E-04	34.4%
10	3.44	2.38	2.835E-04	1.898E-04	33.1%
11	6.67	4.51	4.937E-04	3.237E-04	34.4%
12	6.02	4.06	5.697E-04	3.704E-04	35.0%
13	5.66	3.82	4.721E-04	3.088E-04	34.6%
14	9.67	6.48	6.830E-04	4.425E-04	35.2%
15	13.99	9.12	9.717E-04	6.168E-04	36.5%
16	9.67	6.48	6.630E-04	4.304E-04	35.1%
17	5.10	3.45	4.285E-04	2.812E-04	34.4%
18	4.94	3.34	3.857E-04	2.526E-04	34.5%
Total	75.81	50.97	5.883E-03	3.833E-03	34.8%

Low Wind Inventories

Even though high wind design days are being modeled for this attainment demonstration, there are still several hours, if not the majority of hours, in the design day when winds are not high enough to produce windblown dust. Emissions from these hours contribute to the design day value and need to be accounted for. Significant reductions from the control measures in this plan have also occurred during low wind or stagnant conditions, so much so that a stagnant PM-10 exceedance has not been seen since 2007 in the nonattainment area.

The success of the low wind measures in this plan negates the need to develop complex design day-specific emission inventories. But rather, annual low wind emissions can simply be assigned to the land uses within each of the three low wind domains. The difference in 2007 and 2012 low wind inventories provide the benefits of the measures in this plan under low wind or stagnant conditions.

Initially, an investigation was made to see if the low wind inventory for the nonattainment area as a whole could be used instead of spatially unique low wind domains. However, because the nonattainment area is so large, substantial differences in the distribution of land uses within the nonattainment area provide for drastically different mix of PM-10 sources throughout sub-areas of the nonattainment area. As such, it became apparent that low wind emissions needed to be estimated for the areas immediately surrounding the modeled monitors in order to accurately reflect the benefits of the control measures at each monitor in the attainment demonstrations.

Low wind emissions are assigned to each of the three domains based upon land use distribution within each of the domains. The values for the low wind emissions are taken from Chapter Five of this Plan (the development of those emissions are explained in Chapters II through III of this TSD). As a first step, the 2007 base and 2012 controlled low wind inventories are assigned to the PM-10 nonattainment area as a whole. After the allocation is complete, the allocated emissions are divided by the number of acres in each land use to produce an annual tons/acre rate which can then be applied to the land uses in each of the three low wind domains to estimate the low wind emissions in each domain. Table V-32 lists the low wind emission categories and the land uses to which those emissions are allocated and Table V-33 lists the resulting tons/acre annual PM-10 emission rate for the PM-10 nonattainment area. Tables V-34 through V-36 display the resulting low wind emissions in each of the three low wind domains.

Table V-32
Annual Low Wind PM-10 Emission Inventory Allocated by Land Use Category

Source Category	2007 Emissions (tons)	2012 Emissions (tons)	Land Use Category
POINT	158.53	134.59	Industrial
AREA			
Residential Fuel Combustion	514.20	535.25	Residential
Commercial Fuel Combustion	283.26	294.85	Commercial
Industrial Fuel Combustion	478.48	498.06	Industrial
Commercial Cooking	974.17	1,014.05	Commercial
Construction	16,106.11	3,731.54	Construction
Tilling, Harvesting, Cotton Ginning	936.27	893.20	Agriculture
Travel on Unpaved Farm Roads	768.69	731.03	Agriculture
Livestock	260.95	260.95	Agriculture
Travel on Unpaved parking Lots	2,3750.50	2,472.74	Vacant/Open
Offroad Recreational Vehicles	2,138.74	2,226.28	Vacant/Open
Leaf Blowers	877.98	913.91	Residential
Fires	496.71	496.71	Vacant/Open
Mining/Quarrying	561.81	255.62	Industrial
Travel on Industrial Haul Roads	770.71	350.67	Industrial
Other Industrial Sources	1,032.62	876.65	Industrial
NONROAD			
Aircraft	193.54	145.50	Transportation
Airport Ground Support Equipment	28.64	19.90	Transportation
Locomotives	34.16	34.16	Transportation
Agricultural Equipment	15.37	13.60	Agriculture
Commercial Equipment	119.54	105.78	Commercial
Construction & Mining Equipment	1,269.88	1,123.64	Constr./Indust. 50/50
Industrial Equipment	103.04	91.18	Industrial
Lawn & Garden Equipment	185.95	164.53	Residential
Pleasure Craft	7.13	6.31	Vacant/Open
Railway Maintenance Equipment	1.15	1.02	Transportation
Recreation Vehicles	7.80	6.90	Vacant/Open
ONROAD			
Exhaust	2,943.36	1,407.06	Transportation
Tire Wear	245.80	261.41	Transportation
Brake Wear	727.66	787.25	Transportation
Paved Roads	7,749.01	8,421.72	Transportation
Unpaved Roads	10,217.66	10,312.22	See Note
TOTAL	52,584.31	38,588.59	N/A

Note: Unpaved roads are allocated based upon the land uses that they are nearest to: Residential 26%, Commercial 3%, Agriculture 13%, Vacant/Open 45%, Industrial 2% and Construction 11%.

Table V-33
Annual Low Wind PM-10 Tons per Acre Emission Rates in the Nonattainment Area

Land Use	Acres	2007 Tons	2012 Tons	2007 Tons/Acre	2012 Tons/Acre
Residential	435,720	4,235	4,295	9.72E-03	9.86E-03
Commercial	123,742	1,684	1,724	1.36E-02	1.39E-02
Agriculture	133,761	3,310	3,239	2.47E-02	2.42E-02
Vacant/Open	1,026,817	9,624	9,849	9.37E-03	9.59E-03
Transportation	28,856	11,923	11,078	4.13E-01	3.84E-01
Industrial	54,364	3,944	2,975	7.25E-02	5.47E-02
Construction*	43,795	17,865	5,428	4.08E-01	1.24E-01
TOTAL	1,847,054	52,584	38,588	2.86E-02	2.09E-02

*Construction acreage comes from Maricopa County Air Quality Department permit records for the year 2007. Only locations that were verifiable were included in the acreage total.

Table V-34
Annual Base Case 2007 and Controlled 2012 Low Wind PM-10 Emissions Inventories for the Salt River Area Low Wind Domain

Land Use	Acres	2007 Emissions (tons)	2012 Emissions (tons)	% Reduction
Residential	6,296	61.19	62.05	(1.4%)
Commercial	4,508	61.34	62.81	(2.4%)
Agriculture	1,180	29.19	28.57	2.1%
Vacant/Open	2,984	27.97	28.62	(2.3%)
Transportation	405	167.28	155.42	7.1%
Industrial	6,410	465.10	350.77	24.6%
Construction	1,073	437.70	132.98	69.6%
Total	22,856	1,249.76	821.23	34.3%

Table V-35
Annual Base Case 2007 and Controlled 2012 Low Wind PM-10 Emissions Inventories for the Central City Low Wind Domain

Land Use	Acres	2007 Emissions (tons)	2012 Emissions (tons)	% Reduction
Residential	12,161	118.19	119.87	(1.4%)
Commercial	6,419	87.33	89.43	(2.4%)
Agriculture	0	0.00	0.00	0.0%
Vacant/Open	2,745	25.73	26.33	(2.3%)
Transportation	244	100.82	93.67	7.1%
Industrial	3,619	262.58	198.03	24.6%
Construction	404	164.80	50.07	69.6%
Total	25,592	759.46	577.41	24.0%

Table V-36
Annual Base Case 2007 and Controlled 2012 Low Wind PM-10 Emissions Inventories for the Higley Low Wind Domain

Land Use	Acres	2007 Emissions (tons)	2012 Emissions (tons)	% Reduction
Residential	4,216	40.97	41.55	(1.4%)
Commercial	1,123	15.28	15.65	(2.4%)
Agriculture	1,865	46.15	45.17	2.1%
Vacant/Open	1,774	16.62	17.01	(2.3%)
Transportation	389	160.74	149.34	7.1%
Industrial	36	2.58	1.95	24.6%
Construction	765	312.06	94.81	69.6%
Total	10,167	594.41	365.49	38.5%

CONTROL MEASURE ANALYSIS

Under rollback modeling, the reductions achieved by the control measures are reflected as a comparison between the base case (2007) and controlled case (2012) inventories. Calculation of the emission reductions associated with these control measures for the entire nonattainment area are presented in Chapters II and III of this TSD, as part of the requirement to show five percent annual reductions in PM-10 emissions.

Since high wind days are being modeled for this attainment demonstration, both high wind and low wind inventories were developed to compare the effectiveness of the control measures in this plan. For the high wind hours, reductions between the 2007 and 2012 inventories is solely due to the benefits of the control measures in this plan (increased rule effectiveness), as land use is conservatively held constant between 2007 and 2012. No adjustment for economic growth or recession has been applied to the high wind inventories. These reductions have been shown as part of the high wind inventory tables presented earlier (Tables V-25 through V-31). Although no credit has been taken, in practice, land use conversion has also reduced PM-10 emissions within the high wind domains, as construction activity has been limited due to the economic recession and as agricultural land within the PM-10 area slowly converts to other uses.

The reductions seen during the low wind hours are a result of both the control measures and economic growth factors. Because of the large size of the nonattainment area, the reductions of PM-10 emissions between the base case 2007 and controlled case 2012 inventories were calculated for three low wind domains within the nonattainment area. These reductions have been shown in Tables V-34 through V-36 as part of the discussion of the creation of the low wind inventories.

DEMONSTRATION OF ATTAINMENT

As discussed earlier in the Chapter, May 4, 2007 was selected as the high wind design day to demonstrate attainment in the Salt River area, where the West 43rd Avenue monitor alone had exceeded the 24-hour PM-10 standard. June 6, 2007 was chosen as the high wind design day for the entire nonattainment area when two monitors in the nonattainment area exceeded on this date (West 43rd Avenue and Higley). The control measures in this plan are designed to reduce PM-10 emissions and their resulting concentrations to the point where the design days can be shown to attain the standard.

Rollback modeling assumes a linear relationship between PM-10 emissions sources and their contribution to observed ambient PM-10 concentrations. Hours where the wind speeds are low (< 12 mph), limit the emissions sources to those within the predetermined low wind domain. Because all of the low wind sources are within a few miles of the modeled monitor, all sources are weighted equally. During high wind hours, PM-10 emission sources follow the back trajectory of the prevailing winds at the monitor, forming a high wind domain whose distance from the monitor stretches back based upon the magnitude of the wind speeds. This creates high wind domains that can be over 20 miles in length. To account for the distance of the windblown PM-10 sources from the modeled monitor, these sources are weighted by their relative distance to the impacted monitor.

The reductions observed between the base case 2007 and controlled case 2012 low inventory and the high wind (distance-weighted) inventory provides the expected reductions of concentrations at the impacted monitor. Holding background values constant, the reductions seen in the inventories are applied to the low and high wind hourly concentrations of the design day to demonstrate that the control measures in the plan will achieve attainment. Attainment in 2012 has been shown for both the May 4, 2007 and June 6, 2007 design days. Results of the attainment demonstrations are presented in Tables V-37 through V-44.

Table V-37
2012 Attainment Demonstration
High Wind Design Day (May 4, 2007) at the West 43rd Avenue Monitor

Hour	Wind Speed (mph)	May 4, 2007 PM-10 Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	2012 Controlled PM-10 Concentration ($\mu g/m^3$)
0	2.5	25.9	14.9	22.1
1	1.4	19.8	14.9	18.1
2	0.4	27.0	14.9	22.8
3	5.5	31.5	14.9	25.8
4	6.7	50.7	14.9	38.4
5	8.5	82.7	14.9	59.4
6	7.2	117.3	14.9	82.2
7	4.9	71.9	14.9	52.3
8	4.5	73.5	14.9	53.4
9	9.2	73.0	14.9	53.1
10	9.4	144.2	14.9	99.9
11	10.6	147.0	14.9	101.7
12	***13.4***	***196.6***	***21.9***	***137.5***
13	***17.6***	***521.0***	***21.9***	***346.4***
14	***17.4***	***451.6***	***21.9***	***300.6***
15	***18.7***	***449.9***	***21.9***	***295.8***
16	***17.7***	***311.2***	***21.9***	***206.7***
17	***19.4***	***570.0***	***21.9***	***367.7***
18	***17.6***	***357.2***	***21.9***	***237.2***
19	***15.5***	***204.0***	***21.9***	***140.7***
20	9.8	174.7	14.9	119.9
21	***13.6***	***148.8***	***21.9***	***105.4***
22	***15.6***	***281.1***	***21.9***	***191.0***
23	11.6	205.6	14.9	140.2
24-Hour Avg.		197.3		134.1

Note: High wind hours highlighted in bold italics.

Table V-38
2012 Attainment Demonstration
High Wind Design Day (June 6, 2007) at the Central Phoenix Monitor

Hour	Wind Speed (mph)	June 6, 2007 PM-10 Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	2012 Controlled PM-10 Concentration ($\mu g/m^3$)
0	***12.5***	***138.5***	***21.9***	***102.7***
1	***13.1***	***176.2***	***21.9***	***131.6***
2	8.6	133.6	14.9	105.1
3	8.0	109.7	14.9	86.9
4	10.9	92.9	14.9	74.2
5	10.3	81.5	14.9	65.5
6	***12.4***	***99.6***	***21.9***	***76.1***
7	***12.8***	***104.0***	***21.9***	***80.2***
8	11.1	80.2	14.9	64.5
9	11.3	73.2	14.9	59.2
10	***12.1***	***69.6***	***21.9***	***55.6***
11	***13.9***	***96.1***	***21.9***	***73.8***
12	***15.3***	***106.2***	***21.9***	***79.5***
13	***15.4***	***150.5***	***21.9***	***107.3***
14	***16.9***	***211.2***	***21.9***	***148.9***
15	***17.8***	***255.7***	***21.9***	***180.1***
16	***15.7***	***111.7***	***21.9***	***83.5***
17	***14.0***	***71.0***	***21.9***	***55.7***
18	***14.0***	***74.4***	***21.9***	***58.4***
19	11.9	72.5	14.9	58.7
20	11.1	59.8	14.9	49.0
21	11.7	70.6	14.9	57.2
22	8.8	63.0	14.9	51.5
23	8.5	66.9	14.9	54.4
24-Hour Avg.		107.0		81.7

Note: High wind hours highlighted in bold italics.

Table V-39
2012 Attainment Demonstration
High Wind Design Day (June 6, 2007) at the Durango Complex Monitor

Hour	Wind Speed (mph)	June 6, 2007 PM-10 Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	2012 Controlled PM-10 Concentration ($\mu g/m^3$)
0	8.9	132.6	14.9	92.2
1	6.3	166.4	14.9	114.4
2	5.0	133.6	14.9	92.9
3	1.0	112.7	14.9	79.2
4	2.6	124.4	14.9	86.8
5	7.3	101.4	14.9	71.7
6	9.1	164.5	14.9	113.2
7	8.7	113.4	14.9	79.6
8	10.5	93.6	14.9	66.6
9	11.2	86.3	14.9	61.8
10	11.9	83.3	14.9	59.8
11	***12.5***	***130.3***	***21.9***	***94.8***
12	***13.9***	***168.1***	***21.9***	***121.4***
13	***13.5***	***202.7***	***21.9***	***145.4***
14	***15.7***	***405.5***	***21.9***	***275.9***
15	***17.9***	***398.1***	***21.9***	***276.5***
16	***14.5***	***119.9***	***21.9***	***87.1***
17	***12.9***	***70.0***	***21.9***	***54.9***
18	10.3	53.9	14.9	40.5
19	8.9	57.0	14.9	42.6
20	6.4	61.1	14.9	45.3
21	7.5	83.0	14.9	59.6
22	6.3	67.8	14.9	49.7
23	5.2	79.6	14.9	57.4
24-Hour Avg.		133.7		94.6

Note: High wind hours highlighted in bold italics.

Table V-40
2012 Attainment Demonstration
High Wind Design Day (June 6, 2007) at the Greenwood Monitor

Hour	Wind Speed (mph)	June 6, 2007 PM-10 Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	2012 Controlled PM-10 Concentration ($\mu g/m^3$)
0	8.1	138.4	14.9	108.8
1	5.7	159.9	14.9	125.1
2	4.9	123.4	14.9	97.4
3	2.9	105.2	14.9	83.5
4	2.1	105.6	14.9	83.8
5	5.4	86.5	14.9	69.3
6	6.7	112.6	14.9	89.2
7	7.7	103.8	14.9	82.5
8	8.3	77.9	14.9	62.8
9	10.0	79.0	14.9	63.6
10	11.0	74.7	14.9	60.3
11	10.8	103.2	14.9	82.0
12	***12.7***	***172.2***	***21.9***	***129.2***
13	***12.6***	***194.6***	***21.9***	***147.1***
14	***15.4***	***442.1***	***21.9***	***310.3***
15	***13.9***	***240.6***	***21.9***	***175.1***
16	11.9	93.5	14.9	74.6
17	11.7	96.9	14.9	77.2
18	11.4	82.5	14.9	66.3
19	8.7	68.3	14.9	55.5
20	7.4	61.3	14.9	50.2
21	7.0	67.9	14.9	55.2
22	5.1	63.5	14.9	51.8
23	4.0	68.3	14.9	55.5
24-Hour Avg.		121.7		94.0

Note: High wind hours highlighted in bold italics.

Table V-41
2012 Attainment Demonstration
High Wind Design Day (June 6, 2007) at the Higley Monitor

Hour	Wind Speed (mph)	June 6, 2007 PM-10 Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	2012 Controlled PM-10 Concentration ($\mu g/m^3$)
0	7.4	39.6	14.9	30.1
1	5.8	72.9	14.9	50.6
2	8.8	135.2	14.9	88.9
3	9.0	130.9	14.9	86.2
4	9.1	104.9	14.9	70.3
5	7.4	96.4	14.9	65.0
6	9.4	113.4	14.9	75.5
7	9.4	90.9	14.9	61.6
8	10.8	187.2	14.9	120.9
9	11.6	195.1	14.9	125.7
10	***14.6***	***580.2***	***21.9***	***431.9***
11	***15.2***	***379.0***	***21.9***	***266.3***
12	***17.6***	***568.8***	***21.9***	***406.7***
13	***15.3***	***408.1***	***21.9***	***290.5***
14	***15.8***	***387.9***	***21.9***	***271.1***
15	***15.6***	***268.9***	***21.9***	***190.5***
16	***15.3***	***167.5***	***21.9***	***120.8***
17	***13.5***	***96.4***	***21.9***	***75.3***
18	10.1	45.2	14.9	33.5
19	6.9	50.7	14.9	36.9
20	6.6	43.1	14.9	32.2
21	7.1	60.5	14.9	42.9
22	2.9	55.7	14.9	40.0
23	3.2	66.9	14.9	46.9
24-Hour Avg.		181.1		127.5

Note: High wind hours highlighted in bold italics.

Table V-42
2012 Attainment Demonstration
High Wind Design Day (June 6, 2007) at the State Super Site Monitor

Hour	Wind Speed (mph)	June 6, 2007 PM-10 Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	2012 Controlled PM-10 Concentration ($\mu g/m^3$)
0	7.6	99.3	14.9	79.0
1	6.3	149.6	14.9	117.3
2	5.4	112.2	14.9	88.8
3	5.4	95.8	14.9	76.4
4	6.7	92.4	14.9	73.8
5	7.2	80.6	14.9	64.8
6	7.2	80.2	14.9	64.5
7	6.5	82.7	14.9	66.4
8	7.2	63.5	14.9	51.8
9	6.7	60.8	14.9	49.8
10	6.9	53.6	14.9	44.3
11	9.4	65.5	14.9	53.4
12	8.9	77.8	14.9	62.7
13	9.8	107.8	14.9	85.5
14	10.5	142.1	14.9	111.6
15	11.4	109.4	14.9	86.7
16	10.1	62.3	14.9	50.9
17	9.2	54.4	14.9	44.9
18	11.2	57.5	14.9	47.3
19	9.6	53.9	14.9	44.5
20	7.8	60.9	14.9	49.9
21	6.3	62.5	14.9	51.1
22	3.8	55.1	14.9	45.5
23	3.6	54.8	14.9	45.2
24-Hour Avg.		80.6		64.8

Table V-43
2012 Attainment Demonstration
High Wind Design Day (June 6, 2007) at the West Phoenix Monitor

Hour	Wind Speed (mph)	June 6, 2007 PM-10 Concentration ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	2012 Controlled PM-10 Concentration ($\mu g/m^3$)
0	7.1	134.4	14.9	105.7
1	7.8	164.9	14.9	128.9
2	8.4	123.8	14.9	97.7
3	4.2	106.1	14.9	84.2
4	5.1	99.1	14.9	78.9
5	6.1	84.4	14.9	67.7
6	8.5	94.4	14.9	75.3
7	10.3	102.9	14.9	81.8
8	8.7	75.2	14.9	60.7
9	8.6	70.3	14.9	57.0
10	8.8	62.1	14.9	50.8
11	***12.1***	***122.2***	***21.9***	***99.7***
12	***13.6***	***169.6***	***21.9***	***130.8***
13	***15.1***	***256.6***	***21.9***	***192.2***
14	***15.1***	***259.8***	***21.9***	***193.6***
15	***13.5***	***132.1***	***21.9***	***102.9***
16	12.0	88.2	14.9	70.6
17	11.7	71.9	14.9	58.2
18	10.0	66.7	14.9	54.3
19	9.3	65.1	14.9	53.1
20	9.1	66.7	14.9	54.3
21	6.8	67.3	14.9	54.7
22	5.3	62.6	14.9	51.2
23	4.8	63.7	14.9	52.0
24-Hour Avg.		108.8		85.7

Note: High wind hours highlighted in bold italics.

Table V-44
2012 Attainment Demonstration
High Wind Design Day (June 6, 2007) at the West 43rd Avenue Monitor

Hour	Wind Speed (mph)	June 6, 2007 PM-10 Concentration (µg/m^3)	Background Concentration (µg/m^3)	2012 Controlled PM-10 Concentration (µg/m^3)
0	***13.3***	***175.1***	***21.9***	***124.9***
1	9.9	177.0	14.9	121.4
2	9.1	150.0	14.9	103.7
3	7.8	115.5	14.9	81.0
4	10.6	145.0	14.9	100.4
5	***14.5***	***318.0***	***21.9***	***218.8***
6	***14.9***	***267.2***	***21.9***	***182.9***
7	11.4	208.1	14.9	141.8
8	11.3	131.4	14.9	91.4
9	12.0	152.0	14.9	105.0
10	***13.8***	***180.8***	***21.9***	***128.3***
11	***16.0***	***438.3***	***21.9***	***294.9***
12	***16.6***	***449.1***	***21.9***	***299.6***
13	***15.1***	***394.9***	***21.9***	***265.9***
14	***17.6***	***643.1***	***21.9***	***424.3***
15	***18.1***	***662.3***	***21.9***	***428.4***
16	***17.0***	***237.5***	***21.9***	***161.8***
17	***14.5***	***92.3***	***21.9***	***68.1***
18	***14.9***	***77.9***	***21.9***	***58.6***
19	12.0	56.1	14.9	42.0
20	8.8	87.3	14.9	62.5
21	9.3	98.1	14.9	69.6
22	7.0	82.6	14.9	59.4
23	6.8	78.3	14.9	56.6
24-Hour Avg.		225.7		153.8

Note: High wind hours highlighted in bold italics.

APPENDIX B

EXHIBIT 2:

Calculation of Benefits from PM-10 Certified Street Sweepers Purchased with CMAQ Funds in 2001-2009

CMAQ Funded PM-10 Certified Street Sweepers Purchased in 2001-2009							PM-10 Emission Reductions (kg/day)									
Sweeper		AADT Per	Lane	Lane	Cycle	Cycle					Total	Reduction	Benefit with	Month of	Age in	Usage
#	Agency Requesting Sweeper	Lane	MIles Old	Miles New	LenOld	LenNew	Replace	Expand	Incr Freq	Process	Reduction	by Unit	Usage Factor	Purchase	Dec-09	Factor
1	Apache Junction	832	98	118	45	30		0.41	1.20		1.61	1.61	1.28	Mar-04	5.8	0.795
4	Chandler	5,260	131	131	14	14	32.30			0.22	32.51	32.51	22.86	Nov-01	8.1	0.703
6	Chandler	8,313	165	165	7	7	118.53			0.54	119.08	119.08	94.67	Aug-04	5.3	0.795
8	El Mirage	1,469	129	108	30	15		-1.13	5.83		4.70	4.70	3.73	Jan-04	5.9	0.795
9	Fort McDowell	1,500	21	21	30	30	0.69			0.02	0.71	0.71	0.52	Dec-01	8.0	0.734
21	Litchfield Park	4,518	12	12	30	30	1.19			0.01	1.20	5.34	4.24	Jun-04	5.5	0.795
		2,259	23	28	14	14	2.44	0.89		0.05	3.37			Jun-04	5.5	0.795
		244	35	50	14	14	0.40	0.29		0.08	0.77			Jun-04	5.5	0.795
23	Mesa	229	342	342	38	38	1.35			0.21	1.56	1.56	1.34	Oct-06	3.2	0.857
24	Paradise Valley	10,000	20	20	90	30	1.46		4.90	0.02	6.37	15.41	10.83	Jul-01	8.4	0.703
		7,000	22.5	22.5	90	30	1.15		3.86	0.02	5.02			Jul-01	8.4	0.703
		3,000	18	18	90	45	0.39		0.66	0.01	1.06			Jul-01	8.4	0.703
		1,000	147	147	90	45	1.07		1.80	0.08	2.95			Jul-01	8.4	0.703
26	Peoria	4,500	53.4	53.4	25	25	6.31			0.05	6.36	7.88	6.02	Nov-03	6.1	0.764
		1,000	18	18	35	35	0.34			0.01	0.35			Nov-03	6.1	0.764
		500	116.8	116.8	35	35	1.09			0.08	1.17			Nov-03	6.1	0.764
27	Phoenix	4,205	302	302	21	14			33.33		33.33	33.33	23.43	Aug-01	8.3	0.703
28	Phoenix	4,205	302	302	21	14			33.33		33.33	33.33	23.43	Aug-01	8.3	0.703
29	Phoenix	4,205	302	302	21	14			33.33		33.33	33.33	23.43	Aug-01	8.3	0.703
30	Phoenix	4,205	302	302	21	14			33.33		33.33	33.33	23.43	Aug-01	8.3	0.703
31	Phoenix	4,205	302	302	14	14	59.52			0.50	60.02	60.02	47.72	Jun-04	5.5	0.795
32	Phoenix	4,205	302	302	14	14	59.52			0.50	60.02	60.02	47.72	Jun-04	5.5	0.795
33	Phoenix	4,205	302	302	14	14	59.52			0.50	60.02	60.02	45.86	Oct-03	6.2	0.764
34	Phoenix	4,205	302	302	14	14	59.52			0.50	60.02	60.02	45.86	Oct-03	6.2	0.764
35	Phoenix	4,205	302	302	14	14	59.52			0.50	60.02	60.02	45.86	Oct-03	6.2	0.764
36	Phoenix	4,205	302	302	14	14	59.52			0.50	60.02	60.02	45.86	Oct-03	6.2	0.764
37	Phoenix	4,205	302	302	14	14	59.52			0.50	60.02	60.02	45.86	Oct-03	6.2	0.764
38	Phoenix	4,205	302	302	14	14	59.52			0.50	60.02	60.02	45.86	Oct-03	6.2	0.764
39	Phoenix	4,205	302	302	14	14	59.52			0.50	60.02	60.02	45.86	Oct-03	6.2	0.764
40	Phoenix	4,205	302	302	14	14	59.52			0.50	60.02	60.02	45.86	Oct-03	6.2	0.764
41	Phoenix	4,205	302	302	14	14	59.52			0.50	60.02	60.02	45.86	Oct-03	6.2	0.764
42	Phoenix	4,205	302	302	14	14	59.52			0.50	60.02	60.02	45.86	Oct-03	6.2	0.764
43	Scottsdale	8,450	49	49	7	7	35.78			0.16	35.94	37.45	26.33	Oct-01	8.2	0.703
		150	310	310	25	25	1.22			0.29	1.51			Oct-01	8.2	0.703
44	Scottsdale	7,100	101	101	7	7	61.97			0.33	62.30	62.33	49.55	Sep-04	5.3	0.795
		350	4	4	42	42	0.02			0.00	0.02			Sep-04	5.3	0.795
45	Scottsdale	7,000	73	73	7	7	44.16			0.24	44.40	46.54	37.00	Sep-04	5.3	0.795
		2,000	11	11	21	21	0.69			0.01	0.70			Sep-04	5.3	0.795
		350	240	240	42	42	1.31			0.13	1.44			Sep-04	5.3	0.795
49	Tempe	6,600	111.75	111.75	21	5	23.05		94.15	0.51	117.71	133.09	97.69	Jul-02	7.4	0.734
		4,750	26.75	26.75	21	10	3.97		7.34	0.06	11.37			Jul-02	7.4	0.734
		800	153.75	153.75	21	21	3.84			0.17	4.01			Jul-02	7.4	0.734
50	Tempe	6,600	111.75	111.75	21	5	23.05		94.15	0.51	117.71	133.09	105.81	Feb-04	5.8	0.795
		4,750	26.75	26.75	21	10	3.97		7.34	0.06	11.37			Feb-04	5.8	0.795
		800	153.75	153.75	21	21	3.84			0.17	4.01			Feb-04	5.8	0.795
52	Youngtown	1,492	26	26	90	30	0.28		0.95	0.02	1.25	1.25	0.96	Oct-03	6.2	0.764
53	Queen Creek	1,365	20	20	30	15	0.60		1.00	0.03	1.63	2.21	1.76	Nov-04	5.1	0.795
		910	6	6	30	15	0.12		0.20	0.01	0.33			Nov-04	5.1	0.795
		68	46	46	30	15	0.07		0.12	0.07	0.25			Nov-04	5.1	0.795
54	Chandler	1,492	60	60	30	30	1.96			0.05	2.00	5.92	4.89	Jan-05	4.9	0.826
		291	548	548	30	30	3.49			0.42	3.91			Jan-05	4.9	0.826
55	Glendale	5,706	175	175	12	12	54.60			0.34	54.94	64.60	51.35	Sep-04	5.3	0.795
		910	110	110	15	15	4.38			0.17	4.55			Sep-04	5.3	0.795

CMAQ Funded PM-10 Certified Street Sweepers Purchased in 2001-2009							PM-10 Emission Reductions (kg/day)									
Sweeper		AADT Per	Lane	Lane	Cycle	Cycle					Total	Reduction	Benefit with	Month of	Age in	Usage
#	Agency Requesting Sweeper	Lane	MIles Old	Miles New	LenOld	LenNew	Replace	Expand	Incr Freq	Process	Reduction	by Unit	Usage Factor	Purchase	Dec-09	Factor
		228	445	445	15	15	4.43			0.68	5.11			Sep-04	5.3	0.795
56	Tempe	6,006	12	12	7	5	6.23		2.16	0.06	8.45	11.11	9.18	Apr-05	4.7	0.826
		4,323	6	6	10	10	1.70			0.01	1.72			Apr-05	4.7	0.826
		728	40	40	21	21	0.91			0.04	0.95			Apr-05	4.7	0.826
58	Surprise	6,066	6	17	28	15	0.85	2.63	3.52	0.03	7.02	8.08	6.43	Jul-04	5.4	0.795
		218	6	43	28	15	0.03	0.32	0.32	0.07	0.74			Jul-04	5.4	0.795
		67	46	103	42	28	0.05	0.10	0.09	0.08	0.32			Jul-04	5.4	0.795
59	Surprise	6,066	112	123	28	15		2.63	25.46		28.09	28.90	22.97	Jul-04	5.4	0.795
		218	7	44	28	15		0.32	0.33		0.65			Jul-04	5.4	0.795
		67	15	72	42	28		0.10	0.06		0.16			Jul-04	5.4	0.795
60	Peoria	4,095	242	248	25	25		1.08			1.08	3.96	3.27	Dec-04	5.0	0.826
		910	91	111	30	30		0.67			0.67			Dec-04	5.0	0.826
		601	576	676	30	30		2.21			2.21			Dec-04	5.0	0.826
61	Buckeye	3,640	6	6	7	7	1.89			0.02	1.91	3.04	2.42	Aug-04	5.3	0.795
		776	10	10	7	7	0.67			0.03	0.70			Aug-04	5.3	0.795
		194	40	40	14	14	0.36			0.07	0.43			Aug-04	5.3	0.795
62	Gila River IC	6,825	6	6	7	7	3.54			0.02	3.56	4.56	3.77	Aug-05	4.3	0.826
		444	24	24	7	7	0.92			0.08	1.00			Aug-05	4.3	0.826
63	Gila River IC	2,730	4	4	7	7	0.94			0.01	0.96	1.19	0.98	Aug-05	4.3	0.826
		228	10	10	7	7	0.20			0.03	0.23			Aug-05	4.3	0.826
64	Gila River IC	3,640	16	16	25	14			2.02		2.02	2.54	2.10	Aug-05	4.3	0.826
		375	40	40	25	14			0.52		0.52			Aug-05	4.3	0.826
65	Gila River IC	228	4	4	25	14			0.03		0.03	0.15	0.13	Aug-05	4.3	0.826
		118	30	30	25	14			0.12		0.12			Aug-05	4.3	0.826
66	El Mirage	3,550	4	11	30	10		0.91	2.87		3.78	6.42	5.30	Jan-05	4.9	0.826
		1,755	12	12	30	12			1.16		1.16			Jan-05	4.9	0.826
		910	44	44	30	15			1.47		1.47			Jan-05	4.9	0.826
67	Phoenix	4,205	302	302	21	14			33.33		33.33	66.66	55.06	Feb-05	4.8	0.826
		4,205	302	302	21	14			33.33		33.33			Feb-05	4.8	0.826
68	Phoenix	4,205	302	302	21	14			33.33		33.33	66.66	55.06	Feb-05	4.8	0.826
		4,205	302	302	21	14			33.33		33.33			Feb-05	4.8	0.826
69	Tempe - Arterials	6,006	12	12	12	12	3.94			0.02	3.96	6.63	5.69	Mar-06	3.8	0.857
	Tempe - Collectors	4,323	6	6	10	10	1.70			0.01	1.72			Mar-06	3.8	0.857
	Tempe - Res Streets	728	40	40	21	21	0.91			0.04	0.95			Mar-06	3.8	0.857
70	Chandler - Collectors	898	46	46	30	30	0.90			0.04	0.94	2.22	1.90	Mar-06	3.8	0.857
	Chandler - Res Streets	106	414	414	30	30	0.96			0.32	1.28			Mar-06	3.8	0.857
71	Chandler - Collectors	1,356	43	43	30	30	1.28			0.03	1.31	3.37	2.89	Mar-06	3.8	0.857
	Chandler - Res Streets	208	387	387	30	30	1.76			0.30	2.06			Mar-06	3.8	0.857
72	Apache Junction - Arterials	3,458	28.25	28.25	20	20	3.21			0.03	3.24	4.16	3.56	Mar-06	3.8	0.857
	Apache Junction - Collectors	496	10.75	10.75	20	20	0.17			0.01	0.19			Mar-06	3.8	0.857
	Apache Junction - Res Streets	137	61.5	61.5	20	20	0.28			0.07	0.35			Mar-06	3.8	0.857
	Apache Junction - Other mid sect	1,274	9	9	20	20	0.38			0.01	0.39			Mar-06	3.8	0.857
73	Queen Creek - Arterials	1,365	0	9.7	15	15		0.97			0.97	1.46	1.25	Jan-06	3.9	0.857
	Queen Creek - Collectors	455	0	6.8	15	15		0.23			0.23			Jan-06	3.9	0.857
	Queen Creek - Res Streets	228	0	31.3	30	30		0.26			0.26			Jan-06	3.9	0.857
74	Phoenix - Arterials	4,488	450	450	14	7			144.23		144.23	221.40	189.74	Mar-06	3.8	0.857
	Phoenix - Collector/Res Streets	2,401	450	450	14	7			77.17		77.17			Mar-06	3.8	0.857
75	Phoenix - Arterials	4,488	450	450	14	7			144.23		144.23	221.40	189.74	Mar-06	3.8	0.857
	Phoenix - Collector/Res Streets	2,401	450	450	14	7			77.17		77.17			Mar-06	3.8	0.857
76	Scottsdale - Arterials	3,185	0	260	30	30		30.43			30.43	30.43	27.02	Dec-06	3.0	0.888
77	Fountain Hills- Arterials	4,550	85	85	15	15	16.92			0.13	17.05	25.80	22.11	Dec-05	4.0	0.857
	Fountain Hills - Collectors	1,820	140	140	45	30	3.72		3.12	0.11	6.94			Dec-05	4.0	0.857
	Fountain Hills - Res Streets	273	350	350	60	45	1.05		0.59	0.18	1.81			Dec-05	4.0	0.857

CMAQ Funded PM-10 Certified Street Sweepers Purchased in 2001-2009							PM-10 Emission Reductions (kg/day)									
Sweeper		AADT Per	Lane	Lane	Cycle	Cycle					Total	Reduction	Benefit with	Month of	Age in	Usage
#	Agency Requesting Sweeper	Lane	MIles Old	Miles New	LenOld	LenNew	Replace	Expand	Incr Freq	Process	Reduction	by Unit	Usage Factor	Purchase	Dec-09	Factor
79	Gilbert - Arterials -	9,087	269	506	15	15		158.28			158.28	238.43	34.06	Feb-08	1.8	0.143
	Gilbert - Collector/Res Streets	2,730	0	799	30	30		80.15			80.15			Feb-08	1.8	0.143
80	Gilbert - Arterials	9,087	269	506	15	15		158.28			158.28	238.43	34.06	Feb-08	1.8	0.143
	Gilbert - Collector/Res Streets	2,730	0	799	30	30		80.15			80.15			Feb-08	1.8	0.143
81	Buckeye - Arterials	1,593	0	24	7	7		5.74			5.74	5.74	4.92	Mar-06	3.8	0.857
82	ADOT - Freeway	30,030	175	250	14	7		55.74	168.50		224.23	301.18	248.77	Jun-05	4.5	0.826
	ADOT - Other Frontage Roads	7,818	375	500	14	14		76.95			76.95			Jun-05	4.5	0.826
83	ADOT - Freeway	30,030	175	250	14	7		55.74	168.50		224.23	301.18	248.77	Jun-05	4.5	0.826
	ADOT - Other Frontage Roads	7,818	375	500	14	14		76.95			76.95			Jun-05	4.5	0.826
84	Surprise- Arterials	8,964	120	120	20	15			19.76		19.76	20.15	16.65	Oct-05	4.2	0.826
	Surprise- Collectors	198	16	40	28	20		0.19	0.12		0.31			Oct-05	4.2	0.826
	Surprise - Res Streets	61	36	67	120	45		0.02	0.06		0.08			Oct-05	4.2	0.826
85	Guadalupe - Collectors	5,678	5	5	1	1					0.00	0.52	0.44	Nov-06	3.1	0.857
	Guadalupe - Res Streets	578	25	25	4	2			0.52		0.52			Nov-06	3.1	0.857
86	Williams Gateway- Arterials	410	12	12	14	5			0.50		0.50	0.50	0.43	Apr-06	3.7	0.857
87	Mesa - Collectors	1,759	35	35	40	40	1.01			0.02	1.03	1.86	1.59	Oct-06	3.2	0.857
	Mesa - Res Streets	200	215	215	40	40	0.71			0.12	0.83			Oct-06	3.2	0.857
88	Mesa - Collectors	1,759	35	35	40	40	1.01			0.02	1.03	1.86	1.59	Oct-06	3.2	0.857
	Mesa - Res Streets	200	215	215	40	40	0.71			0.12	0.83			Oct-06	3.2	0.857
89	Avondale - Collectors	4,550	44	44	7	7	17.30			0.14	17.45	27.85	23.00	Aug-05	4.3	0.826
	Avondale - Res Streets	910	127	127	7	7	9.99			0.42	10.40			Aug-05	4.3	0.826
90	Chandler Airport - Arterials	523	4	4	5	5	0.20			0.02	0.21	2.61	2.24	Mar-06	3.8	0.857
	Chandler Airport - Collectors	91	1	1	5	5	0.01			0.00	0.01			Mar-06	3.8	0.857
	Chandler Airport - Other	683	35	35	5	5	2.23			0.16	2.39			Mar-06	3.8	0.857
91	Goodyear - Arterials	3,185	176	176	14	14	26.27			0.29	26.56	30.52	26.15	Dec-05	4.0	0.857
	Goodyear - Collectors	601	84	84	14	14	2.36			0.14	2.50			Dec-05	4.0	0.857
	Goodyear - Res Streets	218	122	122	14	14	1.25			0.20	1.45			Dec-05	4.0	0.857
92	Goodyear - Arterials - 2005	3,185	176	176	14	14	26.27			0.29	26.56	30.52	26.15	Dec-05	4.0	0.857
	Goodyear - Collectors	601	84	84	14	14	2.36			0.14	2.50			Dec-05	4.0	0.857
	Goodyear - Res Streets	218	122	122	14	14	1.25			0.20	1.45			Dec-05	4.0	0.857
93	Gilbert - Arterials	6,104	679	679	15	15	181.32			1.04	182.36	236.73	33.82	Oct-05	4.2	0.143
	Gilbert - Collectors	3,000	70	70	20	20	6.89			0.08	6.97			Oct-05	4.2	0.143
	Gilbert - Res Streets	3,000	714	714	30	30	46.85			0.55	47.40			Oct-05	4.2	0.143
94	Gilbert - Arterials	6,982	697	697	15	15	212.90			1.07	213.97	268.34	38.33	Oct-05	4.2	0.143
	Gilbert - Collectors	3,000	70	70	20	20	6.89			0.08	6.97			Oct-05	4.2	0.143
	Gilbert - Res Streets	3,000	714	714	30	30	46.85			0.55	47.40			Oct-05	4.2	0.143
95	Gilbert - Arterials	5,954	697	697	15	15	181.55			1.07	182.62	236.99	33.86	Oct-05	4.2	0.143
	Gilbert - Collectors	3,000	70	70	20	20	6.89			0.08	6.97			Oct-05	4.2	0.143
	Gilbert - Res Streets	3,000	714	714	30	30	46.85			0.55	47.40			Oct-05	4.2	0.143
96	Phoenix - Arterials	5,918	465	465	10	10	142.52				142.52	227.87	0.00	Jun-06	3.5	0.000
	Phoenix - Collector/Res Streets	3,167	460	460	14	14	85.36				85.36			Jun-06	3.5	0.000
97	Phoenix - Arterials	5,918	465	465	10	10	142.52				142.52	205.40	0.00	Sep-07	2.3	0.000
	Phoenix - Collector/Res Streets	3,167	460	460	7	7	62.89				62.89			Sep-07	2.3	0.000
100	Surprise - Arterials	10,000	54	54	20	3			85.52		85.52	85.52	73.29	Dec-05	4.0	0.857
101	Tempe - Arterials	6,600	48	48	12	6			23.11		23.11	33.73	32.05	Aug-09	0.3	0.950
	Tempe - Collectors	4,750	32	32	10	5			10.63		10.63			Aug-09	0.3	0.950
102	Goodyear - Arterials	3,750	234	234	30	14			36.85		36.85	36.85	32.72	Sep-07	2.3	0.888
	Goodyear - Collectors	675	114	114	14	14			0.00		0.00			Sep-07	2.3	0.888
	Goodyear - Res Streets	240	130	130	14	14			0.00		0.00			Sep-07	2.3	0.888
103	Tolleson - Collectors	1,500	26	26	14	7	1.83		2.79	0.09	4.70	5.55	4.93	May-07	2.6	0.888
	Tolleson - Res Streets	250	26	26	14	7	0.30		0.46	0.09	0.85			May-07	2.6	0.888
104	Mesa - Collectors	1,759	40	40	52	43			0.31		0.31	0.49	0.45	May-08	1.6	0.919
	Mesa - Res Streets	182	215	215	52	43			0.17		0.17			May-08	1.6	0.919

CMAQ Funded PM-10 Certified Street Sweepers Purchased in 2001-2009							PM-10 Emission Reductions (kg/day)									
Sweeper		AADT Per	Lane	Lane	Cycle	Cycle					Total	Reduction	Benefit with	Month of	Age in	Usage
#	Agency Requesting Sweeper	Lane	MIles Old	Miles New	LenOld	LenNew	Replace	Expand	Incr Freq	Process	Reduction	by Unit	Usage Factor	Purchase	Dec-09	Factor
	Mesa - Other (Alleys)	109	5	5	52	43			0.00		0.00			May-08	1.6	0.919
105	Mesa Falcon Field - Arterials	1,320	7	7	7	7	0.80			0.02	0.82	0.82	0.73	Nov-07	2.1	0.888
106	Litchfield Park - Arterials	4,111	12	16	30	21		0.60	1.04		1.64	4.07	3.62	Nov-07	2.1	0.888
	Litchfield Park - Collectors	2,056	23	25	14	10		0.32	1.62		1.94			Nov-07	2.1	0.888
	Litchfield Park - Res Streets	222	35	45	14	10		0.17	0.31		0.49			Nov-07	2.1	0.888
107	Buckeye - Arterials	546	0	62	7	7		5.08			5.08	5.57	4.95	Sep-07	2.3	0.888
	Buckeye - Collectors	273	0	4	7	7		0.16			0.16			Sep-07	2.3	0.888
	Buckeye - Res Streets	27	0	80	7	7		0.33			0.33			Sep-07	2.3	0.888
108	Surprise - Arterials	2,093	48	48	16	7			8.16		8.16	8.97	7.96	Aug-07	2.3	0.888
	Surprise - Collectors	1,638	24	24	5	5					0.00			Aug-07	2.3	0.888
	Surprise - Res Streets	455	0	48	30	30		0.80			0.80			Aug-07	2.3	0.888
109	Queen Creek - Arterials	4,550	15	51	15	7		12.04	17.79		29.83	31.88	28.31	May-07	2.6	0.888
	Queen Creek - Collectors	2,730	0	5	15	7		1.00	1.05		2.05			May-07	2.6	0.888
110	Gilbert - Arterials	4,572	256	256	15	15	51.20			0.39	51.59	85.82	12.26	Feb-08	1.8	0.143
	Gilbert - Collectors	2,275	300	300	15	15	29.86			0.46	30.32			Feb-08	1.8	0.143
	Gilbert - Res Streets	228	340	340	15	15	3.38			0.52	3.91			Feb-08	1.8	0.143
111	Gilbert - Arterials	4,576	256	256	15	15	51.25			0.39	51.65	85.87	12.27	Feb-08	1.8	0.143
	Gilbert - Collectors	2,275	300	300	15	15	29.86			0.46	30.32			Feb-08	1.8	0.143
	Gilbert - Res Streets	228	340	340	15	15	3.38			0.52	3.91			Feb-08	1.8	0.143
112	Chandler - Arterials	5,098	0	34.5	30	30		6.46			6.46	6.46	5.74	Jun-07	2.5	0.888
113	Cave Creek - Arterials	3,731	0	10	180	14		0.23	2.71		2.94	22.69	20.15	Jan-07	2.9	0.888
	Cave Creek - Collectors	1,593	0	20	180	30		0.20	0.98		1.17			Jan-07	2.9	0.888
	Cave Creek - Res Streets	228	0	25	180	60		0.03	0.07		0.10			Jan-07	2.9	0.888
	Cave Creek - Major Intersection	7,963	0	10	180	2		0.49	17.99		18.48			Jan-07	2.9	0.888
114	Goodyear - Collectors	655	65	65	21	14			1.12		1.12	1.73	1.59	Jan-08	1.9	0.919
	Goodyear - Res Streets	237	99	99	21	14			0.61		0.61			Jan-08	1.9	0.919
115	Fountain Hills - Arterials	4,550	85	85	15	15	16.92			0.13	17.05	31.59	28.06	Sep-07	2.3	0.888
	Fountain Hills - Collectors	1,820	140	140	45	30	3.72		3.12	0.11	6.94			Sep-07	2.3	0.888
	Fountain Hills - Res Streets	273	350	350	60	45	1.05		0.59	0.18	1.81			Sep-07	2.3	0.888
	Fountain Hills - Downtown	2,730	15	15	45	7	0.60		5.15	0.05	5.79			Sep-07	2.3	0.888
120	Chandler - Arterials	7,745	66	66	14	14	29.95				29.95	32.83	0.00	Jul-08	1.4	0.000
	Chandler - Collectors	1,201	15	15	30	30	1.22				1.22			Jul-08	1.4	0.000
	Chandler - Other	6,120	4	4	30	30	1.66				1.66			Jul-08	1.4	0.000
121	Surprise - Arterials	6,461	0	31	15	15		14.72			14.72	26.71	24.55	Mar-08	1.8	0.919
	Surprise - Collectors	3,185	0	37	15	15		8.66			8.66			Mar-08	1.8	0.919
	Surprise - Res Streets	546	0	166	30	30		3.33			3.33			Mar-08	1.8	0.919
122	Avondale - Arterials	8,190	91	97	7	7		7.38			7.38	9.10	8.36	Jul-08	1.4	0.919
	Avondale - Collectors	1,820	41	43	14	14		0.29			0.29			Jul-08	1.4	0.919
	Avondale - Res Streets	910	244	264	14	14		1.43			1.43			Jul-08	1.4	0.919
123	Queen Creek - Arterials	3,640	29	46	15	7		4.55	12.84		17.38	17.46	16.58	Dec-08	1.0	0.950
	Queen Creek - Res Streets	68	29	58	30	30		0.07			0.07			Dec-08	1.0	0.950
126	Mesa - Collectors	1,759	42	44	43	40		0.09	0.15		0.24	0.37	0.35	May-09	0.6	0.950
	Mesa - Res Streets	182	225	235	43	40		0.05	0.08		0.13			May-09	0.6	0.950
	Mesa - Other	109	5	5	43	40			0.00		0.00			May-09	0.6	0.950
127	Paradise Valley - Arterials	6,825	18	18	15	15			0.00		0.00	0.29	0.28	Feb-09	0.8	0.950
	Paradise Valley - Collectors	364	15	15	35	28			0.04		0.04			Feb-09	0.8	0.950
	Paradise Valley- Res Streets	319	100	100	35	28			0.25		0.25			Feb-09	0.8	0.950
131	Maricopa County - Arterials	364	0	534	14	14		15.31			15.31	24.51	23.28	Jun-09	0.5	0.950
	Maricopa County - Res Streets	364	0	367	16	16		9.20			9.20			Jun-09	0.5	0.950
132	Maricopa County - Arterials	364	0	534	14	14		15.31			15.31	24.51	23.28	Jun-09	0.5	0.950
	Maricopa County - Res Streets	364	0	367	16	16		9.20			9.20			Jun-09	0.5	0.950
133	ASU - Res Streets	2,527	17	29.32	1	1	4.76	7.86		0.67	13.29	21.25	20.19	Apr-09	0.7	0.950
	ASU - Pedestrian Paths	4,095	10.04	13.04	1	1	4.55	3.10		0.30	7.96			Apr-09	0.7	0.950

CMAQ Funded PM-10 Certified Street Sweepers Purchased in 2001-2009							PM-10 Emission Reductions (kg/day)									
Sweeper		AADT Per	Lane	Lane	Cycle	Cycle					Total	Reduction	Benefit with	Month of	Age in	Usage
#	Agency Requesting Sweeper	Lane	MIles Old	Miles New	LenOld	LenNew	Replace	Expand	Incr Freq	Process	Reduction	by Unit	Usage Factor	Purchase	Dec-09	Factor
145	Scottsdale - Arterials	5,897	44	44	7	7	20.84				20.84	41.47	0.00	Apr-09	0.7	0.000
	Scottsdale - Collectors	3,898	62	62	7	7	19.41				19.41			Apr-09	0.7	0.000
	Scottsdale - Res Streets	91	108	108	25	25	1.21				1.21			Apr-09	0.7	0.000
Total purchased through December 31, 2009							2,756.22	919.95	1,570.24	25.35	5,271.77	5,271.77	2,939.89	kg/day	1,182.83	tons/yr
									Sweepers purchased 1/1/01-12/31/06				2,559.12	kg/day	1,029.63	tons/yr
									Sweepers purchased 1/1/07-12/31/09				380.77	kg/day	153.20	tons/yr

Notes:

(1) Missing sweeper #s in column A represent units that were purchased with CMAQ funds, but were no longer in service as of December 31, 2009

(2) EFs are based on the Jan 2011 AP-42 Paved Road equation; EFs for Arterials <10,000 ADT (0.71 g/mi) and ≥10,000 ADT (0.23 g/mi) were weighted by 2008 VMT to obtain 0.35 g/mi for all arterials

(3) If Benefits with Usage Factor = 0.00, the sweeper is replacing an older PM-10 certified sweeper and no credit is taken

APPENDIX C

APPENDIX C

EXHIBIT 1:

Arizona Revised Statutes Listed in Table 4-1

ARIZONA REVISED STATUTES LISTED IN TABLE 4-1

9-500.04. Air quality control; definitions

A. The governing body of a city or town in area A or area B as defined in section 49-541 shall:

3. In area A, beginning on January 1, 2008, develop and implement plans to stabilize targeted unpaved roads, alleys and unpaved shoulders on targeted arterials. The plans shall address the performance goals, the criteria for targeting the roads, alleys and shoulders, a schedule for implementation, funding options and reporting requirements. priority shall be given to the following:

(a) Unpaved roads with more than one hundred average daily trips.

(b) Unpaved shoulders on arterial roads and other road segments where vehicle use on unpaved shoulders is evident or anticipated due to projected traffic volume.

5. In area A, in order to reduce particulate matter in ambient air:

(a) Beginning March 31, 2008, on any high pollution advisory day forecast by the department of environmental quality prohibit employees or contractors of that city or town from operating leaf blowers except while in vacuum mode and prohibit those employees or contractors from blowing landscape debris into public roadways at any time.

(b) No later than March 31, 2008, adopt, implement and enforce an ordinance that bans the blowing of landscape debris into public roadways at any time by any person.

6. In area A, no later than March 31, 2008, adopt or amend codes or ordinances and, no later than October 1, 2008, commence enforcement of those codes or ordinances as necessary to require that parking, maneuvering, ingress and egress areas at developments other than residential buildings with four or fewer units are maintained with one or more of the following dustproof paving methods:

(a) Asphaltic concrete.

(b) Cement concrete.

(c) Penetration treatment of bituminous material and seal coat of bituminous binder and a mineral aggregate.

(d) A stabilization method approved by the city or town.

7. In area A, no later than March 31, 2008, adopt or amend codes or ordinances and, no later than October 1, 2009, commence enforcement of those codes or ordinances as necessary to require that parking, maneuvering, ingress and egress areas that are three thousand square feet or more in size at residential buildings with four or fewer units are maintained with a paving or stabilization method authorized by the city or town by code, ordinance or permit.

8. In area A, no later than March 31, 2008, adopt or amend codes or ordinances as necessary to restrict vehicle parking and use on unpaved or unstabilized vacant lots.

9. In area A, no later than March 31, 2008, require that new or renewed contracts for street sweeping on city streets must be conducted with street sweepers that meet the south coast air quality management district rule 1186 street sweeper certification specifications for pick up efficiency and PM-10 emissions in effect on January 1, 2007.

H. Subsection A, paragraphs 5 through 8 of this section do not apply to any site that

has a permit issued by a control officer as defined in section 49-471 for the control of fugitive dust from dust generating operations.

9-500.27. Off-road vehicle ordinance; applicability; violation; classification

A. No later than March 31, 2008, in area A, as defined in section 49-541, a city or town shall adopt, implement and enforce an ordinance that prohibits the operation of any vehicle, including an off-highway vehicle, an all-terrain vehicle or an off-road recreational motor vehicle, on an unpaved surface that is not a public or private road, street or lawful easement and that is closed by the landowner by rule or regulation of a federal agency, this state, a county or a municipality or by proper posting if the land is private land.

B. This section does not apply to the operation of vehicles used in the normal course of business or the normal course of government operations.

C. This section does not prohibit or preempt the enforcement of any similar ordinance that is adopted by a city or town in area A, as defined in section 49-541, before March 31, 2008 for purposes of dust abatement.

D. A person who violates an ordinance adopted pursuant to subsection A of this section is guilty of a class 3 misdemeanor.

E. In addition to or in lieu of a fine pursuant to this section, a judge may order the person to perform at least eight but not more than twenty-four hours of community restitution or to complete an approved safety course related to the off-highway operation of motor vehicles, or both.

11-871. Emissions control; no burn; exemptions; penalty

A. A county that contains any part of area A, as defined in section 49-541, shall develop, implement, and enforce in area A, as defined in section 49-541, an ordinance relating to residential wood burning restrictions, including a no burn restriction when monitoring or forecasting by the department of environmental quality predicts the carbon monoxide standard is likely to be exceeded.

B. On or before October 31, 2007, a county that contains any part of area A, as defined in section 49-541, shall amend the ordinance prescribed by subsection A of this section to include a no burn restriction for any high pollution advisory day forecast by the department of environmental quality for particulate matter.

D. The ordinance shall provide that a person who violates an ordinance adopted pursuant to this section is subject to:

4. The imposition of a civil penalty of two hundred fifty dollars for the fourth or any subsequent violation.

11-877. Air quality control measures

A. In order to reduce particulate matter in ambient air, the board of supervisors of any county that contains any portion of area A, as defined in section 49-541, shall develop, implement and enforce in area A the following air quality control measures:

1. Beginning on the effective date of this section, prohibit employees or contractors of that county from operating leaf blowers on any high pollution advisory day forecast by the department of environmental quality except while in vacuum mode and prohibit those employees or contractors from blowing landscape debris into public roadways at any time.

2. No later than March 31, 2008, adopt, implement and enforce an ordinance that bans the blowing of landscape debris into public roadways at any time by any person.

3. No later than March 31, 2008, adopt, implement and enforce an ordinance that

prohibits the operation of leaf blowers except on surfaces that have been stabilized with asphaltic concrete, cement concrete, hardscape, penetration treatment of bituminous material and seal coat of bituminous binder and a mineral aggregate, decomposed granite cover, crushed granite cover, aggregate cover, gravel cover, or grass or other continuous vegetative cover, or any combination of those stabilizers.

B. This section does not apply to any site that has a permit issued by a control officer as defined in section 49-471 for the control of fugitive dust from dust generating operations.

28-1098. Vehicle loads; restrictions; civil penalties

A. For the purpose of highway safety or air pollution prevention, a person shall not drive or move a vehicle on a highway unless the vehicle is constructed or loaded in a manner to prevent any of its load from dropping, sifting, leaking or otherwise escaping from the vehicle, except the following are permitted:

1. Sufficient sand may be dropped for the purpose of securing traction.

2. Water or another substance may be sprinkled on a roadway in cleaning or maintaining the roadway.

3. Minor pieces of agricultural materials such as leaves and stems from agricultural loads.

C. If a person is found in violation of this section and the violation:

1. Does not cause any damage or injury and is the person's:

(a) First violation in a sixty month period, the person is subject to a civil penalty of not more than two hundred fifty dollars.

(b) Second or subsequent violation in a sixty month period, the person is subject to a civil penalty of not more than three hundred fifty dollars.

49-424. Duties of department

The department shall:

11. Develop and disseminate air quality dust forecasts for the Maricopa county PM-10 nonattainment area. Each forecast shall identify a low, moderate or high risk of dust generation for the next five consecutive days and shall be issued by noon on each day the forecast is generated. At a minimum, the forecasts shall be posted on the department's website and distributed electronically. When developing these forecasts, the department shall consider all of the following:

(a) Projected meteorological conditions for the Maricopa county area, including all of the following:

(i) Wind speed and direction.

(ii) Stagnation.

(iii) Recent precipitation.

(iv) Potential for precipitation.

(b) Existing concentrations of air pollution at the time of the forecast.

(c) Historic air pollution concentrations that have been observed during meteorological conditions similar to those that are predicted to occur in the forecast.

49-457.01. Leaf blower use restrictions and training; leaf blower equipment sellers; informational material; outreach; applicability

A. This section applies in a county with a population of two million or more persons or any portion of a county within an area designated by the environmental protection

agency as a serious PM-10 nonattainment area or a maintenance area that was designated as a serious PM-10 nonattainment area.

B. After March 31, 2008, no person may use a leaf blower to blow landscape debris into public roadways.

C. After March 31, 2008, no person may operate a leaf blower except on surfaces that have been stabilized with asphaltic concrete, cement concrete, hardscape, penetration treatment of bituminous material and seal coat of bituminous binder and a mineral aggregate, decomposed granite cover, crushed granite cover, aggregate cover, gravel cover, or grass or other continuous vegetative cover, or any combination of those stabilizers.

D. At least once every three years, any person operating a leaf blower for remuneration shall successfully complete training approved by the department on how to operate a leaf blower in a manner designed to minimize the generation of fugitive dust emissions. Any person who is required to be trained under this subsection shall complete initial training no later than December 31, 2008.

E. Any person who rents or sells in the normal course of business equipment that is used for blowing landscape debris shall provide to the buyer or renter of the equipment printed materials that are approved by the department pursuant to this section.

F. The department shall produce printed materials and distribute those materials to persons who sell or rent equipment used for blowing landscape debris. The printed materials shall be designed to educate and inform the user of the equipment on the safe and efficient use of the equipment, including methods for reducing the generation of dust, and shall include information regarding dust control ordinances and restrictions that may be applicable.

G. This section does not apply to any site that has a permit issued by a control officer as defined in section 49-471 for the control of fugitive dust from dust generating operations.

49-457.03. Off-road vehicles; pollution advisory days; applicability; penalties

A. In area A, as defined in section 49-541, a person shall not operate an off-highway vehicle, an all-terrain vehicle or an off-road recreational motor vehicle on an unpaved surface that is not a public or private road, street or lawful easement during any high pollution advisory day forecast for particulate matter by the department.

B. This section does not apply to:

1. An event that is intended for off-highway vehicles, all-terrain vehicles or off-road recreational motor vehicles and that is endorsed, authorized, permitted or sponsored by a public agency, that occurs on a designated route or area and that includes dust abatement measures at all staging areas, parking areas and entrances.

2. An event that occurs at a facility for which an admission or user fee is charged and that includes dust abatement measures.

3. A closed course that is maintained with dust abatement measures.

4. An off-highway vehicle, all-terrain vehicle or off-road recreational motor vehicle used in the normal course of business or the normal course of government operations.

5. Golf carts that are used as part of a private or public golf course operation.

C. A person who violates this section is subject to:

1. A warning for the first violation.

2. The imposition of a civil penalty of fifty dollars for the second violation.

3. The imposition of a civil penalty of one hundred dollars for the third violation.

4. The imposition of a civil penalty of two hundred fifty dollars for the fourth or any subsequent violation.

D. For violations of this section, the control officer or other enforcement officer shall use a uniform civil ticket and complaint substantially similar to a uniform traffic ticket and complaint prescribed by the rules of procedure in civil traffic cases adopted by the supreme court. The control officer or other enforcement officer may issue citations to persons in violation of this section.

49-457.04. Off-highway vehicle and all-terrain vehicle dealers; informational material; outreach; applicability

A. Any person who rents or sells in the normal course of business off-highway vehicles, all-terrain vehicles or off-road recreational motor vehicles, other than golf carts sold to public or private golf courses, shall provide to the buyer or renter of the vehicle printed materials that are approved by the department pursuant to this section.

B. The department shall produce printed materials and distribute those materials to persons who sell or rent off-highway vehicles, all-terrain vehicles or off-road recreational motor vehicles. The printed materials shall be designed to educate and inform the user of the vehicle on methods for reducing the generation of dust and shall include information regarding dust control ordinances and restrictions that may be applicable. The department shall make available on the department's website the printed materials in a format that is accessible to the public.

C. This section applies in a county with a population of two million or more persons or any portion of a county in an area designated by the environmental protection agency as a serious PM-10 nonattainment area or a maintenance area that was designated as a serious PM-10 nonattainment area.

49-457.05. Dust action general permit; best management practices; applicability; definitions

A. This section applies in a county with a population of two million or more persons or any portion of a county within an area designated by the environmental protection agency as a serious PM-10 nonattainment area or a maintenance area that was designated as a serious PM-10 nonattainment area.

B. The director shall issue a dust action general permit for regulated activities, which shall specify the best management practices necessary to reduce or to prevent PM-10 particulate emissions as soon as practicable before and during a day that is forecast to be at high risk of dust generation under a forecast issued by the department pursuant to section 49-424.

C. A person that has a permit issued by the director or a control officer for the control of fugitive dust from dust-generating operations is not required to obtain a dust action general permit under subsection D of this section, except that the person shall implement the control measures required in the permit issued by the director or control officer, including those measures related to wind, to reduce or to prevent PM-10 particulate emissions as soon as practicable before and during a day that is forecast to be at high risk of dust generation under a forecast issued by the department pursuant to section 49-424. Failure to implement a control measure under this subsection shall only be enforced by the

director or control officer that issued the permit. The director or control officer shall not recover penalties for violations of both this subsection and the permit based on the same act or omission.

D. A dust action general permit may be required for any person that owns or conducts a dust-generating operation that is found by the director to have failed to choose and implement an applicable best management practice listed in the dust action general permit as soon as practicable before and during a day that is forecast to be at high risk of dust generation.

I. For the purposes of this section:

1. "Applicable implementation plan" means that term as defined in 42 United States Code section 7602(q).

2. "Best management practices" means techniques that are verified by scientific research and that on a case-by-case basis are practical, economically feasible and effective in reducing PM-10 particulate emissions from a regulated activity.

3. "Control officer" has the same meaning prescribed in section 49-471.

4. "Disturbed surface area" means a portion of the earth's surface or material that is placed on the earth's surface that has been physically moved, uncovered, destabilized or otherwise modified from its undisturbed native condition if the potential for the emission of fugitive dust is increased by the movement, destabilization or modification.

5. "Dust-generating operation" means disturbed surface areas, including those of open areas or vacant lots that are not defined as agricultural land and are not used for agricultural purposes according to sections 42-12151 and 42-12152, or any other area or activity capable of generating fugitive dust, including the following:

(a) Land clearing, maintenance and land clean up using mechanized equipment.

(b) Earthmoving.

(c) Weed abatement by discing or blading.

(d) Excavating.

(e) Construction.

(f) Demolition.

(g) Bulk material handling, including hauling, transporting, stacking, loading and unloading operations.

(h) Storage or transporting operations, including storage piles.

(i) Operation of outdoor equipment.

(j) Operation of motorized machinery.

(k) Establishing or using staging areas, parking areas, material storage areas or access routes.

(l) Establishing or using unpaved haul or access roads.

(m) Installing initial landscapes using mechanized equipment.

6. "Fugitive dust" means particulate matter that could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening, that can be entrained in the ambient air and that is caused by human or natural activities, including the movement of soil, vehicles, equipment, blasting and wind. Fugitive dust does not include particulate matter emitted directly from the exhaust of motor vehicles and other internal combustion engines, from portable brazing, soldering or welding equipment or from pile drivers.

7. "Regulated activity" means all dust-generating operations except for the following:

(a) Normal farm cultural practices as prescribed in section 49-504, paragraph 4 or section 49-457.

(b) Emergency activities that may disturb the soil and that are conducted by any utility or government agency in order to prevent public injury or to restore critical utilities to a functional status.

(c) Establishment of initial landscapes without the use of mechanized equipment, conducting landscape maintenance without the use of mechanized equipment and playing on or maintaining a field used for nonmotorized sports, except that these activities shall not include grading or trenching performed to establish initial landscapes or to redesign existing landscapes.

(d) Rooftop operations for cutting, drilling, grinding or coring roofing tile if that activity is occurring on a pitched roof.

49-474.01. Additional board duties in vehicle emissions control areas; definitions

A. The board of supervisors of a county which contains any portion of area A or area B as defined in section 49-541 shall:

4. In area A, beginning January 1, 2008, develop and implement plans to stabilize targeted unpaved roads, alleys and unpaved shoulders on targeted arterials. The plans shall address the performance goals, the criteria for targeting the roads, alleys and shoulders, a schedule for implementation, funding options and reporting requirements. Priority shall be given to the following:

(a) Unpaved roads with more than one hundred average daily trips.

(b) Unpaved shoulders on arterial roads and other road segments where vehicle use on unpaved shoulders is evident or anticipated due to projected traffic volume.

5. In a county with a population of two million or more persons or any portion of a county in an area designated by the environmental protection agency as a serious PM-10 nonattainment area or a maintenance area that was designated as a serious PM-10 nonattainment area, no later than March 31, 2008, adopt or amend codes or ordinances and, no later than October 1, 2008, commence enforcement of those codes or ordinances as necessary to require that parking, maneuvering, ingress and egress areas at developments other than residential buildings with four or fewer units are maintained with one or more of the following dustproof paving methods:

(a) Asphaltic concrete.

(b) Cement concrete.

(c) Penetration treatment of bituminous material and seal coat of bituminous binder and a mineral aggregate.

(d) A stabilization method approved by the county.

6. In a county with a population of two million or more persons or any portion of a county in an area designated by the environmental protection agency as a serious PM-10 nonattainment area or a maintenance area that was designated as a serious PM-10 nonattainment area, no later than March 31, 2008, adopt or amend codes or ordinances and, no later than October 1, 2009, commence enforcement of those codes or ordinances as necessary to require that parking, maneuvering, ingress and egress areas three thousand square feet or more in size at residential buildings with four or fewer units are maintained with a paving or stabilization method authorized by the county by code, ordinance or permit.

7. In area A, no later than March 31, 2008, adopt or amend codes or ordinances as necessary to restrict vehicle parking and use on unpaved or unstabilized vacant lots.

8. In area A, require that new or renewed contracts for street sweeping on city streets must be conducted with street sweepers that meet the south coast air quality management district rule 1186 street sweeper certification specifications for pick up efficiency and PM-10 emissions in effect on January 1, 2007.

11. In a county with a population of two million or more persons or any portion of a county within an area designated by the environmental protection agency as a serious PM-10 nonattainment area or a maintenance area that was designated as a serious PM-10 nonattainment area, no later than March 31, 2008, adopt rule provisions, and, no later than October 1, 2008, commence enforcement of those rule provisions regarding the stabilization of disturbed surfaces of vacant lots that include the following:

(a) Reasonable written notice to the owner or the owner's authorized agent or the owner's statutory agent that the unpaved disturbed surface of a vacant lot is required to be stabilized. The notice shall be given not less than thirty days before the day set for compliance and shall include a legal description of the property and the estimated cost to the county for the stabilization if the owner does not comply. The notice shall be either personally served or mailed by certified mail to the owner's statutory agent, to the owner at the owner's last known address or to the address to which the tax bill for the property was last mailed.

(b) Authority for the county to enter the lot to stabilize the disturbed surface at the expense of the owner if the vacant lot has not been stabilized by the day set for compliance.

(c) Methods for stabilization of the disturbed surface of the vacant lot, the actual cost of stabilization and the fine that may be imposed for a violation of this section.

B. For the purposes of subsection A, paragraph 11 of this section:

1. "Disturbed surface" means a portion of the earth's surface or material placed on the earth's surface that has been physically moved, uncovered, destabilized or otherwise modified from its undisturbed native condition if the potential for the emission of fugitive dust is increased by the movement, destabilization or modification.

2. Vacant lots do not include any site of disturbed surface area that is subject to a permit issued by a control officer that requires control of PM-10 emissions from dust generating operations.

H. Subsection A, paragraphs 5, 6 and 7 of this section do not apply to any site that has a permit issued by a control officer as defined in section 49-471 for the control of fugitive dust from dust generating operations.

49-474.05. Dust control; training; site coordinators

A. This section applies in a county with a population of two million or more persons or any portion of a county in an area designated by the environmental protection agency as a serious PM-10 nonattainment area or a maintenance area that was designated as a serious PM-10 nonattainment area.

B. No later than January 1, 2008, the control officer shall develop and implement basic and comprehensive training programs for the suppression of PM-10 emissions from sources of PM-10 that are subject to a permit issued by a control officer that requires control of PM-10 emissions from dust generating operations. The control officer may

approve training developed and provided by a third party and the board of supervisors may adopt rules prescribing standards for dust control training.

C. At least once every three years, the following persons are required to successfully complete basic dust control training:

1. The site superintendent or other designated on-site representative of the permit holder if present at a site that has more than one acre of disturbed surface area that is subject to a permit issued by a control officer requiring control of PM-10 emissions from dust generating operations.

2. Water truck and water pull drivers.

D. Persons who are required to be trained under this section shall complete the training no later than December 31, 2008. All persons who have successfully completed training during the 2006 and 2007 calendar years are deemed to have satisfied this requirement if the training program completed was conducted or approved by a county air pollution control officer. Completion of the training required under subsection G satisfies the requirements of this subsection.

E. No later than June 30, 2008, the permittee for any site of five acres or more of disturbed surface area subject to a permit issued by a control officer requiring control of PM-10 emissions from dust generating operations shall have on site at least one dust control coordinator trained in accordance with this section at all times during primary dust generating operations related to the purposes for which the dust control permit was obtained.

F. A dust control coordinator has full authority to ensure that dust control measures are implemented on site, including conducting inspections, deployment of dust suppression resources and modification or shutdown of activities as needed to control dust. The dust control coordinator shall be responsible for managing dust prevention and dust control on the site.

G. At least once every three years, the dust control coordinator shall successfully complete a comprehensive dust control class conducted or approved under subsection A by the county air pollution control officer with jurisdiction over the site. The dust control coordinator shall have a valid dust training certification identification card readily accessible on site while acting as a dust control coordinator. All persons having successfully completed training during the 2006 and 2007 calendar years are deemed to have satisfied this requirement if the training program completed was conducted or approved by a county air pollution control officer.

H. Subsections C and D do not apply when on-site dust generating operations are conducted by a permittee who is required to obtain a single permit for multiple noncontiguous sites that is issued by a control officer and that requires control of PM-10 emissions.

I. The requirements of subsections E and F lapse if all of the following apply:

1. The area of the disturbed surface area is less than five acres.

2. The previously disturbed areas are stabilized in accordance with the requirements of applicable rules.

3. The permittee provides notice of the acreage stabilized to the control officer.

J. Permittees who are required to obtain a single permit for multiple noncontiguous sites that is issued by a control officer and that requires control of PM-10 emissions from

dust generating operations shall have on sites with greater than one acre of disturbed surface area at least one individual who is designated by the permittee as a dust control coordinator trained in accordance with subsection C. The dust control coordinator shall be present on site at all times during primary dust generating activities that are related to the purposes for which the permit was obtained. This subsection does not apply to permittees subject to subsections B and C.

49-474.06. Dust control; subcontractor registration; fee

A. In an area designated by the environmental protection agency as a serious PM-10 nonattainment area or a maintenance area that was designated as a serious PM-10 nonattainment area, a subcontractor who is engaged in dust generating operations at a site that is subject to a permit that is issued by a control officer and that requires control of PM-10 emissions from dust generating operations shall register with the control officer by submitting information in the manner prescribed by the control officer. The control officer shall issue a registration number after payment of the fee authorized under subsection C.

B. The subcontractor shall have its registration number readily accessible on site while conducting any dust generating operations.

C. The control officer may establish and assess a fee for the registration required under subsection a based on the total cost of processing the registration and issuance of a registration number.

49-501. Unlawful open burning; exceptions; fine; definition

A. Notwithstanding the provisions of any other section of this article:

2. From May 1 through September 30 each year, it is unlawful for any person to ignite, cause to be ignited, permit to be ignited or suffer, allow or maintain any open outdoor fire in area A as defined in section 49-541.

B. The following fires are excepted from this section:

1. Fires used only for cooking of food or for providing warmth for human beings or the branding of animals or the use of orchard heaters for the purpose of frost protection in farming or nursery operations.

C. Permission for the setting of any fire given by a public officer in the performance of official duty under sebsection B, paragraph 2, 3 or 4 of this section shall be given in writing and a copy of the written permission shall be transmitted directly to the director of environmental quality and the control officer of the county, district or region in which such fire is allowed. The setting of any such fire shall be conducted in a manner and at such time as approved by the control officer or the director of environmental quality, unless doing so would defeat the purpose of the exemption.

F. Nothing in this section is intended to permit any practice which is a violation of any statute, ordinance, rule or regulation in a county with a population in excess of one million two hundred thousand persons. Notwithstanding any other law, such a county shall prohibit by ordinance the use of wood burning chimineas, outdoor fire pits and similar outdoor fires on those days for which the county has issued a no burn day restriction.

G. A person who violates any provision of this section may be served a notice of violation and be subject to the enforcement provisions of this article to the same extent as a person violating any rule or regulation adopted pursuant to this article, except that a violation that lasts no more than twenty-four hours and that is the first violation committed by that person is subject to a civil penalty of no more than five hundred dollars.

49-541. Definitions

In this article, unless the context otherwise requires:

1. "Area A" means the area delineated as follows:

(a) In Maricopa county:

Township 8 north, range 2 east and range 3 east
Township 7 north, range 2 west through range 5 east
Township 6 north, range 5 west through range 6 east
Township 5 north, range 5 west through range 7 east
Township 4 north, range 5 west through range 8 east
Township 3 north, range 5 west through range 8 east
Township 2 north, range 5 west through range 8 east
Township 1 north, range 5 west through range 7 east
Township 1 south, range 5 west through range 7 east
Township 2 south, range 5 west through range 7 east
Township 3 south, range 5 west through range 1 east
Township 4 south, range 5 west through range 1 east

(b) In Pinal county:

Township 1 north, range 8 east and range 9 east
Township 1 south, range 8 east and range 9 east
Township 2 south, range 8 east and range 9 east
Township 3 south, range 7 east through range 9 east

(c) In Yavapai county:

Township 7 north, range 1 east and range 1 west through range 2 west
Township 6 north, range 1 east and range 1 west

APPENDIX C

EXHIBIT 2:

Maricopa County Resolution to Evaluate Measures in the MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area

RESOLUTION TO EVALUATE MEASURES IN THE MAG 2012 FIVE PERCENT PLAN FOR PM_{10} FOR THE MARICOPA COUNTY NONATTAINMENT AREA

C·85·12·006·M·00

WHEREAS, Maricopa Association of Governments (MAG) has been designated by the Governor of Arizona, as the regional air quality planning agency in Maricopa County; and

WHEREAS, the Maricopa County nonattainment area is classified as a Serious Nonattainment Area for PM_{10} particulate matter according to the Clean Air Act; and

WHEREAS, the Clean Air Act required the Maricopa County nonattainment area to attain the PM_{10} particulate matter standard by December 31, 2006; and

WHEREAS, the Maricopa County nonattainment area failed to attain the PM_{10} particulate matter standard by December 31, 2006; and

WHEREAS, due to the Maricopa County nonattainment areas failure to meet the PM_{10} particulate matter standard MAG as the regional air quality planning agency is required to develop a plan to reduce PM_{10} emissions by five percent per year until the standard is met ("the Five Percent Plan"); and

WHEREAS, the Five Percent Plan contains innovative control measures implemented in 2011 and existing dust control rules to reduce PM_{10} particulate matter emissions which must be retrospectively assessed to evaluate the effectiveness of such measures; and

WHEREAS, Arizona Revised Statutes 49-406 G. requires that each agency that commits to implement a control measure describe that commitment in a resolution adopted by the governing body which specifies its authority for implementing the measures as provided in statute, ordinance, or rule; a program for enforcement of the measure; and the level of personnel and funding allocated to the implementation of the measure; and

WHEREAS, Maricopa County is responsible for tracking emissions from point, area and non-road mobile sources and for tracking implementation of control measures in the 1992 Memorandum of Agreement developed under Arizona Revised Statutes § 49-406 (F).

NOW, THEREFORE BE IT RESOLVED BY THE BOARD OF SUPERVISORS, MARICOPA COUNTY (BOARD) as follows:

SECTION 1. That the BOARD agrees to proceed with a good faith effort to implement the commitment identified in Exhibit A, which is part of this resolution.

SECTION 2. That the BOARD commits to implement the measures as scheduled and with the funding sources identified. Recognizing, however, that the availability of necessary funding may depend on the funding programs or processes of various state and federal agencies, Maricopa County agrees to consider modifications of the funding or schedules for implementation actions, if necessary. Maricopa County agrees to submit any modification to the commitments in Exhibit A to EPA for approval as a SIP revision.

PASSED AND ADOPTED by the Board of Supervisors of Maricopa County, Arizona, this 16th day of November 2011.

Andy Kunasek, Chairman

ATTEST:

Clerk of the Board

MARICOPA COUNTY COMMITMENT 1

Commitment Title: Evaluation of New Innovative Control Measures and Existing Maricopa County Control Measures

County Measure Description: Develop and assess the effectiveness of the innovative control program implemented through the dust generation forecast and dust action general permit on permitted and unpermitted sources of PM_{10} in Maricopa County on forecast high risk days. Perform a rule effectiveness study on the implementation of existing dust control rules.

Responsible Agency and Authority for Implementation: The Maricopa County Board of Supervisors is authorized by A.R.S. § 49-479 to adopt rules for air pollution control and by A.R.S. § 49-480 to establish, administer and enforce a program for air quality permits. The Board adopted rules establishing an air quality permit program and pursuant to A.R.S. § 49-473, designated the Air Quality Department to issue permits and administer and enforce the permit program. In the Memorandum of Agreement developed in 1992 under A.R.S. § 49-406 (F), Maricopa County is responsible for tracking emissions from point, area and non-road mobile sources and for tracking the implementation control measures. By operation of A.R.S. § 49-471, the executive head of the department designated under A.R.S. § 49-473 serves as the Air Pollution Control Officer. The Air Pollution Control Officer is specifically authorized to take the enforcement actions set forth in A.R.S. §§ 49-502, 49-511, 49-512 and 49-513. A.R.S. § 474.01 (A)(11) requires adoption of rule provisions by March 31, 2008, and enforcement of the provisions by October 1, 2008, regarding stabilization of disturbed surfaces of vacant lots.

Implementation Schedule: The Air Quality Department in consultation with the U. S. Environmental Protection Agency (EPA) completed a rule effectiveness study analyzing the impact of Rules 310, 310.01 and 316 for the 2008 PM_{10} Periodic Emissions Inventory contained in the appendix of the MAG 2012 Five Percent Plan for PM_{10} for the Maricopa County Nonattainment Area. The department in consultation with EPA will use a similar approach and process with an appropriate temporal period to evaluate the new innovative control measures such as the dust generation forecast and dust action general permit. The Air Quality Department will conduct the program evaluations as follows:

Initial Evaluation:

January 2013	Initiate evaluation process for new innovative control measures and existing rule effectiveness studies.
March 2013	Complete draft program evaluation reports.
April 2013	Complete final program evaluation reports.

Periodic Evaluation: The department will reevaluate the effectiveness of the new innovative control measures as part of the periodic emissions inventory required by EPA every three years.

Level of Personnel and Funding Allocated for Implementation: Level of Personnel and Funding Allocated for Implementation:

Program evaluations will be accommodated as part of the air quality compliance, enforcement and planning processes and will be coordinated by the Maricopa County Air Quality Department's existing Planning and Analysis Division.

The Maricopa County Air Quality Department administers the air quality program in Maricopa County. Currently the department has 140.6 employees. The Maricopa County Air Quality Department's FY 2010-11 revenue was approximately $15.3 million. No change in funding is anticipated for these program evaluations.

Enforcement Program:

The Air Quality Department's enforcement options for regulatory programs include orders of abatement, civil actions for injunctive relief or civil penalties, and filing a class 1 misdemeanor citation. Senate Bill 1552 authorizes the county to enter the lot to stabilize the disturbed surface, issue notices of violation, and collect monetary penalties that include the cost of stabilization.

Monitoring Program:

As noted above, the Air Quality Department will assess and evaluate the effectiveness of the new innovative measures as well as the complete rule effectiveness studies for the existing Rules 310, 310.01 and 316.

APPENDIX C

EXHIBIT 3:

Arizona Department of Environmental Quality Dust Action General Permit

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
Air Quality Division
1110 West Washington Street • Phoenix, AZ 85007 • Phone: (602) 771-2308

DUST ACTION GENERAL PERMIT

(As required by Arizona Revised Statutes, Title 49, Chapter 3, Article 2, Section 49-457.05)

This air quality control permit does not relieve applicant of responsibility for meeting all air pollution regulations

THIS GENERAL PERMIT ISSUED SUBJECT TO THE FOLLOWING **Conditions contained in Attachments "A", "B" and "C"**

ADEQ GENERAL PERMIT NUMBER **NA** EXPIRATION DATE **December 30, 2016**

PERMIT ISSUED THIS **30th** DAY OF **December, 2011**

Eric C. Massey, Director, Air Quality Division
SIGNATURE TITLE

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DUST ACTION GENERAL PERMIT

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DUST ACTION GENERAL PERMIT

INTRODUCTION

Since the start of Calendar Year 2008, the majority of exceedances of the PM_{10} National Ambient Air Quality Standard (NAAQS) in the Maricopa County serious PM_{10} nonattainment area have been related to high wind events. High wind events, along with a number of other meteorological conditions that can lead to the generation of dust can be predicted through meteorological forecasts.

In accordance with A.R.S. § 49-424(11), ADEQ is developing and disseminating an air quality dust forecast for the Maricopa County serious PM_{10} nonattainment area. Based upon knowledge of historical and recent meteorological conditions, and the prediction of such factors as wind speed and wind direction, forecasts identify the potential risk of dust entrainment as "Low", "Moderate" or "High" for the next five consecutive days. ADEQ updates this five-day *Maricopa County Dust Control Forecast* every Sunday through Friday, and posts it on its website at http://www.azdeq.gov/environ/air/ozone/mcdust.pdf.

In accordance with A.R.S. § 49-457.05, this Dust Action General Permit identifies a series of Best Management Practices (BMPs) for specific dust generating operations. When ADEQ's Maricopa County Dust Control Forecast predicts that a day is at high risk for dust generation, those dust generating operations that are not already required to control dust through a permit issued by the Arizona Department of Environmental Quality (ADEQ) or the Maricopa County Air Quality Department (MCAQD) are expected to choose and implement at least one BMP to reduce or prevent PM_{10} emissions. Implementation of a BMP is expected to occur as soon as practicable before and during the high risk event. Although the BMPs in the Dust Action General Permit only apply to those sources that do not already have a permit, dust generating operations with an air quality permit are also expected to implement the dust controls in their permit at the same time.

According to statute, BMPs identified in the Dust Action General Permit are expected to be employed absent the requirement to obtain an air quality permit. If the owner or operator of a dust-generating operation is found by ADEQ's Director to have failed to choose and implement an applicable BMP as soon as practicable before and during a day that is forecast to be at high risk of dust generation, then the owner or operator can be required to obtain a Requirement to Operate (RTO) under the Dust Action General Permit. The process by which ADEQ's Director makes such a finding is identified within the Dust Action General Permit. Violations of the Dust Action General Permit are subject to the enforcement requirements of Arizona Revised Statutes Title 49, Chapter 3, Article 2, including civil penalties of up to ten thousand dollars per day, per violation, pursuant to Section 463.

In accordance with A.R.S. § 49-457.05(E) this Dust Action General Permit is subject to a 30-day public comment period and shall be effective for a period of five-years.

DUST ACTION GENERAL PERMIT

ATTACHMENT "A": GENERAL PROVISIONS

I. APPLICABILITY

A. This Dust Action General Permit is applicable to the owner or operator of a regulated activity within a county with a population of two million or more persons, or any portion of a county within areas designated by the environmental protection agency as a serious PM_{10} nonattainment area or a maintenance area that was previously designated as a serious PM_{10} nonattainment area who is required by the Director to obtain a general permit in accordance with Condition IV of this Attachment.

B. Each owner or operator of a regulated activity that is required by the Director to obtain this Dust Action General Permit shall obtain a Requirement to Operate that includes the following information:

1. The regulated activity;

2. The legal owner or operator of the regulated activity; and

3. The physical address, location, or parcel number where the regulated activity occurs.

C. Each Requirement to Operate (RTO) issued under this general permit shall only apply to those regulated activities that are identified pursuant to Section V of this attachment and in the RTO, are under the control of the same Permittee, and are located on one or more properties that are adjacent or contiguous to the location of the regulated activity.

II. DEFINITIONS

For the purposes of the Dust Action General Permit the following terms are defined as follows:

A. "Applicable implementation plan" means that term as defined in 42 United States Code section 7602(q).

B. "Best management practices" means techniques that are verified by scientific research and that on a case-by-case basis are practical, economically feasible and effective in reducing PM_{10} particulate emissions from a regulated activity.

C. "Control officer" has the same meaning prescribed in Arizona Revised Statutes § 49-471.

D. "Designated, managed or open trail system" means roads, highways, multiple use corridors, trails or routes that are part of a system of trails and routes that are designated, managed or opened to public motor vehicle travel by government land management agency by rule, order, travel management plan, sign, or map approved by such agency.

E. "Disturbed surface area" means a portion of the earth's surface or material that is placed on the earth's surface that has been physically moved, uncovered, destabilized or otherwise modified from its undisturbed native condition if the potential for the emission of fugitive dust is increased by the movement, destabilization or modification.

F. "Dust-generating operation" means disturbed surface areas, including those of open areas

or vacant lots that are not defined as agricultural land and are not used for agricultural purposes according to Arizona Revised Statutes §§ 42-12151 and 42-12152, or any other area or activity capable of generating fugitive dust, including the following:

1. Land clearing, maintenance and land clean-up using mechanized equipment.

2. Earthmoving.

3. Weed abatement by discing or blading.

4. Excavating.

5. Construction.

6. Demolition.

7. Bulk material handling, including hauling, transporting, stacking, loading and unloading operations.

8. Storage or transporting operations, including storage piles.

9. Operation of outdoor equipment.

10. Operation of motorized machinery.

11. Establishing or using staging areas, parking areas, material storage areas or access routes.

12. Establishing or using unpaved haul or access roads.

13. Installing initial landscapes using mechanized equipment.

G. “Dust Suppressant” means water, hygroscopic material, a solution of water and chemical surfactant, foam, non-toxic chemical stabilizer, or any other dust palliative, which is not prohibited for ground surface application by the Environmental Protection Agency (EPA) or the Arizona Department of Environmental Quality (ADEQ), or any applicable law, rule, or regulation, as a treatment material for reducing fugitive dust emissions.

H. "Fugitive dust" means particulate matter that could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening, that can be entrained in the ambient air and that is caused by human or natural activities, including the movement of soil, vehicles, equipment, blasting and wind. Fugitive dust does not include particulate matter emitted directly from the exhaust of motor vehicles and other internal combustion engines, from portable brazing, soldering or welding equipment or from pile drivers.

I. “Livestock special event” means displaying, racing, training or exercising livestock during an event at which a fee is collected, or is open to 24 or more persons including staff, participants and spectators, and is conducted at a facility specifically designed for this purpose and is not already subject to A.R.S. § 49-457.”

J. “Owner or operator” means any person who owns, leases, operates, controls, or supervises a regulated activity subject to the requirements of this general permit.

K. "Regulated activity" means all dust-generating operations except for the following:

1. Normal farm cultural practices as prescribed in A.R.S. §§ 49-504(4) or 49-457.

2. Emergency activities that may disturb the soil and that are conducted by any utility or government agency in order to prevent public injury or to restore critical utilities to a functional status.

3. Establishment of initial landscapes without the use of mechanized equipment, conducting landscape maintenance without the use of mechanized equipment and playing on or maintaining a field used for nonmotorized sports, except that these activities shall not include grading or trenching performed to establish initial landscapes or to redesign existing landscapes.

4. Rooftop operations for cutting, drilling, grinding or coring roofing tile if that activity is occurring on a pitched roof.

III. GENERAL PERMIT EXPIRATION, RENEWAL AND RE-OPENING

A. This Dust Action General Permit is valid for a period of five years from the date of issuance. The Director of ADEQ (Director) shall review and may renew this General Permit every five years from its date of issuance. The Permittee's RTOs shall coincide with the term of this General Permit, regardless of when the RTO was issued during this five year period. The Director may require an existing RTO to be renewed at the time that this General Permit is renewed.

B. The Director may periodically reexamine, evaluate and modify the Dust Action General Permit as prescribed in A.R.S. Section 49-426(H)(2) through (6). After approval by the Director, any modifications to the Dust Action General Permit shall be provided to the Control Officer and shall be submitted to the United States Environmental Protection Agency as a revision to the applicable State Implementation Plan.

C. At the time that the public notice is required, pursuant to issuance of the proposed General Permit renewal, the Director shall notify in writing all Permittees with existing RTOs that have been renewed. The written notice shall describe the source's duty to comply with the conditions of the General Permit.

IV. COMPLIANCE WITH PERMIT CONDITIONS

A. The Permittee shall comply with all Conditions of this General Permit including all applicable requirements of Arizona air quality statutes and the air quality rules. Any permit noncompliance constitutes a violation of the Arizona Revised Statutes and is grounds for enforcement action, including, but not limited to civil penalties. In addition, non-compliance with any federally enforceable requirements constitutes a violation of the Clean Air Act.

B. It shall not be a defense for a Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this General Permit.

V. ISSUANCE OF A DUST ACTION GENERAL PERMIT FOR CAUSE

A. The Director may require the owner or operator of a regulated activity to obtain a

Requirement to Operate under the Dust Action General Permit at any time if it can be demonstrated that:

1. The regulated activity is not otherwise subject to an air quality permit issued by the Director or the Maricopa County Air Quality Department Control Officer; and

2. The owner or operator of a regulated activity did not choose or implement a Best Management Practice as soon as practicable before and during a day forecast to be at high risk of dust generation.

B. A demonstration that the owner or operator of a regulated activity did not choose or implement a Best Management Practice shall include the following:

1. Documentation that includes a description of the regulated activity;

2. Documentation that clearly identifies the legal owner or operator of the regulated activity;

3. Documentation that clearly identifies the physical address(es), location(s), or parcel number(s) where the regulated activity occurred;

4. Documentation that includes records, field reports or photographic evidence that demonstrates that the owner or operator of the regulated activity was not implementing a Best Management Practice as soon as practicable before and during a day forecast to be at high risk of dust generation;

5. A description of the actions taken by the owner or operator of the regulated activity to comply with the required Best Management Practice(s) at the time of the inspection;

6. Documentation that identifies any previous inspections associated with the owner, operator, physical address(es), location(s), or parcel number(s) as well as results of those inspections; and

7. Documentation that demonstrates that the owner or operator of the regulated activity has been provided with a copy of the documentation identified in Condition III.B.1 through 6 above.

C. Upon receipt of a demonstration that the owner or operator of a regulated activity did not choose or implement a Best Management Practice, the Director shall:

1. Notify the owner or operator of the receipt of the demonstration; and

2. Provide the owner or operator with five (5) business days to demonstrate that a Best Management Practice was employed at the time of the inspection; or provide a document that identifies the Best Management Practice(s) that will be employed at the address(es), location(s), or parcel number(s) identified in the Director's letter.

D. If the Director determines that the owner or operator of a regulated activity was not in compliance with the required Best Management Practices as soon as practicable before and during a day forecast to be at high risk of dust generation, and has not adequately

identified the Best Management Practices that will be employed as soon as practicable before and during future days forecast to be at high risk of dust generation the Director shall issue a RTO under the Dust Action General Permit and shall require the owner or operator to choose and implement Best Management Practices within five (5) business days of the determination.

VI. TERMINATION FOR CAUSE

A. The Permittee may apply to the Director for termination of a RTO under the general permit if it can be demonstrated that:

1. The regulated activity is subject to an air quality permit issued by the Director or the Maricopa County Air Quality Department Control Officer;

2. The Permittee is no longer the legal owner or operator of the regulated activity by demonstrating one of the following;

   a. The regulated activity has been sold, transferred or otherwise been dispossessed by the Permittee; or

   b. The regulated activity is no longer capable of being operated at the physical address(es), location(s), or parcel number(s) where the regulated activity occurred; or

3. The Permittee provides documentation that a Best Management Practice has been chosen and implemented for each applicable regulated activity as soon as practicable before and during a day forecast to be at high risk of dust generation by submitting one of the following:

   a. Demonstrating that a Best Management Practice of a permanent nature has been applied to the regulated activity;

   b. Submitting a copy of the records required in Attachment "B" Conditions I.D and II.C for the two most recent consecutive years after the time that the Dust Action General Permit has been issued; or

   c. Submitting a copy of the records required in Attachment "B" Conditions I.D and II.C for a different time period than that prescribed in Condition VI.A.3.b above based upon a demonstration that:

      (1) A regulated activity was not owned or operated at the location during the two most recent consecutive years; or

      (2) There were no days forecast to be at high risk of dust generation during the two most recent consecutive years.

B. The Director may terminate a RTO under the general permit if the Director makes an independent finding that:

1. The regulated activity is subject to an air quality permit issued by the Director or the Maricopa County Air Quality Department Control Officer;

2. In accordance with Condition VI.A.2 above, the Permittee is no longer the legal

owner or operator of the regulated activity.

VII. COMPLIANCE CERTIFICATION

A. The Permittee shall submit to the Director a compliance certification once each year, which describes the compliance status of the source with respect to each General Permit condition and the methods used for determining the compliance status. This certification shall be submitted by January 31st and shall cover the previous calendar year.

The compliance certification shall include the following:

1. Identification of the dust-generating operation owner or operated by the Permittee.

2. Identification of the Best Management Practice(s) used by the Permittee to comply with the terms and conditions of this General Permit.

B. The Director may request additional information to support the compliance certification.

VIII. INSPECTION AND ENTRY

Upon presentation of credentials and other documents as may be required by law, the Permittee shall allow the Department, or an authorized representative (including an authorized contractor acting as a representative of the Department), to perform the following:

A. Enter upon the Permittee's premises where a regulated activity is located or conducted, or where records must be kept under the conditions of this General Permit;

B. Have access to and copy, at reasonable times, any records that are required to be kept under the conditions of this General Permit;

C. Inspect, at reasonable times, any facilities, equipment (including monitoring and air pollution control equipment), practices, or operations regulated or required under this General Permit;

D. Sample or monitor at reasonable times, substances or parameters for the purpose of assuring compliance with the General Permit or other applicable requirements; and

E. Record any inspection by use of written, electronic, magnetic and photographic media.

IX. RECORD KEEPING REQUIREMENTS

Until the RTO under the general permit is terminated pursuant to Section XIII of Attachment "A", the Permittee shall retain records of all required records and supporting information and shall make the records available to the Director upon request.

X. REPORTING REQUIREMENTS

The Permittee shall submit the following reports:

A. Compliance certifications in accordance with Section IV of Attachment "A".

B. Other reports required by any condition in Attachment "B".

XI. DUTY TO PROVIDE INFORMATION

A. The Permittee shall furnish to the Director, within a reasonable time, any information that the Director may request in writing to determine whether cause exists for revoking the General Permit coverage, or to determine compliance with this General Permit. Upon request, the Permittee shall also furnish to the Director copies of records that the Permittee is required to keep under the General Permit. For information claimed confidential, the Permittee shall furnish an additional copy of such records directly to the Director along with a claim of confidentiality.

B. If the Permittee has failed to submit any relevant facts or if the Permittee has submitted incorrect information in a General Permit coverage application, the Permittee shall, upon becoming aware of such failure or incorrect submittal, promptly submit such supplementary facts or corrected information.

XII. PROPERTY RIGHTS

This General Permit does not convey any property rights of any sort, or any exclusive privilege.

XIII. SEVERABILITY CLAUSE

The provisions of this General Permit are severable. In the event of a challenge to any portion of this General Permit, or if any portion of this permit is held invalid, the remaining permit conditions remain valid and in force.

XIV. RENTING OR LEASING A REGULATED ACTIVITY

In the case that a regulated activity covered under this general permit is rented or leased, a copy of this General Permit and relevant RTOs shall be provided by the owner to the renter or lessee, and the renter or lessee shall be bound by this permit's provisions. In the event a copy of this General Permit and relevant RTOs are not provided to the renter or lessee, both the owner and the renter or lessee shall be responsible for the implementation of a Best Management Practice in compliance with the General Permit conditions and any violations thereof.

DUST ACTION GENERAL PERMIT

ATTACHMENT "B": SPECIFIC CONDITIONS

I. GENERAL CONDITIONS

A. The Permittee shall obtain a copy of the *Maricopa County Dust Control Forecast* each day that it is updated by:

1. Accessing the forecast through ADEQ's website at: http://www.azdeq.gov/environ/air/ozone/mcdust.pdf; or

2. Signing up for ADEQ's electronic mailing system.

B. The Permittee shall register to receive all available electronic updates from all Maricopa County Air Quality Department air quality monitors within 4 miles of the regulated activity.

C. The Permittee shall notify employees who conduct or operate a regulated activity when the *Maricopa County Dust Control Forecast* identifies the following day as being at high risk of dust generation.

D. The Permittee shall keep a record of each *Maricopa County Dust Action Control Forecast* that identifies the next calendar day as being at high risk of dust generation and a log of the date, time and method used to notify employees.

II. BEST MANAGEMENT PRACTICES REQUIREMENT

A. As soon as practicable before, and during a day identified by the *Maricopa County Dust Control Forecast* as being at high risk of dust generation, the Permittee shall take reasonable precautions to reduce or prevent particulate matter from becoming airborne. Examples of Best Management Practices for specific source categories are included in Attachment "C" of this permit.

B. The Permittee shall choose and implement a Best Management Practice for each regulated activity owned or operated by the Permittee.

C. The Permittee shall keep records of the Best Management Practices that are employed in advance of and during a day identified by the *Maricopa County Dust Control Forecast* as being at high risk of dust generation.

III. ALTERNATIVE BEST MANAGEMENT PRACTICES NOT INCLUDED IN THE GENERAL PERMIT

A. The Permittee may choose and implement an alternative Best Management Practice that is not included in Attachment "C" of this permit provided that the Permittee maintains records of documentation demonstrating that the alternative Best Management Practice that was selected and implemented achieves an equivalent or greater control of PM_{10} particle emissions than an example included in Attachment "C";

B. Any person may petition the Director to make a determination that an alternative Best

Management Practice achieves an equivalent or greater control of PM_{10} emissions than the examples included in Attachment "C". These petitions shall include the following:

1. A description of the alternative Best Management Practice; and

2. A demonstration that the alternative Best Management Practice achieves an equivalent or greater control of PM_{10} emissions than an example included in Attachment "C".

C. Upon renewal or re-opening of this general permit, the Director shall add to the Best Management Practices examples in Attachment "C" any alternative Best Management Practices that were approved under Condition III.B above.

DUST ACTION GENERAL PERMIT

ATTACHMENT "C": BEST MANAGEMENT PRACTICE EXAMPLES

I. VEHICLE USE IN OPEN AREAS AND VACANT LOTS

A. This condition does not apply to designated, managed or opened trail systems.

B. As soon as practicable before and during a day forecast to be at high risk of dust generation, the Permittee shall:

1. Reduce or prevent motor vehicle access to the open area or vacant lots by:

a. Installing barriers, curbs, fences, gates, posts, shrubs, trees or other effective control measures; or

b. Installing no trespassing, no parking or no access signs that comply with local, County, State or Federal sign standards; or

2. Uniformly apply and maintain surface gravel or chemical or organic stabilizers to all areas disturbed by motor vehicles.

C. As soon as practicable before and during the day forecast to be at high risk of dust generation the Permittee shall inspect, maintain and repair as necessary the best management practice selected in Condition I.B. above.

II. OPEN AREAS AND VACANT LOTS

A. This condition does not apply to designated, managed or opened trail systems.

B. As soon as practicable before and during a day forecast to be at high risk of dust generation, the Permittee shall control PM_{10} emissions from open areas and vacant lots by:

1. Establishing vegetative ground cover on all disturbed surface area; or

2. Increasing the use of dust suppressants on the open area or vacant lot; or

3. Uniformly applying and maintaining surface gravel or chemical or organic stabilizers to all disturbed areas.

C. As soon as practicable before and during the day forecast to be at high risk of dust generation the Permittee shall inspect, maintain, and repair, as necessary, the best management practice selected in Condition II.B above.

III. UNPAVED PARKING LOTS

A. This condition does not apply to designated, managed or opened trail systems.

B. This condition applies to parking, maneuvering, ingress and egress areas at developments other than residential buildings with four or fewer units.

C. As soon as practicable before and during a day forecast to be at high risk of dust generation, the Permittee shall control PM_{10} emissions from unpaved parking lots by:

1. Increasing the use of dust suppressants other than water on the unpaved parking lot; or

2. Uniformly applying and maintaining surface gravel or chemical or organic stabilizers to all disturbed areas.

D. As soon as practicable before and during the day forecast to be at high risk of dust generation the Permittee shall inspect, maintain, and repair, as necessary, the best management practice selected in Condition III.C above.

IV. UNPAVED ROADWAYS, ALLEYWAYS AND ROAD SHOULDERS

A. This condition does not apply to designated, managed or opened trail systems.

B. This condition applies to unpaved roadways or alleyways that experience an average of 150 vehicle trips or more per day.

C. As soon as practicable before and during a day forecast to be at high risk of dust generation, the Permittee shall control PM_{10} emissions by:

1. Reducing or preventing motor vehicle access as prescribed in Condition I.B above;

2. Increasing the use of dust suppressants other than water on the unpaved roadway or alleyway; or

3. Uniformly applying and maintaining surface gravel or chemical or organic stabilizers to the unpaved roadway or alleyway.

D. As soon as practicable before and during the day forecast to be at high risk of dust generation the Permittee shall inspect, maintain, and repair, as necessary, the best management practice selected in Condition IV.C above.

V. LIVESTOCK SPECIAL EVENTS NOT COVERED UNDER A.R.S. § 49-457

A. This condition applies to livestock facilities at which special events that are not already covered under A.R.S. § 49-457 occur.

B. As soon as practicable before and during the day forecast to be at high risk of dust generation the Permittee shall control PM_{10} emissions by:

1. Increasing the use of dust suppressants, including water, on unpaved access connections and feed lane access areas at the livestock special event; or

2. Uniformly applying and maintaining surface gravel or chemical or organic stabilizers to all areas disturbed by motor vehicles other than areas where such application will create a documentable hazard for livestock activities; or.

3. Reducing or preventing motor vehicle access on unpaved access connections and feed lane access areas at the livestock special event by:

a. Installing barriers, curbs, fences, gates, posts, shrubs, trees or other effective control measures; or

b. Installing no trespassing, no parking or no access signs that comply with local, County, State or Federal sign standards; or

C. As soon as practicable before and during the day forecast to be at high risk of dust generation the Permittee shall inspect, maintain, and repair, as necessary, the best management practice selected in Condition V.B above.

VI. EASEMENTS, RIGHTS-OF-WAY, AND ACCESS ROADS FOR UTILITIES

A. This condition does not apply to designated, managed or opened trail systems.

B. This condition applies to easements, rights-of-way, and access roads for utilities (transmission of electricity, natural gas, oil, water, and gas) that experience an average of 150 vehicle trips or more per day.

C. As soon as practicable before and during a day forecast to be at high risk of dust generation, the Permittee shall control PM_{10} emissions by:

1. Reducing or preventing motor vehicle access as prescribed in Condition I.B above;

2. Increasing the use of dust suppressants other than water on the easement, right-of-way or access road; or

3. Uniformly applying and maintaining surface gravel or chemical or organic stabilizers to the easement, right-of-way or access road.

D. As soon as practicable before and during the day forecast to be at high risk of dust generation the Permittee shall inspect, maintain, and repair, as necessary, the best management practice selected in Condition VI.C above.

VII. TRACKOUT OR DEPOSITS OF BULK MATERIAL

As soon as practicable before and during a day forecast to be at high risk of dust generation, the Permittee shall clean-up loose material or remove deposits of bulk material from areas accessible to the public on day before and during high risk day.

VIII. DESIGNATED, MANAGED OR OPENED TRAIL SYSTEMS

A. During the course of each calendar year, the Permittee shall control PM_{10} emissions from designated, managed or opened trail systems by employing adaptive management techniques such as:

1. Posting public information to educate the riding public about at the impacts of air quality regulation on the use of off-highway vehicles,

including the restriction of operation during high pollution advisories, through methods similar to kiosks, distribution of material at major events and dealerships, and other Public Service Announcements; and

2. Conducting mechanized trail repair and maintenance at slow speeds that:

   a. Reduce the speed of water run-off on the designated, managed or opened trail system;
   b. Reduce the amount of silt that would otherwise accumulate on the designated, managed or open trail system;
   c. Add grade dip or water controls to the designated, managed or open trail system; or
   d. Add or repair silt traps on water drains; or

3. Re-routing an existing designated, managed or opened trail that causes traffic to avoid soils susceptible to dust generation; or constructing a new designated, managed or opened trails that allow for appropriate trail repair and maintenance and include speed limiting features such as turns and climbs; or

4. Rehabilitating open parking areas, mine sites, and old unpaved roads that are not designated, managed or opened trail systems. Rehabilitation includes re-contouring the areas, replanting trees and spreading native seed to hold soil together and reduce windblown dust; or

B. As soon as practicable before and during a day forecast to be at high risk of dust generation, the Permittee shall control PM_{10} emissions from disturbed areas along the designated, managed or opened trail system by employing adaptive management techniques such as:

1. Applying a proven dust surfactant;

2. Repairing roads and other unpaved surfaces to control the water run-off and silt;

3. Using soil binders and compaction to allow for light to moderate traffic flow; or

4. Installing an engineered road or surface that:

   a. Raises the road or surface bed above grade;
   b. Uses an ABC road mix and binder;
   c. Compacts the road or surface; and
   d. Crowns to drain water; or

C. As soon as practicable before and during the day forecast to be at high risk of dust generation the Permittee shall inspect, maintain, and repair, as necessary, the best management practice selected in Conditions VI.A or B above; or

D. When the *Maricopa County Dust Control Forecast* identifies the following day as being at high risk of dust the Permittee shall post information at kiosks or use equivalent methods to notify users of designated, managed or opened trail system.

APPENDIX C

EXHIBIT 4:

Arizona Department of Environmental Quality Commitment to Revise the MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area if Necessary for the Emerging and Voluntary Measure

ARIZONA DEPARTMENT
OF
ENVIRONMENTAL QUALITY

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(602) 771-2300 • www.azdeq.gov

Janice K. Brewer
Governor

Henry R. Darwin
Director

APR 25 2012

Deborah Jordan, Director
Air Division
United States Environmental Protection Agency, Region IX
75 Hawthorne Street
San Francisco, CA 94105-3901

Re: Commitment to Revise the MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area if Necessary for the Emerging and Voluntary Measure

Dear Ms. Jordan:

EPA's September 2004 guidance entitled *Incorporating Emerging and Voluntary Measures in a State Implementation Plan (SIP)* allows air pollution planning organizations to take credit for emissions reductions associated with new and emerging measures. As part of the proposed *MAG 2012 Five Percent Plan for PM-10 for the Maricopa Nonattainment Area* (Five Percent Plan), the Arizona Department of Environmental Quality (ADEQ), the Maricopa County Air Quality Department (MCAQD) and the Maricopa Association of Governments (MAG) are taking emissions reductions credit for the implementation of Dust Action Forecasts and the Dust Action General Permit.

The Arizona Department of Environmental Quality is required by Arizona Revised Statute § 49-424(11) to develop and disseminate an air quality dust forecast for the Maricopa County PM-10 non-attainment area. These forecasts use projected meteorological conditions, wind speed and direction, recent precipitation and historical air pollution concentrations that have occurred under the predicted condition to identify days that are at low, moderate or high risk of dust generation.

A.R.S. § 49-457.05(B) requires ADEQ to develop a Dust Action General Permit that specifies the best management practices (BMPs) that are necessary to reduce or to prevent PM-10 particulate emissions and requires those BMPs to be implemented as soon as practicable before and during a day that ADEQ forecasts to be at high risk of dust generation. Individuals that are subject to BMPs under the Dust Action General Permit are already subject to the requirements of Maricopa County Air Quality Department Rule 310.01. If it can be demonstrated that these individuals did not choose and implement a BMP as soon as practicable before and during a day forecast to be at high risk of dust generation, the ADEQ Director can issue the Dust Action General Permit to that individual. The permit requires additional monitoring, record keeping and reporting requirements to ensure that BMPs are being applied as required.

Because these methods of air pollution control are new, the estimation of emissions reductions due to the use of forecasts and the Dust Action General Permit was completed using the best information and methods possible, specifically an increase in the effectiveness of MCAQD Rule 310.01. To ensure that the projected emissions reductions are achieved, Maricopa County has provided a commitment to evaluate the effectiveness of MCAQD Rule 310.01 in calendar year 2013. If the evaluation does not result in sufficient emissions reductions, a replacement SIP measure must be adopted as a replacement.

A.R.S. § 49-404 requires ADEQ to maintain a State Implementation Plan that provides for the implementation, maintenance and enforcement of national ambient air quality standards. Should it be demonstrated through Maricopa County's April 2013 final program evaluation reports that the emerging and voluntary measure contained within the Five Percent Plan did not achieve the necessary emissions reductions, the Arizona Department of Environmental Quality commits to submitting a SIP revision that contains replacement measures to reduce PM-10 emissions by an amount equal to or more than the total PM-10 emissions reductions that were not achieved by these measures. An implementation schedule for the submission of this revised plan is as follows:

May 2013	ADEQ will consult with MAG to determine if additional emissions reductions are necessary.
June 2013	If additional controls are required, ADEQ will work with MAG to identify potential replacement measures.
April 2014	If additional controls are required, ADEQ will submit a SIP revision that contains the necessary replacement measure(s).

ADEQ does not anticipate the need for additional personnel or funding to comply with this commitment as any required SIP revisions will be accommodated as part of its normal air quality planning process.

If you have any questions, please contact me at (602) 771-2288.

Sincerely,

Eric C. Massey, Director
Air Quality Division

cc. Bill Wiley, Maricopa County Air Quality Department
Lindy Bauer, Maricopa Association of Governments
Colleen McKaughan, U.S. EPA Region IX

APPENDIX D

APPENDIX D

EXHIBIT 1:

Agricultural Best Management Practices Program

AGRICULTURAL BEST MANAGEMENT PRACTICES PROGRAM

Throughout the course of the development of the *MAG 2012 Five Percent Plan for PM-10 for the Maricopa Nonattainment Area* (Five Percent Plan) the Governor's Agricultural Best Management Practices (BMP) Committee has worked to enhance its Best Management Practices program. On December 9, 2011, the Ag BMP Committee approved enhancements to the BMP program. On behalf of the Governor's Agricultural BMP Committee, the Arizona Department of Environmental Quality (ADEQ) sent a Notice of Exempt Rule Making to the Secretary of State's Office on December 29, 2011, making the enhanced BMP program effective on that same date.

The enhanced BMP program is enforceable as a matter of State law. ADEQ has determined that implementation of the program will result in a numerically quantifiable air quality benefit throughout the Maricopa nonattainment area. ADEQ has also determined that the program will result in reduced concentrations of PM-10 at the monitors throughout the same area.

The program will also have benefits outside of Maricopa County. According to the 2011 rule enhancements, the Agricultural BMP program automatically becomes effective in any area of the State that is designated as nonattainment for the PM-10 National Ambient Air Quality Standard (NAAQS) after June 1, 2009. For areas designated as moderate nonattainment, one BMP must be employed, whereas in areas that are designated as serious nonattainment, two BMPs must be employed.

ADEQ has determined that the revised Five Percent Plan already meets EPA's requirements for annual five percent reductions in PM-10 emissions and a demonstration that the plan will result in the area's attainment with the 24-hour PM-10 NAAQS without the inclusion of the enhanced Agricultural BMP program. As part of the public comment period, ADEQ requested comments about whether the Department should make a commitment to EPA to include the enhanced Agricultural BMP program as part of the Five Percent Plan or, given its statewide benefits, if the Department should include the enhanced Agricultural BMP program as a stand alone revision to the State Implementation Plan.

No public comments were made in response to ADEQ's request. Based on the facts listed above, and because the program is now implementable on a statewide basis, ADEQ has determined that it will submit the program as a separate, independent revision to the State Implementation Plan.

Prepared by the Arizona Department of Environmental Quality.

APPENDIX E

APPENDIX E

EXHIBIT 1:

Public Hearing Process Documentation

CERTIFICATION OF HOLDING OF PUBLIC HEARING ON THE MAG 2012 FIVE PERCENT PLAN FOR PM-10 FOR THE MARICOPA COUNTY NONATTAINMENT AREA

I affirm that a public hearing was held jointly by the Arizona Department of Environmental Quality and the Maricopa Association of Governments (MAG) starting at 5:30 p.m. Thursday, April 12, 2012 at the MAG Offices, Saguaro Room, 302 North 1st Avenue, Phoenix, Arizona and that the hearing was held in accordance with the Arizona open meeting laws and 40 CFR 51.102 (d) to receive public comment on the MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area.

April 13, 2012
Date

Lindy Bauer
Lindy Bauer, MAG
Environmental Director

STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

Personally appeared before me the above-named Lindy Bauer known to me to be the same person who executed the foregoing instrument and to be the Environmental Director for the Maricopa Association of Governments and acknowledged to me that she executed the same as her free act.

SUBSCRIBED AND SWORN TO before me on this 13th day of April 2012.

OFFICIAL SEAL
VALERIE DAY
NOTARY PUBLIC State of Arizona
MARICOPA COUNTY
My Comm. Expires Aug. 16, 2012

Valerie Day
Notary Public

My Commission Expires:
August 16, 2012

AFFIDAVIT OF PUBLICATION

THE ARIZONA REPUBLIC

PUBLIC HEARING ON THE MAG 2012 FIVE PERCENT PLAN FOR PM-10 FOR THE MARICOPA COUNTY NONATTAINMENT AREA

April 12, 2012 at 5:30 p.m.
MAG Offices, Saguaro Room
302 North 1st Avenue, Second Floor
Phoenix, Arizona 85003

The Arizona Department of Environmental Quality (ADEQ) and Maricopa Association of Governments (MAG) will jointly conduct a public hearing on the Draft MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area on April 12, 2012 at 5:30 p.m. The purpose of this hearing is to receive public comments.

According to Section 189 (d) of the federal Clean Air Act, the Five Percent Plan for PM-10 is required to be submitted to the Environmental Protection Agency (EPA). The plan contains a wide variety of existing control measures and projects that have been implemented to reduce PM-10 and a new measure to reduce PM-10 during high risk conditions, including high winds. The measures apply to unpaved roads and shoulders, leaf blowers, unpaved parking lots, vacant lots, sweeping streets with certified sweepers, off-road vehicle use, open and recreational burning, residential woodburning, covered vehicle loads, dust generating operations, nonmetallic mineral processing, and other unpermitted sources. The plan demonstrates that the measures will reduce PM-10 emissions by at least five percent per year and demonstrates attainment of the PM-10 standard as expeditiously as practicable, which is 2012.

The draft document is available for public review at the MAG Offices, third floor, from 8:00 a.m. to 5:00 p.m. Monday through Friday and on the MAG website at www.azmag.gov. Public comments are welcome at the hearing, or may be submitted in writing by 5:30 p.m. on April 12, 2012 to Lindy Bauer at the address below. After considering the public comments, the MAG Regional Council may take action on the plan on May 23, 2012. The ADEQ may then adopt the plan for submittal to the EPA.

Contact Person: Lindy Bauer, MAG (602) 254-6300
302 N. 1st Avenue, Suite 300
Phoenix, AZ 85003
Fax: (602) 254-6490
E-mail: lbauer@azmag.gov
Pub: March 12, 13, 2012

STATE OF ARIZONA
COUNTY OF MARICOPA } SS.

Tabitha Antoniadis, being first duly sworn, upon oath deposes and says: That she is a legal advertising representative of the Arizona Business Gazette, a newspaper of general circulation in the county of Maricopa, State of Arizona, published at Phoenix, Arizona, by Phoenix Newspapers Inc., which also publishes The Arizona Republic, and that the copy hereto attached is a true copy of the advertisement published in the said paper on the dates as indicated.

The Arizona Republic

March 12, 13, 2012

Sworn to before me this
14TH day of
March A.D. 2012

BRIAN BILLINGS
Notary Public - Arizona
Maricopa County
My Comm. Expires Jul 25, 2014

Notary Public

MARICOPA ASSOCIATION of GOVERNMENTS

302 North 1st Avenue, Suite 300 ▲ Phoenix, Arizona 85003
Phone (602) 254-6300 ▲ FAX (602) 254-6490
E-mail: mag@azmag.gov ▲ Web site: www.azmag.gov

March 12, 2012

TO: Interested Parties for Air Quality

FROM: Lindy Bauer, Environmental Director

SUBJECT: PUBLIC HEARING ON THE MAG 2012 FIVE PERCENT PLAN FOR PM-10 FOR THE MARICOPA COUNTY NONATTAINMENT AREA

Public Hearing
April 12, 2012 at 5:30 p.m.
MAG Offices, Saguaro Room
302 North 1st Avenue, Second Floor
Phoenix, Arizona 85003

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For your information and convenience, a copy of the public hearing notice is enclosed. The draft document is available for public review at the MAG Offices, third floor, from 8:00 a.m. to 5:00 p.m. Monday through Friday. In addition, the draft document is available for agency and public review on the MAG website at www.azmag.gov.

Attachment

PUBLIC HEARING ON THE MAG 2012 FIVE PERCENT PLAN FOR PM-10 FOR THE MARICOPA COUNTY NONATTAINMENT AREA

April 12, 2012 at 5:30 p.m.
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Phone (602) 254-6300 ▲ FAX (602) 254-6490
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TITLE VI
LETTER EXAMPLE

March 12, 2012

Ms. Cynthia Zwick
Director
Arizona Community Action Association
2700 North 3rd Street, Suite 3040
Phoenix, Arizona 85004-1122

Dear Ms. Zwick:

You are cordially invited to a public hearing on the Draft MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area. The hearing will be held jointly by the Arizona Department of Environmental Quality and Maricopa Association of Governments on Thursday, April 12, 2012 at 5:30 p.m. in the Saguaro Room at the MAG Offices, 302 North 1st Avenue, Second Floor, Phoenix, Arizona, 85003. The purpose of this hearing is to receive public comments. Written and verbal comments are welcomed at the public hearing. After considering public comments, the MAG Regional Council may take action on the plan on May 23, 2012.

According to Section 189 (d) of the federal Clean Air Act, the Five Percent Plan for PM-10 is required to be submitted to the Environmental Protection Agency. The plan contains a wide variety of existing control measures and projects that have been implemented to reduce PM-10 and a new measure to reduce PM-10 during high risk conditions, including high winds. The measures apply to unpaved roads and shoulders, leaf blowers, unpaved parking lots, vacant lots, sweeping streets with certified sweepers, off-road vehicle use, open and recreational burning, residential woodburning, covered vehicle loads, dust generating operations, nonmetallic mineral processing, and other unpermitted sources. The plan demonstrates that the measures will reduce PM-10 emissions by at least five percent per year and demonstrates attainment of the PM-10 standard as expeditiously as practicable, which is 2012.

The draft document is available for review at the MAG Offices, third floor, from 8:00 a.m. to 5:00 p.m. Monday through Friday. In addition, the draft document is available for agency and public review on the MAG website at www.azmag.gov. We hope to see you or your representative at the hearing and to include your input in future planning efforts. For your convenience, a copy of the public hearing notice is attached. If you have any questions or would like to set up a time for us to meet with your organization, please call me at (602) 254-6300.

Sincerely,

Lindy Bauer

Lindy Bauer
Environmental Director

Attachment

PUBLIC HEARING ON THE MAG 2012 FIVE PERCENT PLAN FOR PM-10 FOR THE MARICOPA COUNTY NONATTAINMENT AREA

April 12, 2012 at 5:30 p.m.
MAG Offices, Saguaro Room
302 North 1st Avenue, Second Floor
Phoenix, Arizona 85003

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March 12, 2012

TO: Leslie Rogers, Federal Transit Administration
Karla Petty, Federal Highway Administration
John Halikowski, Arizona Department of Transportation
Henry Darwin, Arizona Department of Environmental Quality
Neal Young, City of Phoenix Public Transit Department
Stephen Banta, METRO/RPTA
William Wiley, Maricopa County Air Quality Department
Brian Tapp, Central Arizona Association of Governments
Donald Gabrielson, Pinal County Air Quality Control District
Gregory Nudd, U.S. Environmental Protection Agency, Region IX

FROM: Lindy Bauer, Environmental Director

SUBJECT: TRANSMITTAL OF THE DRAFT MAG 2012 FIVE PERCENT PLAN FOR PM-10 FOR THE MARICOPA COUNTY NONATTAINMENT AREA

The Maricopa Association of Governments has prepared a Draft MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area. The draft document is available for review at the MAG Offices, third floor, from 8:00 a.m. to 5:00 p.m., Monday through Friday. In addition, the draft document is available for agency and public review on the MAG website. Any comments are requested by 5:30 p.m. on April 12, 2012.

According to Section 189 (d) of the federal Clean Air Act, the Five Percent Plan for PM-10 is required to be submitted to the Environmental Protection Agency (EPA). The plan contains a wide variety of existing control measures and projects that have been implemented to reduce PM-10 and a new measure to reduce PM-10 during high risk conditions, including high winds. The measures apply to unpaved roads and shoulders, leaf blowers, unpaved parking lots, vacant lots, sweeping streets with certified sweepers, off-road vehicle use, open and recreational burning, residential woodburning, covered vehicle loads, dust generating operations, nonmetallic mineral processing, and other unpermitted sources. The plan demonstrates that the measures will reduce PM-10 emissions by at least five percent per year and demonstrates attainment of the PM-10 standard as expeditiously as practicable, which is 2012.

On April 12, 2012, a public hearing will be held jointly by the Arizona Department of Environmental Quality (ADEQ) and MAG at the MAG Offices, Saguaro Room, Second Floor, Phoenix, Arizona at 5:30 p.m. After considering public comments, the MAG Regional Council may take action on the plan on May 23, 2012. The ADEQ may then adopt the plan for submittal to the EPA. If you have any questions, please do not hesitate to contact me at (602) 254-6300.

cc: Eric Massey, Arizona Department of Environmental Quality
Scott Omer, Arizona Department of Transportation

PUBLIC HEARING ON THE MAG 2012 FIVE PERCENT PLAN FOR PM-10 FOR THE MARICOPA COUNTY NONATTAINMENT AREA

April 12, 2012 at 5:30 p.m.
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MARICOPA ASSOCIATION OF GOVERNMENTS

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

PUBLIC HEARING ON THE MAG 2012 FIVE PERCENT PLAN FOR PM-10 FOR THE MARICOPA COUNTY NONATTAINMENT AREA

Phoenix, Arizona

April 12, 2012

5:30 p.m.

Prepared By:

Maricopa Association of Governments

(Original)

Prepared By:

KARA JOHNSON

Administrative Assistant

I N D E X

MARICOPA ASSOCIATION OF GOVERNMENTS

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

PUBLIC HEARING ON THE MAG 2012 FIVE PERCENT PLAN FOR PM-10 FOR THE MARICOPA COUNTY NONATTAINMENT AREA

commenced at 5:30 p.m. on April, 12, 2012 at the offices of Maricopa Association of Governments, 302 North First Avenue, Suite 300, Phoenix, Arizona before KARA JOHNSON, Administrative Assistant for the Environmental Division of Maricopa Association of Governments.

* * * * *

A P P E A R A N C E S

Maricopa Association of Governments:

Lindy Bauer

Cathy Arthur

Arizona Department of Environmental Quality:

Eric Massey

Phoenix, Arizona

April 12, 2012

5:30 p.m.

PROCEEDINGS

MS. BAUER: I'd like to welcome everyone to our public hearing this evening. My name is Lindy Bauer and I am the Environmental Director with MAG.

This public hearing is being held jointly by the Arizona Department of Environmental Quality and the Maricopa Association of Governments to receive public comments on the Draft MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area.

MAG serves as a designated regional air quality planning agency. Our regional air quality plans are prepared through a coordinated effort with the Arizona Department of Environmental Quality, Maricopa County Air Quality Department, and the Arizona Department of Transportation.

Those driving to the meeting this evening, who parked in the garage, can have their tickets validated by the MAG staff. Kara has the validation for the parking tickets.

Now the public hearing this evening will begin with some introductory remarks by the Arizona Department of Environmental Quality and then there will be an overview presentation by the MAG staff. Following the presentation hearing participants are invited

to make comments for the public record. A record of the public hearing will be prepared. Written comments are also welcome at this public hearing.

For those participants wishing to speak, please fill out a form on the table and place it in the box.

If you need to leave early because of a bus schedule, please tell the MAG staff; and we will accommodate your request.

As you come up to the podium, please state some information for the record: your name and who you represent.

I would like to note that we have a timer to assist the public with their presentations. We have a three minute time limit. When two minutes have elapsed, the yellow light will come on, notifying the speaker that they have one minute to sum up. At the end of the three minute time period, the red light will come on.

And now I would like to introduce Eric Massey, the Director of the Air Quality Division at the Arizona Department of Environmental Quality.

MR. MASSEY: Thank you, Lindy.

I will try to keep my comments pretty brief, but what I wanted to acknowledge was that today's activities are really the culmination of the efforts of many people, through our stakeholder process that ran through the entirety of 2011. The process was co-chaired by Representative Amanda Reeve and also our Director Henry Darwin and included a number of efforts from the people that were

in our stakeholder group which also included Maricopa County, MAG, ADEQ staff. And so I wanted to take just a moment to appreciate the efforts of everybody that was involved because we were meeting sometimes twice a month trying to come up with a solution to the issues that EPA had addressed in-- or had raised in its proposed partial approval/partial disapproval back in 2010.

For me, the project is one of collaboration. It's a real source of pride for me because I think we've had a chance to work closely together as regulatory entities with our regulated community to find a solution to a problem that has persisted here in the valley for a very long time. And what I really liked about our major efforts, was the collaboration, specifically between ADEQ, MAG, Maricopa County, and even EPA as we work through some of the technical meetings that occurred behind the scenes, once every two weeks for nearly the entirety of 2011.

So there was a tremendous amount of technical effort that went into this, a tremendous amount of effort from all of the stakeholders involved and I think the result is a really effective piece of work. And the other piece that I really like, about what we've done in this plan, is that we built upon prior efforts. One of the things that was important to MAG, to Maricopa County, to ADEQ through this whole process is that we were, um, cognizant of the efforts that went into 2007's Senate Bill 1552 and that we didn't wipe out the benefits that really came from that rule.

Some of the things that we have seen is just a declining

concentration of PM-10 here in Phoenix. And while there has been some work to do and some issues like exceptional events that have clouded our issues; there has been a tremendous amount of effort that's been done throughout the entire air shed. And we really wanted to take a moment to acknowledge that and notice that we're building on past efforts.

We also have some really new innovative ideas that are part of this plan, some of the forecasting that DEQ is doing, the Dust Action General Permit which came as a collaborative effort from all of us here, to really find a solution to the ongoing issues of high wind days and its just a great opportunity to kind of meld the past effort with new thinking and its been a true honor for me to have been involved in this particular process. I'm looking forward to the continued process that goes through with EPA review and working together with our partners to make sure that this plan itself is one that can be approved.

With that Lindy, I just wanted to say thank you again and the opportunity to be here today. And this is really a tremendous effort and I think a day to be celebrated.

MS. BAUER: Thank you very much, Eric. We really appreciate all of your efforts as well as the efforts of all of the stakeholders that worked with us and Representative Reeve's leadership as well. So, thank you for your comments.

And now we will have an overview presentation on the MAG 2012 Five Percent Plan for PM-10.

Cathy Arthur with the Maricopa Association of Governments.

MS. ARTHUR: Thank you, Lindy and Eric.

This is an overview of this plan. And as those of you have read it know, that it would probably take quite some time to go into a lot of detail so we are just going to do the highlights and hopefully look at the very important points that this plan represents.

The new plan has a large number of control measures that address a variety of sources and many of these have already been implemented. In fact, most of them were in the 2007 Five Percent Plan- there were 53 measures in that plan. And although that plan was withdrawn in January of 2011 by the Arizona Department of Environmental Quality, most of those measures continue to be implemented. And we are resubmitting many of those measures in table 4-1 of the plan.

There is one new measure in this plan and it focuses on high wind events. And this is generally because our 2007 plan focused on stagnant conditions and PM-10 exceedances during those conditions. So we needed to look at additional measures that would help us control PM-10 levels during high wind events and this plan does that.

There have been no violations of the PM-10 standard under stagnant conditions since the 2007 plan was submitted in December 2007. So we feel the plan that we submitted was very

effective-- the control measures were very effective with respect to PM-10 violations under stagnant conditions, but we needed to do additional work under high wind events.

Just to show you some of the sources that we are controlling through the measures in this 2012 Five Percent Plan and you can see there is a large variety of sources, including: trackout, open burning, unpaved shoulders, unpaved roads, vacant lots, earthmoving activities, ATV's, weed abatement operations, leaf blowing activity, street sweeper requirements- PM-10 Certified Street Sweepers, and then nonmetallic mineral processing operations are all being controlled through the measures that are in the 2012 plan.

In terms of monitoring data and this is a fairly complicated bar graph here, we can focus on the fact that in 2010, there was only one exceedance of the PM-10 standard.

In 2011, however, you will see that there are 22; 21 of those, however, we feel are exceptional events. Now an exceptional event is an uncontrollable natural event, which here in the Phoenix area tends to be high wind caused. ADEQ is in the process of documenting 21 exceptional events that occurred in 2011 and in addition we will be working on seven of them that are in purple here for 2009.

Just to add a little information, in 2012 we have already had 3 days that would be considered in purple, so there is going to have to be documentation of those as well by DEQ. And MAG and the

Maricopa County Air Quality Department are working with DEQ to prepare that documentation which is very time consuming, but it is necessary for us to show attainment by 2012.

This is a pie chart that shows you the total emissions of PM-10 in the nonattainment area in 2008 and it totals about 50,000 tons per year. And the top two contributors in 2008, which is the first year of the plan, were unpaved roads at 24 percent and if you add up all the construction activities- 17 percent. So those are the top two in 2008. Keep those in mind because it changes by the time we get to the attainment year of 2012. Not only do the emissions go down, but the sources that contribute the most are different.

The 2012 Five Percent Plan relies on a number of measures in order to demonstrate five percent reductions and show reductions due to contingency measures. And the most important one in terms of the five percent reductions is increasing rule effectiveness for three rules that Maricopa County Air Quality Department has passed. And EPA has approved these rules.

Rule 310, which is for dust generating operations, such as earthmoving.

Rule 310.01, which is for sources of nontraditional dust, such as unpaved roads, vacant lots, and unpaved parking lots.

And Rule 316, which is nonmetallic mineral processing, which is for mining and sand and gravel operations.

So those just give you an idea of the types of sources

covered by these rules.

Compliance with these rules has increased every year since 2007 and that is being measured by the county using a method that was approved by EPA.

So we are using the increases in compliance with these three rules to demonstrate five percent reductions per year. And we are also using the new Dust Action General Permit, which I will talk about in a minute.

The other bullet points here- PM-10 certified street sweeping, road/alley/shoulder paving and stabilization projects, speed limit reductions, and rubberized asphalt overlay- are all measures that have been accomplished. In other words, they are projects that have been completed and we are taking credit for those as contingency measures.

Now I mentioned that we have one new measure called the Dust Action General Permit that addresses high wind events. And the Dust Action General Permit identifies best management practices that need to be implemented before and during a high risk event. And ADEQ is going to give the sources-- hopefully up to five days of notice, when a high risk day is going to occur. And then they are going to expect sources that are uncontrolled to implement at least one best management practice before and during that event. The Dust Action General Permit was passed by the legislature in April 2011 and went into full effect on January 1, 2012.

Now I am just going to go over briefly what the

requirements are for a five percent plan under section 189(d) of the Clean Air Act. First of all it requires five percent reductions per year and in our case we are saying attainment is going to be achieved in 2012. So we need to show five percent per year in 2008, 2009, 2010, 2011, and 2012.

So if we look at the base year emissions in 2007, it is actually close to 60,000 tons and we multiply that by five percent; that tells us what amount of reduction, about three thousand tons that you need each year for five years. So our target is almost 15 thousand tons, over that period.

And you can see from the second bullet point, um, under total PM-10 emissions that we've been able to achieve by applying increased rule effectiveness for those three rules, plus the Dust Action General Permit. We have been able to achieve a reduction to 43,000 tons which means that we exceed the requirement by 1,284 tons or nine percent. So we have been able to meet that five percent reduction requirement.

Now I also mentioned that there are measures or projects that have been implemented which will achieve the requirement for contingency. And the Clean Air Act requires this as well and EPA gives you guidance as to how much you should achieve in the way of tonnage reduction and it's one year of reasonable further progress, which turns out to be about 3,000 tons. And so you need to show that you are reducing 3,000 tons more than you did in order to achieve the five percent reductions. There are quite a few

projects that have been implemented and I will show you a table in a minute and with all of those projects- which cover paving, stabilization, speed limit reduction, and street sweeping- we are able to achieve 3,400 tons. So, we are 220 tons higher than we need to be to achieve the contingency requirement.

Now this slide is just a summary of all of the projects that were completed-- and by the way these were all completed by September 2011 so that way we knew they had been open to traffic when we produced this plan. You can see just as a summary the total miles of roads and alleys that have been paved and stabilized over the period of 2008 to 2011 is 862 miles. So quite a lot of mileage has been stabilized and of course that significantly reduces PM-10. And then the other major statistic here is the total miles of shoulders paved and stabilized over that same period which is 1,158. So between the shoulder and the road paving/stabilization we are able to achieve a very large percentage of what we needed for the contingency requirement.

On the next page it shows you that the benefit we took for PM-10 Certified Street Sweeping-- there are really two aspects to this, ADOT signed a contract on February 20, 2010 which requires their contractor that's sweeping freeways, ramps and frontage roads in the PM-10 nonattainment area to use PM-10 Certified Street Sweepers. Most of the credit, is due to that, but in addition there were 27 PM-10 Certified Street Sweepers purchased between 2007 and 2009 with Congestion Mitigation Air Quality Improvement

funds through MAG. Those are being used to sweep arterials in the PM-10 nonattainment area.

Here is another pie chart. Now this one is for 2012 and so I told you to keep in mind what the top two contributors were in 2008 before a lot of these measures were taken into consideration and now we are showing really the highest contributor is paved roads and unpaved roads which was the highest before is now second at 19 percent. So the percentages change, but more importantly the total amount of tons contributed is down almost 10,000, between 2007 and 2012. This is how we are able to achieve the reductions that we need for both five percent per year and contingency.

So in conclusion the plan meets the five percent reduction requirement, the contingency requirement,-- something I haven't talked about is that EPA requires that your plan demonstrate through modeling that you can attain this standard in 2012 as well. There were two days that we modeled, both high PM-10 and high wind days and one was May 4, 2007 and the other June 6, 2007 and we were able to show attainment in 2012 for both of those scenarios using the same measures that we did to show the five percent reductions which is the increase in rule effectiveness and the Dust Action General Permit. So, those things allowed us show attainment through modeling as well as for five percent reductions.

Now this plan also includes a request to extend the attainment date for a little over six months- from June 6, 2012, which is the date that we were required to meet the five year

extension past 2006. And, we are asking for an extension because the Dust Action General Permit was not implemented fully until January 1, 2012 and we really need a whole year of benefit for the high wind days in order to be able to demonstrate attainment through modeling. So that's why we are asking for this six month extension.

Now in general the overall reduction as I mentioned is about 10,000 tons which is about a third, versus 2007 emissions. The reductions are due to the broad sweeping measures for many, many sources that were included in this plan. And then perhaps most importantly, the bottom line here, is that we need three years of clean data at the monitors, in 2010, 2011, and 2012 in order to demonstrate attainment in the real world as opposed to through this plan. Of course that is going to be dependent on exceptional event documentation that DEQ is preparing for 2011 and 2012. So EPA will need to concur with our documentation in order for us to be able to show attainment and we are hopeful that we will not have any more days in the remainder of 2012, but there are a few months left to go. If they are exceptional events that will put a burden again on us to document them. But we will be up to the task.

And then finally, this is the schedule that we are under for this plan. The plan was released for public review on March the 12th and today is the public hearing. In two weeks we will go to our Air Quality Technical Advisory Committee and ask for a recommendation and then we will be going to the Management

Committee the first part of May. Assuming those two committees recommend that this plan go forward then the Regional Council will adopt the plan on May 23rd. And then at that point we turn the plan over to DEQ and they submit the plan to EPA.

Two other important dates- August 14 th of 2012 is the deadline, about two and a half months we are going to give EPA to find this plan to be complete. If they do that by this date, then that will stop the sanction clocks that are currently ticking. The 18 month and 24 month sanction clocks are ticking right now because we withdrew the 2007 plan. And then February 14th of 2013 is the deadline for EPA to approve the plan, not just find it complete, but approve all the control measures and all the other things that were fulfilled in the plan in order to avoid EPA developing a federal implementation plan.

That completes my overview here and I think we will turn it over to Lindy to entertain comments.

MS. BAUER: Okay, Thank you very much, Cathy.

And now for the public comment period.

PUBLIC COMMENTS

MS. BAUER: At this time public comments are welcome at the hearing. Again, if you would like to speak, please fill out a speaker form and place it in the box and please adhere to the three minute time limit. We have the speaker forms over here, to

the left.

So first we have a speaker form from Jerry Greenberg.

MR. GREENBERG: Hello, my name is Jerry Greenberg and I am from Chandler. Uh, first of all I would like to thank you for all of your hard work, for those of you who have been involved in this; I really appreciate it.

Let me tell you a little about who I am and why in the world I am here in the middle of rush hour and everything else to participate in this meeting.

I have kind of an interesting background. I am a retired registered nurse. I am also a retired Air Force officer, served our Country during two wars and believe it or not, I was a first responder to both the Oklahoma City bombing and 9/11 at the Pentagon. As a result, my lungs were affected because needless to say none of us were protected against everything that was in the air. Particularly pieces of building, fiberglass, you name it, including literally glass fibers, um, that we all inhaled. As a result, I am kind of sensitive and I had no idea when we moved here from the east coast, in 2007, that perhaps my lung sensitivity would come to the forefront. However, they did.

Last, we bought a foreclosed home, sunk a bit of our life savings into it in Chandler in just a regular, nice neighborhood. Last fall, after living in the home for about a year and a half I was having trouble breathing. And so I went to the doctor and they kind of checked me out, did a chest X-ray,

that kind of thing. On my way back I stopped at the intersection of McClintock and Chandler. It was a little bit windy and I looked over to my right, with, and its all vacant lots on the north of that area and dust was just blowing like crazy right into my neighborhood. And so I thought perhaps-- okay, you know where I am going from there. I looked around and I realized my neighborhood, Twelve Oaks, Stellar Air Park, that neighborhood there is surrounded-- I have one minute left? Okay-- is surrounded by dirt lots. So all of sudden I became interested.

I called the City; I called the County, and made formal complaints which were responded to. However, frankly if I kept my front yard like the people keep the vacant lots that they owned, I'd be fined, but yet people are allowed to dump construction dirt on these-- in these lots. They are allowed to dump construction debris. They are allowed to just let it be bare dirt, literally bare dirt, on these lots. And, so, what I would ask of you is why are we coddling these vacant lot owners? The economic recovery is well, you know, going on and another is would you please, maybe you are doing this and I don't know, monitor residential areas for PM-10 and then report on them.

Can I go over just a little bit?

I have a new grandson who was born at Chandler Regional Hospital. On the way, on Frye Road, which was at sunset, I saw huge tractor with a plow on the back of it, raising huge clouds of dust half mile from where my grandson is and I called the City

the next day. They said we'll talk to him about it and they said he'll stop doing that. Thank you, he should have known not to do that and he did it at sunset because he knew that all the offices were closed.

We can't have that kind of thing going on in a City. Chandler is over 250,000 residents and yet this is the kind of thing that is going on. I can't speak for Glendale, or any place else, I can only speak for the City I live in and so what I would ask you is, please continue to enforce this. Lobby the State, the Government, to really be stronger on this and help us to grow up as a community, so that it can be healthier.

Thank you.

MS. BAUER: Thank you very much. Next we have Sandy Bahr.

MS. BAHR: Hi, good afternoon. Thank you for the opportunity to speak this afternoon. My name is Sandy Bahr; I am the Chapter Director for the Sierra Club here in Arizona. And I live in Phoenix and in the PM-10 nonattainment area and have lived in the PM-10 nonattainment area ever since there has been one. Because as far as I know ever since there has been one we haven't met the standards.

Um, as you know PM-10 has been a serious problem in the Valley for more than two decades and there's a long history of inadequate plans being submitted and failure to reach attainment.

We have raised the issue before about the Maricopa

Association of Governments not being the right entity for leading this effort. No offense, I know people work really hard, but I think politically it is a difficult place to try to get clean air when the purpose of the organization is really about transportation and facilitating expenditure of federal highway dollars.

A couple of things, specific to-- so that is kind of an overarching comment and I don't expect that MAG will address that one, but I just wanted to make sure that you were aware that we continue to have that concern.

One of the issues that I wanted to raise this afternoon is this issue of three years of clean data and the fact that you are looking at seeking to identify 21 of the 22 exceedances for 2011 as exceptional events. Uh, I think by anyone's common sense definition, when you start having that many exceptional events they fail to be exceptional, and we strongly question that. We have, I know-- probably used most of my time so I'll try to be quick. We are submitting some written comments.

The other thing is this plan is supposed to demonstrate best available control measures and maximum measures as well and we didn't see where you had demonstrated that in the plan. And, so, I would love for someone to point that out, but I believe you have to demonstrate in the plan as well.

One thing we have raised before, and it just doesn't make a whole lot of sense-- from just when you think about a

contingency measure? How can it be a contingency measure if its already implemented. Contingency measures are supposed to be for, you know, if something else doesn't work, you have a contingency. And what has happened with a lot of previous measures is, we are implementing a contingency and then there is no contingency, right, there is nothing left. And so, we would like to have you take a look at that as well.

Finally, we just continue to have concerns about enforcement and I think the gentleman before me raised some of the issues with that and I know that there have been changes relative to the BMP's for agriculture, but I still think there are good questions about whether those are truly, uh, enforceable and would like to see more information in the plan on that as well. And there are some other issues, but I am out of time.

I appreciate the opportunity. Thank you.

MS. BAUER: Thank you very much.

Do we have any other forms for people wishing to speak?

Okay, thank you very much. The Maricopa Association of Governments appreciates your interest in regional air quality and your comments. Your comments will be presented to the MAG Air Quality Technical Advisory Committee at the April 26, 2012 meeting at 1:30 p.m. A response to comments will be prepared and included in the plan documents.

Again, we thank you for your participation this evening.

(The proceedings concluded at approximately 6:05 p.m.)

STATE OF ARIZONA

COUNTY OF MARICOPA

I HEREBY CERTIFY that the foregoing was taken before me, KARA JOHNSON; that I was present at the public hearing and that the public hearing was video taped, and thereafter reduced to writing by me based upon my presence at the hearing and the video tape; and that the foregoing 22 pages contain a full, true, and correct transcript of said record, all done to the best of my skill and ability.

WITNESS my hand this 20th day of April,2012.

KARA JOHNSON

Administrative Assistant

MAG Environmental Division

MARICOPA ASSOCIATION of GOVERNMENTS
302 North 1st Avenue, Suite 300 ▲ Phoenix, Arizona 85003
Phone (602) 254-6300 ▲ FAX (602) 254-6490
mag@mag.maricopa.gov

Meeting: Public Hearing on the MAG 2012 FIVE PERCENT PLAN FOR PM-10

Room: Saguaro Room

Date: April 12, 2012

PLEASE SIGN IN BELOW:

NAME	ORGANIZATION/AFFILIATION	MAILING ADDRESS
Beth Lewallen	Maricopa County	301 W. Jefferson, 10th Floor Phoenix, AZ 85003
JASON BARAN	SRP	PoBox 52025 PHOENIX, AZ 85072
Beverly Chenausky	AZDOT	206 S. 17th Ave MD 320A Phoenix, AZ 85007
Joonwon Joo	ADOT	206 S. 17th Ave. MD320B Phoenix, AZ 85007
JOHANNA M. KUSPERT	MCAQD	1001 N CENTRAL AVE PHX AZ 85004
Rep. Amanda A Reeve	Az Leg.	
Eric Massey	ADEQ	1110 W. Washington Phx, Az 85007
Joe Gibbs	Phx	~~200 W 4th St~~ 200 W. Washington St. Phx 85003
Jerry Greenberg	Chandler	4531 W. Chicago St Chandler 85226
Bill Wiley	MCAQD	1001 N Central Phx AZ
Sandy Bahr	Sierra Club	202 E McDowell #277 Phoenix AZ 85004

MARICOPA ASSOCIATION of GOVERNMENTS

PUBLIC HEARING ON THE
MAG 2012 FIVE PERCENT PLAN FOR PM-10
FOR THE MARICOPA COUNTY NONATTAINMENT AREA

April 12, 2012

Date 4/12/12

Name Jerry Greenberg
(Please Print)

Address 4531 W. Chicago St, Chandler 85226

Title _____ Phone 480-557-9962

Representing My Family
(Organization, etc.)

Do you wish to be heard? Yes ☒ No ☐ If Necessary ☐

Jy Greenberg
Signature

MARICOPA ASSOCIATION of GOVERNMENTS

PUBLIC HEARING ON THE
MAG 2012 FIVE PERCENT PLAN FOR PM-10
FOR THE MARICOPA COUNTY NONATTAINMENT AREA

April 12, 2012

Date 04/12/2012

Name Sandy Bahr
(Please Print)

Address 202 E McDowell Rd #277

Title Director Phone 602-253-8633

Representing Sierra Club – Grand Canyon Chapter
(Organization, etc.)

Do you wish to be heard? Yes ☒ No ☐ If Necessary ☐

Signature

RESPONSE TO PUBLIC COMMENTS ON THE DRAFT MAG 2012 FIVE PERCENT PLAN FOR PM-10 FOR THE MARICOPA COUNTY NONATTAINMENT AREA

APRIL 12, 2012 PUBLIC HEARING

The Maricopa Association of Governments (MAG) appreciates the comments made during the public comment period for the Draft MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area. An advertised public hearing was conducted on April 12, 2012. Verbal testimony was presented at the April 12, 2012 public hearing. One submittal of written comments was received.

COMMENTS FROM JERRY GREENBURG (Testimony at the April 12, 2012 public hearing)

Comment: We bought a foreclosed home, sunk a bit of our life savings into it, in Chandler, in just a regular, nice neighborhood. Last fall, after living in the home for about a year and a half I was having trouble breathing. So I went to the doctor and they checked me out, did a chest X-ray, that kind of thing. On my way back I stopped at the intersection of McClintock and Chandler and it was a little bit windy and I looked over to my right and its all vacant lots on the north of that area and dust was just blowing like crazy right into my neighborhood. So I thought perhaps, OK, you know where I am going, from there. I looked around and I realized my neighborhood, Twelve Oaks, Stellar Air Park, is surrounded by dirt lots. So all of a sudden I became interested. I called the City, I called the County, and made formal complaints which were responded to. However, frankly, if I kept my front yard like the people keep the vacant lots that they owned, I'd be fined, but yet people are allowed to dump construction dirt on these lots. They are allowed to dump construction debris. They are allowed to just let it be bare dirt, literally bare dirt, on these lots. What I would ask you is, why are we coddling these vacant lot owners? The economic recovery is well going on and another is, would you please, maybe you are doing this and I don't know, monitor residential areas for PM-10 and then report on them?

Response: Thank you for your concern. Fugitive dust produced by vacant lots is regulated under Maricopa County Air Pollution Control Rule 310.01, Fugitive Dust from Non-Traditional Sources of Fugitive Dust. http://www.maricopa.gov/aq/divisions/planning_analysis/rules/docs/310.01.pdf. The Rule requires the owner and/or operator of a vacant lot to keep the soil stabilized at levels that pass tests specified in the rule. A stabilized surface can appear to be bare dirt. Control measures commonly utilized include applying dust suppressants, establishing vegetative ground cover, and covering the surface with gravel.

All County Dust Control inspectors have been trained to inspect vacant lots and regularly conduct proactive as well as complaint inspections throughout Maricopa County. Between 2008 and 2010, Maricopa County conducted a total of 21,753 vacant lot inspections. Given the size of the County and the large number of vacant lots, Maricopa County Air Quality Department (MCAQD) encourages residents to call and report any problem vacant lot or dust creating activity such as illegal

dumping. To report a violation, call (602)372-2703 or log onto http://www.maricopa.gov/aq/contact_us/ReportViolation.aspx.

Vehicles traveling or parking on vacant lots (e.g., to dump construction dust or debris) are also restricted by both County and local government ordinances. The City of Chandler has an ordinance that restricts vehicular use and parking on vacant lots. If you observe vehicles traveling or parking on vacant lots in your neighborhood, call City of Chandler Code Enforcement at (480) 782-4320.

The Maricopa County Air Quality Department operates a monitoring network with a number of monitors sited to measure particulate matter at the neighborhood scale where residents live. Other monitors represent various source types and profiles common in the county such as industrial, commercial, etc. Monitoring data is summarized annually by location in a network review report submitted to the Environmental Protection Agency. In addition, the department prepares an annual report that summarizes its compliance inspection and enforcement activity. Both documents are available on the Maricopa County Air Quality Department website. The network review reports available at http://www.maricopa.gov/aq/divisions/monitoring/network.aspx and the annual report at http://www.maricopa.gov/AQ/media/docs/pdf/NewsItemDocs/2011%20-%20Annual%20Report.pdf.

Comment: I have a new grandson who was born at Chandler Regional Hospital. On the way, on Frye Road, at sunset, I saw a huge tractor with a plow on the back of it, raising huge clouds of dust, a half mile from where my grandson is and I called the City the next day. They said they would talk to him about it and they said oh, he'll stop doing that. Thank you, he should have known not to do that and he did it at sunset because he knew that all the offices were closed. We can't have that kind of thing going on in a City. Chandler is over 250,000 residents and yet this is the kind of thing that is going on. I can't speak for Glendale, or any place else, I can only speak for the City I live in and so what I would ask you is, please continue to enforce this lobby. The State, the Government, to really be stronger on this and really help us to grow up as a community, so that it can be healthier.

Response: The Arizona Department of Environmental Quality (ADEQ) is responsible for controlling dust emissions from agricultural activities in Area A, which includes the Maricopa County PM-10 nonattainment area. Under Senate Bill 1552, passed by the Arizona Legislature in 2007, farmers are required to implement two best management practices (BMPs) to reduce PM-10 emissions in each of the following categories: tillage and harvest, non-cropland, and cropland. Additional information on the BMPs can be obtained at http://www.azdeq.gov/environ/air/plan/download/webguide.pdf. When you observe high levels of dust being generated by a tractor or vacant parcel that is being farmed, you should call Emily Bonnani, ADEQ, (602) 771-2324, to issue a complaint.

COMMENTS FROM SANDY BAHR, SIERRA CLUB IN ARIZONA (Testimony at the April 12, 2012 public hearing)

Comment: We have raised the issue before about the Maricopa Association of Governments not being the right entity for leading the effort. No offense, I know people work really hard, but I think

politically it is a difficult place to try to get clean air when the purpose of the organization is really about transportation and facilitating expenditure of federal highway dollars. A couple of things, so that is kind of an overarching comment and I don't expect that MAG will address that one, but I just wanted to make sure that you were aware that we continue to have that concern.

Response: The Maricopa Association of Governments serves as the designated Regional Air Quality Planning Agency for the Maricopa area. The regional air quality plans are prepared through a coordinated effort with the Arizona Department of Environmental Quality, Arizona Department of Transportation, Maricopa County Air Quality Department, and Maricopa Association of Governments. Over time, significant progress has been made to improve air quality due to the implementation of the aggressive measures in the MAG regional air quality plans by the State and local governments.

The MAG region has met the federal air quality standard for carbon monoxide. There have been no violations of the carbon monoxide standard since 1996. The Environmental Protection Agency redesignated the Maricopa nonattainment area to attainment for carbon monoxide on April 8, 2005. EPA also approved the MAG Carbon Monoxide Redesignation Request and Maintenance Plan, which demonstrated that the standard would be maintained through 2015.

The MAG region has met the federal air quality standard for one-hour ozone. There have been no violations of the one-hour ozone standard since 1996. EPA redesignated the Maricopa nonattainment area to attainment on June 14, 2005. EPA also approved the MAG One-Hour Ozone Redesignation Request and Maintenance Plan, which demonstrated that the standard would be maintained through 2015.

The MAG region has met the federal air quality standard for the 1997 eight-hour ozone standard of 0.08 parts per million. There have been no violations of the 1997 standard since 2004. On April 12, 2012, EPA published a proposed rule to approve the MAG 2007 Eight-Hour Ozone Plan. Regarding the newly implemented, stricter ozone standard of 0.075 parts per million, the region had only one monitor that violated the standard in 2011.

The MAG region meets the fine particulate standard for PM-2.5.

Regarding PM-10, the Revised MAG 1999 Serious Area Particulate Plan for PM-10 was one of the first in the nation and included 77 aggressive measures to reduce coarse particulate matter. On July 25, 2002, the Environmental Protection Agency approved the Revised MAG 1999 Serious Area Particulate Plan for PM-10. The plan was heralded by EPA as one of the most comprehensive in the country. Every city and town within the nonattainment area and Maricopa County have implemented dust control measures to reduce PM-10. In addition, the MAG Regional Council has allocated $24.9 million in Congestion Mitigation and Air Quality Improvement Funds over the last 12 years to purchase clean, dust-reducing street sweepers.

While the MAG 2007 Five Percent Plan for PM-10 was voluntarily withdrawn, the aggressive measures in that plan continue to be implemented to reduce PM-10. In 2010, there were no

violations of the PM-10 standard.

Again, significant strides have been made to improve air quality in the MAG region. Air quality is an important issue to the Maricopa Association of Governments.

Comment: One of the issues that I wanted to raise this afternoon is this issue of three years of clean data and the fact that you are looking at seeking to identify 21 of the 22 exceedances for 2011 as exceptional events. I think by anyone's common sense definition, when you start having that many exceptional events, they fail to be exceptional, and we strongly question that.

Response: The EPA Exceptional Event Rule (EER) became effective on May 21, 2007. The EER allows the ambient air quality data which is submitted to EPA and used in making regulatory decisions, to be flagged and, where appropriate, excluded from calculations in determining whether or not an area has attained the standard. The data flagged as "exceptional" must have been affected by an exceptional event, which is defined as an event that affects air quality; is not reasonably controllable or preventable; is an event caused by human activity that is unlikely to recur at a particular location or a natural event; and is determined by the EPA in accordance with 40CFR 50.14 to be an exceptional event.

In order for PM-10 monitoring data on an exceedance day to be excluded from the attainment calculations for the nonattainment area, ADEQ must prepare documentation that meets requirements of the EER and receives approval from EPA. For the Maricopa County PM-10 nonattainment area, exceptional events are generally caused by high winds. In 2010, there was only one exceedance of the PM-10 standard at one monitor in the nonattainment area, which did not occur on a windy day. In 2011, the PM-10 standard was exceeded on 21 of 22 days during either strong frontal system winds or summer monsoon thunderstorm outflows. The summer thunderstorm outflows produced dust storms (haboobs) that were so unusual that they received national media attention (e.g., July 5, 2011). ADEQ is in the process of preparing documentation that meets EER requirements and justifies that the 21 exceedances were unavoidable due to the uncontrollable meteorological conditions that occurred during 2011.

Additionally, while crafting the EER, EPA acknowledged that natural events like high winds need not be rare in order to qualify as an exceptional event, *"It is important to note that natural events, which are one form of exceptional events according to this definition, may recur, sometimes frequently (e.g. western wildfires)"* (72 FR 13563). The fact that 2011 had an unusually high amount of dust storms does not preclude those dust storms from being considered as exceptional events under the current definition of exceptional events in EPA's EER.

Comment: The other thing is this plan is supposed to demonstrate best available control measures and maximum measures as well and we didn't see where you had demonstrated that in the plan. And so, I would love for someone to point that out, but I believe you have to demonstrate in the plan as well.

Response: The MAG 2012 Five Percent Plan for PM-10 is designed to meet the requirements in Section 189(d) of the Clean Air Act. Section 189(d) indicates that "In the case of a Serious PM-10 nonattainment area in which the PM-10 standard is not attained by the applicable attainment date, the State in which such area is located shall, after notice and opportunity for public comment, submit within 12 months after the applicable attainment date, plan revisions which provide for attainment of the PM-10 air quality standard and, from the date of submission until attainment, for an annual reduction in PM-10 or PM-10 precursor emissions within the area of not less than 5 percent of the amount of such emissions as reported in the most recent inventory for such area."

The Best Available Control Measure (BACM) and Most Stringent Measure (MSM) demonstrations are required under Section 189(b)(1) and 188(e) of the Clean Air Act. The MAG 2012 Five Percent Plan for PM-10 includes control measures above and beyond the measures in the Revised MAG 1999 Serious Area Plan for PM-10, which addressed the BACM/MSM requirements.

On July 25, 2002, the Environmental Protection Agency approved the Revised MAG 1999 Serious Area Plan for PM-10 that included the BACM/MSM demonstrations. On August 14, 2008, EPA again took final action to approve the Best Available Control Measure and the Most Stringent Measure demonstrations in the Revised MAG 1999 Serious Area Plan for PM-10 for the Maricopa County Nonattainment Area (see 73 FR 47542).

Comment: One thing we have raised before, and it just doesn't make a whole lot of sense - from just when you think about a contingency measure. How can it be a contingency measure if it's already implemented? Contingency measures are supposed to be for, you know, if something else doesn't work, you have a contingency. And what has happened with a lot of previous measures is, we are implementing a contingency and then there is no contingency, right, there is nothing left. And so, we would like to have you take a look at that as well.

Response: Section 172(c)(9) of the Clean Air Act requires that nonattainment plans contain contingency measures. Such measures are to be undertaken without further action by the State or the EPA Administrator if the area fails to make reasonable further progress or meet the standard by the attainment date. EPA encourages early implementation of contingency measures to reduce emissions as expeditiously as practicable. (See EPA, Early Implementation of Contingency Measures for Ozone and Carbon Monoxide (CO) Nonattainment Areas, August 13, 1993.)

The contingency requirement is met in the MAG 2012 Five Percent Plan by quantifying the benefits of PM-10 reduction projects that were implemented early (i.e., in 2008-2011). These projects included PM-10 certified street sweeping of freeways and arterials; paving and stabilizing unpaved roads, alleys and shoulders; reducing speed limits on unpaved roads and alleys; and overlaying state highways with rubberized asphalt. It is important to note that there were many other measures in the MAG 2007 Five Percent Plan that have been implemented, for which no credit is taken in the MAG 2012 Five Percent Plan. These additional measures will also assist the area in demonstrating attainment at all monitors by 2012.

Comment: Finally, we just continue to have concerns about enforcement and I think the gentleman

before me raised some of the issues with that and I know that there have been changes relative to the BMPs for agriculture, but I still think there are good questions about whether those are truly enforceable and would like to see more information in the plan on that as well.

Response: The Arizona Department of Environmental Quality (ADEQ) is responsible for controlling dust emissions from agricultural activities in Area A, which includes the Maricopa County PM-10 nonattainment area. Under Senate Bill 1552, passed by the Arizona Legislature in 2007, farmers are required to implement two best management practices (BMPs) to reduce PM-10 emissions in each of the following categories: tillage and harvest, non-cropland, and cropland. Additional information on agricultural BMPs is available at http://www.azdeq.gov/environ/air/plan/download/webguide.pdf. For more information on enforcement of agricultural BMPs, contact Emily Bonnani at ADEQ, (602) 771-2324.

COMMENTS FROM THE ARIZONA CENTER FOR LAW IN THE PUBLIC INTEREST (Letter from Joy E. Herr-Cardillo dated April 12, 2012)

1. BACM and MSM

Comment: As a serious nonattainment area for PM-10, the Phoenix area plan must include BACM for all significant sources of PM-10 and PM-10 precursors. BACM, best available control measures, are the maximum degree of emissions reductions possible after considering technical and economic feasibility and environmental impacts of the control. These must be implemented independent of attainment requirements. Also, because Phoenix obtained a five year extension of its attainment deadline, its plan must include MSM (most stringent measures). In the General Preamble (59 FR 41998), EPA sets forth a multi-step process for identifying BACM/BACT for serious areas. The proposed 5% plan does not include a BACM or MSM demonstration that follows this process, therefore, it is initially difficult to even determine whether the plan satisfies the BACM/MSM requirement. The state cannot rely upon the BACM/MSM demonstrations in the 1999 Serious Area SIP, as that demonstration was prepared more than ten years ago, and, as the EPA recognized in its proposed disapproval of the 2007 Draft 5% Plan, control measures that previously satisfied the BACM requirement, may no longer represent the "best available" control measure. See, 75 FR 54806, 54812. Therefore, an updated BACM/MSM analysis should be included in the 5% plan.

Response: The MAG 2012 Five Percent Plan for PM-10 is designed to meet the requirements in Section 189(d) of the Clean Air Act. Section 189(d) indicates that "In the case of a Serious PM-10 nonattainment area in which the PM-10 standard is not attained by the applicable attainment date, the State in which such area is located shall, after notice and opportunity for public comment, submit within 12 months after the applicable attainment date, plan revisions which provide for attainment of the PM-10 air quality standard and, from the date of submission until attainment, for an annual reduction in PM-10 or PM-10 precursor emissions within the area of not less than 5 percent of the amount of such emissions as reported in the most recent inventory for such area."

The Best Available Control Measure (BACM) and Most Stringent Measure (MSM) demonstrations are required under Section 189(b)(1) and 188(e) of the Clean Air Act. The MAG 2012 Five Percent

Plan for PM-10 includes control measures above and beyond the measures in the Revised MAG 1999 Serious Area Plan for PM-10, which addressed the BACM/MSM requirements.

On July 25, 2002, the Environmental Protection Agency approved the Revised MAG 1999 Serious Area Plan for PM-10 that included the BACM/MSM demonstrations. On August 14, 2008, EPA again took final action to approve the Best Available Control Measure and the Most Stringent Measure demonstrations in the Revised MAG 1999 Serious Area Plan for PM-10 for the Maricopa County Nonattainment Area (see 73 FR 47542).

2. 2008 PM-10 Emissions Inventory

Comment: In its proposed disapproval of the 2007 Draft 5% Plan, EPA found that the 2005 emissions inventory relied upon by the state to be insufficiently accurate because it overestimated the baseline emissions for construction and other sources. See 75 FR 54808. In the current plan, MAG is relying upon a 2008 periodic emissions inventory which, like the 2005 inventory, was prepared by Maricopa County Air Quality Department. At first glance, this more recent inventory appears to address EPA's concerns as it shows emissions from residential construction to be a smaller percentage of the overall emissions. However, a comparison of the two inventories (and the two draft plans) reveals a discrepancy that MAG does no appear to either acknowledge or explain, and that is drastic reductions in the estimated emissions overall. In the 2005 inventory, total PM-10 emissions in the nonattainment area were calculated to be 84,753 tons per year. The 2008 inventory puts that total at 48,148 tons per year - a reduction of more than 40% in just three years. It seems highly unlikely that the area achieved such a reduction in emissions by the implementation of control measures. As noted above, we did not see anywhere in the plan where this huge disparity in the data was acknowledged or explained. This oversight should be addressed,. Also, because the inventory is the principal basis for calculating the 5% annual reduction required under the CAA, it is important to the public health that the amount of current emissions are not understated.

Response: The *2008 PM-10 Periodic Emissions Inventory for the Maricopa County, Arizona, Nonattainment Area* was revised by the Maricopa County Air Quality Department (MCAQD) to address EPA concerns about the 2005 PM-10 Periodic Emission Inventory (PEI) expressed in the proposed partial approval and disapproval of the MAG 2007 Five Percent Plan published by EPA on September 9, 2010. (See 75 FR 54808.) MCAQD and EPA staff worked together to revise the 2008 PEI finalized in June 2011. In accordance with EPA guidance, MAG used the revised 2008 PEI as the basis for developing 2007-2012 emissions for the Draft MAG 2012 Five Percent Plan.

Ninety-two percent of the reduction in total PM-10 emissions from 84,753 tons per year in the 2005 PEI to 48,148 tons per year in the revised 2008 PEI can be attributed to four factors: (1) a decrease in the number of acres permitted for construction activities and increases in compliance with Maricopa County Rule 310, (2) a reduction in the material burned by wild fires, (3) annual variations in meteorological data and use of a new and improved methodology to estimate windblown dust emissions, and (4) decreases in PM-10 emissions from paved roads due to application of a new AP-42 equation released by EPA in January 2011. Each of these factors is discussed in more detail

below.

(1) One reason for the reduction in PM-10 emissions between 2005 and 2008 is the significant decline in construction activity that took place during that period. In 2005, MCAQD issued construction permits for 68,664 acres in Maricopa County; in 2008, this number was reduced to 42,130 acres, a 39 percent decline in three years.

In addition, to address EPA concerns (in 75 FR 54808) regarding potential overestimation of PM-10 emissions from construction activities, MCAQD staff worked closely with EPA to improve the methodology used to quantify rule effectiveness (i.e., compliance with Maricopa County dust control rules). (See Appendix 3 of the revised 2008 PEI contained in Appendix A, Exhibit 1 of the Draft MAG 2012 Five Percent Plan.) The new methodology developed in concert with EPA is used in the revised 2008 PEI, as well as the Draft MAG 2012 Five Percent Plan, to estimate rule effectiveness for Rule 310 (Fugitive Dust from Dust-Generating Operations), Rule 301.01 (Fugitive Dust from Non-Traditional Sources of Fugitive Dust), and Rule 316 (Nonmetallic Mineral Processing). Table 5-1 in the Draft MAG 2012 Five Percent Plan shows the new rule effectiveness rates that were calculated for 2007 through 2010 using the new methodology and actual compliance data. The rule effectiveness rate for construction activities in the 2005 PEI was 51 percent; using the new methodology, the rule effectiveness rate for construction activities in the 2008 PEI is 90 percent. This represents a 76 percent increase in compliance with Rule 310 between 2005 and 2008.

Due to the 39 percent reduction in construction activity and 76 percent increase in rule effectiveness, the PM-10 emissions from construction activities in 2005, 32,130 tons, declines to 7,964 tons in 2008, a 75 percent reduction. This reduction of 24,166 tons per year represents the largest proportion (66 percent) of the decrease in total PM-10 emissions (36,605 tons) between 2005 and 2008.

(2) In the 2005 PEI, wild fires produced 4,860 tons of PM-10 emissions based on 345,909 tons of material burned within the nonattainment area. In the 2008 PEI, the comparable values for wild fires are 424 tons of PM-10 emissions based on 33,479 tons of material burned. Due to the significant reduction in material burned in the nonattainment area between 2005 and 2008, the PM-10 emissions for wild fires are 91 percent lower in the 2008 PEI. This reduction of 4,436 tons explains another 12 percent of the decrease in total PM-10 emissions between 2005 and 2008.

(3) Windblown dust PM-10 emissions in the 2005 PEI are 7,380 tons for the nonattainment area, compared with 4,815 tons in the 2008 PEI. MCAQD contracted with ENVIRON to estimate windblown dust emissions for the 2005 PEI. ENVIRON applied the windblown dust emissions model developed by the Western Regional Air Partnership (WRAP) to 2004 land use and 2005 meteorological data for Maricopa County. The ENVIRON methodology is documented in Appendix 3.2 of the 2005 PEI.

For the revised 2008 PEI, MAG developed a new PM-10 emissions estimation methodology using the latest scientific research on windblown dust in the arid southwest. (See Appendix 4 of the revised 2008 PEI contained in Appendix A, Exhibit 1 of the Draft MAG 2012 Five Percent Plan.)

The methodology uses local data from observed windblown dust events, combined with empirical data from wind tunnel studies performed in the deserts of the southwest. The windblown dust estimates in the 2008 PEI are based on 2008 wind speed and precipitation data from 34 meteorological stations and the most recent land use data (2009) available for the nonattainment area. The new methodology produces a more accurate estimate of the contribution of windblown dust to the 2008 PEI.

The 35 percent reduction in PM-10 emissions from windblown dust between 2005 and 2008 can be attributed to the use of different methodologies, as well as different land use and meteorological data for these years. The 2,565 ton reduction in 2008 represents seven percent of the decrease in total PM-10 emissions between 2005 and 2008.

(4) In January 2011, EPA released a new version of the AP-42 equation that estimates particulate emissions from vehicles traveling on paved roads. The new equation is documented in EPA, *Emission Factor Documentation for AP-42, Section 13.2.1, Paved Roads*, January 2011. The paved road PM-10 emissions in the revised 2008 PEI were developed using this new equation. Application of the previous AP-42 equation (November, 2006) for the 2005 PEI resulted in paved road PM-10 emissions of 13,783 tons for the nonattainment area; paved road emissions estimated with the new AP-42 equation are 6,694 tons, a reduction of 51 percent in the 2008 PEI.

The reduction in paved road PM-10 emissions of 7,089 tons in the 2008 PEI is partially offset by increases in emissions from exhaust, tire wear, brake wear, and vehicles traveling on unpaved roads. The exhaust, tire wear and brake wear emissions are 1,404 tons higher in 2008, due to use of the new EPA MOVES2010a mobile source emissions model, rather than the EPA MOBILE6.2 model used in the 2005 PEI. In the 2008 PEI, unpaved road PM-10 emissions are also 3,221 tons higher, due to use of updated information collected on unpaved roads and alleys. Overall, PM-10 emissions from all onroad mobile sources are reduced from 24,013 tons in the 2005 PEI to 21,549 tons in the 2008 PEI. This net decline of 2,464 tons represents seven percent of the decrease in total PM-10 emissions between 2005 and 2008.

The sum of the emission reductions discussed in (1) through (4) above is 33,631 tons, which represents 92 percent of the total decrease in PM-10 emissions between 2005 and 2008. The remaining eight percent reduction can be attributed to factors such as increased rule effectiveness for Rules 310.01 and 316 and decreased industrial activity, due to the economic recession that commenced in 2008. The factors described above (decline in construction activity, increased compliance with Rule 310, reduced impact of wild fires, improved windblown dust methodology using 2008 meteorological and 2009 land use data, and the new EPA paved road dust equation) explain the reduced emissions in the 2008 PEI and reinforce the accuracy of the 2008 PM-10 emissions used as the basis for the Draft MAG 2012 Five Percent Plan.

It is also important to note that the calculation of annual five percent reductions in the Draft MAG 2012 Five Percent Plan is based on 2007 base case emissions of 59,218 tons per year, which are 23 percent higher than the 2008 emissions of 48,148 tons per year in the revised 2008 PEI. (See Page ES-2 and Table ES-1 in the Draft MAG 2012 Five Percent Plan.) Therefore, the five percent

reductions calculated in the Draft MAG 2012 Five Percent Plan are not understated.

3. Reliance upon EPA's Concurrence Regarding Exceedances Claimed As Exceptional Events:

Comment: We are concerned that the attainment demonstration in the 2012 5% Plan, like the 2007 5% Plan, relies upon the concurrence by EPA regarding exceptional events. As the plan acknowledges there were 7 exceedances in 2009 alone that must be treated as exceptional events in order for the area to meet the extended attainment deadline. Further, although the 2011 data has not yet been finalized, the initial data indicates that there [sic] once again a significant number of exceedances over multiple days and multiple monitors. The likelihood of eliminating all of these exceedances as exceptional events would appear both remote and contrary to the public interest. Therefore, we believe that a plan that proposes to achieve "attainment" simply by whitewashing over severely unhealthful conditions is both irresponsible and contrary to the public interest.

Response: Section 319(b)(2) of the Clean Air Act required EPA to publish and finalize regulations governing the review and handling of air quality monitoring data influenced by exceptional events. In establishing the requirement, Congress provided EPA with a definition of exceptional event that recognized that not all episodes of air pollution can be controlled or prevented by means of implementing the Clean Air Act. Specifically, Section 319(a)(1)(A) defined the term exceptional event to include, among other things, those events that are not "reasonably controllable or preventable" or are "…an event caused by human activity that is unlikely to recur at a particular location or a natural event".

On March 22, 2007, EPA adopted the Exceptional Events Rule, codified in Code of Federal Regulations, Title 40, Parts 50 and 51. In the implementing rules, EPA allows States to request the exclusion of data showing exceedances or violations of the national ambient air quality standard that are directly the result of an exceptional event, provided the State submits a demonstration justifying the exclusion of the data. All such demonstrations must undergo public comment prior to submission for concurrence by EPA.

Section 110 of the Clean Air Act requires all State Implementation Plans (SIPs) to address reasonably controllable sources of air pollution, as well as any reasonably controllable or preventable activities. Through the development of the proposed 5% Plan, ADEQ, MAG and MCAQD have evaluated the exceedances that occurred in 2009 and 2011, and have compared them to the requirements in EPA's Exceptional Events Rule, as well as EPA's Draft 2011 Exceptional Events Guidance document. Based upon that analysis it was concluded that the overwhelming majority of exceedances that occurred during 2009 and 2011 were the direct result of events that could not be prevented or that overwhelmed the controls required by the existing non-attainment area plans.

On March 14, 2012, after 30 days of public comment and in accordance with EPA's Exceptional Event Rule and Draft 2011 Exceptional Events Guidance document ADEQ submitted to EPA

documentation demonstrating that the PM-10 exceedances recorded between July 2 and July 8, 2011, were the result of exceptional events that were not preventable or were beyond any reasonable control. EPA's decision regarding this documentation is expected by July 2012. Based on the submitted analysis, the similarity of other 2011 exceedances to those observed between July 2 through 8, and a review of the likelihood of EPA concurrence under both the Exceptional Events Rule and the Draft 2011 Exceptional Events Guidance, ADEQ, MCAQD, and MAG have concluded that there is a relatively low risk of nonconcurrence.

Finally, recognizing that the public is still exposed to these high concentrations of PM-10, regardless if they are reasonably preventable or controllable, ADEQ is required by Arizona Revised Statute § 49-424(11) to develop and disseminate air quality dust forecasts for the Maricopa County PM-10 nonattainment area. These forecasts are required to identify the risk of dust generation for the next five consecutive days, and must be posted, at a minimum, on ADEQ's web site, five days each week. In addition to the dust forecasts, ADEQ also publishes a forecast that predicts the air quality index for the upcoming days, and issues health watches or high pollution advisories on days where exceedances of the PM-10 standard are expected to occur. ADEQ has taken the additional step of making these forecasts available to any interested party via electronic mail. To sign up for these or other ADEQ issued forecasts, please visit https://public.govdelivery.com/accounts/AZDEQ/subscriber/new.

4. General Permit BMPs and Agricultural Permit BMPs:

Comment: While we generally support the adoption of the general permit requirement for all dust generating activities and the increased stringency of the agricultural permit requirements, the plan does not adequately demonstrate that either of these control measures satisfy the BACM and MSM requirement. The plan did not mention the concerns raised by EPA in its proposed rulemaking in 2010 regarding the agricultural BMPs or indicate whether or how these concerns have been addressed.

Response: As part of the stakeholder process for this revision to the State Implementation Plan, ADEQ, MCAQD and MAG analyzed the conditions under which Maricopa County's PM-10 exceedances occurred. Since 2007, the most common factor associated with PM-10 exceedances in Maricopa County was elevated wind speed. In reviewing other PM-10 control programs, ADEQ, MCAQD and MAG were unable to identify another comprehensive SIP program that was specifically designed to control dust on days with high winds. As a result, a new, innovative method for controlling dust was required.

ADEQ agreed to legislation that requires the Department to issue a pollution forecast that identifies the risk of dust generation on subsequent days. Based upon ADEQ's forecast, all owners or operators of dust generating activities within Maricopa County are required to implement air pollution controls as soon as practicable before and during a day forecast to be at high risk of dust generation. Those owners and operators that already have an air quality permit are required to continue complying with the conditions of their permit on those days. If the owner or operator of

the dust generating activity did not require an air quality permit, ADEQ was given the authority to require these owners or operators to obtain a Dust Action General Permit. The controls that were included in the Dust Action General Permit build upon the existing Best Available Control Measure (BACM) requirements of MCAQD Rule 310 that was approved into the Arizona State Implementation Plan on July 25, 2002 (at 67 FR 48716). In addition to these controls, the permit also adds additional monitoring, record keeping and reporting requirements that enhance the enforceability of these control measures. Because there is no other program in the Country that is similar to the Dust Action General Permit, the control measure is being submitted in accordance with EPA's September 2004 guidance entitled *Incorporating Emerging and Voluntary Measures in a State Implementation Plan (SIP)*, and there are no benchmarks for it.

This plan is being submitted pursuant to Clean Air Act § 189(d) which provides for annual emission reductions of 5% until attainment is demonstrated. This plan includes a commitment to evaluate the effectiveness of MCAQD Rule 310.01 in calendar year 2013. If the evaluation does not result in sufficient emissions reductions, ADEQ has committed to submitting a SIP revision that contains replacement measures to reduce PM_{10} emissions by an amount equal to or more than the total PM_{10} emissions reductions that were not achieved by these measures.

With respect to the Agricultural Best Management Practices (Ag BMP) program, portions of the current program have already been approved into the SIP and those commitments remain on-going. This Section 189 plan did not rely on any improvements to the previously approved Ag BMP program to achieve the required annual 5% emissions reductions or to demonstrate that the plan results in attainment. As a result, the improvements that were made to the program in 2007, 2009, 2010 and in 2011, have not been included as part of this SIP revision.

In 2009 and 2010, the statutes authorizing the Ag BMP program have changed such that after June 1, 2009, this program automatically becomes effective in all areas that are re-designated as moderate or serious nonattainment for PM-10. Operations subject to the program in areas that are re-designated as moderate nonattainment are required to apply at least one BMP in each applicable category, whereas operations in areas that are re-designated as serious nonattainment are required to apply at least two BMPs in each applicable category. Because of the statewide applicability of this program, the Arizona Department of Environmental Quality will submit the program as a separate, independent revision to the State Implementation Plan.

5. Enforceability of Control Measures:

Comment: We have concerns about the enforceability of control measures in the plan. As you know, citizen enforcement is encouraged under the Clean Air Act. However, in recent years, when citizens have brought actions to enforce control measures that the state is responsible for implementing, the state has invoked the Eleventh Amendment in an effort to avoid the enforcement of its obligation to comply with the SIP. *See Paisley v. Brewer*, CV2:10-cv-01253-DGC (D.Ariz.) and *Sweat v. Hull*, 200 F. Supp. 2d. 1162 (D. Ariz. 2001). Although the defense did not preclude injunctive relief in either case, it unnecessarily protracted the litigation and demonstrated the lack

of commitment on the part of the state to fulfilling its obligation under the SIP. Therefore, we believe that where the state or one of its subdivisions (i.e., a county) assumes responsibility for the implementation of specific control measures, the commitment should include an unequivocal consent to federal jurisdiction if enforcement is sought under the citizen suit provision. This consent will ensure that the measures are fully enforceable by both EPA and affected citizens, as the enforcement scheme adopted by the Act contemplates.

Response: As noted in the comment, the legal strategy employed by Arizona did not preclude injunctive relief and it did not affect the enforceability of the SIP by either EPA or affected citizens. Because the merits of each lawsuit must be reviewed on a case-by-case basis, the response to the lawsuit must address the merits of each case, and the defense strategy in question did not affect the enforceability of the SIP, it is not prudent to unnecessarily limit future defense strategies.

6. Technical Issues and Concerns:

GENERAL

Editorial Comments:

Comment:

- The report provides very limited examples and few calculations to support the reported values.
- The report is also lacking equations to support reported values.
- The reported values are in a variety of units, which makes comparisons difficult.

Response: The technical analyses conducted to support the attainment demonstration in the Draft MAG 2012 Five Percent Plan for PM-10 were performed by MAG, with assistance from Sierra Research. Some of the calculations and equations used to perform the rollback modeling for the attainment demonstration were too voluminous to be included in the Draft Plan. However, all of the technical assumptions, equations and reported values documented in the Draft MAG 2012 Five Percent Plan have been reviewed by and received concurrence from EPA and other members of the 5% PM-10 Plan Technical Committee.

The 5% PM-10 Plan Technical Committee was formed by the Arizona Department of Environmental Quality (ADEQ) in response to a stakeholder meeting conducted on February 8, 2011. The meeting was held to discuss the withdrawal of the *MAG 2007 Five Percent Plan for PM10 for the Maricopa County Nonattainment Area* and to allow EPA to directly discuss what portions of the 5% Plan required additional work in order to be considered an approvable plan. During the meeting it was determined that a technical workgroup comprised of members from ADEQ, the Maricopa County Air Quality Department, the Maricopa Association of Governments and the U.S. EPA would be formed to meet on Wednesday of every other week. The first meeting of the 5% PM-10 Plan Technical Committee occurred on February 9, 2011.

The stated mission and purpose of the Maricopa 5% PM-10 Plan Technical Committee was to provide technical work to support a SIP submission to EPA by January 2012; investigate and resolve stated plan deficiencies and support improvements in emission inventories, exceptional event documentation and conceptual model of air quality problem/control measures.

The 5% PM-10 Plan Technical Committee met more than twenty times to review technical work related to the revised 2008 PM-10 emissions inventory, exceptional events documentation, the Dust Action General Permit, and the modeling assumptions and protocol for the Draft MAG 2012 Five Percent Plan. The Technical Support Document for the Draft Plan describes the Committee-endorsed modeling methodology that demonstrates attainment of the PM-10 standard in 2012.

MODELING

Model Selection:

Comment:

- The air quality modeling demonstration for the 24-hour PM10 standard is based on U.S. EPA's rollback modeling method. Federal regulations state that "all applications of air quality modeling involved in this subpart shall be based on the applicable models, data bases, and other requirements specified in appendix W of this part (Guideline on Air Quality Models)." 40 CFR Part 51.160(f).

- Appendix W section 5.2.2.2 PM10; "Refined models such as those discussed in subsection 4.2.2 are recommended for PM-10."

- Appendix W Section 4.2.2(b) Refined Analytical Techniques: "For a wide range of regulatory applications in all types of terrain, the recommended model is AERMOD."

- Appendix W Section 5.2.2.2(e): "Due to the difficult nature of characterizing and modeling fugitive dust and fugitive emissions, it is recommended that the proposed procedure be cleared by the Regional Office for each specific situation before the modeling exercise is begun."

- The rollback approach is not one of U.S. EPA's preferred methods for demonstrating attainment of the PM10 NAAQS

Response: Use of distance-weighted rollback was cleared by staff from EPA Region IX before the modeling exercise for the Draft MAG 2012 Five Percent Plan began. As discussed in the previous response to the editorial comments, EPA was an active member in the 5% PM-10 Plan Technical Committee and reviewed all of the technical assumptions and methods to be used prior to the commencement of attainment modeling for the draft Plan.

In an August 5, 2011 e-mail from Greg Nudd, EPA, to the 5% PM-10 Plan Technical Committee, Scott Bohning, EPA, provided the following comments on the Draft Conceptual Model for Demonstrating PM-10 Attainment document, July 25, 2011: "The chosen distance-weighted rollback seems like a good approach. It gets the main benefit of dispersion modeling over simple rollback in that it accounts for source distance from the monitor, but with less work and without the misleading precision that can accompany dispersion modeling of fugitive dust. Back-trajectories along with judgement based on available wind speed and direction measurements are a reasonable basis for choosing the emission inventory domain."

Although AERMOD was used to model attainment in the MAG 2007 Five Percent Plan for PM-10, EPA's preferred model for demonstrating attainment in the replacement 2012 Plan is distance-weighted rollback, rather than AERMOD. In addition to model selection, EPA provided other technical recommendations that are reflected in the attainment modeling described in Chapter V of the Technical Support Document in Appendix B, Exhibit 1 of the Draft MAG 2012 Five Percent Plan.

Weighted Rollback:

Comment: The report does not present any of the rollback questions used so it is unclear which rollback method was used.

Response: The calculations made using the rollback model are better understood through stepwise text descriptions rather than by a single or set of equations. The steps used in the weighted rollback model used in the 2012 Five Percent Plan are described as follows:

1. Determine the hourly concentrations recorded at the designated monitoring station on the design day.

2. Parse the hourly concentrations into high wind and low wind bins.

3. Determine the background PM_{10} concentration for the design day.

High Wind Hours (Baseline Year):

4. Plot hourly back-trajectories for each high wind hour using the 5-minute meteorological data recorded at the designated monitoring station.

5. From a GIS land use database, extract the land use designations and coordinates of each 10-acre grid cell within 1 mile laterally of the back-trajectory path.

6. For each 5-minute segment of a high wind hour, use the average measured windspeed to calculate the emissions for each of 11 land use classes and 2 disturbance states (disturbed and undisturbed) and then sum the 5-minute contributions to derive an hourly emission rate for each land use and disturbance state.

7. For each 10-acre grid cell, apply the appropriate hourly emission rate and then divide by the distance in feet between the grid cell and the monitor to calculate the distance-weighted emission rate for that parcel.

8. Sum over all of the 10-acre grid cells in the hourly modeling domain to compute total distance-weighted emissions for that hour and domain.

High Wind Hours (Attainment Year):

9. Apply the appropriate reduction factor by land use and disturbance state to the emissions from each 10-acre grid cell. Divide the resulting emissions by the distance to the monitor to calculate the attainment year distance-weighted emissions for each grid cell.

10. Sum over of the 10-acre grid cells to compute total distance-weighted emissions for that hour and domain.

High Wind Hour Reduction Factor:

11. Divide each hour's Attainment Year total distance-weighed emissions by the appropriate baseline year total distance-weighted emissions and subtract these fractions from one to compute the high wind hourly reduction factors.

12. Compute the attainment year high wind hour PM_{10} concentration at the monitor by subtracting the background concentration from the baseline year high wind hour concentration, multiply this result by the appropriate high wind hour reduction factor, and add this result to the background concentration.

Low Wind Hours (Baseline Year):

13. Compute annual ton/acre PM_{10} emission rates by dividing nonattainment area-wide land use-specific annual emissions by total acres devoted to that land use to derive annual ton/acre emission rates by land use.

14. Extract total acres per land use within the low wind modeling domain from a GIS land use database.

15. Multiply total acres per land use by the appropriate annual emission rate to derive total annual emissions per land use type in the low wind modeling domain. Sum over all land uses to derive total annual baseline emissions within the low wind modeling domain.

Low Wind Hours (Attainment Year):

16. Apply land use-specific reduction factors to appropriate annual baseline emissions by land use to derive total attainment year emissions by land use category in the low wind modeling domain. Sum over all land uses to compute total annual attainment year emissions with the low wind modeling domain.

Low Wind Hour Reduction Factor:

17. Divide the annual attainment year domain-wide emissions by the annual baseline year domain-wide emissions and subtract from one to determine the low wind hour reduction factor.

18. Compute the attainment low wind hour PM10 concentration at the monitor by subtracting the background concentration from the baseline year low wind hour concentration, multiply this result by the appropriate low wind hour reduction factor, and add this result to the background concentration.

Design Day Attainment Year PM10 Concentration:

19. Sum over all high and low wind hourly attainment year PM_{10} concentrations to determine the attainment year 24-hour PM_{10} concentration for the design day.

The basic equations for high wind and low wind hour PM10 concentrations are:

For a high wind hour: $C_{future} = ((C_{baseline} - C_{background}) * (1 - HW_{reduction})) + C_{background}$
For a low wind hour: $C_{future} = ((C_{baseline} - C_{background}) * (1 - LW_{reduction})) + C_{background}$

where: C = PM_{10} concentration, ug/m3
HW = percent high wind reduction,
LW = percent low wind reduction.

This methodology is described in more detail on p. V-62 to V-78 in Appendix B, Exhibit 1.

Comment: If the analysis is based on the modified rollback method, was a spatial distribution analysis performed?

Response: A spatial analysis was performed when the reductions in distance-weighted emissions were evaluated for high wind hours on the June 6, 2007 design day. For each high wind hour, back-trajectories were plotted, and emissions per grid cell in the back-trajectory modeling domain were calculated. Control factors applicable to individual land uses in the attainment year, 2012, were applied to 2007 baseline emissions. Baseline and horizon year emissions for each grid cell were adjusted by the distance-related weighting factor and then summed over the entire back-trajectory to arrive at total distance-weighted emissions. The overall fractional reductions in emissions were

calculated for each high wind hour, and the results were presented in Table V-31 of Appendix B, Exhibit 1.

The results in percent reduction of weighted emissions shown in this table for each high wind hour cluster remarkably closely. During the June 6th design day, wind directions measured at the West 43rd Avenue station varied from 220° to 255°, resulting in corresponding variations in fractional land uses between each hourly back-trajectory. Regardless of these differences, the resulting fractional reductions in weighted emissions varied by less than 12%, from a low of 33.2% to a high of 37.1%. This result demonstrates that reductions in concentrations measured at the monitoring station are relatively independent of wind azimuth – and accompanying emission source spatial distribution - during high wind hours.

Comment: In appendices Volume 2 p. V-5, under the Weighted Rollback section, the report states: "The reduction factor is calculated on the basis of the distance between each source and the impacted monitoring site"

- Please provide the equation(s) used for the weighted rollback analysis. Based on the statement above, it is not clear how MAG has calculated the emissions weighting. The equations[1] used in EPA's proportional or modified rollback method do not involve any interactions among individual sources, only each individual source and a monitor.

Response: Please see the Response to the first Weighted Rollback Comment above.

Comment: Rollback typically requires speciated profiles of soil dust from ambient measurements and chemical analysis for source apportionment calculations, using CMB (Chemical Mass Balance). Did MAG use any source profiles to support the modeling analysis? Please refer to "Guidelines to Sampling and Analysis Applicable to Receptor Modeling"

Response: The first sentence of the referenced report states "Chemical characterization of suspended particles is necessary, along with the application of receptor models to apportion ambient concentrations to their sources for the development of emission reduction strategies." The methods outlined in the report are designed to guide the collection and chemical characterization of ambient aerosol samples. The role of CMB is to then establish the relative contribution of sources with known unique chemical signatures to the ambient samples collected in the field. Under high wind conditions, the dominant PM-10 emission source is fugitive dust. Unfortunately, there are no chemical signatures available to characterize fugitive dust from different land uses within the nonattainment area. Without this information, it is not possible for the rollback methodology to use CMB to address source apportionment.

Comment: MAG 2012 FIVE PERCENT PLAN FOR PM-10 FOR THE MARICOPA COUNTY NONATTAINMENT AREA. P. 6-44: " The attainment modeling for the nonattainment area demonstrates that the 24-hour PM-10 standard will be met by a relatively narrow margin in 2012

[1] Rollback Modeling Basic and Modified, Air Waste Management Association 25:9 (September 1975)

(i.e., 153.8 ug/m^3 at the West 43rd Avenue monitor)." Was a sensitivity analysis performed to evaluate the degree of confidence in the results? A sensitivity analysis may reveal conditions where the modeling fails or requires improvement, so as to ensure NAAQS are attainment according to the plan.

Response: The dominance of near upwind sources on monitored concentrations during high wind hours, as evidenced by the analysis conducted to determine the appropriate distance-weighting factor, and the tight cluster of back-trajectory hour reduction factors presented in Tables V-25 through V-31, demonstrate the relative insensitivity of monitored PM_{10} concentrations to emission source spatial distribution during high wind hours. The variability in source spatial distribution is the greatest uncertainty with respect to determining locations of peak PM_{10} concentrations. Distributions of meteorological parameters and soil surface emissions rates during high wind conditions have been measured and better characterized than land use distributions. Thus, a sensitivity analysis was conducted on the emission parameter possessing the greatest uncertainty, and no further analysis is needed.

Comment: Rollback only works if the monitor is at the point of highest impact. Since air pollution standards must be attained within the entire planning area and not simply at the monitors, how confident is MAG in their choice to use a single point to represent the entire Maricopa County nonattainment area? Dispersion modeling typically provides for a more credible product, since they more realistically account for spatial and temporal patterns.

Response: The analysis of the temporary monitoring data shows that when winds exceeded 12 mph and were coming from the dominant high wind direction (220° to 290°), the maximum concentrations were always recorded at the West 43rd Avenue monitoring site. Additional analysis, presented in Table V-19, demonstrates that the highest wind gusts in 2007 were recorded at the West 43rd Avenue monitor. Given the frequency and magnitude of exceedances at this site, it is reasonable that it was selected and approved by EPA for one of the design day attainment demonstrations (i.e., May 4th). However, to ensure that a single location does not bias the attainment demonstration, a second high wind day was selected, one in which multiple monitors exceeded the standard (i.e., June 6th) and attainment demonstrations were prepared for the six monitoring sites in the nonattainment area with meteorological measurements. The use of rollback to demonstrate attainment at six widely dispersed monitoring sites with varying back trajectories capturing a variety of land uses, activity and emissions provides ample evidence that a single point was not used to demonstrate attainment. The fact that EPA participated in the development of this approach and ultimately approved it further demonstrates the validity of the methodology.

Comment: Is MAG confident that the receptor location in the high-wind micro inventory domain is representative of worst case conditions? Are there any locations within the high-wind domain where predicted concentrations can be potentially higher than the monitor site?

Response: The temporary monitoring study provides insight into concentrations recorded at multiple locations between the West 43rd Avenue monitor and the edge of the desert (west of

Buckeye at the Arlington monitor), a distance of roughly 35 miles. The results of that study, presented in V-7 – V-20, show that when winds exceeded 12 mph and were coming from the dominant high wind direction (220° to 290°), the maximum concentrations were always recorded at the West 43rd Avenue monitoring site. Empirically this data supports the conclusion that the receptor location in the high-wind micro inventory is located at the worst case location. The fact that attainment was demonstrated on June 6th at six widely dispersed monitoring sites adds further confidence that the modeled domain represents worst case conditions.

Comment: According to the charts in Fig. V4 Appendix 2. ~98.6% of the total exceeding PM10 concentration originates from sources within 2km of the monitor. Under the current modeling scenario, sand & gravel sources are by far the greatest contributor to PM10. Yet, the source sand and gravel source category is also the source category with the greatest estimated improvement in Rule Effectiveness. While nearly all of the vacant lots, agricultural sources and open areas are beyond 2km from the W43rd monitor and contribute less than to 1.4% of their total potential emissions to the monitor.

Response: It is incorrect to assume that sand and gravel land uses are by far the greatest contributor to PM10 under the distance-weighted rollback modeling performed at the West 43rd Avenue monitor. In fact, a close examination of the land uses nearest to the West 43rd Avenue monitor within the high wind domains do not support that conclusion. The land uses nearest the monitor in the high wind domains are industrial and commercial lots. Under the distance-weighted rollback methodology, these high wind emissions have the highest weight. There are also vacant lots that are closer to the monitor within the high wind domain than sand and gravel land uses. Also, open areas of the Salt River that are not mined for sand and gravel (displayed as "wash" land use in Figure V-16 as an example) within the high wind domain are closer to the West 43rd Avenue monitor than active sand and gravel operations. As such, these land uses contribute far more distance-weighted emissions than 1.4% assumed by the commenter.

Comment: So, the weighted emissions scenario for this model design favors an increase in Rule Effectiveness of approximately 73%, from 40% yielding a net change of ~33%.

Response: Between 2007 and 2012, rule effectiveness for sand and gravel operations (Rule 316) does increase from 40% to 73%. The impact of this increase directly impacts un-weighted emissions and has an indirect effect on distance-weighted emissions, as distance to the modeled monitor has a greater impact on distance-weighted emissions than increases in rule effectiveness in the land use categories.

Comment: A quick comparison with the average *% Reduced of Weighted Emissions* in Appendix 2. P. V – 68, Tables V-25 : V-36, provides a check of the assumptions. The average reduction according to the current model design is very close to the net increase in Rule Effectiveness for sand and gravel operations.

Response: The average percent reduction in distance-weighted high wind emissions ranges from 26.9% to 35.6% in Tables V-25 through V-31 from a variety of monitors across the nonattainment area, not just the monitor located at West 43rd Avenue. Many of the modeled high wind emissions are from domains that have little to no sand and gravel land uses (e.g., Central Phoenix monitor, Table V-26 or Higley monitor, Table V-29). The commenter's observation that the percent reductions in high wind emissions is around the increase in rule effectiveness for sand and gravel operations (33%) is merely a mathematical coincidence.

Comment: If a receptor is placed in the middle of the domain, where there are no sand and gravel sources, will the emissions still work? What are the new impacts from vacant lots and other nearby sources?

Response: As noted above, many of the modeled high wind emissions are from domains where sand and gravel land use is limited or nonexistent. The increased rule effectiveness impacting these land uses is clearly not required to demonstrate attainment within these domains.

General Modeling:

Comment: There are a number of inaccuracies in Volume 2 p. V-5, Available Modeling Concepts.

Response: Without identification of the specific inaccuracies alleged, it is impossible to respond.

Comment: MAG's assertion that AERMOD is less accurate than rollback models is baseless. There are a number of model evaluation studies[2] that test AERMOD against a variety of regulatory scenarios. In the vast majority of cases, AERMOD provides an adequate level of conservatism for NAAQS protection.

Response: The limitations of using AERMOD in high wind day attainment demonstrations are discussed on p. V-5 and V-6 of Appendix 2, Exhibit 1.

Comment: MAG concludes that AERMOD model performance is poor for high winds. Yet, the weighted rollback (1/d) method used in the 2012 5% plan attainment modeling is calculated from AERMOD model results.

Response: AERMOD was used in the attainment demonstration to determine the appropriate width of high wind hour modeling domains and to determine the appropriate form of the distance-weighting factor. These model runs used hypothetical source configurations typical of bare soil areas predominately contributing to fugitive dust emissions on high wind hours. Further detail on these analyses are provided on pp. V-21 to V-27 and V-55 to V-58.

[2] AERMOD ADERMD Evaluations Under the Evaluations Under the 1-hour NO_2 and SO_2 NAAQS. 10th Conference on Air Quality Modeling March 14, 2012; AERMOD Evaluation for Non-Guideline Applications. 9th Conference on Air Quality Modeling October 9, 2008; AERMOD Latest Features and Evaluation Results: U.S. EPA, 2003

Back Trajectory:

Comment: Appendix 2, V-55. Please provide a citation for the back trajectory equations?

- X=X1+WS*0.447*60*5*SIN(WD*2*PI/360)
- Y=Y1+WS*0.447*60*5*COS(WD*2*PI/360)

Response: The back trajectory equations are based on the wind direction and wind speed measurements recorded at each monitoring site. The equations back calculate where the air parcel would be based on these 2 variables in a 2_D wind field. The calculations begin with the ending 5-minute values recorded each hour and calculate the location of where the air parcel was located at the end of the previous 5-minute period, etc. A similar approach has been used in "Analysis of Ozone in the Southeast Desert Air Basin on the Case Study Day of April 29, 1989, June 25, 1991. Sierra Research Inc."

Comment: It appears that the trajectories may actually be tangential streamlines and not parcel trajectories. According to the equations above, X and Y are calculated for each hour of meteorological data. This method creates a simplified representation path, because streamlines are actually a series of straight line tangents to a path, in this case one tangent for each new hourly record. Trajectories are based on motion equations are more representative of a true path. Considering the "relatively narrow margin" of modeled attainment, MAG should perform additional trajectory sensitivity analysis so that the most conservative domain size and source mix is selected for modeling.

Response: It is correct that X and Y represent the end point of tangential streamlines, however, they are based on 5-minute measurements, not hourly measurements. It is important to note that the weighted rollback methodology places a premium on the accuracy of the location of sources producing nearby emissions relative to those located farther away. Thus, insight provided by 5-minute measurements have much higher value than those provided by hourly values. The principle difference between the air parcel-based method and the method used in the report is 3D versus 2D (i.e., representation of vertical air movement). High wind conditions, however, are usually characterized by elevated mixing layers and greater instability. Under these conditions, emissions from upwind sources should be well mixed in the vertical structure, therefore, the gradient between concentrations aloft and nearer the ground are not expected to be significant. Thus, the air parcel-based method and the one employed in this effort are expected to produce similar results if they employ the same time step and employ a similar spatial representation.

With regard to investigating alternate domains and source mixes, the attainment demonstration methodology has rendered domain size to be mute because emissions from nearby sources have dramatically greater influence on monitored concentrations than emissions from sources located farther upwind. A review of trajectories over nearby sources, however, shows that they vary substantially as the high wind arc shifts within the southwest quadrant (roughly 220° to 260°). Within this domain the share of passive open space drops by an order of magnitude as the arc shifts

toward the west. While this shift produces a large change in the land use distribution and the related distance weighted emissions, there is little difference in the 2007 versus 2012 reductions observed across any the high wind days. A review of Tables V-25 to V 31 shows little variance between individual high wind hourly reductions and the overall daily mean reduction, despite the fact that there are large differences in the hourly wind directions and land uses. Given the relatively tight cluster of observed reductions there is no need to investigate the effect of alternate source mixes on demonstrating attainment.

Comment: Did MAG consider using ensemble or matrix trajectories using NOAA's HYSPLIT model? The variation in trajectory start times and location could prove to be a valuable form of sensitivity test for calculating domain size and source mix.

Response: Yes, we considered using HYSPLIT, but the following technical and accuracy concerns led us to choose the method we used in the report.

1. HYSPLIT is structured to run on an hourly basis. Meteorological data is typically supplied from hourly 3-D meteorological model (e.g., WRF, MM5, etc.) outputs. Readily available meteorological models addressing the PM-10 nonattainment area are structured to represent a relatively coarse hourly 12 km by 12 km grid domain.

2. 5-minute wind speed and wind direction measurements are available from many of the monitoring sites. These data provide the best representation of air movement impacting each of these monitors. To use these data in HYSPLIT requires that they be assimilated into one of the available meteorological models.

3. Discussions with NOAA indicated the data need to be gridded into a specific format and the preferred approach would be to use something like WRF-ARW.

Our concern is that once the 5-minute data is entered into WRF or a similar model, it would be modified to reflect the physical principals governing the operation of the model. Uncertainty about the magnitude of these changes and the coarse size of the available grid structure were considered relative to the demands of the weighted rollback methodology which places a premium on emissions of nearby sources relative to those located farther away. We determined that more accurate estimates of the location of nearby sources impacting the monitors would be produced by using un-altered 5-minute measurements in the back trajectory calculations and for that reason did not pursue the use of HYSPLIT.

Comment: Are high wind back trajectories calculated for each monitor and event with high winds in 2007? How about other years? Will 2008, 2009, 2010 and 2011 have a day that is more conservative?

Response: High wind back trajectories were calculated for May 4th for the West 43rd Avenue monitor (when it alone exceeded the standard) and on June 6th for six monitors (i.e., West 43rd

Avenue, Central Phoenix, Durango Complex, Greenwood, Higley, and West Phoenix) that collected meteorological data (when both the West 43rd Avenue and Higley monitors exceeded the standard). Since EPA accepted and approved the selection of these design days, there was no need to investigate high wind conditions on other days or years.

Emissions:

Comment: Appendix 2. P. V – 62 High Wind Inventories; Were emissions calculated based on wind speeds from meteorological monitor, or wind speeds calculated at each back trajectory location?

Response: High wind emissions were calculated using the five-minute or hourly average wind speeds as measured by the anemometer co-located at each modeled PM-10 monitor (i.e., West 43rd Avenue, Higley, etc.).

Comment: Appendix 2. P. V – 67 "The calculated emissions for each land use parcel are divided by the distance (feet) from the modeled monitor." Please provide these calculations.

Response: As described on page V – 62, the maximum size of a land use parcel within the high wind domain is 10 acres. Many of the parcels within the high wind domain are less than 10 acres, as land use types and property boundaries change frequently within the high wind domain. Through the use of GIS, the distance from each parcel within the high wind domain to the modeled monitor is calculated. This distance can then be used to weight the high wind emissions of each parcel by distance from the modeled monitor (i.e., emissions from land uses closest to the monitor are weighted higher than land uses farther away from the monitor). There are thousands of individual land uses parcels within each hourly high wind domain. It would be impractical to provide each individual land use parcel distance-weighted calculation, for each modeled high wind hour (over 200,000 individual calculations). As such, the sum of un-weighted and distance-weighted emissions for all land use parcels within each hourly high wind domain are provided in Tables V – 25 through V – 31 (pages V – 68 through V – 73).

Comment: Appendix 2. P. V – 68, Tables V – 25 : V – 36. It is very difficult to compare tons to tons/feet (if at all). Please explain the units tons/feet. Are the tons/feet estimates the emissions equivalent to the source receptor interaction coefficient (x/Q)? If so, please explain.

Response: In Tables V – 25 through V – 31 both un-weighted and distance weighted emissions are provided for each modeled high wind hour. The unit of measure for un-weighted emissions is tons. The descriptor of tons/feet in the distance-weighted column of tables V – 25 through V – 31 is provided to remind the reader that these tons have been weighted by distance from the monitor (1/d), as measured in feet. For example: If land use parcel *X* in the high wind domain has un-weighted emissions of 100 tons, and is 1000 feet away from the monitor, its distance weighted emissions are 0.1. If land use parcel *Y* in the high wind domain has un-weighted emissions of 100 tons and is 2000 feet away from the monitor, its distance weighted emissions are 0.05. If there were only land use parcels *X* and *Y* in a hypothetical high wind domain, total un-weighted emissions for that

hypothetical high wind domain would be 200 tons and distance-weighted emissions would be 0.15. As such, Tables V – 25 through V – 31 provide the sum of un-weighted and distance-weighted emissions for all land use parcels within each hourly high wind domain. (Note: Tables V – 32 through V – 36 do not discuss distance-weighted emissions (tons/feet) as incorrectly implied by the comment.)

Comment: Appendix 2. P. V – 68, Tables V – 25 : V – 36. A comparison of *% Reduction of Weighted Emissions* for both un-weighted and distance-weighted emissions would be helpful.

Response: The percent reduction of un-weighted emissions in Tables V – 25 through V – 31 can be obtained by a simple formula; 1-(2012 emissions/2007 emissions). For example: In Table V – 25, the un-weighted emissions for high wind hour 12 are 3.05 tons in 2007 and 2.09 tons in 2012. Using the formula above (1-(2.09/3.05)) the percent reduction of un-weighted emissions for hour 12 in Table V – 25 is 31.5%. This compares to 33.8% reduction in distance-weighted emissions. (Note: Tables V – 32 through V – 36 do not discuss percent reductions of high wind emissions as incorrectly implied by the comment.)

Comment: Dust Action General Permit claims a 1% benefit in 2012. The DAGP is for windblown emissions, yet windblown inventory is largely crushing & screening.

Response: The one percent increase in 2012 rule effectiveness attributable to the Dust Action General Permit applies to land use parcels that are regulated by Maricopa County Rule 310.01 (e.g., vacant lots, unpaved roads, etc.). Each high wind domain, upon which high wind emissions are calculated, contains a wide variety of land uses beyond crushing or screening or other sand & gravel activities. Each hourly high wind domain is unique (see Figure 6–5 on page 6–17 of main plan) based upon the local meteorology of that hour. There are many high wind domains that do not include crushing and screening or other sand and gravel activities as sources of windblown PM-10 emissions. The largest land uses by area within the high wind domains are vacant and open areas. Also, as shown in Figure 3–1 on page 3–5 of the main plan, the 2008 PM-10 emissions inventory for the nonattainment area list windblown PM-10 from sand and gravel sources as less than 0.5% of the inventory, while windblown PM-10 from vacant and open areas each comprise 4% of the nonattainment area PM-10 inventory. It is therefore inaccurate to assume that the windblown inventory within the high wind domains is largely crushing and screening activities.

Temporary Monitor Insights:

Comment:

- In the Temporary Monitor Study, did the temporary meteorological sites conform to EPA Meteorological Monitoring Guidance for Regulatory Modeling Applications?

- What was the height of each met tower?

- Were they monitors calibrated before the research started? Were they audited during the study?

- Did the study meet data completeness standards?

- The wind direction data are organized into five-degree increments, so concentration differences could be computed as a function of wind direction V-3. Did the anemometer used to collect the data provide an accuracy better than +- 5 degrees?

Response: The Temporary Monitor Insights, described on pages V-7 through V-20, in Chapter V of the Technical Support Document, Appendix B, Exhibit 1 of the Draft MAG 2012 Five Percent Plan, were derived from monitoring data collected by the Maricopa County Air Quality Department (MCAQD) beginning in February 2010. Consistent with the study protocol, MCAQD sited, installed, operated and maintained all instruments in conformance with applicable EPA regulations and guidance. MCAQD uses the same instruments and applies the same protocols to its existing monitoring network. Specifically:

- All of the temporary meteorological sites conformed to the EPA Meteorological Monitoring Guidance for Regulatory Modeling Applications.

- Both met towers were ten meters high (above ground level).

- All anemometers were calibrated before, during and after the study. In addition, all EPA quality assurance methods were followed for all particulate monitors.

- All particulate and anemometer instruments had data completeness ratios above 90% meeting EPA's data completeness standards.

- The anemometer used to collect the data provided an accuracy better than ± 3 degrees.

ACLPI ARIZONA CENTER FOR LAW IN THE PUBLIC INTEREST
dedicated to ensuring government accountability and protecting the legal rights of Arizonans

April 12, 2012

VIA FACSIMILE (602) 254-6490
Lindy Bauer
Maricopa Association of Governments
302 N. 1st Avenue, Suite 300
Phoenix, AZ 85003

RE: Draft MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area

Dear Ms. Bauer:

Thank you for the opportunity to comment on the draft State Implementation Plan revision ("5% Plan") referenced above. We provide the following comments.

Particulate pollution has been a serious problem in the Valley for the past two decades. Since they were first adopted, the Phoenix metropolitan area has never attained the PM-10 standards and has a long history of proposing inadequate plans to address the problem. Now, having once again failed to meet its attainment deadline, the state is required under Section 189(d) of the Clean Air Act (CAA) to submit "plan revisions which provide for attainment of the PM-10 air quality standard and, from the date of such submission until attainment, for an annual reduction in PM-10 or PM-10 precursor emissions within the area of not less than 5 percent of the amount of such emissions as reported in the most recent inventory prepared for such area." 42 U.S.C. §7513(a)(d). In addition to the attainment demonstration and 5 percent requirements, the plans under section 189(d) must address all applicable requirements of the CAA. With respect to the draft plan, we raise the following concerns:

1. BACM and MSM.

As a serious nonattainment area for PM10, the Phoenix area plan must include BACM for all significant sources of PM10 and PM10 precursors. BACM, best available control measures, are the maximum degree of emissions reductions possible after considering technical and economic feasibility and environmental impacts of the control. These must be implemented independent of attainment requirements. Also, because Phoenix obtained a five year extension of its attainment deadline, its plan must include MSM (most stringent measures). In the General Preamble (59 FR 41998), EPA sets forth a multi-step process for identifying BACM/BACT for serious areas. The proposed 5% plan does not include a BACM or MSM demonstration that follows this process,

therefore, it is initially difficult to even determine whether the plan satisfies the BACM/MSM requirement. The state cannot rely upon the BACM/MSM demonstrations in the 1999 Serious Area SIP, as that demonstration was prepared more than ten years ago, and, and as the EPA recognized in its proposed disapproval of the 2007 Draft 5% Plan, control measures that previously satisfied the BACM requirement. may no longer represent the "best available" control measure. *See,* 75 FR 54806, 54812. Therefore, an updated BACM/MSM analysis should be included in the 5% plan.

2. 2008 PM-10 Emissions Inventory.

In its proposed disapproval of the 2007 Draft 5% Plan, EPA found that the 2005 emissions inventory relied upon by the state to be insufficiently accurate because it overestimated the baseline emissions for construction and other sources. See 75 FR 54808. In the current plan, MAG is relying upon a 2008 periodic emissions inventory which, like the 2005 inventory, was prepared by Maricopa County Air Quality Department. At first glance, this more recent inventory appears to address EPA's concerns as it shows emissions from residential construction to be a smaller percentage of the overall emissions. However, a comparison of the two inventories (and the two draft plans) reveals a discrepancy that MAG does not appear to either acknowledge or explain, and that is drastic reduction in the estimated emissions overall. In the 2005 inventory, total PM-10 emissions in the nonattainment area were calculated to be 84.753 tons per year. The 2008 inventory puts that total at 48,148 tons per year—a reduction of more than 40% in just three years. It seems highly unlikely that the area achieved such a reduction in emissions by the implementation of control measures. As noted above, we did not see anywhere in the plan where this huge disparity in the data was acknowledged or explained. This oversight should be addressed. Also, because the inventory is the principal basis for calculating the 5% annual reduction required under the CAA, it is important to the public health that the amount of current emissions are not understated.

3. Reliance upon EPA's Concurrence Regarding Exceedances Claimed As Exceptional Events

We are concerned that the attainment demonstration in the 2012 5% Plan, like the 2007 5% Plan, relies upon the concurrence by EPA regarding exceptional events. As the plan acknowledges there were 7 exceedances in 2009 alone that must be treated as exceptional events in order for the area to meet the extended attainment deadline. Further, although the 2011 data has not yet been finalized, the initial data indicates that there once again a significant number of exceedances over multiple days and multiple monitors. The likelihood of eliminating all of these exceedances as exceptional events would appear both remote and contrary to the public interest. Therefore, we believe that a plan that proposes to achieve "attainment" simply by whitewashing over severely unhealthful conditions is both irresponsible and contrary to the public interest.

4. General Permit BMPs and Agricultural Permit BMPs

While we generally support the adoption of the general permit requirement for all dust generating activities and the increased stringency of the agricultural permit requirements, the plan does not adequately demonstrate that either of these control measures satisfy the BACM and MSM requirement. The plan did not mention the concerns raised by EPA in its proposed rulemaking in

2010 regarding the agricultural BMPs or indicate whether and how those concerns had been addressed.

5. Enforceability of Control Measures

We have concerns about the enforceability of control measures in the plan. As you know, citizen enforcement is encouraged under the Clean Air Act. However, in recent years, when citizens have brought actions to enforce control measures that the state is responsible for implementing, the state has invoked the Eleventh Amendment in an effort to avoid the enforcement of its obligation to comply with the SIP. *See Paisley v. Brewer*, CV 2:10-cv-01253-DGC (D.Ariz.) and *Sweat v. Hull*, 200 F. Supp. 2d. 1162 (D. Ariz. 2001). Although the defense did not preclude injunctive relief in either case, it unnecessarily protracted the litigation and demonstrated a lack of commitment on the part of the state to fulfilling its obligations under the SIP. Therefore, we believe that where the state or one of its subdivisions (i.e. a county) assumes responsibility for the implementation of specific control measures, that commitment should include an unequivocal consent to federal jurisdiction if enforcement is sought under the citizen suit provision. This consent will ensure that the measures are fully enforceable by both EPA and affected citizens, as the enforcement scheme adopted by the Act contemplates.

6. Technical issues and concerns

Attached to this letter is a technical review of the plan which raises questions and concerns regarding the modeling included in the plan and supporting documents.

These comments are submitted on behalf of the Sierra Club-Grand Canyon Chapter.

Sincerely,

Joy E. Herr-Cardillo

Technical Review of **MAG 2012 FIVE PERCENT PLAN FOR PM-10 FOR THE MARICOPA COUNTY NONATTAINMENT AREA**

On March 12, 2012, The Maricopa Association of Governments (MAG) published a new 2012 Draft Five Percent Plan for 24-hour PM10 for public review. This paper provides comments based on the technical work comprising the draft plan.

GENERAL

Editorial Comments:

- The report provides very limited examples and few calculations to support the reported values.
- The report is also lacking equations to support reported values.
- The reported values are in a variety of units, which makes comparisons difficult.

MODELING

Model Selection:

- The air quality modeling demonstration for the 24-hour PM10 standard is based on U.S. EPA's rollback modeling method. Federal regulations state that "all applications of air quality modeling involved in this subpart shall be based on the applicable models, data bases, and other requirements specified in appendix W of this part (Guideline on Air Quality Models). " 40 CFR part § 51.160(f).
- Appendix W section 5.2.2.2 PM10; "Refined models such as those discussed in subsection 4.2.2 are recommended for PM–10."
- Appendix W Section 4.2.2(b) Refined Analytical Techniques; "For a wide range of regulatory applications in all types of terrain, the recommended model is AERMOD."
- Appendix W Section 5.2.2.2(e): "Due to the difficult nature of characterizing and modeling fugitive dust and fugitive emissions, it is recommended that the proposed procedure be cleared by the Regional Office for each specific situation before the modeling exercise is begun."
- The rollback approach is not one of U. S. EPA's preferred methods for demonstrating attainment of the PM10 NAAQS

Weighted Rollback:

- The report does not present any of the rollback equations used and so it is unclear which rollback method was used.
- If the analysis is based on the modified rollback method, was a spatial distribution analysis performed?
- In appendices Volume 2 p. V - 5, under the Weighted Rollback section, the report states: "The reduction factor is calculated on the basis of the distance between each source and the impacted monitoring site."
    - Please provide the equation(s) used for the weighted rollback analysis. Based on the statement above, it is not clear how MAG has calculated the emissions weighting. The equations[1] used in EPA's proportional or modified rollback method do not involve any interactions among individual sources, only each individual source and a monitor.
- Rollback typically requires speciated profiles of soil dust from ambient measurements and chemical analysis for source apportionment calculations, using CMB (Chemical Mass Balance). Did MAG use any source profiles to support the modeling analysis? Please refer to: "Guidelines to PM10 Sampling and Analysis Applicable to Receptor Modeling"
- MAG 2012 FIVE PERCENT PLAN FOR PM-10 FOR THE MARICOPA COUNTY NONATTAINMENT AREA. P. 6-44: "The attainment modeling for the nonattainment area demonstrates that the 24-hour PM-10 standard will be met by a relatively narrow margin in 2012 (i.e., 153.8 ug/m3 at the West 43rd Avenue monitor)." Was a sensitivity analysis performed to evaluate the degree of confidence in their results? A sensitivity analysis may reveal conditions where the modeling fails or requires improvement, so as to ensure the NAAQS are attained according to the plan.
- Rollback only works if the monitor is at the point of highest impact. Since air pollution standards must be attained within the entire planning area and not simply at the monitors, how confident is MAG in their choice to use a single point to represent the entire Maricopa County nonattainment area? Dispersion modeling typically provides for a more credible product, since they more realistically account for spatial and temporal patterns.
- Is MAG confident that the receptor location in the high-wind micro inventory domain is representative of worst case conditions? Are there any locations within the high-wind domain where predicted concentrations can be potentially higher than the monitor site?
- According to the charts in Fig. V4. Appendix 2. ~98.6% of the total exceeding PM10 concentration originates from sources within 2km of the monitor. Under the current modeling scenario, sand & gravel sources are by far the greatest contributor to PM10. Yet, the source sand and gravel source category is also the source category with the

[1] Rollback Modeling: Basic and Modified. Air Waste and Management Association 25:9 (September 1975)

greatest estimated improvement in Rule Effectiveness. While nearly all of the vacant lots, agricultural sources and open areas are beyond 2km from the W43rd monitor and contribute less than to 1.4% of their total potential emissions to the monitor.

- So, the weighted emissions scenario for this model design favors an increase in Rule Effectiveness of approximately 73%, from 40% yielding a net change of ~33%.
- A quick comparison with the average *% Reduced of Weighted Emissions* in Appendix 2. P. V – 68, Tables V-25 : V-36, provides a check of the assumptions. The average reduction according to the current model design is very close to the net increase in Rule Effectiveness for sand and gravel operations.
- If a receptor is placed in the middle of the domain, where there are no sand and gravel sources, will the emissions benefits still work? What are the new impacts from vacant lots and other nearby sources?

General Modeling:

- There are a number of inaccuracies in appendix 2 p. V-5, Available Modeling Concepts.
- MAG's assertion that AERMOD is less accurate than rollback models is baseless. There are a number of model evaluation studies[2] that test AERMOD against a variety of regulatory scenarios. In the vast majority of cases, AERMOD provides an adequate level of conservatism for NAAQS protection.
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- Appendix 2, V- 55. Please provide a citation for the back trajectory equations?
  - X=X1+WS*0.447*60*5*SIN(WD*2*PI/360)
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- It appears that the trajectories may actually be tangential streamlines and not parcel trajectories. According to the equations above, X and Y are calculated for each hour of meteorological data. This method creates a simplified representation of a path, because streamlines are actually a series of straight line tangents to a path, in this case one tangent for each new hourly record. Trajectories are based on motion equations are more representative of a true path. Considering the "relatively narrow margin" of modeled attainment, MAG should perform an additional trajectory sensitivity analysis so that the most conservative domain size and source mix is selected for modeling.

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[2] AERMOD AERMOD Evaluations Under the Evaluations Under the 1-hour NO_2 and SO2 NAAQS. 10th Conference on Air Quality Modeling March 14, 2012; AERMOD Evaluation for Non-Guideline Applications. 9th Conference on Air Quality Modeling October 9, 2008; AERMOD: Latest Features and Evaluation Results. U.S. EPA, 2003

- Did MAG consider using ensemble or matrix trajectories using NOAA's HYSPLIT model? The variation in trajectory start times and location could prove to be a valuable form of sensitivity test for calculating domain size and source-mix.
- Are high wind back trajectories calculated for each monitor and event with high winds in 2007? How about other years? Will 2008, 2009, 2010 or 2011 have a day that is more conservative?

Emissions:

- Appendix 2. P. V - 62 High Wind Inventories; Were emissions calculated based on winds speeds from meteorological monitor, or wind speeds calculated at each back trajectory location?
- Appendix 2. P. V - 67 "The calculated emissions for each land use parcel are divided by the distance (feet) from the modeled monitor." Please provide these calculations.
- Appendix 2. P. V – 68, Tables V-25 : V-36. It is very difficult to compare tons to tons/feet (if at all). Please explain the units tons/feet. Are the tons/feet estimates the emissions equivalent to the source receptor interaction coefficient (x/Q)? If so, please explain.
- Appendix 2. P. V – 68, Tables V-25 : V-36. A comparison of *% Reduction of Weighted Emissions* for both un-weighted and distance-weighted emissions would be helpful.
- Dust Action General Permit claims a 1% benefit in 2012. The DAGP is for windblown emissions, yet windblown inventory is largely crushing & screening.

Temporary Monitor Insights:

- In the Temporary Monitor Study, did the temporary meteorological sites conform to EPA Meteorological Monitoring Guidance for Regulatory Modeling Applications?
- What was the height of each met tower?
- Were they monitors calibrated before the research started? Were they audited during the study?
- Did the study meet data completeness standards?
- The wind direction data are organized into five-degree increments, so concentration differences could be computed as a function of wind direction V – 3. Did the anemometer used to collect the data provide an accuracy better than +-5 degrees?

APPENDIX E

EXHIBIT 2:

Certification of Adoption

RESOLUTION TO ADOPT THE MAG 2012 FIVE PERCENT PLAN FOR PM-10 FOR THE MARICOPA COUNTY NONATTAINMENT AREA

WHEREAS, the Maricopa Association of Governments (MAG) is a Council of Governments composed of twenty-five cities and towns within Maricopa County and the contiguous urbanized area, the County of Maricopa, the Gila River Indian Community, the Salt River Pima-Maricopa Indian Community, Fort McDowell Yavapai Nation, Arizona Department of Transportation, and Citizens Transportation Oversight Committee; and

WHEREAS, the Governor of Arizona designated MAG as the regional air quality planning agency and metropolitan planning organization for transportation in Maricopa County; and

WHEREAS, the Maricopa County nonattainment area is classified as a Serious Area for PM-10 particulate matter according to the Clean Air Act; and

WHEREAS, the MAG 2007 Five Percent Plan for PM-10 was required by the Clean Air Act since the Maricopa County nonattainment area failed to attain the PM-10 standard by December 31, 2006; and

WHEREAS, the MAG 2007 Five Percent Plan for PM-10 was voluntarily withdrawn on January 25, 2011 to include new information, such as the new Environmental Protection Agency equation for paved road dust emissions; and

WHEREAS, the MAG 2012 Five Percent Plan for PM-10 is a replacement for the 2007 plan that was withdrawn; and

WHEREAS, the plan is required to reduce PM-10 emissions by at least five percent per year until the standard is met; and

WHEREAS, MAG has prepared the 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area; and

WHEREAS, A.R.S. 49-406 H. requires that the governing body of the metropolitan planning organization adopt the nonattainment area plan.

NOW THEREFORE, BE IT RESOLVED BY THE MARICOPA ASSOCIATION OF GOVERNMENTS REGIONAL COUNCIL as follows:

SECTION 1. That the MAG Regional Council adopts the MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area which contains control measures from the State and local governments.

SECTION 2. That the MAG Regional Council further recommends implementation of the appropriate measures by the MAG cities and towns, Maricopa County, and the State of Arizona and authorizes the submission of the plan to the Arizona Department of Environmental Quality and the U.S. Environmental Protection Agency.

PASSED AND ADOPTED BY THE REGIONAL COUNCIL OF THE MARICOPA ASSOCIATION OF GOVERNMENTS THIS TWENTY-THIRD DAY OF MAY 2012.

Hugh Hallman, Chair
MAG Regional Council

ATTEST:

Dennis Smith
Executive Director

CERTIFICATION OF ADOPTION OF THE
MAG 2012 FIVE PERCENT PLAN FOR PM-10
FOR THE MARICOPA COUNTY NONATTAINMENT AREA

An Excerpt from the May 23, 2012 MAG Regional Council Meeting Minutes

Mayor Michael LeVault moved to adopt the MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area. Supervisor Max Wilson seconded, and the motion passed unanimously.

I certify that on May 23, 2012, the MAG Regional Council adopted the MAG 2012 Five Percent Plan for PM-10 for the Maricopa County Nonattainment Area.

Dennis Smith
MAG Executive Director

05/23/12
Date

WESLEY BOLIN
GOVERNOR

OFFICE OF THE GOVERNOR

STATE HOUSE
PHOENIX, ARIZONA 85007

IN REPLY
REFER TO:

February 7, 1978

The Honorable Douglas M. Costle
Administrator
United States Environmental Protection Agency
401 "M" Street, S.W.
Washington, DC 20460

Dear Mr. Costle:

In accordance with Section 174(a) of the Clean Air Act as amended August 7, 1977, I hereby designate the Maricopa Association of Governments as the lead planning organization for Maricopa County, (Phoenix) Arizona and the Pima Association of Governments as the lead planning organization for Pima County, (Tucson) Arizona for the purpose of determining which elements of a revised Air Quality Implementation Plan will be planned, implemented and enforced by the State and local governments in Arizona. Attached are letters from each agency requesting such designations.

This action is required because national primary ambient air quality standards for carbon monoxide and photochemical oxidants will not be attained in metropolitan Phoenix and Tucson by July 1, 1979. Detailed agreements with the above organizations of elected officials of local governments and the State of Arizona are now being developed. These agreements will identify the responsibilities of each of the participants, i.e. the Maricopa Association of Governments, the Pima Association of Governments, the Maricopa County Health Department, and the Arizona Department of Health Services. Upon completion of such agreements, they will be certified by this office and forwarded to the U.S. Environmental Protection Agency.

Sincerely,

Wesley Bolin

WB:vabclm
Attachments

cc: Suzanne Dandoy
Bruce Scott
G. Kenneth Driggs
Thomas L. Swanson
Paul De Falco, Jr.

STATE OF ARIZONA
EXECUTIVE OFFICE

FIFE SYMINGTON
Governor

June 24, 1993

The Honorable Charles Hayes
Chairman, MAG Regional Council
1820 West Washington
Phoenix, AZ 85007

Dear Mayor Hayes:

I concur with your May 10th letter--MAG should coordinate its aviation planning with the statewide aviation planning effort.

Please inform the Regional Council that I support their continuation as the Metropolitan Planning Organization. I believe the MAG Regional Aviation System Plan will do much to help your region of the state make decisions on airport improvements. I salute your process.

If you are not aware, however, my Regional Airport Feasibility Assessment (RAFA) was a statewide aviation planning effort. In the case of the RAFA, regional does not mean a limited area like MAG but means the Southwestern United States. My RAFA study was paid for by FAA funding and focused on the statewide issue of a new major airport facility to serve needs throughout Arizona and the entire Southwest within the next 20 to 30 years. It also considers long-term economic effects on the state. Your MAG RASP was also paid for by FAA funding but focused on 10 to 20 years of airport improvements in Maricopa County. As you can see, the two studies differ greatly in scope and substance.

1700 WEST WASHINGTON, PHOENIX, ARIZONA 85007 • (602) 542-4331

I notice that about a dozen of your MAG RASP Committee Members were also on my GRAAC Committee. It seems to me that this overlap of membership provides a good basis for the coordination you seek.

Thank you for your continued concern to keep Arizona's aviation industry viable and vital in the 21st century.

Sincerely,

Fife Symington
GOVERNOR

FS/JL:me

cc: Joe Lane, Executive Assistant for the Governor
Marvin Cohen, GRAAC Chairman
Linda Brock-Nelson, GRAAC Vice Chairman
GRAAC Committee Members
MAG Regional Council

49-406. Nonattainment area plan

A. For any ozone, carbon monoxide or particulate nonattainment or maintenance area the governor shall certify the metropolitan planning organization designated to conduct the continuing, cooperative and comprehensive transportation planning process for that area under 23 United States Code section 134 as the agency responsible for the development of a nonattainment or maintenance area plan for that area.

B. For any ozone, carbon monoxide or particulate nonattainment or maintenance area for which no metropolitan planning organization exists, the department shall be certified as the agency responsible for development of a nonattainment or maintenance area plan for that area.

C. For any ozone, carbon monoxide or particulate nonattainment or maintenance area, the department, the planning agency certified pursuant to subsection A of this section on behalf of elected officials of affected local government, the county air pollution control department or district, and the department of transportation shall, by November 15, 1992, and from time to time as necessary, jointly review and update planning procedures or develop new procedures.

D. In preparing the procedures described in subsection C of this section, the department, the planning agency certified pursuant to subsection A of this section on behalf of elected officials of affected local government, the county air pollution control department or district, and the department of transportation shall determine which elements of each revised implementation plan will be developed, adopted, and implemented, through means including enforcement, by the state and which by local governments or regional agencies, or any combination of local governments, regional agencies or the state.

E. The department, the planning agency certified pursuant to subsection A of this section on behalf of elected officials of affected local government, the county air pollution control department or district, and the department of transportation shall enter into a memorandum of agreement for the purpose of coordinating the implementation of the procedures described in subsection C and D of this section.

F. At a minimum, the memorandum of agreement shall contain:

1. The relevant responsibilities and authorities of each of the coordinating agencies.
2. As appropriate, procedures, schedules and responsibilities for development of nonattainment or maintenance area plans or plan revisions and for determining reasonable further progress.
3. Assurances for adequate plan implementation.
4. Procedures and responsibilities for tracking plan implementation.
5. Responsibilities for preparing demographic projections including land use, housing, and employment.
6. Coordination with transportation programs.
7. Procedures and responsibilities for adoption of control measures and emissions limitations.
8. Responsibilities for collecting air quality, transportation and emissions data.
9. Responsibility for conducting air quality modeling.
10. Responsibility for administering and enforcing stationary source controls.
11. Provisions for the timely and periodic sharing of all data and information among the signatories relating to:

(a) Demographics.
(b) Transportation.
(c) Emissions inventories.
(d) Assumptions used in developing the model.
(e) Results of modeling done in support of the plan.
(f) Monitoring data.

G. Each agency that commits to implement any emission limitation or other control measure, means or technique contained in the implementation plan shall describe that commitment in a resolution adopted by the appropriate governing body of the agency. The resolution shall specify the following:

1. Its authority for implementing the limitation or measure as provided in statute, ordinance or rule.
2. A program for the enforcement of the limitation or measure.

3. The level of personnel and funding allocated to the implementation of the measure.

H. The state, in accordance with the rules adopted pursuant to section 49-404, and the governing body of the metropolitan planning organization shall adopt each nonattainment or maintenance area plan developed by a certified metropolitan planning organization. The adopted nonattainment or maintenance area plan shall be transmitted to the department for inclusion in the state implementation plan provided for under section 49-404.

I. After adoption of a nonattainment or maintenance area plan, if on the basis of the reasonable further progress determination described in subsection F of this section or other information, the control officer determines that any person has failed to implement an emission limitation or other control measure, means or technique as described in the resolution adopted pursuant to subsection G of this section, the control officer shall issue a written finding to the person, and shall provide an opportunity to confer. If the control officer subsequently determines that the failure has not been corrected, the county attorney, at the request of the control officer, shall file an action in superior court for a preliminary injunction, a permanent injunction, or any other relief provided by law.

J. After adoption of a nonattainment or maintenance area plan, if, on the basis of the reasonable further progress determination described in subsection F of this section or other information, the director determines that any person has failed to implement an emission limitation or other control measure, means or technique as described in the resolution adopted pursuant to subsection G of this section, and that the control officer has failed to act pursuant to subsection I of this section, the director shall issue a written finding to the person and shall provide an opportunity to confer. If the director subsequently determines that the failure has not been corrected, the attorney general, at the request of the director, shall file an action in superior court for a preliminary injunction, a permanent injunction, or any other relief provided by law.

K. Notwithstanding subsections A and B of this section, in any metropolitan area with a metropolitan statistical area population of less than two hundred fifty thousand persons, the governor shall designate an agency that meets the criteria of section 174 of the clean air act and that is recommended by the city that causes the metropolitan area to exist and the affected county. That agency shall prepare and adopt the nonattainment or maintenance area plan. If the governor does not designate an agency, the department shall be certified as the agency responsible for the development of a nonattainment or maintenance area plan for that area.