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Final

Arizona State Implementation Plan

Miami
PM_{10} Nonattainment Area

Air Quality Division
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EXECUTIVE SUMMARY

Miami, Arizona, is a historic copper mining town in Gila County, 80 miles southeast of Phoenix and 112 miles northeast of Tucson. Miami's sister city, Globe, lies four miles to the east. The Hayden/Miami Nonattainment Area was designated for nonattainment of the particulate matter National Ambient Air Quality Standard (NAAQS) by operation of law following the Clean Air Act (CAA) amendments of 1990. The U.S. Environmental Protection Agency (EPA) based its decision on emissions from copper mining facilities and high measurements of airborne particulate matter. In March, 2007, EPA approved a boundary redesignation of the Hayden/Miami PM_{10} nonattainment area into two separate, but adjoining, PM_{10} nonattainment areas. Together, these two new PM_{10} nonattainment areas cover the same geographic area as the original Hayden/Miami PM_{10} nonattainment area. In the same ruling, EPA determined that the Miami Nonattainment (MNA) met the PM_{10} NAAQS - the first test for redesignation to attainment.

The CAA states that an area designated as nonattainment due to a violation of the NAAQS may be redesignated to attainment if the State submits and EPA approves a plan demonstrating that permanent emission controls that resulted in attainment will remain in place. The plan must also demonstrate that the NAAQS has been attained, that the plan contains contingency measures, and that the plan has been fully approved under Sections 110(k), 110 Part D, and 175A of the CAA. This plan demonstrates that all CAA requirements for attainment and maintenance have been met and summarizes the progress of the area in attaining the PM_{10} standard. This plan also summarizes and demonstrates that the MNA qualified for EPA's Clean Data Policy and the Limited Maintenance Plan (LMP) option. The LMP option is a plan design approach that assures continued attainment without many of the burdens of a standard maintenance plan. To qualify for the LMP option the State must submit an approved maintenance plan, the area must be in attainment of the NAAQS for a minimum of five years, and expect only limited growth in motor vehicle traffic.

This document includes a formal request to EPA to redesignate the Miami, Arizona PM_{10} nonattainment area to attainment for the health-based 24-hour average PM_{10} NAAQS. Chapter 1 includes the regulatory requirements for PM_{10} nonattainment area plans for areas that have attained the NAAQS, along with a detailed description of the economic and physical makeup of the MNA. Chapter 2 demonstrates that monitors in the MNA have not recorded an exceedance of the PM_{10} NAAQS since 1987.[1] Chapter 3 contains the emissions inventory and lists sources within the MNA. Chapter 4 describes the control measures that were implemented to achieve attainment of the PM_{10} NAAQS along with contingency measures designed to ensure continued maintenance of the NAAQS for the required ten-year maintenance period (2009-2019) following redesignation of the area to attainment. Finally, Chapter 5 includes administrative commitments required under the LMP option.

With this submittal, ADEQ requests that EPA approve this LMP for the Miami PM_{10} nonattainment area and redesignate the area to attainment for the 24-hour PM_{10} NAAQS.

[1] On July 16, 2006, a statewide wind event triggered high readings at a number of air quality monitors across the state, including one of the Miami monitors. The measurement recorded by the monitor, 105.9 $\mu g/m^3$, was not a violation of the NAAQS but above the standard criteria to qualify for a LMP, 98 $\mu g/m^3$. The measurement was flagged as an exceptional wind event and a technical demonstration was submitted to EPA in accordance with EPA's Exceptional Events Policy on June 29, 2007.

1.0 BACKGROUND

The Miami Nonattainment Area (MNA) was designated as nonattainment for particulate matter equal to or less than 10 microns in size (PM_{10}). Nonattainment status was attributed to emissions from nearby copper mines and fugitive emissions from vehicular traffic. The current condition of the MNA and ADEQ's approach to redesignation are discussed in the following subsections.

1.1 Physical, Demographic, and Economic Description of the MNA

Sections 1.1.1 through 1.1.3 describe the climate, physiography, and economy of the MNA.

1.1.1 Climate and Meteorology

Miami is located in a canyon alongside U.S. Highway 60 in the Pinal Mountains of southern Gila County. The elevation is approximately 3,400 feet above sea level. The MNA contains four complete townships and is 144 square miles in size (40 CFR 81.303). The Town of Miami is geographically located in the center of the MNA. The MNA is defined by the following seven townships (see Figure 1.1): T1N, R13E; T1N, R14E; T1N, R15E; T1S, R13E (sections 1-6); T1S, R14E (sections 1-24); T1S, R14\1/2\E; and T1S, R15E.

Gila County's unique environment experiences both warm desert and cool alpine climates. The warmest month of the year is July, when the average daily maximum temperature is 97° Fahrenheit (F). January is the coolest month with an average daily maximum temperature of 45° F. Precipitation generally occurs in two seasons; the month with the most precipitation is August, when monsoonal thunderstorms produce an average monthly total of 3.33" (inches) of rain. Pacific winter storms pass through the area in January, producing a monthly average of 2.40" of precipitation in the form of rain or a light dusting of snow. The driest month is June, with an average of 0.25" of rain. The average yearly precipitation is 18.00".

1.1.2 Population

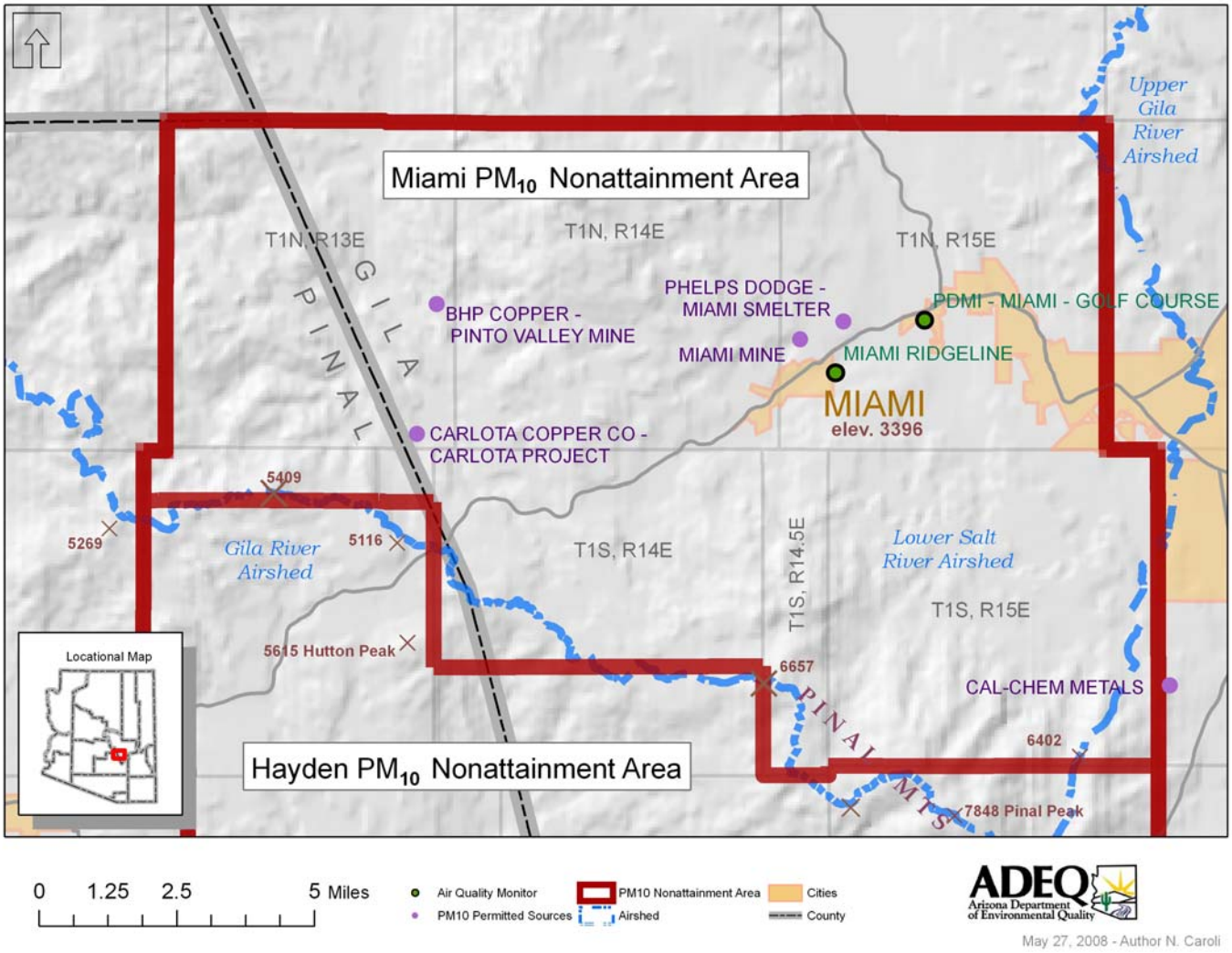
The population of Miami has consistently declined since the population peaked in the 1930's. The declining population trend is evident when comparing the 1970 decennial Census population, 3,394, with the 2000 Census population, 1,936. Population projections indicate a modest growth rate for the Miami-Globe area, shown below in Table 1.1.

Table 1.1 – Historical Population Data and Projections for the Region

Year	1990	2000	2005	2010	2015
Miami	2,018	1,936	2,000	1,988	2,022
Globe	6,062	7,486	7,550	7,709	7,974
Gila County	40,216	51,335	56,800	57,766	61,128

Source: U.S. Census Bureau and Arizona Department of Economic Security, Population Statistics Unit.

Figure 1.1 Map of the Miami PM_{10} Nonattainment Area



1.1.3 Economy

Copper has been produced in the Miami area for over a century and still forms the backbone of the local economy. Mining is the largest employment sector in the region, accounting for more than twenty percent of the workforce. The Miami area is also a gateway to recreational areas, such as Roosevelt Lake and Tonto National Monument. More information on the area's economy is included in tables 1.2 and 1.3.

Table 1.2
Key Growth Indicators for the Miami-Globe Area

	1990	2000	2006
Globe New Building Permits	84	69	50
Globe Taxable Sales	57.3 mil	131.6 mil	172 mil
Globe Net Assessed Value	17.1 mil	31.3 mil	37.6 mil
Miami New Building Permits	13	0	0
Miami Taxable Sales	6.9 mil	7.6 mil	10.5 mil
Miami Net Assessed Value	3.6 mil	3.7 mil	4.3 mil

Source: Arizona Department of Economic Security

Table 1.3
Civilian Labor Force Data for the Miami-Globe Area

	1990	2000	2006
Globe Civilian Labor Force	2,798	3,246	3,296
Globe Unemployment Rate	4.7%	4.2%	4.5%
Miami Civilian Labor Force	757	705	718
Miami Unemployment Rate	7%	6.4%	7%

Source: Arizona Department of Economic Security

1.2 Miami Regulatory History

The original particulate matter National Ambient Air Quality Standards (NAAQS), known as total suspended particulate matter (TSP), included the size range of particles collected by hi-volume samplers. In 1979, one township in the Hayden area and one township in the Miami area were designated as nonattainment for TSP. In 1987 the U.S. Environmental Protection Agency (EPA) revised the standards to include only particulate matter of a size range less than or equal to 10 microns (PM_{10}). As part of the implementation policy for the new standards, where insufficient PM_{10} data were available, EPA categorized areas of the country based on their probability of violating the standard. Group I areas with a high probability of violating the standards, Group II areas with a moderate probability of violating, or Group III areas that were likely to be attaining the standards. In EPA's published Group descriptions the "Hayden/Miami" area was listed as a "Group I Area," or one with a "strong likelihood" of violating the PM_{10} NAAQS. The State was required to submit a state implementation plan (SIP) within nine months of promulgation of the NAAQS (52 FR 24672, July 1, 1987, and 52 FR 29383, August 7, 1987).

Based on new emissions, ambient monitoring, and other information, EPA subsequently updated the initial geographic descriptions for the Group I and Group II areas which, until that time, were described generally as towns, cities, counties, or planning areas. In a 1990 clarification, the combined Hayden/Miami Group I Area was specified to include all or part of 26 contiguous townships in and around the towns of Hayden and Miami. Consistent with EPA's PM_{10} grouping scheme, the Hayden/Miami Group I Area was designated and classified as a moderate PM_{10} nonattainment area upon

enactment of the 1990 Clean Air Act (CAA) amendments[2]. This action included requirements for submittal of an attainment demonstration and RACT implementation provisions for the designated areas by November 15, 1991.

In September 1989 the Arizona Department of Environmental Quality (ADEQ) submitted the *Final PM_{10} State Implementation Plan for the Hayden Group I Area* (SIP). In July 1994, EPA proposed a limited approval/disapproval of the Hayden SIP. EPA proposed the limited disapproval primarily because the plan only addressed the Hayden portion of the nonattainment area. ADEQ submitted a formal petition to exclude the Miami area from the Hayden/Miami PM_{10} Nonattainment Area in November 1994. The petition was based on topographical and climatological differences between the Hayden and Miami areas (the areas are in separate airsheds) and the clean PM_{10} air quality record in the Miami area (no exceedances have been recorded since PM_{10} monitoring began in 1987). EPA advised ADEQ that because the Miami area had recorded past exceedances of the TSP standards and had met the 1990 PM_{10} nonattainment designation criteria, the Miami portion could not be excluded from nonattainment area status.

In July 2006, ADEQ requested that the Hayden/Miami PM_{10} Nonattainment Area be separated into two nonattainment areas based on the criteria discussed above. On March 28, 2007, EPA concurred with ADEQ's request and the Hayden/Miami PM_{10} Nonattainment Area was officially split into two independent nonattainment areas[3]. In the same action, EPA also determined that the MNA had continued to meet the PM_{10} NAAQS and issued a clean data finding for the area. EPA's Clean Data Policy relieves the State from certain demonstrations of attainment, since by qualifying for a clean data finding, attainment has already been achieved (72 FR 14502).

1.2.1 EPA's Particulate Matter NAAQS

The CAA requires EPA to assess the latest scientific information and review the particulate matter NAAQS every five years. In September 2006, EPA reviewed the latest scientific information on the health effects of exposure to PM_{10}. During the 2006 review period, EPA received comments from external scientific advisors and the general public about the science and policy review reports. After reviewing over 120,000 written comments, on September 27, 2006, EPA revised the 1997 standards by retaining the existing 24-hour PM_{10} standard and revoking the Annual PM_{10} standard. This decision was based on a lack of demonstrations linking health problems to long-term PM_{10} exposure. Therefore, this LMP addresses EPA's 24-hour PM_{10} standard. The following table reviews the history of EPA's particulate matter NAAQS.

Table 1.4
History of EPA's Particulate Matter NAAQS

Date	EPA Action
1971	Established Total Suspended Particles Standard (45 microns or less)
1987	Established 24-hour and Annual PM_{10} Standards
1997	Established 24-hour and Annual $PM_{2.5}$ Standards
2006	Revoked the PM_{10} Annual Standard

1.3 Applicable CAA Requirements

[2] Effective November 15, 1990.
[3] See Appendix F for a map of the Hayden and Miami nonattainment areas.

Section 107(d)(3)(E) of the CAA, as amended, states that an area can be redesignated to attainment if the following conditions are met:

1. The NAAQS has been attained;
2. The applicable implementation plan has been fully approved under Section 110(k);
3. The improvement in air quality is due to permanent and enforceable reductions in emissions;
4. The State has met all applicable requirements for the area under Section 110 and Part D; and
5. A maintenance plan with contingency measures has been fully approved under Section 175A.

A detailed table of how the MNA meets these conditions is included in Appendix A.

1.4 Requirements for Nonattainment Areas That Have Attained the NAAQS

EPA issued a clean data finding for the MNA effective May 29, 2007. EPA's Clean Data Policy applies to PM_{10} nonattainment areas that are meeting the NAAQS. Specifically, it addresses whether such areas must develop an attainment demonstration. The requirements for the approach and how the Miami area meets them are described below in Table 1.5.

Table 1.5 - Requirements for Nonattainment Areas Seeking Redesignation that have a Clean Data Finding

CAA Requirement	Action to Meet Requirement
The area must be attaining the NAAQS based on the three most recent years of quality assured monitored air quality data.	No exceedances of the PM_{10} NAAQS have been recorded since monitoring began in 1987. Thus, the three-year average number of exceedances was less than 1.0, which indicates Miami attained the 24-hour PM_{10} NAAQS.
The State must continue to operate an appropriate PM_{10} air quality monitoring network, in accordance with 40 CFR Part 58, in order to verify the attainment status of the area.	In an agreement with ADEQ, Freeport McMoRan Miami Inc. will continue operation of the Miami monitoring network in accordance with 40 CFR Part 58 in order to continue to verify the attainment status of the area. The Miami monitoring network is described in Section 2 of this plan.
The control measures responsible for bringing the area into attainment must meet EPA standards for reasonably available control measures (RACM) and reasonably available control technology (RACT) requirements.	Control measures responsible for bringing the area into attainment are located in Section 4 of this plan. These measures meet EPA's RACM and RACT requirements.
An emissions inventory must be developed for the area.	An emissions inventory for the Miami area is contained in Section 3 of this plan.
EPA must make a finding that the area attained the 24-hour PM_{10} NAAQS, known as a "clean data finding".	On May 29, 2007, EPA issued a clean data finding for the MNA.

In addition to the above requirements, any requirements that are connected solely to designation or classification, such as new source review (NSR) and reasonably available control measures (RACM)/reasonably available control technology (RACT), must remain in effect. Certain requirements under CAA Section 172(c), including modeling, attainment demonstrations, and reasonable further progress (RFP) demonstrations, are waived due to the fact that the areas which are eligible under this approach have already attained the PM_{10} NAAQS. General conformity and some transportation conformity requirements continue to apply, see Section 4.0 of this plan.

1.5 EPA's Limited Maintenance Plan Option

The LMP option applies to qualified moderate PM_{10} nonattainment areas seeking redesignation to attainment. The option was established to readily redesignate nonattainment areas that present a low risk of future violations of the PM_{10} NAAQS. EPA determined that by qualifying for a LMP, a nonattainment area has demonstrated the ability to continue attainment of the PM_{10} NAAQS. Therefore, a nonattainment area seeking redesignation under an LMP is relieved of some requirements that are mandatory in a traditional maintenance plan. Among these requirements are emission inventory projections, modeling for maintenance and transportation conformity tests (for more information on conformity, see Section 4.5).

Under a LMP, the state is obligated to ensure the control measures responsible for helping the area reach attainment will remain in place through the duration of the LMP. Section 4.0 of this plan provides details on control measures for the Miami Nonattainment Area (MNA). The State must also complete an emissions inventory, included in Section 3.0, as well as calculate a motor vehicle regional emissions analysis to project future growth in vehicle emissions, referenced in Table 1.7 of this section and shown in detail in Appendix C.1. Finally, the State must provide contingency measures to bring the area back into attainment should an exceedance occur. Section 4.0 contains a menu of contingency measures.

To qualify for the LMP option, an area should be attaining the NAAQS and the average PM_{10} Design Values (DV) for the area, based upon the most recent five years of air quality data at monitors in the area, should be less than 98 $\mu g/m^3$ for the 24-hr PM_{10} standard. Table 1.6 features DVs for the MNA during the five-year attainment period, 2002-2006. Table 1.7 lists EPA's LMP criteria and how the MNA qualifies. A detailed justification of the LMP option for the MNA appears in Appendix C.1.

In order to qualify for a LMP, an area should also expect only limited growth in on-road motor vehicle PM_{10} emissions (including fugitive dust) and must pass EPA's motor vehicle regional emissions analysis test. The scientific analysis that determined the MNA meets this criterion appears in Appendix C.1.

Table 1.6
ADEQ Official 24-hour Design Values for
Miami PM_{10} Nonattainment Area

3-Year Period	24-hour Design Values ($\mu g/m^3$)	
	Ridgeline	Golf Course
2002-2004	59	55
2003-2005	59	53
2004-2006	26	40
Average	48.0	49.3

Table 1.7 - Limited Maintenance Plan Option	
Criteria	**MNA Qualifications**
1. The PM_{10} nonattainment area must comply with the 24-hour PM_{10} NAAQS based upon the most recent five years of air quality data for all monitors in the PM_{10} nonattainment area.	During the most recent five-year period from 2002 to 2006, monitors in the MNA measured 24-hour PM_{10} levels below the NAAQS (150 $\mu g/m^3$), thus, criterion #1 has been achieved. For a complete summary, see page 10 of this section.
2. A PM_{10} nonattainment area may qualify for the LMP option if the average 24-hour DVs are less than 98 $\mu g/m^3$.	Calculations conducted in accordance with EPA guidelines established the DV at the Ridgeline monitor is 48 $\mu g/m^3$ and the DV at the Golf Course monitor is 49.3 $\mu g/m^3$. Because the DVs are less than 98 $\mu g/m^3$, criterion #2 has been met.
3. The PM_{10} nonattainment area should expect only limited growth in on-road motor vehicle PM_{10} emissions (including fugitive dust) and must pass the motor vehicle regional emissions analysis test.	To pass the test, the projected increase of onroad motor vehicle PM_{10} emissions during the first ten-year period of the LMP must not cause the DV to exceed 98 $\mu g/m^3$. The adjusted DV for the MNA is 64.34; therefore criterion #3 has been met.

1.6 Applicable EPA Guidance

EPA Guidance consulted for this plan are listed in Appendix B.

2.0 AIR QUALITY

2.1 Monitoring Network and Quality Assurance Procedures

The two monitors currently in operation in the Miami Nonattainment Area (MNA) have been in their locations since 1991. The locations were selected in an effort to monitor the maximum PM_{10} impacts from the smelter and related vehicular traffic. Freeport McMoRan Miami Inc. (FMMI) will continue operation of the Miami monitoring network in accordance with 40 CFR Part 58 in order to continue to verify the attainment status of the area. ADEQ commits to continue working with FMMI to ensure quarterly monitoring data is transmitted in proper format for certification and for entering into EPA's Air Quality System (AQS) database. ADEQ has reviewed the records for the Miami monitoring network and has certified that the data collected by FMMI meets EPA's quality assurance requirements. Table 2.1 features more details on the Miami monitoring network.

Table 2.1
Miami Monitor Site History and Specifications

Site Address	Began Operating	Latitude	Longitude	Device Type	Pollutants Measured	Classification	Scale	Objective
Ridgeline	1991	33.399	110.8589	Dichot	PM_{10}	Industrial[4]	Neighborhood	Source Impact
Golf Course	1991	33.413	110.830	Dichot	PM_{10}	Industrial	Neighborhood	Source Impact

2.2 Historical Air Quality Data

Monitoring for the Annual and 24-hour PM_{10} standards began in the MNA in 1987. EPA revoked the Annual standard in 2007, but retained the 24-hour PM_{10} standard. Therefore, this plan addresses the 24-hour standard only. Table 2.2 contains air quality data recorded by FMMI in an agreement with ADEQ. Monitors in the MNA have been operating in their current location since 1991. The Miami monitors operate on a once-in-every six days sampling schedule. The table contains the maximum 24-hour values recorded at both PM_{10} monitors in the Miami monitoring network. Appendix C.1 contains data for each quarter in the five year period.

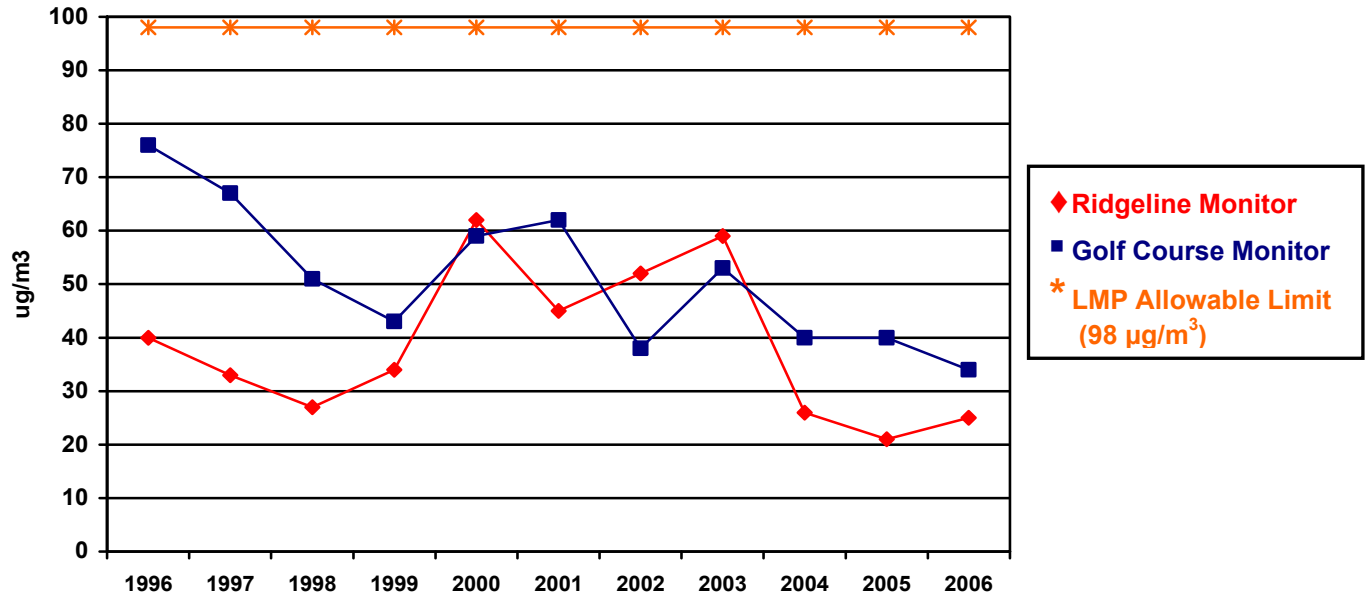
[4] Monitors classified as Industrial are owned and operated by a point source. In this case, the monitors are operated by FMMI in an agreement with ADEQ.

*The term "observations" refers to the number of recorded monitor samples.

TABLE 2.2
MIAMI AIR QUALITY MONITOR DATA 2002-2006

Year	Quarter	# of Observations* Ridgeline	Max 24-hour Concentration Ridgeline ($\mu g/m^3$)	2nd Highest Concentration Ridgeline ($\mu g/m^3$)	# of Exceedances Ridgeline	# of Observations* Golf Course	Max 24-hour Concentration Golf Course ($\mu g/m^3$)	2nd Highest Concentration Golf Course ($\mu g/m^3$)	# of Exceedances Golf Course
2002	1	15	18	16	0	15	38	32	0
	2	15	52	36	0	15	55	43	0
	3	15	24	23	0	15	34	33	0
	4	16	16	13	0	16	31	28	0
	Annual	**61**	**52**	**24**	**0**	**61**	**38**	**38**	**0**
2003	1	15	25	15	0	15	38	22	0
	2	15	39	38	0	14	53	49	0
	3	15	59	23	0	15	47	27	0
	4	16	34	33	0	16	47	40	0
	Annual	**61**	**59**	**39**	**0**	**60**	**53**	**47**	**0**
2004	1	15	24	15	0	15	40	21	0
	2	15	20	19	0	15	32	30	0
	3	15	17	16	0	14	25	24	0
	4	16	26	13	0	12	29	18	0
	Annual	**61**	**26**	**24**	**0**	**56**	**40**	**32**	**0**
2005	1	15	19	12	0	12	21	21	0
	2	15	23	23	0	14	40	39	0
	3	14	20	20	0	15	36	32	0
	4	16	16	16	0	15	35	33	0
	Annual	**60**	**21**	**21**	**0**	**56**	**40**	**36**	**0**
2006	1	14	25	23	0	14	34	32	0
	2	14	25	21	0	14	31	29	0
	3	15	15	15	0	14	22	21	0
	4	15	18	13	0	16	32	31	0
	Annual	**58**	**25**	**25**	**0**	**58**	**34**	**34**	**0**

Figure 2.1 – Maximum 24-hour PM_{10} Concentrations 1996-2006



3.0 EMISSIONS INVENTORY

According to the LMP guidance, the State's maintenance plan should include an emissions inventory. The inventory should represent emissions during the same five-year period associated with the air quality data used to determine whether the area meets the applicability requirements of this policy (i.e., the most recent five years of air quality data). For the Miami Nonattainment Area (MNA), 2005 was selected as the base year for the emissions inventory. Table 3.1 features estimated emissions for 2005.

Table 3.1
Miami Nonattainment Area Daily Emissions
Design Year 2005

	Daily Emissions (tons per day)	Vehicular Emissions (tons per day)
Onroad Mobile - exhaust, brakes and tires	0.058	0.058
Nonroad Mobile	0.016	N/A
Fugitive Dust from Paved roads	0.370	0.370
Fugitive Dust from Unpaved roads	0.180	0.180
Fugitive Dust from Unpaved shoulders	0.300	0.300
Fugitive Dust from Trackout	0.200	0.200
Industrial Permitted Sources	1.072	N/A
TOTAL	2.196	1.108

For vehicular emissions, the PM_{10} emission factors from exhaust, brake and tire wear were estimated using EPA's MOBILE6 model. Fugitive PM_{10} emission factors were calculated based on the equations outlined in Chapter 13 of EPA's AP-42 Compilation of Air Pollutant Emission Factors. The number of vehicle miles traveled (VMT) was obtained from the 2005 Highway Performance Monitoring System (HPMS).

Descriptions of emission estimation methods by source category are described under separate headings below.

Onroad Mobile – Exhaust, Brake and Tire Wear: Particulate matter and gaseous precursors generated by vehicles are termed primary and secondary emissions. Primary emissions are particles emitted by mobile sources which are distributed directly into the atmosphere, for example carbon particles originating from tire wear. Secondary emissions include gases and exhaust generated by vehicles that form particles in the atmosphere through chemical reactions.

MOBILE6 requires a variety of inputs, including meteorological conditions, fuel properties, and local vehicle fleet and traffic information. The calculation also requires data from the HPMS, a database containing information on all public roads in the U.S. HPMS data categories include road classifications,

speed limits, surface type, shoulder conditions, and the annual average daily traffic. For all road segments the emission factors were calculated using MOBILE6 for each road segment reported in the 2005 HPMS for the nonattainment area. VMT for each road segment was determined by its segment length and average annual daily traffic. The PM_{10} emissions for each road segment were determined by multiplying the emission factor by the VMT. For the private roads in the nonattainment area, VMT was estimated based on population. The results of the calculations for this segment are featured in Table 3.1. The analysis for this emissions category is located in Appendix C.2.

Unpaved Roads - Fugitive Dust: EPA's emission factor equation depends upon the surface material silt content, the average speed of vehicles traveling on the unpaved roads, the surface material moisture content, and the number of days with measurable precipitation.

The calculated emission factor is representative of a fleet average emission factor rather than a vehicle-specific emission factor. A value of 0.64 percent for the surface material moisture content was chosen to be representative of conditions in the MNA. A silt content value of 5.68 percent is representative for local unpaved road conditions. Precipitation data for unpaved roads are from a site within the MNA. Emissions from all unpaved roads total 66.00 tons per year (approximately 0.18 tons per day). The analysis for this emissions category is located in Appendix C.3.

Paved Roads - Fugitive Dust: Paved road emissions factors were calculated for each road segment reported in 2005 HPMS. The emission factors were then multiplied by the VMT to generate emissions. For the private roads in the nonattainment area, VMT was estimated based on population.

Using EPA's AP-42 model, the PM_{10} emission factor depends on road surface silt loading, vehicle weight, and precipitation. A silt loading of 0.3 g/m^2 was used for streets, roadways, and highways. PM_{10} emissions from all paved roads total 135.74 tons per year (approximately 0.37 tons per day). The analysis for this emissions category is located in Appendix C.4.

Trackout – Fugitive Dust: ADEQ staff identified dust trackout during a field trip to the MNA and by using satellite images. While most roads within the nonattainment area have been paved, a significant number of residences do not have paved or stabilized driveways and therefore contribute to fugitive PM_{10} emissions in the area. The total of the PM_{10} emissions from all trackout is 73.30 tons per year (approximately 0.20 tons per day).The analysis for this emissions category is located in Appendix C.5.

Industrial Activities: The FMMI smelter and mine, and the BHP Billiton mine are the major sources permitted by ADEQ currently operating in the MNA. ADEQ also permits a minor source, the Carlota Mine. Air quality monitors are situated so that the maximum possible emissions are recorded. Production at the facilities has varied in recent years due to market fluctuations. Table 3.1 features average daily PM_{10} emissions generated by mining facilities for the emission inventory design year. More data on this emissions category are located in Appendix C.6.

Nonroad Mobile Sources: EPA's NONROAD model was used to estimate the PM_{10} emissions from this category for Gila County in 2005. The NONROAD model contains Total emissions for Gila County, which were then proportionally allocated to the estimated population of the MNA. Data from the NONROAD model were used for each category listed in Table 3.2. Data from those categories were extracted from the respective EPA guidance on emissions factors for each. For the complete analysis on this section, see Appendix C.7

Table 3.2 Annual Nonroad PM_{10} Emissions in the MNA Design Year 2005		
Category	**PM_{10} Emissions (tons/year)**	**(tons/day)**
Lawn & Garden	0.423	0.001
Industrial	0.401	0.001
Agricultural	0.000	0
Recreational	0.903	0.002
Commercial	0.201	0.001
Construction	4.134	0.011
Logging	0.029	0.000
Total	6.091	0.016

4.0 CONTROL MEASURES

Sections 4.1 and 4.2 describe control measures for sources within the Miami Nonattainment Area (MNA). Section 4.3 describes the contingency measures that will be considered if the predetermined trigger level is reached or if an exceedance of Limited Maintenance Plan (LMP) eligibility occurs (98 $\mu g/m^3$). Section 4.4 describes the trigger in further detail. Section 4.5 discusses conformity and the LMP option.

EPA's Limited Maintenance Plan (LMP) guidance requires areas seeking redesignation to demonstrate improvements in air quality are not due to temporary economic downturns. Chapter 2 contains economic and population data for the region. The data reveal that since 1970 the population of the MNA has decreased. Housing units in the region have remained stagnant and key indicators point to a flat economy.

The LMP guidance also requires the State to demonstrate air quality improvements are not due to unusually favorable meteorological conditions. According to the National Weather Service, the average annual precipitation in Miami is 19.49 inches. As shown in Table 4.1, during the 2002-2006 attainment period, 2005 was the only year that exceeded the average. Although recent years have provided unfavorable conditions for PM_{10} formation in Miami, there has not been an exceedance of the NAAQS.

Table 4.1
MNA Inches of Precipitation
2002-2006

2002	2003	2004	2005	2006
4.51	17.89	16.29	19.71	12.21

4.1 Reasonably Available Control Measures (RACM)

The Clean Air Act (CAA) requires moderate PM_{10} nonattainment area plans to ensure reasonably available control measures (RACM) will be implemented no later than four years after designation. The Act further requires the plan to provide for the implementation of controls reflecting reasonably available control technology (RACT) within the same time period. RACM and RACT are not required for sources which do not contribute significantly to violations of the 24-hour PM_{10} NAAQS or where additional controls on the sources would not expedite attainment of the NAAQS.

As discussed previously, the MNA was classified along with Hayden as a Group I area by EPA due to potential PM_{10} emissions. EPA based this finding due to the presence of copper mining facilities and emissions from mobile sources. The 1989 Hayden-Miami SIP revision focused on control measures for sources in the Hayden portion of the nonattainment area, but did not contain control measures for sources in Miami. Therefore, ADEQ has elected to cite control measures included in operating permits issued for major point sources in the area. These measures, along with road maintenance conducted the City of Globe and the Town of Miami, are responsible for the area meeting the NAAQS.

ADEQ issues operating permits for two major point sources within the MNA. These facilities are the FMMI smelter and the BHP Billiton (BHP) mine. ADEQ also issues the operating permits for two minor sources, the FMMI mine and the Carlota Mining Company (CMC).

The operating permits for FMMI's Miami mine and smelter require renewal every five years. The permit for the mine was last reissued November 26, 2007; the permit for the smelter was reissued July 5,

2006. The RACM and RACT implemented at the FMMI facility are sufficient to qualify as permanent and enforceable measures, as shown below in Table 4.2. In addition to these permit provisions, FMMI capped and seeded its tailings pile with vegetation.

Table 4.2 **RACM and RACT included in FMMI Operating Permits**
Wet scrubbers, bag houses, and vent hoods were installed where applicable.
Water spray bars were installed on conveyor belt transfer and drop points.
Dust suppressants or soil stabilizers are used on unpaved roadways, parking areas, and vacant lots. Paved streets are kept free from dirt and debris.
Loaded materials must be covered or stabilized during transportation. Stored materials must be covered or stabilized.
Windbreaks were erected near material staging areas outside the smelter.

The operating permit for the BHP Billiton mine was last reissued December 26, 2006, and requires renewal every five years. The permit authorizes the company's mining, milling, and leaching operations. The RACM and RACT implemented at the BHP mine are sufficient to qualify as permanent and enforceable measures, as shown below in Table 4.3. In addition to these permit provisions, BHP armored its tailings pile south of the town of Miami.

Table 4.3 **RACM and RACT included in the BHP Operating Permit**
Wet scrubbers, electrostatic precipitators, and vent hoods were installed where applicable.
Water spray bars were installed on conveyor belt transfer and drop points. Drop heights are positioned to produce the lowest possible emissions.
Dust suppressants or soil stabilizers are used on unpaved roadways, parking areas, and vacant lots. Paved streets are kept free from dirt and debris.
Loaded materials must be covered or stabilized during transportation.
Stored materials must be covered or stabilized.

The implementation of these measures helped bring the area into attainment of the 24-hour standard. Including these measures in the plan satisfies the CAA requirement for RACM. In addition to these RACM controls, the Arizona Department of Transportation's (ADOT) Standard Specification Section 810 mandates that state contractors utilize a comprehensive series of control measures designed to mitigate airborne PM_{10} emissions during road construction projects. ADOT also implemented Encroachments in Highway Rights-of-Way, Arizona Administrative Code (AAC) R17-3-702, which authorizes ADOT to issue permits to allow private landowners and tenants to enter or exit the State Highway System but directs mitigation of trackout nuisances.

The Carlota Mining Company is a minor source located approximately six miles west of the Town of Miami. ADEQ issued the CMC permit in 2003; however, the mine only recently commenced operation. The permit contains comprehensive measures to ensure PM_{10} emissions from vehicular traffic are kept to a minimum. CMC is required to limit daily vehicular traffic, enforce low speed limits on roadways on company premises, and maintain comprehensive records to verify compliance with permit conditions. The company is required to stabilize roadways with water or chemical suppressants on a routine basis.

These supplemental strategies contributed to fugitive dust reductions and protection of the public health. Continued implementation of these measures will help ensure the Miami area continues to meet the NAAQS.

4.2 Permanent and Enforceable Control Measures

The CAA requires that all types of maintenance plans demonstrate that measures credited with bringing the area into attainment are federally enforceable and continued into the future. These measures resulted in emissions reductions sufficient for attaining the PM_{10} standard in the Miami Nonattainment Area. The RACM included in this LMP are sufficient and the deficiencies of the maintenance plan submitted by ADEQ in 1989 have been now been addressed.

New major sources or major modifications to existing sources located in nonattainment areas are subject to Arizona Administrative Code (AAC) R18-2-403 (Permits for Sources Located in Nonattainment Areas). Following redesignation, AAC R18-2-406 (Permit Requirements for Sources Located in Attainment and Unclassifiable Areas) will apply for any major source or major modification to a source located within the maintenance area.

4.3 Contingency Measures

Section 175A of the CAA requires a maintenance plan's contingency provisions to be enacted should a violation of the PM_{10} standard occur following redesignation to attainment. EPA's memo, *Limited Maintenance Plan Option for Moderate PM_{10} Nonattainment Areas* (Lydia Wegman, August 9, 2001), states that contingency measures do not have to be fully adopted at the time of redesignation, but the LMP should identify measures to be implemented if necessary.

The State commits to act promptly if a violation of the area's design value occurs following redesignation to attainment. Specifically, the State commits to determine if violations occurred within six months of the close of the calendar year. The State also commits to identify and implement the appropriate control measure(s) needed to remedy the situation by the end of the same calendar year.

A redesignated area with an LMP is also required to recalculate annually the average design value for the area to determine if the area has continued to meet the qualifications to be eligible for a LMP. If after performing the annual recalculation the state determines that the area no longer qualifies for a LMP, the State commits to take actions to reduce PM_{10} concentrations sufficiently to re-qualify for a LMP or prepare a Maintenance Plan.

4.4 Contingency Measure Trigger

The contingency measures featured in Table 4.4 will be considered for prompt implementation by the State should an exceedance of 98 $\mu g/m^3$ occur. In order to prevent an exceedance from occurring, ADEQ opted to identify a specific indicator, or trigger, if PM_{10} concentrations reach a level that signals an exceedance may be imminent. The trigger will be used by ADEQ to determine if it is necessary to implement contingency measures in order to prevent an exceedance from occurring.

For this LMP, contingency measures will be considered if ambient concentrations reach a pre-determined threshold level, 93 $\mu g/m^3$. ADEQ based this level on 95 percent of the maximum allowable limit to remain eligible for a LMP, 98$\mu g/m^3$. Sources contributing to the trigger activation will help the state determine the appropriate contingency measure or measures to be implemented. While not a

requirement for a LMP, ADEQ believes that identifying a trigger will increase protection of the public health and help assure the area will continue to qualify for an LMP.

Table 4.4 - Contingency Measure Options	
Contingency Measures	**Implementing Entity**
If any PM_{10} generating industrial source operating within the maintenance area is found to be contributing to monitored readings above the Limited Maintenance Plan allowable limits, ADEQ will review existing air quality permits to identify additional control measures that may be needed. If a PM_{10} source does not have a permit, the permitting authority will determine if an air quality permit and PM_{10} controls are needed.	ADEQ
Review and revise dust control measures for material storage piles to determine if additional action is needed.	ADEQ
Pave any new unpaved public roads, vacant lots, and unpaved parking lots located in the PM_{10} maintenance area subject to limits of statutory authority.	Gila County
Review and revise existing grading ordinance, if necessary.	Gila County
Reduce particulate matter by paving or stabilizing unpaved or unimproved shoulders and alleys.	Town of Miami and Gila County
Review and revise standards for installation and maintenance of landscaping and screening, if necessary.	Gila County
Review and revise roadway maintenance practices following exceptional events, if necessary.	Gila County

4.5 Conformity

The Transportation Conformity Rule (40 CFR Parts 51 and 93) and General Conformity Rule (58 FR 63214; November 30, 1993) apply to nonattainment areas and maintenance areas operating under maintenance plans. Under transportation conformity rules, one means of demonstrating conformity of federal actions is to indicate that expected emissions from planned actions are consistent with the emissions budget for the area. Emissions budgets in LMP areas may be treated as essentially non-constraining for the length of the maintenance period because it is unreasonable to expect that an LMP area would experience so much growth during that period of time that a violation of the PM_{10} NAAQS would result. This does not exempt an LMP area from the need to affirm conformity, but it does allow the area to demonstrate conformity without undertaking certain rule requirements. For transportation conformity purposes, EPA would most likely conclude that emissions in these areas do not require a cap for the duration of the maintenance period, and, therefore, a regional emissions analysis will not be required.

General Conformity requires that non-transportation based projects in areas that have air quality plans for either nonattainment or maintenance areas submit a description of the project to the State. The description must show either that the project will not increase the relevant emissions for the area, or that specific control measures will be applied for the duration of the project in order to prevent increased emissions, in this case, increased emissions of PM_{10}.

5.0 LIMITED MAINTENANCE PLAN ADMINISTRATION

5.1 Commitment to Calculate PM_{10} Design Values Annually

The State commits to recalculate the area's PM_{10} design values annually to track the area's air quality levels. If the concentrations rise above the threshold or trigger that qualifies the area for the Limited Maintenance Plan (LMP), the State will act to correct the problem. If the actions fail to restore eligibility for the LMP, the state commits to submit a full maintenance plan.

5.2 Discussion of Permitting Program to Ensure that New Sources Will Not Jeopardize Continued Maintenance

As previously discussed in Section 4.2, Arizona Administrative Code (AAC) R18-2-403 (Permits for Sources Located in Nonattainment Areas) and AAC R18-2-406 (Permit Requirements for Sources Located in Attainment and Unclassifiable Areas) will apply for any major source or major modification to a source located within the maintenance area.

5.3 CAA Section 175(A) Maintenance Plans

ADEQ commits to submit a limited maintenance plan for the second ten-year period (2020-2030) by 2017. ADEQ also commits to submit an annual attainment report and review the emissions inventory every three years to ensure emissions growth is incorporated in the attainment inventory.

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LIST OF APPENDICES

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APPENDIX A: APPLICABLE CLEAN AIR ACT (CAA) REQUIREMENTS

Appendix A - CAA Regulatory Requirements		
CAA Citation	**Action to Meet Requirement**	**Location in Document**
CAA Section 172(c), Nonattainment Plan Provisions		
172(c)(1) General	"...Such plan provisions shall provide for the implementation of all reasonably available control measures (RACM) as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology (RACT)) and shall provide for attainment of the national primary ambient air quality standards."	Chapter 4 contains an explanation of applicable RACM/RACT for PM_{10} point sources in the nonattainment area.
172(c)(2) Reasonable Further Progress (RFP)	Plan provisions shall demonstrate reasonable further progress or "annual incremental reductions in emissions … for the purpose of ensuring attainment of the applicable national ambient air quality standards by the applicable date."	Chapter 4 of this submittal demonstrates that the Miami Nonattainment Area (MNA) has attained and will maintain the PM_{10}NAAQS with current control measures.
172(c)(3) Emissions Inventory	The plan provisions "… shall include a comprehensive, accurate, current inventory of actual emissions from all sources of the relevant pollutant(s)..." ADEQ maintains a database of historical and current actual emissions from State permitted point and area sources. All non-permitted source emissions data (i.e.: mobile sources) are obtained from EPA's national emissions inventory.	Base-year emissions are contained in Chapter 3. In qualifying for the LMP option, the requirement for projecting emissions is waived.
172(c)(4) Identification and Quantification	Plan provisions "… shall expressly identify and quantify the emissions, if any, of any such pollutant or pollutants which will be allowed, in accordance with Section 173(a)(1)(B), from the construction and operation of major new or modified stationary sources in each such area. The plan shall demonstrate to the satisfaction of the Administrator that the emissions quantified for this purpose will be consistent with the achievement of reasonable further progress and will not interfere with attainment of the applicable national ambient air quality standard …" The permit requirements of CAA Section 173(a)(1)(B) are applicable to sources located in a targeted economic development zone as determined by the Administrator under consultation with the Secretary of Housing and Urban Development. No such zones exist within the MNA.	

172(c)(5) Permits for New and Modified Major Stationary Sources	The plan provisions "…shall require permits for the construction and operation of new or modified major stationary sources anywhere in the nonattainment area…" All new sources and modifications to existing sources in Arizona are subject to state requirements for preconstruction review and permitting pursuant to AAC, Title 18, Chapter 2, Articles 3 and 4. All new major sources and major modifications to existing major sources in Arizona are subject to the New Source Review (NSR) provisions of these rules or Prevention of Significant Deterioration (PSD) for maintenance areas. ADEQ currently has full approval of its Title V permit program.	
172(c)(6) Other Measures	The plan "... shall include enforceable emissions limitations, and such other control measures, means or techniques …, as well as schedules and timetables for compliance, as may be necessary or appropriate to provide for attainment of such standard in such area by the applicable attainment date..."	Emissions limitations and control measures for PM_{10} sources in the nonattainment area may be found in Chapter 5.
172(c)(7) Compliance with Section 110(a)(2), Implementation Plans	The plan provisions "... shall also meet the applicable provisions of Section 110(a)(2)." The requirements of Section 110(a)(2) are detailed elsewhere in this Table.	
172(c)(8) Equivalent Techniques	The plan may include upon application by the state "... the use of equivalent modeling, emission inventory, and planning procedures …" as allowed by the administrator. Per the conditions of the Limited Maintenance Plan option, the obligation to model is waived.	
172(c)(9) Contingency Measures	The plan "... shall provide for the implementation of specific measures to be undertaken if the area fails to make reasonable further progress, or to attain the national primary ambient air quality standard … Such measures shall be included in the plan revision as contingency measures to take effect in any such case without further action by the State or the Administrator." As noted in 172(c)(2) above, this submittal includes monitoring data and source permit information that demonstrate that the applicable area has attained, and will maintain. Per the conditions of the Limited Maintenance Plan option, the obligation to model is waived. The MNA is meeting EPA's NAAQS with the control measures currently fully implemented. As such, the RFP requirement is met.	
CAA Section 175(A), Maintenance Plans		
175(A)(a) Plan Revisions	"Each State which submits a request under Section 107(d) for redesignation of a nonattainment area … shall also submit a revision of the applicable State implementation plan to provide for the maintenance of the national primary ambient air quality standard … for at least 10 years after the redesignation…" This submittal demonstrates attainment through 2019. ADEQ commits to submit a maintenance plan for the second ten year period (2019-2029) by 2018.	
175(A)(b) Subsequent Plan Revisions	"8 years after redesignation of any area as an attainment area under Section 107(d), the State shall submit to the Administrator an additional revision of the applicable State implementation plan for maintaining the national primary ambient air quality standard for 10 years after the expiration of the 10-year period referred to in subsection (a)." ADEQ commits to submit an additional SIP revision ten years after redesignation.	

175(A)(c) Nonattainment Requirements Applicable Pending Plan Approval	"Until such plan revision is approved and an area is redesignated as attainment for any area designated as a nonattainment area, the requirements of this part shall continue in force and effect with respect to such area." ADEQ commits to keeping all applicable measures in place.	
175(A)(d) Contingency Provisions	"Each plan revision submitted under this Section shall contain such contingency provisions as the Administrator deems necessary to assure that the State will promptly correct any violation of the standard which occurs after the redesignation of the area as an attainment area. Such provisions shall include a requirement that the State will implement all measures with respect to the control of the air pollutant concerned which were contained in the state implementation plan for the area before redesignation…" ADEQ commits to implementing all identified measures as necessary.	
CAA Section 110(a)(2) – Implementation Plans		
110(a)(2)(A) Control Measures and Emission Limits	Section 110(a)(2)(A) requires that states provide for enforceable emission limitations and other control measures, means, or techniques, as well as schedules for compliance necessary to meet applicable requirements of the CAA.	Chapter 4 includes the measures utilized to bring this area into attainment and ensure future maintenance of the PM_{10} NAAQS.
110(a)(2)(B) Ambient Monitoring	Section 110(a)(2)(B) requires that states provide for establishment and operation of appropriate devices, methods, systems, and procedures necessary to monitor, compile, and analyze data on ambient air quality.	Chapter 2 includes ambient monitoring network information and data for the MNA
110(a)(2)(C) Permitting and Compliance	Section 110 (a)(2)(C) requires states to have permitting, compliance, and source reporting authority. Arizona Revised Statutes (ARS) 49-402 establishes ADEQ's permitting and enforcement authority. Under ADEQ's air permits program, stationary sources that emit regulated pollutants are required to obtain a permit before constructing, changing, replacing, or operating any equipment or process which may cause air pollution. This includes equipment designed to reduce air pollution. Permits are also required if an existing facility that causes air pollution transfers ownership, relocates, or otherwise changes operations. Under ADEQ's air quality compliance program, scheduled and unscheduled inspections are conducted at the major sources annually. The ADEQ Air Compliance Section also implements compliance assistance initiatives to address non-compliance issues (i.e., seminars and workshops for the regulated community explaining the general permit requirements, individual inspections of all portable sources within a geographical area, mailings, etc.). In addition, compliance initiatives are developed to address upcoming or future requirements and include such actions as training for inspectors; development of checklists and other inspection tools for inspectors; public education workshops; targeted inspections; mailings, etc. ADEQ's Air Compliance Section also has an internal performance measure to respond to all complaints as soon as possible, but within five working days.	

110(a)(2)(D) Other States	Section 110 (a)(2)(D) requires adequate provisions to ensure that emissions activity within the state does not contribute significantly to nonattainment in or interfere with maintenance by any other state or interfere with any other state's required applicable implementation plan to prevent significant deterioration of air quality or to protect visibility. Also required are provisions to ensure compliance with Sections 126 and 115 relating to interstate and international pollution abatement. Analysis of the MNA demonstrates attainment and maintenance of the PM_{10} air quality standards. Based on enforceable emission reductions, no significant contribution or interference with air quality in any other state is expected.
110(a)(2)(E) Adequate Resources	Section 110 (a)(2)(E) requires that states have adequate personnel, funding, and authority under state law to carry out the implementation plan. As authorized under ARS 49-104, 49-402, and 49-404, ADEQ retains adequate funding and employs adequate personnel to administer the air quality program. Appendix E includes the organization chart for ADEQ's Air Quality Division.
110(a)(2)(F) Emissions Monitoring and Reporting	Section 110 (a)(2)(F) requires, as prescribed by the Administrator, provision for emissions monitoring and reporting, by owners or operators of stationary sources and periodic reports on the nature and amounts of emissions as well as correlation of such reports by the state agency with any emission limitations or standards. AAC R18-2-327 requires that any source subject to a permit must complete and submit to the Director their responses to an annual emissions inventory questionnaire. A current air pollutant emissions inventory of both permitted and non-permitted sources within the state is necessary to properly evaluate the air quality program effectiveness, as well as determine appropriate emission fees for major sources. This inventory encompasses those sources subject to state permitting requirements emitting 1 ton per year or more of any individual regulated air pollutant, or 2.5 tons per year or more of any combination of regulated air pollutants. ADEQ is responsible for the preparation and submittal of an emissions inventory report to EPA for major sources and emission points prescribed in 40 CFR 51.322, and for sources that require a permit under ARS 49-426 for criteria pollutants.
110(a)(2)(G) Emergency Powers	Section 110(a)(2)(G) requires that states provide for authority to establish emergency powers and authority and contingency measures to prevent imminent endangerment. ARS 49-465 authorizes state actions to alleviate or prevent an emergency health risk to the public. AAC R18-2-220 prescribes the procedures the ADEQ Director shall implement in order to prevent the occurrence of ambient air pollution concentrations which would cause significant harm to the public health. In addition, as authorized by ARS 49-426.07, ADEQ may seek injunctive relief upon receipt of evidence that a source or combination of sources is presenting an imminent and substantial endangerment to public health or the environment.
110(a)(2)(H) Plan Revisions	Section 110(a)(2)(H) requires revisions to plans to take account of revised primary or secondary ambient air quality standards or the availability of improved or more expeditious methods of attaining such standards. This Section also requires states to provide for plan revisions to ensure the adequacy of the plan to attain the air quality standards or to otherwise comply with any additional requirements established under the CAA. ADEQ will revise this plan as necessary to comply with the requirements of the Clean Air Act.

APPENDIX B

Applicable EPA Guidance Documents

PM_{10} SIP Development Guideline, U.S. Environmental Protection Agency, OAQPS, EPA-450/2-86-001, Research Triangle Park, NC, June 1987.

Procedures for Processing Requests to Redesignate Areas to Attainment, John Calcagni, Director, Air Quality Management Division, memorandum dated September 4, 1992.

PM_{10} Emission Inventory Requirements, U.S. Environmental Protection Agency, OAQPS, Research Triangle Park, NC, September 1994.

Reasonable Further Progress, Attainment Demonstration, and Related Requirements for Ozone Nonattainment Areas Meeting the Ozone National Ambient Air Quality Standard. John S. Seitz, Director, Office of Air Quality Planning and Standards (MD-10), May 15, 1995.

Limited Maintenance Plan Option for Moderate PM_{10} Nonattainment Areas, Lydia Wegman, Director, AQSSD (MD-15), memorandum dated August 9, 2001.

Clean Data Policy for the Fine Particulate National Ambient Air Quality Standards. Stephen D. Page, Director, Office of Air Quality Planning Standards, December 14, 2004**.**

US EPA, AP 42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Source, Chapter 13.2.1. November 2006.

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APPENDIX C

Appendix C - Emissions Inventory Analyses

C.1. Justification for LMP Option for the MNA

C.2. 24-hour Emissions Inventory

C.3. On-Road Mobile Source Emissions Inventory

C.4. Fugitive Emissions from On-Road Mobile Sources

C.5. PM_{10} Emissions from Trackout in the MNA

C.6. Off-Road Mobile Source PM_{10} Emissions Inventory for the MNA

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APPENDIX C.1
Justification for Limited Maintenance Plan Option for
Miami PM_{10} Nonattainment Area

Assessment Staff

May 2008

Background

To qualify for the limited maintenance plan (LMP) option, a PM_{10} nonattainment area must meet the following criteria[1]:

1. No Violations of 24-hour PM_{10} Standard

The PM_{10} nonattainment area must be in compliance with the 24-hour PM_{10} National Ambient Air Quality Standards (NAAQS) based upon the most recent five years of air quality data for all PM_{10} monitors in the PM_{10} nonattainment area (24-hour PM_{10} standard = 150 $\mu g/m^3$). Note: EPA revoked the annual PM_{10} NAAQS in 2006, thus it is not necessary to consider the annual PM_{10} NAAQS when qualifying for the LMP option as per e-mail correspondence with EPA Region IX[2].

2. Average 24-Hour PM_{10} Design Value be at or below 98 $\mu g/m^3$ or Otherwise below Critical Design Value

The average 24-hour PM_{10} design value (DV) for the PM_{10} nonattainment area must be at or below 98 $\mu g/m^3$. Note: EPA revoked the annual PM_{10} NAAQS in 2006, thus it is nc
consider the annual PM_{10} DV when qualifying for the LMP option as per e-mail c
with EPA Region 9[2].

If a PM_{10} nonattainment area cannot meet the DV test, it may still be able to qualify for the LMP option if the average 24-hour design value for the PM_{10} nonattainment area is less than its respective site-specific critical design value (CDV)[1].

3. Pass Motor Vehicle Regional Emissions Analysis Test

The PM_{10} nonattainment area should expect only limited growth in on-road motor vehicle PM_{10} emissions (including fugitive dust) and must have passed the motor vehicle regional emissions analysis test[1].

LMP Option Analyses

The following section describes the data and calculations that ADEQ used to demonstrate that the Miami PM_{10} Nonattainment Area meets the criteria for the LMP option.

***Criterion #1 – 24-Hour PM_{10} Standard*:**

The Miami PM_{10} Nonattainment Area has two PM_{10} monitors operated by Freeport-McMoRan Copper & Gold Inc. at Miami Ridgeline and Golf Course sites. The Miami Ridgeline site is located at 4030 Linden Street in Miami, AZ, and its Air Quality System (AQS) site ID is 04-007-0009. The Miami Golf Course site is located at SR-188 & US-60 in Miami, AZ, and its AQS site ID is 04-007-8000. They measure 24-hour PM_{10} concentrations on a one-in-six day schedule. During the most recent five-year period from 2002 to 2006, because this monitor measured 24-hour PM_{10} levels below the 24-hour NAAQS (150 $\mu g/m^3$); therefore, the attainment of 24-hour PM_{10} NAAQS has been achieved.

Criterion #2 – Design Value / Critical Design Value:

Besides the requirement of attaining 24-hour PM_{10} NAAQS, the average 24-hour PM_{10} design value for the Miami PM_{10} Nonattainment Area should be at or below 98 $\mu g/m^3$. ADEQ calculated the 24-hour PM_{10} design values following EPA's PM_{10} SIP Development Guideline[3]. The design values were determined by selecting the highest 24-hour PM_{10} concentration in a three-year period. The 24-hour design values for the most recent five years (2002 – 2006) and their average are listed in Table 1. The most recent five years of data consists of three consecutive three-year periods (2002 – 2004, 2003 – 2005, and 2004 – 2006). The data in Table 1 indicate that the 24-hour design values for all these three-year periods and the average of those three design values are all well below 98 $\mu g/m^3$.

Table 1
ADEQ Official 24-hour Design Values for Miami PM_{10} Nonattainment Area

Three-year Period	24-hour Design Values ($\mu g/m^3$)	
	Ridgeline	Golf Course
2002-2004	59	55
2003-2005	59	53
2004-2006	26	40
Average	48.0	49.3

The Miami PM_{10} Nonattainment Area has attained the 24-hr NAAQS and the 24-hour PM_{10} design values, based on that the most recent five years of 24-hour PM_{10} data, are less than 98 $\mu g/m^3$. Thus, the Miami PM_{10} Nonattainment Area meets criteria #1 and #2 of the LMP option.

Criterion 3 – Mobile Source Emissions:

This criterion is related to projected growth of mobile source emissions in a PM_{10} nonattainment area. The motor vehicle regional emissions analysis test is a test in which the increase in 24-hour PM_{10} concentrations resulting from an increase in vehicle miles traveled (VMT) by onroad mobile sources over the next 10 year period is added to the PM_{10} design values for a PM_{10} nonattainment area. This projected

24-hour PM_{10} design value must be less than 98 μg/m^3 or the site-specific CDV. This analysis should be done for all the monitors in the nonattainment area.
ADEQ used the following equation for the motor vehicle regional emissions analysis[5]:

$$\text{Projected } DV = DV + \left(VMT_{pi} \times DV_{mv}\right) \leq MOS \qquad (1)$$

where:

DV	The area's average 24-hour PM_{10} design value based on the most recent five years of quality assured data in μg/m^3
VMT_{pi}	The projected percentage increase in vehicle miles traveled (VMT) over the next 10 years
DV_{mv}	Motor vehicle design value based on on-road mobile portion of the attainment year inventory in μg/m^3 and it is calculated by multiplying DV by the percentage of the attainment year 24-hour PM_{10} emissions inventory represented by on-road mobile sources
MOS	Margin of safety for the 24-hour PM_{10} standard for a given area: 98 μg/m^3 (or using site-specific CDV)

The average 24-hour PM_{10} design values are 48.0 μg/m^3 and 49.3 μg/m^3 for Ridgeline and Golf Course sites, respectively, according to Table 1.

The projected VMT increase over the next ten years (2009 – 2019) was estimated from projected 2009 and 2019 populations of Gila County estimated by Arizona Department of Economic Security, Population Statistics Unit[6]. The projected 2009 population is 57,092 and the projected 2019 population is 63,751. Then the projected VMT increase (VMT_{pi}) from 2009 – 2019 is 11.7%. The motor vehicle portion of the Miami PM_{10} Emissions Inventory was approximately 50%.

Details:

DV = 49.3 μg/m^3
VMT_{pi} = 11.7%
DV_{mv} = 49.3 μg/m^3 × 50% = 24.7 μg/m^3

Then:

Projected DV = 49.3 μg/m^3 + (11.7% × 24.7 μg/m^3) = 52.19 μg/m^3

The projected DV was calculated to be 52.19 μg/m^3, which is less than the 98 μg/m^3. Thus, the motor vehicle regional emissions analysis test has been satisfied.

Conclusions

In conclusion, the MNA qualifies for the LMP option because it meets the three criteria set forth by EPA:

(1) No violations of 24-hour PM_{10} standard.

(2) Average 24-Hour PM_{10} design values are at or below 98 μg/m^3.

(3) Projected growth in onroad mobile emissions does not cause 24-hour PM_{10} concentrations to be greater than 98 μg/m^3.

References

1. Lydia Wegman, Memorandum: Limited Maintenance Plan Option for Moderate PM_{10} Nonattainment Areas, 2001.
2. Weinke Tax, USEPA R9, Personal Communications, 2007.
3. U.S. Environmental Protection Agency, PM_{10} State Implementation Plan Development Guideline, 1987.
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APPENDIX C.2 Miami Nonattainment Area Daily Emissions (tons/day) Design Year 2005		
	Daily Emissions	**Vehicular Emissions**
Onroad Mobile		
(Mobile6.2 including: exhaust, brakes and tires)		
Primary Emission	0.020	0.020
Secondary Emission	0.038	0.038
Subtotal	**0.058**	**0.058**
Nonroad Mobile		
Agricultural	0	
Lawn & Garden	0.001	
Aircraft	0	
Industrial	0.001	
Logging	0	
Recreational	0.002	
Commercial	0.001	
Construction and Mining	0.011	
Subtotal	**0.016**	
Fugitive PM_{10} Emissions from On-road Mobile Sources		
Paved roads	0.370	0.370
Unpaved roads	0.180	0.180
Unpaved shoulders	0.300	0.300
Trackout	0.200	0.200
Subtotal	**1.050**	**1.050**
Industrial Permitted Sources		
Phelps Dodge Smelter	0.888	
Phelps Dodge Mine	0.115	
BHP Pinto Valley Operations	0.069	
Subtotal	**1.072**	
TOTAL	**2.196**	**1.108**

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APPENDIX C.3
On-Road Mobile Source PM_{10} Emissions Inventory for Miami PM_{10} Nonattainment Area

Assessment Staff
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April 2008

Introduction

This paper documents how the PM_{10} emissions from on-road mobile sources in Miami PM_{10} Nonattainment Area (MNA) were quantified.

Methodology

EPA's MOBILE6 model was used to calculate the emission factors. The emission factors were then coupled with VMT (vehicle miles traveled) to generate emissions. MOBILE6 requires a variety of input parameters, such as meteorological conditions, fuel properties, and vehicle information. Each required parameter can be found in Table 1 along with its value and estimation method. Table 1 also shows that the calculation requires substantial data reported in the Highway Performance Monitoring System (HPMS). HPMS is a database containing system information on all public roads in the country. The data include road classifications, speed limit, surface type, shoulder type, and average annual daily traffic (AADT). Traffic counts used to calculate VMTs were also obtained from this database.

Analysis of 2005 HPMS Database

A total of 39 fields for all the road segments in the MNA were extracted from the 2005 HPMS database[1] (e.g., name of the road segments, speed limit, and surface type). All these da essential in developing an onroad mobile source emissions inventory. There are 112 segments in the MNA reported in the 2005 HPMS database[1]. Only one road segment, I from milepost 234 to the Gila/Pinal boundary, is located in Pinal County. All the road segments are located in either a rural area or a small urban area (with population from 5,000 to 49,999). The road classifications include rural minor arterial, rural major collector, rural minor collector, urban principal arterial - other than freeways and expressways - urban minor arterial, urban collector, and urban local.

Table 1.MOBILE6 Input Analysis for Miami Nonattainment Area		
Parameter	Value	Notes
Pollutants	PM_{10}	
Calendar year	2005	2005 was the most current year HPMS data were available.
Month of evaluation	--	Not necessary since season does not affect PM_{10} emissions.
Altitude	Low	Average elevation in Miami is 3402 ft[2]. Although a small portion of the MNA in the mountains exceeds 4000 ft, low altitude was selected, which is consistent with the recommendation by EPA[2]. Only five counties in Arizona have been categorized as high-altitude counties for mobile source regulatory purposes only[4] and Gila County is not one of them.
Min/Max temperature	50.6/76.6°F	No influence on PM_{10} emissions. Average values for the whole year were chosen[5].
Humidity	--	Not included since it has no influence on PM_{10} emissions.
Barometric pressure	--	Not included since it has no influence on PM_{10} emissions.
Refueling	None	Only Area A (Phoenix) requires Stage II Refueling in Arizona.
Average percent cloud cover, period of peak sun	MOBILE6 default	EPA recommends using national averages for SIP purposes[2].
Sunrise/sunset time	--	Not included since it has no influence on PM_{10} emissions.
Age distribution of vehicle registration	Gila County's January 2005 vehicle registration[6]	The vehicles traveling in the MNA come from local areas (Gila and Pinal County), other counties in the state such as Maricopa County, or from other states. The majority of the non-local vehicles are from Maricopa County. The local area has an older fleet than Maricopa County; an older fleet tends to emit more PM_{10}. To be conservative, Gila County's vehicle registrations are used to determine the vehicle registration distribution in the MNA. Because MOBILE6 requires July registrations, July registrations were calculated based on January registrations and then converted to the MOBILE6 format.
Annual mileage accumulation rate	MOBILE6 default	EPA recommends using national default if local data are unavailable[2].
Diesel fractions	Local information[6] + national default[7]	MOBILE6 requires 350 diesel fractions for 25 age categories of 14 composite vehicle types. Diesel fractions of light duty vehicles and buses were directly obtained from Motor Vehicle Division's vehicle registration report[6]. National default values[7] were used for the other 12 vehicle types.
Natural gas vehicle	--	Negligible since the fraction is low.

Table 1.MOBILE6 Input Analysis for Miami Nonattainment Area		
Parameter	Value	Notes
VMT by vehicle class	Based on 2005 HPMS database[1]	EPA expects states to develop local estimates[2]. HPMS reports percentages of AADT by single unit truck (25 ~ 50 feet) and multi-unit truck (>50 feet). Vehicles longer than 25 feet are considered as heavy-duty vehicles[8]. Based on this information, the split between light duty and heavy duty can be determined.
VMT by facility	--	Not necessary since each segment will be modeled separately.
VMT by hour	MOBILE6 default	States may choose to use the default values instead of developing local values[2]. If local data are difficult to obtain, MOBILE6 defaults can be used.
VMT by speed	Null	EPA expects states to develop local estimates[2]. At a minimum speeds should be estimated separately by roadway function class using 'Average Speed'.
Average speed	--	The emissions are insensitive to the changes in speed.
Idle emission rates	--	Not necessary.
Vehicle engine starts per day, by hour of the day, vehicle soak time between engine starts, vehicle soak time after engine shut down, vehicle diurnal soak time, vehicle trip length (duration) distributions	MOBILE6 default	Local data are unavailable and have negligible effects on overall emissions.
Weekday and weekend day activity	MOBILE6 default	Not necessary and local data are unavailable.
Fuel Reid Vapor Pressure	8.789 psi	It is a required input although it has no influence on PM_{10} emissions. Fuel properties were obtained from the inspection report provided by the Arizona Department of Weights and Measures[9]. Average value was chosen.
Fuel oxygen content	--	Not required in the MNA.
Gasoline sulfur content	68.75 ppm	Average value was chosen[9].
Diesel sulfur content	293.8 ppm	Average value was chosen[9].
Inspection/Maintenances program Anti-tampering	--	Not required in the MNA.

Several adjustments were made to the HPMS MNA data in order to fill the data gap which appear below:

1. There are 10 road segments that cross the boundary of the MNA. Portions of these segments outside of the MNA were eliminated by subtracting the length outside the area from the original length reported in HPMS.

2. There are 21 road segments without reported AADT (annual average daily traffic). The AADT of these segments was estimated using HPMS assigned volume groups. The information needed to estimate the AADT includes rural/urban designation, functional classification of road segment, and standard sample volume groups. For example, Latham Boulevard from unknown Miami to US-60 is classified as small urban collector, and its AADT volume group is assigned as '1'. According to the lookup table in the HPMS field manual[10], Appendix C, its AADT ranges from 0 to 999. The average (500) was used as estimated AADT.

3. There are 34 road segments without reported surface type. Satellite images were analyzed to locate these road segments and determine whether they are paved or not.

4. There are seven road segments without reported shoulder type. Satellite images were analyzed to determine whether shoulders are stabilized or not.

VMT by Vehicle Class

The VMT by vehicle class input is used to allocate VMT to 16 specific vehicle types. These 16 vehicle types can be found in Table B.1 in MOBILE6 User's Guide[7]. As mentioned in Table 1, EPA expects states to develop local estimates[2]. HPMS database[1] lists the percentages of annual average daily traffic counts (AADT) of single unit truck (25 ~ 50 feet) and multi-unit truck (> 50 feet) for several road segments. All singe truck unit and multi-unit truck are considered heavy-duty vehicles. The remainder (< 25 feet) are considered light duty vehicles, including motorcycles and light duty trucks[8]. MOBILE6 Technical Guidance[2] describes the method to calculate the VMT fractions for each vehicle type. Assuming the percentage of heavy duty vehicles is x, and that of light duty vehicles is (1-x), the calculations are as follows:

VMT fraction of each light duty type = national default of VMT fraction for this type * (1-x) / national default of percentage of light duty vehicles

VMT fraction of each heavy duty type = national default of VMT fraction for this type * x / national default of percentage of heavy duty vehicles

The national default of VMT fraction for each vehicle type[2] can be found in Table 2.

HPMS database[1] does not provide the percentages of AADT of single unit truck and multi-truck unit for all the road segments. There area a total of 112 road segments are in the HPMS database[1] in the MNA. Only those segments on US-60 and SR-188 have the data to directly determine VMT fractions. Many of these segments share the same VMT fractions. There are two different sets of VMT fractions, one for US-60 and the other for SR-188. For US-60, the percentage of heavy-duty vehicles is 15 percent. For

SR-188, the percentage of heavy-duty vehicles is five percent. VMT by vehicle class (A or B) is used to denote these different sets of VMT fractions. For other road segments lacking reported data in the HPMS database, it is assumed that the percentage of heavy-duty vehicles is five percent, consistent with SR-188.

Table 2 - National Default VMT Fraction for Each Vehicle Type		
Vehicle type	**VMT fraction**	**Description**
LDV	0.4858	Light duty vehicles (passenger cars)
LDT1	0.0671	Light duty trucks 1
LDT2	0.2230	Light duty trucks 2
LDT3	0.0690	Light duty trucks 3
LDT4	0.0321	Light duty trucks 4
HDV2b	0.0383	Class 2b heavy duty vehicles
HDV3	0.0038	Class 3 heavy duty vehicles
HDV4	0.0029	Class 4 heavy duty vehicles
HDV5	0.0022	Class 5 heavy duty vehicles
HDV6	0.0083	Class 6 heavy duty vehicles
HDV7	0.0099	Class 7 heavy duty vehicles
HDV8a	0.0109	Class 8a heavy duty vehicles
HDV8b	0.0389	Class 8b heavy duty vehicles
HDBS	0.0019	School buses
HDBT	0.0009	Transit and urban buses
MC	0.0051	Motorcycles

MOBILE6 Cases and Emission Factors

As mentioned above, a total of 112 road segments in the MNA. Each segment was modeled separately in MOBILE6.

Only two cases should be run to generate emission factors; VMT-A (SR-188 and other roads) and VMT-B (US-60). The emission factor for each case is also shown in the following table.

Table 3 - MOBILE6 Cases and Emission Factors		
Case	Primary Emission Factor (grams/mile)	Total Emission Factor (grams/mile)
VMT-A	0.0453	0.1662
VMT-B	0.0798	0.2119

Calculation of Emissions from All Road Segments Reported by HPMS Database

For each segment, HPMS database[1] reports its AADT and length. Thus, the daily VMT of each segment can be calculated by the following equation:

Daily VMT = segment length * segment AADT

Then, the emissions from each segment is,

Daily PM_{10} emissions for each segment = Daily VMT * Emission factor

The total PM_{10} emissions from HPMS reported segments are the sum of emissions from all the segments in the MNA. The total of the primary PM_{10} emissions from HPMS reported road segments was calculated to be **7.05 tons per year (approximately 0.02 tons per day)**. The total of the PM_{10} emissions, including secondary emissions from HPMS reported road segments was calculated to be **19.70 tons per year (approximately 0.05 tons per day)**.

Calculation of Emissions from Road Segments not Reported by HPMS Database

After inspecting the HPMS database[1], it was discovered that some roads were not reported. The majority of those roads are local roads in residential areas.

In 2005, the estimated population of Gila County was 54,445[10] and the MNA population was 14,560[12]. The number of private vehicles in 2005 was 48,813[1]. The ratio of private vehicles to population is 0.897. On average, 897 out of 1,000 people own a vehicle.

It is assumed that each vehicle would travel four times per day an average 0.5 miles from local residential roads to adjacent major roads or from adjacent major roads to local residential roads. The VMT can be calculated by the following equation:

Daily VMT = 14,560 × 0.897 × 4 (trips/day) × 0.5 (mile/trip) = 26,121 miles

EPA's MOBILE6.2 model was run to generate the emissions factors. All the input parameters are the same as those listed in Table 1 except VMT by vehicle class. It is assumed that all the VMTs are generated by light duty vehicles.
The primary PM_{10} emissions factor is 0.0282 gram/mile and total PM_{10} emission factor is 0.1434 grams/miles.

The PM_{10} emissions from road segments not reported in HPMS database are:

26,121 (miles/day) × 0.1434 (gram/mile) × 365 (days/year) / 1,000,000 (grams/tons) = 1.37 tons/year.
The PM_{10} emissions from road segments not reported in the HPMS database was calculated to be **1.37 tons per year (approximately 0.004 tons per day)**.

Results

The results of the calculations are shown in Table 4.

Table 4 - Onroad PM_{10} Emissions on the Miami Nonattainment Area				
Source	**PM_{10} Emissions**		**Total PM_{10} Emissions**	
	Primary	**Secondary**	**(tons/year)**	**(tons/day)**
Emissions from road segments reported in HPMS database	7.05	12.65	19.70	**0.054**
Emissions from road segments not reported in HPMS database	0.27	1.10	1.37	**0.004**
TOTAL Emissions from all road segments	**7.32**	**13.75**	**21.07**	**0.058**

The total of the PM_{10} emissions from vehicles is **21.07 tons per year (0.058 tons per day)**.

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APPENDIX C.4
2005 Fugitive PM_{10} Emissions from On-road Mobile Sources for Miami Nonattainment Area

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to the paved roads and unpaved shoulders of paved roads due to vehicle traveling. They are usually calculated using the methodologies outlined in Chapter 13 of AP 42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Source[1,2]. The fugitive emissions must be calculated separately for paved and unpaved roads. The calculation for each category will be described next.

There is a field in HPMS (Highway Performance Monitoring System) database[3] that specifies the type of road surface, such as unpaved, low type, intermediate type, high type flexible etc. However, HPMS database[3] does not provide this information for all the road segments in the nonattainment area. There are 34 road segments that do not have this value specified. These road segments will be defined as local residential roads. Satellite images were utilized to determine whether the road was paved or unpaved before the calculations were performed.

Paved Road Fugitive Emissions:

HPMS Reported Roads

The equation[1] to calculate reentrained emissions on paved road is,

$$E = k\left(\frac{sL}{2}\right)^{0.65} \times \left(\frac{W}{3}\right)^{1.5} - C \qquad (1,$$

Where;

k = the particle size multiplier and is 7.3 grams/VMT[1].
sL = the road silt loading (g/m^2).
W = the average weight (tons) of the vehicles traveling on the roads
C = the emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear. Its value is 0.2119 grams/VMT[1].

The road segments in the nonattainment area are either arterials or collectors.

The baseline silt loading sL is assumed to be 0.3 g/m^2 based on a study MAG conducted in Salt River area in Phoenix[4].

The average weight W can be estimated by the vehicle mix traveling on the roads. HPMS[3] reports percentages of Annual average daily traffic (AADT) by single truck unit (25 ~ 50 feet) and multi truck

unit (>50 feet). Vehicles longer than 25 feet are considered as heavy-duty vehicles[3]. Based on this information, the split over light duty and heavy duty can be determined. It is then assumed that the average weight of light duty vehicles is 2 tons and that of heavy-duty vehicles is 10 tons. Thus: W = 2 tons × percentage of light duty vehicles + 10 tons × percentage of heavy-duty vehicles.

The HPMS database[3] does not provide the percentages of AADT of single truck unit and multi-truck unit for all the road segments. There are totally 112 road segments in the HPMS database[3] in the nonattainment Area. Only those segments on US-60 and SR-188 have the information to directly determine VMT fractions. For other road segments without this information reported in the HPMS database, it is assumed that the percentage of heavy-duty vehicles is 5percent, same as SR-188.

The emission factor should be adjusted based on precipitation,

$$E = \left[k\left(\frac{sL}{2}\right)^{0.65} \times \left(\frac{W}{3}\right)^{1.5} - C \right]\left(1 - \frac{P}{4N}\right) \qquad (2)$$

Where:

P = the number of wet days with at least 0.254 mm of precipitation during the average period, and
N = the number of days in the averaging period.

It was assumed that no control measures are implemented to reduce re-entrained road dust.

According to the measurements reported by NCDC (National Climatic Data Center)[5], in 2005, there were 33 days with precipitation over 0.254 mm. Thus, P is 33 and N is 365.

The emission from each road segment reported in HPMS database[3] was calculated and then aggregated into the total emissions.

The total of the PM_{10} emissions from paved HPMS reported roads is **127.00 tons per year (approximately 0.35 tons per day)**.

Non HPMS Reported Roads (local residential roads)

For the roads that were not reported in HPMS database[3], i.e. local residential roads, it was determined through the satellite images that majority of those roads were the local roads in the residential areas. The VMT generated on those roads were due to private vehicles traveling from residents to major roads or from major roads to residents. It was then assumed that each private vehicle would travel 4 times each day and 0.5 miles each time on those roads. Thus, the daily VMT generated by each vehicle is 2 miles.

In 2005, the estimated Gila County population was 54,445[6] and the nonattainment area population was 14,560[12]. The number of private vehicles in 2005 was 48,8138. The ratio of the number of private vehicles to population is 0.897. That means, out of 1000 people, 897 own a vehicle.

The vehicle miles traveled can be calculated by the following equation,

Daily VMT = 14,560 × 0.897 × 4 (trips/day) × 0.5 (mile/trip) = 26,121 miles

It was assumed that 99 percent of VMT was generated on paved local residential roads, thus the VMT on paved local residential roads was 25,860miles. The emission factor was calculated using equation (2), in which the silt loading was assumed to be 0.3 g/m^2 and the average weight of vehicles was assumed to be 2 tons. The emission factor then is 0.926 g/mile.

The total of the PM_{10} emissions from paved local residential roads is **8.74 tons per year (approximately 0.02 tons per day).**

Unpaved roads:

HPMS Reported Roads

The following equation calculates the emission factor in lb/VMT for vehicles traveling on publicly accessible roads,

$$E = \frac{k\left(\frac{s}{12}\right)^a\left(\frac{S}{30}\right)^d}{\left(\frac{M}{0.5}\right)^c} - C \qquad (4)$$

k = particle size multiplier and is 1.8 lb/VMT^2.

a, c and d are constants whose values are 1, 0.2 and 0.5[2].

C = the emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear and is 0.00047 lb/VMT^2.

s = the surface material silt content (%).

S = the mean vehicle speed in mph.
M = the surface material moisture content (%). It is assumed to be 0.64%[5].

The mean speed S was estimated for each road segment in the nonattainment area.

The silt content s was estimated based a study[6] conducted by Engineering Science in 1987. Eight values of silt content from bulk sample measurements on unpaved roads in Maricopa and Gila County are presented in Table 1. The silt content ranges from 0.104% to 15.2%. The average of 5.68% was used as the average silt content for the nonattainment area.

Table 1 - Unpaved Street Silt Content Measurement Results in Maricopa and Gila County			
Location	County	Type	Silt Content (%)
Apache, between 9th & 10th	Maricopa	Unpaved boulevard	2.9
Grand & McDowell	Maricopa	Dirt street	6.5
Avalon & 25th	Maricopa	Unpaved alley	15.2
3rd & Miller (residential)	Maricopa	Graveled alley	7.5
Lambert Lane, W. of La Canada	Gila	Dirt road	4.459
Kelting Drive	Gila	Gravel road	0.104
Panorama Road	Gila	Dirt road	4.363
El Moraga Drive	Gila	Dirt road	4.397

The equation above should also be adjusted based on precipitation,

$$E_{ext} = E\left(\frac{(365 - P)}{365}\right) \quad (5)$$

Where:
P = the number of days in a year with at least 0.254 mm of precipitation.

The emission from each unpaved road segment was calculated and then aggregated into the total emissions.

The total of the PM_{10} emissions from unpaved HPMS reported roads is **43.48 tons per year (approximately 0.12 tons per day)**.

Non HPMS Reported Roads (local residential roads)

The same method as paved roads was used to calculate fugitive emissions from those unpaved local residential roads that were not reported in HPMS database[3]. It was assumed that only 1percent of VMT (261 miles) was generated on unpaved local residential roads. The emission factor was calculated using equation (4), in which the speed is assumed to be 15 miles/hr. The emission factor then is 236.399 g/mile.

The total of the PM_{10} emissions from unpaved local residential roads is **22.52 tons per year (approximately 0.06 tons per day).**

Unpaved shoulders

Unpaved shoulders on paved roads were determined based on the information from HPMS database[3]. The database provides a field called "shoulder type". Many of the road segments are marked as "no shoulders or curbs". Satellite images were further utilized to identify what was the meaning of "no shoulders or curbs". Field trip was conducted to verify the observations from the satellite images. In conclusion, although many of the road segments are marked as "no shoulders or curbs", most of them have in fact unpaved shoulders and some of them have semi-stable shoulders although unpaved.

After all the road segments with unpaved and unstable shoulders were identified, the emissions for each segment were calculated using the following equation,

Emissions from unpaved shoulders (tons/year) = AADT × Length of Unpaved Shoulder × Emission $\text{Factor}_{\text{road shoulder}}$ (6)

The emission factor was extracted from a study by Moosmuller[6]. This study reported that high profile vehicles, traveling at 50 ~ 60 mph, had a PM_{10} emission factor of 12.88 ± 6.44 grams/VMT. The emission factor for the overall fleet is then 12.88 × percentage of high profile vehicle. It was assumed that high profile vehicles were heavy duty vehicles.

Therefore,

$\text{Emission Factor}_{\text{road shoulder}} = 12.88 \times$ percentage of heavy duty vehicles (7)

The percentage of heavy duty vehicles were determined based on HPMS database[3] as discussed in the section of Paved Roads.

The emission from each road segment was then calculated using equation (6) and aggregated to the total emissions.

The total of the PM_{10} emissions from all unpaved shoulders is **109.04 tons per year (approximately 0.30 tons per day)**.

Trackout

The emissions from trackout were documented in a separate document[11].

The total of the PM_{10} emissions from all trackout is **73.30 tons per year (approximately 0.20 tons per day)**.

Summary

The emissions for each category and total emissions are organized in Table 2.

Table 2 - 2005 Fugitive PM_{10} Emissions Inventory

Category		**Emissions**	
		(tons/year)	**(tons/day)**
Paved roads	HPMS reported roads	127.00	0.35
	Local residential roads	8.74	0.02
Unpaved roads	HPMS reported roads	43.48	0.12
	Local residential roads	22.52	0.06
Unpaved shoulders		109.04	0.30
Trackout		73.30	0.20
Total		**384.08**	**1.05**

References

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APPENDIX C.5
2005 PM_{10} Emissions from Trackout in the Miami Nonattainment Area

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May 2008

Identification of Trackout

Trackout was identified using satellite images. Observations by each township and range are organized as follows.

[T1N, R13E] There are no public roads.

[T1N, R14E] The major road is US-60. The categories and amount of trackout can be found in Table 1. The annual average daily traffic (AADT)[1] and VMT by vehicle class[2] are also shown in this table.

Table 1 - Trackout in T1N, R14E

Road	Trackout Category	VMT by Vehicle Class	AADT	Incidence of Trackout
US-60 Mackey Camp ~ Miami TB	Private	B	11673	3
US-60 Miami TB ~ M243 + 0.33	Private	B	11673	1

[T1N, R15E]

Table 2 - Trackout in T1N, R15E

Road	Trackout Category	VMT by Vehicle Class	AADT	Incidence of Trackout
Sullivan St Keystone ~ Miami	Commercial	A	512	2
US-60 US-60 Noncard ~ Mill	Industrial	B	20012	3
US-60 Mill ~ M246 + 0.94	Industrial	B	5992	4
US-60 M246 + 0.94 ~ SR-188	Industrial	B	20012	1
US-60 M248 + 0.54 ~ M249 + 0.11	Industrial	B	23347	1
US-60 Mesquite ~ Oak	Commercial	B	18354	1

Table 2 - Trackout in T1N, R15E				
Road	Trackout Category	VMT by Vehicle Class	AADT	Incidence of Trackout
Elwood Ave Reppy ~ Rose	Private	A	500	2
Forest Ave Rose ~ US-60	Private	A	500	2
Keystone Ave US-60 ~ Sullivan	Private	A	50	1
Adonis Ave Begin/End/Cul-de-sac ~ US-60	Private	A	2855	3
Latham Blvd Unknown Miami ~ US-60	Private	A	500	2
Loomis Ave Hardy ~ US-60	Private	A	500	1 2
Broadway US-60 ~ Rear Broadway	Industrial	A	500	1
Ragus Railroad ~ US-60	Commercial	A	2102	1
SR-188 Cypress ~ Phelps Dodge	Industrial	A	4291	1
SR-188 Phelps Dodge ~ M217 + 0.55	Industrial	A	718	1
SR-188 M218 + 0.42 ~ M218 + 0.80	Industrial	A	1339	1
Bixby Rd Pinal Creek ~ Pinal Creek + 1.49	Private Industrial	A	1250	4 1
Bixby Rd SR-188 ~ Pinal Creek	Industrial	A	1250	3
Pinaleno Pass Rd Escudilla ~ Unknown Globe	Private	A	500	2
Escudilla Dr. US-60 ~ Pinaleno Pass	Commercial	A	500	1
Golden Hill Rd US-60 ~ Thomas	Private Commercial	A	4837	1 1
Golden Hill Rd Thomas ~ Main	Private	A	1451	2
Main St Short ~ US-60	Commercial	A	4658	1
Thomas Rd Michigan ~ Golden Hill	Private	A	3413	2
Michigan Thomas ~ Russell	Private	A	3413	1
Russell Rd Roberts ~ Michigan	Private	A	994	1

Table 2 - Trackout in T1N, R15E				
Road	Trackout Category	VMT by Vehicle Class	AADT	Incidence of Trackout
Russell Rd Globe ~ Roberts	Commercial	A	994	1
Roberts Dr Russell ~ Main	Industrial	A	1989	1
Main St Roberts ~ Golden Hill	Private	A	1989	1
Jesse Hayes Rd Oil Circle ~ Ruiz Canyon	Industrial	A	5849	1
Jesse Hayes Rd Hagen ~ Oil Circle	Private	A	5849	2
Jesse Hayes Rd Beer Tree ~ Hagen	Industrial	A	5849	1
Highland Dr Carico ~ Noble	Private	A	1308	4
Yuma St Broad ~ High	Industrial	A	500	1
Copper Hill Rd High ~ High + 0.14	Industrial	A	500	2
Mesquite Broad ~ 3rd	Private	A	1171	1
Mesquite St 3rd ~ Josephine	Private	A	713	4
3rd St US-60 ~ Mesquite	Private	A	590	3
Maple St 3rd ~ 11th	Private Commercial	A	693	1 1

[T1S, R13E] There are no public roads.

[T1S, R14E]

Table 3 - Trackout in T1S, R14E				
Road	Trackout Category	VMT by Vehicle Class	AADT	Incidence of Trackout
US-60 M239 + 0.58 ~ M240 + 0.34	Private	B	5992	1

[T1S, R15E]

Table 4 - Trackout in T1S, R15E				
Road	Trackout Category	VMT by Vehicle Class	AADT	Incidence of Trackout
Icehouse Canyon Rd Tonto NF ~ Hagen	Private	A	2364	4
Six Shooter Canyon Rd Globe ~ Marlin	Private	A	3878	4

Emission Calculation

The calculation of PM_{10} emissions from trackout followed the procedures outlined in PM_{10} State Implementation Plan for the Salt River Area[3]. The emission factors were calculated using the equations from AP-42[4] shown as follows:

$$E = \left[k\left(\frac{sL}{2}\right)^{0.65} \times \left(\frac{W}{3}\right)^{1.5} - C \right]\left(1 - \frac{P}{4N}\right) \quad (1)$$

Where:

e= emissions factor in grams/VMT.

k = the particle size multiplier or PM_{10}, which is 7.3 grams/VMT[4].

sL = the road silt loading (g/m^2). sL for each trackout category was estimated based on the study[3] conducted for Salt River SIP in 2005.

W = the average weight (tons) of the vehicles traveling on the roads.

C = the emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear. Its value is 0.2119 grams/VMT[4]

P = the number of wet days with at least 0.254 mm of precipitation during the average period, and

N = the number of days in the averaging period.

The average weight W can be estimated by the vehicle mix traveling on the roads. HPMS reports the percentages of AADT (annual average daily traffic) by single unit truck (25 ~ 50 feet) and multi-unit truck (>50 feet). Vehicles longer than 25 feet are considered as heavy-duty vehicles[1]. Based on this information, the split between light duty and heavy duty can be determined. It is then assumed that the average weight of light duty vehicles is two tons and that of heavy-duty vehicles is 10 tons calculated as follows:

W = 2 tons × percentage of light duty vehicles + 10 tons × percentage of heavy duty vehicles

For the average weight W the HPMS database does not provide the percentages of AADT of single unit truck and multi-unit truck for all the road segments. There are a total of 112 road segments reported in the HPMS in the MNA. Only those segments on US-60 and SR-188 have the information to directly determine VMT fractions. Many of these segments share the same VMT fractions. There are two different sets of VMT fractions, one for US-60 and the other for SR-188. For US-60, the percentage of heavy-duty vehicles is 15 percent. For SR-188, the percentage of heavy-duty vehicles is five percent. VMT by vehicle class, A or B, is used to denote these different sets of VMT fractions. For other road segments without this reported data in the HPMS database, it is assumed that the percentage of heavy-duty vehicles is five percent, consistent with SR-188.

According to the measurements reported by NCDC (National Climatic Data Center)[5], in 2005, there were 33 days with precipitation in the MNA over 0.254 mm. Thus, P = 33 and N = 365.

The emissions from trackout for each road segment were then calculated by equation (2). Table 5[3] shows the trackout distance and silt loading for each trackout category.

Table 5. Trackout Distance and Silt Loading for Each Trackout Category

Trackout Category	Distance (m)	Silt Loading (g/m^2)
Agricultural	100	1.90
Construction	200	1.67
Industrial	200	3.06
Private	50	0.75
Commercial	50	1.08

PM_{10} Emissions (tons/yr) = PM_{10} Emission Factor × AADT × Trackout Distance × Incidence of Trackout × 0.000621371 mi/m × 366 days/yr × 1ton/1,000,000 grams (2)

Total PM_{10} emissions are the sum of emissions from all road segments, which were calculated to be 73.295 tons/yr.

The total of the PM_{10} emissions from all trackout is **73.295 tons per year (approximately 0.20 tons per day)**.

References

1. Arizona Department of Transportation, HPMS database, 2005.
2. Appendix C.3, 2005 On-Road Mobile Source PM_{10} Emissions Inventory for Miami Non-Attainment Area, 2008.
3. Arizona Department of Environmental Quality, Revised PM_{10} State Implementation Plan for the Salt River Area, Technical Support Document, June 2005.
4. US EPA, AP-42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Source, Chapter 13.2.1, November 2006.
5. National Climatic Data Center, Annual Climatological Summary, Miami, Arizona, 2005.

APPENDIX C.6
2005 Non-Road Mobile Source PM_{10} Emissions Inventory for Miami Nonattainment Area

Assessment Staff
Air Quality Division, Arizona Department of Environmental Quality
May 2008

NONROAD Model Input Data

Fuel Reid Vapor Pressure: 8.789 psi (average from 2005 Gila County fuel survey[1]).
Oxygen content: 0%.
Average temperature: 63.6°F[2].
Min/Max temperature: 50.6/76.6°F (average for the whole year[2]).
Gasoline/diesel sulfur: 68.75/293.8 ppm (average from 2005 Gila County fuel survey[1]).
Compressed Natural Gas/Liquid Natural Gas sulfur: 30ppm (EPA NONROAD model default; WRAPMSEI2 2002 inputs).
Off-road diesel sulfur percent: same as on-road diesel (Arizona Department of Weights and Measures mentioned that in most of the state, off-road diesel is the same as on-road diesel with red dye added[2]).
Marine diesel sulfur: zero.
Stage II control percent: zero.

Lawn & Garden

EPA's NONROAD model was used to estimate the PM_{10} emissions from this category for Gila County 2005. The total emissions were estimated to be 1.58 tons/year. The total emissions for Gila County w then allocated to the Miami Nonattainment Area (MNA) using population ratios.

ADEQ staff estimated the 2005 population of the MNA at 14,560[4]. Arizona Department Security estimated that the total population of Gila County in 2005 was 54,445[5].

PM_{10} emissions (lawn & garden) = PM_{10} emissions in Gila County (lawn & garden) × population in the MNA / Gila County population = 1.58 (tons/year) × 14,560 / 54,445 = 0.423 tons/year. The total of the PM_{10} emissions from lawn and garden activities is **0.423 tons per year (approximately 0.001 tons per day)**.

Industrial

EPA's NONROAD model was used to estimate the PM_{10} emissions from this category for Gila County in 2005. The total emissions were estimated to be 1.50 tons per year. The total emissions for Gila County were then allocated to the MNA using population ratios.

PM_{10} emissions (industrial) = PM_{10} emissions in Gila County (industrial) × population in the MNA / Gila County population = 1.50 (tons/year) × 14,560 / 54,445 = 0.401 tons/year**.** The total of the PM_{10} emissions from industrial activities **is 0.401 tons per year (approximately 0.001 tons per day)**.

Aircraft and Airport Service

No airport is in the MNA.

Locomotive and Railway Maintenance

No railroad is in the MNA.

Agricultural

No agriculture is in the MNA.

Recreational

EPA's NONROAD model was used to estimate PM_{10} emissions from this category for Gila County. The total emissions from Recreational Equipment were estimated to be 35.09 tons/year. Table 1 shows the emissions from different types of recreational equipment.

Table 1 – Gila County PM_{10} Emissions From Recreational Equipment

Recreational Equipment	PM_{10} Emissions (tons/year) Gila County	PM_{10} Emissions (tons/year) MNA
Motorcycles: off-road	2.95	See Text
ATVs	4.01	See Text
Specialty vehicles/carts	0.18	See Text
Recreational vehicles subtotal	7.14	0.893
Golf carts	0.03	0.010
Snowmobiles	27.92	0
Recreational vehicles total	35.09	0.903
Pleasure craft	15.32	0
Total Recreational Equipment	50.41	0.903

The emissions for Gila County for each type of equipment were then allocated to the MNA according to allocation surrogates shown below:

There is one recreational vehicle park in the MNA, Gila County RV Park and Batting Range. NONROAD model reports eight parks in Gila County for 2002. There is one golf course in the MNA. NONROAD model reports three golf courses in Gila County. The navigable water surface area in the MNA is observed to be zero. No snowmobiles are observed in the MNA.

PM_{10} emissions (off-road motorcycle, ATVs and specialty vehicles/carts) = PM_{10} emissions in Gila County (off-road motorcycle, ATVs and specialty vehicles/carts) × number of recreational vehicle parks in the MNA / number of recreational vehicle park establishments in Gila County = 7.14 / 8 = 0.893 tons/year. The total of the PM_{10} emissions from off-road motorcycle, ATVs and specialty vehicles/carts activities is **0.893 tons per year (approximately 0.002 tons per day)**.

PM_{10} emissions (golf carts) = PM_{10} emissions in Gila County (golf carts) × number of golf course in the MNA / number of golf courses in Gila County = 0.03 / 3 = 0.01 tons/year. The total of the PM_{10} emissions from golf cart activities **is 0.01 tons/year.**

The grand total PM_{10} emissions from recreational equipment are **0.903 tons per year (approximately 0.002 tons per day)**.

Commercial

EPA's NONROAD model was used to estimate PM_{10} emissions from this category for Gila County. The total emissions were estimated to be 0.75 tons/year. The total emissions for Gila County were then allocated to the MNA using population ratios.

PM_{10} emissions (commercial) = PM_{10} emissions in Gila County (commercial) × population in the MNA / Gila County population = 0.75 (tons/year) × 14,560 / 54,445 = 0.201 tons/year. The total of the PM_{10} emissions from commercial facilities is **0.201 tons per year (approximately 0.0006 tons per day)**.

Construction and Mining Equipment

EPA's NONROAD model was used to estimate PM_{10} emissions from this category for Gila County. The total emissions were estimated to be 15.46 tons/year. The total emissions for Gila County were then allocated to the MNA using population ratios.

PM_{10} emissions (construction) = PM_{10} emissions in Gila County (construction) × population in the MNA / Gila County populations = 15.46 (tons/year) × 14,560 / 54,445 = 4.134 tons/year. PM_{10} emissions from Construction and Mining Equipment total **4.134 tons per year (approximately 0.011 tons per day)**.

Logging

EPA's NONROAD model was used to estimate PM_{10} emissions from this category for Gila County. The total emissions were estimated to be 0.11 tons/year. The total emissions for Gila County are then allocated to the MNA using populations.

PM_{10} emissions (logging) = PM_{10} emissions in Gila County (logging) × population in the MNA / Gila County populations = 0.11 (tons/year) × 14,560 / 54,445 = 0.029 tons/year. The total of the PM_{10} emissions from logging operations is **0.029 tons/year.**

Summary

The emissions from each nonroad category and total nonroad emissions are summarized in Appendix C.2.

References

1. Arizona Department of Weights and Measures; 2005 Gila County Fuel Inspection Report. 2005.
2. National Oceanic and Atmospheric Administration and National Climactic Data Center; Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1971 – 2000.
3. Arizona Department of Weights and Measures; Personal Communications. 2007.
4. Population Statistics Unit, Research Administration, Arizona Department of Economic Security, 2005 Population in MNA, April 2008.
5. Arizona Department of Economic Security; July 1, 2005 Population Estimates for Arizona's Counties, Incorporated Places and Balance of County, February 2006.

APPENDIX D

Public Process Documentation

D.1. Public Notice and Affidavit
D.2. Public Hearing Agenda
D.3. Public Hearing Sign-in Sheet
D.4. Public Hearing Presiding Officer Certification
D.5. Public Hearing Transcripts
D.6. Public Comments and Responsiveness Summary

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APPENDIX D.1.

Public Notice and Affidavit

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APPENDIX D.2.

Public Hearing Agenda

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APPENDIX D.3.

Public Hearing Sign-in Sheet

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APPENDIX D.4.

Public Hearing Presiding Officer Certification

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APPENDIX D.5.

Public Hearing Transcripts

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APPENDIX D.6.

Public Comments and Responsiveness Summary

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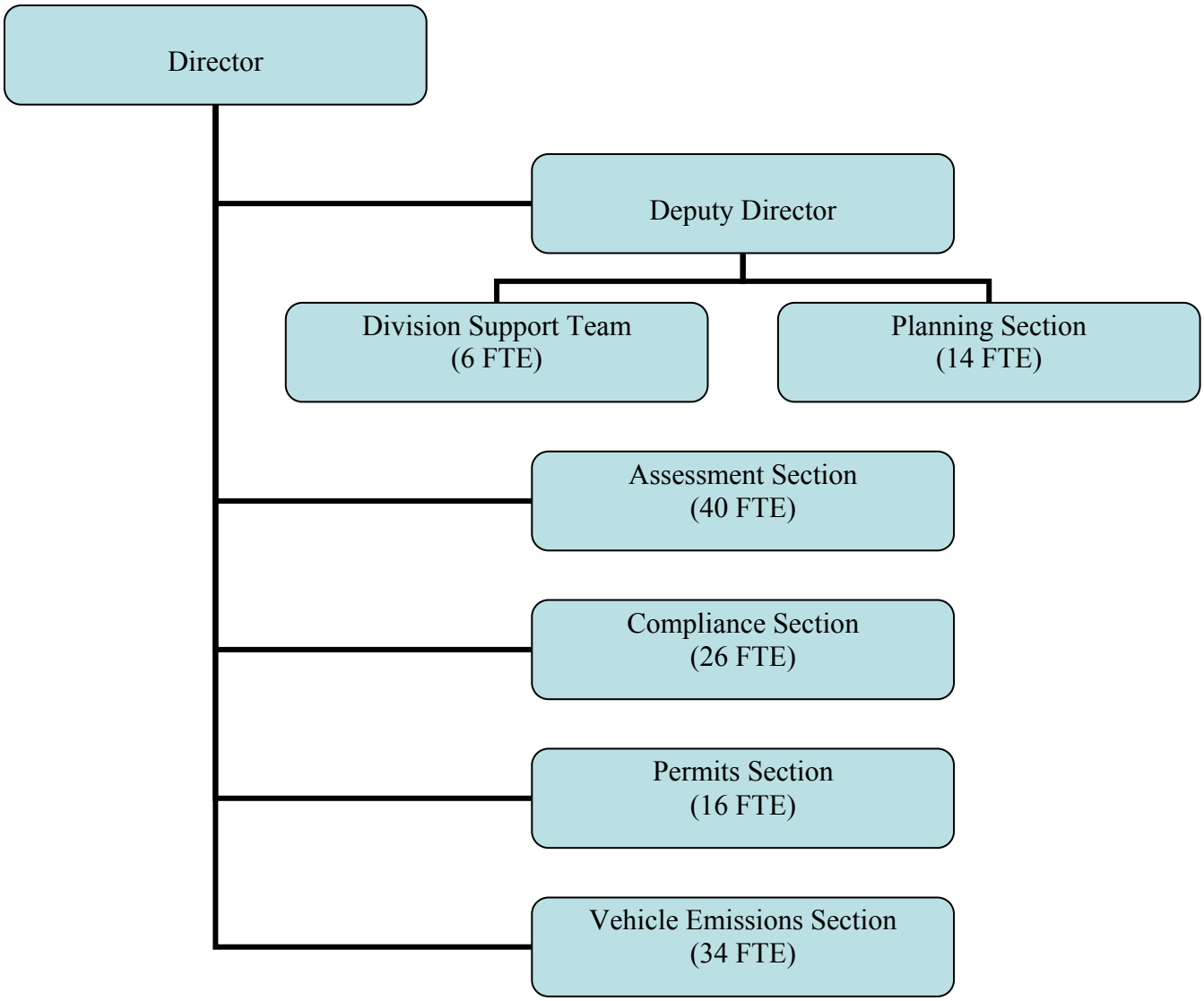
Appendix E – Organizational Chart
Arizona Department of Environmental Quality – Air Quality Division



FTE = Full Time Employees

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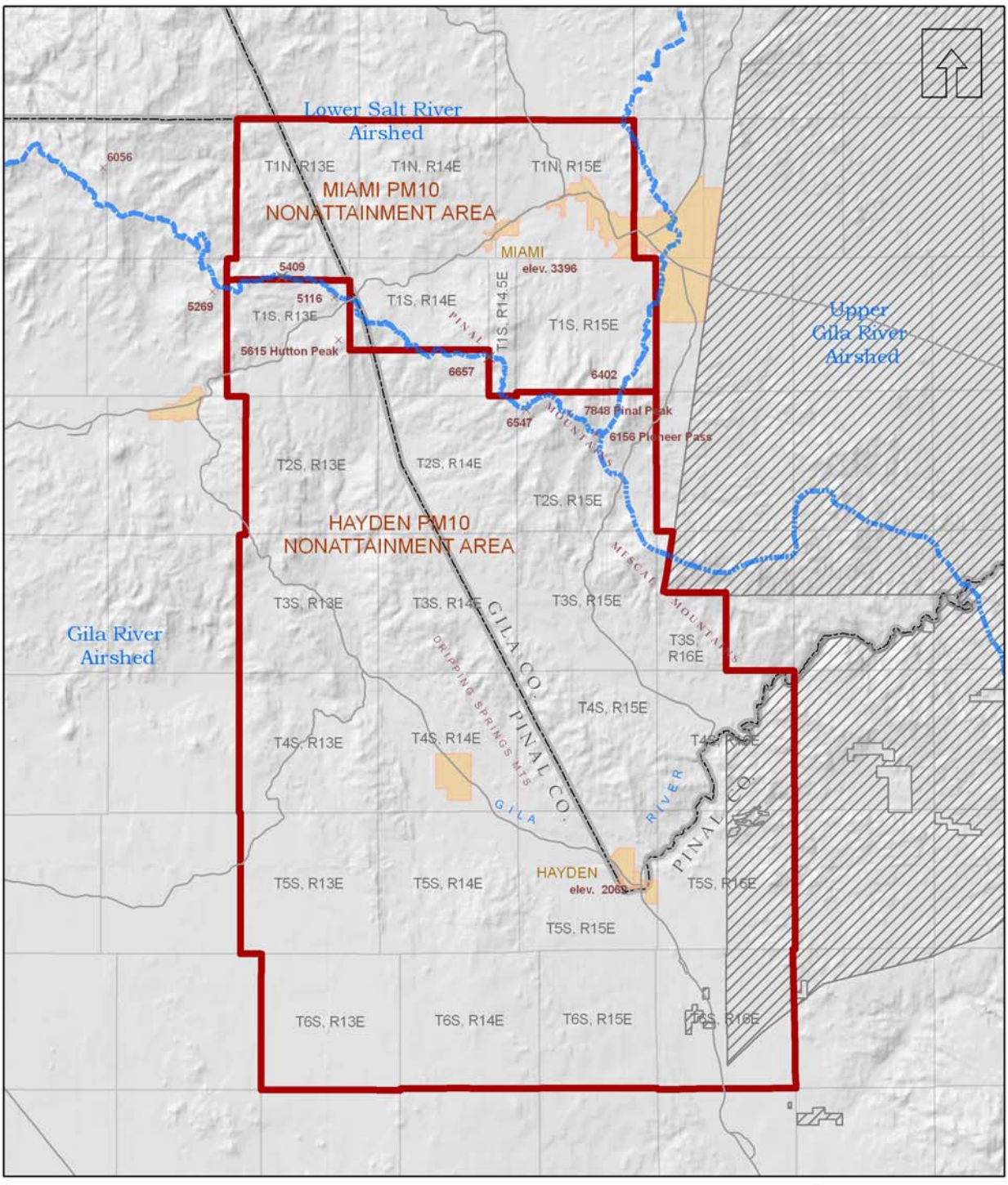
Appendix F
Map of Hayden and Miami PM10 Nonattainment Areas



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