

Chapter 5

Best Available Control Measures and Most Stringent Measures

2015 Plan for the 1997 PM_{2.5} Standard
SJVUAPCD

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Chapter 5: Best Available Control Measures and Most Stringent Measures

The best available control measures (BACM) and most stringent measures (MSM) analyses conducted for this *2015 Plan for the 1997 PM2.5 Standard (2015 PM2.5 Plan)* are the first such analyses performed for PM2.5 and its precursors in the nation. Maricopa County in Arizona is the only other area that has conducted BACM and MSM demonstrations to comply with federal Clean Air Act (CAA) Title 1, Part D Subpart 4 (Subpart 4) requirements as a Serious PM10 nonattainment area.

PM2.5 and its precursors are already being extensively controlled in the San Joaquin Valley (Valley); every feasible opportunity identified to reduce these emissions is already being implemented as soon as practicable. While the District already implements the most stringent control program in the nation through its existing planning and regulatory efforts, this plan leaves no stone unturned in evaluating additional emissions reductions opportunities that might qualify as BACM and MSM.

5.1 BACM DEFINED

As discussed in Chapter 1 of this *2015 Plan for the 1997 PM2.5 Standard (2015 PM2.5 Plan)*, one of the requirements for a Serious nonattainment area attainment plan under CAA Subpart 4 is to demonstrate, “Provisions to assure that the best available control measures (BACM), including best available control technology (BACT) for stationary sources, for the control of direct PM2.5 and PM2.5 precursors shall be implemented no later than four years after the area is reclassified.”¹ As such, this *2015 PM2.5 Plan* demonstrates that the District’s regulatory control measures satisfy the U.S. Environmental Protection Agency (EPA) BACM requirements.

EPA defines a BACM-level of control as:

- The maximum degree of emissions reductions achievable from a source or source category, which is determined on a case-by-case basis considering energy, economic and environmental impacts.²
- More stringent than reasonably available control measure (RACM) standards, but less stringent than the lowest achievable emission rate (LAER), which doesn’t take into consideration the cost effectiveness of implementing a particular control measure.³
- Additive to RACM, as BACM will generally consist of a more extensive implementation of RACM measures (i.e. paving more unpaved roads, strengthening components of a smoke management system (SMS) program, etc.)⁴

¹ Clean Air Act Subpart 4 Section 189(b)(1)(B).

² Environmental Protection Agency (EPA). 1994 Addendum to the General Preamble, p. 42010.

³ EPA. 1994 Addendum to the General Preamble, p. 42010.

⁴ EPA. 1994 Addendum to the General Preamble, p. 42013.

- Inclusive of BACT. EPA defines BACT similarly to BACM as an emission limitation based on the, "maximum degree of reduction of each pollutant emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems, and techniques." BACT is also at least as stringent as new source performance standards (NSPS) and national emissions standards for hazardous air pollutants (NESHAPs).⁵

BACM must be implemented within 4 years after an area is reclassified as Serious nonattainment, with the exception of source categories that EPA has determined do not contribute significantly to exceedances of the federal PM_{2.5} standards.⁶

5.2 MSM DEFINED

As a Serious nonattainment area, the Valley would have until December 31, 2015 to attain the 1997 PM_{2.5} air quality standards. As demonstrated in Chapter 4 and Appendix A of this *2015 PM_{2.5} Plan*, the Valley will not attain the standard by December 31, 2015; as such, the District is requesting an extension of the attainment date with this *2015 PM_{2.5} Plan*. Pursuant to CAA Subpart 4, EPA may grant one extension of the attainment date of up to five years for a Serious nonattainment area, provided certain criteria are met. One of those criteria requires the District to, "*Demonstrate to the satisfaction of the Administrator that the plan for the area includes the most stringent measures (MSM) that are included in the implementation plan of any State, or are achieved in practice in any State, and can feasibly be implemented in the area.*"⁷ EPA further clarifies that, similarly to BACM, the definition of a MSM is the maximum degree of emission reduction that has been required or achieved from a source or source category in other SIPs or in practice in other states and can be feasibly implemented in the area.⁸ Unlike BACM, the CAA does not specify an implementation deadline for MSM; EPA states that all MSM should be implemented as expeditiously as practicable.⁹

5.3 BACM/MSM EVALUATION PROCESS

As previously discussed, the Maricopa County PM₁₀ Serious nonattainment area is the only other area in the nation that has conducted a BACM and MSM analysis to comply with Subpart 4 requirements. Within EPA's Technical Support Document (TSD) for

⁵ EPA. 1994 Addendum to the General Preamble, p. 42009.

⁶ EPA. Proposed Approval and Promulgation of Implementation Plans; Arizona—Maricopa County PM-10 Nonattainment Area; Serious Area Plan for Attainment of the 24-Hour PM-10 Standard and Contingency Measures. 66 FR 50255.

⁷ Clean Air Act Subpart 4 Section 189(b)(1)(B).

⁸ EPA TSD for Maricopa County PM₁₀ Nonattainment Area. 2001, p. 31.

⁹ EPA TSD for Maricopa County PM₁₀ Nonattainment Area. 2001, p. 237.

evaluation of the Maricopa County Serious Area Nonattainment Plan,¹⁰ EPA defined the processes for evaluating whether an attainment plan satisfies BACM and/or MSM requirements. Recognizing the similarity between the BACM and MSM requirements, EPA defines the MSM evaluation process as the same as the BACM evaluation process, but with one additional step, to compare the potential MSM against the measures already adopted in the area to determine if the existing measures are most stringent. The process is as follows:¹¹

1. Develop a detailed emissions inventory of PM_{2.5} sources and source categories (Appendix B).
2. Model to evaluate the impact of various source categories on PM_{2.5} concentrations over the air quality standard to determine which sources are significant and which sources are de minimis (less than significant) for the purposes of adopting BACM and MSM.

More source categories should be subject to the MSM analysis than those subject to a BACM analysis by lowering the threshold for what is considered a de minimis source category.¹² What constitutes a de minimis source category for BACM is dependent upon the specific facts of the nonattainment problem under consideration. According to EPA, one means of determining an appropriate de minimis level is to determine if applying MSM to the proposed de minimis source categories would meaningfully expedite attainment. If it does, then the established de minimis level is too high, and if it does not, then the de minimis level is appropriate.

Section 5.4 presents the calculations for determining the de minimis thresholds for sources of PM_{2.5}, NO_x, and SO_x emissions.

3. Identify potential BACM and MSM in other implementation plans or used in practice in other states for each significant source category, and for each measure evaluate the technological and economic feasibility for the area, as necessary (Appendix C).
 - a. **Technological feasibility**¹³ – This analysis determines if the new control can be integrated with the existing controls without reducing or delaying the emission reductions from the existing control. If it cannot, then it would not be considered to be technologically feasible for the area unless the emission benefit of the new measure is substantially greater than the existing measure.

¹⁰ EPA. Technical Support Document (Notice of Proposed Rulemaking on the Serious Area PM-10 State Implementation Plan for the Maricopa County PM-10 Nonattainment Area Provisions for Attaining the 24-Hour Standard and Contingency Measures). (2001, September 14).

¹¹ EPA Technical Support Document for Maricopa County PM₁₀ Nonattainment Area. 2001, pp. 237-238

¹² EPA. Technical Support Document (Notice of Proposed Rulemaking on the Serious Area PM-10 State Implementation Plan for the Maricopa County PM-10 Nonattainment Area Provisions for Attaining the 24-Hour Standard and Contingency Measures). (2001, September 14).

¹³ EPA. Technical Support Document for Maricopa County PM₁₀ Nonattainment Area. 2001, p. 34.

- b. **Economic feasibility**¹⁴ – If the potential control is determined to be technologically feasible, it is then evaluated for economic feasibility.

The District has evaluated the economic feasibility of various control measures by conducting cost effectiveness analyses within Appendix C of this *2015 PM2.5 Plan*. A cost effectiveness analysis examines the added cost, in dollars per year, of the control technology or technique, divided by the emissions reductions achieved, in tons per year. Within the Maricopa County TSD, EPA cautions that they have not established a general guide for evaluating when a measure is economically infeasible, but will instead address the issue on a case-by-case basis as needed.

4. Compare potential BACM/MSM for each significant source category against the control measures, if any, already adopted for that source category (Appendix C).
5. Provide for the adoption of any BACM/MSM that is more stringent than existing similar local measures and provide for implementation as expeditiously as practicable or, in lieu of adoption, provide a reasoned justification for rejecting the potential MSM, i.e., why such measures cannot be feasibly implemented in the area (Appendix C).

Using the EPA defined BACM/MSM process above, emission control requirements for stationary and area source categories were evaluated in Appendix C to determine if they satisfy both BACM and MSM requirements or if there are any technologically and economically feasible technologies or practices that could further reduce PM2.5 and precursor emissions for sources in the Valley.

5.4 DE MINIMIS THRESHOLD FOR DETERMINING SIGNIFICANT SOURCE CATEGORIES

As described in the previous section, BACM and MSM are required for all categories of sources in Serious nonattainment areas unless the State adequately demonstrates that a particular source category does not contribute significantly to nonattainment of the PM2.5 NAAQS. Using modeling data from this *2015 PM2.5 Plan*, the calculations below were used to quantify the impact of various source categories on PM2.5 concentrations over the federal air quality standards to determine which sources are significant and which sources are de minimis for the purposes of adopting BACM and MSM. The sections below outline the significance determination approach used and summarize which source categories are considered significant based on the de minimis thresholds.

¹⁴ EPA. Technical Support Document for Maricopa County PM10 Nonattainment Area. 2001, p. 34.

5.4.1 Significance Determination Approach

5.4.1.1 U.S. EPA Guidance

For PM_{2.5} implementation, EPA has directed states to follow guidance that was used to implement the PM₁₀ standard. For the PM₁₀ standard, guidance specifies that sources are considered significant and are required to have BACM and MSM controls if they contribute 1 µg/m³ PM₁₀ out of an annual PM₁₀ standard of 50 µg/m³. Applying this guidance to PM_{2.5}, the PM₁₀ significance ratio is applied to the annual PM_{2.5} standard to estimate the level considered significant requiring BACM and MSM controls.

$$1 \mu\text{g}/\text{m}^3 / 50 \mu\text{g}/\text{m}^3 = X \mu\text{g}/\text{m}^3 / 15 \mu\text{g}/\text{m}^3$$

$$X = 0.3 \mu\text{g}/\text{m}^3$$

PM_{2.5} is very complex with many species and associated emissions contributing to its formation. A first step is to determine whether an individual species is significant. If a species is determined to be significant, then a de minimis threshold needs to be established for the pollutant.

5.4.1.2 Significant Species

Available speciation data collected from 2011 through 2013 was used to determine which PM_{2.5} species are significant. In the Valley, four speciation sites are operated, one each in Bakersfield, Visalia, Fresno and Modesto. The composition for each site was applied to the highest design value in the area related to that speciation site. The highest concentration from all the sites was used to establish the significance level. As shown in Table 5-1, all species are considered significant in relationship to the 0.3 µg/m³ threshold established above.

Table 5-1 PM_{2.5} Significance Thresholds (µg/m³)

	Bakersfield	Visalia	Clovis	Modesto	Significant level
2013 DV	17.3	16.6	16.4	13.3	n/a
Ammonium Nitrate	7.1	7.6	6.4	5.0	7.6
Ammonium Sulfate	2.4	2.1	1.9	1.6	2.4
Organic Carbon	4.1	4.7	5.5	4.5	5.5
Elemental Carbon	1.0	0.7	1.1	0.8	1.1
Dust	2.4	1.1	1.1	0.8	2.4
Elements	0.4	0.4	0.4	0.6	0.6

The next step is to establish a significant emission level for each pollutant associated with the species using the 2012 baseline emission inventory. Any source that exceeds the significance emission level is assumed to contribute $0.3 \mu\text{g}/\text{m}^3$ of $\text{PM}_{2.5}$ and would need to be evaluated for BACM and MSM controls. The equation to establish the significant emission level is as follows:

$$\text{Significant emissions level} = (0.3 \mu\text{g}/\text{m}^3 / \text{significant level in } \mu\text{g}/\text{m}^3) \times \text{Basin-wide 2012 emissions}$$

The above $\text{PM}_{2.5}$ species will be correlated to the following emission inventory categories:

- 5% of organic carbon (OC) will be considered secondary organic aerosols-volatile organic carbon (VOC) emissions
- Am Sulfate- SO_x and ammonia emissions
- Am Nitrate- NO_x and ammonia emissions
- Dust-directly emitted $\text{PM}_{2.5}$ from dust sources
- Elemental Carbon (EC) + OC & elements-directly emitted $\text{PM}_{2.5}$ combustion emissions

Sulfur Oxide (SO_x) Emissions

SO_x emissions contribute to the formation of ammonium sulfate. Per the equation below, the amount of emissions that cause at least a $0.3 \mu\text{g}/\text{m}^3$ impact on air quality for SO_x is 1.0 tpd.

$$\begin{aligned} \text{Significant } \text{SO}_x \text{ emissions level} &= (0.3 \mu\text{g}/\text{m}^3 / 2.4 \mu\text{g}/\text{m}^3) \times 8.1 \text{ tpd } \text{SO}_x \\ &= \underline{1.0 \text{ tpd } \text{SO}_x} \end{aligned}$$

Nitrogen Oxide (NO_x) Emissions

NO_x emissions contribute to the formation of ammonium nitrate. Per the equation below, the amount of emissions that cause at least a $0.3 \mu\text{g}/\text{m}^3$ impact on air quality for NO_x is 13.1 tpd.

$$\begin{aligned} \text{Significant } \text{NO}_x \text{ emissions level} &= (0.3 \mu\text{g}/\text{m}^3 / 7.6 \mu\text{g}/\text{m}^3) \times 332 \text{ tpd } \text{NO}_x \\ &= \underline{13.1 \text{ tpd } \text{NO}_x} \end{aligned}$$

$\text{PM}_{2.5}$ Emissions

$\text{PM}_{2.5}$ emissions contribute to the remaining species, dust, OC, EC, and element species. It is appropriate to separate the dust and combustion emissions. Per the equation below, the amount of emissions that cause at least a $0.3 \mu\text{g}/\text{m}^3$ impact on air quality for $\text{PM}_{2.5}$ dust is 4.0 tpd $\text{PM}_{2.5}$ dust emissions. Also, per the equation below, the amount of emissions that cause at least a $0.3 \mu\text{g}/\text{m}^3$ impact on air quality for $\text{PM}_{2.5}$ combustion is 1.4 tpd $\text{PM}_{2.5}$ combustion emissions.

$$\begin{aligned} \text{Significant PM}_{2.5} \text{ dust level} &= (0.3 \mu\text{g}/\text{m}^3 / 2.4 \mu\text{g}/\text{m}^3) \times 32.3 \text{ tpd PM}_{2.5} \text{ dust} \\ &= \underline{4.0 \text{ tpd PM}_{2.5} \text{ dust emissions}} \end{aligned}$$

$$\begin{aligned} \text{Significant PM}_{2.5} \text{ combustion level} &= (0.3 \mu\text{g}/\text{m}^3 / 7.2 \mu\text{g}/\text{m}^3) \times 33.7 \text{ tpd PM}_{2.5} \\ &\quad \text{combustion emissions} \\ &= \underline{1.4 \text{ tpd PM}_{2.5} \text{ combustion emissions}} \end{aligned}$$

5.4.2 De Minimis Thresholds

Table 5-2 below demonstrates which source categories in the Valley are above and which source categories in the Valley are below de minimis based on the de minimis thresholds calculated above and the emissions inventories presented in Appendix B. There are only six source categories that exceed the de minimis thresholds for PM_{2.5}, NO_x, or SO_x emissions in the Valley. The CAA does not require a control measure evaluation for the remaining de minimis source categories for the purpose of satisfying BACM/MSM requirements. However, within Appendix C of this *2015 PM_{2.5} Plan*, the District has still conducted full control measure evaluations for all of the rules and source categories listed in Table 5-2.

Table 5-2 Valley Source Category De Minimis Determinations (using 2012 data)

Source Category	Rule Number (if any)	Emissions of Qualifying Pollutant(s) (tpd)			Above de minimis?
		PM _{2.5}	NO _x	SO _x	
Open Burning	4103	2.27	1.61	0.05	Yes
Reduction of Animal Matter	4104	0.03	0.00	0.00	No
Prescribed Burning and Hazard Reduction Burning	4106	0.76	0.07	0.03	No
Particulate Matter Emissions from the Incineration of Combustible Refuse	4203	0.00	0.00	0.00	No
Cotton Gins	4204	0.22	0.00	0.00	No
Fuel Burning Equipment	4301	N/A	N/A	N/A	N/A
Boilers, Steam Generators, and Process Heaters Greater than 5.0 MMBtu/hr	4306/4320	1.27	1.93	0.60	No
Boilers, Steam Generators, and Process Heaters—2.0 to 5.0 MMBtu/hr	4307	0.32	0.49	0.15	No
Boilers, Steam Generators, and Process Heaters—0.075 to less than 2.0 MMBtu/hr	4308	0.61	0.92	0.28	No
Dryers, Dehydrators, and Ovens	4309	0.85	0.20	0.47	No
Flares	4311	0.16	0.56	0.33	No
Lime Kilns	4313	0.00	0.00	0.00	No
Solid Fuel Fired Boilers, Steam Generators, and Process Heaters	4352	0.62	2.69	0.56	No
Glass Melting Furnaces	4354	0.33	6.04	1.96	Yes
Conservation Management Practices	4550				Yes

Source Category	Rule Number (if any)	Emissions of Qualifying Pollutant(s) (tpd)			Above de minimis?
		PM2.5	NOx	SOx	
<ul style="list-style-type: none"> • <i>Tilling Dust</i> • <i>Harvest Operations Dust</i> • <i>Dust from Ag Lands (non-pasture)</i> • <i>Dust from Pasture Lands</i> 		5.17	0.00	0.00	
		7.28	0.00	0.00	
		6.15	0.00	0.00	
		1.09	0.00	0.00	
Commercial Charbroiling	4692	2.84	0.00	0.00	Yes
Internal Combustion Engines	4702	0.49	13.06	0.12	No
Stationary Gas Turbines	4703	1.22	3.09	0.22	No
Sulfuric Acid Mist	4802	0.00	0.00	0.75	No
Wood Burning Fireplaces and Wood Burning Heaters	4901	4.48	0.50	0.08	Yes
Residential Water Heaters	4902	0.21	2.21	0.06	No
Natural Gas-Fired, Fan-Type Central Furnaces	4905	0.20	2.46	0.06	No
General Requirements	8011	N/A	N/A	N/A	N/A
Construction, Demolition, Excavation, Extraction, and Other Earthmoving Activities	8021	1.46	0.00	0.00	No
Bulk Materials	8031	0.04	0.00	0.00	No
Carryout and Trackout¹⁵	8041	N/A	N/A	N/A	N/A
Open Areas	8051	0.34	0.00	0.00	No
Paved and Unpaved Roads	8061	7.59	0.00	0.00	Yes
Unpaved Vehicle/Equipment Traffic Areas	8071	0.59	0.00	0.00	No
Agricultural Sources	8081	1.21	0.00	0.00	No
Lawn and Garden Equipment	SC 001	0.04	0.58	0.00	No
Energy Efficiency	SC 002	N/A	N/A	N/A	N/A
Fireworks	SC 003	N/A	N/A	N/A	N/A
Sand and Gravel Operations	SC 004	0.09	0.00	0.00	No
Asphalt/Concrete Operations (Mineral Processes)	SC 005	0.82	0.20	0.36	No
Almond Hulling/Shelling Operations	SC 006	0.38	0.00	0.00	No
Pistachio Hulling/Shelling Operations¹⁶	SC 007	N/A	N/A	N/A	N/A
Agricultural Material Screening/Shaking Operations¹⁷	SC 008	N/A	N/A	N/A	N/A
Tub Grinding¹⁸	SC 009	N/A	N/A	N/A	N/A
Abrasive Blasting	SC 010	0.33	0.00	0.00	No

¹⁵ Emissions from Rule 8041 are included in Rule 8061 (Paved and Unpaved Roads).

¹⁶ The emissions inventory for SC 007 (Pistachio Hulling/Shelling Operations) is included as part of the emissions inventory for SC 006 (Almond Hulling/Shelling Operations).

¹⁷ The emissions inventory for SC 008 (Agricultural Material Screening/Shaking Operations) is accounted for in other control measure source categories.

¹⁸ The emissions generated by the engines of the tub grinders are accounted for in the the emissions inventory for Rule 4702 (Internal Combustion Engines). The fugitive particulate emissions from these units are accounted for as a part of the stationary and area inventory.

5.5 DISTRICT BACM AND MSM

Based on the analyses conducted in Appendix C, the District currently has in place the Best Available Control Measures and Most Stringent Measures feasible and did not identify any additional technologically feasible and cost effective control measures. Therefore, the District meets or exceeds both BACM and MSM requirements for all stationary and area source categories.

5.6 ARB BACM AND MSM

Based on the analysis conducted in Appendix D, ARB did not identify any additional technologically feasible and cost effective control measures that would qualify as BACM or MSM. The ARB currently has in place the most stringent measures feasible to implement in the Valley and therefore meets or exceeds both BACM and MSM requirements for mobile source categories.

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