Chapter 1

Introduction

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Chapter 1: Introduction

The U.S. Environmental Protection Agency (EPA) establishes and periodically reviews health-based air quality standards (often referred to as National Ambient Air Quality Standards, or NAAQS) for ozone, particulates, and other pollutants. The San Joaquin Valley (Valley) experiences unique and significant difficulties in achieving these increasingly stringent standards, although the Valley's air quality has been improving. Over the past couple of decades, the San Joaquin Valley Air District (District) has implemented several generations of emissions control measures for sources under its jurisdiction, and the California Air Resources Board (ARB) has adopted regulations on mobile source emissions that greatly contribute to the Valley's ozone and particulate matter concentrations. Many of the nation's toughest air pollutant emissions controls are already in place in the Valley. Despite the Valley's significant air quality progress under these regulations and effort by Valley businesses and residents, many air quality challenges remain – including attainment of EPA's most recent standard for PM2.5 (particulate matter that is 2.5 microns or less in diameter).

This *2012 PM2.5 Plan* outlines the San Joaquin Valley's strategy for attaining the 2006 federal national ambient air quality standard (NAAQS) for PM2.5 as expeditiously as possible, and synthesizes the District's strategies for improving air quality and public health in the Valley.

1.1 THE VALLEY'S UNIQUE CHALLENGES

The Valley's geography and meteorology exacerbate the formation and retention of high levels of air pollution. Surrounding mountains and consistently stagnant weather patterns prevent the dispersal of pollutants that accumulate within the Valley. The Valley has significant naturally-occurring biogenic emissions. California's natural environment can also allow for air pollutant transport – both within the Valley as well as between the Valley and other air basins. These natural factors will continue to impact the Valley's progress towards attainment of federal air quality standards.

In addition, the Valley's population increases make it one of the fastest growing regions in the state. Between 2010 to 2020, the Valley's population is expected to increase by 21% (Table 1-1). In contrast, the total population for the State of California is projected to grow by 11% over the same time period. Increasing population generally increases air pollutant emissions, due to increased consumer product usage and motor vehicle emissions. Between 2010 and 2020, the Valley's total vehicle miles traveled (VMT) will increase about 21%[1], consistent with the Valley's population growth. This region also is home to the state's major arteries for goods and people movement, thereby attracting a large volume of vehicular traffic.

[1] Data from CEPAM: 2009 Almanac – Population and Vehicle Trends Tool. http://www.arb.ca.gov/app/emsinv/trends/ems_trends.php

Table 1-1 Estimated Valley Population by County, 2010-2020[2]

County	Estimated 2010	Projected 2020
San Joaquin	741,417	965,094
Stanislaus	559,708	699,144
Merced	273,935	348,690
Madera	162,114	212,874
Fresno	983,478	1,201,792
Kings	164,535	205,707
Tulare	466,893	599,117
Kern (Valley)*	723,970	902,017
Total	***4,076,050***	***5,134,435***

*Kern County is separated into two air districts: San Joaquin Valley and Eastern Kern. This data is the Valley-portion of Kern only.

Although reducing mobile source emissions is critical to the Valley's attainment of federal standards, the District does not have direct regulatory authority to reduce motor vehicle tailpipe emissions. As described in Section 2 of this plan and in Appendix D, the District must collaborate with interagency partners and utilize innovative approaches to reduce mobile source emissions.

Despite the magnitude of the challenges described above, the Valley has a history of success in reducing emissions and improving air quality. The Valley must continue to reduce air pollutant emissions to improve air quality and to improve public health Valley-wide.

1.2 PM2.5 AND ASSOCIATED HEALTH IMPACTS

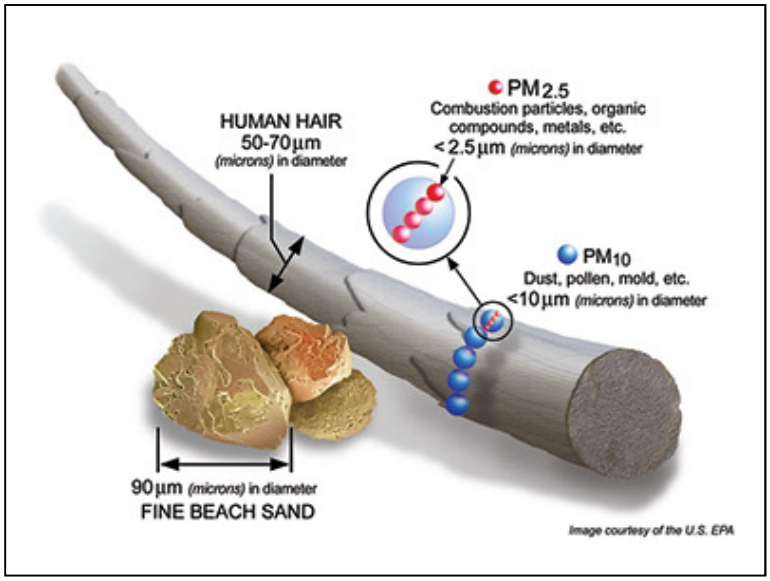
Particle pollution (particulate matter, or PM) is a mixture of solid particles and liquid droplets in the air. PM can be emitted directly into the atmosphere, or "secondary particulates" can form in the atmosphere through the chemical reactions of precursors. PM is thus made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. PM10 is PM that is 10 microns or less in diameter, and the PM2.5 subset includes smaller particles that are 2.5 microns or less in diameter (Figure 1-1).

The potential health impacts of particle pollution are linked to the size of the particles, with the smaller particles having larger impacts. Any particles 10 microns or less are considered respirable, meaning they can be inhaled into the body. PM10 can generally pass through the nose and throat and enter the lungs. PM2.5 can be inhaled more deeply into the gas exchange tissues of the lungs, where it can be absorbed into the bloodstream and carried to other parts of the body.

[2] Data from CEPAM: 2009 Almanac – Population and Vehicle Trends Tool. http://www.arb.ca.gov/app/emsinv/trends/ems_trends.php

Numerous studies link PM2.5 to a variety of health effects, including aggravated asthma, increased respiratory symptoms (irritation of the airways, coughing, difficulty breathing), decreased lung function in children, development of chronic bronchitis, irregular heartbeat, nonfatal heart attacks, increased respiratory and cardiovascular hospitalizations, lung cancer, and premature death. Children, older adults, and individuals with heart or lung diseases are the most likely to be affected by PM2.5.

Figure 1-1 PM10, PM2.5, Human Hair, and Fine Beach Sand



In addition to particle size, the chemical composition and surface area of PM2.5 can be a factor in the type and severity of health impacts. For example, ammonium nitrate is estimated to comprise about 40% of the Valley's total PM2.5 concentrations, but it is generally regarded as having relatively low toxicity as compared to other types of PM2.5. In contrast, metals have higher health impacts, but are found in relatively low concentrations in the Valley. Bioaerosols, such as mold spores, bacteria, pollen, and endotoxins, carry significant health risks for sensitive individuals. Ultrafine particles (PM0.1) are small enough to effectively deliver harmful chemicals into the lungs, bloodstream, and the brain, but typically comprise a small portion of the Valley's total airborne PM mass. The District will be translating these types of health study findings into risk-based strategies for this and upcoming attainment plans (see Chapter 2).

Air pollutant health impacts carry economic costs as well. In *The Health and Related Economic Benefits of Attaining Healthful Air in the San Joaquin Valley*, researchers Jane V. Hall, Victor Brajer, and Frederick Lurmann report that the economic benefits of meeting the federal standards for both PM2.5 and ozone (as compared to 2004 air

quality) could save an average of nearly $1,000 per person per year Valley-wide for a total of more than $3 billion annually (2005 dollars)[3].

In addition to affecting human health, air pollution also affects the health of the natural environment. PM2.5 can be transported from sources hundreds of miles away to contribute to visibility problems at remote locations, such as the Sierra Nevada Mountain Range or national parks. As PM settles out of the air, it can make lakes and streams acidic, change an ecosystem's nutrient balance, and affect ecosystem diversity. PM can affect vegetation by damaging foliage, disrupting the chemical processes within plants, reducing light adsorption, and disrupting photosynthesis. This can impact green spaces as well as crops. PM can also stain and damage stone and other materials. As the Valley progresses towards attainment of EPA's human-health-based PM2.5 standards, there will also be less impact to the surrounding environment.

1.3 NATIONAL AMBIENT AIR QUALITY STANDARDS

1.3.1 EPA's Standard Setting Process

Clean Air Act (CAA) Sections 108 and 109 require EPA to set health-based standards for six "criteria pollutants," such as PM2.5. EPA periodically reviews existing standards to consider the most recent health studies. These reviews are to be conducted every five years, though in the past, some standard revisions did not meet the 5-year deadline. The review process starts as the Clean Air Scientific Advisory Committee (CASAC) analyzes available science and then, if supported by research, suggests to EPA a range of revised standards that would protect public health from the adverse effects of air pollution. The EPA Administrator appoints CASAC members, who are non-EPA experts in the fields of science, engineering, or the social sciences. The committee is to provide objective, independent advice to EPA on the technical basis for the standard. Thousands of peer-reviewed scientific studies are considered as EPA formulates its proposed standard, which is made available for scientific peer review and public comment. EPA then sets the standard.

In evaluating and setting new standards, federal law prohibits EPA from taking into account economic feasibility. Economic feasibility issues can be considered as EPA promulgates the implementation rules that establish the deadlines for meeting the standards and in devising individual control measures aimed attaining the standards.

Once a standard is set, EPA designates an area as attainment or nonattainment based on the most recent three years of air quality data available. For some pollutants, EPA classifies nonattainment areas as marginal, moderate, serious, severe, and extreme. The classification sets the attainment deadline and other planning requirements. The classification is to be based on certain air quality parameters, though areas can request reclassification with adequate documentation.

[3] Hall, Jane V; Brajer, Victor; and Lurmann, Frederick W. (March 2006). "The Health and Related Economic Benefits of Attaining Healthful Air in the San Joaquin Valley." Institute for Economic and Environmental Studies.

EPA also adopts implementation rules to guide states and local air districts as they prepare state implementation plans (SIPs) to bring areas into attainment with the standard. While EPA cannot consider costs or difficulty in setting the standards, costs and difficulty are inescapable for local air districts as they determine the best way to bring areas into attainment. That said, local air districts must meet planning and attainment requirements to avoid federal sanctions and to improve public health.

There are a number of serious penalties and risks associated with any failure to submit approvable attainment strategies for meeting federal standards. Upon development of an attainment strategy, an area submits the plan to EPA for approval. If EPA finds that an area fails to submit an approvable plan on time or fails to implement plan commitments after the plan has been approved, then the following sanctions may be applied:

- 2:1 offset requirement for major sources, leading to a de-facto ban on new and expanding business
- Loss of federal highway funds, which would cost the Valley an estimated $250 million per year
- A federal implementation plan (FIP), which would result in a loss of local control

Once EPA approves a SIP, that plan becomes federally enforceable. The plan can then be enforced by the public or EPA through lawsuits. In addition, failure to reach attainment by the deadline would result in the assessment of Section 185 penalty fees.

1.3.2 Federal PM2.5 Standards and Implementation

EPA set the first PM2.5 standard in 1997 and designated the San Joaquin Valley (Valley) as nonattainment of the 1997 standard in 2005. The 1997 standard has two components: an annual average of 15 µg/m³ and a 24-hour average of 65 µg/m³ (see Appendix A for information on the applicable attainment calculations). The District adopted the *2008 PM2.5 Plan* in April 2008 to document its regulatory commitments, demonstrate the anticipated effectiveness of its PM2.5 strategy in bringing the Valley into attainment of the 1997 PM2.5 standard no later than April 2015 (based on 2012-2014 data), and meet other federal requirements. EPA approved the 2008 plan in 2011, though the District must still quantify contingency measure reductions for this plan (see Chapter 8 of this *2012 PM2.5 Plan*).

EPA revised the 24-hour average PM2.5 standard to 35 µg/m³ in October 2006 (71 *FR* 61143). EPA designated the Valley as nonattainment of the 2006 PM2.5 standard in 2009, effective December 14, 2009.[4] The effective date of designation triggers the plan due date, so the District's attainment plan must be submitted through ARB to EPA by December 14, 2012. Foundational analysis has been in progress for several months. The technical analysis is ongoing as of this April 2012 draft. To ensure that the public has the opportunity to be meaningfully involved in reviewing and commenting on the

[4] EPA (November 14, 2009). Air Quality Designations for the 2006 PM2.5 NAAQS, Final Rule. www.epa.gov/pmdesignations/2006standards/documents/2009-10-08/FR-11-13-2009.pdf

plan, the District intends to utilize the following tentative timeline for the public process (Table 1-2).

Table 1-2 Proposed *2012 PM2.5 Plan* Development and Public Process Timeline

Ongoing	**Outreach on plan process and findings: presentations/discussions with stakeholders at various meetings**
April 27th and 30th 2012	Public workshops and commenting period.
June 2012	Public workshops and public commenting on revised plan draft
August 2012	Public workshops and public commenting on revised plan draft
September 2012	Post proposed draft of the plan
October 18, 2012	District Governing Board hearing to adopt the plan
November 15-16, 2012	ARB hearing to adopt the SJV plan and the state strategy
December 14, 2012	**Plan due to EPA**

Areas must attain the 2006 standard within five years of the effective date of EPA designations, though up to a five year extension is possible. This sets initial attainment dates at December 14, 2014, with an extension up to December 14, 2019, if needed. This *2012 PM2.5 Plan* will demonstrate that the Valley will attain the 2006 standard as expeditiously as practicable, with all feasible measures and strategies being considered to accomplish this goal.

Designation under the federal PM2.5 standard (unlike the ozone standard) does not use a nonattainment area classification system (i.e., moderate, serious, severe, and extreme). Therefore, attainment planning requirements are the same for all PM2.5 nonattainment areas. EPA finalized the Clean Air Fine Particle Implementation Rule in April 2007 to provide rules and guidance on the CAA requirements for attainment plans required under the 1997 PM2.5 standard (79 FR 20586). On March 2, 2012, EPA issued its "Implementation Guidance for the 2006 24-hour PM2.5 NAAQS."[5] This memo confirmed the continued appropriateness 2007 implementation rule framework for PM2.5 attainment planning and provided additional guidance where needed. Table 1-3 summarizes PM2.5 attainment planning requirements and where those requirements will be met in this plan.

[5] http://www.epa.gov/ttn/naaqs/pm/pdfs/20120302_implement_guidance_24-hr_pm2.5_naaqs.pdf

Table 1-3 Federal Requirements for PM2.5 Nonattainment Areas

General Requirements	Federal CAA	PM2.5 Implementation Rule	Description	2012 PM2.5 Plan
Attainment Demonstration Due Date	172(b)	72 *FR* 20599	PM2.5 SIPs are due to EPA by December 14, 2012, three years from the designation date.	NA
Attainment Date	172(b)(2)	72 *FR* 20601	Nonattainment areas should reach attainment as expeditiously as practicable, but no later than 5 years from the designation date. EPA may extend the attainment date to up to 10 years from the designation date, considering severity of nonattainment and availability and feasibility of control measures.	Chapter 8*
RACT/RACM	172(c)(1)	72 *FR* 20609-20633	SIP provisions should provide for the implementation of reasonably available control measures (RACM), including, at minimum, reasonably available control technologies (RACT).	Chapter 4*
RFP	172(c)(2)	72 *FR* 20633-20642	SIP provisions must provide for reasonable further progress.	Chapter 8*
Contingency Provisions	172(c)(1)	72 *FR* 20642-20645	The SIP must provide for the implementation of specific measures that would take effect without further action by the State and that would be undertaken if the area fails to make RFP or attainment on time.	Chapter 8*
Emissions Inventory	172(c)(3)	72 *FR* 20647-20651	The SIP must include a comprehensive, accurate, current inventory of actual emissions from all sources of the relevant pollutants in the area.	Appendix B
NSR	172(c)(4-5)	72 *FR*	The SIP must identify and quantify the emissions of pollutants that will be allowed (in accordance with section 173(a)(1)(B), from the construction and operation of major new or modified stationary sources in the area. The SIP must require permits for new or modified stationary sources.	Appendix G*
Other measures	172(c)(6)	72 *FR* 20599	The SIP must include enforceable emission limitations, other control measures and techniques, and compliance schedules to provide for attainment by the applicable deadline.	Chapters 4 through 7*
**Full discussion forthcoming in future plan drafts.*				

As the District compiles and implements this plan for the 2006 standard, EPA will be reviewing the PM2.5 standard yet again, with a proposal in June 2012 and a finalized standard by June 2013. Yet the Valley will still be developing and implementing its strategies under the 1997 and 2006 standards. Local planning and regulatory processes can be confounded by these overlapping federal standards and planning requirements (Table 1-4).

However, efforts to reduce PM2.5 and PM2.5 precursors under one PM2.5 standard will help the Valley to start progressing towards more stringent PM2.5 standards on the horizon. This is already occurring with the 1997 and 2006 standards. The emissions reductions strategy being implemented under the plan for the 1997 PM2.5 standard will continue to achieve additional emissions reductions as fully implemented over the next couple of years, and these reductions will contribute to improvements in 24-hour average PM2.5 concentrations, bring the Valley closer to the 2006 standard. The District is coordinating emissions reductions strategies whenever possible to address multiple standards, to maximize efficiency for staff as well as stakeholders, and to maximize health benefits.

Table 1-4 Federal Air Quality Standards and Valley Status for PM2.5

	PM2.5 Standards and Timelines		
	1997 PM2.5	**2006 PM2.5**	**2013 PM2.5**
LEVEL OF THE STANDARD	24-hr: 65 µg/m³ annual: 15 µg/m³	24-hr: 35 µg/m³ annual: 15 µg/m³	To be determined
1997	EPA sets standard		
1998 – 2004			
2005	EPA finalizes attainment designations		
2006		EPA sets standard	
2007	EPA implementation rule		
2008	Attainment plan due (SJV's *2008 PM2.5 Plan*)		
2009		EPA finalizes attainment designations	
2010			
2011	EPA approved SJV plan		
⇨ **2012**		Attainment plan due (SJV's *2012 PM2.5 Plan*)	EPA expects to propose NAAQS
2013			EPA expects to finalize NAAQS
2014		Initial attainment deadline	EPA attainment designations, attainment plan due date, and attainment deadline to be determined
2015	Final attainment deadline		
2016 & beyond		Final attainment deadline: 2019	

1.3.3 State Standards

California also sets ambient air quality standards for several pollutants, including PM2.5. The California ambient air quality standards are considerably more stringent than the federal standards and are more protective of human health. California's annual average PM2.5 standard is currently 12 $\mu g/m^3$. There is no California standard for 24-hour average PM2.5 concentrations.

California has no specific attainment date for state air quality standards, nor does it require attainment plans. In fact, California Health and Safety Code (CH&SC) Section 39602 says, "Notwithstanding any other provision of this division, the state implementation plan shall only include those provisions necessary to meet the requirements of the [federal] Clean Air Act." Federal standards thus provide the framework for SIPs, such as this PM2.5 plan. However, progress towards federal standards also brings areas closer to the lower, California standards.

1.4 GUIDING PRINCIPLES

Federal requirements alone do not describe everything the District and the Valley can achieve with this *2012 PM2.5 Plan*. The District utilizes Guiding Principles to provide overall strategic direction to each step in the plan development process, and to synthesize and articulate project goals. At its February 2012 Public Hearing, the District Governing Board adopted the following Guiding Principles for developing the *2012 PM2.5 Plan*:

1. With public health as our number one priority, meet the federal ambient air quality standards as expeditiously as practicable.
2. Use sound science as the plan's foundation. This includes efforts to assess public health impacts, predict future air quality, determine the extent of emissions reductions needed, and evaluate the availability, effectiveness, and feasibility of emission control measures.
3. Consider the Valley's unique challenges and develop cost-effective strategies that provide adequate operational flexibility and minimize costs to Valley businesses.
4. Consider all opportunities for timely, innovative, and cost-effective emission reductions. Consider traditional regulations, but look beyond traditional regulations to incorporate monetary incentives, policy initiatives, guidance documents, and outreach, including working with cities and counties to incorporate *2012 PM2.5 Plan* principles their general plans.
5. Given that 80% of the Valley's emissions originate from mobile sources, provide a balanced approach to reducing mobile and stationary source emissions.
6. Devise and implement reasonable strategies that involve the public in reducing emissions.

7. Prioritize strategies that contribute to the District's Risk-based Strategy by achieving the greatest public health benefits.
8. Prioritize strategies that contribute to attainment of multiple air quality standards.
9. Recognize that there is no "silver bullet" for attainment. In this plan and upcoming attainment plans, every sector – from the public through all levels of government, businesses, and industry – must continue to reduce emissions.
10. Compel State and Federal agencies to provide adequate resources and regulatory assistance to reduce emissions from sources under their jurisdiction.
11. Address air pollutant transport issues with air districts neighboring the Valley.
12. Provide ample opportunity for public participation and feedback in the design and implementation of these plans. Utilize the planning process to also inform participants of the Valley's air quality challenges and successes as well as actions that can be taken to improve Valley air quality.
13. Build off of the successes of the District's Technology Advancement Program by identifying further opportunities to continue fostering technology advancement, paving the way for new emissions control devices to be increasingly used in the San Joaquin Valley.

1.5 PLAN DEVELOPMENT EFFORTS

The District has expended considerable resources and effort in conducting foundational work and preparing elements of the draft *2012 PM2.5 Plan*. Much of this analysis has been performed in collaboration with ARB, and is reflected in the draft sections of this plan. The draft 2012 PM2.5 Plan is in early stages of development, and will evolve as new information, including through public commenting, becomes available and as further analysis is completed. To date, staff resources have been dedicated to conducting analysis and coordinating efforts in the following areas:

- PM2.5 air quality trends – Extensive analysis has been conducted to evaluate and document trends in PM2.5 concentrations in the Valley. This includes design values, average concentrations, and other air quality trends, such as analysis of the most recent winter season (2011-2012).
- Emissions inventory for Valley – District and ARB staff have reviewed and enhanced various emissions inventory categories for the Valley.
- Analysis of potential emission reduction opportunities – District staff have compiled and initial list of source categories for evaluation of potential emission reduction opportunities. This evaluation is ongoing, and will evolve as additional information, including through comments, becomes
- Modeling and prediction of future PM2.5 air quality and attainment – ARB staff are currently conducting modeling and scientific analysis to determine future PM2.5 concentrations and emissions reductions needed to attain the standard. Given the unique complexity involved in modeling the Valley's PM2.5 levels, this modeling requires extensive staff resources.