# 2009 IMPERIAL COUNTY STATE IMPLEMENTATION PLAN FOR PARTICULATE MATTER LESS THAN 10 MICRONS IN AERODYNAMIC DIAMETER

## FINAL

Prepared for

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# Preface to the Final Imperial County 2009 $PM_{10}$ SIP (Dated August 11, 2009)

On May 20, 2009, the Imperial County Air Pollution Control District (ICAPCD) released the Draft Imperial County 2009 $PM_{10}$ SIP ($PM_{10}$ is small airborne particulate matter less than 10 microns in diameter). On June 3-4, 2009, ICAPCD held four public workshops to discuss the Draft Imperial County 2009 $PM_{10}$ SIP (dated May 2009) and to take comments from the public. Based on comments made at the workshops, both verbal and written comments submitted to the ICAPCD, and on-going cooperative efforts with air and other agencies, ICAPCD prepared a Draft Final Imperial County 2009 $PM_{10}$ SIP (dated July 10, 2009); it contained, among other revisions, the revised transportation conformity budgets that were considered for approval by the ICAPCD Governing Board (Chapter 6) and additional information on windblown emissions from vacant lands (Appendix III.B). The public hearing for the Imperial County 2009 $PM_{10}$ SIP was scheduled for August 11, 2009.

Since the release of the July 10, 2009 Draft Final Imperial County 2009 $PM_{10}$ SIP, U.S. Environmental Protection Agency (EPA) staff requested additional information on, and analysis of, windblown emissions from vacant lands disturbed by off-highway vehicle (OHV) use. This resulted in minor revisions to the emission inventory and related SIP text, particularly in Chapters 3 and 4, and Appendix III.A and III.B. Other minor revisions, including the correction of some typographical errors, were made. Based on all of these revisions, ICAPCD prepared a Draft Final Imperial County 2009 $PM_{10}$ SIP (dated July 30, 2009). An 'Erratum Sheet' documenting those revisions was prepared and released on July 31, 2009.

On August 11, 2009, the ICAPCD Board held a public hearing and unanimously adopted the Imperial County 2009 $PM_{10}$ SIP. The Board's action included:

- Approval and adoption of the Draft Final Imperial County 2009 $PM_{10}$ SIP (dated July 10, 2009), with changes as specified in the July 31, 2009 Errata Sheet;
- Adoption of the findings in the associated Staff Report;
- Certification of the Negative Declaration for the 2009 $PM_{10}$ SIP;
- Adoption of the transportation conformity budgets in the Imperial County 2009 $PM_{10}$ SIP; and
- Direction to staff to submit the Imperial County $PM_{10}$ SIP and related documents to the California Air Resources Board for their review and action.

This Final Imperial County 2009 $PM_{10}$ SIP (dated August 11, 2009), as adopted, consists of the Draft Final Imperial County 2009 $PM_{10}$ SIP (dated July 10, 2009), with revisions described in the July 31st Erratum Sheet, as well as minor corrections to footnote numbering and typographical errors.

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## Abbreviations and Acronyms

| | |
|---|---|
| AVTD | Average Vehicle Trips per Day |
| BACM | Best Available Control Measure |
| BACT | Best Available Control Technology |
| CAA | Federal Clean Air Act |
| CARB | California Air Resources Board |
| CMP | Conservation Management Practice (agriculture) |
| DM | *de minimis* |
| ICAPCD | Imperial County Air Pollution Control District |
| ICPWD | Imperial County Public Works Department |
| IID | Imperial Irrigation District |
| NAAQS | National Ambient Air Quality Standards |
| NEAP | Natural Events Action Plan |
| PM | particulate matter |
| PM10 | particulate mater less than 10 microns in aerodynamic diameter |
| RACM | Reasonably Available Control Measure |
| RFP | Reasonable Future Progress |
| SCAG | Southern California Association of Governments (MPO) |
| SIP | State Implementation Plan |
| SSI | Size Selective Inlet |
| TPA | Regional Transportation Planning Agency |
| tpd | Tons per Day |
| USEPA | United States Environmental Protection Agency |
| VDT | Vehicle daily trips |
| VDE | Visible Dust Emissions |
| WESTAR | Western States Air Resources Council |
| WRAP | Western Regional Air Partnership |
| $\mu g/m^3$ | microgram per cubic meter |
| μm | micron or micrometer |

# 1 Introduction

This document brings together the necessary data and discussion in presenting the State Implementation Plan (SIP) for particulate matter less than 10 microns in aerodynamic diameter, $PM_{10}$, on behalf of the Imperial County Air Pollution Control District (ICAPCD or the District). This chapter provides an overview of particulate matter as an air pollutant, a brief description of the Imperial County area, and a discussion of the purpose, regulatory background, and regulatory agencies concerned with this SIP.

## 1.1 Particulate Matter Air Pollution

Particulate matter (PM) is a general term used to describe a complex group of airborne solid, liquid, or semi-volatile materials of various size and composition. Primary PM is emitted directly into the atmosphere from both human activities (including agricultural operations, industrial processes, construction and demolition activities, and entrainment of road dust into the air) and non-anthropogenic activities (such as windblown dust and ash resulting from forest fires). Secondary PM is formed in the atmosphere from predominantly gaseous combustion by-product precursors, such as sulfur and nitrogen oxides, and volatile organic compounds. The overwhelming majority of airborne PM in Imperial County is primary PM. The major source of primary PM is fugitive windblown dust, with other contributions from entrained road dust, farming, and construction activities.

Particle size is a critical characteristic of PM that primarily determines the location of PM deposition along the respiratory system (and associated health effects) as well as the degradation of visibility through light scattering. In the United States, federal and state agencies have established two types of PM air quality standards, reported in the Table 1.1 below. $PM_{10}$ corresponds to the fraction of PM no greater than 10 microns or micrometers (µm) in aerodynamic diameter, while $PM_{2.5}$ refers to the subset of $PM_{10}$ of aerodynamic diameter smaller than 2.5 µm, which is commonly called fine particulate matter. The state standards are presented for comparative purposes and are otherwise outside of the scope of this SIP document.

**Table 1.1 National and State Ambient Air Quality Standards for Particulate Matter**

| Pollutant | Averaging Time | California Standards | National Standards |
|---|---|---|---|
| Respirable Particulate Matter ($PM_{10}$) | Annual | 20 µg/m$^3$ | -- |
| | 24-hour | 50 µg/m$^3$ | 150 µg/m$^3$ |
| Fine Particulate Matter ($PM_{2.5}$) | Annual | 12 µg/m$^3$ | 15 µg/m$^3$ |
| | 24-hour | --- | 35 µg/m$^3$ |

PM air pollution has undesirable and detrimental environmental effects. PM affects vegetation, both directly (e.g. deposition of nitrates and sulfates may cause direct foliar damage) and indirectly (e.g. coating of plants upon gravitational settling reduces light absorption). PM also accumulates to form regional haze, which reduces visibility due to scattering of light. Agencies concerned with haze include the National Park Service, the U.S. Forest Service, the Western Regional Air Partnership (WRAP), and the Western States Air Resources Council (WESTAR).

$PM_{10}$ is respirable, with fine and ultrafine particles reaching the alveoli deep in the lungs, and larger particles depositing principally in the nose and throat area. $PM_{10}$ deposition in the lungs results in irritation that triggers a range of inflammation responses, such as mucus secretion and bronchoconstriction, and exacerbates pulmonary dysfunctions, such as asthma, emphysema, and chronic bronchitis. Sufficiently small particles may penetrate into the bloodstream and impact functions such as blood coagulation, cardiac autonomic control, and mobilization of inflammatory cells from the bone marrow. Individuals susceptible to higher health risks from exposure to $PM_{10}$ airborne pollution include children, the elderly, smokers, and people of all ages with low pulmonary/cardiovascular function. For these individuals in particular, adverse health effects of $PM_{10}$ pollution include coughing, wheezing, shortness of breath, phlegm, bronchitis, and aggravation of lung or heart disease, leading for example to increased risks of hospitalization and mortality from asthma attacks and heart attacks.[1]

## 1.2 Imperial County

### 1.2.1 Geography, Population, and Land Use

Imperial County extends over 4,597 square miles[2] in the southeastern portion of California, bordering Mexico to the south, Riverside County to the north, San Diego County to the west, and the State of Arizona to the east. The Imperial Valley runs approximately north-to-south through the center of the county and extends into Mexico. The terrain elevation varies from as low as 230 feet below sea level at the Salton Sea to the north to more than 2,800 feet above sea level at the mountain summits to the east.

Imperial County's population is about 173,000 people,[3] and its principal industries are farming and retail trade. Most of the population, farming, and retail trade exist in a band of land that, on average, comprises less than one-fourth the width of the county, stretching from the south shore of the Salton Sea to the Mexican border. The road network is densest within this strip, as shown in Figure 1.1. The rest of Imperial County is the Salton Sea and mostly dry, barren desert area with little or no human population. Imperial County's population distribution and population growth in recent years are reported in Appendix V.

Imperial County's agricultural industry[4] grew to $1.37 billion in 2007, led by cattle farming at $334 million. More than 40 types of crops and commodities are grown in the county, ranking Imperial County 11th among California counties.[5] The total acreage of famed land has remained fairly constant at ~500,000 acres over the last decade, and nearly 25% of the county's labor force works in the Agricultural Sector during the high season.

1 Additional details regarding the adverse health effects of PM can be found in the San Joaquin Valley 2006 $PM_{10}$ Plan (Chapter 1, Section 1.5), available at http://www.valleyair.org/Air_Quality_Plans/06PM10.htm.

2 Official website of Imperial County, http://www.co.imperial.ca.us/.

3 Southern California Association of Governments, http://www.scag.ca.gov/publications/pdf/2007/SOTR07/SOTR07_Population.pdf

4 Imperial County Agricultural Commissioners Office, *Imperial County 2007 Agricultural Crop and Livestock Report*; available at http://imperialcounty.net/ag/Crop%20&%20Livestock%20Reports/Crop%20&%20Livestock%20Report%202007%20Color.pdf

5 California Farm Bureau Federation, http://www.cfbf.com/counties/index.cfm?id=13

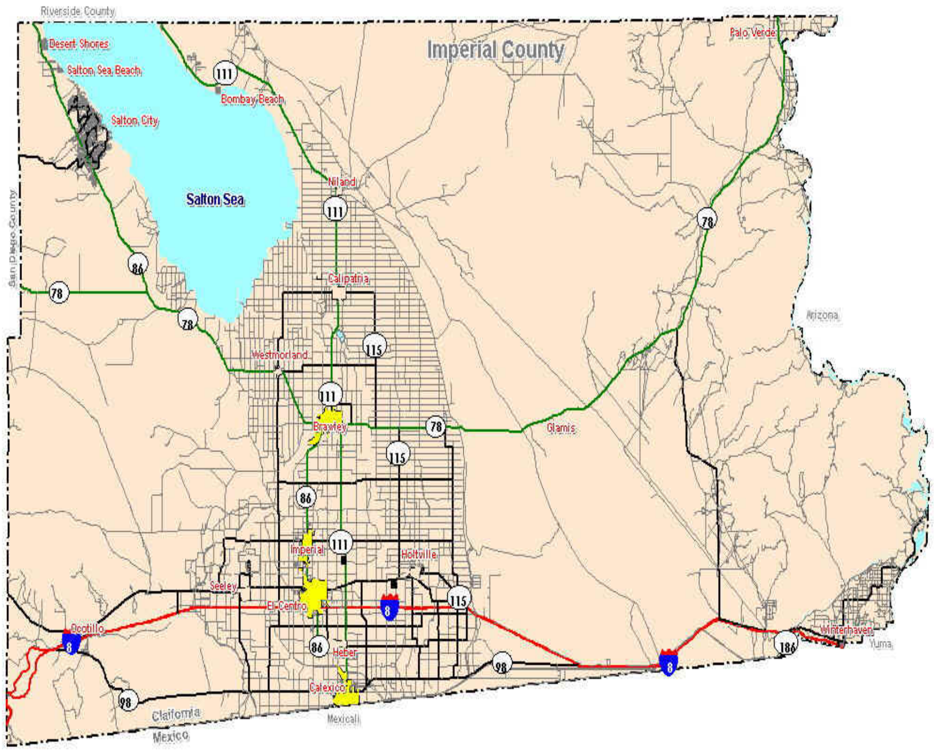


**Figure 1.1** Road map of Imperial County

### 1.2.2 Climate and Meteorology

Imperial County experiences mild and dry winters with daily maximum temperatures in the 65 to 75ºF (18-24ºC) range, extremely hot summers with daily maximum temperatures of 104 to 115ºF (40-46ºC), and very little rain (most of the ~3 inches annual precipitation occurs in late summer or midwinter). Summer weather patterns are dominated by intense heat inducing low-pressure areas over the interior desert. The flat terrain of the valley and the strong temperature differentials created by intense solar heating produce moderate winds and deep thermal convection. The sun shines, on the average, more in the Imperial County that anywhere else in the United States.

Humidity is low throughout the year, ranging from 28% in summer to 52% in winter. The large daily oscillation of temperature produces a corresponding large variation in the relative humidity. Nocturnal humidity rises to 50-60%, but drops to about 10% during the day.

Although Imperial County occasionally experience high winds of speed >30 mph (most frequently in April and May), wind speeds in the area are generally <10 mph. Wind statistics reveal that prevailing winds blow from the northwest-northeast; a secondary trend of wind direction from the southeast is also evident.

### 1.2.3 Atmospheric Stability and Dispersion

Air pollutant concentrations are primarily determined by the amount of pollutant emissions in an area and the degree to which these pollutants are dispersed in the atmosphere. Restricted horizontal and vertical air exchange, characteristic of low wind speeds and temperature inversions,[6] constitute stagnant conditions during which pollutants can accumulate to elevated concentrations.

Imperial County experiences surface inversions almost every day of the year, caused by cooling of the air layer in contact with the cold surface of the earth (due to radiational cooling) at night. Because of strong surface heating during the day, these inversions are usually broken, allowing pollutants to disperse more easily. Nevertheless, the atmosphere is stable enough to allow $PM_{10}$ pollution to accumulate and frequently reach elevated concentrations across the southern border of Imperial County in the densely populated city of Mexicali, Mexico. These elevated pollutions levels are then observed to impact ambient air quality in the nearby city of Calexico, Imperial County, as documented in Chapter 2.

## 1.3 Imperial County 2009 $PM_{10}$ SIP

### 1.3.1 Background

In response to the opinion of the US Court of Appeals for the Ninth Circuit in *Sierra Club* v. *United States Environmental Protection Agency, et al.*, in August 2004 the United States Environmental Protection Agency (USEPA) found that the Imperial Valley $PM_{10}$ nonattainment area had failed to attain by the moderate area attainment date of December 31, 1994, and as a result reclassified under the Clean Air Act (CAA) the Imperial Valley from a moderate to a serious $PM_{10}$ nonattainment area (see 69 FR 48792, August 11, 2004). Also in August 2004, the USEPA proposed a rule to find that the Imperial area had failed to attain the annual and 24-hour $PM_{10}$ standards by the serious area deadline of December 31, 2001. The USEPA finalized the rule on December 11, 2007 (see Appendix I), citing as the basis for the rule that six Imperial County monitoring stations were in violation of the 24-hour standard during 1999-2001. The USEPA's final rule action requires the State to submit to the USEPA by December 11, 2008 (within one year of the rule's publication in the Federal Register) an air quality plan that demonstrates that the County will attain the $PM_{10}$ standard as expeditiously as practicable.

Ever since the area was designated as nonattainment for $PM_{10}$ Imperial County government agencies and industry groups (i.e. Farm Bureau, COLAB, BIA), private and public stakeholders, along with the District have proactively worked to reduce $PM_{10}$ emissions in order to bring the area into compliance with the NAAQS. These efforts culminated in the 2005 amendments of the District's Regulation VIII Best Available Control Methods (BACM), adopted in advance of the present $PM_{10}$ SIP for the purposes of accelerating BACM implementation and of meeting the requirements and schedule of the County's Natural Event Action Plan (NEAP).

### 1.3.2 Summary of Planning Requirements

The 2009 Imperial County $PM_{10}$ SIP is required to address and meet the following elements, required under the CAA of areas classified to be in serious nonattainment of the NAAQS:

- Best available emission inventories;
- A plan that enables attainment of the $PM_{10}$ federal air quality standards;

[6] A temperature inversion is simply a layer of cool air trapped below a warmer layer of air, whereby the normal gradient of air temperature with increasing altitude is reversed. This condition is associated with poor vertical mixing of air and therefore poor vertical dispersion of pollutants.

- Annual reductions in $PM_{10}$ or $PM_{10}$ precursor emissions that are of not less than 5 percent from the date of SIP submission until attainment;
- Best available control measures and best available control technologies for significant sources and major stationary sources[7] of $PM_{10}$, to be implemented no later than 4 years after reclassification of the area as serious;
- Transportation conformity and motor vehicle emission budgets in accord with the attainment plan;
- Reasonable further progress and quantitative milestones; and
- Contingency measures to be implemented (without the need for additional rulemaking actions) in the event that the control measure regulations incorporated in the plan cannot be successfully implemented or fail to give the expected emission reductions.

## 1.4 Regulatory Responsibility

Federal, state, and local agencies participate in the planning process for attaining air quality in compliance with NAAQS. The roles of the several agencies involved are outlined in the following.

### 1.4.1 USEPA

The USEPA administers the provisions of the federal CAA and other air quality related legislation. A principal function of the USEPA is to set national ambient air quality standards (NAAQS) and promulgate new regulations based on the scientific evidence of the health and environmental effects of pollutants. In addition, the USEPA establishes national emission limits for major sources of air pollution; regulates emissions from locomotives, aircraft, and other mobile sources most effectively controlled at the national level; inspects and monitors emission sources; and provides financial and technical support for air quality research and development programs.

The USEPA enforces federal air quality laws. Under the CAA, the USEPA is authorized to require states to prepare plans to attain the NAAQS by deadlines specified in the CAA. SIPs, which are intended to outline specific pollution control strategies for each federal nonattainment area within a state, are prepared by regional and county air pollution control districts in collaboration with state agencies and with the USEPA, who is ultimately responsible for the SIP final review and approval.

Under the CAA, the USEPA also has authority to impose sanctions for failure to submit a plan or failure to carry out commitments in a plan. Sanctions include (i) increased emissions offsets requirements for major stationary sources, and (ii) withholding of federal highway, sewage treatment, and air planning funds.

### 1.4.2 California Air Resources Board (CARB)

The CARB is the state agency responsible for the coordination and administration of both state and federal air pollution control programs in California. The CARB undertakes research, sets

[7] A major stationary source is defined in a serious nonattainment area for $PM_{10}$ as any source that has the potential to emit ≥ 70 tons per year of $PM_{10}$ or $PM_{10}$ precursors.

state ambient air quality standards as well as emission standards for motor vehicles, provides technical assistance to local districts, compiles emission inventories, develops suggested control measures, and provides oversight of district control programs. An important function of the CARB is to coordinate and guide regional and local air quality planning efforts required by the California Clean Air Act, and to prepare and submit air quality management plans to the USEPA.

### 1.4.3 Imperial County Air Pollution Control District (ICAPCD)

The District shares responsibility with the CARB for ensuring that all state and federal ambient air quality standards are achieved and maintained within the county. The District is responsible for monitoring ambient air quality and has authority to regulate stationary sources and some area sources of emissions. The District is responsible for developing the overall attainment strategy for Imperial County, and therefore, is responsible for planning activities involving the development of emission inventories, modeling of air pollution, and quantification and comparison of emission reduction strategies.

Air districts in state nonattainment areas are also responsible for developing and implementing transportation control measures necessary to locally achieve ambient air quality standards. In so doing, air districts cooperate with Regional Transportation Planning Agencies (TPAs) in the development of the transportation control measures adopted in the SIP. Under the conformity requirements of the CAA (1977, 1990), Imperial County's TPAs cannot approve any Regional Transportation Plan[8] or Transportation Improvement Program[9] that does not conform to the SIP's purpose of expeditiously bringing the area into attainment of the NAAQS.

## 1.5 Document Organization

This document is organized as outlined in Table 1.2.

**Table 1.2 Contents of Imperial County 2009 $PM_{10}$ SIP Document**

| | Chapter Features |
|---|---|
| **Chapter 1** | This chapter provides an overview of particulate matter as an air pollutant and a brief description of the Imperial County area. The purpose, regulatory background, and requirements for the preparation of this SIP are also discussed, as well as the roles and responsibilities of the regulatory agencies involved. |
| **Chapter 2** | This chapter documents ambient $PM_{10}$ air quality data in the Imperial Valley in recent years. |
| **Chapter 3** | The Imperial County $PM_{10}$ Emissions Inventory is described in this chapter. Based on this inventory, source categories that contributed significantly to violations of the NAAQS in 2006-2008 are identified. |

8 A Regional Transportation Plan is a county's master plan outlining policies, actions, and financial projections to guide investment decisions over a 20-year horizon.

9 A Transportation Improvement Program specifies all highway and transit projects spanning a multi-year period, that are either regionally significant or that require federal funding or approval.

**Table 1.2 Contents of Imperial County 2009 $PM_{10}$ SIP Document**

| | |
|---|---|
| **Chapter 4** | This chapter provides an overview of Imperial County's $PM_{10}$ control program. It includes a description of fugitive dust rules, analyses of the control effectiveness and implementation costs of these rules, and analyses of the comparative stringency and applicability of the rules relative to similar rules adopted in other $PM_{10}$ serious non-attainment areas. |
| **Chapter 5** | Analyses presented in this chapter demonstrate attainment of the $PM_{10}$ NAAQS in Imperial County in 2006-2008 "but-for" the impact of International Emissions from Mexicali. Thus, this chapter satisfies the attainment demonstration requirement of this SIP according to section 179B(a) of the CAA. |
| **Chapter 6** | Additional CAA requirements concerning contingency measures and transportation conformity are addressed in this chapter. |
| **Chapter 7** | The impact of $PM_{10}$ emissions from the Salton Sea on Imperial County air quality in future years is briefly considered in this chapter. |
| **Chapter 8** | This chapter concludes the SIP document and presents a checklist verifying that all SIP requirements have been addressed. |

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# 2 Ambient Data

## 2.1 Background

As stated in the introduction, a dominant fraction of Imperial County is dry, barren desert. According to the latest emission inventory estimate,[10] the vast majority of $PM_{10}$ emissions impacting Imperial County originate from natural, non-anthropogenic sources (for instance, fugitive windblown dust from barren lands alone accounts for >55% of average daily emissions). During high winds, Imperial County's desert areas can produce $PM_{10}$ emissions over 50 times greater than the emissions from any anthropogenic source, including agricultural crop land.[11] Imperial County is also bordered to the south by the densely populated city of Mexicali, Mexico. Mexicali comprises approximately 760,000 people within ~200 square miles, and has $PM_{10}$ emissions estimated at 257 tons/day, compared with emissions of ~13 tons/day for the considerably smaller US town of Calexico (population ~32,000) situated just across the Mexican border from Mexicali. Under stagnant and light wind conditions, elevated dust concentrations in Mexicali can cause $PM_{10}$ from Mexico to drift across the border into Calexico.

As a result of Imperial County's desert climate and of its shared border with the densely populated city of Mexicali, the primary reasons for elevated $PM_{10}$ levels in Imperial County are thus (i) disturbance of soils by wind and human activity, (ii) transport of $PM_{10}$ from Mexico, and occasionally, (iii) wildfires.[12]

### 2.1.1 Emissions from Outside the United States

Ambient $PM_{10}$ concentrations in Imperial County are at times significantly impacted by anthropogenic and non-anthropogenic emission sources in Mexico, with whom Imperial County shares its southern border. These sources are beyond the reasonable control of Imperial County. Section 179B(d) of the CAA provides grounds for discounting contributions to $PM_{10}$ exceedences due to foreign sources beyond the local nonattainment area's control; the application of this provision in the present SIP is discussed in Section 5.

### 2.1.2 Exceptional Events

The USEPA promulgated a Natural Events Policy (NEP) in 1996, allowing exclusion of "$PM_{10}$ air quality data…attributable to uncontrollable natural events from the decisions regarding an area's nonattainment status."[13] This policy enabled local air districts to exclude from the decisions regarding an area's attainment status documented high ambient $PM_{10}$ air quality data that were caused by uncontrollable natural events such as (i) volcanic, seismic activity, (ii) wild land fires,

[10] See Chapter 3 and Appendices A-B of *Draft Final Technical Memorandum, Regulation VIII BACM Analysis*, prepared by ENVIRON International Corporation for the ICAPCD, October 2005

[11] ENVIRON, Development of a Wind Blown Fugitive Dust Model and Inventory for Imperial County, California, Table 7-1, May 2004.

[12] Documented examples of wildfire natural events in Imperial County may be found in a previous report (ENVIRON, Technical Support Document: Exclusion of $PM_{10}$ Measurements in Excess of the 24-Hour $PM_{10}$ NAAQS for Imperial County from 2001 through 2003 Due to Natural Events and Emissions from Mexico, Volume I of II, November 2004)

[13] Mary Nichols, USEPA. *Areas Affected by PM-10 Natural Events*," June 6, 1996. This memorandum sets forth USEPA's Natural Event Policy.

and/or (iii) high wind episodes.[14] The NEP has been incorporated into and superseded by the 2007 Exceptional Event Rule (below).

As of May 21, 2007, States petitioning the USEPA to exclude any air quality monitoring data from regulatory determinations related to compliance with the NAAQS must comply with the USEPA's updated Exceptional Event policy.[15] The rule defines an Exceptional Event as one that "affects air quality, is not reasonably controllable or preventable, is caused by a natural event or by human activity that is unlikely to recur at a particular location, and is determined by the USEPA to be an exceptional event." A clear causal relationship must be established between a measured exceedence of a NAAQS and an exceptional event in order to exclude the exceedence from regulatory determination of an area's attainment status.

## 2.2 Ambient Air Quality Data (2001 to 2008)

Under the CAA, the assessment of an area's air quality for the preparation of a SIP is based on the most recent three years of complete data (2006-2008 for the present SIP). Imperial County's air monitoring stations are introduced in the next section, followed in Section 2.2.2 by a brief overview of $PM_{10}$ air quality during 2001-2005 in order to provide historical perspective. Air quality data of importance in the preparation of Imperial County's 2009 $PM_{10}$ SIP, corresponding to years 2006-2008, is subsequently presented and discussed in detail.

### 2.2.1 Imperial County Air Monitoring Network

Figure 2.1 illustrates the locations of $PM_{10}$ monitoring stations[16] throughout Imperial County on a relief map. The stations are located in the populated areas of the County, which are surrounded by barren and desert lands, including the lower Borrego Desert Valley to the west, and, to the south in Mexico, the salt flats along the dried lake bed of Laguna Salada, and the great eastern desert area in Mexico. We note that the Calexico-Grant station was permanently decommissioned after July 2007. The $PM_{10}$ stations are equipped with filter-based, size-selective inlet (SSI) monitors that meet federal performance criteria and are considered to be the official data source for long-term air quality planning and attainment demonstrations.[17]

[14] As a requirement for data flagging and data exclusion from NAAQS compliance determination, the NEP required States to develop area-specific Natural Events Action Plans (NEAPs) designed to protect public health through public education, public notification, and efforts to minimize emissions from contributing anthropogenic sources during natural events. The ICAPCD satisfied this requirement by collaborating with local governments and stakeholders to develop the Imperial County NEAP document in 2005. (The Imperial County NEAP, which dealt specifically with natural events caused by high winds and wildland fires, was adopted by the ICAPCD Board of Directors on August 9, 2005. We note that the Imperial County NEAP development process involved the development of BACM measures to satisfy the requirements of controlling and abating wind-generated dust from anthropogenic sources.)

[15] USEPA, *Treatment of Data Influenced by Exceptional Events; Final Rule*, Federal Register, Vol. 72, No. 55, March 22, 2007, p. 13560.

[16] The minimum number of monitors required by EPA regulations (CFR, Part 58, Appendix D) for the purpose of $PM_{10}$ air quality monitoring in an area is based on the population of the area and on the nature of the $PM_{10}$ air quality in the area. For the Imperial County area, the 5 $PM_{10}$ monitors currently operated by the CARB and the ICAPCD are well in excess of the 1-2 monitors needed to satisfy the Federal minimum requirements (refer to the *Annual Network Plan for Ambient Air Monitoring*, Imperial County, May 2009; available from the ICAPCD website at http://www.imperialcounty.net/AirPollution/).

[17] It should be noted here that, in addition to the SSI units, collocated Beta Attenuation Mass (BAM) monitors were also in operation at the Brawley, Westmorland, and Niland stations in 2006-2008. These monitors, however, were used for the purpose of daily forecasting, and were not operated in accordance with the quality assurance

Additional information about PM and meteorological monitoring stations in the Imperial Valley is given in Appendix II.

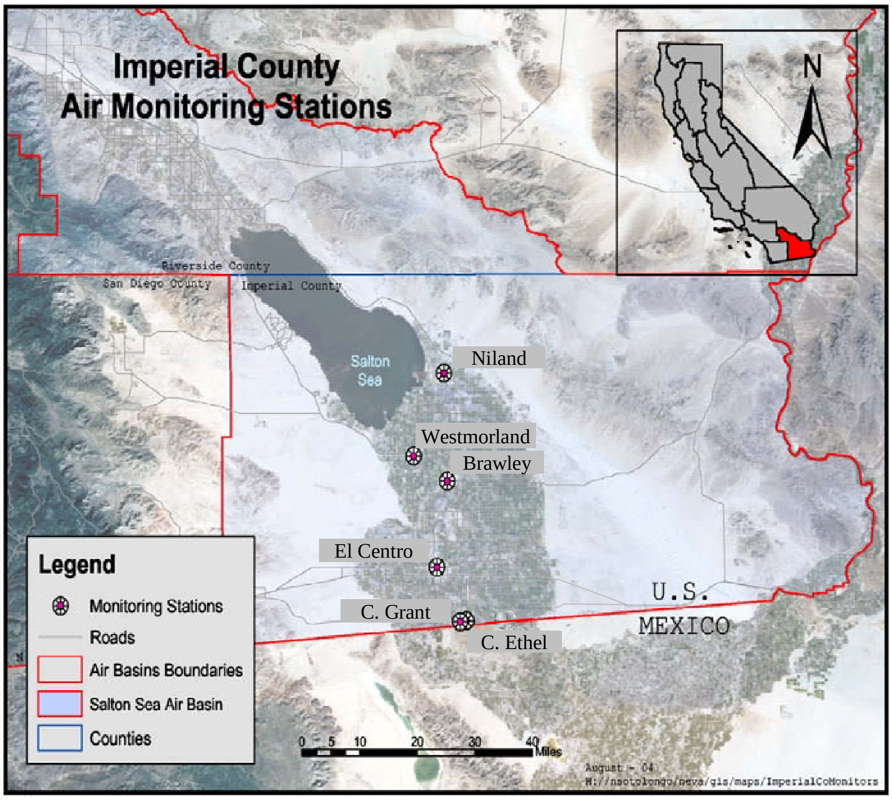


**Figure 2.1** Locations of Imperial County $PM_{10}$ monitoring stations.

### 2.2.2 Air Quality Data During 2001-2005

The time period of 2001-2003 corresponded to dry years with below-average rainfall in Imperial County. The exceptional aridity of the County led to abnormally dry soils with a greater potential for entrainment of dust into the atmosphere, and also facilitated the wildfire events of October 2003 (releasing tremendous amounts of ash and dust into the atmosphere). As a result, $PM_{10}$ concentrations in exceedence of the 24-hour NAAQS arising from high-winds or wildfires occurred on 11 days during 2001-2003.[18] In addition, seven additional days saw recordings of $PM_{10}$ concentrations in excess of the 24-hour NAAQS in Calexico, as a result of transport, by light and variable winds, of pollution generated in Mexico. In 2004 and 2005, Imperial County

procedures required to generate data suitable for regulatory compliance evaluations. A 2008 ICAPCD/ARB evaluation of the Imperial County 2006-2008 $PM_{10}$ BAM data revealed that monitor performance had been inaccurate as a result of deviations from operational specifications. Consequently, the Imperial County 2006-2008 BAM data is invalid for consideration in the area's attainment demonstration, and unfit for submission to the USEPA Air Quality System (AQS). Additional information about continuous $PM_{10}$ monitoring in Imperial County in given in Appendix II.

[18] ENVIRON, Technical Support Document: Exclusion of $PM_{10}$ Measurements in Excess of the 24-Hour $PM_{10}$ NAAQS for Imperial County from 2001 through 2003 Due to Natural Events and Emissions from Mexico, Volume I of II, November 2004.

monitors recorded exceedences of the 24-hour $PM_{10}$ NAAQS on seven days, of which three involved high winds, and four involved high levels of PM transport from Mexico.

### 2.2.3 Ambient Air Quality in the Time Period from 2006 to 2008

SSI monitor measurements acquired during 2006-2008 are plotted by station in Figure 2.2 and tabulated in Appendix II. The plots reveal that $PM_{10}$ air quality patterns throughout Imperial County fall within two groups. The first includes the Brawley, El Centro, Niland, and Westmorland stations, where the overwhelming majority of 24-hour ambient $PM_{10}$ concentration measurements are well below the 150 $\mu g/m^3$ NAAQS: only 2-3% of measurements at those stations were above 100 $\mu g/m^3$ during 2006-2008, and only 17-31% were above 50 $\mu g/m^3$. The second group corresponds to the Calexico stations, for which 8-16% of recordings during 2006-2008 were above 100 $\mu g/m^3$, and 51-64% were above 50 $\mu g/m^3$ (leading to higher averages and standard deviations relative to those at non-Calexico stations). As discussed in Chapter 5, the difference between the two groups is primarily caused by transport of pollution from Mexicali, which may be substantial even on days that do not exceed the NAAQS.

### 2.2.4 Exceedences of the 24-Hour $PM_{10}$ NAAQS from 2006 to 2008

In the 2006 to 2008 time period, Imperial County experienced five days with $PM_{10}$ concentrations in excess of the 24-hour NAAQS, as listed in Table 2.1. Exceedences on September 2, 2006, April 12, 2007, and June 5, 2007 were Exceptional Events caused by high winds. These events were documented, publicly noticed, and are being submitted to EPA in separate submittals.[19] Exceedences on December 21, 2006 and December 25, 2006 arose from transport across the Mexican border of pollution originated in Mexicali, as discussed in Chapter V and Appendix V.

**Table 2.1 $PM_{10}$ Measurements in Excess of the 24-Hour NAAQS in Imperial County for the Time Period 2006-2008**

| Date | Monitor | Measurement ($\mu g/m^3$) | Comments |
|---|---|---|---|
| 12/21/2006 | Calexico Grant | 171 | Transport from Mexico |
| 12/25/2006 | Calexico Grant | 248 | Transport from Mexico |
| 9/2/2006 | Calexico Ethel | 164 | High winds |
| | Calexico Grant | 233 | High winds |
| | Westmorland | 167 | High winds |
| 4/12/2007 | Brawley | 291 | High winds |
| | Westmorland | 155 | High winds |
| 6/5/2007 | Brawley | 281 | High winds |
| | Calexico Ethel | 282 | High winds |
| | El Centro | 200 | High winds |
| | Niland | 162 | High winds |
| | Westmorland | 226 | High winds |

[19] For these days, documentation satisfying the requirements of 40 CFR Parts 50 and 51 is available from the ICAPCD at *http://www.imperialcounty.net/AirPollution/Web%20Pages/2009%20March%20Natural%20Events.htm*. We note that these events are still under process review.

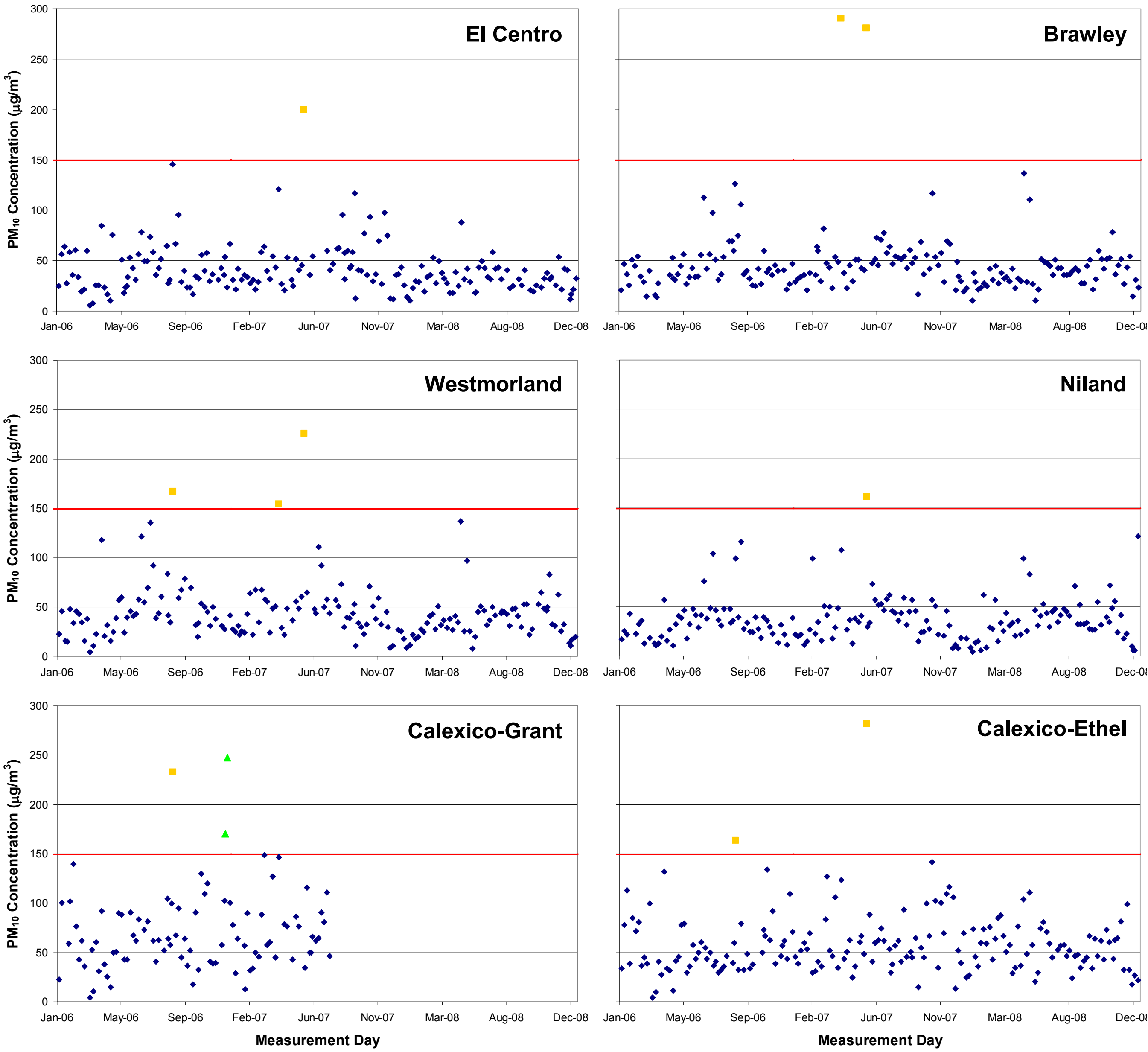


**Figure 2.2** Time-series plots of 24-hour $PM_{10}$ ambient air concentration in Imperial County during 2006-2008: SSI measurements at the El Centro, Brawley, Westmorland, Niland, Calexico-Grant and Calexico-Ethel stations. Note that the Calexico-Grant station was permanently decommissioned in August 2007. Gold-colored exceedences were affected by high wind exceptional events, and green-colored exceedences were affected by transport from Mexico. Tabulated results are given in Appendix II.

# 3 Inventory and Analysis of Significant Sources

## 3.1 Emission Inventory

An emission inventory (EI) for a specified criteria pollutant is an accounting of the amount of the pollutant that is emitted into the atmosphere by various sources over a specific period of time. Because pollution-generating activities are continuously changing and methods to estimate their impact are continuously improving, the updating of an EI is an ongoing process. In the next subsection, we discuss recent changes to the Imperial County $PM_{10}$ inventory that reflect the latest, best available data.[20] The resulting best estimate of the EI for the 2005 baseline year, along with projected growth in emissions until 2010, is presented thereafter.

### 3.1.1 Important Recent Adjustments to the Imperial County $PM_{10}$ Emission Inventory

The EI used in the present $PM_{10}$ SIP is derived from CARB's SIP inventory Version 1.06, base year 2002, which has been updated to incorporate revised cattle emissions, revised windblown dust model results, revised SCAG activity data, and updated entrained and windblown unpaved road dust estimates. Here, we briefly present the revisions to (i) windblown dust estimates from open areas and non-pasture agricultural lands and (ii) emissions from unpaved roads. Additional documentation of the adjustments to the $PM_{10}$ V1.06 inventory is given in Appendix III.A.

*Windblown Dust from Open Areas and Non-Pasture Agricultural Lands.* Consistent with model development done for the Western Regional Air Partnership, ENVIRON developed and implemented a Windblown Dust Model to estimate windblown fugitive dust for specific sources in Imperial County.[21,22] This work was conducted in light of the known importance of the windblown dust category in the total Imperial County $PM_{10}$ Emission Inventory[23] and in an effort to address the following inadequacies in the existing CARB methodology previously used for Imperial County: (i) a failure to include windblown dust emissions from all lands within Imperial County (e.g. from disturbed, vacant lands such as the shrublands, barren lands, and desert sand dunes), and (ii) an inability to use information on local soil types, vegetation coverage, crop types, and agricultural practices.[24]

For each land parcel within the modeling domain, the Windblown Dust Model (i) assesses emission characteristics based on soil texture and soil stability, including reservoir[25] and reservoir recharge characteristics; (ii) assesses hourly emission factors for the land parcel

[20] We note that these changes have been found to be appropriate by the CARB.

[21] Development of a Windblown Fugitive Dust Model and Inventory for Imperial County, California. Final Report, May 12, 2004. Prepared by ENVIRON International Corporation and Eastern Research Group for the ICAPCD.

[22] Appendix A (Technical Memorandum: Latest Revisions to the Windblown Dust Model) of the Technical Memorandum: Regulation VIII BACM Analysis. ENVIRON, October 2005.

[23] For instance, windblown dust accounted for more than 170 of the approximately 230 tons/day of total Imperial County $PM_{10}$ emissions in the V1.06 CARB Inventory.

[24] The ARB methodology to calculate windblown emissions relies on a modified form of the wind erosion equation (WEA) developed by the United States Department of Agriculture (USDA) based on a single field study carried out in Manhattan, Kansas.

[25] Reservoir characteristics refer to the limit placed on the amount of dust that can be emitted in any single wind episode.

based on the emission characteristic profile and hourly meteorological data; and (iii) applies correction terms to the obtained hourly emission rates based on vegetative cover, as well as non-climatic corrections for agricultural lands. Windblown Dust Model estimates of windblown $PM_{10}$ emissions from all Imperial County lands calculated using model assumptions selected based on CARB and USEPA input[26] are reported in Table 3.1.

We note that the model assumptions used to generate the emission estimates of Table 3.1 did not evaluate the impact of off-road vehicular activities on the soil stability and emission characteristic profiles. Consequently, the level of additional emissions resulting from anthropogenic disturbance of vacant lands in Imperial County was assessed (in a conservative manner as documented in Appendix III.B) and incorporated in the present SIP Emission Inventory. The corresponding annual average level of additional $PM_{10}$ emissions from open areas is 12.2 tpd (Table III.B.4 of Appendix III.B).[27]The Windblown Dust Model provides a rigorous and comprehensive treatment of windblown dust erosion based on a thorough analysis and use of available information/correlations from the existing literature, and thereby enables considerable improvements in the accuracy of windblown $PM_{10}$ emissions in Imperial County (relative to the previously-used CARB methodology). Nevertheless, because of limitations in the availability of model input information, it was necessary to make assumptions,[28] especially for vacant lands. We see in subsequent sections of this SIP document that this uncertainty (related to the model input assumptions) does not affect the results of the technical analyses for any of the key elements of the present SIP (i.e., analysis of significant sources, rulemaking, attainment demonstration, and conformity). Further discussion of windblown dust emissions from vacant lands is given in Appendix III.B.

**Table 3.1 Windblown Dust Model Estimates[a] of $PM_{10}$ Emissions (in tons/day) in Imperial County (Reported According to Land Use/Land Coverage)**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Annual | Summer | Winter |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Agriculture | 8.59 | 11.3 | 19.9 | 28.4 | 12.9 | 16.2 | 7.37 | 4.33 | 9.76 | 0.38 | 6.60 | 4.42 | 10.81 | 8.46 | 13.21 |
| Shrub/Grassland | 96.1 | 102. | 120. | 243. | 97.5 | 189. | 40.6 | 140. | 63.8 | 7.32 | 64.0 | 25.4 | 98.75 | 89.46 | 108.2 |
| Desert - Dunes | 21.7 | 31.8 | 36.2 | 62.3 | 24.7 | 4.59 | 16.7 | 11.9 | 8.22 | 0.00 | 9.32 | 11.6 | 19.85 | 11.10 | 28.74 |
| Desert - Other | 20.5 | 38.0 | 52.0 | 97.3 | 57.0 | 71.8 | 15.7 | 43.1 | 29.2 | 6.36 | 22.0 | 13.3 | 38.74 | 37.11 | 40.40 |
| Urban Open Areas | 0.07 | 0.00 | 0.00 | 0.03 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.01 | 0.00 | 0.02 |
| Total | 147 | 183 | 228 | 431 | 192 | 282 | 80.5 | 199 | 111 | 14.0 | 102 | 54.8 | 168 | 146 | 190 |

[a]Calculated using 2002 meteorological data as documented in Appendix A of the Imperial County 2005 BACM analysis report.[29]

[26] Refer to Appendix A of the Regulation VIII BACM Analysis document (ENVIRON, October 2005), and to Appendix III.B, Section III.B.2 for details.

[27] As noted in Appendix III.B, this estimate is conservative and the actual number is likely to be smaller. Winter and summer contributions were calculated using the winter/summer temporal profile derived from the results of the windblown dust model for contributing sources (i.e., Shrubland/Grassland, Dunes, and other barren lands, see Table III.B.4 of Appendix III.B). Thus, the winter (181 days from November to April) and summer (184 days from May to October) emissions were 177.34/157.34 = 112.7% and 137.66/157.34 = 87.5% of the annual average, respectively.

[28] E.g., assumptions about threshold velocity for the onset of emissions, reservoir recharge, surface stability, vegetative canopy cover, etc (refer to the May 2004 windblown dust model report for details).

[29] ENVIRON, Draft Final Technical Memorandum, Regulation VIII BACM Analysis, prepared for the ICAPCD, October 2005

*Dust from Unpaved Roads (Entrained and Windblown).* Estimates of the windblown and entrained emissions from all unpaved roads in Imperial County were revised in the 2005 BACM analysis[29] using updated emission factors for canal road windblown emissions[30] and for unpaved road travel dust[31] (refer to Appendix B of the 2005 BACM report). The same methodology has been used to estimate emissions from unpaved roads for the present SIP (Table 3.2) using the latest mileage and traffic information[32] available from the county, the cities of Imperial County, and the Imperial Irrigation District (IID). (We note, however, that additional adjustments were made to the entrained emission levels from unpaved roads by incorporating rainfall corrections.)

**Table 3.2 2005 Estimates of Entrained and Windblown $PM_{10}$ Emission from Unpaved Roads (Annual Averages)**

| Unpaved roads category | Mileage | Windblown (tpd) | Entrained (tpd)[a] |
|---|---|---|---|
| County < 50 ADT[b] | 1155 | 6.64 | 11.11 |
| County > 50 ADT[c] | 199 | 1.14 | 13.40 |
| City Roads[b] | 7.5 | 0.03 | 0.07 |
| Maintenance (Canal) Roads[d] | 6148 | 16.32 | 29.57 |
| Federal Roads[b] | 139 | 0.37 | 1.34 |
| Farm Roads | 2263 | 6.01 | 1.35 |

ADT = Average Daily Trips. [a]Note that entrained emissions levels were adjusted to incorporate rainfall corrections. [b]Average traffic taken to be 10 ADT. [c]Average traffic taken to be 70 ADT. [d]Average traffic taken to be 5 ADT.

### 3.1.2 2005 Base Year and Future Inventories

The updated EI for the baseline year 2005 is summarized in Table 3.3. Estimates of the EI for years during which emission-generating activities are mitigated are obtained by subtracting the projected reductions in emissions from the projected emissions valued by accounting for growth in activities (see Table 3.4 for “grown” EIs in 2006-2010). Control strategies and associated reductions are discussed in Chapter 4.

[30] ARB, *Windblown Dust—Unpaved Roads*. Areawide Source Methodologies, Section 7.13, , August 1997, http://www.arb.ca.gov/ei/areasrc/fullpdf/full7-13.pdf

[31] CARB, *Summary of Fugitive Dust and Ammonia Emission Inventory Changes for the SJVAPCD Particulate Matter SIP*, Revision 2.1, May 2003, http://www.valleyair.org/Air_Quality_Plans/docs/2003%20PM10%20Plan/PDF%202003%20PM10%20Plan%20adpt%20app/App%20C-EI%20Changes.pdf

[32] Communications to the ICAPCD from the ICPWD and the IID (see Attachment A to Appendix III.A for documentation from the ICPWD).

**Table 3.3 $PM_{10}$ Emission Inventory for Imperial County in Baseline Year 2005[a] (tpd)**

| Source Category | Annual Average | Winter Average | Summer Average |
|---|---|---|---|
| Fuel Combustion | 0.41 | 0.35 | 0.48 |
| Waste Disposal | 0.00 | 0.00 | 0.00 |
| Cleaning/Surface Coatings | 0.00 | 0.00 | 0.00 |
| Petroleum Production/Marketing | 0.00 | 0.00 | 0.00 |
| Industrial Processes: | *2.79* | *2.79* | *2.78* |
| Mineral Processes | 2.63 | 2.62 | 2.64 |
| Food/Agriculture | 0.16 | 0.17 | 0.14 |
| Solvent Evaporation | 0.00 | 0.00 | |
| Res Fuel Combustion | 0.09 | 0.16 | 0.02 |
| Farming | *9.88* | *11.55* | *8.20* |
| Tilling | 7.10 | 8.77 | 5.42 |
| Harvest | 0.01 | 0.01 | 0.01 |
| Cattle | 2.77 | 2.77 | 2.77 |
| Construction | 2.20 | 2.01 | 2.38 |
| Paved Road Dust | 3.38 | 3.30 | 3.46 |
| Entrained Unpaved Road Dust: | *56.85* | *33.71* | *79.98* |
| City/County | 24.58 | 14.58 | 34.59 |
| Canal | 29.57 | 17.54 | 41.61 |
| BLM/USFS | 1.34 | 0.79 | 1.88 |
| Farm | 1.35 | 0.80 | 1.90 |
| Windblown Dust: | *212.67* | *223.79* | *201.95* |
| Open Areas—Urban | 0.01 | 0.02 | 0.00 |
| Open Areas—Others[b] | 169.54 | 191.09 | 148.34 |
| Unpaved Roads: | *30.52* | *18.10* | *42.94* |
| City/County | 7.82 | 4.64 | 11.00 |
| Canal | 16.32 | 9.68 | 22.96 |
| BLM/USFS | 0.37 | 0.22 | 0.52 |
| Farm | 6.01 | 3.56 | 8.46 |
| Non-Pasture Ag Lands | 10.81 | 13.21 | 8.46 |
| Pasture | 1.79 | 1.37 | 2.20 |
| Fires | 0.00 | 0.00 | 0.00 |
| Waste Burning | 2.77 | 2.77 | 2.77 |
| Cooking | 0.06 | 0.06 | 0.06 |
| On-Road Mobile | 1.05 | 1.06 | 1.05 |
| Other Mobile | 0.99 | 0.95 | 1.04 |
| **Total** | **293** | **282** | **304** |

[a]Entries corresponding to the summed contributions of subcategories are in italics. [b]Grasslands, dunes, and other barren lands (see Table 3.1). As documented in Appendix III.B, emissions were estimated using available information on the conditions of the vacant lands (e.g., desert areas of barren, grass/shrubland, and dunes). Reported emissions also include the conservatively-estimated contributions due to soil disturbances caused by off-road vehicle usage.

**Table 3.4 Imperial County $PM_{10}$ Emission Inventory[a] in 2006-2010 (tpd)**

| Source Category | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| Fuel Combustion | 0.42 | 0.42 | 0.42 | 0.42 | 0.43 |
| Waste Disposal | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cleaning/Surface Coatings | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Petroleum Production/Marketing | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Industrial Processes: | *2.83* | *2.87* | *2.91* | *2.98* | *3.01* |
| Mineral Processes | 2.67 | 2.71 | 2.74 | 2.81 | 2.85 |
| Food/Agriculture | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 |
| Solvent Evaporation | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Res Fuel Combustion | 0.09 | 0.09 | 0.09 | 0.09 | 0.10 |
| Farming: | *10.37* | *10.37* | *10.36* | *10.36* | *10.36* |
| Tilling | 7.10 | 7.09 | 7.09 | 7.09 | 7.08 |
| Harvest | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Cattle | 3.26 | 3.26 | 3.26 | 3.26 | 3.26 |
| Construction | 2.22 | 2.24 | 2.26 | 2.27 | 2.28 |
| Paved Road Dust | 3.62 | 3.86 | 4.09 | 4.32 | 4.13 |
| Entrained Unpaved Road Dust: | *56.84* | *56.84* | *56.84* | *56.84* | *56.84* |
| City/County | 24.58 | 24.58 | 24.58 | 24.58 | 24.58 |
| Canal | 29.57 | 29.57 | 29.57 | 29.57 | 29.57 |
| BLM/USFS | 1.34 | 1.34 | 1.34 | 1.34 | 1.34 |
| Farm | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 |
| Windblown Dust: | *212.66* | *212.66* | *212.64* | *212.64* | *212.63* |
| Open Areas—Urban | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Open Areas—Others[b] | 169.54 | 169.54 | 169.54 | 169.54 | 169.54 |
| Unpaved Roads | *30.52* | *30.52* | *30.52* | *30.52* | *30.52* |
| City/County | 7.82 | 7.82 | 7.82 | 7.82 | 7.82 |
| Canal | 16.32 | 16.32 | 16.32 | 16.32 | 16.32 |
| BLM/USFS | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 |
| Farm | 6.01 | 6.01 | 6.01 | 6.01 | 6.01 |
| Non-Pasture Ag Lands | 10.80 | 10.80 | 10.79 | 10.79 | 10.78 |
| Pasture | 1.79 | 1.78 | 1.78 | 1.78 | 1.78 |
| Fires | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Waste Burning | 2.75 | 2.73 | 2.71 | 2.69 | 2.67 |
| Cooking | 0.06 | 0.06 | 0.06 | 0.06 | 0.07 |
| On-Road Mobile | 1.01 | 0.93 | 0.88 | 0.82 | 0.77 |
| Other Mobile | 0.98 | 0.96 | 0.95 | 0.95 | 0.94 |
| **Total** | **294** | **294** | **294** | **294** | **294** |

[a]Annual averages accounting for projected growth in emission-generating activities, but not for reductions due to control or mitigation of $PM_{10}$ sources. Entries corresponding to the summed contributions of subcategories are in italics. [b]Grasslands, dunes, and other barren lands (see Table 3.1). As documented in Appendix III.B, emissions were estimated using available information on the conditions of the vacant lands (e.g., desert areas of barren, grass/shrubland, and dunes). Reported emissions also include the conservatively-estimated contributions due to soil disturbances caused by off-road vehicle usage.

## 3.2 Determination of Significant Sources of $PM_{10}$

### 3.2.1 Background

USEPA policy for State Implementation Plans for serious $PM_{10}$ nonattainment areas (Federal Register, August 16, 1994, p. 41998) instructs that Best Available Control Measures are required for all source categories except those that "the State [can] demonstrate [do] not contribute significantly to nonattainment of the NAAQS." As a criterion for classification of $PM_{10}$ sources into significant or *De Minimis* categories, the preamble states that "a source category… will be presumed to contribute significantly to a violation of the 24-hour NAAQS if its $PM_{10}$ impact at the location of the expected violation would exceed 5 $\mu g/m^3$" (p. 42011). This language unambiguously implies that this test should be applied, for any violation, to every source category using information specific to the day of the violation. Violations of the 24-hour $PM_{10}$ NAAQS recorded at Imperial County stations in 2006-2008 are reported in Table 3.5 below.[33] We note that, as discussed in Chapter 5 and Appendix V, both of the violations listed in Table 3.5 correspond to air quality impacts strongly affected by the transport of $PM_{10}$ originating from emission sources in Mexicali.

**Table 3.5 $PM_{10}$ Measurements in Violation of the 24-Hour NAAQS in 2006-2008**

| Date | Monitor | Measurement ($\mu g/m^3$) |
|---|---|---|
| 12/21/2006 | Calexico Grant | 171 |
| 12/25/2006 | Calexico Grant | 248 |

### 3.2.2 Implementation

The implementation of the criterion for any specific violation requires *a day-specific* decomposition of the air quality impacts at the location of the measurement into fractional contributions from all relevant source categories. Thus, a day-specific emission inventory is needed. Significance for any source category can be conveniently assessed by comparison of the calculated day-specific fractional contribution to the critical fraction of (5 $\mu g/m^3$)/(violation measurement). We illustrate the approach below with the assessment of significance for an arbitrary source category X in the 248 $\mu g/m^3$ 24-hour $PM_{10}$ exceedence recorded at the Calexico Grant station on December 25, 2006.

The critical fractional contribution for December 25, 2006 is (5 $\mu g/m^3$)/(248 $\mu g/m^3$) = 2.0%, so any source category with fractional contribution to the Calexico Grant PM air quality measurement greater than 2.0% is significant. The simplest way to conduct the analysis is to derive a day-specific Imperial County emission inventory (for example, by making adjustments to the seasonal average emission levels of Table 3.3 to account for day-specific information and conditions), and assume that each source category makes a contribution to the measured ambient $PM_{10}$ concentration that is proportional to its emission level.[34] Note that for both days

[33] Table 3.6 does not include exceedences of the standard for which ICAPCD has submitted reports to seek exclusion of the measurements from regulatory consideration on the basis that they were influenced by exceptional (high winds) events.

[34] This is simply an assumption of linearity. All other assumptions in this analysis are carefully outlined where they arise.

listed in Table 3.5 above, wind speeds were *very* low[35] and therefore emissions from windblown dust sources are expected to have been but a small fraction of the average numbers listed in Table 3.3. The fractional impact $FI_X$ of US emissions from a specific source category X at the Calexico Grant station is:

$$FI_X = \frac{a}{b+c} = \left(\frac{a}{b}\right) \cdot \frac{1}{1+c/b} = \left(\frac{a}{b}\right) \cdot \frac{1}{1+(FM^{-1}-1)^{-1}} \qquad (3.1)$$

where: *a* is the impact of US emissions from the source category X at the Grant station;
*b* is the sum of the impacts of all US emissions at the Grant station;
*c* is the sum of the impacts of all Mexicali emissions at the Grant station; and
$FM = c/(c+b)$ is the fractional impact of Mexicali emissions at the Grant station.

Of course, the US emissions that significantly impact the Grant station may only be a small subset of the total US emissions derived for the entire Imperial County. However, if that small subset is representative of the entire Imperial County Emission Inventory (in terms of *relative* contributions from all US source categories), then under the assumption of linearity mentioned above the ratio *a*/*b* can be simply derived from the day-specific emission inventory derived for the entire Imperial County.

Such an inventory for December 21, and December 25, 2006 is given in Table 3.6. Emission rates were obtained assuming that (i) the winter average emissions inventory of Table 3.3 is representative of non-windblown emissions for Imperial County on December 21 and 25, 2006, and (ii) day-specific windblown emissions for these days can be estimated as a fraction (in Table 3.6, the fraction is simply chosen to be 0%) of the seasonal average. Note that this latter assumption allows convenient analysis of the sensitivity of results to the estimated levels of windblown emissions.

The fractional impact of Mexicali emissions at the Grant station (i.e., the ratio *FM* in Equation 3.1) can be estimated for the days in Table 3.5 using an analysis of international PM transport across the US-Mexico border. Such an analysis, involving a number of complementary approaches, is presented in detail in Appendix V. Resulting best estimates of the Mexicali contribution to $PM_{10}$ air concentrations at the Grant station are *FM* = 71% for December 25, 2006, and 61% for December 21, 2006. We note that these contributions are consistent with the relative ratios of non-windblown $PM_{10}$ emissions for the Imperial County and the Mexicali municipalities according to best-available inventories.[36]

[35] For example, hourly wind speeds were < 4 mph and 24-hour average wind speeds were < 2 mph at meteorological stations in the Mexicali-Calexico area (see description of the December 21 and December 25 episodes in Appendix V)

[36] According to a 2008 inventory (*2005 Mexicali Emission Inventory*, Draft Final Report, October 2008; prepared by Eastern Research Group for the USEPA, the Secretaria de Proteccion al Ambiente de Baja California, and the Western Governors Association), the total level of non-windblown $PM_{10}$ emissions in Mexicali is 147 tpd. Comparison with Imperial County non-windblown $PM_{10}$ winter emission of 59 tpd yields a 71:29 ratio for Mexicali/Imperial County $PM_{10}$ emissions.

**Table 3.6 Estimated Imperial County $PM_{10}$ Emission Inventory for December 21 and December 25, 2006, and Predicted Contributions of Emissions to the Measured Calexico-Grant Exceedences by Source Category**

| Source Category | Emissions (tpd) assuming Windblown = 0 % average | % Contribution[a] on December 21 | % Contribution[a] on December 25 |
|---|---|---|---|
| Fuel Combustion | 0.35 | 0.2% | 0.2% |
| Waste Disposal | 0.00 | 0.0% | 0.0% |
| Cleaning/Surface Coatings | 0.00 | 0.0% | 0.0% |
| Petroleum Production/Marketing | 0.00 | 0.0% | 0.0% |
| Industrial Processes: | | | |
| Mineral Processes | 2.62 | 1.7% | 1.3% |
| Food/Agriculture | 0.17 | 0.1% | 0.1% |
| Solvent Evaporation | 0.00 | 0.0% | 0.0% |
| Res Fuel Combustion | 0.16 | 0.1% | 0.1% |
| Farming | | | |
| Tilling | 8.77 | 5.8% | 4.3% |
| Harvest | 0.01 | 0.0% | 0.0% |
| Cattle | 2.77 | 1.8% | 1.3% |
| Construction | 2.01 | 1.3% | 1.0% |
| Paved Road Dust | 3.30 | 2.2% | 1.6% |
| Entrained Unpaved Road Dust | | | |
| City/County | 14.58 | 9.6% | 7.1% |
| Canal | 17.54 | 11.5% | 8.6% |
| BLM/USFS | 0.79 | 0.5% | 0.4% |
| Farm | 0.80 | 0.5% | 0.4% |
| Windblown Dust: | | | |
| Open Areas | 0.00 | 0.0% | 0.0% |
| Unpaved Roads | 0.00 | 0.0% | 0.0% |
| Non-Pasture Ag Lands | 0.00 | 0.0% | 0.0% |
| Pasture | 0.00 | 0.0% | 0.0% |
| Fires | 0.00 | 0.0% | 0.0% |
| Waste Burning | 2.77 | 1.8% | 1.3% |
| Cooking | 0.06 | 0.0% | 0.0% |
| On-Road Mobile | 1.06 | 0.7% | 0.5% |
| Other Mobile | 0.95 | 0.6% | 0.5% |
| **Total IC Emissions (tpd)** | 59 | | |
| **Critical Fractional Contribution** | | 2.9% | 2.0% |

[a]Estimated fractional contributions of US emissions from the specified source categories to the December 21, 2006 or the December 25, 2006 $PM_{10}$ ambient concentrations at the Calexico Grant station, assuming that the fractional impact (*FM* in Equation 3.1) of Mexicali emissions were 61% on December 21 and 71% on December 25. Entries in pink indicate source categories with emissions above the significance level.

### 3.2.3 Classification of $PM_{10}$ Source Categories by Significance

The above approach was used to calculate, for each violation reported in Table 3.5, the fractional contribution to the violation of US emissions from each source category. The analysis included investigation of the sensitivity of results to the estimated level of windblown emissions on the days of interest. As examples, results are reported in Table 3.6 for analyses that assume windblown emissions on December 21 and December 25, 2006 were negligible. For both December 21, 2006 and December 25, 2006, we find that:

- At zero levels of windblown emissions, the only significant sources are "Tilling", and "Entrained Dust from Unpaved Roads;"
- Any increase in the assumed level of windblown emissions results in fractional contribution from all source categories (other than windblown sources) that are even lower (i.e., the sources are even further below the significance level); and
- For windblown sources, the only source category that becomes significant at non-zero levels of windblown emissions is "Open Areas" (as noted in Table 3.3, about 99% of emissions from these open areas are from non-populated areas such as dunes, grasslands, and other barren lands). This is true regardless of the assumed level of windblown emissions within the range of 0 to 100% of the seasonal average emission levels.

We note that results of the significance analysis are the same if the calculations are run using the annual average inventory rather than the winter average inventory (except that all sources other than unpaved roads are then even further below the significance threshold). Given that windblown emissions can be expected to be negligible at wind speeds as low as those observed on both December 21 and December 25, 2006, we conclude that the only $PM_{10}$ source categories that may have contributed significantly to non-attainment of the NAAQS in the 2006-2008 period are those reported in Table 3.7. Although BACM is not specifically required for non-significant sources, emissions from most source categories contributing >1 tpd to County's EI are addressed in the Imperial County $PM_{10}$ control program outlined by ICAPCD Rule 420 and amended ICAPCD Regulation VIII rules (as discussed in Chapter 4).

**Table 3.7 Significant Source Categories in 2006-2008**

| Source Category |
|---|
| Unpaved Roads – Entrained Dust |
| Farming – Tilling Dust |

### 3.2.4 Major $PM_{10}$ Stationary Sources

The previous analysis determined significance for categories representing the aggregated value of emissions from similar sources integrated over all of Imperial County. That analysis may not capture localized effects of major $PM_{10}$ stationary sources. (A major stationary source is defined in a serious nonattainment area for $PM_{10}$ as any source that has the potential to emit ≥70 tons per year of $PM_{10}$ or $PM_{10}$ precursors). Stationary sources are required to implement BACT to control $PM_{10}$ emissions (Rule 207, New and Modified Stationary Source Review), and they are also required to comply with 20% opacity (Rule 403, Opacity of Emissions). In addition, stationary sources will be required to mitigate fugitive dust emissions from access roads, construction activities, handling and transferring of Bulk Materials[37] and Track-Out and Carry-Out[38] according to the requirements of Regulation VIII. According to the 2005 stationary source emission inventory, there is only one $PM_{10}$ major stationary source that operates in Imperial County. This source, which accounted for $PM_{10}$ emissions of 155.9 tons/year in 2006, manufactures gypsum wallboard and related products, and is located approximately 20 miles west from the nearest $PM_{10}$ monitoring site. In addition, it underwent an expansion within the last ten years, during which BACT was implemented on its major sources. Its impact on Imperial County $PM_{10}$ monitors is not significant. Regardless, this source is required to comply with all the above mentioned requirements and regulations; thus it meets the requirement for BACM and BACT, regardless of significance.

[37] Bulk Material is any organic and/or inorganic material consisting of or containing particulate matter with ≥ 5% silt content, including materials such as earth, rock, silt, sediment, sand, gravel, soil, fill, aggregate, dirt, mud, or debris.

[38] Track-out/carry out refers to any Bulk Material that adhere to and agglomerate on the exterior surfaces of motor vehicles and/or equipment (including tires) that may then fall onto the pavement.

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# 4 CONTROL STRATEGIES AND IMPACT ANALYSIS

Reclassification of the Imperial County area to "serious" non-attainment in 2004 prompted the ICAPCD to begin the development of revised dust control rules at the BACM level. This process was begun ahead of a SIP development[39] for the purpose of accelerating BACM implementation and to meet the requirements and schedule of the District's NEAP[40] (approved in August 2005). In March 2004, the ICAPCD began a review and assessment of BACMs in other areas. Rule development, initiated at a stakeholder meeting in October 2004, was conducted in a public process that involved a local Technical Advisory Committee[41] as well as state and federal air agencies.[42] The process resulted in the adoption in November 2005 of revised Regulation VIII fugitive dust control measures,[43] which form the core of the Imperial County $PM_{10}$ control strategy. (Note that additional controls of $PM_{10}$ emissions in Imperial County are outlined in ICAPCD Rule 420 (beef feedlots) and Rule 710 (agricultural burning). These rules, which were most recently updated in October 2006 and August 2002, respectively, are SIP approved.)

This chapter provides a summary of the Regulation VIII fugitive dust rules. Provisions in these rules were effective January 2006.[44] Analyses of the control effectiveness/implementation costs of the rules (Section 4.2) and of the comparative stringency/applicability of the rules (relative to similar fugitive dust rules adopted in other $PM_{10}$ serious non-attainment areas, Section 4.3) are also presented.

## 4.1 Control Strategies

Only a brief description of the control measures of the Regulation VIII rules are presented in this section; a comprehensive description of the rules is available in Appendix IV.A.

### 4.1.1 Rule 801: Construction and Earthmoving Activities

*Purpose and Requirements***.** The purpose of Rule 801 is to reduce the amount of $PM_{10}$ that is emitted into the air as a result of construction and other earthmoving activities, such as land clearing, excavating, land leveling, grading, demolishing, etc. All persons who own or operate a construction site or who perform any earthmoving activities are required to limit Visible Dust Emissions (VDE) to 20% opacity by complying with the following measures:

- Phase work to minimize the amount of disturbed surface area at one time;
- Apply water or chemical stabilization;
- Construct and maintain wind barriers around the activity site;
- Restrict vehicular access to the area by fencing or signage;

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39 The USEPA did not take final action regarding non-attainment of the Imperial County area until December 2007.

40 Needed to support the exclusion of natural events from attainment determination, as allowed by USEPA's Natural Events Policy.

41 Including representatives from the Coalition of Labor and Business, the Farm Bureau, the Bureau of Land Management, Border Patrol, the IID, the ICPWD, as well as farmers and private industry stakeholders.

42 Meetings with the CARB and the USEPA were held on March 23, 2005 and on August 10, 2005. Informal comments were also submitted by the California Department of Transportation.

43 These rules apply to local sources.

44 The only exception is that control of County unpaved roads according to Rule 805 is phased over a 10 year period.

- Mitigate track out/carry out of Bulk Materials (defined in footnote on page 3-5) at the site in compliance with Rule 803; and
- Transport Bulk Material to, from, and around the site in compliance with Rule 802.

*Dust Control Plan*. Owners or operators of construction/earthmoving sites of ≥10 acres for residential developments and ≥5 acres for non-residential development are required to provide written notification to the ICAPCD 10 days prior to the commencement of activities, and to develop a dust control plan. The plan is expected to document the type and location of the project, the expected start and completion dates of the dust generating activities, the total area of land surface to be disturbed, the actual and potential sources of fugitive dust emissions on the site (including the location of Bulk Material handling and storage areas, paved and unpaved roads, entrances and exits where track out/carry out may occur, etc.), and all the fugitive dust control measures to be implemented before, during, and after any dust-generating activity.

### 4.1.2 Rule 802: Bulk Materials

The purpose of Rule 802 is to reduce the amount of $PM_{10}$ that is emitted into the air as a result of outdoor handling, storage, and transport of Bulk Material.[45] The rule requires implementation of the following controls in order to limit VDE to 20% opacity:

- For Bulk Material handling (e.g. stacking, loading, unloading, conveying, etc.), control measures include spraying with water, applying and maintaining chemical stabilization, and protecting from wind erosion by sheltering or enclosing;
- For Bulk Material storage, control measures include confinement of the material using a physical barrier (e.g. covering with tarps, plastic, etc.) and confinement by applying water or other chemical/organic stabilizers/suppressants;
- For Bulk Material transport/hauling, control measures include complete covering or enclosing of all haul trucks loads, proper selection and maintenance of the cargo compartments of haul trucks to ensure no spillage or loss of Bulk Materials from holes or openings in the compartment's floor, side, or tailgate, and adequate cleaning of the cargo compartment of all haul trucks at the delivery site after removal of Bulk Material.

### 4.1.3 Rule 803: Carry-Out and Track-Out

The purpose of Rule 803 is to reduce the amount of $PM_{10}$ that is entrained in the ambient air as a result of Track-Out and Carry-Out[46] occurring on paved public roads. The rule requires mitigation of the deposition of Bulk Material by tracking out/carrying out onto a paved road surface by implementation of the following controls:

- Any Bulk Material tracked out or carried out onto a paved road is to be cleaned up at the end of the workday (or immediately if within an urban area and Track-Out or Carry-Out extends a cumulative distance of ≥50 feet);

[45] Bulk Material is any organic and/or inorganic material consisting of or containing particulate matter with ≥ 5% silt content, including materials such as earth, rock, silt, sediment, sand, gravel, soil, fill, aggregate, dirt, mud, or debris.

[46] Track-out/carry out refers to any Bulk Material that adhere to and agglomerate on the exterior surfaces of motor vehicles and/or equipment (including tires) that may then fall onto the pavement.

- All sites with access to a paved road and with ≥150 Average Vehicle Trips per Day[47] (AVTD) are to (i) install one or more Track-Out prevention devices and (ii) apply and maintain paving, chemical stabilization, or gravel for a distance of ≥50 consecutive feet, at access points where unpaved roads adjoin paved roads.

### 4.1.4 Rule 804: Open Areas

The purpose of Rule 804 is to reduce the amount of $PM_{10}$ that is emitted from non-agricultural[48] open areas, such as vacant portions of residential or commercial lots. The rule applies to any open area of ≥0.5 acres within urban areas, or ≥3 acres within rural areas, that contain ≥1000 square feet of disturbed surface area. Rule 804 requires all persons who own or otherwise have jurisdiction over an open area to prevent vehicle use in the open area by posting "No Trespassing" signs or installing physical barriers to prevent trespassing. In addition, surface stabilization is required in open areas to limit VDE to 20% opacity by (i) applying water or dust suppressant(s) to all unvegetated areas, (ii) establishing vegetation on all previously disturbed areas, and/or (iii) paving, applying and maintaining gravel, or applying and maintaining chemical stabilizers/ suppressants.

### 4.1.5 Rule 805: Paved and Unpaved Roads

*Purpose and Requirements*. The purpose of Rule 805 is to reduce the amount of $PM_{10}$ that is windblown or entrained from new or modified paved roads, from unpaved traffic areas and all non-farm[49] unpaved roads, or from road construction or road modification projects in Imperial County. The rule requirements are the following:

- For unpaved haul/access roads, unpaved traffic areas larger than 1 acre and with ≥75 AVTD, unpaved roads with ≥50 AVTD, and canal roads with ≥20 AVTD, VDE must be limited to 20% opacity by applying at least one of the stabilization methods described below;
- Parties responsible for the use of canal roads with ≥20 AVTD are further required to implement one of a number of additional measures that include maintenance of canal bank surfaces, conversion of open canals to pipeline, installation of remote-control delivery gates to eliminate manual gate operation by maintenance personnel in vehicles along canal banks, or lining of canals to eliminate maintenance associated with the control of silt or weed;
- Construction of new unpaved roads is prohibited within any area with a population ≥500, except for temporary activity and if the road is stabilized to limit VDE to 20% opacity;
- New or modified paved roads must be constructed with curbing adjacent to the travel lanes, or with shoulders of width 2-6 feet (depending on the frequency of road usage) that are either paved or that meet the conditions of a stabilized surface.

*Stabilization Methods*. BACMs for Fugitive $PM_{10}$ dust emitted from unpaved roads include stabilization of the unpaved surfaces by (i) paving, (ii) applying chemical stabilization as directed by the product manufacturer, (iii) applying and maintaining gravel, recrushed/recycled asphalt or

[47] Or ≥20 AVTD by vehicles with three or more axles.
[48] Emissions from agricultural open areas are controlled by regulations outlined in Rule 806.
[49] Emissions from agricultural unpaved roads are controlled by regulations outlined in Rule 806.

other material of low silt content (<5%) to a depth of three or more inches, or (iv) wetting by applying water one or more times daily.

*Rule Implementation.* Rule 805 requires each city or county agency with primary responsibility for any existing unpaved road to provide to the ICAPCD (by March 31, 2006) a compliance plan and a compliance schedule demonstrating implementation of Rule 805 to all unpaved roads within its jurisdiction at an incremental rate of no less than 10% per fiscal year during the time period of 2006-2015. The plan identifies the control measures selected for each unpaved road segment, and report of yearly progress is to be made to the APCD by July 31 of each year until 2015.

### 4.1.6 Rule 806: Conservation Management Practices

*Purpose and Requirements*. The purpose of Rule 806 (effective since January 1, 2006) is to reduce the amount of $PM_{10}$ emitted from agricultural operations in Imperial County. The rule requires all owners or operators of Agricultural Operation Sites of ≥40 acres to implement in each Agricultural Parcel at least one Conservation Management Practices (CMP, described below) for each of the following categories: (i) land preparation and cultivation, (ii) harvest activities, (iii) unpaved roads, and (iv) unpaved traffic areas. Owners and operators are required to prepare, for each Agricultural Operation Site, a CMP Plan that must be made available to the ICAPCD upon request within 72 hours of the notice.

*Conservation Management Practices for Fugitive Dust ($PM_{10}$).* One or more of a number of listed CMPs must be implemented to satisfy the requirements of Rule 806. Owners or operators of Agricultural Operation Sites may develop and implement alternative CMPs, provided that the achieved $PM_{10}$ emission reductions are at least equivalent to those obtained from CMPs listed for the applicable operation. (An alternative CMP must receive approval by the ICAPCD after review of its technical merit before it may be included in a CMP Plan.) A subset of the allowed CMPs is reported below for each category covered by Rule 806; a comprehensive listing of the practices is available at the ICAPCD webpage.

- For the control of $PM_{10}$ emissions from land preparation and cultivation, owners or operators may implement alternate tilling, non-tillage or chemical tillage, chemigation/fertigation, covering of crops, land fallowing, mulching, or night farming;
- For the control of $PM_{10}$ emissions from harvesting, owners or operators may implement green chopping, hand harvesting, night harvesting, pre-harvesting soil preparation, no-burning, or equipment changes/technological improvements;
- For the control of $PM_{10}$ emissions from unpaved roads and unpaved traffic areas, owners or operators may implement graveling, paving, restricted access, speed limits, track-out control, or wind barriers.

### 4.1.7 Record of Control Implementation

Any person subject to the requirements of any one of the Regulation VIII rules is required to compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). The records are expected to document the type of treatment or control measure, extent of coverage, frequency of application, and date applied. Records must be kept for at least two years and be made available to the APCD upon request.

## 4.2 Impact Analysis and Cost Information

This section presents information about the emission reductions and implementation costs of the above Regulation VIII rules. (An analysis of cost-effectiveness is presented in Appendix IV.B of this SIP.) Cost estimates are based on the BACM analyses of the 1993 Imperial Valley $PM_{10}$ SIP[50] and the 2003 San Joaquin Valley $PM_{10}$ SIP,[51] on cost-information for $PM_{10}$ control measures compiled by the CARB,[52] and on information from Imperial County's Public Works Department (ICPWD). Note that all costs listed in this section are in 2003 dollars; current costs will likely be higher. For each adopted Regulation VIII rule, estimated emissions from sources covered by the rule, the fraction of those emissions that are subject to control requirements, the control factor for those controls, and the estimated emission reductions at full implementation are summarized in Table 4.1. The input information and assumptions of Table 4.1 are presented in the ensuing sections. The expected actual emission inventories for years 2006-2010, accounting for mitigation of pollution by implementation of Regulation VIII rules, are reported in Appendix IV.C.

**Table 4.1 Imperial County Regulation VIII Emission Reduction Summary (Based on the 2005 Annual Average Inventory)[a]**

| Regulation VIII Rule | Emissions (tpd) | Applicability | Control Factor | Reductions (tpd) |
|---|---|---|---|---|
| 801 (Construction) | 2.20 | 1.00 | 0.12 | 0.26 |
| 802 (Bulk Materials) | 2.63 | 0.10 | 0.5 | 0.13 |
| 803 (Track-out) | 3.38 | 0.184 | 0.6 | 0.37 |
| 804 (Open Areas) | 169.55 | - | - | 1.20 |
| Urban Open Areas | 0.01 | 1.00 | 0.7 | 0.01 |
| Other Open Areas[b] | 169.54 | 0.01 | 0.7 | 1.19 |
| 805 (Non-Farm Unpaved Roads)[c] | 32.40 | - | - | 8.73 |
| City/County Roads (Entrained) | 24.58 | 0.55 | 0.6 | 8.04 |
| City/County Roads (Windblown) | 7.82 | 0.15 | 0.6 | 0.69 |
| 805 (Paved Roads) | 3.38 | 0.01 | 0.8 | 0.03 |
| 806 (CMPs) | 25.29 | - | - | 5.40 |
| Farming–Tilling | 7.10 | 0.97 | 0.29 | 2.00 |
| Farming–Harvest | 0.01 | 0.97 | 0.41 | 0.01 |
| Farm Unpaved Roads (Entrained) | 1.35 | 0.97 | 0.23 | 0.30 |
| Farm Unpaved Roads (Windblown) | 6.01 | 0.97 | 0.19 | 1.11 |
| Non-Pasture Ag Lands (Windblown) | 10.81 | 0.97 | 0.19 | 1.99 |
| TOTAL | **235** | **-** | **-** | **16.12** |

[a]Actual emissions reductions in any year vary based on projected emissions for the year and on the implementation schedule of the adopted rules (refer to Appendix IV.C for the implementation schedule of Rule 805). Entries in this table assume full implementation. [b]Referring to grasslands, dunes, and other barren lands. [c]The IID has estimated that traffic on all canal roads is presently below the 20 ADVT threshold above which Rule 805 requirements apply. Nevertheless, IID is controlling $PM_{10}$ emissions from canal roads, although resulting reductions are not reported here.

50 ICAPCD, State Implementation Plan for $PM_{10}$ in the Imperial Valley, Final, September 28, 1993.

51 SJVAPCD, BACM/T and RACM/T Demonstration for Sources of $PM_{10}$ and $PM_{10}$ Precursors in the San Joaquin Valley Air Basin. SJVAPCD 2003 $PM_{10}$ SIP, Appendix G. April 2003.

52 CARB, Proposed List of Measures to Reduce Particulate Matter – $PM_{10}$ and $PM_{2.5}$, October 18, 2004

### 4.2.1 Rule 801: Construction

Rule 801 applies to any construction or other earth moving activity. Only construction at existing single family homes is exempt, so the rule applies to all new construction emissions. Rule 801 upgrades the RACM controls in the previous Rule 800[53] to BACM controls consistent with requirements in other serious nonattainment areas. Emission estimates for construction already include the effect of basic RACM controls, such as watering. BACM upgrades will require additional watering and/or stabilizing during and after construction activities. As noted in the South Coast 1997 AQMP, such BACM upgrades provide an additional control efficiency of approximately 12%, mostly from additional water and/or stabilizing during and after construction or other earthmoving activities. Overall reductions from Rule 801 are estimated at 0.26 tons/day.

Estimated costs[54] for certain construction-related controls include: additional use of water trucks ($3,152 per 40 acre project);[55] water sprinkler ($30 per acre); and dust control plans and related costs ($112/acre).[56] Actual costs for compliance are subject to the control options used by the site, the level of dust control currently practiced, and the local material and labor costs.

### 4.2.2 Rule 802: Bulk Materials

Rule 802 applies to the handling, storage, and transport of bulk materials. There is not an explicit inventory category for bulk materials, although it can be assumed that the majority of handling, storage, and transport of these materials occurs at mineral processing facilities and, to some extent, at construction sites. It is assumed that 10% of the emissions from mineral processing facilities are related to bulk materials. Wetting of bulk material piles at transfer points has an estimated control efficiency of 50%. (San Joaquin estimated a 56% to 81% control efficiency.) Emission reductions from transfer controls have not been estimated, but most mineral processing plants are operating under ICAPCD permits that require control at major transfer points. Overall reductions from Rule 802 are estimated at 0.13 tons/day.

Estimated costs[54] for Rule 802-related controls include: Truck covers ($900 per truck);[57] and three-sided enclosures ($830 per enclosure).[58] Actual costs for compliance are subject to the control options used by the site, the level of dust control currently practiced, and the local material and labor costs.

### 4.2.3 Rule 803: Carry-Out and Track-Out

Rule 803 applies to material carried or tracked out onto paved roadways. There is not an explicit inventory category for track-out, although it can be assumed that a given percentage of the silt loading on paved road surfaces is from track-out. The USEPA guidance[59] indicates that 46% of paved road deposition is attributable to mud and dirt carry-out. In addition, many permanent facilities (e.g., mineral processing facilities) currently implement track-out controls. It is assumed

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53 ENVIRON, *Draft Regulation VIII Rules and Rule Amendments*. Draft Final Technical Memorandum, Regulation VIII BACM Analysis, Appendix E, October 2005

54 Listed estimates are in 2003 nominal dollars.

55 SJAPCD, Final BACM Technological and Economic Feasibility Analysis, SJVAPCD 2003 $PM_{10}$ SIP, April 2003.

56 SCAQMD, Rule 403 Final Staff Report, September 1992.

57 ICAPCD, State Implementation Plan for $PM_{10}$ in the Imperial Valley, Final Draft, adopted September 28, 1993.

58 SJAPCD, Final BACM Technological and Economic Feasibility Analysis, SJVAPCD 2003 $PM_{10}$ SIP, April 2003.

59 USEPA, Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures, Document Number USEPA-450/2-92-004, Office of Air Quality Planning and Standards, 1992.

that 40% of the track-out emissions originate from construction and other temporary sites that have not previously been using track-out controls. Thus, 18% of paved road dust will be affected by new Rule 803 controls. Overall reductions from Rule 803 are estimated at 0.37 tons/day.

Estimated costs[60] for Rule 803-related controls include: paving access points ($6,000 to $8,500 per access point);[61] chemical stabilization ($984);[62] gravelling ($680 to $1,360 per year per access point);[63] and track-out control device ($3,500 to $4,800 plus maintenance costs).[64] Actual costs for compliance are subject to the control options used by the site, the level of dust control currently practiced, and the local material and labor costs.

### 4.2.4 Rule 804: Open Areas

Rule 804 applies to non-agricultural open areas more than 3 acres (rural) or 0.5 acres (urban). Review of Imperial County parcel data indicates that over 99.5% of parcels are greater than 3 acres in size. However, 77.5% of Imperial County is desert and/or scrubland, much of which is under the control of BLM or other federal agencies. BLM areas are exempt from Rule 804 to the extent that BLM can demonstrate that Rule 804 measures are prohibited by federal or state laws, regulations, or approved plans concerning wilderness preservation and species management and recovery. (However, BLM areas are subject to other general dust control plan requirements per Rule 800.F.5. $PM_{10}$ emission reductions arising from BLM control measures not mandated under Rule 804 are not reported here.) Agricultural areas, which cover 21% of Imperial County, are subject to Rule 806. For purposes of estimating emission reductions, it is assumed the applicability of Rule 804 is limited to open areas in close vicinity to urban areas, which represent 1.5% of Imperial County. Assuming that up to 2/3 of that area could be disturbed open lands, the applicability of Rule 804 is estimated to be 1% or less. The composite control factor is estimated to be 70% (based on control efficiencies cited in San Joaquin Valley's 2003 $PM_{10}$ SIP). Overall reductions from Rule 804 are estimated at 1.20 tons/day.

Estimated costs[60] for Rule 804-related controls include: dust suppressants ($3,340 per acre); and signage ($200 per sign).[65] Actual costs for compliance are subject to the control options used by the site, the level of dust control currently practiced, and the local material and labor costs.

### 4.2.5 Rule 805: Unpaved Roads and New or Modified Paved Roads

Rule 805 applies to new or modified paved roads (0.03 tpd reductions as shown in Table 4.1), as well as to unpaved city/county roads with >50 vehicles per day (199 miles according to the ICPWD; see Attachment A of Appendix III.A).[66] Windblown emissions from these roads account

[60] Listed estimates are in 2003 nominal dollars.

[61] ICAPCD, *State Implementation Plan for $PM_{10}$ in the Imperial Valley*, Final, adopted September 28, 1993, and SCAQMD, Rule 403 Final Staff Report, Appendix G, February 1997.

[62] SCAQMD, Rule 403 Final Staff Report, Appendix G, February 1997.

[63] SJVAPCD, Final BACM Technological and Economic Feasibility Analysis, SJVAPCD 2003 $PM_{10}$ SIP, April 2003.

[64] SJVAPCD, *Final BACM Technological and Economic Feasibility Analysis*, SJVAPCD 2003 $PM_{10}$ SIP, April 2003, and SCAQMD, Rule 403 Final Staff Report, Appendix G, February 1997

[65] SJVAPCD, Final BACM Technological and Economic Feasibility Analysis, SJVAPCD 2003 $PM_{10}$ SIP, April 2003.

[66] Rule 805 also applies to the following: (i) unpaved canal roads with >20 ADVT (current estimates from the IID are that traffic is presently below that threshold on all canal roads), (ii) paved and unpaved roads under the jurisdiction of the U.S. Border Patrol (except to the extent that Rule 805 measures are demonstrated to be inconsistent with Border Patrol authority and/or mission), and (iii) paved and unpaved roads under the jurisdiction of the BLM

for 15% of the total windblown emissions from city/county unpaved roads, and entrained emissions from these roads account for 55% of the total entrained emissions from city/county unpaved roads. Assuming a composite control factor of 60%,[67] reductions from unpaved roads obtained by implementation of Rule 805 are estimated at 8.73 tons/day.

The ICPWD has provided the following cost information[68] for the paving or gravelling of high ADT roads.[69,70] They estimate that it would cost $2,980 to apply dust suppressant to 1 mile of unpaved road, $8,950 to gravel, grade, compact, and water 1 mile of unpaved road, and $131,200 to pave 1 mile of unpaved road. The current budget for paved road maintenance is $2 million per year.

### 4.2.6 Rule 806: Conservation Management Practices

Rule 806 requires implementation of CMPs at all farms over 40 acres. According to information obtained from USDA/NRCS, parcels of size ≥ 40 acres account for approximately 96.95% of the area of all agricultural parcels in Imperial County. Thus, if emissions per acre of agricultural parcel are equal for all parcels (regardless of size), then Rule 806 applies to ~ 97% of total emissions from all agricultural parcels.[71] If we assume that the control factors achieved in the San Joaquin Valley (through implementation of Rule 4550) can be applied to Imperial County, overall reductions from Rule 806 are ~5.40 tons/day.

Costs for CMPs related to unpaved roads and traffic areas would be similar to control costs presented for Rule 803 (track-out controls) and Rule 805 (unpaved road/traffic area controls). Costs for CMPs for land preparation/cultivation and harvesting are highly dependent on crop type and the specific CMP option chosen.

## 4.3 BACM Determination

As explained in Section 3.2, significant source categories (Table 3.7) are required to be mitigated by BACM. Whether a control strategy meets this requirement is determined through comparative analysis. Determination of stringency for a control strategy involves consideration of both rule applicability and the effectiveness of imposed control methods. In general, a control strategy meets the “best available” criterion if the combination of its applicability and control effectiveness is as stringent as or more stringent than that of similar measures implemented

(except to the extent that Rule 804 measures are prohibited by federal or state laws, regulations, or approved plans concerning wilderness preservation and species management and recovery). $PM_{10}$ emission reductions achieved from general dust control programs (not mandated by Rule 805) undertaken by the IID, the U.S. Border Patrol, and the BLM are not reported here.

67 Assuming that graveling is chosen as the primary control option and based on the control efficiency cited in San Joaquin Valley’s Final Draft Staff Report for Regulation VIII (May 2004).

68 Listed estimates are in 2003 nominal dollars. Actual costs for compliance will depend on how the mitigations are implemented and on local material and labor costs.

69 ICPWD cost estimate of compliance, August 1, 2005.

70 ICPWD letter to ICAPCD, dated August 22, 2005.

71 Agricultural parcels, which are defined as portions of real property used for carrying out specific agricultural operations, include non-cultivated land such as roads, vehicle/equipment traffic areas, and facilities adjacent to the cropland. We note that the applicability of Rule 806 reported in the 2005 BACM document incorrectly relied on a “net” percentage of farmland that excluded the fraction of non-cropland within parcels of size ≥ 40 acres. In other words, the 90% applicability reported in that document corresponds to (the total area available for land preparation, cultivation, and harvest that belongs to agricultural parcels ≥ 40 acres) divided by (the total Imperial County area designated as farmland).

elsewhere, provided there exists such a feasible strategy given local conditions, needs, and resources.

The 2005 BACM analysis included a detailed evaluation[72] of the stringency of Imperial County's Regulation VIII rules by comparison to analogous control strategies adopted in the following $PM_{10}$ serious nonattainment areas: San Joaquin Valley, Maricopa County, Clark County, South Coast, and Coachella Valley areas. Although Regulation VIII rules mitigate emissions from a broad range of source categories, only sources determined to be significant according to the 5 $\mu g/m^3$ criterion (Section 3.2) are strictly subject to BACM requirements. We thus limit the scope of this section to a comparative analysis (Table 4.2) of rules directly relevant to the control of (i) entrained dust from unpaved roads (City/County and Canal), and (ii) dust generated from agricultural tilling (Table 3.7).

[72] ENVIRON, Draft Final Technical Memorandum, Regulation VIII BACM Analysis, Appendix C and Appendix D, October 2005.

**Table 4.2 Comparative Stringency of Controls for Significant Source Categories**

| Control Category | Imperial | San Joaquin Valley | South Coast | Maricopa County | Clark County | Discussion/Justification |
|---|---|---|---|---|---|---|
| Unpaved Roads: (Rule) Applicability | • (Rule 805 amended November 2005)<br>• All new unpaved roads in urban areas (Ref: R805, Section E.3)<br>• Unpaved haul/ access roads: All roads (Ref: R805, Section E.1)<br>• Unpaved roads: 50 or more average daily vehicle trips (Ref: R805, Section E.2)<br>• Canal roads: 20 or more ADT (Ref: R805, Section E.4) | • (Rule 8061 amended August 2004)<br>• All new unpaved roads in urban areas (Ref: R8061, Section 5.2.2)<br>• All unpaved road segments with ≥ 26 annual average vehicle daily trips must comply with requirements 5.2.1 of R8061 (pertaining to VDE emissions)<br>• All unpaved public roads in urban areas must comply with the paving requirements of R8061, Section 5.2.3.1.3 | • (Rule 403 amended June 2005; Rule 1186 amended July 2008)<br>• Required to meet the requirements of R403(d)(1) and R403(d)(3): all unpaved roads except (Ref: R403(g)(2)(B)):<br>a) Unpaved public alleys as defined in R1186; or<br>b) Service roads (i) < 50' wide at all points, (ii) within 25' of property line; and (iii) with < 20 VDT traffic.<br>• Subject to the requirements of R1186(5) (mandating surface treatment of unpaved roads): All public unpaved roads that have greater than the average VDT of all unpaved roads in the corresponding jurisdiction. | • (Rule 310.01 amended March 2008)<br>• 150 vehicles or more per day (Ref: R310.01, Section 302.7) | • (Rule 91 amended July 2004)<br>• All new unpaved roads/alleys in public thoroughfares; (Ref AQR Section 91.2.1.2)<br>• For existing unpaved roads (prior to June 22, 2000), the control measures apply to roads with 150 or more vehicles per day. | • Applicability of Imperial's rule for new unpaved roads is as stringent as the most stringent<br>• The ADT limit for unpaved city and county roads in Imperial's rule (50 ADT) is significantly lower than the 150 ADT limit in Maricopa and Clark Counties, but higher than the 26 ADT limit in San Joaquin. Nevertheless, the percentage of unpaved city/county roads to which the rule applies is 12% in the San Joaquin Valley (90 out of 750 miles),[73] compared to 15% in Imperial County (199 out of 1354 miles). Thus, the proposed Regulation VIII is the most stringent with respect to the rule applicability for existing unpaved city/county roads.<br>• Only Imperial County sets a separate, lower threshold for canal roads, and 20 ADT is below any other unpaved road threshold. Proposed Regulation VIII is the most stringent in this regard. |
| Unpaved Roads: Control | • For roads with 50 ADVT or more, limit VDE to 20% opacity and comply with | • For unpaved roads with ≥ 26 ADVT: establish a | • Except for exempt unpaved roads:<br>a) Prevent dust | • For roads with 150 vehicles or more per day, implement | • Implement one of the control measures listed | • Requirements of Imperial's rule for new unpaved roads is as stringent as the most stringent in other areas |

[73] EPA's Technical Support Document for the San Joaquin Valley, California 2003 $PM_{10}$ Plan and 2003 $PM_{10}$ Plan Amendments., p. 31, January 27, 2004.

**Table 4.2 Comparative Stringency of Controls for Significant Source Categories**

| Control Category | Imperial | San Joaquin Valley | South Coast | Maricopa County | Clark County | Discussion/Justification |
|---|---|---|---|---|---|---|
| Requirements | the requirements of a stabilized unpaved road surface by application and/or maintenance of at least one of the following control requirements (Ref: R805, Sections E.2, F.1):<br>a) Pave<br>b) Apply chemical stabilization<br>c) Apply and maintain gravel, asphalt, or other material of low silt content of a depth of 3 or more inches<br>d) Apply water one or more times daily<br>e) Implement permanent road closure<br>f) Restrict unauthorized vehicle access<br>g) Implement any other method that limits VDE to 20% opacity and meets the conditions of a stabilized unpaved road.<br>• Stabilization standards (Ref: R800, Section C.35 and Section C.10 of Appendix B)<br>a) Silt loading ≤ 0.33 oz/ft$^2$, or<br>b) Silt content ≤ 6%.<br>• Within an urban area, construction of a new unpaved road is | maximum speed limit of 25 mph (and post speed limit signs); limit VDE to 20% opacity; and comply with the requirements of a stabilized unpaved road by implementing at least one of the following control measures:<br>a) Apply water<br>b) Apply uniform layer of washed gravel<br>c) Apply chemical/ organic dust suppressant<br>d) Apply roadmix (cover material with crude-oil-containing soil)<br>e) Pave<br>f) Use any other approved method to limit VDE to 20% opacity and meets the condition of a stabilized unpaved road (Ref: R8061, Section 5.2.1)<br>• Stabilization standards (Ref: | emission that exceed 20% opacity (Ref: R403(d)(1)(B))<br>b) Prevent the occurrence of > 50 $\mu g/m^3$ $PM_{10}$ levels (in terms of the difference in upwind and downwind ambient air concentrations) (Ref: R403(d)(3))<br>• Annually treat unpaved public roads beginning in 1998 and continuing for each of 8 years thereafter by implementing one of the following (Ref: R1186(d)(4)):<br>a) Pave at least one mile with typical roadway material<br>b) Apply chemical stabilizers to at least two miles to maintain stabilized surface<br>c) Speed control (15 mph) on at least three | at least one of the following BACM (Ref: R310.01, Section 302.7.b):<br>a) Pave<br>b) Apply dust suppressants<br>c) Uniformly apply and maintain surface gravel<br>• BACM must meet the following stabilization standards (Ref: ibid, Section 302.7.a)<br>a) VDE ≤20% opacity, and<br>b) Silt loading ≤0.33 oz/ft$^2$ or<br>c) Silt content ≤6%<br>• Compliance schedule requires implementation on 5 miles (of unpaved roads with ≥150 vehicles/day) per year beginning in 2008 (Ref: ibid, Section 302.7.c.(3)(b)) | below to comply with the stabilization standard described below according to the following schedule (Ref: AQR Section 91.2.1.1):<br>a) 1/3 of unpaved roads with ≥150 VDT per year over a 3 year period<br>b) At the end of which period roads that are newly found to have ≥ 150 VDT are required to be brought into compliance within 365 days<br>• Applicable control measures are as follows:<br>a) Pave<br>b) Apply dust palliatives to meet stabilization standards<br>• Stabilization standards (Ref: ibid, 91.2.1.4):<br>a) VDE ≤20% opacity, and<br>b) Silt loading ≤0.33 oz/ft$^2$ or | • Imperial's R805 and rules in all areas require compliance with the 20% opacity standard; thus R805 is as stringent as the most stringent for this requirement.<br>• The stabilization standards in all areas except South Coast are identical (there is no stabilization standard in South Coast; as a substitute South Coast calls for a 50 $\mu g/m^3$ $PM_{10}$ maximum air quality impact). Imperial's R805 is as stringent as the most stringent for this requirement.<br>• Although the ICAPCD R805 list of controls options to achieve compliance with the stabilized surface requirement includes measures (such as watering) that are less stringent than those allowed in Clark and Maricopa County, the required results of controls (i.e., stabilization standards) are equivalent. Therefore, allowance of measures with lower control efficiencies (such as watering) as control options does not imply lower stringency.<br>• ICAPCD R805 does not include a requirement to pave all existing unpaved public roads in urban areas, such as is included in San Joaquin's rule. We note that EPA does not require that every component of a rule be as stringent as the most stringent in other areas, provided that all the elements of the |

[74] Federal Register Vol. 69, No. 102, p. 30019, May 26, 2004.
[75] Federal Register Vol. 59, p. 41998, 42013, August 16, 1994. See also EPA's Technical Support Document for the San Joaquin Valley, California 2003 $PM_{10}$ Plan and 2003 $PM_{10}$ Plan Amendments., p. 31-32, January 27, 2004.

**Table 4.2 Comparative Stringency of Controls for Significant Source Categories**

| Control Category | Imperial | San Joaquin Valley | South Coast | Maricopa County | Clark County | Discussion/Justification |
|---|---|---|---|---|---|---|
| | prohibited, unless it meets the definition of a Temporary Unpaved Road (Ref: R805, Section E.3)<br>• Cities and the County shall comply with Section E.2 by treating 10% of applicable roads per year over a 10 year schedule (Ref: R805, Section E.7)<br>• (Note: the requirements for canal roads are discussed in the next row: Unpaved Roads: Canal Roads) | R8011, Section 3.59 and Section 3.10 of Appendix B):<br>a) VDE ≤20% opacity, and<br>b) Silt loading ≤0.33 oz/ft$^2$ or<br>c) Silt content ≤6%.<br>• As alternative to the above, obtain Fugitive $PM_{10}$ Management Plan (Ref: ibid, Section 5.2.1, R8011, Section 7) with specific requirements.<br>• Within an urban area, construction of a new unpaved road is prohibited, unless it meets the definition of a temporary unpaved Road (Ref: R8061, Section 5.2.2.)<br>• Cities and the County shall pave an average of 20% per year of all existing unpaved public roads in urban areas form 2006 through 2010, to a cap of 5 miles per year per jurisdiction. A statement of financial hardship can be submitted if a jurisdiction cannot afford to meet the | miles of road surface | | c) Silt content ≤6%<br>• No new unpaved roads are to be constructed, except for temporary use (Ref: AQR Section 91.2.1.2)<br>• For unpaved roads with less than 150 VDT, maintain stabilized surface standards within 365 days of determination of non-stabilized surface (*Note: not a SIP measure*) | rule combine to provide adequate stringency.[74] (This allowance is to provide districts adequate flexibility in establishing rules particularly suited to their areas' specific situations.) In Imperial County, urban roads amount to only 8 miles and account for an insignificant fraction of the total emissions from city/county roads (refer to Table 3.2). Therefore, ICAPCD R805 does not specifically target existing unpaved urban roads.<br>• The schedule of implementation of controls to applicable unpaved roads (i.e., with ≥ 50 ADVT) is less demanding in Imperial County (i.e., a 10-year implementation schedule) that in other areas. Once again, we note that this does not imply that the rule lacks sufficient stringency. EPA's BACM guidance states that "where the economic feasibility of a measure, (e.g. road paving) depends on public funding, EPA will consider past funding of similar activities, as well as availability of funding sources to determine whether a good faith effort is being made to expeditiously implement available control measures."[75] Given the levels of funding available to the Imperial County Public Works Department to implement R805, the rule's implementation schedule is very aggressive and constitutes a good faith effort to stabilize the applicable roads in an expeditious manner.<br>• Thus, the elements of R805 combine to meet BACM stringency in that the rule requirements taken together are at least as stringent as the most stringent in other areas, |

**Table 4.2 Comparative Stringency of Controls for Significant Source Categories**

| Control Category | Imperial | San Joaquin Valley | South Coast | Maricopa County | Clark County | Discussion/Justification |
|---|---|---|---|---|---|---|
| | | requirements of this section (Ref R8061, Section 5.2.3) | | | | and in that the implementation schedule represents a good faith, best effort. |
| Unpaved Roads: Canal Roads | For Canal Roads with ≥20 ADT, limit VDE to 20% opacity, comply with the requirements of a stabilized unpaved road, and implement at least one of the following control measures (Ref: PR805, Sections E.4 and F.2):<br>a) Stock Triploid Grass carp in canals to reduce maintenance trips<br>b) Install remote control delivery gates<br>c) Implement Silt removal program to delay grading of spoil piles<br>d) Implement permanent road closure<br>e) Convert open canals to pipeline<br>f) Line canals to eliminate maintenance for silt/weed control<br>g) Initiate canal bank surface maintenance | (No requirements specified.) | (No requirements specified.) | (No requirements specified.) | (No requirements specified.) | Canal roads are unpaved roads used by the Imperial Irrigation District to maintain the irrigation canal network. San Joaquin has identified private canal roads in its inventory but does not anticipate that these private canal roads have traffic levels that meet the threshold triggering applicability of general unpaved road requirements; neither does San Joaquin specify additional canal road requirements such as the ones in ICAPCD R805. Thus, Imperial's requirements are the most stringent for this source. (We note that these requirements are in addition to the general unpaved road requirements for unpaved roads that canal roads are also subject to; see above.) |
| Agricultural Sources—Tilling: Conservation Management Practices (CMPs) | • (Rule 806 amended November 2005)<br>• CMPs requirements of R806 apply to commercial farms on sites ≥ 40 acres (Ref: R806, Section D.1)<br>• For land preparation and | • (Rule 4550 re-adopted August 2004)<br>• CMP requirements of R4550 apply to commercial farms on sites ≥100 acres | • (Rule 403 amended June 2005; South Coast Air Basin Rule 403 Agricultural Handbook revised December 1998; Coachella Valley | • (Rules 18-2-610 and 18-2-611 amendments effective November 2007)<br>• BMP requirements apply to commercial | (No requirements for this source) | • The adopted ICAPCD CMP requirements are similar to the requirements in San Joaquin Valley, Maricopa County and South Coast, and are directly based on the San Joaquin Valley requirements that were approved by EPA[77] as meeting the BACM requirements. |

[76] Guide to Agricultural $PM_{10}$ Best Management Practices, prepared by the Governor's Agricultural Best Management Practices Committee, 2nd Edition, 2008.

**Table 4.2 Comparative Stringency of Controls for Significant Source Categories**

| Control Category | Imperial | San Joaquin Valley | South Coast | Maricopa County | Clark County | Discussion/Justification |
|---|---|---|---|---|---|---|
| | cultivation, owners/operators are required to implement at least one of the following control measures (Ref: PR806, Section E.1):<br>a) Alternative till<br>b) Bed/row size spacing<br>c) Chemigation/ fertigation<br>d) Combined operations<br>e) Conservation irrigation<br>f) Conservation tillage<br>g) Cover crops<br>h) Equipment changes<br>i) Fallowing land<br>j) Integrated pest control<br>k) Mulching<br>l) Night farming;<br>m) Non tillage/chemical tillage<br>n) Organic practices<br>o) Precision farming<br>p) Transgenic crops | (Ref: R4550, Section 4.1.1)<br>• For land preparation and cultivation, owners/operators are required to implement at least one of the following control measures (Ref: R4550, List of CMPs):<br>a) Alternate till<br>b) Bed/row size spacing<br>c) Chemigation/ fertigation<br>d) Combined operations<br>e) Conservation irrigation<br>f) Conservation tillage<br>g) Cover crops<br>h) Equipment changes<br>i) Fallowing land<br>j) Floor management<br>k) Integrated pest control<br>l) Mulching<br>m) Night farming<br>n) Non tillage/ chemical tillage<br>o) Organic practices<br>p) Precision farming<br>q) Transgenic | Rule 403 Agricultural Handbook revised April 2004)<br>• For agricultural operations within the South Coast Air Basin, with combined disturbed surface area ≥10 acres, the standards of Rule 403 apply unless Best Management Practices (BMPs) as delineated in the Rule 403 Agricultural Handbook are implemented (Ref: R403(g)(1))<br>• BMPs for Active activities (i.e., agricultural activities involved in disturbing the soil) require that operators/producers cease activities during wind conditions greater than 25 mph and implement at least one of the following conservation practices (Ref:R403 South Coast Air Basin Agricultural Handbook, R403 Coachella Valley | farms on sites ≥10 acres (Ref: p. 6 of Guide to Agricultural $PM_{10}$ Best Management Practices.)[76]<br>• For tillage and harvest, commercial farmers are required to implement at least two of the following BMPs:<br>a) Chemical irrigation<br>b) Combined operations<br>c) Equipment modifications<br>d) Green chop<br>e) Integrated pest management<br>f) Limited activity during a high-wind event<br>g) Multi-year cropping<br>h) Cessation of night tilling<br>i) Planting based on soil moisture<br>j) Precision farming<br>k) Reduced harvest activity<br>l) Reduced tillage<br>m) Tillage based on soil moisture<br>n) Timing of tillage operation | | • Although South Coast and Maricopa rules apply to farm sizes ≥10 acres, in 2004 EPA approved[77] the San Joaquin rules as BACM, with applicability to sites ≥100 acres (which account for ~ 91% of farm land in the San Joaquin Valley). By comparison, ICAPCD R806 applying to farm sites ≥40 acres covers ~97% of farm land in Imperial County. Thus, the farm size limit in Imperial County meets BACM stringency with respect to rule applicability.<br>• San Joaquin, Maricopa, and South Coast rules involve detailed application submittal and/or review procedures for CMP forms in order to provide the APCD the oversight needed to ensure compliance at the BACM level. In Imperial County, farm site operators are required to maintain documentation of CMP implementation and to make it available to the ICAPCD. Section F.6 of Rule 806 gives the ICAPCD the authority to modify the CMP Plan forms as needed to require adequate specificity of CMP implementation from farm site operators. Thus, ICAPCD R806 allows the APCD unlimited oversight in verifying BACM compliance of CMP plans.<br>• The number of required CMPs/BMPs affecting "tilling emissions" are as follows:<br>a) 0-1 for San Joaquin, since the requirement for land preparation/ cultivation may be |

[77] Federal Register Vol. 69, No. 102, p.30035, May 26, 2004.

**Table 4.2 Comparative Stringency of Controls for Significant Source Categories**

| Control Category | Imperial | San Joaquin Valley | South Coast | Maricopa County | Clark County | Discussion/Justification |
|---|---|---|---|---|---|---|
| | | crops<br>r) Transplanting | Agricultural Handbook):<br>a) Soil moisture monitoring<br>b) Irrigation<br>c) Minimum tillage<br>d) Mulching | o) Transgenic crops | | satisfied by implementing a CMP that does not affect emissions from tilling activities<br>b) 0-1 for Imperial (following the same logic)<br>c) 0-2 for Maricopa<br>d) 2 for South Coast (including the practice to cease activities that disturb soil during wind conditions in excess of 25 mph)<br>• As noted above (see Footnote 74), EPA does not require that every component of a rule be as stringent as the most stringent in other areas, in order to provide districts adequate flexibility in establishing rules particularly suited to their areas' specific situations. Although the South Coast rule is more stringent in terms of the number of BMPs required (see above bullet), in 2004 EPA nevertheless found[77] that San Joaquin R4550 met BACM stringency. Given the equivalence of ICAPCD R806 and San Joaquin R4550, and that the pertinent requirements of the San Joaquin and South Coast rules have not changed since EPA's 2004 finding, it can be concluded that R806 meets BACM requirements as it relates to the tilling source of emissions. |

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# 5 Attainment Demonstration

## 5.1 Introduction

The central requirement of a SIP is to outline a plan that provides for attainment of the standard as expeditiously as possible (in the present case, a minimum of 5% yearly reductions of emissions is required). Traditionally, attainment for a specific area is demonstrated through modeling and is based on the highest exceedence of the standard in the relevant time period of analysis (the design value).[78] Based on the March 2007 USEPA final rule[79] giving states the authority to exclude from regulatory determinations air quality monitoring data related to qualifying exceptional events (such as, e.g., high wind natural events), the September 2, 2006, April 12, 2007, and June 5, 2007 exceedences were excluded from consideration in the present attainment demonstration.[80] As a result, the design value for the present SIP is equal to the 248 $\mu g/m^3$ value measured at the Calexico Grant station on December 25, 2006.

In international areas, the SIP attainment requirements are designed so that only attainment "but-for" international emissions is required. USEPA guidelines[81] state that "for $PM_{10}$ nonattainment areas, section 179B(a) [of the CAA] provides that EPA must approve [a $PM_{10}$] SIP if (i) the SIP meets all the applicable requirements under the Act other than a requirement that such plan or revision demonstrate attainment and maintenance of the $PM_{10}$ NAAQS by the applicable attainment date, and (ii) the State demonstrates to EPA's satisfaction that the SIP would be adequate to attain and maintain the $PM_{10}$ NAAQS by the attainment date but for emissions emanating from outside the US."

An attainment demonstration for the present Imperial County 2009 $PM_{10}$ SIP therefore requires analyses to determine the contribution of Mexican emissions to the Imperial County exceedences of Table 2.1. Such analyses, which are documented in detail in Appendix V and summarized here in Section 5.2, demonstrate that ambient air quality on December 21, 2006 and December 25, 2006 would have attained the 24-hour $PM_{10}$ NAAQS in the absence of impact contributions from Mexicali emissions. The consequences of these findings for the present attainment demonstration are discussed in Section 5.3.

## 5.2 Analyses of Transport Episodes

Excluding exceedences due to high winds exceptional events, all exceedences of the 24-hour $PM_{10}$ federal standard recorded at Imperial County monitors between the years 2006 and 2008 occurred at the Calexico-Grant station (Table 2.1). This station is located less than 1 mile north of the Mexican border, against which lies the ~¾ million city of Mexicali (Figure 5.1). The potential for activity-related PM emissions is significantly higher in Mexicali than in Calexico,

[78] The design value for a nonattainment pollutant is a baseline ambient concentration used in an attainment analysis to determine whether projected emissions reductions are sufficient to reduce the pollutant's concentrations to levels that meet federal or state standards.

[79] USEPA, 40 CFR Parts 50 and 51, *Treatment of Data Influenced by Exceptional Events; Final Rule*, Federal Register, Vol. 72, No. 55, March 22, 2007, p. 13560

[80] For these days, documentation satisfying the requirements of 40 CFR Parts 50 and 51 is available from the ICAPCD at *http://www.imperialcounty.net/AirPollution/Web%20Pages/2009%20March%20Natural%20Events.htm*.

[81] State Implementation Plans for Serious $PM_{10}$ Nonattainment Areas, and Attainment Date Waivers for $PM_{10}$ Nonattainment Areas Generally; Addendum to the General Preamble for the Implementation of Title I of the Clear Air Act Amendments of 1990; *Federal Register*, August 16, 1994, p. 42000

judging by the enormously larger population and mileage of unpaved roads in Mexicali. Research and analyses indicate that Mexicali emissions can have high short-range impacts on US air quality north of the border. Historical trends have demonstrated that these impacts are highest when (i) stagnant atmospheric conditions result in low dispersion of pollution, and/or (ii) emission levels in Mexicali are particularly high. Under these conditions, $PM_{10}$ air concentration in Mexicali can reach very elevated levels, and Mexicali $PM_{10}$ "overflows" into Calexico (this cross-border transport is of course greatly facilitated if light winds have a southerly direction). In this section, we first introduce the tools used to analyze, both qualitatively and quantitatively, the impact of Mexican emissions on near-border Calexico stations, and then summarize the results of transport analyses for each of the Calexico exceedences recorded on December 21, 2006, and December 25, 2006.

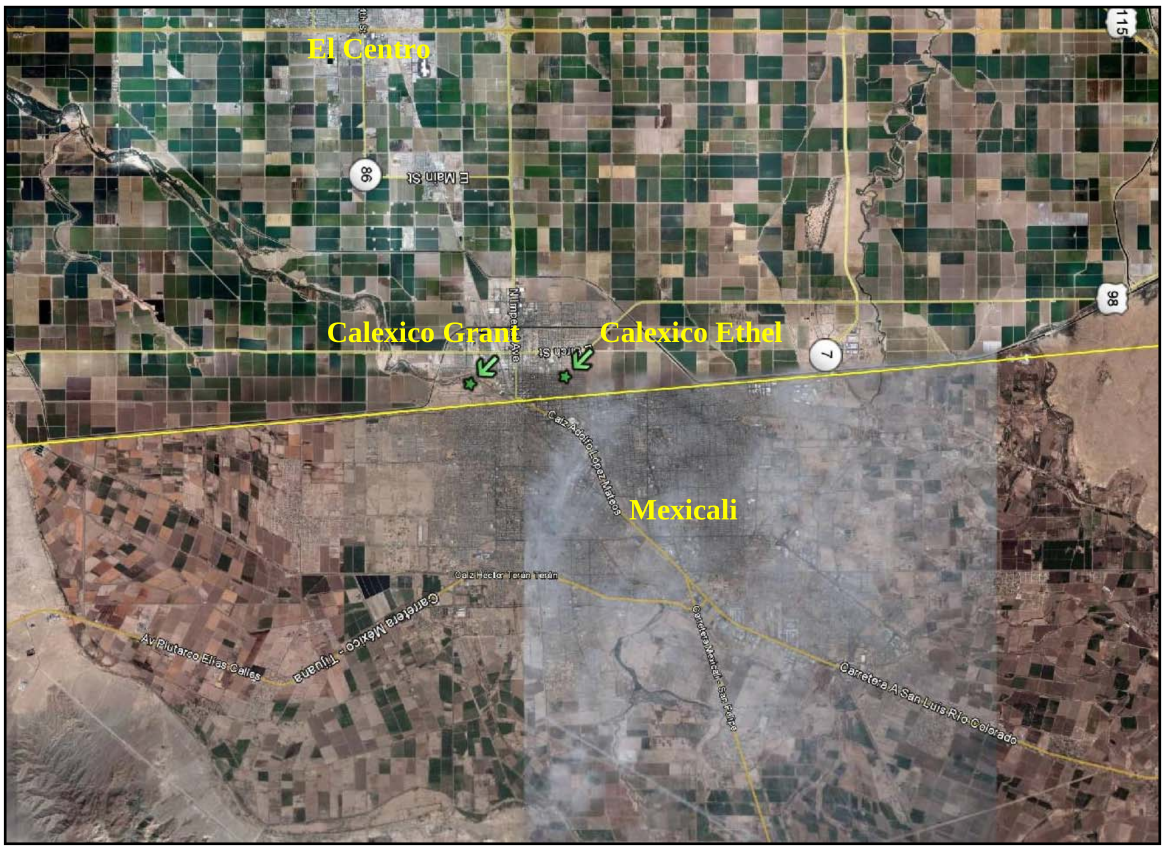


**Figure 5.1** Satellite image showing the proximity and relative sizes of Calexico and Mexicali (an interactive map of the area is available online at http://wikimapia.org/#lat=32.6347491&lon=-115.4796982&z=12&l=0&m=a&v=2). The green arrows represent the location of $PM_{10}$ monitors.

### 5.2.1 Methods of Analysis

For $PM_{10}$ nonattainment areas, USEPA guidance[82] describes the following 5 approaches to demonstrate "but-for" attainment in State Implementation Plans involving international border areas:

- "Evaluate and quantify…changes in monitored $PM_{10}$ concentrations [in the U.S., near the border] with predominant wind direction;"
- "Demonstrate that local U.S. emissions … [do] not cause the NAAQS to be exceeded;"
- "Analyze ambient sample filters for specific types of particles emanating from across the border;"
- "Inventory…sources on both sides of the border and compare the magnitude of $PM_{10}$ emissions originating within the US to those emanating from outside the US;" and
- "Perform air dispersion and/or receptor modeling to quantify the relative impacts [of US and international sources]."

The guidance further instructs that states may use any number of these approaches, or other techniques, "depending on their feasibility and applicability, to evaluate the impact of emissions emanating from outside the US on the nonattainment area." The following paragraphs outline our efforts to implement the 5 suggested approaches, to the extent possible, to the Calexico/Mexicali international area; a full description is provided in Section 2 of Appendix V.

*Approach I.* Our first approach involves statistical analyses that rely on meteorology and $PM_{10}$ measurements for days with characteristics similar to those on exceedence days of interest in order to predict the impact of Mexican emissions at Calexico monitors on the days of interest. The approach assumed that atmospheric dispersion, wind direction, and Mexicali emissions (using 24-hour average wind speed, fractional cross-border air transport from the south, and Mexicali $PM_{10}$ concentrations as indicators) were the primary determinants of the impact of Mexican emissions on Calexico air quality. The following procedure was used to get a conservative estimate of the expected impact of pollution coming from Mexico at the Calexico-Grant station on any specified day:

- A subset of historical days with characteristics similar to the specific day of interest was selected;
- For each of the Brawley, El Centro, Niland, and Westmorland stations, we approximated the expected value of the difference ($PM_{10}$ at Grant) – ($PM_{10}$ at non-Calexico station) for the specific day of interest as the historical average of these differences for the days with similar characteristics;
- For each of the Brawley, El Centro, Niland, and Westmorland stations, we determined the expected value of the difference ($PM_{10}$ at Grant) – ($PM_{10}$ at non-Calexico station) for days similar to the specific day of interest, except with no southerly flow; and
- The results of steps 2 and 3 were subtracted.

[82] State implementation plans for serious $PM_{10}$ nonattainment areas, and attainment date waivers for $PM_{10}$ nonattainment areas generally; Addendum to the general preamble for the implementation of Title I of the Clean Air Act Amendments of 1990, Federal Register, Vol. 59, No. 157, Tuesday, August 16, 1994, p. 41998

The results of the second and third steps are estimates of the expected “excess” $PM_{10}$ concentration, for the day of interest, at the Calexico Grant station (relative to the $PM_{10}$ concentration at a reference non-Calexico station) due to the impact of both US and Mexican emissions (step 2) and due to the impact of US emissions alone (step 3). Hence, the differences are estimates of the expected impact of Mexican pollution on ambient air quality at the Calexico Grant station on the specific day of interest.

*Approach II.* As a complementary analysis to Approach I, our second quantitative approach relies on statistical measures to predict the impact of US emissions alone at Calexico monitors, based on air quality at nearby Imperial County stations and in the light of historical trends in same-day ambient $PM_{10}$ concentrations throughout the County. Motivated by arguments that air qualities at Calexico and at proximate Imperial County stations are impacted by similar levels of US emissions and by comparable meteorology, we test the hypothesis that same-day ambient $PM_{10}$ concentrations at Imperial County stations are correlated (and indeed comparable in value). The analysis reveals that $PM_{10}$ concentrations at any one of the El Centro, Brawley, Westmorland, and Niland stations can be predicted with <25 $\mu g/m^3$ error in >95% of cases (<40 $\mu g/m^3$ error in >99% of cases) using same-day measurements at nearby Imperial County stations. Although correlations between Calexico and non-Calexico $PM_{10}$ concentrations is diminished by the high variability in the impact of Mexicali emissions, the analysis argues that $PM_{10}$ concentrations at Calexico stations *“but-for” Mexican emissions* could likewise be predicted with <40 $\mu g/m^3$ error in >99% of cases using same-day measurements at the El Centro and Westmorland stations.

*Approach III.* USEPA guidelines suggest analysis of ambient sample filters for specific types of particles emanating from across the border. The most common method of source apportionment relies on elemental analysis[83] of filter samples. This is referred to as receptor modeling and it applies chemical mass balances to apportion observed levels of pollutants in a sample to several independent sources of known emission characteristics (referring to the composition of emissions from these sources).

A 1992-1993 Cross Border Transport Study performed receptor modeling for analysis of the particles collected in areas within Imperial County where exceedences had been recorded.[84] The implications of the findings of that study for international apportionment of $PM_{10}$ in the present investigation are the following:

- The depth of intrusion of lead[85] from Mexicali into Imperial County indicates that the impacts of Mexicali activity-related PM are measurable up to 20 km north of Mexicali. Given that the distance between Calexico stations and the US-Mexicali border is <1 mile, the potential impacts of Mexicali emissions at Calexico monitors under conditions favorable to stagnation and cross-border transport are very significant.

[83] That is, analysis of the concentrations of chemical constituents, such as nitrate, chloride, or sulfur.
[84] Chow J.C., Watson J.G., Green C.M., Lowenthal D.H., Bates B., Oslund W., Torres G., Cross-border transport and spatial variability of suspended particles in Mexicali and California’s Imperial Valley, *Atmospheric Environment*, **34**, 2000, p. 1833-1843.
[85] While there was no source of lead in Imperial County, leaded gasoline was still in use in Mexicali at the time of the study.

- Although it is possible to apportion ambient $PM_{10}$ in both Calexico and Mexicali to source categories such as geological dust or vegetative burning, the study was not able to apportion ambient $PM_{10}$ to source sub-categories classified by international origin. In other words, the profiles of the various source categories contributing significantly to ambient $PM_{10}$ concentration do not differ enough to accurately predict what portion of the $PM_{10}$ captured on Imperial County filters originates in Mexico. (The same finding was confirmed in another study led by CARB in 2001.)[86] Given the very limited use that filter analysis can serve in apportioning ambient PM to Mexicali versus Imperial County sources, chemical analyses of filter loadings is not part of the weight of evidence in the present attainment demonstration (and it was therefore not conducted for the December 21, 2006 and December 25, 2006 samples).

*Approach IV.* USEPA guidelines also suggest the comparison of $PM_{10}$ emission levels on both sides of the international border to determine the relative impact of international and domestic sources on air quality at the border. Given that wind speeds were very low in the Calexico/Mexicali area on December 21 and 25, 2006, windblown emission sources are not expected to have contributed significantly to ambient levels of $PM_{10}$ on these days. Because emissions from the remaining source categories are related to human activity, in the absence of an accurate gridded emission inventory for the Mexicali area[87] we rely on population as a metric to estimate the relative magnitude of cumulative emissions originating from US and international sources.

Comparison of population and total PM emissions (excluding windblown) for Imperial County and the Mexicali Municipality[87] lead to a Mexicali:Imperial per capita emission ratio of 1:2.2 (Table V.15 of Appendix V). Using that number and assuming that the relative impacts of US:Mexican emissions at the Calexico-Grant station reflect the relative proportion of US:Mexican populations within a disc of radius $R$ = 2-4 miles centered at the station, the contributions of international emissions to the December 21 and 25, 2006 Grant exceedences are in the range of 65% to 80% (Table V.16 of Appendix V).

*Approach V.* The fifth example of analysis suggested by EPA guidelines involves air dispersion modeling to quantify the relative impacts of international and domestic sources on the nonattainment area. Unfortunately, this approach has found limited success (refer to a 2001 modeling study[88] conducted by ENVIRON for the ICAPCD) for the Calexico/Mexicali international area due to the lack of an adequate gridded emission inventory for Mexicali. For this reason, no dispersion modeling was conducted to supplement the transport analyses presented in the present SIP.

We found, however, that valuable insight could be derived in an analysis that relies on the results of the aforementioned 2001 dispersion modeling study.[88] This study considered US

[86] As part of the year 2001 Imperial County SIP development, CARB performed chemical mass balance receptor modeling using 1995-1996 PM data and new source profiles for U.S. versus Mexico gasoline combustion sources (which differed mainly in sulfur contents). Even using the new source profiles, the difference in the relative contributions between gasoline combustion sources in the United States and Mexico could not be identified.

[87] A new gridded inventory of the emissions of several air pollutants in Mexicali is in progress (2005 Mexicali Emission Inventory, Draft Final Report, Eastern Research Group, Inc., February 27, 2009).

[88] Imperial County $PM_{10}$ Attainment Demonstration, ENVIRON, July 2001, included as Attachment D to Appendix V.

emissions alone to assess the maximum impact of domestic emissions on $PM_{10}$ ambient concentrations in Imperial County in 1992-1994 and 1999. Given that (i) the total levels of emissions on December 21, 2006 and December 25, 2006 are estimated to be significantly lower than the minimum level of daily emissions used in the 2001 modeling (> 147 tpd of $PM_{10}$ for winter days), and (ii) that the 2001 modeling did not predict any exceedences using 4-years of meteorological data, we argue that new modeling (conducted in a manner consistent with the 2001 analysis) for the 2 days above would also predict that US emissions alone would not have been sufficient to cause exceedences of the 24-hour $PM_{10}$ NAAQS on these days.

### 5.2.2 Analysis for December 21, 2006

*Description of the Episode.* On December 21, 2006, the Calexico Grant SSI monitor recorded a 24-hour $PM_{10}$ measurement of 171 μg/m$^3$. Available SSI and BAM monitor measurements available at non-Calexico Imperial County stations were 3-7 times lower (in the range of 25-55 μg/m$^3$), indicating that there was not a county-wide air quality problem on that day. Although the only information about Mexicali air quality was a 10-hour BAM reading of 262 μg/m$^3$ at the UABC monitor, available measurements reveal that $PM_{10}$ air quality levels in Mexicali were elevated just two days earlier (in the range of 115 and 286 μg/m$^3$ at the Conalep, Cobach, and Progresso stations). Overall, $PM_{10}$ measurements throughout the region showed a strong concentration gradient from south to north and are evidence of $PM_{10}$ transport from Mexico into Imperial County.

Surface hourly wind data collected in both Calexico and Mexicali indicate that stagnant atmospheric conditions and light winds of variable (but predominantly southerly) direction were prevalent on that day, providing ideal conditions for low dispersion and accumulation of $PM_{10}$ pollution in Mexicali, and cross-border transport of elevated levels of $PM_{10}$ from Mexical into Calexico:

- The 24-hour average wind speeds recorded in Calexico were ≤1.1 knots, and similar low-speed winds were recorded in Mexicali;
- A wind rose of hourly surface wind speeds and directions measured at Calexico Grant on December 21, 2006 shows that the prevailing wind directions on that day were SW, W, and SE. Winds of direction with a northerly component only accounted for a total of 6 hours, while winds having the potential to carry emissions from Mexico into Imperial County[89] prevailed for 15 hours (>60% of the day).

*Quantitative Analyses.* Meteorological conditions in Calexico on December 21, 2006 were conducive to very low dispersion (the average and maximum wind speeds at the Calexico-Grant station were 0.4 knots and 2 knots, respectively), and to much transport from Mexico (85% of the cross-border air flow at Grant was from the south). Because the number of days with meteorological conditions similar to those of December 21, 2006 is extremely small, we chose to analyze this exceedence in the context of the larger subset of days with 24-hr wind speeds at Grant <1.0 knots. Relative to other days within that subset (for which the average Mexicali contribution to $PM_{10}$ ambient concentration at Grant is in the range of 50-55 μg/m$^3$), we found that (i) wind speeds were comparatively low, (ii) southerly flow at the Grant station was

[89] Of direction ranging from 85 to 265 (E to WSW) based on the location of the border.

comparatively more pronounced, and (iii) $PM_{10}$ concentration at the Mexicali UABC station (the only available data point) was comparatively high. All these factors would have caused the impact of $PM_{10}$ pollution from Mexicali on December 21, 2006 to have been significantly higher than the 50-55 μg/m$^3$ group average. Therefore, the expected air quality at Calexico Grant for December 21, 2006 "but for" international sources of pollution is (by subtraction of 50-55 μg/m$^3$ from the 171 μg/m$^3$ observed value) significantly lower than 116-121 μg/m$^3$, and hence in attainment of the federal standard.

The $PM_{10}$ air quality in Calexico that would have occurred in the absence of Mexicali pollution (i.e., as a result of US emissions alone) was also estimated based on observed same-day $PM_{10}$ concentrations at nearby US stations, by relying on the existence of correlations in air quality measurements at geographically proximal locations. Using the only available same-day measurement of 54 μg/m$^3$ at El Centro, this method predicted that the $PM_{10}$ concentration at the Calexico-Grant station on December 21, 2006 *as a result of US emissions alone* would have been 66 ± 50 μg/m$^3$ (so up to 116 μg/m$^3$). This result is also consistent with attainment of the 24-hour $PM_{10}$ NAAQS at Calexico Grant on December 21, 2006 in the absence international pollution from Mexico.

*Additional Evidence*. Unusually high levels of $PM_{10}$ are emitted every year in Mexico on the 9 consecutive nights of "Las Posadas" (December 16$^{th}$ through December 24$^{th}$). Thousands throughout Mexicali in rural and urban communities participate in religious festivals celebrated by dinner parties involving piñatas, heavy use of fireworks, and bonfires generated by the combustion of wood, coal, and tires. These activities, combined with the seasonally heavy vehicular traffic created by the Christmas season on unpaved roads in Mexicali, are major contributors to elevated $PM_{10}$ emission levels in the Mexicali/Calexico area. When stagnant and/or light southerly wind conditions prevail, such as those experienced on December 21, 2006, these $PM_{10}$ emissions accumulate to reach levels capable of causing high impact at neighboring Calexico monitors. Diminished visibility and breathing difficulty attributed to $PM_{10}$ pollution in Mexicali were pronounced enough to receive attention in Mexicali's *La Crónica* newspaper on December 23, 2006.

*Conclusion*. Quantitative statistical analyses independently confirm that the impact of US emissions alone at the Calexico Grant station would not have been sufficient to cause an exceedence of the NAAQS on December 21, 2006. This quantitative result is supported by the following evidence and qualitative analyses:

- Unusually high levels of $PM_{10}$ are emitted every year in Mexico between December 16 and 24 as a result of firework shows, a high volume of vehicular traffic, and of the burning of wood, coal and trash. On December 21 in 2006, stagnant and low-wind conditions facilitated the accumulation of $PM_{10}$ in ambient air in Mexicali;
- Comparative analysis of Calexico vs. Mexicali emission inventories supports high impacts of Mexicali emissions under suitable meteorological conditions (Approach IV); and
- Information derived from previous modeling analyses adds further evidence to support that US emissions alone would not cause exceedences at Calexico stations (Approach V).

### 5.2.3 Analysis for December 25, 2006

*Description of the Episode.* On December 25, 2006, monitors in Calexico recorded 24-hour $PM_{10}$ measurements of 248 µg/m$^3$ and 110 µg/m$^3$ at the Grant station and Ethel stations, respectively. Available SSI and BAM monitor measurements available at non-Calexico Imperial County stations on that day were in the range of 12-27 µg/m$^3$, indicating that there was not a county-wide air quality problem. Instead, remarkably high $PM_{10}$ ambient air quality measurements recorded in Mexicali on that day point to cross-border transport of $PM_{10}$ from Mexicali into Calexico: the average of $PM_{10}$ concentrations at Mexicali stations was 344 µg/m$^3$, with a maximum at the Progresso station >85% higher than the highest Imperial County measurement at Calexico-Grant, and a minimum at the UABC station 60% higher than the 24-hour $PM_{10}$ federal standard.

Surface hourly wind data collected in both Calexico and Mexicali indicate that very stagnant atmospheric conditions and light winds of variable direction were prevalent on that day, providing ideal conditions for low dispersion and accumulation of $PM_{10}$ pollution in Mexicali, and for cross-border transport of elevated levels of $PM_{10}$ from Mexical into Calexico:

- The 24-hour average wind speeds recorded in Calexico were ≤1.4 knots, and similar low-speed winds were recorded in Mexicali;
- A wind rose of hourly surface wind speeds and directions measured at Calexico Grant on December 21, 2006 shows that the prevailing wind directions on that day were ESE and W, although wind direction varied greatly. The low wind speeds and varying wind direction allowed $PM_{10}$ emissions to drift from Mexicali to other areas, including Calexico.

*Quantitative Analyses.* Meteorological conditions on December 25, 2006 were conducive to extremely low dispersion (the average and maximum wind speeds at the Grant station were 0.5 knots and 1 knots, respectively), and to considerable transport from Mexico (41% of the cross-border air flow at Grant was from the south). Because the number of days with meteorological conditions similar to those of December 25, 2006 is extremely small, we chose to analyze this exceedence in the context of the larger subset of days with 24-hr wind speeds at Grant <1.0 knots (as was done for the December 21, 2006 analysis). Relative to other days within that subset, we found that (i) wind speeds were comparatively low, (ii) southerly flow at the Grant station was comparatively high (in the 80% percentile), and (iii) $PM_{10}$ concentrations at all Mexicali stations were extreme. All these factors would have caused the impact of $PM_{10}$ pollution from Mexicali on December 25, 2006 to have been significantly higher than the subset average: an estimate of 150-200 µg/m$^3$ was obtained using correlations based on Mexicali air quality for days with comparable meteorology. Our best estimate of the air quality at Calexico Grant on December 25, 2006 "but for" international sources of pollution is therefore (by subtraction of 150-200 µg/m$^3$ from the 248 µg/m$^3$ observed value) <100 µg/m$^3$, and hence in attainment of the federal standard.

The $PM_{10}$ air quality in Calexico that would have occurred in the absence of Mexicali pollution (i.e., as a result of US emissions alone) was also estimated based on observed same-day $PM_{10}$ concentrations at nearby US stations, by relying on the existence of correlations in air quality measurements at geographically proximal locations. Using same-day measurements of 24 and 27 µg/m$^3$ at El Centro and Brawley, this method predicted that the $PM_{10}$ concentration at the

Calexico-Grant station on December 21, 2006 *as a result of US emissions alone* would have been 31 ± 40 µg/m$^3$ (so up to 71 µg/m$^3$). This result is also consistent with attainment of the 24-hour $PM_{10}$ NAAQS at Calexico Grant on December 25, 2006 in the absence of international pollution from Mexico.

*Additional Evidence*. As described in Section 5.2.2, unusually high levels of $PM_{10}$ are emitted every year in Mexico on the 9 consecutive nights of "Las Posadas" (December 16$^{th}$ through December 24$^{th}$). Finale accentuations in the celebrations on Christmas Eve and Christmas Day lead to extreme levels of PM emissions from the use of legal/illegal fireworks, the burning of wood, coal, and tires, and from extreme levels of activity on unpaved roads.[90] On those days in 2006, stagnant atmospheric conditions enabled the accumulation of $PM_{10}$ pollution in the Mexicali airshed, leading to the extreme $PM_{10}$ concentrations recorded by all Mexicali monitors.

*Conclusion*. Quantitative statistical analyses independently confirm that the impact of US emissions alone at the Calexico Grant station would not have been sufficient to cause an exceedence of the NAAQS on December 25, 2006. This quantitative result is supported by the following evidence and qualitative analyses:

- Unusually high levels of $PM_{10}$ are emitted every year in Mexico on Christmas Eve and Christmas Day as a result of firework activity, a high volume of activity on paved/unpaved roads, and of the burning of wood, coal and trash. On these days in 2006, stagnant and low-wind conditions facilitated the accumulation of $PM_{10}$ in ambient air in Mexicali;
- Comparative analysis of Calexico vs. Mexicali emission inventories supports high impacts of Mexicali emissions under suitable meteorological conditions (Approach IV); and
- Information derived from previous modeling analyses adds further evidence to support that US emissions alone would not cause exceedences at Calexico stations (Approach V).

The preponderance of the evidence is that the combination of extreme $PM_{10}$ emissions in Mexicali, low atmospheric dispersion, and light winds from the south resulted on December 25, 2006, in a high impact of Mexicali $PM_{10}$ at the Calexico Grant station, in the absence of which there would have been no exceedence of the federal 24-hour $PM_{10}$ standard in Imperial County.

## 5.3 Implications of Results of Transport Analyses

Quantitative and qualitative analyses summarized in the previous section have demonstrated that, after exclusion of $PM_{10}$ measurements affected by high-wind exceptional events, ambient air quality on every monitored day in 2006-2008 would have been in attainment of the 24-hour $PM_{10}$ NAAQS "but-for" international emissions from Mexicali. Consequently:

- The transport analyses of Section 5.2 are sufficient to meet the attainment demonstration requirements pertaining to international areas; so that
- Reasonable Future Progress (RFP) and milestone requirements are unnecessary, and specifically

[90] Mexican authorities are recognizing and addressing the issue by requesting communities to limit these activities for the sake of reducing air quality impacts.

- The 5% yearly emission reductions requirement does not apply to future years.

Nevertheless, because EPA cannot exclude monitoring data influenced by international transport from regulatory determination related to attainment or nonattainment:[91]

- Imperial County cannot request attainment redesignation;[92] and
- Requirements pertaining to non-attainment areas remain, including BACM or RACM requirements on significant sources, non-attainment conformity, non-attainment source review, etc.

Imperial County's fugitive dust control plan designed to improve PM air quality and to meet regulatory BACM requirements was discussed in Chapter 4. Contingency measures and transportation conformity are addressed in Chapter 6.

[91] USEPA, 40 CFR Part 81, *Finding of Failure to Attain, California—Imperial Valley Nonattainment Area; $PM_{10}$; Final Rule*; Federal Register, Vol. 72, No. 237, December 11, 2007, p. 70226. (See Appendix I of this SIP.)

[92] That is, Imperial County cannot request attainment redesignation as long as one or more "but-for" transport exceedences continue to occur in any three-year period.

# 6 Other Clean Air Act Requirements

## 6.1 Contingency Measures

The CAA requires air quality SIPs to include a contingency plan, i.e., to outline additional actions to be taken by the state in the event that air quality improvements or air quality maintenance is not satisfactory. Specifically:

- For a nonattainment area, the contingency plan must provide for "the implementation of specific measures to be undertaken if the [USEPA] Administrator finds that the nonattainment area has failed to make RFP toward attainment or to attain the primary NAAQS by the applicable statutory deadline…States must show that their contingency measures can be implemented with minimal further action on their part and with no additional rulemaking actions such as public hearings or legislative review." [93]
- For an attainment area, the contingency plan is intended to assure prompt correction of any future violation(s). In this case however, the plan does not need to provide fully adopted measures that would go into effect without further action by the state, but rather to outline a schedule and procedure for adoption and implementation of new measures in the event that air quality deteriorates to specific, predetermined levels.[94]

An underlying, fundamental requirement of a contingency plan is to provide for additional control measures intended to reduce emissions beyond the expected minimum (as established by the attainment demonstration) necessary for attainment or maintenance of the NAAQS. Although these measures do not need to be implemented until progress towards attainment has been shown to be unsatisfactory (in a non-attainment area) or until air quality deteriorates beyond a specific level (in an attainment area), there should be no penalty imposed on districts for taking aggressive preemptive/early action to improve air quality beyond the NAAQS standards. Measures that are beyond the minimum needed for attainment may be relied upon to satisfy the contingency requirement even if these measures are already implemented.

We also note that USEPA has determined that the attainment demonstration, RFP, and contingency measure requirements of the CAA do not apply to designated nonattainment areas for which monitored data demonstrates that the NAAQS has already been achieved, "since these requirements have the purpose of helping achieve attainment of the NAAQS."[95] In light of Imperial County's attainment of the 24-hour $PM_{10}$ NAAQS "but-for" international emissions in 2006-2008, contingency measures are not a required element in the Imperial County 2009 $PM_{10}$ air quality plan. Nevertheless, Imperial County is addressing contingency measures in the present SIP to provide additional assurance that $PM_{10}$ levels will remain below the standard.

The ICAPCD has adopted regulations that have, in part, contributed to the fact that no non-international-impact exceedences have occurred since they were adopted. Regulation VIII fugitive dust control regulations (cf. Chapter 4) were amended three years in advance of the

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[93] USEPA guidelines regarding Section 172(c)(9) of the CAA, FR Vol. 59, No. 157, August 16, 1994, p. 42014.
[94] Calcagni, John, Memorandum: *Procedures for Processing Requests to Redesignate Areas to Attainment*; USEPA, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina, September 4, 1992.
[95] USEPA Clean Data Policy, see FR Vol. 71, No. 91, May 11, 2006, p. 27443, and FR. Vol. 71, No. 138,July 19, 2006, p. 40954.

present SIP[96] for the purpose of accelerating improvements of PM air quality throughout the County and to meet the requirements and schedule of the County's Natural Event Action Plan. Because the Regulation VIII fugitive dust control plan provides emission reductions that exceed the minimum necessary to bring the area into attainment, as supported by the evidence below, ICAPCD rules that are beyond the minimum control requirements for serious non-attainment areas[97] qualify as contingency measures. (These include Rules 801-804, as well as the portion of Rule 805 targeting paved roads and the portion of Rule 806 targeting source categories other than Tilling.)

- Given that the Imperial County attained the 24-hour $PM_{10}$ NAAQS in 2006-2008, any emission reductions derived from Regulation VIII that decrease the total Imperial County EI below the 2006 level of 274 tpd is in excess of the minimum necessary for attainment. Phased implementation of Rule 805, which is expected to result in $PM_{10}$ emission reductions (from City/County unpaved roads) that increase at a rate of 0.87 tpd per year from 2006 to 2015, provides such excess reductions (as shown by the steady decrease with time of the total Imperial County $PM_{10}$ emissions inventory, cf. Table IV.C-2 of Appendix IV.C.)
- In fact, $PM_{10}$ air measurements "but-for" Mexicali emissions in 2006-2008 were at least 5% below the standard in all cases,[98] as shown in Table 6.1. Therefore, some of the reductions achieved by implementation of Regulation VIII rules in 2006-2008 were already in excess of the minimum required for attainment.[99]

**Table 6.1 Imperial County $PM_{10}$ Measurements > 140 $\mu g/m^3$ in 2006-2008 Excluding Exceptional Events[a]**

| Date | Location | Measurement ($\mu g/m^3$) | Estimate of US impact ($\mu g/m^3$) | Comments |
|---|---|---|---|---|
| 12/25/2006 | Calexico Grant | 248 | < 100 | Documented in Chapter 5 |
| 12/21/2006 | Calexico Grant | 171 | < 121 (very conservative) | Documented in Chapter 5 |
| 03/13/2007 | Calexico Grant | 149 | < 132[b] | FMTS = 0.98, Average wind speed at Grant = 3.1 knots |
| 10/21/2007 | Calexico Ethel | 142 | 142 | No southerly flow, relatively high winds |

[a]Includes all SSI measurements of 2006-2008 except measurements acquired on September 2, 2006, April 12, 2007, and June 5, 2007. [b]Most conservative result obtained from Approach I of Appendix V by subtracting the last row of Table V.5 from the first row of Table V.8. By comparison, the most conservative result from Approach II of Appendix V is 69 $\mu g/m^3$, based on same-day measurements of 64 and 48 $\mu g/m^3$ at El Centro and Brawley, respectively.

[96] The rules were adopted in November 2005 and implemented in January 2006.

[97] I.e., BACM-level control of significant sources, which in this case are entrained dust from unpaved roads, and farming emissions from tilling activities.

[98] Excluding measurements acquired on September 2, 2006, April 12, 2007 and June 5, 2007, which were flagged and excluded from regulatory consideration on the basis that they were strongly influenced by high-wind events.

[99] In this light, Imperial County Regulation VIII rules can be seen to be aggressively preemptive in addressing future conditions conducive to possible exceedences.

## 6.2 Transportation Conformity

The transportation conformity requirements of air quality SIPs (in section 176 of the CAA) are intended to ensure that transportation plans, programs, and projects are consistent with the purpose and intent of the air quality plan. This objective is accomplished by requiring MPOs to conform their plans and programs to transportation emissions budgets specified in the air quality plan.[100]

The motor vehicle emission budgets are defined[101] as the "portion of the total allowable emissions defined in [a SIP] for a certain date for the purpose of meeting reasonable further progress milestones or demonstrating attainment or maintenance of the NAAQS…[that is] allocated to highway and transit vehicle use and emissions." For conformity purposes, the motor vehicle emissions budget for $PM_{10}$ includes, in addition to vehicular exhaust, tire, and break wear emissions, entrained dust from travel on paved and unpaved roads, as well as emissions from road construction. The following minimum criteria must be satisfied before EPA may approve a motor vehicle emission budget as adequate for transportation conformity purposes (40 CFR Part 93, Section 118(e)(4)):

- The motor vehicle emissions budget must be clearly identified and precisely quantified;
- The motor vehicle emissions budget must be consistent with and clearly related to the emissions inventory and the control measures in the submitted control strategy implementation plan…or maintenance plan;
- The motor vehicle emissions budget, when considered together with all other emissions sources, must be consistent with applicable requirements for reasonable further progress, attainment, or maintenance; and
- Before the control strategy implementation plan or maintenance plan is submitted to EPA, consultation among federal, State, and local agencies must occur; full implementation plan documentation must be provided to EPA; and EPA's stated concerns, if any, must be addressed.

Thus, the budget for regional transportation emissions is intended to be established in consultation with all concerned regional transportation organizations, and must be consistent with the emission levels used in the demonstration of attainment, maintenance, or RFP of the air quality plan.

The Imperial County transportation conformity budget is derived based on projected $PM_{10}$ emissions within the SCAG Imperial County nonattainment area. (Although this area differs from the Imperial County area as shown in Figure 6.1, it captures the overwhelming majority of transportation emissions generated within the Imperial County.) Projected $PM_{10}$ transportation emissions are obtained (using 2009 SCAG activity data as well as activity data from the

[100] Federal transportation conformity regulations are found in 40 CFR Part 51, subpart T, and in 40 CFR Part 93, subpart A, Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 U.S.C. of the Federal Transit Laws.

[101] 40 CFR Part 93, Subpart A, §93.101—Definitions, available at http://law.justia.com/us/cfr/title40/40-20.0.1.1.7.1.1.2.html.

ICPWD) by subtracting the Regulation VIII emissions reductions from the uncontrolled $PM_{10}$ inventory for the area.

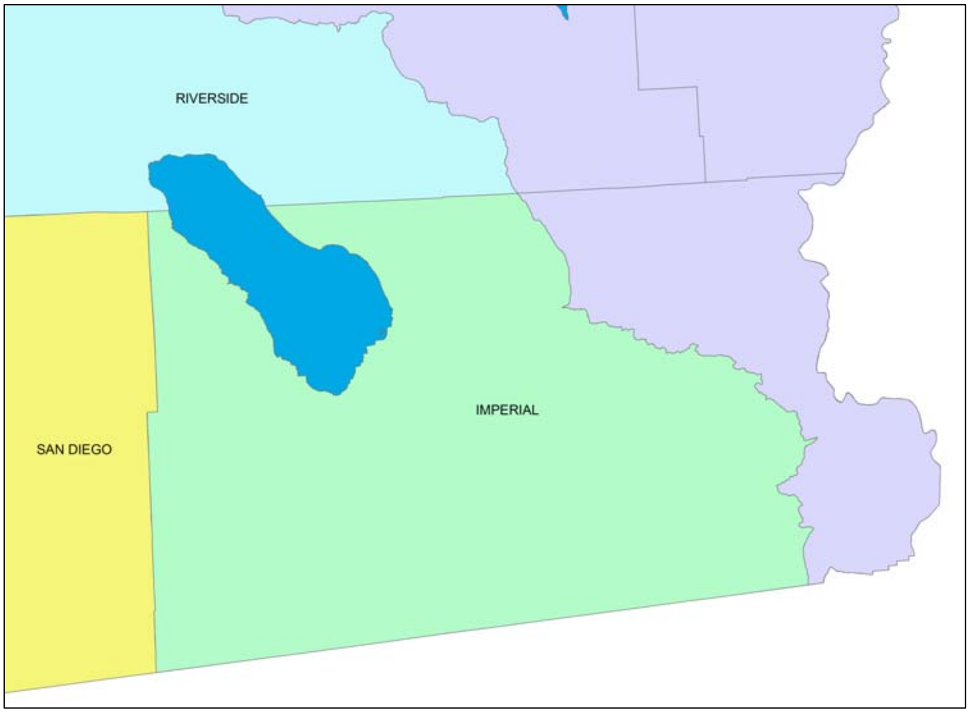


**Figure 6.1** Imperial County $PM_{10}$ non-attainment area as represented in SCAG model.

The projected $PM_{10}$ transportation emission inventory for the 25-year horizon reveals that vehicular exhaust, tire, and break wear emissions are projected to decrease steadily at a slow rate, while controlled emissions from road construction are projected to increase marginally. Much larger changes in emissions over time are expected in paved road dust emissions (which are projected to increase by >5 tpd between 2006 and 2035), and in unpaved road dust emissions (which are projected to decrease by >7 tpd between 2006 and 2015 and remain constant in subsequent years).

The Imperial County motor vehicle emissions budgets (i.e., the transportation conformity budgets), reported in Table 6.2, were chosen here to be equal to the projected levels of cumulative controlled emissions from the contributing source categories. We note that the budget for each of the 2010, 2020, 2030, and 2035 years does not exceed the level of transportation emissions (taken as the 3-year average rounded up to the nearest ton) in attainment years 2006-2008.[102]

[102] Regulation VIII $PM_{10}$ emission reductions increase by > 3 tpd between 2006 and 2010.

**Table 6.2 Imperial County $PM_{10}$ Motor Vehicle Emission Budgets (tpd)**

| | 2010 | 2020 | 2030 | 2035 |
|---|---|---|---|---|
| Vehicular Exhaust, Tire, and Break Wear[a] | 0.8 | 0.7 | 0.8 | 0.9 |
| Paved Road Dust (entrained) | 3.9 | 6.5 | 7.9 | 8.5 |
| Unpaved Road Dust (entrained) | 24.5 | 24.5 | 24.5 | 24.5 |
| Road Construction | 0.5 | 0.4 | 1.4 | 1.9 |
| *Reductions from District Rules* | *4.5* | *8.8* | *9.1* | *9.2* |
| Total | 25.1 | 23.3 | 25.5 | 26.5 |
| **Motor Vehicle Emission Budget[b] (annual average)** | **26** | **24** | **26** | **27** |

[a]EMFAC 2007 with Imperial County activity provided by SCAG April 2009. [b]$PM_{10}$ transportation budgets are rounded up to the nearest tpd.

The transportation conformity budgets of Table 6.2, which were established in consultation with SCAG, the Federal Highway Administration, the ICAPCD, the USEPA, and the CARB, satisfy the requirements established in 40 CFR Part 93, Section 118(e)(4) (see above).[103] The budgets apply as a ceiling on transportation emissions in Imperial County in the year for which they are defined and for all subsequent years until another year for which a different budget is defined (or until a SIP revision modifies the budget). Consistency of transportation activities and transportation plans with the outlined budgets is required to be demonstrated in all future years by means of regional analyses involving all regionally significant projects and activities, as outlined in 40 CFR Part 93, Section 122.

[103] Specifically, we find that the requirement that “the motor vehicle emissions budget, when considered together with all other emissions sources, [be] consistent with applicable requirements for attainment” is satisfied given that (i) $PM_{10}$ air quality in Imperial County was in attainment (but-for Mexicali emissions) of the NAAQS standard by a margin of at least 5% on all days in 2006-2008, (ii) the budgets for 2010, 2020, 2030, and 2035 are smaller than the level of emissions from the corresponding source categories in attainment year 2006-2008, and (iii) emissions from non-transportation sources are expected to remain approximately constant in future years.

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# 7 Salton Sea Considerations

The Salton Sea, which is located in the northwest corner of Imperial County, lies in the bed of an ancient lake that has repeatedly been desiccated and reformed by flooding within the Lower Colorado Basin. The current Sea was formed by a break in the bank of canal carrying water from the Colorado to the Imperial Valley in 1905. The Sea has been sustained since then by agricultural drainage waters flowing from lands under cultivation in the Coachella and Imperial Valleys. In 2002, a water transfer agreement was executed by the IID, the Coachella Valley Water District, and urban water agencies in Southern California that will transfer agricultural water to urban areas for domestic use. This transfer will reduce drainage flows to the Salton Sea after 2017, the date until which IID must guarantee existing salinity levels in the Sea.

An increase in salinity levels in the Salton Sea threatens both fish and waterfowl habitat values. Under legislation enacted in 2003, the CARB was required to undertake a restoration study to determine a preferred alternative for the restoration of the Salton Sea ecosystem and the permanent protection of wildlife dependent on that ecosystem. In June 2007, a final Programmatic EIR that analyzed each of eight alternative restoration options was certified and a preferred alternative recommended to the Legislature. Under all of the alternatives studied, a portion of the Sea bed would be exposed. These exposed areas could become sources of windblown dust, depending on the granularity of the exposed soils and the behavior of salt crystals on the soil surface.

The control of windblown dust from exposed Sea bed has benefitted dramatically from control efforts tested in a similar environment at Owens Lake, California. Owens Lake was completely desiccated in the 1920s by the diversion of all incoming flows to an aqueduct constructed by the Los Angeles Department of Water and Power. Due to the highest $PM_{10}$ concentrations recorded in the United States from windblown dust, the Owens Lake region has been subject to federal CAA nonattainment planning requirements since 1991. Under the most recently approved $PM_{10}$ attainment plan, almost 30 square miles of lakebed surface are being treated with gravel cover, shallow flooding, and managed vegetation controls. The plan also calls for controls on an additional 13 square miles by April 2010, and testing of a trench and berm design for catching saltating sand particles and reducing wind shear on downwind surfaces has begun on a pilot basis.

Differences in soil and wind conditions between Owens Lake and the Salton Sea suggest that windblown dust will not be as much of a problem at the Salton Sea as is experienced at Owens Lake. Salts at Owens Lake are dominated by sodium carbonate, which tends to fracture easily into very fine particles, while sodium chloride, which is harder and less vulnerable to abrasion, constitutes the majority salt at the Salton Sea. Additionally, peak wind speeds and the number of hours per year with wind speeds above the windblown dust generation threshold are substantially higher at Owens Lake than at the Salton Sea. On the basis of these two conditions, worse case $PM_{10}$ windblown emission rates—and resultant ambient $PM_{10}$ concentrations - are expected to be lower at the Salton Sea than are recorded at Owens Lake.

Several state statutes and water use permits provide significant authority to the ICAPCD and the CARB to control windblown $PM_{10}$ emissions from the Salton Sea. Section 2081.7 of the California Fish and Game Code makes the state Department of Water Resources responsible for any environmental impacts related to the use or transfer of water from the Imperial Valley to out-of-basin users that would cause declines in Salton Sea levels or increases in salinity. The California State Water Resources Control Board permit that authorizes transfer of agricultural water to urban water districts[104] requires the IID to comply with all $PM_{10}$ rules of the Imperial County Air Pollution Control District, including Rule 804. This rule requires the owner of any undeveloped property to maintain stabilized soil surfaces and to prevent the emission of visible dust in concentrations greater than those producing 20% or more opacity reduction.

Mitigation of windblown dust from playa exposed by drops in sea level is currently being designed by a multi-agency working group hosted by the Department of Water Resources. Members of this working group include the ICAPCD and the CARB, together with other local, state, and federal wildlife and environmental protection agencies. The goals of the mitigation process are to prevent exceedences of federal ambient air quality standards as the sea level declines. Mitigation plans are being developed in concert with the Salton Sea Ecosystem Restoration Program Environmental Impact Report.[105]

The requirements to control $PM_{10}$ emissions from exposed seabed surfaces incorporated into state law and water transfer permits will mitigate potential impacts on air quality from implementation of the water transfer agreement.

[104] Order WRO 2002-0013, In the Matter of Imperial Irrigation District's (IID) and San Diego County Water Authority's (SDCWA) Amended Joint Petition for Approval of a Long-Term Transfer of Conserved Water From IID to SDCWA and To Change The Point of Diversion, Place of Use, and Purpose of Use Under Permit 7643 Issued on Application 7482 of IID, State Water Resources Control Board, December 20, 2002

[105] Salton Sea Ecosystem Restoration Program Draft and Final Programmatic Environmental Impact Reports, prepared for the CARB by the Department of Water Resources and the Department of Fish and Game, October 2006 and May 2007, http://www.saltonsea.water.ca.gov/

# 8 Conclusions and SIP Checklist

A checklist of SIP requirements pertinent to the present plan (as outlined both in USEPA general SIP guidelines for "serious" $PM_{10}$ non-attainment areas[106] and in the December 11, 2007 USEPA Final Rule[107] concerning $PM_{10}$ non-attainment in Imperial County) is presented in Table 8.1. Because the Imperial County is shown in this document to have attained the 24-hour $PM_{10}$ NAAQS but-for international transport of Mexicali emissions in 2006-2008, RFP and milestone requirements are unnecessary, and specifically the 5% yearly emission reductions requirement does not apply to future years. As documented in Table 8.1, all remaining SIP requirements applicable to the 2009 Imperial County $PM_{10}$ Plan have been successfully addressed.

**Table 8.1 SIP Checklist**

| Required Elements | Document Location | Comments |
|---|---|---|
| Emissions Inventory | Chapter 3; Appendix III.A; Appendix IV.C | CARB's SIP inventory Version 1.06, base year 2002, was revised as described in Section 3.1.1 and in Appendix III.A. |
| A plan that enables attainment of the $PM_{10}$ federal air quality standards | Chapter 4 (control plan); Chapter 5 (attainment demonstration) | The SIP demonstrates that Imperial County attained the Federal $PM_{10}$ NAAQS, but-for international emissions from Mexico (see Chapter 5), based on 2006-2008 monitoring data. Attainment was due, in part, to ICAPCD's November 2005 adoption and subsequent implementation of Regulation VIII fugitive dust rules; those rules were based on the related 2005 BACM analysis. |
| Annual reductions in $PM_{10}$ or $PM_{10}$ precursor emissions that are of no less than 5% until attainment | Chapter 5, Section 5.3; Appendix V | Imperial County is shown in this document to have already attained the 24-hour $PM_{10}$ NAAQS "but-for" transport of Mexicali emissions in 2006-2008. Therefore, this provision is not applicable to future years. |
| BACM and BACT for significant sources and major stationary sources of $PM_{10}$, to be implemented no later than 4 years after reclassification of the area as serious | Chapter 4 | Reclassification of Imperial County to serious nonattainment for $PM_{10}$ occurred on August 2004.<br>Control of fugitive $PM_{10}$ emissions from the significant source categories identified in Section 3.2 began in January 2006 and meets BACM stringency, as established in Section 4.3. Major stationary sources meet the BACT requirement (Section 3.2.4). |
| Transportation conformity and motor vehicle emission budgets in accord with the attainment plan | Chapter 6, Section 6.2 | Included. |
| RFP and quantitative milestones | Chapter 5, Section 5.3 | These requirements are not applicable in the present SIP since Imperial County is already in attainment (but-for international emissions) based on air quality data from 2006 to 2008. |
| Contingency measures | Chapter 6, Section 6.1 | Included. |

[106] FR Vol. 59, No. 157, August 16, 1994, p. 42002
[107] FR Vol. 72, No. 237, December 11, 2007, p. 70222 (reported in Appendix I)

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# APPENDIX I

# FINDING OF FAILURE TO ATTAIN

# Appendix I

# Finding of Failure to Attain

In response to the opinion of the US Court of Appeals for the Ninth Circuit in *Sierra Club* v. *United States Environmental Protection Agency, et al.*, in August 2004 the United States Environmental Protection Agency (USEPA) found that the Imperial Valley $PM_{10}$ nonattainment area had failed to attain by the moderate area attainment date of December 31, 1994, and as a result reclassified under the Clean Air Act the Imperial Valley from a moderate to a serious $PM_{10}$ nonattainment area (see 69 FR 48792, August 11, 2004). Also in August 2004, the USEPA proposed a rule to find that the Imperial area had failed to attain the annual and 24-hour $PM_{10}$ standards by the serious area deadline of December 31, 2001. The USEPA finalized the rule on December 4, 2007; this Appendix is the Federal Register publication of the USEPA's finding of failure to attain and requirement for SIP submittal.

**ENVIRONMENTAL PROTECTION AGENCY**

**40 CFR Part 81**

**[EPA–R09–OAR–2005–CA–0017; FRL–8504–2]**

## Finding of Failure To Attain; California—Imperial Valley Nonattainment Area; PM–10

**AGENCY:** Environmental Protection Agency (EPA).

**ACTION:** Final rule.

**SUMMARY:** EPA is finding that the Imperial Valley serious PM–10 nonattainment area did not attain the 24-hour particulate matter (PM–10) National Ambient Air Quality Standard (NAAQS) by the deadline mandated in the Clean Air Act (CAA), December 31, 2001. In response to this finding, the State of California must submit a revision to the California State Implementation Plan (SIP) that provides for attainment of the PM–10 standard in the Imperial Valley area and at least five percent annual reductions in PM–10 or PM–10 precursor emissions until attainment as required by CAA section 189(d). The State must submit the SIP revision by December 11, 2008.

**DATES:** *Effective Date:* This finding is effective on January 10, 2008.

**ADDRESSES:** EPA has established docket number EPA–R09–OAR–2006–0583 for this action. The index to the docket is available electronically at *http://www.regulations.gov* and in hard copy at U.S. Environmental Protection Agency Region IX, 75 Hawthorne Street, San Francisco, CA 94105–3901. While documents in the docket are listed in the index, some information may be publicly available only at the hard copy location (e.g., copyrighted material), and some may not be publicly available in either location (e.g., Confidential Business Information). To inspect the hard copy materials, please schedule an appointment during normal business hours with the contact listed in the **FOR FURTHER INFORMATION CONTACT** section.

**FOR FURTHER INFORMATION CONTACT:** Adrienne Priselac, EPA Region IX, (415) 972–3285, *priselac.adrienne@epa.gov*.

**SUPPLEMENTARY INFORMATION:** Throughout this document "we," "us," and "our" refer to EPA.

### I. Background

On August 11, 2004, EPA reclassified under the Clean Air Act (CAA or the Act) the Imperial Valley PM–10 nonattainment area (Imperial area) from moderate to serious in response to the opinion of the U.S. Court of Appeals for the Ninth Circuit in *Sierra Club* v. *United States Environmental Protection Agency, et al.*, 346 F.3d 955 (9th Cir. 2003), amended 352 F.3d 1186, *cert. denied,* 542 U.S. 919 (2004). See 69 FR 48792 (August 11, 2004).

Also on August 11, 2004 (69 FR 48835), EPA proposed to find under the CAA that the Imperial area failed to attain the annual [1] and 24-hour PM–10 standards by the serious area deadline of December 31, 2001. Our proposed finding of failure to attain was based on monitored air quality data for the PM–10 NAAQS from January 1999 through December 2001. A summary of these data was provided in the proposed rule and is not reproduced here.

EPA has the responsibility, pursuant to sections 179(c) and 188(b)(2) of the Act, of determining within 6 months of the applicable attainment date (i.e., June 30, 2002), whether the Imperial area attained the PM–10 NAAQS. Because the June 30, 2002 date has passed, EPA is required to make that determination as soon as practicable. *Delaney* v. *EPA*, 898 F.2d 687 (9th Cir. 1990).

Section 179(c)(1) of the Act provides that attainment determinations are to be based upon an area's "air quality as of

[1] Effective December 18, 2006, EPA revoked the annual PM–10 standard. 71 FR 61144 (October 17, 2006). References to the annual standard in this proposed rule are for historical purposes only. EPA is not taking any regulatory action with regard to this former standard.

the attainment date,'' and section 188(b)(2), which is specific to PM–10, is consistent with that requirement. EPA determines whether an area's air quality is meeting the PM–10 NAAQS based upon air quality data gathered at monitoring sites in the nonattainment area and entered into EPA's Air Quality System (AQS) database. These data are reviewed to determine the area's air quality status in accordance with EPA regulations at 40 CFR part 50, appendix K.[2] For details about EPA's proposed failure to attain finding, please see the proposed rule.

## II. EPA's Responses to Comments on the Proposed Rule

EPA received eight comment letters on the proposed finding. Summaries of the comments and EPA's responses are set forth below.

### *1. Retroactive Finding of Failure To Attain Is Unlawful*

The Imperial County Air Pollution Control District (District or ICAPCD) claimed that EPA's proposed finding that the Imperial area failed to attain the serious area deadline of December 31, 2001, issued the same day as the reclassification of the area from moderate to serious, constitutes an unlawful and unjust retroactive rulemaking in that the area would be at once reclassified and punished for failing to meet the requirements of the new classification. The District strongly urged EPA to refrain from finalizing any rule that makes a nonattainment finding under these circumstances.

In support of its position that this type of rulemaking is illegal under the Administrative Procedure Act (APA), the District cited a number of federal court decisions and EPA rulemakings. The District believes that these decisions and rulemakings support its position that the nonattainment finding could create liabilities and penalties for missing long past deadlines associated with serious nonattainment areas and/or impose more rigorous requirements than would otherwise be justified, e.g., the requirement under CAA section 189(d) to submit a revised plan in 12 months rather than the 18 months allowed under section 189(b)(2) when a moderate area fails to meet its attainment deadline.

*Response:* At bottom, the argument that the District makes is that if the Imperial area had been reclassified as the CAA envisioned, the area would not now be subject to the requirements of section 189(d). In other words, EPA would have found that the area failed to attain the moderate area deadline of December 31, 1994 well before the serious area deadline of December 31, 2001. Consequently, the serious area plan for the Imperial area would have been due 18 months from the reclassification pursuant to section 189(b)(2) instead of being subject to the 12-month deadline in section 189(d). Furthermore, the argument goes, if the State had been able to demonstrate that attainment by 2001 was impracticable the area would have been able to avail itself of the attainment date extension provisions of section 188(e),[3] thereby potentially avoiding both the substantive and procedural requirements of section 189(d) entirely. Instead, the District argues, EPA's action has illegally circumvented the statutory scheme by precluding the area from taking advantage of allegedly more lenient submittal and substantive requirements.

The cases and EPA actions cited by the District, however, do not support its position. With respect to the Imperial PM–10 nonattainment area, EPA reclassified it from moderate to serious and immediately proposed to find that the area had failed to attain the serious area deadline. The result of these actions is that the State will be required to submit in the future a plan for the area under CAA section 189(d). In contrast, in *Sierra Club* v. *EPA*, 356 F.3d 296 (D.C. Cir. 2004), EPA set a prospective submittal date pursuant to CAA section 182(i) upon reclassification of the Washington, D.C. ozone nonattainment area from serious to severe because the severe area plan submittal deadline in the CAA had already passed. Similarly, in several other ozone reclassification actions, EPA also determined that where a submittal date had passed and was therefore impossible to meet, the Agency could administratively establish a later date. EPA's reasoning in these cases was that to do otherwise would have subjected these areas to an immediate finding of failure to submit and the immediate initiation of sanctions clocks.[4]

In the case of Washington, DC, EPA stated in its final rule that ''the Administrative Procedure Act * * * requires that before a rule takes effect, persons affected will have advance notification of its requirements. A failure to meet an obligation, especially one accompanied by sanctions, cannot occur in advance of the imposition of that obligation.'' 68 FR at 3414. The Court of Appeals agreed, quoting EPA, ''that adopting petitioner's suggestion [that EPA retain the original submittal deadlines] 'would give the reclassification retroactive effect by holding the States in default of their submission obligations before the events necessary to trigger that obligation (reclassification) * * * occurred.' '' 356 F.3d at 309.

In *Sierra Club* v. *Whitman*, 130 F.Supp. 2d. 78 (D.D.C. 2001), cited by the D.C. Circuit in *Sierra Club* v. *EPA* above and the District in its comment letter, and affirmed in *Sierra Club* v. *Whitman*, 285 F.3d 63, 68 (D.C. Cir 2002), the plaintiffs sought to compel EPA to backdate a nonattainment determination to the date on which the Agency was statutorily required to make such a determination. In affirming the District Court's denial of the relief sought, the D.C. Circuit opined that:

> Although EPA failed to make the nonattainment determination within the statutory time frame, Sierra Club's proposed solution only makes the matter worse. Retroactive relief would likely impose large costs on the States, which would face fines and suits for not implementing air pollution prevention plans in 1997, even though they were not on notice at the time.

*Id.* at 68.[5]

In the instant case, however, by giving the State the benefit of a future plan submittal deadline for the Imperial area, EPA's action is consistent with the holdings of the cases and with the EPA regulatory actions cited by the District.

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[2] Pursuant to appendix K, attainment of the 24-hour PM–10 NAAQS is achieved when the expected number of exceedances of the 24-hour NAAQS (150 mg/m$^3$) per year at each monitoring site is less than or equal to one. A total of three consecutive years of clean air quality data is generally necessary to show attainment of the 24-hour standard for PM–10. A complete year of air quality data, as referred to in 40 CFR part 50, appendix K, is comprised of all four calendar quarters with each quarter containing data from at least 75 percent of the scheduled sampling days.

[3] Section 188(e) provides for a one-time extension of the attainment deadline for serious PM–10 nonattainment areas if certain conditions are met. However such an extension cannot extend beyond December 31, 2006. Because that date has now passed, a section 188(e) extension for the Imperial area is unavailable under any circumstances. Nevertheless we address in this final rule the comments we received relating to section 188(e) insofar as doing so enables us to fully respond to those comments. For example, here a discussion of section 188(e) is relevant to the District's claim, among others, that EPA's action subjects the area to more stringent requirements than otherwise would have been imposed.

[4] See Washington, DC, 68 FR 3410, 3413 (January 24, 2003). See also Santa Barbara, California, 62 FR 65025 (December 10, 1997); Phoenix, Arizona, 62 FR 60001 (November 6, 1997); and Dallas-Fort Worth, Texas, 63 FR 8128 (February 18, 1998).

[5] The District also cites *Georgetown University Hospital* v. *Bowen* in which a federal agency reissued a procedurally defective rule and gave it retroactive effect. Both the D.C. Circuit and the U.S. Supreme Court invalidated the action, finding, among other things, that under the APA legislative rules must be given future effect only. 821 F.2d 759 (D.C. Cir. 1987); 488 U.S. 204 (1988).

Under section 189(d), the State must submit a plan revision for the Imperial area ''within 12 months after the applicable attainment date. * * *'' That date was December 31, 2002. However, because, at the time of EPA's proposed finding of failure to attain, that date had already passed, EPA proposed that the section 189(d) plan revision be due ''within one year of publication of a final finding of nonattainment pursuant to CAA section 179(d).'' 69 FR at 48837. Thus, rather than invoking the long past submittal deadline in section 189(d), EPA looked to another provision of the Act to supply a prospective deadline. In doing so, EPA alleviated the problem of imposing a retroactive deadline without imposing immediate sanctions.

While it is true, as the District points out, that a serious PM–10 area proceeding initially under section 189(b) instead of section 189(d) would in theory have had more time to submit a plan (18 rather than 12 months), in both instances the submittal deadlines are prospective and not retroactive. Furthermore, as we point out in our response to comment #3 below, the section 189(d) plan that the State is now required to submit is actually due later than the serious area plan would have been due under the scenario preferred by the District. Therefore, the retroactive penalty the District complains of with respect to the plan submittal deadline simply does not exist.

Moreover, while it is also true that, as a result of EPA's nonattainment finding, the Imperial area must comply with the substantive requirements of CAA section 189(d) instead of those of section 188(e), this consequence cannot be construed as ''punishment.'' Under both sections 189(d) and 188(e), implementation of best available control measures (BACM) under section 189(b)(1) and attainment of the PM–10 standards as expeditiously as practicable are required. In addition, while the respective substantive requirements of sections 188(e) and 189(d) are different, neither are necessarily more onerous than the other. See Corrected Brief of Respondent EPA, pages 40–42, in *Association of Irritated Residents, et al.* v. *EPA*, 423 F.3d 989 (9th Cir. 2005). Only if the State fails to submit the new plan in the future could sanctions come into play. Thus the substantive consequences here of EPA's nonattainment finding are not in fact retroactive, nor do they impose a penalty.

For the reasons discussed in its proposed finding, EPA is legally compelled to finalize the nonattainment finding with the result that section 189(d) applies to the Imperial area. The section 189(d) plan is due within one year of publication of this final finding of nonattainment.[6]

*2. Waive the Attainment Date and Related Requirements*

Several commenters suggested that instead of finding that the Imperial area failed to attain the serious area attainment date, EPA should waive that date and the related submittal requirements and penalties to reduce the burden of the Agency's action on Imperial County. While two commenters who suggested this approach did not describe EPA's legal authority to grant a waiver, one commenter, the District, cited CAA section 188(f) as providing EPA with the authority to waive a specific attainment date where the Agency determines that nonanthropogenic sources contribute significantly to violations in the area and to waive any requirement applicable to any serious PM–10 area where anthropogenic sources do not contribute significantly to violations. The District stated that in the Imperial area, dry soil from vast barren lands are entrained by high winds producing an impact on the monitors. The District asserted that EPA has determined that this type of dust raised by high wind events constitutes a nonanthropogenic source of PM–10 pursuant to section 188(f) and, citing a May 30, 1996 EPA memorandum, that monitoring data impacted by such events may be excluded from consideration in attainment decisions.

*Response:* Congress recognized in the Clean Air Act that there may be areas where the NAAQS may never be attained because of PM–10 emissions from nonanthropogenic sources, and that the imposition in such areas of certain state planning requirements may not be justified. Therefore, under section 188(f), Congress provided a means for EPA to waive a specific date for attainment and certain control and planning requirements when specified conditions are met in a nonattainment area. Section 188(f) provides two types of waivers. First, EPA may, on a case-by-case basis, waive any PM–10 nonattainment planning requirement applicable to any serious nonattainment area where EPA determines that anthropogenic sources of PM–10 do not contribute significantly to violation of the standards in the area. Second, EPA may waive a specific date for attainment of the standards where EPA determines that nonanthropogenic sources of PM–10 contribute significantly to the violation of the standards in the area.[7] In the Addendum, EPA set forth threshold levels for determining whether areas qualify for waivers under section 188(f). Addendum at 42004–42005.

In its comment letter, the District included and discussed a report[8] that it characterized as showing that windblown dust from barren lands represents over 92% or 792 tons per day (tpd) of the total PM–10 inventory in Imperial County. The District maintained that ''high winds frequently entrain large amounts of this dry soil into the ambient air, producing a documented impact on County monitors.'' As a result of comments provided to the District by EPA and the California Air Resources Board (CARB), the Windblown Dust Study was revised in 2005.[9] The Revised Study concluded, among other things, that there are 157 tpd of fugitive dust emissions from barren lands. Revised Study at A–15. The Windblown Dust Study and the Revised Study are primarily inventories of windblown dust emissions in Imperial County. These documents do not address the requirements of section 188(f) and EPA's guidance on that provision. Therefore they do not provide sufficient analysis and documentation to support a waiver of either the December 31, 2001 attainment deadline or any of the serious area requirements. However, the section 188(f) waivers, if the conditions for them can be met, are available to the State in the context of the section 189(d) serious area plan.[10]

The May 30, 1996 memorandum cited by the District is entitled ''Areas Affected by PM–10 Natural Events'' and

[6] Our rationale for this plan submittal deadline is discussed in the proposed rule. See at 69 FR at 48837.

[7] 59 FR 41998 (August 16, 1994) (''State Implementation Plans for Serious PM–10 Nonattainment Areas, and Attainment Date Waivers for PM–10 Nonattainment Areas Generally; Addendum to the General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990'' (Addendum)).

[8] *Development of a Wind Blown Fugitive Dust Model and Inventory for Imperial County, California, ENVIRON International Corporation and Eastern Research Group,* 2004 (Wind Blown Dust Study).

[9] *Technical Memorandum: Latest Revisions of the Windblown Dust Study,* ENVIRON International Corporation, September 20, 2005 (Revised Study), attached as Appendix A to *Draft Final Technical Memorandum, Regulation VIII BACM Analysis,* ENVIRON, October 2005 (Regulation VIII BACM Analysis).

[10] With respect to the section 188(f) waiver of serious area requirements, EPA cautions that while the District in its comment appears to characterize the predominant issue in the Imperial area to be nonanthropogenic sources, the District has identified anthropogenic PM–10 source categories that contribute significantly to peak 24-hour average PM–10 values in the area. See Regulation VIII BACM Analysis.

is from Mary Nichols, Assistant Administrator for Air and Radiation to EPA Regional Division Directors (Natural Events Policy or NEP). This policy provides, among other things, that EPA believes it is appropriate to exclude air quality data attributable to uncontrollable natural events from the Agency's decisions regarding an area's attainment status. NEP at p. 2.[11] In the case of high winds, under the NEP EPA considers ambient PM–10 concentrations due to dust raised by unusually high winds as due to uncontrollable natural events (and thus excludable from attainment determinations) if either (1) the dust originated from nonanthropogenic sources or (2) the dust originated from anthropogenic sources controlled with BACM. NEP at pp. 4–5.

The NEP sets forth a process for declaring an exceedance as due to natural events and for documenting a natural events claim. NEP at pp. 7–10. Where a state believes that natural events caused the NAAQS exceedances it must establish through supporting documentation a clear causal relationship between the exceedance and the natural event. The amount and type of documentation must be sufficient to demonstrate that the natural event occurred and that it impacted a particular monitoring site in such a way as to cause the PM–10 concentrations measured. The documentation also should provide evidence that, absent the natural event emissions, concentrations at the monitoring site would not cause an exceedance.

Under the NEP, when air quality data affected by a natural event are submitted to EPA for inclusion into the AIRS database,[12] the state is to request that a flag be placed on the data to indicate that a natural event was involved. NEP at 8–9. A number of exceedances in 1999–2001 in the Imperial area were flagged as high wind and other natural events. Under the NEP, the documentation supporting a natural events flag was required to be submitted no later than 180 days from the time the exceedance occurred. However no documentation with respect to the 1999–2001 exceedances was submitted to EPA.[13] Because the State did not comply with the provisions of the NEP, the flagged 1999–2001 data cannot be excluded as affected by natural events from EPA's determination of whether the Imperial area attained the PM–10 standard by December 31, 2001.

*3. EPA Should Grant a 5-Year Extension To Allow More Time To Develop Plan*

Several commenters opposing our proposed action stated that our proposed time frame for the development and submittal of a serious area PM–10 plan, including a CAA section 189(d) plan, was too short, and that EPA should grant a 5-year extension of the attainment date for the Imperial area to provide time for preparation, submittal and consideration of an attainment demonstration. Of the commenters making this request, only the District cited any legal authority for a 5-year extension: ''* * * The District requests that EPA withdraw its proposed 12-month deadline for the County's serious area SIP submittal * * * and instead grant a five-year extension under Section 188(e) to allow sufficient time for preparation, submittal and consideration of the County's final PM–10 attainment demonstration.'' The District characterized the 12-month plan submittal schedule as ''abbreviated'' and as a ''penalty.'' One of the commenters suggesting the 5-year extension approach urged EPA to utilize our discretion under the CAA to extend the time allowed to prepare a plan so that unwarranted imposition of additional measures could be avoided.

Another commenter stated that although a preferable outcome would have been an extension of the attainment date, it was clear that no attainment date extension was in place, and thus, the finding of failure to attain by EPA was mandatory under the Clean Air Act with the one-year deadline for an attainment demonstration.

*Response:* CAA section 188(e) provides that, upon application by a state, EPA may extend the attainment deadline for a serious PM–10 nonattainment area no more than 5 years beyond, in this case, December 31, 2001, if: (a) Attainment by that date would be impracticable; (b) the state has complied with all requirements and commitments in the implementation plan for the area; and (c) the state demonstrates that the plan contains the most stringent measures (MSM) in the plan of any state or are achieved in practice in any state, and can feasibly be implemented in the area. The state must submit at the time of its extension application a demonstration of attainment by the most expeditious alternative date practicable.

As stated above, the Imperial area is no longer eligible for an attainment date extension under section 188(e) because that extension cannot extend beyond 2006. Regardless, the attainment date extension provided for in section 188(e) does not relate in any way to the submittal date for a serious area plan. Rather, under the Act, submittal dates for serious area PM–10 plans are initially governed by subpart 4 of part D of the CAA, i.e, either by section 189(b)(2) or 189(d). As explained in the proposed rule, EPA believes that section 189(d) applies to the Imperial area's situation. 69 FR at 48837. In the first instance, EPA looked to this provision, which applies exclusively to PM–10 nonattainment areas, for the applicable submittal date for the Imperial area's section 189(d) plan. Because the deadline for plan submittal under that section, December 31, 2002 has passed, EPA looked to subpart 1 of part D of the CAA in order to determine Congressional intent. Section 179(d) requires submittal of a plan revision within one year after EPA publishes a notice of a finding of failure to attain.

In case of the Imperial area, the application of the deadline provided for in section 179(d) has already resulted in a significantly longer time for submittal of the serious area plan than the deadline that would otherwise have applied. If the Imperial area had been reclassified to serious prior to the end of 2001, it would have been subject to section 189(b)(2). As such, the deadline for submittal of a serious area plan would be 18 months from the date of the reclassification. The effective date of the reclassification here was September 10, 2004; therefore, the alternative to the due date provided in section 179(d) would result in the plan having been due by March 10, 2006. Instead, the area's serious area plan is not due until one year from publication of the **Federal Register** notice of this action. EPA knows of no legal theory that would allow the Agency to provide the 5 years apparently sought by the commenters

[11] On March 22, 2007, EPA issued a final rule, intended to replace the NEP, governing the review and handling of air quality data influenced by exceptional events. 72 FR 13560. The rule became effective on May 21, 2007 and is codified at 40 CFR 50.1, 50.14 and 51.920. 72 FR 13560, 13580–13581. However, as discussed below, the 1999–2001 data relevant to this final action are not eligible for exclusion under the transition policy for the rule because the State did not meet the provisions of the NEP that were applicable at the time of the exceedances. See 72 FR 49046, 49048 (August 27, 2007).

[12] The AIRS database is the predecessor to the AQS database.

[13] Note that even if adequate documentation had been submitted for the flagged events, the Imperial area would not have attained the PM–10 standard because of the number of unflagged exceedances. See ''Imperial valley PM10 Exceedances 1999–2001,'' Excel Spreadsheet, Bob Pallarino, EPA.

for the development and submittal of a serious area PM–10 plan.[14]

*4. Economic Hardship*

A number of commenters claimed that an EPA finding of failure to attain would result in adverse economic consequences for Imperial County. One commenter stated that the County has one of the poorest economies in the State, that EPA's finding will place an undue hardship on an economy that is already on the brink of breaking, and that the Agency should take economic justice into account. Another commenter suggested that another set of government-imposed regulations would place an unnecessary financial hardship on area companies and could possibly disrupt farming operations. Another commenter cited the County's high unemployment rate that would increase under severe emission control requirements that undermine an agriculture-dependent economy. The commenters attributed these perceived hardships to various factors they believe to be related to a nonattainment finding: the five percent and BACM requirements applicable to serious PM–10 attainment areas; the inability of the County to control Mexican emissions; and the prevalence of high wind natural events. We address each of these factors below.

A. Five Percent and BACM Requirements

A number of commenters opposed to our proposed rule requested that EPA reduce or remove entirely the proposed requirement that Imperial County submit a plan that achieves at least 5 percent annual reductions in PM–10 or PM–10 precursor emissions as required by CAA section 189(d). Some commenters stated that this requirement was not feasible or was too burdensome for Imperial County. Another commenter attributed severe economic consequences to the serious area plan requirements for expeditious implementation of BACM.

*Response:* As stated above and in the proposed rule, EPA is legally compelled to finalize the nonattainment finding with the result that the 5 percent requirement of section 189(d) applies. Under section 189(b)(1)(B), the serious area PM–10 plan for the Imperial area is required to provide for the expeditious implementation of BACM. This requirement applies as a result of the Imperial area's reclassification to serious which was mandated by the U.S. Court of Appeals for the Ninth Circuit in *Sierra Club* v. *U.S. Environmental Protection Agency, et al.*, 346 F.3d 955 (9th Cir. 2003), amended 352 F.3d 1186, *cert. denied*, 542 U.S. 919 (2004). Therefore BACM would have to be implemented in the Imperial area even in the absence of EPA's finding that the area failed to attain the PM–10 standards by the end of 2001.

EPA has defined BACM as: ''* * * The maximum degree of emissions reduction of PM–10 and PM–10 precursors from a source * * * which is determined on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, to be achievable for such source through application of production processes and available methods, systems, and techniques for control of each such pollutant.'' Addendum at 42010. Therefore, while EPA cannot take into account the general economy of a nonattainment area in determining what statutory requirements apply in a serious nonattainment area, it can consider the cost of reducing emissions from a particular source category and costs incurred by similar sources that have implemented emission reductions. In addition, where the economic feasibility of a measure depends on public funding, an appropriate consideration is past funding of similar activities as well as availability of funding sources. *Id.* at 42013. Nevertheless, the CAA still requires that the State submit a plan for the Imperial area to, among other things, attain the PM–10 NAAQS as expeditiously as practicable. Moreover, there are economic benefits to attaining the NAAQS.

B. Mexican Emissions

Several commenters felt that the economic hardship was a result of the failure of EPA, in its proposed action, to consider the fact that significant amounts of particulate matter air pollution in Imperial County emanate from the large and growing city of Mexicali, Mexico. Many commenters opposing our proposed rule stated that EPA ignored the fact that emissions from Mexico are one of the reasons that poor air quality exists in Imperial County. Some commenters pointed out that in the past, EPA has agreed that Imperial County would have attained the PM–10 NAAQS but for emissions from Mexico (e.g., EPA's approval of CAA section 179B demonstration; 66 FR 53106, October 2001). Additionally, the commenters claimed that the PM–10 plan needs to include consideration of how emissions from Mexico impact the attainment of the PM–10 NAAQS in Imperial County.

*Response:* As explained in our proposed rule, EPA has the responsibility, pursuant to CAA sections 179(c) and 188(b)(2), to determine within 6 months of the applicable attainment date whether a PM–10 nonattainment area attained the 24-hour NAAQS. Section 179(c)(1) of the Act provides that determinations of failure to attain are to be based upon an area's ''air quality as of the attainment date,'' and section 188(b)(2) is consistent with this requirement. EPA determines whether an area's air quality is meeting the PM–10 NAAQS based upon air quality data gathered at monitoring sites in the nonattainment area and entered into EPA's AQS database. These data are reviewed to determine the area's air quality status in accordance with EPA regulations at 40 CFR part 50, appendix K. 69 FR at 48836. Thus, neither the CAA nor EPA regulations authorize the Agency to consider the economic circumstances of an area in making a finding of attainment or nonattainment; the determination is to be made solely on the basis of the ambient air quality in the area. Similarly, neither the CAA nor EPA regulations allow EPA to ignore the actual attainment status of an area based on the influx of a pollutant from another country. The attainment status is intended to reflect the actual ambient pollutant levels.

Section 179B(d) of the Act does allow a moderate PM–10 nonattainment area to avoid a reclassification to serious if a state establishes to the satisfaction of EPA that such an area would have attained but for emissions emanating from outside the United States. EPA did approve such a demonstration for the Imperial area but that approval was overturned by the Ninth Circuit in *Sierra Club*. See the discussion of this case and its aftermath, 69 FR at 48835. The State can, however, take the effect of Mexican emissions into account in addressing the CAA section 189(d) attainment demonstration requirement. See CAA section 179B(a) and the Addendum at 42000–42002. In this regard, note that section 179B does not provide authority to exclude monitoring data influenced by international transport from regulatory determinations related to attainment and nonattainment. Thus, even if EPA approves a section 179B ''but for'' demonstration for an area, the area would continue to be designated as nonattainment and subject to the applicable requirements, including nonattainment new source review,

[14] We note that subpart 4 of part D of title I which contains the Act's provisions specific to PM–10 does not have a provision that is analogous to section 182(i) which grants EPA considerable latitude to adjust submittal and other schedules upon an ozone area's reclassification. See also section 187(f).

nonattainment conformity, and other measures prescribed for nonattainment areas by the CAA.

C. High Wind Events

Several commenters felt that the economic hardship was a result of the failure of EPA's proposal to consider the fact that significant amounts of particulate matter air pollution in Imperial County are the result of high wind natural events. To support their claims, commenters cited the Wind Blown Dust Study.

*Response:* As discussed in our response to comment #2, EPA will under certain circumstances exclude from attainment determinations ambient PM–10 concentrations due to dust raised by unusually high winds. However, the State did not provide documentation to support the flagged high wind events from 1999–2001 and the data are therefore not eligible for exclusion here.[15] Moreover, as noted previously, even if the State had met the provisions of EPA's NEP that were applicable at the time of the relevant exceedances, the Imperial area would not have attained the PM–10 standard by December 31, 2001. The State can, however, if it meets the requirements of EPA's exceptional events rule, take future unusually high winds into account in developing its CAA section 189(d) attainment demonstration. See 72 FR at 13565–13566 and 13576–13577.

*5. Governmental Entities Should Work Together*

One commenter urged EPA to immediately initiate a coordinated effort involving the federal government, Mexican government counterparts and County officials to develop a federally funded international plan to reduce emissions. Another commenter requested that, given the short time provided in the CAA to develop and submit a plan in this case, and the need for the plan to consider international transport, and perhaps, nonanthropogenic sources, EPA be involved early in the plan development to ensure a timely plan submittal. One commenter also stated that EPA needs to work with other governmental agencies to implement reasonable policies for controlling PM–10 pollution in the Imperial area.

*Response:* EPA agrees with the commenters who encourage governmental entities to work together to address air pollution from Mexicali to Imperial County. Reducing air pollution anywhere along the U.S./Mexico border requires binational cooperation and coordination. Since 1983, EPA has been working with the Mexican Government and other stakeholders to reduce air pollution along the border region. Pursuant to the 1983 La Paz Agreement, the U.S. and Mexico developed the Border XXI Program and more recently its successor, the Border 2012 U.S.-Mexico Environmental Program. Through these programs, EPA and Mexico have worked together with border tribal, state, and local governments, as well as academia and the general public, to improve our understanding of the relative impacts of contributing international sources of air pollution and have developed and implemented cost-effective control strategies to reduce those emissions.

EPA continues to implement the Border 2012 regionally-based border program in the Mexicali-Imperial area. We are active participants in the Imperial/Mexicali Air Quality Task Force which provides a forum for the federal, state, and local governments to discuss and analyze with community stakeholders how to improve air quality in the binational region. EPA continues to fund numerous projects that study and manage air pollution in various crossborder airsheds like the Imperial/Mexicali area. In addition to supporting the District's work to develop its PM–10 plan, EPA also provides direct funding for the Mexicali-Imperial Air Quality Task Force for binational public forums to discuss the air quality of the Mexicali-Imperial region, and to carry out projects, including projects to monitor air quality (especially in Mexico), to demonstrate retrofit equipment technologies for diesel trucks, and to provide real time air quality information to residents of Imperial County.

Regarding the comment that EPA be involved early in the development of the air quality plan, we intend to provide guidance and assistance to the District and the State to support a technically sound and timely submittal.

Lastly, regarding the need to develop reasonable policies, EPA has worked closely with the State and District to improve the PM–10 emissions inventory for the Imperial area, to develop a natural events action plan (NEAP),[16] and to develop rules to control certain sources of fugitive dust in the nonattainment area.

*6. Finding of Failure To Attain Is Mandatory Under the CAA and Fully Supported by Ambient Monitoring Data*

One commenter stated that the proposal correctly reflects that the Imperial Valley is a serious PM–10 nonattainment area that has missed its attainment date and does not have an extension of the attainment date in place. The same commenter stated further that EPA correctly assessed that areas in situations like this have one-year to submit a plan including a 5 percent plan. Another commenter who agreed with EPA's proposed rule stated that EPA's proposal had omitted some statutory requirements (e.g., BACM implemented expeditiously, major source cutoffs), and reserved the right to comment further on EPA's proposed action on the PM–10 SIP.

*Response:* EPA agrees with comments supporting the proposal. We did not include a comprehensive list of the CAA requirements applicable to the Imperial area, but expect the plan to address all of them. See Section III below.

*7. PM–10 Is Not a Regulated Pollutant*

One commenter, California Cattlemen's Association (CCA), notes that the U.S. Court of Appeals for the District of Columbia Circuit in *American Trucking Ass'n* v. *Browner* vacated EPA's 1997 PM–10 standard because it included both coarse and fine PM and therefore was ''inherently confounded.'' CCA claims that the 1987 standard suffers from the same defect. Therefore, CCA argues, there is no 1987 standard and, as a result, the Imperial area cannot be out of compliance with it. CCA states that if EPA's response is that the 1987 standard was re-instituted in a final rule (65 FR 80776; December 22, 2000), there was not sufficient notice as that rule was noticed within a ruling for Ada County, Idaho (65 FR 39321; June 26, 2000). Also, CCA believes that because the same problem exists with the 1987 standard as the 1997 standard, simply reinstating the old standard was not the court's intention. Finally, CCA discusses EPA's then current process of revising the PM NAAQS and finds, among other things, similar confounding problems in measurements contained in studies that EPA is using to consider setting its new NAAQS.

*Response:* In a portion of *American Trucking Ass'ns* v. *EPA,* 175 F. 3d 1027, not later reversed by the Supreme Court, the D.C. Circuit held that, although there was ''ample support'' for EPA's decision to regulate coarse-fraction particles, EPA had not provided a

[15] See footnote 11.

[16] Under EPA's NEP, if natural events caused ambient concentrations of PM–10 that exceeded the NAAQS in an area, the State was responsible for developing a NEAP meeting certain specified requirements to address future events. NEP at 5–8. Under EPA's exceptional events rule NEAPs are not required, although similar requirements apply under 40 CFR 51.920. 72 FR at 13581.

reasonable justification for its choice of PM–10 as an indicator for coarse particles, especially given that PM–10 includes not only coarse particles but PM fine as well. 175 F. 3d at 1054–55.

Pursuant to the D.C. Circuit's decision, EPA deleted 40 CFR 50.6(d), the regulatory provision controlling the transition from the pre-existing 1987 PM–10 standards to the 1997 PM–10 standards. 65 FR 80776. EPA proposed this deletion in the context of a proposed rule to rescind a finding, made prior to the D.C. Circuit's vacatur of the 1997 standards, that the 1987 PM–10 standards no longer applied in Ada County, Idaho. As EPA explained in the proposed rule, the Ada County finding was based on the existence of the 1997 standards as well as the transition policy. Because the court vacated those standards, leaving in place the finding would have resulted in no federal protection from high levels of coarse particulate matter pollution. Finding that result untenable, EPA concluded that it was appropriate to restore the pre-existing PM–10 standards with respect to Ada County. 65 FR at 39323. As is clear from the final rule, however, the 1987 standards were never revoked with respect to the rest of the country. Therefore, although EPA deleted 40 CFR 50.6(d)(as required by the mandate of *ATA I*), the pre-existing NAAQS continue to apply. 65 FR at 80777. If CCA believes that insufficient notice was provided in connection with this final action, it was required under CAA section 307(b)(1) to file a petition for review of that action in the U.S. Court of Appeals within 60 days of December 22, 2000. CCA did not do so and is therefore foreclosed from raising this issue now.

Moreover, to the extent that CCA raises issues with respect to the pre-existing 1987 PM–10 standards, we note that those standards were upheld in *Natural Resources Defense Council, Inc.*, *et al.* v. *EPA, et al.*, 902 F.2d 962 (D.C. Cir. 1990). In any case, the 1987 standards do not use PM–10 as an indicator exclusively for coarse particles, but rather are intended to address both PM–2.5 and PM–10–2.5, i.e. both fine and coarse particles. 52 FR 24634, 24639 (July 1, 1987). Thus, any concerns that PM–10 may be an inappropriate indicator for coarse particles exclusively are inapplicable to the 1987 standard.

When CCA submitted its comment letter in 2004, EPA was in the process of developing proposed regulations to again address thoracic coarse particles. The Agency subsequently finalized such regulations in 2006. 71 FR 61144 (October 17, 2006). CCA's concerns regarding new standards for PM–10, including putative confounding problems, were properly raised in the context of that rulemaking. In fact, challenges to the use of PM–10 as an indicator for coarse particles, as well as challenges to the scientific bases for the 2006 final rule have been raised by various petitioners in the pending D.C. Circuit cases (*American Farm Bureau Fed. et al.* v. *EPA* and consolidated cases) challenging the rule. CCA can, and is, pursuing its concerns in that forum.

## III. Final Action

EPA is finding that the Imperial area failed to attain the 24-hour PM–10 NAAQS by the December 31, 2001 attainment deadline and is requiring the State to submit under section 189(d) of the Act ''plan revisions which provide for attainment of the PM–10 air quality standards and, from the date of such submission until attainment, for an annual reduction in PM–10 or PM–10 precursor emissions within the area of not less than 5 percent of the amount of such emissions as reported in the most recent inventory prepared for such area.'' The plan must be submitted to EPA no later than one year from the publication of this final rule.

The pollutant-specific requirements for moderate and serious PM–10 nonattainment areas are found in section 189 of the CAA, and the general planning and control requirements for nonattainment plans are found in CAA sections 110 and 172. In addition to the attainment demonstration and 5 percent annual reductions requirements referenced above, the PM–10 plan for the Imperial area must include the following elements: [17]

- Transportation conformity and motor vehicle emissions budgets;
- Emissions inventories;
- Best available control measures for significant sources of PM–10;
- Reasonably available control measures for significant sources of PM–10;
- Control requirements applicable to major stationary sources of PM–10 precursors pursuant to section 189(e); and
- Reasonable further progress and quantitative milestones.

The District must also revise its new source review (NSR) rule to reflect the serious area definitions for major new sources in CAA section 189(b)(3) and must make any changes in its Title V operating permits program necessary to reflect the change in the major source threshold from 100 tpy for moderate areas to 70 tpy for serious areas. Revisions to the NSR and Title V rules must also be submitted no later than one year from the publication of this final rule.

[17] For a brief discussion of these requirements, see our proposed approval of the San Joaquin Valley PM–10 plan at 69 FR 5413, 5414 (February 4, 2004). See also the final rule at 69 FR 30006 (May 26, 2004).

## IV. Statutory and Executive Order Reviews

Under Executive Order 12866 (58 FR 51735, October 4, 1993), this final action is not a ''significant regulatory action'' and therefore is not subject to review by the Office of Management and Budget. For this reason, this action is also not subject to Executive Order 13211, ''Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use'' (66 FR 28355, May 22, 2001). This action merely makes a determination based on air quality data and does not impose any additional requirements. Accordingly, the Administrator certifies that this final rule will not have a significant economic impact on a substantial number of small entities under the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*). Because this rule does not impose any additional enforceable duty, it does not contain any unfunded mandate or significantly or uniquely affect small governments, as described in the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4). This rule also does not have tribal implications because it will not have a substantial direct effect on one or more Indian tribes, on the relationship between the Federal Government and Indian tribes, or on the distribution of power and responsibilities between the Federal Government and Indian tribes, as specified by Executive Order 13175 (65 FR 67249, November 9, 2000). This action also does not have Federalism implications because it does not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132 (64 FR 43255, August 10, 1999).

This action merely makes a determination based on air quality data and does not alter the relationship or the distribution of power and responsibilities established in the CAA. Executive Order 12898 establishes a Federal policy for incorporating environmental justice into Federal agency actions by directing agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. Today's action involves determinations based on air quality considerations. It will not have disproportionately high and adverse effects on any communities in the area, including minority and low-income communities. This rule also is not subject to Executive Order 13045 ''Protection of Children from Environmental Health Risks and Safety Risks''(62 FR 19885, April 23, 1997), because it is not economically significant. The requirements of section 12(d) of the National Technology Transfer and Advancement Act of 1995 (15 U.S.C. 272 note) do not apply. This rule does not impose an information collection burden under the provisions of the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*).

Under section 307(b)(1) of the Clean Air Act, petitions for judicial review of this action must be filed in the United States Court of Appeals for the appropriate circuit by February 11, 2008. Filing a petition for reconsideration by the Administrator of this final rule does not affect the finality of this rule for the purposes of judicial review nor does it extend the time within which a petition for judicial review may be filed, and shall not postpone the effectiveness of such rule or action. This action may not be challenged later in proceedings to enforce its requirements. (See section 307(b)(2).)

**List of Subjects in 40 CFR Part 81**

Environmental protection, Air pollution control, National parks, Wilderness areas.

**Authority:** 42 U.S.C. 7401 *et seq.*

Dated: November 30, 2007.

**Laura Yoshii,**

*Acting Regional Administrator, Region IX.*

[FR Doc. E7–23943 Filed 12–10–07; 8:45 am]

**BILLING CODE 6560–50–P**

# APPENDIX II

# IMPERIAL COUNTY AIR MONITORING INFORMATION: 2006-2008

# Appendix II

# Imperial County Air Monitoring Information: 2006-2008

This appendix provides detailed information about the $PM_{10}$ and meteorological monitoring networks (Section II.1 and II.2, respectively) in Imperial County. Ambient $PM_{10}$ measurements acquired at all filter-based (SSI) monitors in Imperial County are also reported in tabulated format (Section II.3).

## II.1 Imperial County $PM_{10}$ Air Monitoring

### II.1.1 Filter-Based Monitors

During the 2006-2008 time period, the Imperial County Air Pollution Control District (ICAPCD) operated filter-based, size-selective inlet (SSI) $PM_{10}$ monitors at six stations located in the populated areas of the County (Figure II.1): Calexico-Grant, Calexico-Ethel, El Centro, Brawley, Westmorland, and Niland. These SSI monitors meet federal performance criteria and are considered to be the official data source for long-term air quality planning and attainment demonstration. Detailed information about these individual monitors is provided in this section.

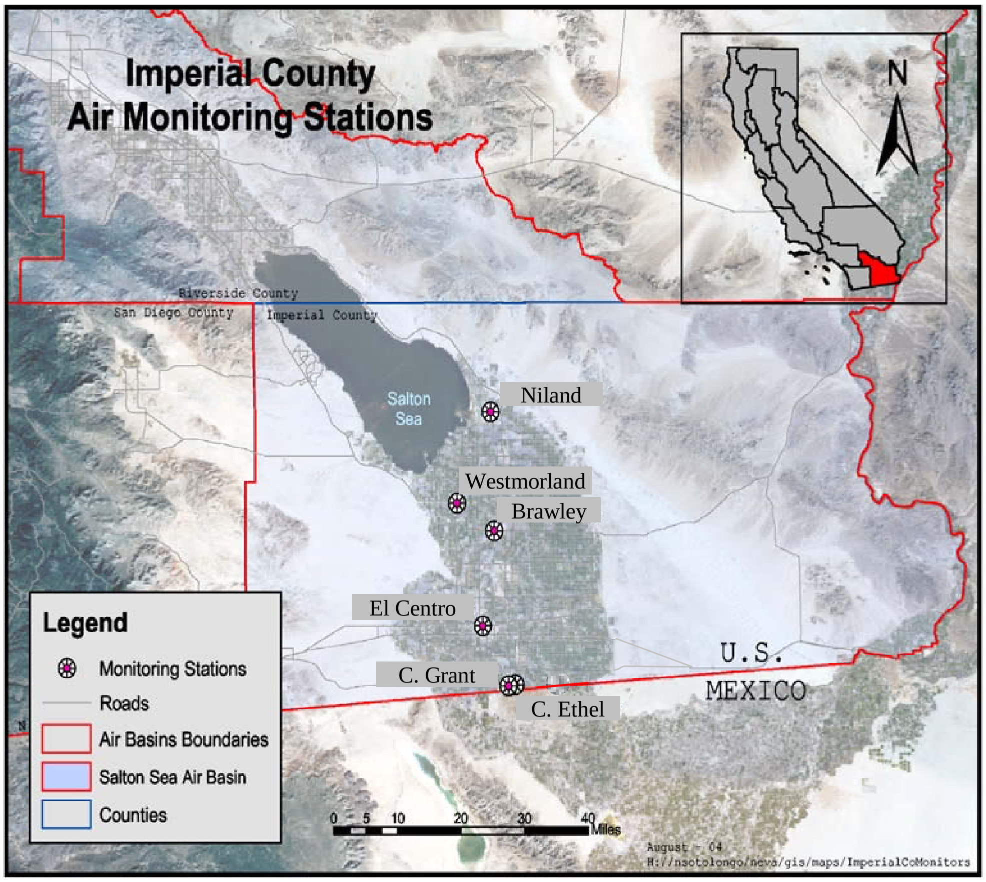


**Figure II.1** Locations of Imperial County $PM_{10}$ SSI stations.

**Calexico Grant.** The Calexico Grant station, a hi-volume sampler, is located on top of a trailer at 900 Grant Street in a residential area with homes lying immediately to the east, west, and north of the site. Grant Street is a fairly busy street with visible dust accumulations on the street. The station is found on the southwest side of the city of Calexico, approximately 0.5 miles west of the central business district. To the south lies the Calexico International Airport and the US-Mexican border (0.75 miles south), and to the southeast lies Anza Road, with a large 5-acre unpaved lot, and the New River. The Calexico-Grant monitor was permanently decommissioned in August 2007.

**Calexico Ethel.** The Calexico Ethel station, a hi-volume sampler, is located on top of a trailer at 1029 Ethel Street southeast of the Calexico High School parking lot. A residential community surrounds the Ethel station on the southeast, west, and northwest sides. The football athletic field and the school buildings including tennis courts and a baseball field lie to the north and northeast, respectively. The Mexican border is approximately 0.75 miles to the south. The monitoring inlet is approximately 10.5 feet above ground level (AGL).

**El Centro.** The El Centro station, a hi-volume sampler, is located on the rooftop of the old County Jail Building at 150 S. 9th Street. The El Centro station is located in close proximity to a commercial area within the center of the city and is north of Calexico. The site has been classified as an urbanized location with large agricultural areas to the east and west of the city.

**Westmorland.** The Westmorland station, a hi-volume sampler, is located on top of a trailer at 202 West 1st Street in Westmorland. The city of Westmorland is a rural community with a population under 2,000 people. The site is located on the southwest section of the community within the wastewater treatment plant. Westmorland is located 14.9 miles northwest of the city of Brawley and 16.5 miles southwest of the city of Calipatria. Residential and agricultural areas lie within 33 feet and 1,312 feet of the site, respectively. The monitoring inlet is approximately 16 feet AGL.

**Niland.** The Niland station, a hi-volume sampler, is located on the rooftop of a trailer at 7711 English Road within a rural area, approximately 2 miles southwest from the city of Niland. The Niland site is the most northerly positioned of the Imperial County monitoring stations and is located near the Salton Sea and Imperial County's border with Riverside County. The monitoring inlet is approximately 10.5 feet AGL.

**Brawley.** The Brawley monitor, a hi-volume sampler, is located on the roof of a two-story building at 220 Main Street in downtown Brawley next to a commercial area. The closest street is approximately 100 feet away and the site experiences approximately 5,000 vehicle passages a day. Agricultural land adjoins Brawley on the east, north, and west sides. It is the second site north of Calexico (the first is El Centro).

### II.1.2 Continuous Monitors

In addition to the $PM_{10}$ SSI units, the ICAPCD also operated Beta Attenuation Mass (BAM) monitors at the Brawley, Westmorland, and Niland station in 2006-2008. These monitors were used for the purpose of daily forecasting, and were not operated in accordance with the quality assurance procedures required to generate data suitable for regulatory compliance evaluations. A 2008 ICAPCD/ARB evaluation of the Imperial County 2006-2008 $PM_{10}$ BAM data revealed that monitor performance had been inaccurate as a result of deviations from operational specifications. Consequently, the Imperial County 2006-2008 BAM data was unfit for submission to the USEPA Air Quality System (AQS).

To overcome inaccurate BAM monitor performance, in June 2008 the ICAPCD suspended the operation of all three of the Brawley, Westmorland, and Niland BAM units to allow for their recalibration. Operation of continuous $PM_{10}$ monitors (either BAM monitors or Tapered Element Oscillating Microbalance (TEOM) monitors) at the Brawley, Westmorland, and Niland stations is expected to have resumed by Summer 2009. The CARB and the ICAPCD are also implementing a new monitor network surrounding the Salton Sea. Comprising 5 additional TEOM monitoring units positioned around the Sea as shown in Figure II.2, operation of this network by the ICAPCD is expected to begin by Summer 2009 as well.

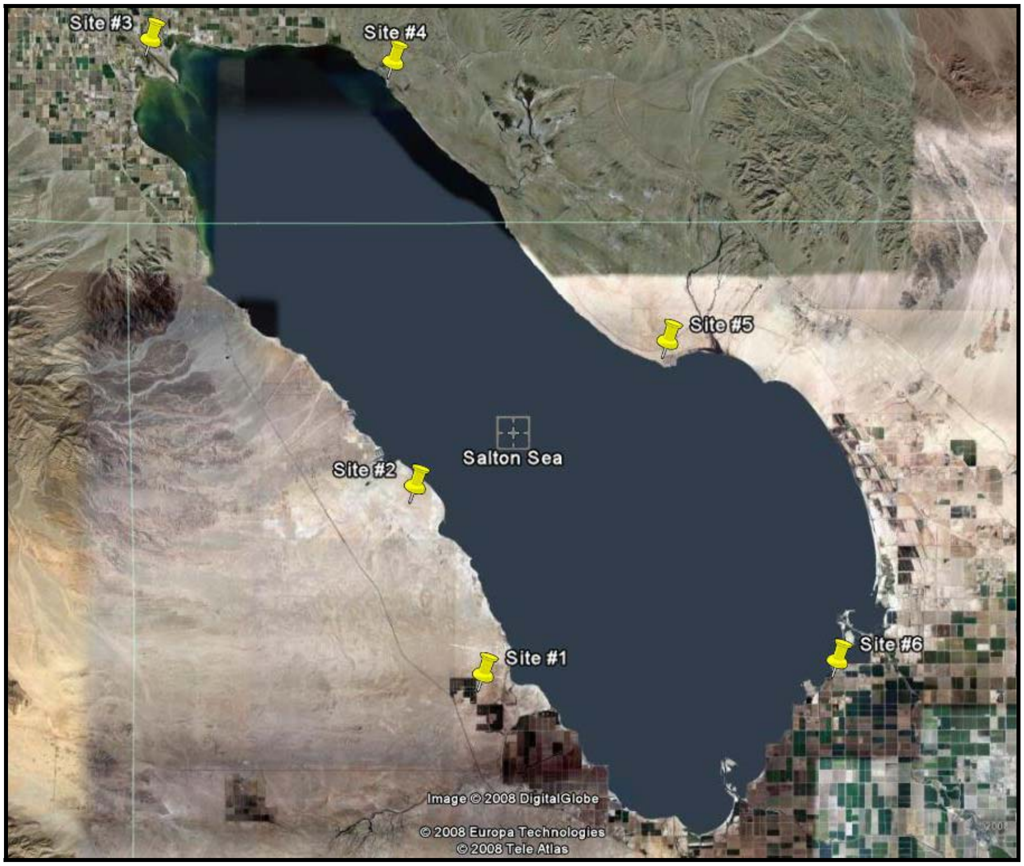


**Figure II.2** Proposed Continuous $PM_{10}$ Monitor network around the Salton Sea.

## II.2 Meteorological Stations

Figure II.3 shows the location of meteorological monitoring stations from which data may be obtained in the analysis of the transport and dispersion of atmospheric pollutants. The meteorological stations are divided into four categories based on the agency or organization that operates them, as discussed in detail below. The geographic coordinates, anemometer height, and anemometer type of the meteorological stations shown in Figure II.3 are reported in Table II.1.

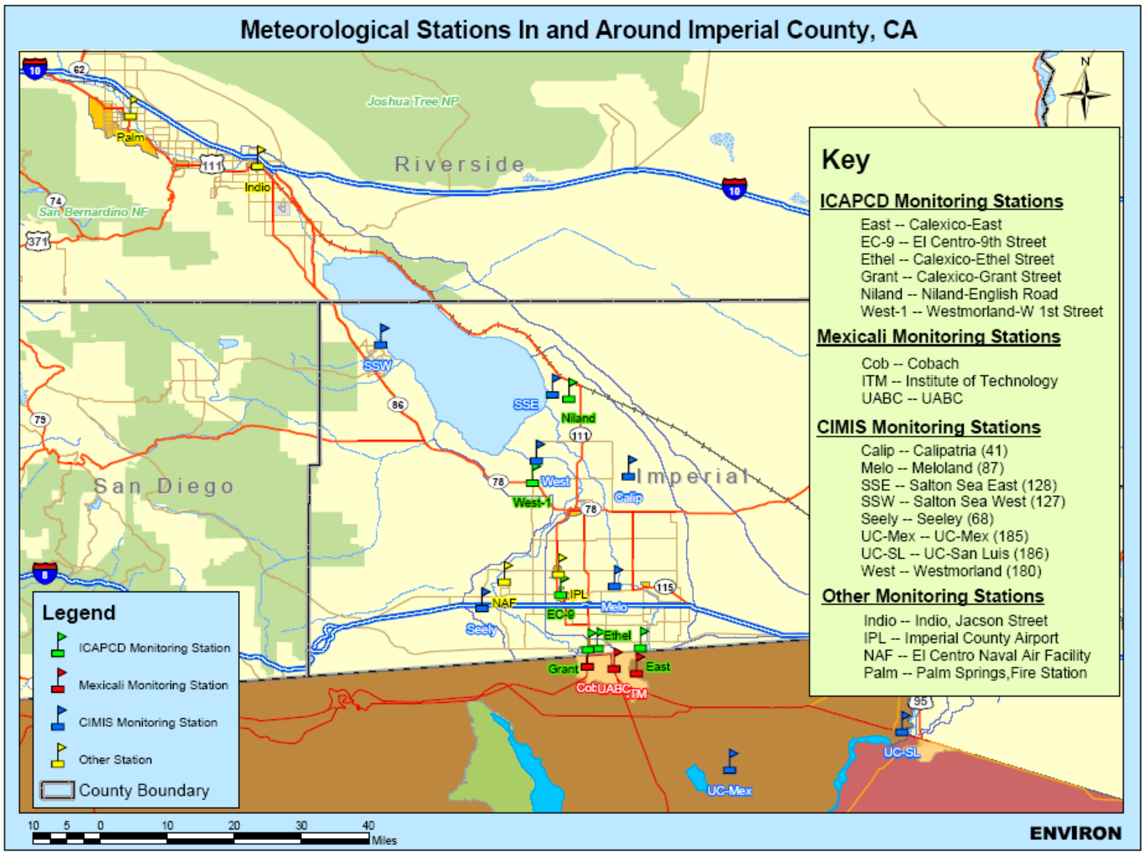


**Figure II.3** Meteorological Stations in and around Imperial County.

**Table II.1** Meteorological Station Location Information

| Meteorological Station | Owner/Operator | Latitude | Longitude | Anemometer Height (m) | Anemometer Type |
|---|---|---|---|---|---|
| Calexico East | CARB[1] | 32° 40' 27" | 115° 23' 28" | 10 | Information Unavailable |
| El Centro | | 32° 47' 32" | 115° 33' 47" | | |
| Calexico Ethel | | 32° 40' 34" | 115° 28' 59" | | |
| Calexico Grant | | 32° 40' 26" | 115° 30' 59" | | |
| Niland | | 33° 12' 49" | 115° 32' 43" | | |
| Westmorland | | 33° 1' 57" | 115° 37' 25" | | |
| Indio | | 33° 42' 30" | 116° 12' 57" | | |
| Palm Springs Fire Station | | 33° 49' 10" | 116° 29' 24" | | |
| Cobach | | 32° 38' 25" | 115° 30' 21" | 6 | |
| Institute of Technology | | 32° 37' 17" | 115° 23' 52" | 10 | |
| UABC | | 32° 37' 45" | 115° 26' 45" | 10 | |
| Calipatria | California DWR CIMIS | 33° 02' 37" | 115° 24' 56" | 2 | Met-One, Model 014A, Three-cup, 0-100 mph, ± 0.25 mph |
| Meloland | | 32° 48' 24" | 115° 26' 46" | | |
| Salton Sea East | | 33° 13' 12" | 115° 34' 48" | | |
| Salton Sea West | | 33° 19' 38" | 115° 57' 00" | | |
| Seeley | | 32° 45' 34" | 115° 43' 54" | | |
| UC-Mex | | 32° 24' 40" | 115° 11' 50" | | |
| UC-San Luis | | 32° 29' 34" | 114° 49' 34" | | |
| Westmorland | | 33° 04' 39" | 115° 36' 50" | Inactive | |
| Imperial County Airport | FAA/NOAA | 32° 55' 3" | 115° 34' 43" | 10 | Standard Automated Surface Observation System |
| El Centro Naval Air Facility | US Navy | Information Unavailable | | | |

[1] These stations may be operated by the local air districts

### II.2.1 ICAPCD Monitoring Stations

The ICAPCD Stations are operated by the Imperial County Air Pollution Control District. All ICAPCD stations record wind speed and direction from anemometers and wind vanes mounted on 33 foot (10 meter) towers. A general description of each ICAPCD site can be found in Section 2 of this report. Additionally, information about all air monitoring stations in CARB's network is available at www.arb.ca.gov/qaweb/site.php. This site includes maps of each site, GPS coordinates, site photos, pollutants monitored, and site surveys. The site surveys list in-depth monitoring information such as traffic descriptions, calibration dates, distances to trees and obstacles, and residence times. In some cases, real-time and recent observations are also reported.

In addition to wind speed and wind direction, $PM_{10}$ is monitored at the ICAPCD Stations of El Centro, Niland, Westmorland, Calexico Grant, Calexico Ethel and Calexico East. Note that the Brawley $PM_{10}$ monitoring station does not gather meteorological data and is therefore not shown in Figure II.3.

The meteorological sensors operated by ICAPCD are routinely subjected to performance audits by CARB's Quality Assurance Section. The parameters audited include wind speed, wind direction, ambient temperature, relative humidity, barometric pressure, and total solar radiation. The criteria used for auditing meteorological sensors can be found in Ambient Monitoring Guidelines for Photochemical Assessment Monitoring Stations (PAMS) (USEPA, 1994) and Quality Assurance Handbook for Air Pollution Measurement Systems, Volume IV: Meteorological Measurements (USEPA, March 1995). These documents specify that the sensors must meet the following criteria:

| **Parameters** | **Criteria** |
|---|---|
| Wind Speed | Starting Threshold: less than 0.5 m/s<br>Accuracy: +/- 0.2 m/s + 5% |
| Wind Direction | Starting Threshold: less than 0.5 m/s<br>Accuracy: +/- 5 degrees |

### II.2.2 Mexicali Monitoring Stations

The Mexicali Stations are operated by the Mexican Secretaría de Medio Ambiente y Recursos Naturales (SEMARNAT). The Institute of Technology and UABC stations monitor wind speed and direction at 33 feet (10 meters) while the Cobach station monitors at 19.8 feet (6 meters). These Mexicali Stations, as well as the Progresso and Conalep stations, measure $PM_{10}$, however the latter two stations do not gather meteorological data. The meteorological sensors on the Mexicali stations are also routinely audited by CARB, as described above. Additional information about these monitoring sites can be found on the CARB website (www.arb.ca.gov/qaweb/site.php).

### II.2.3 CIMIS Monitoring Stations

The California Department of Water Resources (DWR) operates a network of over 120 automated weather stations in the state of California as part of its California Irrigation Management Information System (CIMIS). CIMIS was developed in 1982 by DWR and the University of California, Davis to assist irrigators in managing their water resources efficiently. CIMIS weather stations collect weather data on a minute-by-minute basis, calculate hourly and daily values and transmit that information to a central database at the DWR headquarters in Sacramento each day. The data are analyzed for quality, apportioning appropriate flags as necessary, and recorded in the central database, which can be accessed at http://wwwcimis.water.ca.gov/cimis/welcome.jsp.

The CIMIS stations measure wind speeds using a Met-One (Model 014A) three-cup anemometer, with a magnet activated reed switch whose frequency is proportional to wind speed, mounted 6.6 feet (2.0 meters) above the ground. They measure wind speeds from 0-100 mph, with an accuracy of 0.25 mph. Wind direction is measured by a Met-One (Model 024A) wind vane mounted 6.6 feet (2.0 meters) above the ground. The threshold speed for the wind vane is 1 mph and has ± 5% accuracy. Most of the CIMIS stations are sited on standardized grass surfaces.

### II.2.4 Other Monitoring Stations

For large scale regional natural events, meteorological data from the Palm Springs and Indio stations in the Coachella Valley can be used. These stations, which are also $PM_{10}$ monitoring stations, are operated by the South Coast Air Quality Management District (SCAQMD) and are routinely audited by CARB. Both of these stations monitor wind speed and direction using sensors mounted on a 33 foot (10 meter) tower. More information about these monitoring sites can also be found on the CARB website (www.arb.ca.gov/qaweb/site.php).

To supplement the data from these stations, wind speed and direction information was also collected from the Imperial County Airport and the El Centro Naval Air Facility. The Imperial County Airport (ICA) is located north of El Centro. Data from the meteorological station at ICA were obtained from the Western Regional Climate Center (WRCC). Meteorological conditions are monitoring using a standard automated surface observation system and wind speed and direction data are collected using sensors mounted on a 33 foot (10 meter) tower.

The El Centro Naval Air Facility (NAF) is located northeast of Seeley and 5 miles northwest of El Centro. Information about the type and location of the meteorological station at this facility were unavailable.

## II.2.5 Impact of Anemometer Height on Wind Speed Readings

The surface of the Earth exerts a frictional drag on the air blowing just above it, therefore the wind speed an anemometer measures depends on the height of that anemometer. Wind speeds can be adjusted to a consistent reference height using the following wind power law:

$$u_{reference} = u_{measured} \cdot \left( \frac{z_{reference}}{z_{measured}} \right)^p$$

where $u_{reference}$ is the estimated wind speed at the reference height ($z_{reference}$), $u_{measured}$ is the wind speed measured at the anemometer height ($z_{measured}$), and p is the wind profile exponent.[1] The wind profile exponent can range from 0.07 to 0.55 depending on the Pasquill stability category and land use surrounding the monitor.

CIMIS stations measure wind speed and direction at an average height of approximately 6.6 feet above ground level, while many other meteorological stations, including most of the CARB audited stations, measure wind speeds at a height of 33 feet (10 meters) above ground level. The wind speeds from CIMIS stations reported herein are the actual wind speeds measured at the monitor. To compare these wind speeds to those measured at higher (e.g. 10 meter) monitors, the CIMIS wind speeds need to be scaled up by a factor of 1.12 to 2.42, depending on Pasquill stability category.

[1] *User's Guide for the Industrial Source Complex (ISC3) Dispersion Models: Volume II – Description of Model Algorithms*. U.S. Environmental Protection Agency, Document Number EPA-454/B-95-003b, September 1995.

## II.3 2006-2008 $PM_{10}$ Air Quality Data

2006 Data

| Sampling Day | Sampling Date | Brawley | Calexico Ethel | Calexico Grant | El Centro | Niland | Westmorland |
|---|---|---|---|---|---|---|---|
| Tue | 5-Jan | 21 | 34 | 23 | 25 | 17 | 23 |
| Wed | 11-Jan | 47 | 78 | 101 | 57 | 26 | 46 |
| Tue | 17-Jan | 37 | 113 | | 64 | 22 | |
| Thu | 19-Jan | | | | | | 16 |
| Mon | 23-Jan | 26 | 39 | | 28 | 43 | 15 |
| Wed | 25-Jan | | | 59 | | | |
| Sun | 29-Jan | 51 | 85 | 102 | 59 | | 48 |
| Sat | 4-Feb | 45 | 72 | 140 | 36 | 23 | 34 |
| Fri | 10-Feb | 55 | 81 | 77 | 61 | 33 | 46 |
| Thu | 16-Feb | 35 | 37 | 43 | 34 | 36 | 43 |
| Wed | 22-Feb | 29 | 45 | 62 | 20 | 13 | 35 |
| Tue | 28-Feb | 15 | 39 | 36 | 22 | | 16 |
| Mon | 6-Mar | 40 | 100 | | 60 | 19 | 38 |
| Sun | 12-Mar | | 5 | 5 | 6 | | 5 |
| Wed | 15-Mar | | | 53 | | 13 | |
| Sat | 18-Mar | 16 | 10 | 11 | 8 | 11 | 11 |
| Tue | 21-Mar | 14 | | | | | |
| Fri | 24-Mar | 28 | | 61 | 26 | 13 | 23 |
| Sat | 25-Mar | | 41 | | | | |
| Thu | 30-Mar | | 28 | 31 | 26 | 20 | |
| Wed | 5-Apr | | 132 | 92 | 85 | 57 | 118 |
| Tue | 11-Apr | | 34 | 38 | 24 | 16 | 21 |
| Mon | 17-Apr | 36 | 32 | 26 | 17 | 27 | 32 |
| Sun | 23-Apr | 53 | 12 | 15 | 11 | 11 | 16 |
| Tue | 25-Apr | 33 | | | | | |
| Sat | 29-Apr | 31 | 42 | 50 | 76 | 33 | 25 |
| Fri | 5-May | 37 | 46 | 51 | | 41 | 39 |
| Thu | 11-May | 45 | 78 | 90 | | 39 | 57 |
| Wed | 17-May | 57 | 80 | 89 | | 47 | 60 |
| Thu | 18-May | | | | 51 | | |
| Tue | 23-May | 27 | 30 | 43 | 18 | 18 | 24 |
| Thu | 25-May | | | | 24 | | |
| Mon | 29-May | 34 | 36 | 43 | 25 | 33 | 40 |
| Wed | 31-May | | | | 34 | | |
| Sun | 4-Jun | 43 | 58 | 91 | 53 | 48 | 46 |
| Sat | 10-Jun | 34 | 44 | 68 | 43 | 42 | 41 |
| Fri | 16-Jun | 35 | 50 | 62 | 31 | 29 | 43 |
| Thu | 22-Jun | 56 | 61 | 84 | 57 | 42 | 58 |
| Wed | 28-Jun | 113 | | | 79 | 76 | 122 |
| Fri | 30-Jun | | 55 | | | | |
| Tue | 4-Jul | 42 | 44 | 73 | 50 | 38 | 55 |
| Mon | 10-Jul | 57 | 50 | 82 | 50 | 49 | 70 |
| Sun | 16-Jul | 98 | | | 74 | 104 | 136 |
| Tue | 18-Jul | | 37 | | | | |
| Sat | 22-Jul | 51 | 41 | 62 | 59 | 47 | 92 |
| Fri | 28-Jul | 31 | 30 | 41 | 36 | 37 | 39 |
| Thu | 3-Aug | 37 | 33 | 63 | 43 | 31 | 44 |

| Sampling Day | Sampling Date | Brawley | Calexico Ethel | Calexico Grant | El Centro | Niland | Westmorland |
|---|---|---|---|---|---|---|---|
| Wed | 9-Aug | 54 | 36 | | 52 | 48 | 61 |
| Tus | 15-Aug | | 47 | 52 | | | |
| Mon | 21-Aug | 70 | | 105 | 65 | 48 | 84 |
| Wed | 23-Aug | | | 64 | 28 | 34 | 42 |
| Sun | 27-Aug | 70 | 40 | 58 | 31 | 36 | 35 |
| Wed | 30-Aug | 60 | 60 | 100 | | | |
| Sat | 2-Sep | 127 | **164** | **233** | 146 | 99 | **167** |
| Fri | 8-Sep | 75 | 33 | 68 | 67 | 40 | Invalidated |
| Thu | 14-Sep | 106 | 80 | 95 | 96 | 116 | 59 |
| Wed | 20-Sep | 37 | 33 | 45 | 29 | 28 | 68 |
| Tue | 26-Sep | 40 | 49 | 64 | 40 | 34 | 79 |
| Mon | 2-Oct | 33 | 34 | 37 | 24 | 25 | |
| Sun | 8-Oct | 26 | 38 | 52 | 24 | 24 | |
| Tue | 10-Oct | | | | | | 70 |
| Sat | 14-Oct | 25 | | 18 | 17 | 40 | |
| Fri | 20-Oct | 42 | | 91 | 35 | 28 | 32 |
| Tue | 24-Oct | | | | | | 20 |
| Thu | 26-Oct | 27 | | 33 | 33 | 19 | 34 |
| Sat | 28-Oct | | 50 | | | | |
| Wed | 1-Nov | 60 | 73 | 130 | 56 | 40 | 54 |
| Fri | 3-Nov | | 67 | | | | |
| Tue | 7-Nov | 39 | 134 | 110 | 40 | 36 | 50 |
| Mon | 13-Nov | 42 | 63 | 120 | 58 | 30 | 45 |
| Sun | 19-Nov | 36 | 92 | 41 | 30 | 23 | 31 |
| Sat | 25-Nov | 46 | 39 | 39 | 37 | | 50 |
| Fri | 1-Dec | 40 | | 40 | | 14 | 38 |
| Thu | 7-Dec | | 47 | | 31 | 32 | |
| Sun | 10-Dec | | 57 | | | | |
| Wed | 13-Dec | 41 | 62 | 58 | 43 | 22 | 31 |
| Tue | 19-Dec | 22 | 44 | 103 | 36 | 12 | 28 |
| Thu | 21-Dec | | | **171** | 54 | | |
| Mon | 25-Dec | 27 | 110 | **248** | 24 | | |
| Sun | 31-Dec | 47 | 71 | 101 | 67 | 39 | 42 |

2007 Data

| Sampling Day | Sampling Date | Brawley | Calexico Ethel | Calexico Grant | El Centro | Niland | Westmorland |
|---|---|---|---|---|---|---|---|
| Sat | 6-Jan | 29 | 46 | 78 | 31 | 22 | 28 |
| Fri | 12-Jan | 33 | 39 | 29 | 22 | 20 | 25 |
| Mon | 16-Jan | 34 | | 64 | 42 | | |
| Thu | 18-Jan | | 52 | | | 22 | 31 |
| Sat | 20-Jan | | | | | | 22 |
| Wed | 24-Jan | 36 | 60 | | 31 | 12 | 26 |
| Tue | 30-Jan | 21 | 54 | 57 | 36 | 15 | 24 |
| Thu | 1-Feb | | | 13 | | | |
| Mon | 5-Feb | 38 | 70 | 90 | 34 | 27 | 43 |
| Sun | 11-Feb | | 30 | 32 | 28 | 99 | 64 |
| Sat | 17-Feb | 36 | 31 | 34 | 31 | 23 | 22 |
| Wed | 21-Feb | 64 | | | | | |

| Sampling Day | Sampling Date | Brawley | Calexico Ethel | Calexico Grant | El Centro | Niland | Westmorland |
|---|---|---|---|---|---|---|---|
| Fri | 23-Feb | 60 | 41 | 50 | 22 | 35 | 68 |
| Thu | 1-Mar | 30 | 36 | 46 | 29 | 16 | 35 |
| Wed | 7-Mar | 82 | | 89 | 59 | 51 | 68 |
| Sat | 10-Mar | | 84 | | | | |
| Tue | 13-Mar | 48 | 127 | 149 | 64 | 42 | |
| Thu | 15-Mar | | | | | | 58 |
| Mon | 19-Mar | 44 | 52 | 58 | 40 | 50 | 56 |
| Sun | 25-Mar | 23 | 47 | 61 | 32 | 18 | 24 |
| Fri | 30-Mar | | | | | | 49 |
| Sat | 31-Mar | 54 | 106 | 127 | 55 | 29 | |
| Fri | 6-Apr | 49 | 35 | 45 | 44 | 49 | 51 |
| Thu | 12-Apr | **291** | 124 | 147 | 121 | 108 | **155** |
| Wed | 18-Apr | 38 | 44 | | 27 | | 29 |
| Tue | 24-Apr | 23 | 51 | 79 | 21 | 27 | 22 |
| Mon | 30-Apr | 46 | 63 | 77 | 53 | 37 | 49 |
| Sun | 6-May | 30 | 25 | | | 13 | |
| Wed | 9-May | | | | 31 | | |
| Sat | 12-May | 51 | 36 | 43 | 25 | 38 | 37 |
| Fri | 18-May | 51 | | 87 | 52 | 35 | 56 |
| Tue | 22-May | | 61 | | | | |
| Thu | 24-May | 43 | 67 | 77 | 41 | 41 | 49 |
| Wed | 30-May | 41 | 49 | | 46 | | 61 |
| Tue | 5-Jun | **281** | **282** | | **200** | **162** | **226** |
| Thu | 7-Jun | | | 35 | | 30 | |
| Mon | 11-Jun | | 89 | 116 | | 34 | 65 |
| Sun | 17-Jun | 48 | 41 | 50 | 36 | 73 | |
| Wed | 20-Jun | | | 50 | | | |
| Sat | 23-Jun | 52 | 60 | 66 | 55 | 57 | |
| Tue | 26-Jun | 73 | | | | | 48 |
| Fri | 29-Jun | 46 | 63 | 62 | | 52 | 44 |
| Thu | 5-Jul | 71 | 75 | 65 | | 53 | 111 |
| Wed | 11-Jul | 78 | 62 | 91 | | 47 | 92 |
| Tue | 17-Jul | 58 | | 81 | | 58 | 50 |
| Mon | 23-Jul | 64 | 54 | 111 | 60 | 62 | 58 |
| Wed | 25-Jul | | 30 | | | | |
| Sun | 29-Jul | 47 | 38 | 47 | 41 | 46 | 44 |
| Sat | 4-Aug | 55 | 57 | **Decommissioned Unit** | 47 | 44 | |
| Fri | 10-Aug | 53 | 62 | | | 36 | 57 |
| Mon | 13-Aug | | | | 62 | | |
| Thu | 16-Aug | 52 | 41 | | 63 | 44 | 51 |
| Wed | 22-Aug | 55 | 94 | | | 59 | 73 |
| Fri | 24-Aug | | | | 96 | | |
| Tue | 28-Aug | 43 | 46 | | 32 | 32 | 30 |
| Wed | 29-Aug | | | | 58 | | |
| Mon | 3-Sep | 61 | | | 60 | 45 | 40 |
| Wed | 5-Sep | | 51 | | | | |
| Sun | 9-Sep | 48 | 45 | | 43 | 57 | 39 |
| Tue | 11-Sep | | | | 45 | | |
| Sat | 15-Sep | 53 | 65 | | 59 | 46 | 44 |
| Wed | 19-Sep | | | | 117 | | 53 |

| Sampling Day | Sampling Date | Brawley | Calexico Ethel | Calexico Grant | El Centro | Niland | Westmorland |
|---|---|---|---|---|---|---|---|
| Fri | 21-Sep | 17 | 15 | | 13 | 15 | 11 |
| Thu | 27-Sep | 69 | 55 | | 41 | 24 | 34 |
| Wed | 3-Oct | 37 | 45 | | 40 | 25 | 30 |
| Tue | 9-Oct | 56 | 100 | | 77 | 36 | 23 |
| Mon | 15-Oct | 42 | 67 | | 36 | 28 | 33 |
| Sun | 21-Oct | 117 | 142 | | 94 | 57 | 71 |
| Sat | 27-Oct | 54 | 103 | | 30 | 51 | 51 |
| Fri | 2-Nov | 46 | 35 | | 37 | 22 | 38 |
| Thu | 8-Nov | 58 | 101 | | 70 | | 59 |
| Wed | 14-Nov | 29 | 70 | | 27 | 21 | 33 |
| Tues | 20-Nov | 70 | 110 | | 98 | 46 | |
| Mon | 26-Nov | 67 | 117 | | 75 | 31 | 45 |
| Wed | 28-Nov | | | | | | 30 |
| Sun | 2-Dec | | | | 13 | 8 | 9 |
| Tue | 4-Dec | | 106 | | | | |
| Sat | 8-Dec | 21 | 14 | | 12 | 12 | 11 |
| Wed | 12-Dec | 49 | | | | | |
| Fri | 14-Dec | 35 | 52 | | 36 | 8 | |
| Thu | 20-Dec | 30 | 40 | | 37 | 19 | 27 |
| Wed | 26-Dec | 20 | 70 | | 44 | | 26 |

2008 Data

| Sampling Day | Sampling Date | Brawley | Calexico Ethel | El Centro | Niland | Westmorland |
|---|---|---|---|---|---|---|
| Tue | 1-Jan | 23 | 25 | 26 | 18 | 18 |
| Mon | 7-Jan | | 27 | 14 | | 9 |
| Wed | 9-Jan | | | | 9 | |
| Sun | 13-Jan | 11 | | 11 | 5 | 12 |
| Tue | 15-Jan | | 74 | | | |
| Wed | 16-Jan | 38 | | | | |
| Sat | 19-Jan | 29 | 46 | 23 | 14 | 22 |
| Fri | 25-Jan | 22 | 36 | 30 | 15 | 18 |
| Thu | 31-Jan | 24 | 60 | 29 | 6 | 20 |
| Wed | 6-Feb | 28 | 74 | 45 | 62 | 28 |
| Tue | 12-Feb | 25 | 59 | 20 | 9 | 25 |
| Mon | 18-Feb | 42 | 76 | 34 | 29 | 34 |
| Sun | 24-Feb | 31 | 43 | 36 | 28 | 41 |
| Sat | 1-Mar | 45 | 64 | 53 | 57 | 43 |
| Fri | 7-Mar | 28 | 85 | 28 | 15 | 28 |
| Thu | 13-Mar | 38 | 88 | 50 | 34 | 51 |
| Wed | 19-Mar | 33 | 67 | 38 | 26 | 32 |
| Tue | 25-Mar | 34 | 51 | 33 | 44 | 37 |
| Mon | 31-Mar | 30 | 58 | 28 | 31 | 29 |
| Sun | 6-Apr | 42 | 29 | 18 | 34 | 38 |
| Sat | 12-Apr | 23 | 35 | 18 | 21 | 27 |
| Fri | 18-Apr | 33 | 77 | 39 | 36 | 41 |
| Thu | 24-Apr | 30 | 37 | 25 | 22 | 35 |
| Wed | 30-Apr | 137 | 104 | 88 | 99 | 137 |
| Tue | 6-May | 29 | 49 | 32 | 26 | 26 |

| Sampling Day | Sampling Date | Brawley | Calexico Ethel | El Centro | Niland | Westmorland |
|---|---|---|---|---|---|---|
| Mon | 12-May | 111 | 111 | 42 | 83 | 97 |
| Sun | 18-May | 27 | 58 | 29 | | 26 |
| Sat | 24-May | 11 | 21 | | 47 | 8 |
| Wed | 28-May | | | 18 | | |
| Fri | 30-May | 22 | 30 | 19 | 31 | 20 |
| Thu | 5-Jun | 52 | 75 | 44 | 41 | 45 |
| Wed | 11-Jun | 49 | 81 | 50 | 53 | 51 |
| Tus | 17-Jun | 48 | 71 | 43 | 44 | 47 |
| Mon | 23-Jun | 45 | 59 | 34 | 30 | 32 |
| Sun | 29-Jun | 36 | 45 | 32 | 45 | 37 |
| Sat | 5-Jul | 51 | | 59 | 48 | 50 |
| Fri | 11-Jul | 43 | 53 | 42 | 35 | 42 |
| Thu | 17-Jul | 43 | 57 | 44 | 42 | |
| Wed | 23-Jul | 36 | 58 | 32 | 48 | 44 |
| Fri | 25-Jul | | | | | 46 |
| Tue | 29-Jul | 36 | 47 | | 45 | 45 |
| Mon | 4-Aug | 37 | 52 | 41 | 41 | 43 |
| Sun | 10-Aug | 40 | 24 | 23 | | 31 |
| Sat | 16-Aug | 43 | 47 | 25 | 71 | 48 |
| Fri | 22-Aug | 40 | 48 | | 33 | 49 |
| Tue | 26-Aug | | | | 52 | |
| Thu | 28-Aug | 28 | 35 | 32 | 33 | 41 |
| Wed | 3-Sep | 28 | 42 | 26 | 33 | 30 |
| Tue | 9-Sep | 45 | 45 | 41 | 34 | 53 |
| Mon | 15-Sep | 51 | 67 | | 28 | 53 |
| Sun | 21-Sep | 22 | 34 | 21 | 27 | 22 |
| Sat | 27-Sep | 32 | 64 | 20 | 27 | 28 |
| Fri | 3-Oct | 60 | 47 | 26 | 55 | |
| Thu | 9-Oct | 52 | 62 | | 32 | 53 |
| Wed | 15-Oct | 42 | 43 | 24 | | 65 |
| Tue | 21-Oct | 52 | 73 | 33 | 40 | 49 |
| Mon | 27-Oct | 53 | 61 | 38 | 35 | 47 |
| Wed | 29-Oct | | | | 72 | 50 |
| Sun | 2-Nov | 79 | | 32 | 49 | 83 |
| Tue | 4-Nov | | 44 | 34 | | |
| Sat | 8-Nov | 37 | 63 | | 56 | 33 |
| Fri | 14-Nov | 46 | 65 | 26 | 24 | 31 |
| Thu | 20-Nov | 52 | 82 | 54 | 42 | 63 |
| Wed | 26-Nov | 27 | 33 | 22 | 18 | 26 |
| Tue | 2-Dec | 44 | | 42 | 23 | 33 |
| Thu | 4-Dec | | 99 | | | |
| Mon | 8-Dec | 55 | 33 | 41 | | |
| Sun | 14-Dec | 15 | 18 | 12 | 10 | 14 |
| Tue | 16-Dec | | | 17 | 6 | 11 |
| Sat | 20-Dec | 31 | 27 | 22 | 6 | 17 |
| Fri | 26-Dec | 24 | | 33 | 122 | 20 |
| Sat | 27-Dec | | 22 | | | |

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# APPENDIX III.A

# IMPERIAL COUNTY UNCONTROLLED $PM_{10}$ EMISSIONS INVENTORY

# Appendix III.A

# Imperial County $PM_{10}$ Uncontrolled Emissions Inventory

The emission inventory used in the Imperial County 2009 $PM_{10}$ SIP is derived from CARB's SIP inventory Version 1.06 (SIP V1.06), base year 2002. Since SIP V1.06 was developed, changes have occurred which impact the emissions inventory. To ensure that the Imperial County SIP is based on the best available data, appropriate adjustments were implemented to update the SIP V1.06 inventory. These adjustments fall in two categories: (i) adjustments to incorporate new methodology and updated information (e.g., throughputs, activity data, etc.), and (ii) adjustments to incorporate emission reductions arising from the implementation of new control measures. This appendix discusses updates to the Imperial County $PM_{10}$ emissions inventory that fall within the first category. Adjustments to the inventory to reflect reductions resulting from ICAPCD's fugitive dust control measures (Regulation VIII rules) are discussed in Chapter IV.

## III.1 Summary of Adjustments to the Imperial County $PM_{10}$ Emission Inventory

Adjustments to the Imperial County $PM_{10}$ Emissions Inventory to reflect updated information and/or methodology are summarized in Table 1. Overall, these adjustments resulted in a >20% increase in total $PM_{10}$ emissions in Imperial County in 2005 from 232 tpd[1] to 281 tpd. Additional details concerning the adjustments are presented in subsequent subsections.

**Table 1: Summary of Adjustments to the Imperial County $PM_{10}$ Inventory (Excluding Control Reductions)**

| EIC | Category Description | External Adjustments |
|---|---|---|
| 620-618-0262-0101 | Farming Operations - Livestock Husbandry – Dairy Cattle | 1. Reduce emissions by incorporating reductions from Rule 420.<br>2. Revise emissions, based on updated cattle population data and 2004 methodology.<br>3. Revise Total PM emissions by changing PM profile from #900 (Unspecified) to #423 (Livestock Operations Dust) with lower $PM_{10}$ fractions. |
| 620-618-0262-0103 | Farming Operations - Livestock Husbandry – Feedlot Cattle | 1. Reduce emissions by incorporating reductions from Rule 420.<br>2. Revise emissions, based on updated cattle population data and 2004 methodology.<br>3. Revise Total PM emissions by changing PM profile from #900 (Unspecified) to #423 (Livestock Operations Dust) with lower $PM_{10}$ fractions. |
| 645-638-5400-0000 | Unpaved Road Travel Dust - City and County Roads | Increase emissions, based on higher average daily trip (ADT) estimates from the Imperial County Public Works Dept. |
| 645-640-5400-0000 | Unpaved Road Travel Dust - US Forest and Park Roads | Decrease emissions, based on keeping forest road miles at 1993 levels, rather than growing them. |
| 645-644-5400-0000 | Unpaved Road Travel Dust - B.L.M. Roads | Decrease emissions, based on keeping BLM road miles at 1993 levels, rather than growing them. |
| 645-648-5400-0000 | Unpaved Road Travel Dust – Unspecified (Canal Roads) | Increase emissions, based on increased canal road miles from the Imperial County Public Works Dept. Replace default growth factors with zero growth. |
| 650-650-5400-0000 | Fugitive Windblown Dust - Dust from Agricultural Lands (Non-Pasture) | Decrease emissions, based on lower estimates from the 2004 Windblown Dust Study. |
| 650-652-5400-0000 | Fugitive Windblown Dust - Dust from Unpaved Roads and Associated Areas | Increase emissions, based on the 2004 Windblown Dust Study and ARB's latest (1997) emission factor. |

## III.2 Farming Operations – Livestock Husbandry – Dairy Cattle & Feedlot Cattle (EICs 620-618-0262-0101 and 620-618-0262-0103)

In the original SIP V1.06 inventory, EIC 620-618-0262-0101 had zero emissions and did not appear in forecast scenarios. This was corrected so that the $PM_{10}$ Imperial County SIP inventory includes emissions for EIC 620-618-0262-0101.

[1] This number corresponds to the 2004 projection from SIP Inventory V1.06

In 2002, the Imperial County APCD revised Rule 420, Beef Feedlots, to reduce PM emissions. Rule 420 became effective in 2004, resulting in a 50% reduction of PM emissions. Rule 420 was also revised in 2006, although with no change in the percent reduction. The SIP inventory V1.06 has been adjusted to reduce PM emissions 50% for EICs 620-618-0262-0101 and 620-618-0262-0103, beginning in 2004.

In 2004, ARB published an updated methodology for Livestock Husbandry which included new emission factors for dairy cattle and feedlot cattle.[2] In 2005, the Imperial County APCD obtained updated cattle population data for 2004, as documented in the Best Available Control Measure (BACM) Analysis.[3] These changes resulted in external adjustments for EIC 620-618-0262-0101 that increased uncontrolled $PM_{10}$ emissions slightly from zero tpd to 0.01 tpd in 2004.

When calculating $PM_{10}$ emissions for dairy cattle, the BACM Analysis specifically excluded the population of 21,452 heifers. However, in a subsequent Imperial County APCD letter,[4] heifers were grouped with feedlot cattle under EIC 620-618-0262-0103. To ensure consistency, ARB staff used the approach in the Imperial County APCD letter and grouped heifers with feedlot cattle to determine the 2004 emissions adjustment. For EIC 620-618-0262-0103, the updated methodology and population data resulted in an 18% increase of uncontrolled $PM_{10}$ emissions from 4.66 to 5.52 tpd. When 50% reductions from Rule 420 were applied, $PM_{10}$ emissions decreased in 2004. The SIP inventory V1.06 has been adjusted to reduce 2004 and 2005 $PM_{10}$ emissions for EIC 620-618-0262-0101 to 0.006 tpd and 620-618-0262-0103 to 2.76 tpd.

For the years 2006 and 2007, Imperial County APCD provided updated cattle population data.[4] The SIP inventory V1.06 has been adjusted to include the following from 2006 to 2010:

(1) For EIC 620-618-0262-0101, the growth factor increased from 1 (i.e., no growth) to 1.452 and the emissions increased from 0.006 to 0.009 tpd, beginning in 2006; and

(2) For EIC 620-618-0262-0103, the growth factor increased from 1 (i.e., no growth) to 1.177 and the emissions increased from 2.76 to 3.25 tpd, beginning in 2006.

## III.3 Unpaved Road Travel Dust-City and County Roads (EIC 645-638-5400-0000)

For the SIP Inventory V1.06, emissions from unpaved road travel dust were based on an emission factor of 2.27 lbs $PM_{10}$/vehicle mile traveled (VMT) using ARB's 1997 methodology.[5] In 2003, ARB updated this emission factor to 2.0 lbs $PM_{10}$/VMT for the San Joaquin Valley $PM_{10}$

[2] Air Resources Board. Areawide Source Methodologies, Section 7.6, Livestock Husbandry, May 2004, http://www.arb.ca.gov/ei/areasrc/fullpdf/FULL7-6.PDF.
[3] Environ International Corporation, "Draft Final Technical Memorandum, Regulation VIII BACM Analysis", prepared for the Imperial County APCD, October 2005.
[4] Letter from Imperial County APCD (Reyes Romero) to ARB (Andrew Deleo), regarding an emission inventory update for Livestock Husbandry, dated April 9, 2008.
[5] Air Resources Board. Areawide Source Methodologies, Section 7.6, Unpaved Road Dust (Non-Farm Roads), August 1997, http://www.arb.ca.gov/ei/areasrc/fullpdf/full7-10prev.pdf.

SIP.[6] In 2005,[7] and later in 2008,[8] the Imperial County APCD obtained updated information from the Imperial County Public Works Department regarding the miles of unpaved city and county roads. The updated emission factor and road data resulted in a ~50% increase[9] in travel road dust emissions from unpaved city and county roads to 25.6 tpd (24.6 tpd after correcting for rainfall).

## III.4 Unpaved Road Travel Dust – US Forest and Park Roads & BLM Roads (EICs 645-640-5400-0000 and 645-644-5400-0000)

For the SIP Inventory V1.06, emissions from unpaved road travel dust were based on an emission factor of 2.27 lbs $PM_{10}$/vehicle mile traveled (VMT) using ARB's 1997 methodology.[5] In 2003, ARB updated this emission factor to 2.0 lbs $PM_{10}$/VMT for the San Joaquin Valley $PM_{10}$ SIP.[6] Also, Imperial County APCD requested revision of emissions estimates for these source categories to reflect no growth in the mileage of forest roads (USFS roads) and Bureau of Land Management roads (BLM roads) after 1993.[7] The updated emission factor and road data result in a ~40% decrease in 2004 $PM_{10}$ emissions from 2.3 to 1.4 tpd (1.3 tpd after correcting for rainfall). The SIP inventory V1.06 has been externally adjusted to account for this decrease.

## III.5 Fugitive Windblown Dust – Dust from (Non-Pasture) Agricultural Lands (EIC 650-650-5400-0000)

In 2004, ENVIRON completed an updated windblown dust study for Imperial County.[7] The results of this study were used to develop revised emission estimates that amount to an 88% decrease in $PM_{10}$ emissions from 91.5 to 10.8 tpd. In addition, the windblown dust study resulted in changes to the temporal factors for this category. The Summer Temporal Factor changed from 1.539 to 0.782 and the Winter Temporal Factor changed from 0.462 to 1.221. The SIP inventory V1.06 has been externally adjusted to account for the decreased emissions and the temporal factor changes.

## III.6 Fugitive Windblown Dust – Dust from Unpaved Roads and Open Areas (EIC 650-652-5400-0000)

The SIP inventory V1.06 apparently used an older emission factor than is contained in ARB's 1997 methodology.[10] Emissions estimates for this category were revised based on the 1997 emission factor. The results of the revised windblown dust study (see section III.5) were also

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[6] Air Resources Board. "Summary of Fugitive Dust and Ammonia Emission Inventory Changes for the SJVU APCD Particulate Matter SIP", Revision 2.1, May 2003, http://www.valleyair.org/Air_Quality_Plans/docs/2003%20PM10%20Plan/PDF%202003%20PM10%20Plan%20adpt%20app/App%20C-EI%20Changes.pdf.

[7] Environ International Corporation, "Draft Final Technical Memorandum, Regulation VIII BACM Analysis", prepared for the Imperial County APCD, October 2005.

[8] Communications between the ICAPCD and the Imperial County Public Works Department; refer to Attachment A of this Appendix.

[9] Primarily as a consequence of higher average daily trip estimates from the Imperial County Public Works Department.

[10] Air Resources Board. Areawide Source Methodologies, Section 7.13, Windblown Dust – Unpaved Roads, August 1997, http://www.arb.ca.gov/ei/areasrc/fullpdf/full7-13.pdf.

used to develop revised annual and seasonal emission estimates for open areas (i.e., grasslands, dunes, barren lands).[11] Finally, additional $PM_{10}$ emissions due to disturbance of soils as a result of off-road vehicle usage on Imperial County vacant lands were calculated as documented in Appendix III.B. The revised emission factor and updated studies resulted in a >150% increase in $PM_{10}$ emissions from these categories to 200.1 tpd.

## III.7 Unpaved Road Travel Dust – Unspecified (IID Maintenance Roads) (EIC 645-648-5400-0000)

For the SIP Inventory V1.06, emissions from unpaved road travel dust were based on an emission factor of 2.27 lbs $PM_{10}$/vehicle mile traveled (VMT) using ARB's 1997 methodology.[12] In 2003, ARB updated this emission factor to 2.0 lbs $PM_{10}$/VMT for the San Joaquin Valley $PM_{10}$ SIP.[13] In 2005,[14] and later in 2008,[15] Imperial County APCD obtained updated information from the Imperial County Public Works Department regarding the miles of unpaved roads along canals. The updated emission factor and road data increased 2005 $PM_{10}$ emissions ~140% to 30.7 tpd (29.6 tpd after correcting for rainfall), primarily as a consequence of higher inventory of canal road miles.

The default growth factors for unspecified unpaved roads are based on vehicle miles traveled by Light Duty Trucks and Medium Duty Trucks (i.e., LDT&MDT_VMT), and correspond to a 24% mileage growth from 2002 to 2010. The ICAPCD suggested that these default growth factors are not appropriate for IID maintenance roads, given that (i) these roads are only used for canal maintenance and irrigation duties, and (ii) IID is installing concrete lining on many canals, which reduces the use of canal roads for maintenance purposes. For these reasons, ICAPCD requested that zero growth be assumed for this source category after 2002. (We note that there is a precedent for applying a zero growth assumption to unpaved road dust: for the San Joaquin Valley Unified Air Pollution Control District 2003 $PM_{10}$ SIP, ARB determined[16] that the growth should be set to zero for dust from unpaved roads.)

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[11] Note here that the 0.593 and 1.407 winter and summer temporal factors were retained for windblown dust from unpaved roads, since the windblown dust study did not estimate emissions from roads.

[12] Air Resources Board. Areawide Source Methodologies, Section 7.6, Unpaved Road Dust (Non-Farm Roads), August 1997, http://www.arb.ca.gov/ei/areasrc/fullpdf/full7-10prev.pdf.

[13] Air Resources Board. "Summary of Fugitive Dust and Ammonia Emission Inventory Changes for the SJVU APCD Particulate Matter SIP", Revision 2.1, May 2003, http://www.valleyair.org/Air_Quality_Plans/docs/2003%20PM10%20Plan/PDF%202003%20PM10%20Plan%20adpt%20app/App%20C-EI%20Changes.pdf.

[14] Environ International Corporation, "Draft Final Technical Memorandum, Regulation VIII BACM Analysis", prepared for the Imperial County APCD, October 2005.

[15] Communications between the ICAPCD and the Imperial Irrigation District.

[16] Air Resources Board. "Summary of Fugitive Dust and Ammonia Emission Inventory Changes for the SJVU APCD Particulate Matter SIP, Revision 2.1". May 2003.

## III.8 Baseline and Projected Imperial County $PM_{10}$ Emissions

The 2005 baseline and the projected 2006-2010 Imperial County $PM_{10}$ emission inventories derived using the above adjustments are given in Tables III.1-III.4 below.

**Table III.1** $PM_{10}$ Emission Inventory for Imperial County in Baseline Year 2005[a] (tpd)

| Source Category | Annual Average | Winter Average | Summer Average |
|---|---|---|---|
| Fuel Combustion | 0.41 | 0.35 | 0.48 |
| Waste Disposal | 0.00 | 0.00 | 0.00 |
| Cleaning/Surface Coatings | 0.00 | 0.00 | 0.00 |
| Petroleum Production/Marketing | 0.00 | 0.00 | 0.00 |
| Industrial Processes: | *2.79* | *2.79* | *2.78* |
| Mineral Processes | 2.63 | 2.62 | 2.64 |
| Food/Agriculture | 0.16 | 0.17 | 0.14 |
| Solvent Evaporation | 0.00 | 0.00 | |
| Res Fuel Combustion | 0.09 | 0.16 | 0.02 |
| Farming | *9.88* | *11.55* | *8.20* |
| Tilling | 7.10 | 8.77 | 5.42 |
| Harvest | 0.01 | 0.01 | 0.01 |
| Cattle | 2.77 | 2.77 | 2.77 |
| Construction | 2.20 | 2.01 | 2.38 |
| Paved Road Dust | 3.38 | 3.30 | 3.46 |
| Entrained Unpaved Road Dust: | *56.85* | *33.71* | *79.98* |
| City/County | 24.58 | 14.58 | 34.59 |
| Canal | 29.57 | 17.54 | 41.61 |
| BLM/USFS | 1.34 | 0.79 | 1.88 |
| Farm | 1.35 | 0.80 | 1.90 |
| Windblown Dust: | *212.67* | *223.79* | *201.95* |
| Open Areas—Urban | 0.01 | 0.02 | 0.00 |
| Open Areas—Others[b] | 169.54 | 191.09 | 148.34 |
| Unpaved Roads: | *30.52* | *18.10* | *42.94* |
| City/County | 7.82 | 4.64 | 11.00 |
| Canal | 16.32 | 9.68 | 22.96 |
| BLM/USFS | 0.37 | 0.22 | 0.52 |
| Farm | 6.01 | 3.56 | 8.46 |
| Non-Pasture Ag Lands | 10.81 | 13.21 | 8.46 |
| Pasture | 1.79 | 1.37 | 2.20 |
| Fires | 0.00 | 0.00 | 0.00 |
| Waste Burning | 2.77 | 2.77 | 2.77 |
| Cooking | 0.06 | 0.06 | 0.06 |
| On-Road Mobile | 1.05 | 1.06 | 1.05 |
| Other Mobile | 0.99 | 0.95 | 1.04 |
| **Total** | **293** | **282** | **304** |

[a]Entries corresponding to the summed contributions of subcategories are in italics. [b]Grasslands, dunes, and other barren lands (see Table 3.1 of the main document). As documented in Appendix III.B, emissions were estimated using available information on the conditions of the vacant lands (e.g., desert areas of barren, grass/shrubland, and dunes). Reported emissions also include the conservatively-estimated contributions due to soil disturbances caused by off-road vehicle usage.

**Table III.2** Imperial County $PM_{10}$ Annual-Average Emission Inventory[a] in 2006-2010 (tpd)

| **Source Category** | **2006** | **2007** | **2008** | **2009** | **2010** |
|---|---|---|---|---|---|
| Fuel Combustion | 0.42 | 0.42 | 0.42 | 0.42 | 0.43 |
| Waste Disposal | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cleaning/Surface Coatings | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Petroleum Production/Marketing | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Industrial Processes: | *2.83* | *2.87* | *2.91* | *2.98* | *3.01* |
| Mineral Processes | 2.67 | 2.71 | 2.74 | 2.81 | 2.85 |
| Food/Agriculture | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 |
| Solvent Evaporation | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Res Fuel Combustion | 0.09 | 0.09 | 0.09 | 0.09 | 0.10 |
| Farming: | *10.37* | *10.37* | *10.36* | *10.36* | *10.36* |
| Tilling | 7.10 | 7.09 | 7.09 | 7.09 | 7.08 |
| Harvest | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Cattle | 3.26 | 3.26 | 3.26 | 3.26 | 3.26 |
| Construction | 2.22 | 2.24 | 2.26 | 2.27 | 2.28 |
| Paved Road Dust | 3.62 | 3.86 | 4.09 | 4.32 | 4.13 |
| Entrained Unpaved Road Dust: | *56.84* | *56.84* | *56.84* | *56.84* | *56.84* |
| City/County | 24.58 | 24.58 | 24.58 | 24.58 | 24.58 |
| Canal | 29.57 | 29.57 | 29.57 | 29.57 | 29.57 |
| BLM/USFS | 1.34 | 1.34 | 1.34 | 1.34 | 1.34 |
| Farm | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 |
| Windblown: | *212.66* | *212.66* | *212.64* | *212.64* | *212.63* |
| Open Areas-Urban | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Open Areas-Others[b] | 169.54 | 169.54 | 169.54 | 169.54 | 169.54 |
| Unpaved Roads | *30.52* | *30.52* | *30.52* | *30.52* | *30.52* |
| City/County | 7.82 | 7.82 | 7.82 | 7.82 | 7.82 |
| Canal | 16.32 | 16.32 | 16.32 | 16.32 | 16.32 |
| BLM/USFS | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 |
| Farm | 6.01 | 6.01 | 6.01 | 6.01 | 6.01 |
| Non-Pasture Ag Lands | 10.80 | 10.80 | 10.79 | 10.79 | 10.78 |
| Pasture | 1.79 | 1.78 | 1.78 | 1.78 | 1.78 |
| Fires | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Waste Burning | 2.75 | 2.73 | 2.71 | 2.69 | 2.67 |
| Cooking | 0.06 | 0.06 | 0.06 | 0.06 | 0.07 |
| On-Road Mobile | 1.01 | 0.93 | 0.88 | 0.82 | 0.77 |
| Other Mobile | 0.98 | 0.96 | 0.95 | 0.95 | 0.94 |
| **Total** | **294** | **294** | **294** | **294** | **294** |

[a]Annual averages accounting for projected growth in emission-generating activities, but not for reductions due to control or mitigation of $PM_{10}$ sources. Entries corresponding to the summed contributions of subcategories are in italics. [b]Grasslands, dunes, and other barren lands (see Table 3.1 of the main document). As documented in Appendix III.B, emissions were estimated using available information on the conditions of the vacant lands (e.g., desert areas of barren, grass/shrubland, and dunes). Reported emissions also include the conservatively-estimated contributions due to soil disturbances caused by off-road vehicle usage.

**Table III.3** Imperial County $PM_{10}$ Winter-Average Emission Inventory[a] in 2006-2010 (tpd)

| **Source Category** | **2006** | **2007** | **2008** | **2009** | **2010** |
|---|---|---|---|---|---|
| Fuel Combustion | 0.35 | 0.35 | 0.35 | 0.36 | 0.36 |
| Waste Disposal | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cleaning/Surface Coatings | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Petroleum Production/Marketing | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Industrial Processes: | *2.84* | *2.88* | *2.91* | *2.99* | *3.02* |
| Mineral Processes | 2.67 | 2.70 | 2.74 | 2.81 | 2.84 |
| Food/Agriculture | 0.17 | 0.18 | 0.18 | 0.18 | 0.18 |
| Solvent Evaporation | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Res Fuel Combustion | 0.16 | 0.16 | 0.17 | 0.17 | 0.17 |
| Farming: | *12.04* | *12.04* | *12.04* | *12.03* | *12.03* |
| Tilling | 8.77 | 8.77 | 8.76 | 8.76 | 8.76 |
| Harvest | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Cattle | 3.26 | 3.26 | 3.26 | 3.26 | 3.26 |
| Construction | 2.04 | 2.05 | 2.07 | 2.08 | 2.09 |
| Paved Road Dust | 3.52 | 3.76 | 3.99 | 4.21 | 4.03 |
| Entrained Unpaved Road Dust: | *33.71* | *33.71* | *33.71* | *33.71* | *33.71* |
| City/County | 14.58 | 14.58 | 14.58 | 14.58 | 14.58 |
| Canal | 17.54 | 17.54 | 17.54 | 17.54 | 17.54 |
| BLM/USFS | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 |
| Farm | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| Windblown: | *223.77* | *223.77* | *223.76* | *223.76* | *223.74* |
| Open Areas-Urban | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| Open Areas-Others[b] | 191.09 | 191.09 | 191.09 | 191.09 | 191.09 |
| Unpaved Roads | *18.10* | *18.10* | *18.10* | *18.10* | *18.10* |
| City/County | 4.64 | 4.64 | 4.64 | 4.64 | 4.64 |
| Canal | 9.68 | 9.68 | 9.68 | 9.68 | 9.68 |
| BLM/USFS | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 |
| Farm | 3.56 | 3.56 | 3.56 | 3.56 | 3.56 |
| Non-Pasture Ag Lands | 13.19 | 13.19 | 13.18 | 13.18 | 13.17 |
| Pasture | 1.37 | 1.37 | 1.37 | 1.37 | 1.37 |
| Fires | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Waste Burning | 2.75 | 2.73 | 2.71 | 2.69 | 2.67 |
| Cooking | 0.06 | 0.06 | 0.06 | 0.06 | 0.07 |
| On-Road Mobile | 1.02 | 0.93 | 0.88 | 0.83 | 0.78 |
| Other Mobile | 0.94 | 0.91 | 0.91 | 0.90 | 0.90 |
| **Total** | **283** | **283** | **284** | **284** | **284** |

[a]Winter (November-April) averages accounting for projected growth in emission-generating activities, but not for reductions due to control or mitigation of $PM_{10}$ sources. Entries corresponding to the summed contributions of subcategories are in italics. [b]Grasslands, dunes, and other barren lands (see Table 3.1 of the main document). As documented in Appendix III.B, emissions were estimated using available information on the conditions of the vacant lands (e.g., desert areas of barren, grass/shrubland, and dunes). Reported emissions also include the conservatively-estimated contributions due to soil disturbances caused by off-road vehicle usage.

**Table III.4** Imperial County $PM_{10}$ Summer-Average Emission Inventory[a] in 2006-2010 (tpd)

| Source Category | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| Fuel Combustion | 0.48 | 0.49 | 0.49 | 0.49 | 0.49 |
| Waste Disposal | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cleaning/Surface Coatings | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Petroleum Production/Marketing | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Industrial Processes: | *2.82* | *2.87* | *2.90* | *2.97* | *3.01* |
| Mineral Processes | 2.68 | 2.71 | 2.75 | 2.82 | 2.86 |
| Food/Agriculture | 0.14 | 0.15 | 0.15 | 0.15 | 0.15 |
| Solvent Evaporation | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Res Fuel Combustion | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| Farming: | *8.69* | *8.69* | *8.69* | *8.69* | *8.68* |
| Tilling | 5.42 | 5.42 | 5.42 | 5.41 | 5.41 |
| Harvest | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Cattle | 3.26 | 3.26 | 3.26 | 3.26 | 3.26 |
| Construction | 2.41 | 2.43 | 2.44 | 2.46 | 2.48 |
| Paved Road Dust | 3.71 | 3.96 | 4.20 | 4.43 | 4.24 |
| Entrained Unpaved Road Dust: | *79.98* | *79.98* | *79.98* | *79.98* | *79.98* |
| City/County | 34.59 | 34.59 | 34.59 | 34.59 | 34.59 |
| Canal | 41.61 | 41.61 | 41.61 | 41.61 | 41.61 |
| BLM/USFS | 1.88 | 1.88 | 1.88 | 1.88 | 1.88 |
| Farm | 1.90 | 1.90 | 1.90 | 1.90 | 1.90 |
| Windblown: | *201.93* | *201.93* | *201.92* | *201.92* | *201.91* |
| Open Areas-Urban | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Open Areas-Others[b] | 148.34 | 148.34 | 148.34 | 148.34 | 148.34 |
| Unpaved Roads | *42.94* | *42.94* | *42.94* | *42.94* | *42.94* |
| City/County | 11.00 | 11.00 | 11.00 | 11.00 | 11.00 |
| Canal | 22.96 | 22.96 | 22.96 | 22.96 | 22.96 |
| BLM/USFS | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 |
| Farm | 8.46 | 8.46 | 8.46 | 8.46 | 8.46 |
| Non-Pasture Ag Lands | 8.44 | 8.44 | 8.43 | 8.43 | 8.43 |
| Pasture | 2.20 | 2.20 | 2.20 | 2.20 | 2.20 |
| Fires | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Waste Burning | 2.75 | 2.73 | 2.71 | 2.69 | 2.67 |
| Cooking | 0.06 | 0.06 | 0.06 | 0.06 | 0.07 |
| On-Road Mobile | 1.00 | 0.92 | 0.87 | 0.82 | 0.77 |
| Other Mobile | 1.03 | 1.00 | 1.00 | 0.99 | 0.99 |
| **Total** | **305** | **305** | **305** | **306** | **305** |

[a]Summer (May-October) averages accounting for projected growth in emission-generating activities, but not for reductions due to control or mitigation of $PM_{10}$ sources. Entries corresponding to the summed contributions of subcategories are in italics. [b]Grasslands, dunes, and other barren lands (see Table 3.1 of the main document). As documented in Appendix III.B, emissions were estimated using available information on the conditions of the vacant lands (e.g., desert areas of barren, grass/shrubland, and dunes). Reported emissions also include the conservatively-estimated contributions due to soil disturbances caused by off-road vehicle usage.

# Attachment A

## Mileage and Traffic Information for Imperial County Unpaved County Roads

This attachment is an excerpt of a yearly report from the Imperial County Public Works Department providing the best available estimates of the mileage of unpaved county roads with average daily traffic above and below 50 VDT.

# Estimated Mileage of Unpaved Roads with an Average Daily Traffic of Fifty (50) or Greater

| Sample Size | Population Size | Sample ≥ 50 ADT | Sample < 50 ADT |
|---|---|---|---|
| 595.85 | 1354 | 87.54 | 508.31 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Relative Frequency ≥ 50 ADT | = | $\frac{\text{\# of Miles} \geq 50 \text{ ADT}}{\text{Total \# of Miles}}$ | → | $\frac{87.54}{595.85}$ | → | 14.69% |

| | | | | | | |
|---|---|---|---|---|---|---|
| Relative Frequency < 50 ADT | = | $\frac{\text{\# of Miles} < 50 \text{ ADT}}{\text{Total \# of Miles}}$ | → | $\frac{508.31}{595.85}$ | → | 85.31% |

**THUS:** Total Miles with ADT ≥ 50: 1354 X .1469 → 198.92

Total Miles with ADT < 50: 1354 X .8531 → 1155.08

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# APPENDIX III.B

# WINDBLOWN DUST EMISSIONS FROM VACANT LANDS

# Appendix III.B

# Windblown Dust Emissions from Vacant Lands

This appendix provides additional information about windblown dust estimates from vacant lands, as calculated by the windblown dust model (ENVIRON, 2004 and later revisions). In addition, it considers the impact of off-road activity on the emission inventory for these areas by identifying those state and federal lands where off-road activities are allowed and estimating the additional levels of emissions (relative to the estimates of Table 3.1 of the SIP document) that arise from these lands due to anthropogenic soil disturbance unaccounted for in prior modeling assumptions (see Section III.B.2 of this appendix for details).

## III.B.1 Vacant Lands Classification

Nearly two-thirds of the land area in Imperial County (1.89 out of 2.87 million acres) falls under the jurisdiction of state and federal agencies, including the Bureau of Land Management (BLM), the U.S. Fish and Wildlife Service (USFWS), the Bureau of Reclamation, the State of California, and the U.S. Military (Figure III.B.1). The overwhelming majority of these areas corresponds to vacant lands. The remaining third of Imperial County (labeled as "unclassified" in Figure III.B.1) corresponds primarily to parts of the Salton Sea and to agricultural lands (although a fraction of these private areas is expected to also be vacant lands), and will not be discussed in this appendix.

In Imperial County, BLM land is divided into 3 classes:

- *Multiple Use Class I areas* are areas where Off-Highway Vehicles (OHV) usage is permitted. This class includes the Imperial County Sand Dunes to the east, as well as the Plaster City, Superstition Mountains, and Arroyo Salado open areas to the west (Figure III.B.1). We note that part of the Sand Dunes is currently in administrative closure.
- *Multiple Use Class L areas* (also called limited-usage areas) are closed to cross-country OHV usage, but vehicle travel is allowed on approved/signed routes of travel. This class includes:
    - Approximately 455,000 acres of Critical Environmental Concern areas (for which road traffic is limited to street legal vehicles).
    - Approximately 465,000 acres where roads are open to all vehicles.
- *Multiple Use Class C areas* (also called wilderness areas) are closed to all motorized vehicle activity, while open to horseback and foot travel (196,000 acres, plus part of the dune areas under administrative closure).

Approximately 100 thousand acres of vacant lands are under the jurisdiction of the State of California. Parts of the following two state parks are located within Imperial County:

- The Anza-Borrego Desert State Park (west of Superstition Mountains and Plaster City in Figure III.B.1) is closed to OHV usage; while
- The Ocotillo Wells State Vehicular recreation Area (parts of which lie in the north-west corner of Imperial County, Figure III.B.1) is open for off-highway exploration and recreation.

Nearly 420 thousand acres of vacant lands are under the jurisdiction of the military. These areas are not open to cross-country vehicle use. Lands under the jurisdiction of the Bureau of Reclamation and of the U.S. Fish and Wildlife Service (USFWS) account for 110 thousand acres, but (owing to the nature/location of these lands, see Figure III.B.1) for only 1.6 tpd of windblown $PM_{10}$ according the results of the Windblown Dust Model.

**Table III.B.1** Vacant/Open Lands in Imperial County Under the Jurisdiction of State and Federal Agencies

| Agency | Open to Vehicle Use | Area ($10^3$ acres) | $PM_{10}$ Emissions (tpd)[a] |
|---|---|---|---|
| BLM | | 1,260 | 83 |
| Open Areas | OHV | 136 | 8.1 |
| Sand Dunes | OHV | 85 | 7.5 |
| Plaster City | OHV | 27 | 0.02 |
| Superstition Mountains | OHV | 13 | 0.2 |
| Arroyo Salado/Ocotillo Wells | OHV | 11 | 0.4 |
| Limited Areas | On trails only | 915 | 69 |
| Wilderness Areas | No | 209 | 5.4 |
| State | | 100 | 4.3 |
| Ocotillo Wells SVRA | OHV | 28 | 0.7 |
| Other | No | 72 | 3.6 |
| Military | No | 418 | 32 |
| Bureau of Reclamation | No | 65 | 0.3 |
| USFWS | No | 45 | 1.3 |
| **Total[b] for State/Federal Lands** | - | 1,888 | 121 |

[a]Windblown dust model emission estimates for non-road, non-pasture land sources using assumptions described in Section III.B.2. [b]Acreage totals may not be exact due to rounding. Emissions from the remaining 985,000 acres in Imperial County predicted by the Windblown Dust Model are 47 tpd (mostly from private sources including agricultural lands at 10.8 tpd). Other windblown $PM_{10}$ emissions not accounted for by the Windblown Dust Model are 32 tpd from unpaved roads and pasture lands, for an overall annual average total of ~200 tpd of windblown $PM_{10}$ emissions in Imperial County.

## III.B.2 Modeled Windblown Dust Emissions Estimates

The Windblown Dust Model[1] determines emissions for each land parcel as a function of wind speed based on soil emission characteristics such as soil type (derived from the State Soil Geographic Database, see Figure III.B.2), Land Use/Land Cover (LULC, derived from survey data from the Department of Water Resources and from the U.S. Geological Survey National Land Cover Data, see Figure III.B.3), surface stability, and reservoir characteristics. Of these characteristics, soil type and surface stability play dominant roles. For example, comparative inspection of these figures with results of the windblown dust model (Figure III.B.4) reveals that:

- Sandy, stable soil (either with shrubland or bare rock) emits at very low rates; while
- Sandy, unstable soil (e.g., dunes) emits at much higher rates; and
- Sandy loam soils generally emit at tremendously higher rates than sandy soils, and can have high emissions even when stable. (We note that most of the sandy loam soil in IC corresponds to *Shrubland* LULC, which explains why this category accounts for such a

[1] Development of a Windblown Fugitive Model and Inventory for Imperial County, California. Final Report, May 12, 2004. Prepared by ENVIRON International Corporation and Eastern Research Group for the ICAPCD.

high fraction of the total windblown dust emissions within the county as seen in Table 3.1 of the SIP document).

Sensitivity analyses[2] have shown that model results are also particularly sensitive to the value of the threshold velocity above which soils begin to emit $PM_{10}$ into the atmosphere. For example, emission rates were approximately reduced or increased by a factor of 2 when threshold velocities were increased from 15 to 20 mph or decreased from 15 to 10 mph, respectively.

*Model Assumptions in Calculation of Imperial County Windblown $PM_{10}$ Emissions Best Estimates.* The Windblown Dust Model provides a rigorous and comprehensive treatment of windblown dust erosion based on a thorough analysis and use of available information/ correlations from the existing literature. Use of the model enables considerable improvements in the accuracy of windblown $PM_{10}$ emissions in Imperial County relative to the previously-used CARB methodology (refer to Section 3.1 of the SIP document). Nevertheless, because of limitations in the availability of model input information, it was necessary to make assumptions about stability and reservoir characteristics, vegetative cover, and threshold velocities. Best estimates of windblown dust emissions in Imperial County calculated using the windblown dust model[3] (Table 3.1 of the SIP document) were obtained assuming:

- All soils are stable except for the sand dunes (this assumption was made in response to comments by CARB and USEPA on the results of the initial study);
- Stable soils emit for 1 hr; unstable soils for 10 hrs;
- Threshold velocities of 15 mph;
- Vegetative canopy cover as listed in Table III.B.2.

**Table III.B.2** Default Vegetation Cover Percentages for Each LULC Type Used in Revised Calculation of Windblown Dust Emissions

| **Land Use/Land Coverage (LULC) Category** | **Vegetation Cover (%)** |
|---|---|
| *Urban* | 55 (stable)/0 (unstable) |
| *Shrubland* | 11 |
| *Grassland* | 23 |
| *Mixed Shrub/Grassland* | 17 |
| *Forest* | 55 |
| *Barren Lands* (Excluding *Sand Dunes*) | 9 |
| *Sand Dunes* | 0 |

As discussed in Section 3.1 of the SIP document, the uncertainty (related to the validity of the above assumptions) in accurately representing windblown emissions in Imperial County does

[2] Ibid, Section 8.
[3] See Appendix A (Technical Memorandum: Latest revisions to the Windblown Dust Model) of the Technical Memorandum: Regulation VIII BACM Analysis. ENVIRON, October 2005.

not affect the result of any of the analyses for the key elements of the SIP (DM analysis, rulemaking, attainment demonstration, or conformity).

## III.B.3 Estimated Impact of Anthropogenic Disturbance of Vacant Lands Beyond Model Assumptions

We acknowledge that anthropogenic disturbance of soil can lead to higher emissions in wind events.

- The anthropogenic contribution should be estimated as the incremental level of emissions relative to the native baseline, i.e., the difference in windblown emissions from disturbed soil relative to emissions from native soil;
- In some cases, this difference is zero. For instance, the sand dunes are fully unstable and have 0% vegetative canopy cover in the native state. Therefore, vehicle off-roading on these lands does not alter any of the parameters that impact emissions, such as soil type, LULC, stability, or reservoir characteristics;
- In most cases, a higher emission factor would be appropriate for vacant lands disturbed by humans.

Unfortunately, it was not possible to acquire sufficient information to very accurately describe both (i) the native state and (ii) the extent of changes in the soil characteristics (such as stability and reservoir capacity, canopy cover, etc) for Imperial County lands that are significantly disturbed by anthropogenic activity (such as the BLM Open Areas). Nevertheless, in response to particular interest in the level of emissions from vacant lands that is due to off-road anthropogenic activity, and to establish a complete emission inventory, we conducted additional analyses to estimate conservative estimates of the incremental levels of windblown dust emissions that might be obtained using assumptions of much more severe disturbance of the soils subject to OHV usage. The results of these analyses are summarized in Table III.B.3.

**Table III.B.3** Conservative Estimates of Additional[a] $PM_{10}$ Emissions Due to Off-Road Anthropogenic Disturbance[b] of Federal and State Vacant Lands in Imperial County.

| Agency | Area ($10^3$ acres) | | Conservative Estimate of Additional[a] $PM_{10}$ Emissions (tpd) |
|---|---|---|---|
| | Total area | Open to Vehicle use | |
| BLM | 1,260 | 136 | 7.5 |
| Open Areas | 136 | 136 | 5.8 |
| Sand Dunes | 85 | 85 | 0.9 |
| Plaster City | 27 | 27 | 0.6 |
| Superstition Mountains | 13 | 13 | 0.3 |
| Arroyo Salado/Ocotillo Wells | 11 | 11 | 4.0 |
| Limited Areas | 915 | Negligible | Negligible |
| Wilderness Areas | 209 | Negligible | Negligible |
| State | 100 | 28 | 6.3 |
| Ocotillo Wells SVRA | 28 | 28 | 6.3 |
| Other | 72 | Negligible | Negligible |
| Military | 418 | Negligible | Negligible |
| Bureau of Reclamation | 65 | Negligible | Negligible |
| USFWS | 45 | Negligible | Negligible |
| **Total** | **~1,888** | **165** | **~ 12.1 tpd** |

[a]Relative to windblown dust model results established in Section 3.1.1 of the SIP document and Section III.B.2 of this appendix. [b]This analysis only relates to anthropogenic disturbance of soils due to authorized OHV usage excluding military OHV usage. This is expected to be the dominant mechanism of soil disturbance of Imperial County vacant lands.

The reasoning is as follows:

- Superstition Mountains and Plaster City:
  - o The soil texture (Figure III.B.5) is mostly sand (which is the soil texture of the Sand Dunes), bedrock (which is assumed by the model to generate no $PM_{10}$ emissions), and a small fraction of sandy loam (which is expected to emit more than sand for a specified level of disturbance).
  - o The model results (based on the assumptions listed in the previous section, Figure III.B.6) show that these areas emit much less than the Sand Dunes *per acre of land*. This is a consequence of the difference in stability and canopy cover between these open areas and the sand dunes.
  - o Anthropogenic disturbance of these lands can be expected to generate some level of instability. Based on information provided by the BLM,[4] we assume here that up to 16% of these lands are disturbed by OHV usage. Using this assumption, conservative estimates of emissions may be obtained using the rate of emissions per acre predicted by the model for the *Sand Dune* LULC classification (corresponding to a fully unstable surface with no vegetation); results[5] obtained in this manner are reported in Table III.B.3. This analysis is

[4] Communication to the ICAPCD from the El Centro Field Office of the Bureau of Land Management, United States Department of the Interior, July 22, 2009.

[5] The average rate of $PM_{10}$ emissions from the *Sand Dunes* based on the information in Table 3.1 of the SIP document is $1.3\times10^{-4}$ tons/day/acre. (Note that this emission rate is higher that the average rate

conservative because (i) the assumption of 16% disturbance is conservative, (ii) the extent of disturbance for the disturbed fraction will probably be much less than that of the dunes, and (iii) the remaining vegetative cover is certain to be greater than 0.

- Sand Dunes:
  - Of the 85,000 acres of Sand Dune area open to OHV usage, approximately 58,000 acres correspond to the *Sand Dune* LULC classification (Figure III.B.7), with emissions of 6.6 tpd. These areas are unstable with no vegetation in the native state; therefore, human activities on these areas do not reduce the level of stability or of vegetative canopy cover, and as a result cause no change in windblown dust emissions from these areas.
  - The remaining 27,000 acres correspond primarily to *Shrubland* LULC (Figure III.B.7) on the same soil texture, i.e., sand (Figure III.B.7), accounting for a balance of 0.9 tpd of $PM_{10}$ emissions according to model predictions (Table III.B.1). Information provided by the BLM (refer to footnote 4 above) indicates that approximately 50% of these lands are disturbed by OHV usage. If we apply the rate of $PM_{10}$ emissions for fully disturbed *Sand Dunes* LULC to this area in an analysis similar to that above for Plaster City and Superstition Mountains, a conservative estimate of the excess $PM_{10}$ emissions (relative to model estimates of Table III.B.1) due to OHV usage in the Sand Dune Open Area is therefore $50\% \times 1.3\times10^{-4}$ tpd/acre $\times 27\times10^{3}$ acres – 0.9 tpd = 0.9 tpd.

- Arroyo Salado and Ocotillo Wells:
  - The windblown dust emissions from the Arroyo Salado area (the portion of the Ocotillo Wells SVRA under the jurisdiction of the BLM according to Figure III.B.1) are dominated by the small fraction featuring sandy loam soil (Figures III.B.5 and III.B.6). If we conservatively assume that up to 50% of the area is disturbed and that the disturbed soils emit at rates up to 20 times[6] as high as the same soils in

calculated using the information in Table III.B.1 for the Sand Dune Open Area; the difference is primarily due to the fact that a portion of the Sand Dune Open Area corresponds to *Shrubland* LULC, which emits at much lower rates.) Applying this factor to the Plaster City and Superstition Mountain areas and assuming that the baseline emissions from these lands in the native (undisturbed) state are negligible (this is the most conservative analysis), the excess emissions due to anthropogenic activity from these areas are $16\% \times 1.3\times10^{-4}$ tpd/acre $\times 27\times10^{3}$ acres = 0.6 tpd for the Plaster City Open Area and $16\% \times 1.3\times10^{-4}$ tpd/acre $\times 13\times10^{3}$ acres = 0.3 tpd for the Superstition Mountains Open Area.

[6] We rely here on information contained in the reference of footnote 1 (ENVIRON, May 12, 2004). Based on the data in Figures 2.6 and 2.7 of that report, hourly emission rates for sandy loam soils (soil group code = 2, see Table 3.2) are on average twice as high for unstable than for stable surfaces (1-3 times as high depending on wind speed). Because the Windblown Dust Model assumed that unstable soils could emit for up to 10 times a long as stable soils (10 hours instead of 1 hour), in wind events ≥ 10 hours with continuous wind speeds above the 15 mph entrainment threshold, unstable sandy loam soils may be expected (according to the model) to emit $PM_{10}$ levels ~ 20 times a high as stable sandy loam soils. Note that in wind events of shorter duration (in terms of the consecutive number of hours with

the natural state, the excess $PM_{10}$ emissions due to anthropogenic disturbance of the Arroyo Salado area are 50%×0.4 tpd×20 = 4 tpd. (Note that in the calculation of this conservative upper bound we have again assumed that emissions in the native, undisturbed state are negligible.)

- o The windblown dust emissions from the remainder of the Ocotillo Wells SVRA are also dominated by the small fraction featuring sandy loam soil. Following the same analysis as above, a conservative upper bound of the excess $PM_{10}$ emissions (relative to the model prediction) due to anthropogenic disturbance are 50%×0.7 tpd×20 -0.7 tpd = 6.3 tpd.

To complete the above analysis, we next assess the levels of incremental $PM_{10}$ emissions due to anthropogenic disturbance of soils as a result of OHV usage on non-OHV-designated vacant lands. In doing so, we again apply the emission rate per acre for the *Sand Dunes* LULC to the estimated acreage of areas subject to non-designated vehicle off-roading. The results are incorporated in Table III.B.4, which summarizes the results of our windblown dust analyses according to LULC (enabling cross-referencing and comparison with results of Table 3.1 of the SIP document).

## III.B.4 Summary

According to the foregoing analyses, a conservative estimate of additional[7] windblown $PM_{10}$ emissions due to anthropogenic activities[8] on Imperial County vacant lands is 12.2 tpd. (The actual number is likely to be smaller, based on the nature of the conservative assumptions used in the above analysis.) This can be compared to the estimated ~200 tpd annual average emissions for windblown $PM_{10}$ emissions, which includes ~32 tpd of windblown dust emissions from unpaved roads and pasture land (as estimated using CARB's methodology) and ~168 tpd from other windblown dust sources (as estimated by the windblown dust model). A summary of results according to LULC is given in Table III.B.4.

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wind speeds above the threshold), the ratio of emissions for disturbed vs. undisturbed soils is correspondingly smaller.

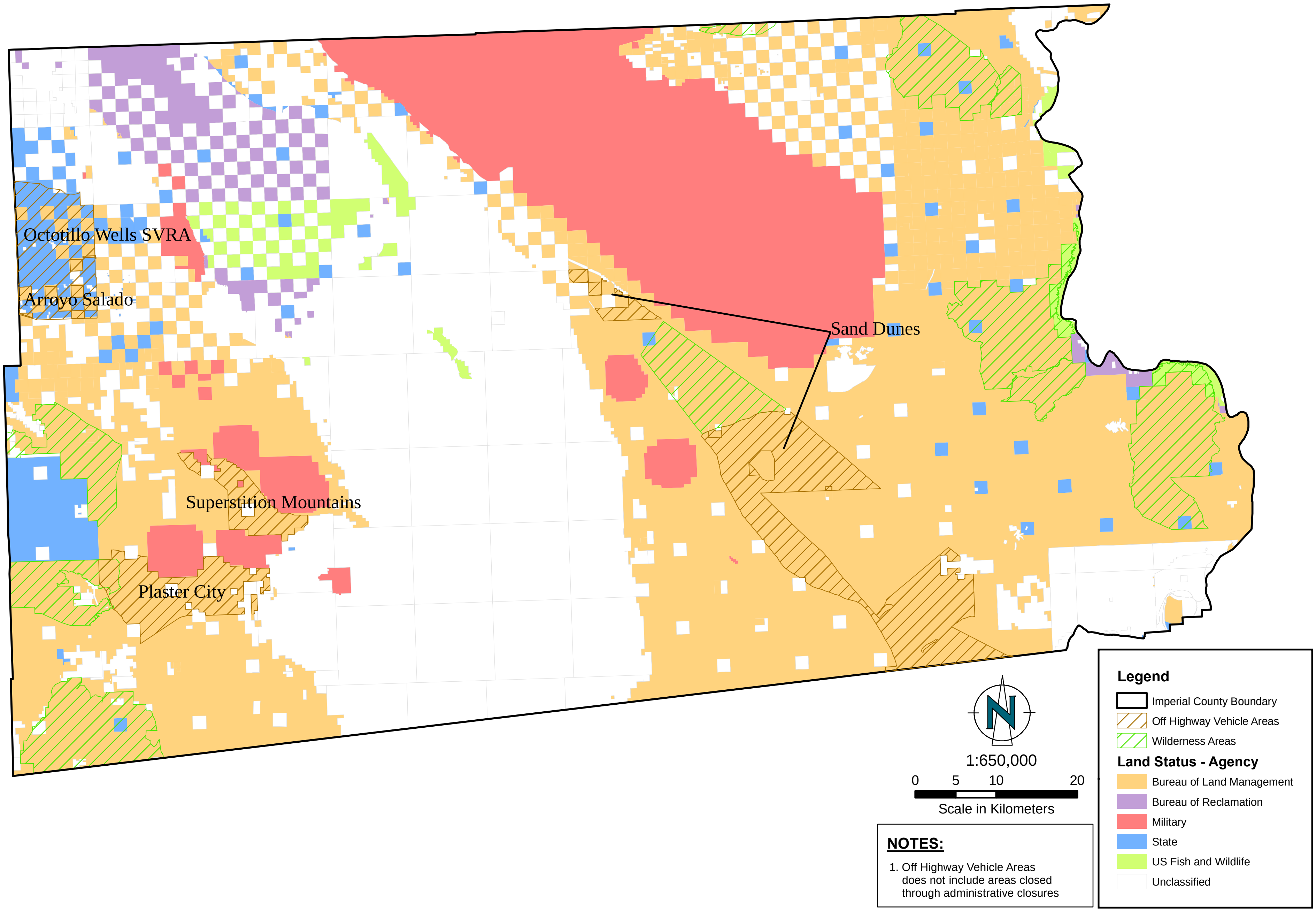
[7] Relative to windblown dust model results established in Section 3.1.1 of the SIP document and Section III.B.2 of this appendix, and obtained using assumptions of much more severe levels of disturbance of the soils subject to OHV usage.

[8] Focusing on OHV usage on Imperial County vacant lands, and excluding disturbance of vacant lands due to military activities on lands under military jurisdiction.

**Table III.B.4** Summary Table of Modeled $PM_{10}$ Emissions (Reported According to LULC) and Conservative Estimates of Additional $PM_{10}$ Emissions Resulting from Assumptions of More Severe Impacts of OHV Usage on Soils Disturbed by OHV Usage.

| Category | Area[a] ($10^3$ acres) | Modeled annual $PM_{10}$ Emissions[b] (tpd) | Conservative Estimate of additional[c] $PM_{10}$ emissions due to OHV usage (tpd) |
|---|---|---|---|
| Agriculture | 559 | 10.81 | |
| Designated for OHV usage | 0.3 | Negligible | - |
| Closed to OHV usage | 558 | 10.81 | |
| Desert-Dunes | 151 | 19.85 | - |
| Designated for OHV usage | 58 | 7.77 | - |
| Closed to OHV usage | 93 | 12.08 | - |
| Undesignated OHV usage | 0.3 | | - |
| Desert-Other | 588 | 38.74 | 11.0 |
| Designated for OHV usage | 66 | 1.43 | 11.0[d] |
| Closed to OHV usage | 522 | 37.31 | 0.04 |
| Undesignated OHV usage | 0.3 | | 0.04[e] |
| Shrubland/Grassland | 1337 | 98.75 | 1.1 |
| Designated for OHV usage | 39 | 0.80 | 1.1[f] |
| Closed to OHV usage | 1298 | 97.95 | 0.03 |
| Undesignated OHV usage | 0.2 | | 0.03[e] |
| Urban Open Areas | 40 | 0.01 | |
| Designated for OHV usage | 1 | Negligible | - |
| Closed to OHV usage | 39 | 0.01 | |
| **Total** | **2675** | **168.16** | **12.2** |

[a]Areas where undesignated OHV usage takes place were conservatively estimated to be equal to 0.5% of the designated OHV usage area for the specified category. [b]Emissions estimates of the windblown dust model as described in Section 3.1.1 of the SIP document and Section III.B.2 of this appendix. [c]Relative to windblown dust model results established in Section 3.1.1 of the SIP document and Section III.B.2 of this appendix. [d]Corresponding to additional emissions (Table III.B.3) from the Ocotillo Wells SVRA, Arroyo Salado Open Area, Superstition Mountains Open Area, and ~2/3 of the Plaster City Open Area as seen in Figure III.B.7. [e]Additional emissions due to OHV usage in undesignated areas closed to OHV usage were calculated by applying the emission rate for the *Sand Dunes* LULC to the areas where undesignated OHV usage may take place (e.g., $1.3\times10^{-4}$ tpd/acre × $0.2\times10^{3}$ acres = 0.03 tpd for Shrubland/Grasslands). [f]Corresponding to additional emissions (Table III.B.3) from the Sand Dunes Open Area and ~1/3 of the Plaster City Open Area as seen in Figure III.B.7.




ENVIRON

Projection set to:
NAD 1983 CTM

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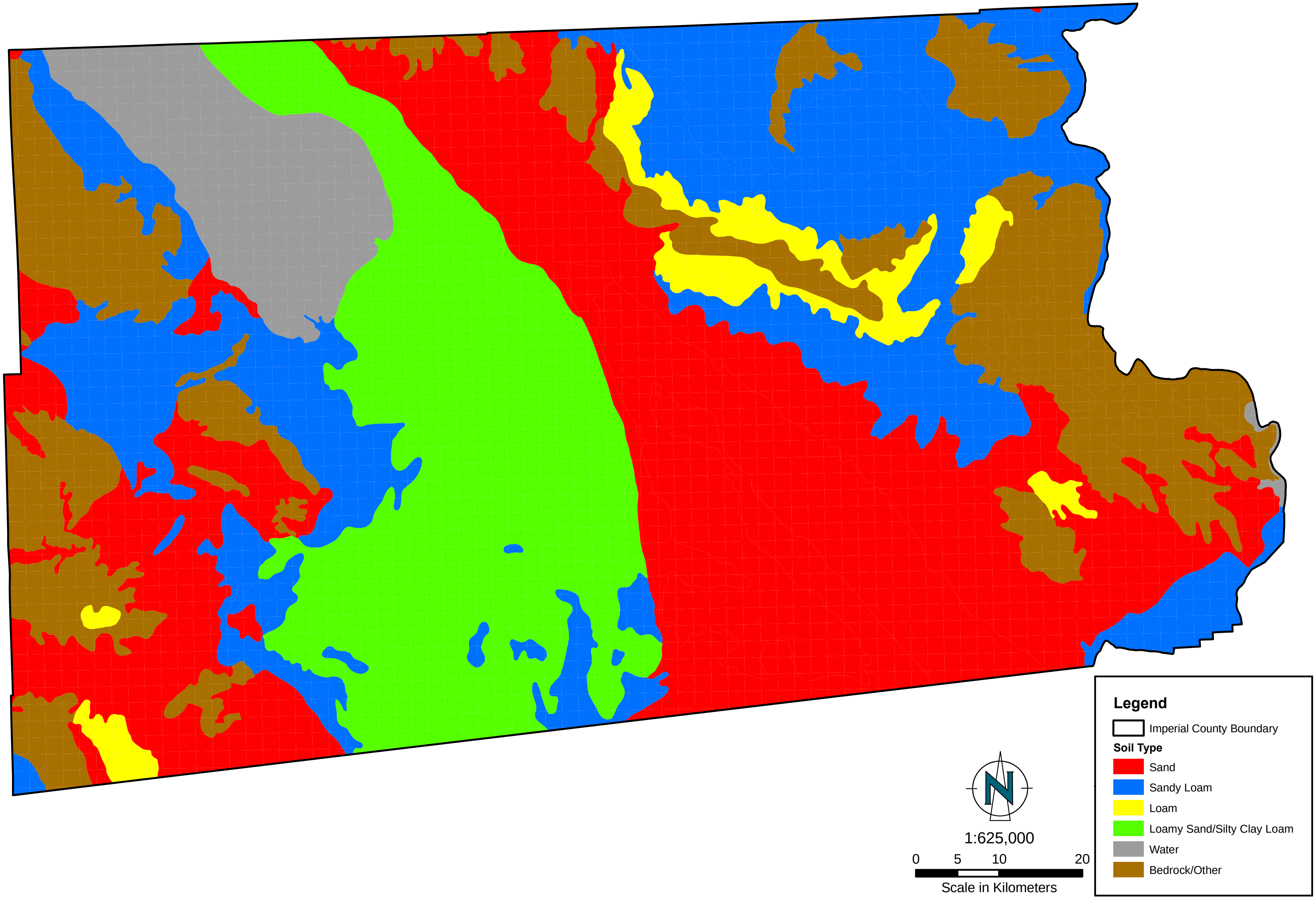
CONTRACT NUMBER 0521191A

# Federal and State Managed Lands in Imperial County

Figure III.B.1

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NAD 1983 CTM

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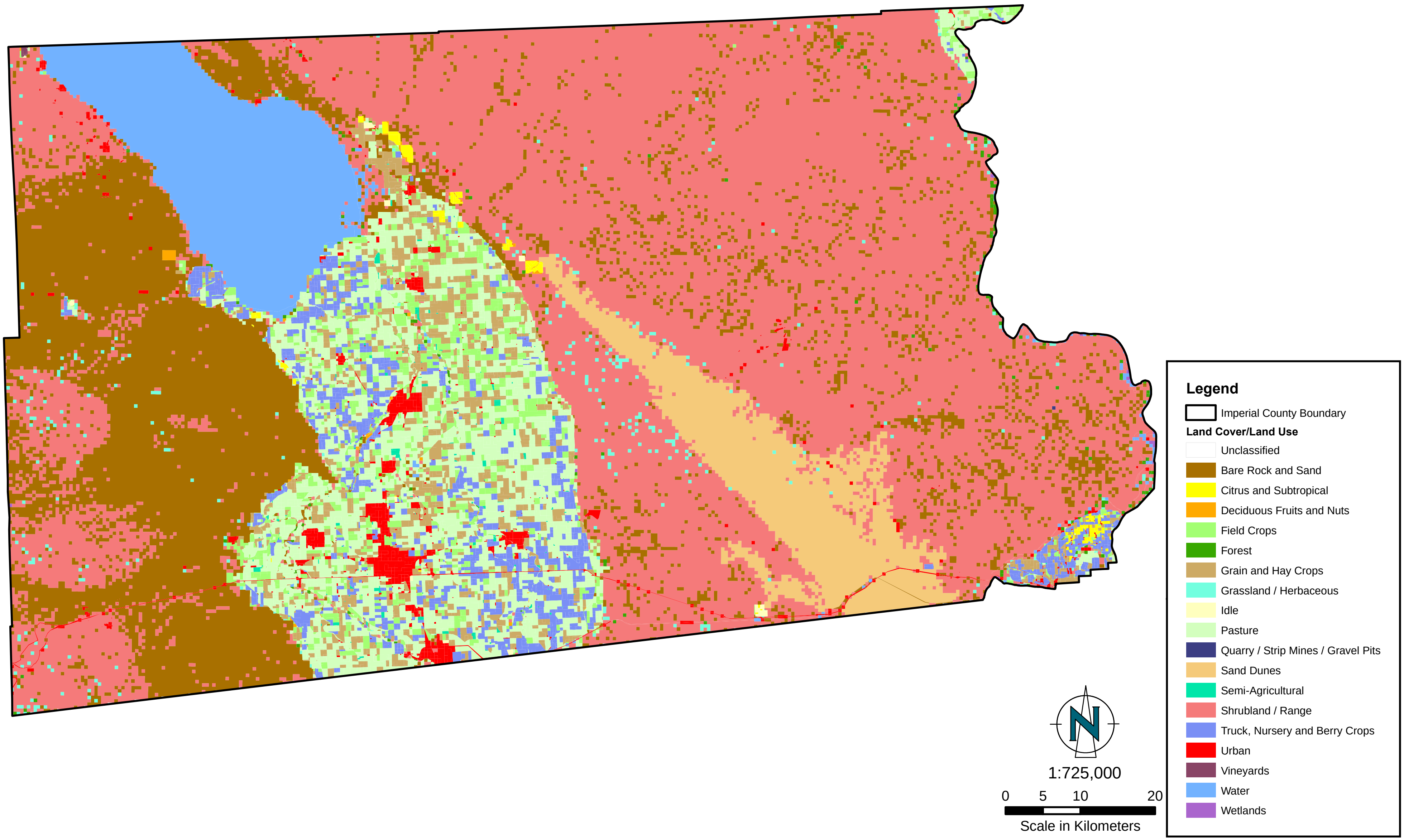
# Soil Texture Classification in Imperial County

Figure

III.B.2

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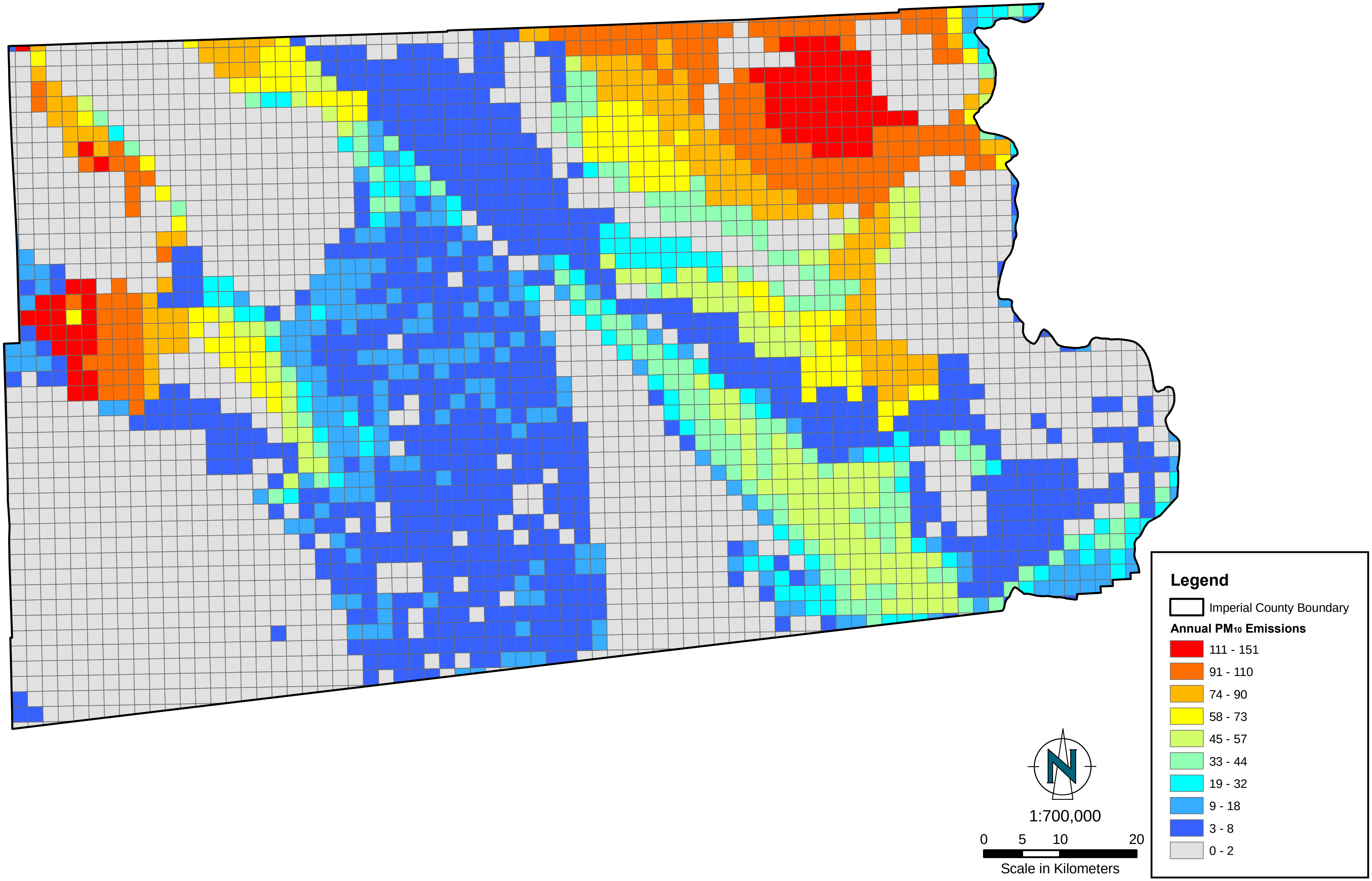
# Land Cover/Land Use Classification in Imperial County

Figure III.B.3

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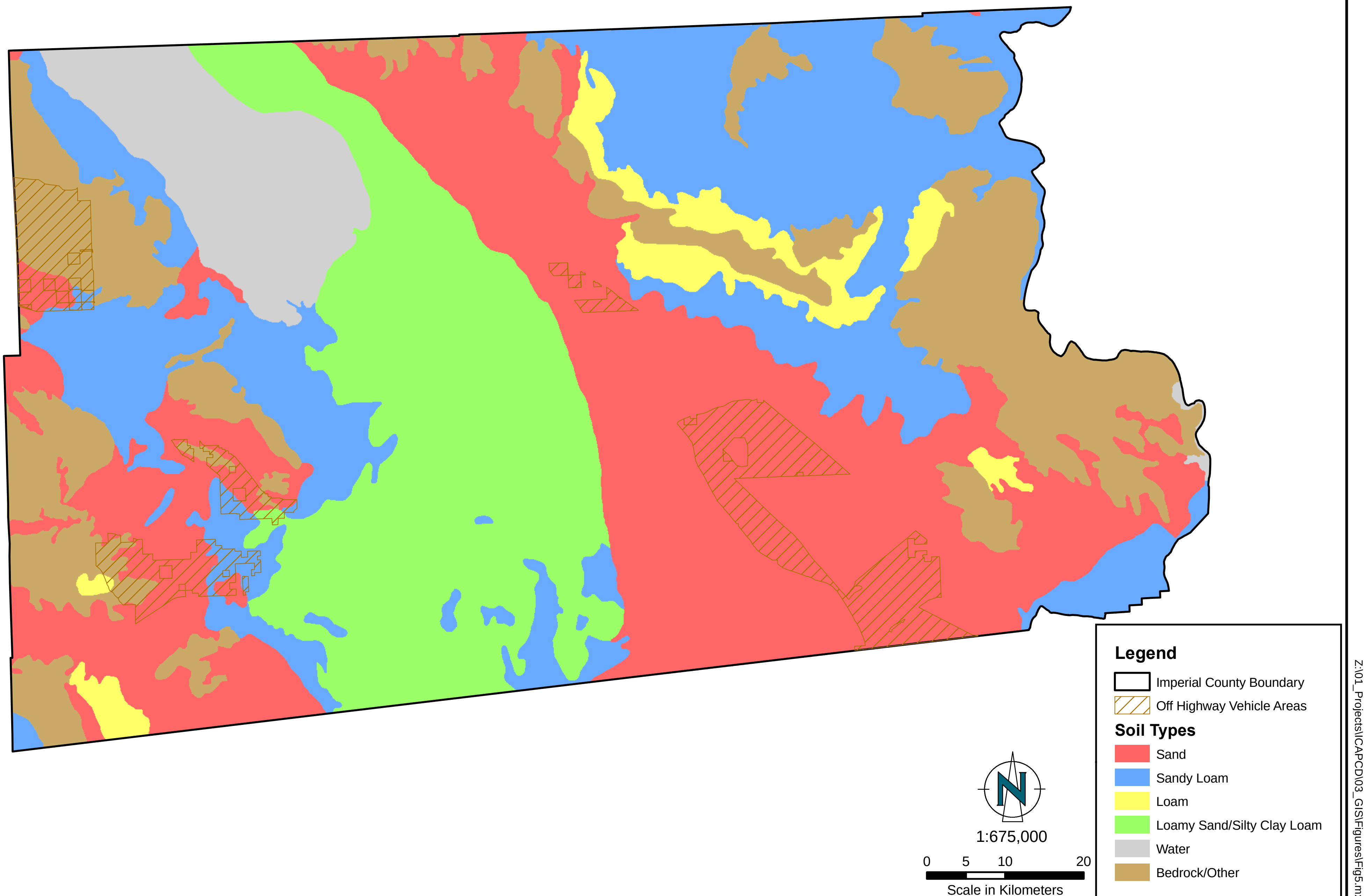
# Modeled Windblown Dust $PM_{10}$ Emissions in Imperial County

**Figure**

**III.B.4**

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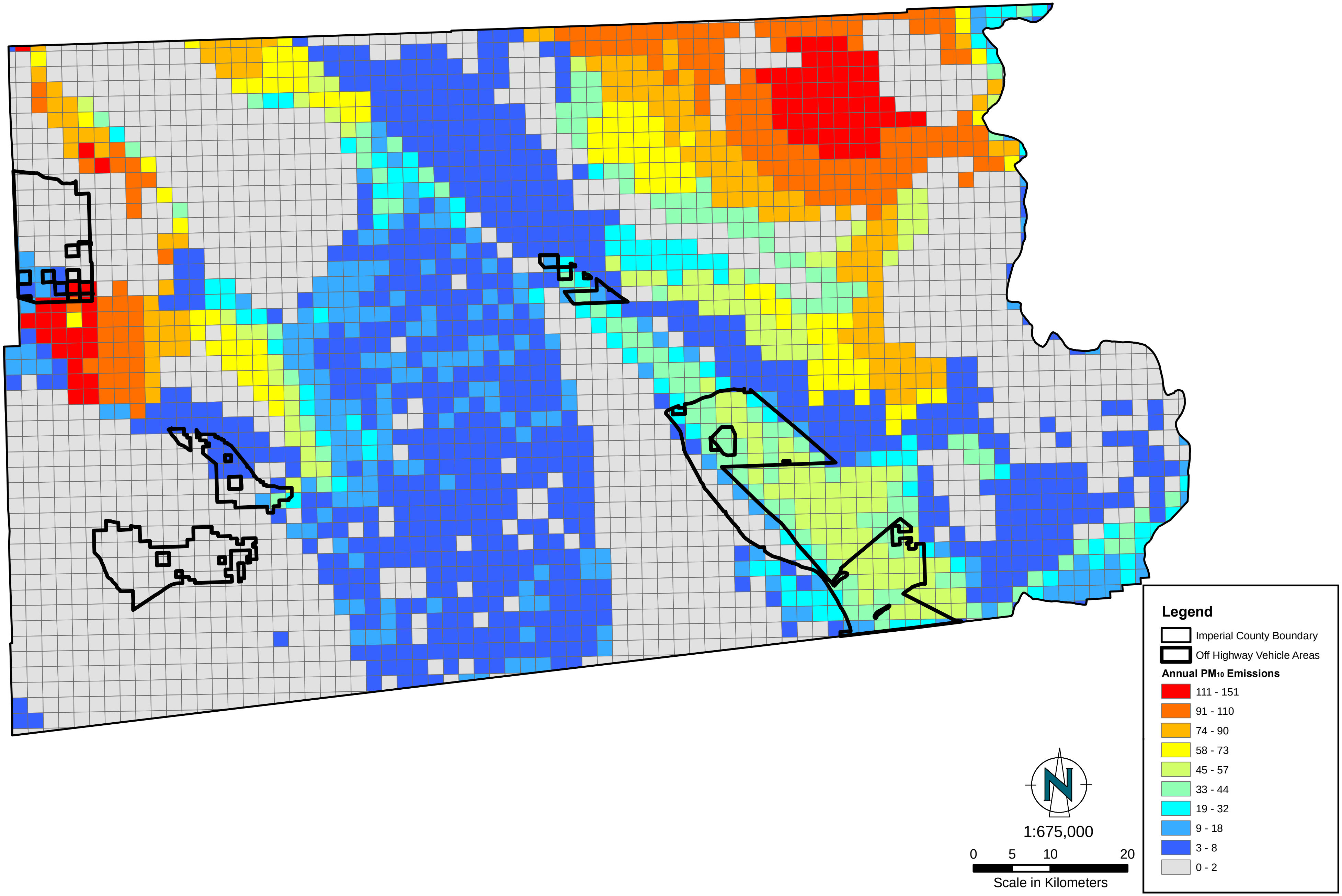
# Soil Texture Classification in Imperial County Showing Areas Open to Off-Highway Vehicle Usage

Figure III.B.5

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Projection set to:
NAD 1983 CTM

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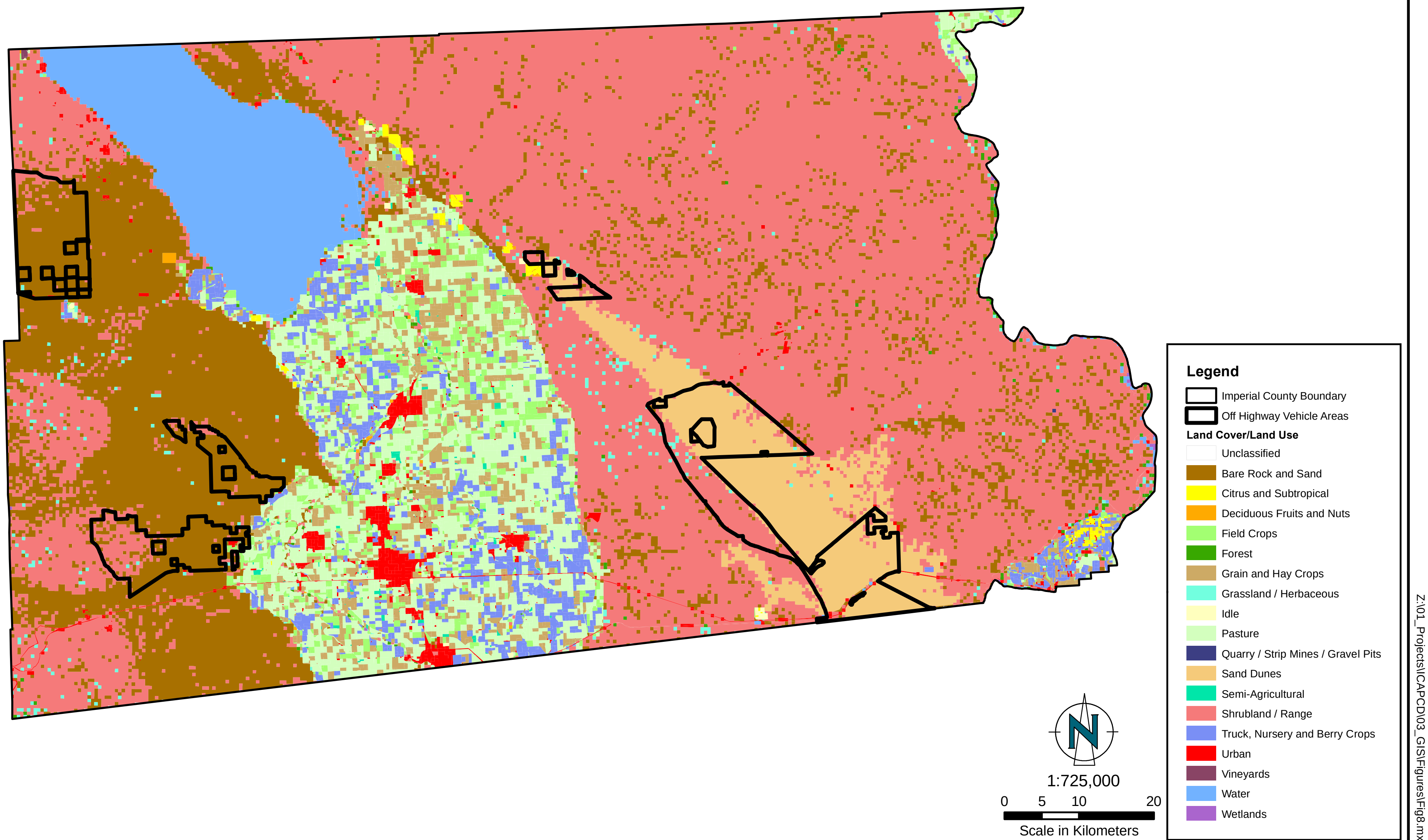
# Modeled Windblown Dust $PM_{10}$ Emissions in Imperial County Showing Areas Open to Off-Highway Vehicle Usage

Figure III.B.6

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# Land Cover/Land Use Classification in Imperial County Showing Areas Open to Off-Highway Usage

Figure III.B.7

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# APPENDIX IV.A

## IMPERIAL COUNTY FUGITIVE DUST CONTROL PROGRAM: REGULATION VIII RULES

# Appendix IV.A

## Imperial County Fugitive Dust Control Program: Regulation VIII Rules

This Appendix reports the Imperial County APCD Regulation VIII rules addressing mitigation of fugitive dust as found in the ICAPCD Rulebook (available online at http://www.co.imperial.ca.us/AirPollution/Forms%20&%20Documents/RULEBOOK/APCD%20Rules%20Feb%203%202009.pdf).

# RULE 800 GENERAL REQUIREMENTS FOR CONTROL OF FINE PARTICULATE MATTER (PM-10)

(Adopted 10/10/94; revised 11/25/96; revised 11/08/2005)

## A. General Description

The purpose of this regulation is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from anthropogenic (man-made) Fugitive Dust (PM-10) sources generated from within Imperial County by requiring actions to prevent, reduce, or mitigate PM-10 emissions. The Rules contained within this Regulation have been developed pursuant to United States Environmental Protection Agency guidance for Serious PM10 Non Attainment Areas.

## B. Applicability

The requirements of this rule shall apply to any Active Operation, and/or man-made or man-caused condition or practice capable of generating Fugitive Dust (PM-10) as specified in this Regulation except those determined exempt as defined in Part E of this Rule. The definitions, exemptions, requirements, administrative requirements recordkeeping requirements, and test methods set forth in this rule are applicable to all the rules under Regulation VIII (Fugitive Dust Requirements) of the Rules and Regulations of the Imperial County Air Pollution Control District.

## C. Definitions

For the purpose of this Regulation, the following terms are defined:

C.1 ACTIVE OPERATION: Activities capable of generating Fugitive Dust (PM-10), including but not limited to, Earthmoving Activities, Construction activities, Unpaved Roads, Track-Out/Carry-Out, Bulk Material storage and transport, Unpaved Haul/Access Roads.

C.2 AGGREGATE MATERIALS: Consists of sand, Gravel, quarried stone and/or rock fragments that are typically used in Construction. Aggregates may be natural, artificial or recycled.

C.3 ANEMOMETRS: Are devices used to measure wind speed and direction in accordance with manufacturer's performance standards, maintenance and calibration criteria.

C.4 ANNUAL AVERAGE DAILY VEHICLE TRIPS: annual average 24-hour total of all vehicles counted on a road.

C.5 APCD: The Imperial County Air Pollution Control District.

C.6 APCO: The Imperial County Air Pollution Control Officer.

C.7 AVERAGE VEHICLE TRIPS PER DAY: Means the average number of vehicles that cross a given point surface during a specific 24-hour period as determined by the most recent Institute of Transportation Engineers trip generation manual, tube counts, or observations.

C.8 BLM: The Bureau of Land Management.

C.9 BP: The United States Border Patrol.

C.10 BULK MATERIAL: Earth, rock, Silt, sediment, sand, Gravel, soil, fill, Aggregate, dirt, mud, debris, and other organic and/or inorganic material consisting of or containing Particulate Matter with five percent or greater Silt content. For the purpose of this Regulation, the Silt content level is assumed to be 5 percent or greater, unless the Person responsible for the Active Operation conducts the applicable laboratory tests and demonstrate that the Silt content is less than 5 percent. Active Operations seeking to determine if the Silt content is less than five percent are required to conduct the laboratory analysis in accordance with ASTM method C-136-a (Standard Test Method for Sieve analysis of Fine and Coarse Aggregates), or other equivalent test methods approved by EPA, ARB, and the APCD.

C.11 CANAL BANK: A rise of land on either side of an irrigation canal.

C.12 CHEMICAL STABILIZATION/SUPPRESSION: A means of Fugitive Dust (PM-10) control implemented to mitigate PM-10 emissions by applying petroleum resins, asphaltic emulsions, acrylics, adhesives, or any other materials approved for use by the California Air Resources Board (CARB), U.S. Environmental Protection Agency (U.S. EPA) and/or the APCO.

C.13 CONSTRUCTION: Any on-site mechanical activities preparatory to or related to the building, alteration, rehabilitation, or demolition of an improvement on real property, including, but not limited to, land clearing, excavation related to construction, land leveling, grading, cut and fill grading, and the erection or demolition of any structure. As used in Regulation VIII, a construction site may encompass several contiguous parcels, or may encompass only a portion of one parcel, depending on the relationship of the property boundaries to the actual construction activities.

C.14 DESIGNATED REPRESENTATIVE: The agent for a Person. The Designated Representative shall be responsible for and have the full authority to implement BACM on behalf of the Person.

C.15 EARTHMOVING ACTIVITIES: The use of any equipment for an activity that may generate Fugitive Dust emissions, including, but not limited to, cutting and filling, grading, leveling, excavation, trenching, loading or unloading of Bulk

Materials, demolishing, drilling, adding to or removing bulk of materials from open storage piles, weed abatement through disking, and back filling.

C.16 FUGITIVE DUST: The Particulate Matter entrained in the ambient air which is caused from man-made and natural activities such as, but not limited to, movement of soil, vehicles, equipment, blasting, and wind. This excludes Particulate Matter emitted directly in the exhaust of motor vehicles or other fuel combustion devices, from portable brazing, soldering, or welding equipment, pile drivers, and stack emissions from stationary sources.

C.17 GRAVEL: Gravel travelways shall have a three (3) inch minimum depth Stabilized Surface. The travelway shall have a relative compaction of not less than 95% as determined by Test Method No. California 216 of State of California, Business and Transportation Agency Department of Transportation, and conforming to the following grading:

| Sieve Designation | ¾” Maximum Percent Passing |
|---|---|
| 1” | 100 |
| ¾” | 90-100 |
| #4 | 35-60 |
| #30 | 10-30 |
| #200 | 2-9 |

Reference: California Department of Transportation Standard Specification Section 26/class II Aggregate Base

C.18 HAUL/ACCESS ROAD: Any on-site road used for commercial, industrial, institutional, and/or governmental traffic.

C.19 HAUL TRUCK: Any fully or partially open-bodied licensed motor vehicle used for transporting Bulk Material for industrial or commercial purposes.

C.20 IMPLEMENT OF HUSBANDRY: An unlicensed vehicle which is used exclusively in the conduct of Agricultural Operations. An Implement of Husbandry does not include a vehicle if its existing design is primarily for the transportation of persons or property on a highway, unless specifically designated as such by some other provision of the Vehicle Code of California.

C.21 NON-RESIDENTIAL AREA: Any unpaved vehicle and equipment traffic area operated at any commercial, manufacturing or government sites.

C.22 MODIFIED PAVED ROAD: Any Paved Road that is widened or improved so as to increase traffic capacity. This term does not include road maintenance, repair, chip seal, pavement or roadbed rehabilitation that does not affect roadway geometrics, or surface overlay work.

C.23 OFF-FIELD AGRICULTURAL SOURCE: Any Agricultural Source or activity at an Agricultural Source that falls into one or more of the following categories:

C.23.a Outdoor handling, storage and transport of Bulk Material;

C.23.b Paved Road;

C.23.c Unpaved Road; or

C.23.d Unpaved Traffic Area.

C.24 OFF-ROAD VEHICLE: Any nonstationary device, powered by an internal combustion engine or motor, used primarily off the highways to propel, move, or draw persons or property including any device propelled, moved, or drawn exclusively by human power, and used in, but not limited to, any of the following applications: marine vessels, construction/farm equipment, utility and lawn and garden equipment, off-road motorcycles, and off-highway vehicles.

C.25 ON-FIELD AGRICULTURAL SOURCE: Any Agricultural Source or activity at an Agricultural Source that is not an Off-Field Agricultural Source, including (but not limited to) the following:

C.25.a Activities conducted solely for the purpose of preparing land for the growing of crops or the raising of fowl or animals, such as brush or timber clearing, grubbing, scraping, ground excavation, land leveling, grading, turning under stalks, disking, or tilling;

C.25.b Drying or pre-cleaning of agricultural crop material on the field where it was harvested;

C.25.c Handling or storage of agricultural crop material that is baled, cubed, pelletized, or long-stemmed, on the field where it was harvested, and the handling of fowl or animal feed materials at sites where animals or fowl are raised;

C.25.d Disturbances of cultivated land as a result of fallowing, planting, fertilizing or harvesting.

C.26 OPEN AREA: Any of the following described in Subsection C.26.a through C.26.c of this rule. For the purpose of this rule, vacant portions of residential or commercial lots and contiguous parcels that are immediately adjacent to and owned and/or operated by the same individual or entity are considered one open area. An open area does not include any Unpaved Traffic Area as defined in this rule.

C.26.a An un-subdivided or undeveloped land adjoining a developed (or partially developed) residential, industrial, institutional, governmental, or commercial area.

C.26.b A subdivided residential, industrial, institutional, governmental, or commercial lot, which contains no approved or permitted building or structures of a temporary or permanent nature.

C.26.c A partially developed residential, industrial, institutional, governmental, or commercial lot and contiguous lots under common ownership.

C.27 PARTICULATE MATTER: Any material, except uncombined water, which exists in a finely divided form as a liquid or solid at 60 degrees F and one atmosphere pressure.

C.28 PAVED ROADS: An improved street, highway, alley, public way, that is covered by concrete, asphaltic concrete, or asphalt.

C.29 PERSON: Any individual, public or private corporation, partnership, association, firm, trust, estate, municipality, or any other legal entity whatsoever which is recognized by law as the subject of rights and duties, who is responsible for an Active Operation.

C.30 PM-10: Particulate Matter with an aerodynamic diameter smaller than or equal to a nominal 10 microns as measured by the applicable State and Federal reference test methods. -

C.31 RECREATIONAL USE: The use of motorized vehicles on public lands.

C.32 RURAL: Areas not classified as urban constitute “rural.”

C.33 SILT: Any Aggregate Material with a particle size less than 75 micrometers in diameter as measured by a No. 200 sieve as defined in ASTM D-2487 and as tested by ASTM-C-136 or other equivalent test methods approved by EPA, ARB, and the APCD.

C.34 STABILIZED SURFACE: Any disturbed surface area or open bulk storage pile that is resistant to wind blown Fugitive Dust emissions. A surface is considered to be stabilized if it meets at least one of the following conditions specified in this Section and as determined by the test methods specified in Appendix B, Section A, B and D-G tests of this rule:

C.34.a A visible crust; or

C.34.b A threshold friction velocity (TFV) for disturbed surface areas corrected for non-erodible elements of 100 centimeters per second or greater; or

C.34.c A flat vegetative cover of at least 50 percent that is attached or rooted vegetation; or unattached vegetative debris lying on the surface with a predominant horizontal orientation that is not subject to movement by wind; or

C.34.d A standing vegetative cover of at least 30 percent that is attached or rooted vegetation with a predominant vertical orientation; or

C.34.e A standing vegetative cover that is attached or rooted vegetative with a predominant vertical orientation that is at least 10 percent and where the TFV is at least 43 centimeters per second when corrected for non-erodible elements; or

C.34.f A surface that is greater than or equal to 10 percent of non-erodible elements such as rocks, stones, or hard-packed clumps of soil.

C.35 STABILIZED UNPAVED ROAD: Any Unpaved Road or unpaved vehicle/equipment traffic area surface which meets the definition of Stabilized Surface as determined by the test method in Appendix B, Section C of this rule, and where VDE is limited to 20% opacity.

C.36 TACTICAL TRAINING: Training conducted by the U.S. Department of Defense, the U.S. military services, or its allies for combat, combat support, combat service support, tactical or relief operations. Examples include but are not limited to munitions training.

C.37 TEMPORARY UNPAVED ROAD: Any Unpaved Road surface which is created to support a temporary or periodic activity and the use of such road surface is limited to vehicle access for a period of not more than six months during any consecutive three-year period.

C.38 THRESHOLD FRICTION VELOCITY (TFV): The corrected velocity necessary to initiate soil erosion as determined by the test method specified in Appendix B, Section D, of this rule. The lower TFV, the greater the propensity for fine particles to be lifted at relatively low wind speeds.

C.39 TRACK-OUT/CARRY-OUT: Any and all Bulk Materials that adhere to and agglomerate on the exterior surfaces of motor vehicles and/or equipment (including tires) that may then fall onto the pavement.

C.40 TRACK-OUT PREVENTION DEVICE: A Gravel pad, grizzly, wheel wash system, or a paved area, located at the point of intersection of an unpaved area and a Paved Road that prevents or controls Track-Out.

C.41 UNPAVED ROADS: Streets, alley ways, or roadways that are not covered by one of the following: concrete, asphaltic concrete, asphalt, or other similar materials specified by the U.S.EPA, CARB and/or the APCO.

C.42 UNPAVED TRAFFIC AREA: Any nonresidential area that is:

C.42.a Not covered by asphalt, recycled asphalt, asphaltic concrete, concrete, or concrete pavement, and

C.42.b Used for fueling and servicing; shipping, receiving and transfer; or parking or storing equipment, haul trucks, vehicles, and any conveyances.

C.43 URBAN AREA: An area within an incorporated city boundary or within unincorporated areas completely surrounded by an incorporated city.

C.44 VDE: Visible dust emissions. Dust emissions that are visible to an observer.

C.45 VMT: Vehicle miles traveled.

C.46 WIND GUST: Is the maximum instantaneous wind speed as measured by an anemometer.

D. Compliance Schedule

D.1 Existing sources subject to this Regulation shall comply with its requirements no later than 90 days after its adoption date.

D.2 New sources subject to this Regulation shall comply with its requirements prior to initiation of activity.

D.3 The BLM and BP shall each comply with the following compliance schedule:

D.3.a Submit a draft dust control plan addressing all applicable portions of this Regulation including section F.5 within three (3) months of the adoption date of this rule, to which the APCO shall respond within 60 days;

D.3.b Submit a final dust control plan addressing all APCO comments within two (2) months after receiving APCO's comments, which the APCO shall transmit to CARB and U.S. EPA for 45-day review and comment;

D.3.c Implement all final dust control plan elements within six (6) months of submittal; and

D.3.d Submit an updated dust control plan every two calendar years by the procedures described in D.3.a to D.3.c. The updated plans shall be transmitted to the District no later than 90 days after the end of the calendar year and, in addition to information required of the initial plan, shall include a summary of actions taken to prevent or mitigate PM10 emissions during the previous two years.

E. Exemptions

The following activities are exempt from provisions of this Regulation:

E.1 Actions required by the Federal or State Endangered Species Act or any order issued by a court or governmental agency.

E.2 Off-Field Agricultural Sources necessary to minimize or respond to adverse effects on agricultural crops caused during freezing temperatures as declared by the National Weather Service.

E.3 Emergency maintenance of flood control channels and water spreading basins.

E.4 Any emergency operation activities performed to ensure public health and safety. Emergency activities lasting more than 30 days shall be subject to this Regulation, except where compliance would limit the effectiveness of the emergency activity performed to ensure public health and safety.

E.5 Blasting operations permitted by the California Division of Industrial Safety. Other activities performed in conjunction with blasting are not exempt from complying with the provisions of this rule.

E.6 The Recreational Use of public lands covered by the most recent BLM dust control plan that complies with Rule 800, including but not limited to Off-Road Vehicles, all-terrain vehicles, trucks, cars, motorcycles, motorbikes or motorbuggies.

E.7 The following military training activities conducted by the Department of Defense: (1) military Tactical Training, (2) maintenance, repair, and removal of targets and munitions associated with military Tactical Training, (3) open areas on active military ranges, including but not limited to designated impact areas, landing zones, and bivouac areas. Other activities performed in conjunction with military Tactical Training are not exempt from complying with the provisions of this rule.

F. General Requirements

F.1 Materials used for Chemical Stabilization of soils, including petroleum resins, asphaltic emulsions, acrylics, and adhesives shall not violate State Water Quality Control Board standards for use as a soil stabilizer. Materials accepted by the California Air Resources Board (ARB) and the United States Environmental Protection Agency (EPA), and which meet State water quality standards, shall be considered acceptable to the ICAPCD.

F.2 Any material prohibited for use as dust Suppressant by EPA, the ARB, or other applicable law, rule, or regulation is also prohibited under Regulation VIII.

F.3 Use of hygroscopic materials may be prohibited by the APCD in areas lacking sufficient atmospheric moisture of soil for such materials to effectively reduce Fugitive Dust emissions. The atmospheric moisture of soil is considered to be sufficient if it meets the application specifications of the hygroscopic product manufacturer. Use of such materials may be approved in conjunction with sufficient wetting of the controlled area.

F.4 Any use of dust Suppressants or gravel pads, and paving materials such as asphalt or concrete for paving, shall comply with other applicable District Rules.

F.5 Bureau of Land Management (BLM) Requirements

The BLM shall prepare a dust control plan to minimize PM10 emissions for sources under the control of BLM. The dust control plan shall include at a minimum the following:

F.5.a A stipulation that all new authorizations for point and area stationary emission sources obtain all necessary permits and satisfy all applicable SIP provisions, including Regulation VIII specific control measures;

F.5.b A summary of: the total miles of BLM roads that are paved, paved with unpaved shoulders, and unpaved roads with 50 or more average vehicle trips per day, including length and level of usage of each such road; the priority for control of road segments based on annual and episodic (e.g. event) usage; the plans for control of PM-10 emissions from these roads; the location and extent (e.g. acreage) of open areas disturbed by legal and illegal Recreational Use; the priority for control of these open areas based on annual and episodic (e.g. event) usage; the plans for control of PM-10 emissions from these areas;

F.5.c BLM must demonstrate in its dust control plan that Unpaved Roads, parking, and Open Areas are controlled pursuant to the applicability and requirements of Rules 804 and 805 except where measures are demonstrated by BLM to be prohibited by federal or state laws, regulations, or approved plans concerning wilderness preservation and species management and recovery.

F.5.d Where compliance with any control measure in Rules 804 and 805 is prohibited pursuant to F.5.c, the dust control plan must discuss and commit to implement other possible control measures, such as vehicle speed limits.

F.5.e The dust control plan must describe all PM-10 control measures that will be implemented, such as restricted use areas, stabilization of Unpaved

Traffic Areas and current Recreation Area Management Plan (RAMP) measures, to reduce PM10 emissions during off-road events and/or competitions on public land and include all those measures that are feasible and not prohibited by the laws, regulations and plans described in F.5.c;

F.5.f Use BLM-standard road design and drainage specifications when maintaining existing roads or authorizing road maintenance and new road construction; and

F.5.g Include public educational information on reducing PM-10 emissions with BLM open area literature (e.g. identification of restricted areas and/or applicable speed limits) and on related information signs in heavily used areas.

F.6. Border Patrol (BP) Requirements

The BP shall prepare a dust control plan designed to minimize PM10 emissions from sources under the control of the BP. The dust control plan shall include those dust control measures found in Rules 804 and 805. The dust control plan shall include the following fugitive dust control measures:

F.6.a A stipulation that all new authorizations for point and area stationary emission sources obtain all necessary permits and satisfy all applicable SIP provisions, including Regulation VIII specific control measures;

F.6.b Implement alternatives to tire-dragging that result in fewer PM10 emissions, unless BP demonstrates such alternatives to be inconsistent with the monitoring of immigration across the U.S.-Mexico border; and

F.6.c Control dust emissions from certain Unpaved Roads and routes owned or operated by the BP as identified through general BP planning consistent with Rule 805 unless those dust control measures are demonstrated to be inconsistent with BP authority and/or mission.

G. Administrative Requirements

G.1 Test Methods

G.1.a Determination of VDE Opacity

Opacity observations to determine compliance with VDE standards shall be conducted in accordance with the test procedures for “Visual Determination of Opacity” as described in Appendix A of this rule. Opacity observations for sources other than unpaved traffic areas (e.g., roads, parking areas) shall be conducted per Section B of Appendix A and shall require 12 readings at 15-second intervals.

G.1.b Determination of Stabilized Surface

Observations to determine compliance with the conditions specified for a stabilized surface, in any inactive disturbed surface area, whether at a work site that is under construction, at a work site that is temporarily or permanently inactive, or on an open area and vacant lot, shall be conducted in accordance with the test methods described in Appendix B of this rule. If a disturbed surface area passes any of the applicable Appendix B-Section A, B and D-G tests, then the surface shall be considered stabilized.

G.1.c Determination of Soil Moisture Content

Soil moisture content shall be determined by using ASTM Method D2216-98 (Standard Test Method for Laboratory Determination of Water [Moisture] Content of Soil and Rock by Mass), or other equivalent test methods approved by the EPA, ARB, and the APCO.

G.1.d Determination of Silt Content for Bulk Materials

Silt content of a Bulk Material shall be determined by ASTM Method C136a (Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates), or other equivalent test methods approved by EPA, ARB, and the APCD.

G.1.e Determination of Silt Content for Unpaved Roads and Unpaved Vehicle/Equipment Traffic Areas

Silt Content for Unpaved Roads and Unpaved Traffic Areas shall be determined by using Section C of Appendix B of this Rule or other equivalent test methods approved by EPA, ARB, and the APCO.

G.1.f Determination of Threshold Friction Velocity (TFV)

TFV shall be determined by using Section D of Appendix B of this Rule or other equivalent test methods approved by EPA, ARB, and the APCO.

H. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application and compliance with this rule (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. For control measures which require multiple daily applications, recording the frequency of application will fulfill the recordkeeping requirements of this rule (i.e., water being applied three times a day and the date) Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

I. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII. Failure to comply with the provisions of an APCO approved dust control plan shall also constitute a violation of this Regulation. Regardless of whether an APCO approved dust control plan is being implemented or not, or whether a Person responsible for an Active Operation(s) is complying with an approved dust control plan, the Person is still subject to the requirements of Regulation VIII at all times.

# APPENDIX A
## Visual Determination of Opacity

SECTION A Test Method For Unpaved Roads and Unpaved Traffic Areas
SECTION B Test Method For Time-Averaged Regulations

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## SECTION A TEST METHOD FOR UNPAVED ROADS AND UNPAVED TRAFFIC AREAS

A. Opacity Test Method. The purpose of this test method is to estimate the percent opacity of Fugitive Dust plumes caused by vehicle movement on Unpaved Roads and Unpaved Traffic Areas. This method can only be conducted by an individual who has current certification as a qualified observer.

A.1 Step 1: Stand at least 16.5 feet from the fugitive dust source in order to provide a clear view of the emissions with the sun oriented in the 140° sector to the back. Following the above requirements, make opacity observations so that the line of vision is approximately perpendicular to the dust plume and wind direction. If multiple plumes are involved, do not include more than one plume in the line of sight at one time.

A.2 Step 2: Record the Fugitive Dust source location, source type, method of control used, if any, observer's name, certification data and affiliation, and a sketch of the observer's position relative to the Fugitive Dust source. Also, record the time, estimated distance to the Fugitive Dust source location, approximate wind direction, estimated wind speed, description of the sky condition (presence and color of clouds), observer's position to the Fugitive Dust source, and color of the plume and type of background on the visible emission observation form both when opacity readings are initiated and completed.

A.3 Step 3: Make opacity observations, to the extent possible, using a contrasting background that is perpendicular to the line of vision. Make opacity observations approximately 1 meter above the surface from which the plume is generated. Note that the observation is to be made at only one visual point upon generation of a plume, as opposed to visually tracking the entire length of a dust plume as it is created along a surface. Make two observations per vehicle, beginning with the first reading at zero seconds and the second reading at five seconds. The zero-second observation should begin immediately after a plume has been created above the surface involved. Do not look continuously at the plume but, instead, observe the plume briefly at zero seconds and then again at five seconds.

A.4 Step 4: Record the opacity observations to the nearest 5% on an observational record sheet. Each momentary observation recorded represents the average opacity of emissions for a 5-second period. While it is not required by the test method, EPA recommends that the observer estimate the size of the vehicles which generate dust plumes for which readings are taken (e.g. mid-size passenger car or heavy-duty truck.) and take the approximate speeds the vehicles are traveling when the readings are being taken.

A.5 Step 5: Repeat Step 3 (Section A.3. of this appendix) and Step 4 (Section A.4. of this appendix) until you have recorded a total of 12 consecutive opacity readings. This will occur once six vehicles have driven on the source in your line of observation for which you are able to take proper readings. The 12 consecutive readings must be taken within the same period of observation but must not exceed 1 hour. Observations immediately preceding and following interrupted observations can be considered consecutive.

A.6 Step 6: Average the 12 opacity readings together. If the average opacity reading equals 20% or lower, the source is in compliance with the opacity standard described in the applicable rule.

SECTION B TEST METHOD FOR VISUAL DETERMINATION OF OPACITY OF EMISSIONS FROM SOURCES FOR TIME-AVERAGED REGULATIONS

B. Applicability. This method is applicable for the determination of the opacity of emissions from sources of visible emissions for time-averaged regulations. A time-averaged regulation is any regulation that requires averaging visible emission data to determine the opacity of visible emissions over a specific time period.

B.1 Principle. The opacity of emissions from sources of visible emissions is determined visually by a qualified observer who has received certification.

B.2 Procedures. A qualified observer who has been certified shall use the following procedures for visually determining the opacity of emissions.

B.2.a Position. Stand at a position at least 5 meters from the Fugitive Dust source n order to provide a clear view of the emissions with the sun oriented in the 140° sector to the back. Consistent as much as possible with maintaining the above requirements, make opacity observations from a position such that the line of sight is approximately perpendicular to the plume and wind direction. The observer may follow the Fugitive Dust plume generated by mobile earthmoving equipment, as long as the sun remains oriented in the 140° sector to the back. As much as possible, if multiple plumes are involved, do not include more than one plume in the line of sight at one time.

B.2.b Field Records. Record the name of the site, Fugitive Dust source type (i.e., pile, material handling (i.e., transfer, loading, sorting)), method of control used, if any, observer's name, certification data and affiliation, and a sketch of the observer's position relative to the Fugitive Dust source. Also, record the time, estimated distance to the Fugitive Dust source location, approximate wind direction, estimated wind speed, description of the sky condition (presence and color of clouds,) observer's position relative to the fugitive dust source, and color of the plume and type of the background on the visible emission observation form when opacity readings are initiated and completed.

B.2.c Observations. Make opacity observations, to the extent possible, using a contrasting background that is perpendicular to the line of sight. For storage piles, make opacity observations approximately 1 meter above the surface from which the plume is generated. For extraction operations and the loading of haul trucks in open-pit mines, make opacity observations approximately one meter above the rim of the pit. The initial observation should begin immediately after a plume has been created above the surface involved. Do not look continuously at the plume, but instead observe the plume momentarily at 15-second intervals. For Fugitive Dust from Earthmoving equipment, make opacity observations approximately 1 meter above the mechanical equipment generating the plume.

B.2.d Recording Observations. Record the opacity observations to the nearest 5% every 15 seconds on an observational record sheet. Each momentary observation recorded represents the average opacity of emissions for a 15-second period. If a multiple plume exists at the time of an observation, do not record an opacity reading. Mark an "x" for that reading. If the equipment generating the plume travels outside of the field of observation, resulting in the inability to maintain the orientation of the sun within the 140° sector or if the equipment ceases operating, mark an "x" for the 15 – second interval reading. Readings identified as "x" shall be considered interrupted readings.

B.2.e Data Reduction For Time-Averaged Regulations. For each set of 12 or 24 consecutive readings, calculate the appropriate average opacity. Sets must consist of consecutive observations, however, readings immediately preceding and following interrupted readings shall be deemed consecutive and in no case shall two sets overlap, resulting in multiple violations.

# APPENDIX B
## Determination of Stabilization



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## SECTION A TEST METHODS FOR DETERMINING STABLIZATION

The test methods described in Section B through Section G of this appendix shall be used to determine whether an area has a Stabilized Surface. Should a disturbed area contain more than one type of disturbance, soil, vegetation, or other characteristics, which are visibly distinguishable, test each representative surface separately for stability, in an area that represents a random portion of the overall disturbed conditions of the site, according to the appropriate test methods in Section B through Section G of this appendix, and include or eliminate it from the total size assessment of disturbed surface area(s) depending upon test method results.

## SECTION B VISIBLE CRUST DETERMINATION

B.1 Where a visible crust exists, drop a steel ball with a diameter of 15.9 millimeters (0.625 inches) and a mass ranging from 16-17 grams from a distance of 30 centimeters (one foot) directly above (at a 90° angle perpendicular to ) the soil surface. If blowsand is present, clear the blowsand from the surfaces on which the visible crust test method is conducted. Blowsand is defined as thin deposits of loose uncombined grains covering less than 50% of a site which have not originated from the representative site surface being tested. If material covers a visible crust, which is not blowsand, apply the test method in Section D of this appendix to the loose material to determine whether the surface is stabilized.

B.2 A sufficient crust is defined under the following conditions: once a ball has been dropped according to section B.1 of this appendix, the ball does not sink into the surface, so that it is partially or fully surrounded by loose grains and, upon removing the ball, the surface upon which it fell has not been pulverized, so that loose grains are visible.

B.3 Drop the ball three times within a survey area that measures 1 foot by 1 foot and that represents a random portion of the overall disturbed conditions of the site. The survey area shall be considered to have passed the Visible Crust Determination Test if the results of at least two out of the three times that the ball was dropped, met the criteria in section B.2 of this appendix. Select at least two other survey areas that represent a random portion of the overall disturbed conditions of the site, and repeat this procedure. If the results meet the criteria of section B.2 of this appendix for all of the survey areas tested, then the site shall be considered to have passed the Visible Crust Determination Test and shall be considered sufficiently crusted.

B.4 At any given site, the existence of a sufficient crust covering one portion of the site may not represent the existence or protectiveness of a crust on another portion of the site. Repeat the visible crust test as often as necessary on each random portion of the overall conditions of the site for an accurate assessment.

SECTION C DETERMINATION OF SILT CONTENT FOR UNPAVED ROADS AND UNPAVED VEHICLE/EQUIPMENT TRAFFIC AREAS

The purpose of this test method is to estimate the silt content of the trafficked parts of Unpaved Roads and Unpaved vehicle/equipment Traffic Areas. The higher the Silt content, the more fine dust particles that are released when vehicles travel on Unpaved Roads and Unpaved vehicle/equipment Traffic Areas.

C.1 Equipment:

C.1.a. A set of sieves with the following openings: 4 millimeters (mm), 2mm, 1mm, 0.5mm and 0.25 mm, a lid, and collector pan.
C.1.b A small whisk broom or paintbrush with stiff bristles and dustpan 1 ft. in width (the broom/brush should preferably have one, thin row of bristles no longer than 1.5 inches in length.)
C.1.c A spatula without holes.
C.1.d A small scale with half-ounce increments (e.g., postal/package scale.)
C.1.e A shallow, lightweight container (e.g., plastic storage container.)
C.1.f A sturdy cardboard box or other rigid object with a level surface.
C.1.g A basic calculator.
C.1.h Cloth gloves (optional for handling metal sieves on hot, sunny days.)
C.1.i Sealable plastic bags (if sending samples to a laboratory.)
C.1.j A pencil/pen and paper.

C.2 Step 1: Look for a routinely traveled surface, as evidenced by tire tracks. Only collect samples from surfaces that are not damp due to precipitation or dew. This statement is not meant to be a standard in itself for dampness where watering is being used as a control measure. It is only intended to ensure that surface testing is done in a representative manner. Use caution when taking samples to ensure personal safety with respect to passing vehicles. Gently press the edge of a dustpan (1 foot in width) into the surface four times to mark an area that is 1 square foot. Collect a sample of loose surface material into the dustpan, minimizing escape of dust particles. Use a spatula to lift heavier elements such as gravel. Only collect dirt/Gravel to an approximate depth of 3/8 inch or 1 cm in the 1 square foot area. If you reach a hard, underlying subsurface that is <3/8 inch in depth, do not continue collecting the sample by digging into the hard surface. In other words, you are only collecting a surface sample of loose material down to 1 cm. In order to confirm that samples are collected to a 1cm depth, a wooden dowel or other similar narrow object at least one-foot in length can be laid horizontally across the survey area while a metric ruler is held perpendicular to the dowel. (Optional: At this point, you can choose to place the sample collected into a plastic bag or container and take it to an independent laboratory for silt content analysis. A reference to the procedure the laboratory is required to follow is at the end of this section.)

C.3 Step 2: Place a scale on a level surface. Place a lightweight container on the scale. Zero the scale with the weight of the empty container on it. Transfer the entire sample collected in the dustpan to the container, minimizing escape of dust particles. Weigh the sample and record its weight.

C.4 Step 3: Stack a set of sieves in order according to the size openings specified above, beginning with the largest size opening (4mm) at the top. Place a collector pan underneath the bottom (0.25mm) sieve.

C.5 Step 4: Carefully pour the sample into the sieve stack, minimizing escape of dust particles by slowly brushing material into the stack with a whiskbroom or brush. On windy days, use the trunk or door of a vehicle as a wind barrier. Cover the stack with a lid. Lift up the sieve stack and shake it vigorously up and down and sideways for at least 1 minute.

C.6 Step 5: Remove the lid from the stack and disassemble each sieve separately, beginning with the top sieve. As you remove each sieve, examine it to make sure that all of the material has been sifted to the finest sieve through which it can pass (e.g., material in each sieve (besides the top sieve that captures a range of larger elements) should look the same size.) If this is not the case, re-stack the sieves and collector pan, cover the stack with the lid, and shake it again for at least 1 minute. You only need to reassemble the sieve(s) that contain material, which require further sifting.

C.7 Step 6: After disassembling the sieves and collector pan, slowly sweep the material from the collector pan into the empty container originally used to collect and weigh the entire sample. Take care not to minimize escape of dust particles. You do not need to do anything with material captured in the sieves – only the collector pan. Weigh the container with the materials from the collector pan and record its weight.

C.8 Step 7: If the source is an unpaved road, multiply the resulting weight by 0.38. If the source is an Unpaved vehicle/equipment Traffic Area, multiply the resulting weight by 0.55. The resulting number is the estimated silt loading. Then, divide the total weight of the sample you recorded earlier in Step 2 (Section C.4) and multiply by 100 to estimate the percent Silt content.

C.9 Step 8: Select another two routinely traveled portions of the Unpaved Road or Unpaved vehicle/equipment Traffic Area and repeat this test method. Once you have calculated the silt loading and percent silt content of the 3 samples collected, average your results together.

C.10 Step 9: Examine Results. If the average silt loading is less than 0.33 oz/ft$^2$, the surface is STABLE. If the average silt loading is greater than or equal to 0.33 oz/ft$^2$, then proceed to examine the average percent Silt content. If the source is an Unpaved Road and the average percent Silt content is 6% or less, the surface is STABLE. If the source is an unpaved parking lot and the average percent Silt content is 8% or less, the surface is STABLE. If your field test results are within 2% of the standard (for example, 4%-8% Silt content on an Unpaved Road) it is recommended that you collect 3 additional samples from the source according to Step 1 (section C.2) and take them to an independent laboratory for Silt content analysis.

C.11 Independent Laboratory Analysis: You may choose to collect samples from the source, according to Step 1 (section C.2) and send them to an independent laboratory for Silt content analysis rather than conduct the sieve field procedure. If so, the test method the laboratory is required to use is: “Procedures For Laboratory Analysis for Surface/Bulk Dust Loading Samples,” (Fifth Edition, Volume 1, Appendix C.2.3 “Silt Analysis,” 1995,) AP-42, Office of Air Quality Planning & Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina.

## SECTION D DETERMINATION OF THRESHOLD FRICTION VELOCITY (TFV)

For disturbed surface areas that are not crusted or vegetated, determine threshold friction velocity (TFV) according to the following sieving field procedure (based on a 1952 laboratory procedure published by W.S. Chepil).

D.1 Obtain and stack a set of sieves with the following openings: 4 millimeters (mm), 2 mm, 1 mm, 0.5 mm, and 0.25 mm or obtain and stack a set of standard/commonly available sieves. Place the sieves in order according to size openings, beginning with the largest size opening at the top. Place a collector pan underneath the bottom (0.25 mm) sieve. Collect a sample of loose surface material from an area at least 30 cm by 30 cm in size to a depth of approximately 1 cm using a brush and dustpan or other similar device. Only collect soil samples from dry surfaces (i.e. when the surface is not damp to the touch). Remove any rocks larger than 1 cm in diameter from the sample. Pour the sample into the top sieve (4 mm opening) and cover the sieve/collector pan unit with a lid. Minimize escape of particles into the air when transferring surface soil into the sieve/collector pan unit. Move the covered sieve/collector pan unit by hand using a broad, circular arm motion in the horizontal plane. Complete twenty circular arm movements, ten clockwise and ten counterclockwise, at a speed just necessary to achieve some relative horizontal motion between the sieves and the particles. Remove the lid from the sieve/collector pan unit and disassemble each sieve separately beginning with the largest sieve. As each sieve is removed, examine it for loose particles. If loose particles have not been sifted to the finest sieve through which they can pass, reassemble and cover the sieve/collector pan unit and gently rotate it an additional ten times. After disassembling the sieve/collector pan unit, slightly tilt and gently tap each sieve and the collector pan so that material aligns along one side. In doing so, minimize escape of particles into the air. Line up the sieves and collector pan in a row and visibly inspect the relative quantities of catch in order to determine which sieve (or whether the collector pan) contains the greatest volume of material. If a visual determination of relative volumes of catch among sieves is difficult, use a graduated cylinder to measure the volume. Estimate TFV for the sieve catch with the greatest volume using Table 1 of this appendix, which provides a correlation between sieve opening size and TFV.

Table 1. Determination of Threshold Friction Velocity (TFV)

| Tyler Sieve No. | ASTM 11 Sieve No. | Opening (mm) | TFV (cm/s) |
|---|---|---|---|
| 5 | 5 | 4 | 135 |
| 9 | 10 | 2 | 100 |
| 16 | 18 | 1 | 76 |
| 32 | 35 | 0.5 | 58 |
| 60 | 60 | 0.25 | 43 |
| Collector Pan | --- | --- | 30 |

D.2 Collect at least three soil samples which represent random portions of the overall conditions of the site, repeat the above TFV test method for each sample and average the resulting TFVs together to determine the TFV uncorrected for non erodible elements. Non-erodible elements are distinct elements, in the random portion of the overall conditions of the site, that are larger than 1 cm in diameter, remain firmly in place during a wind episode, and inhibit soil loss by consuming Section of the shear stress of the wind. Non-erodible elements include stones and bulk surface material but do not include flat or standing vegetation. For surfaces with non-erodible elements, determine corrections to the TFV by identifying the fraction of the survey area, as viewed from directly overhead, that is occupied by non-erodible elements using the following procedure. Select a survey area of 1 meter by 1 meter that represents a random portion of the overall conditions of the site. Where many non-erodible elements lie within the survey area, separate the non-erodible elements into groups according to size. For each group, calculate the overhead area for the non-erodible elements according to the following equations:

| | |
|---|---|
| Average Dimensions =<br>(Average Length) x ( Average Width) | Eq. 1 |
| Overhead Area =<br>(Average Dimensions) x (Number of Elements) | Eq. 2 |
| Total Overhead Area =<br>Overhead Area Of Group 1 + Overhead Area of Group 2 (etc) | Eq. 3 |

| | |
|---|---|
| Total Frontal Area = Total Overhead Area/2 | Eq. 4 |
| Percent Cover of Non-Erodible Elements = (Total Frontal Area/Survey Area) x 100 | Eq. 5 |

Note: Ensure consistent units of measurements (e.g., square meters or square inches when calculating percent cover).

Repeat this procedure on an additional two distinct survey areas that represent a random portion of the overall conditions of the site and average the results. Use Table 2 of this appendix to identify the correction factor for the percent cover of non-erodible elements. Multiply the TFV by the corresponding correction factor to calculate the TFV corrected for non-erodible elements.

Table 2. Correction Factors for Threshold Friction Velocity

| Percent Cover of Non-Erodible Elements | Correction Factor |
|---|---|
| Greater than or equal to 10% | 5 |
| Greater than or equal to 5% and less than 10% | 3 |
| Less than 5% and greater than or equal to 1% | 2 |
| Less than 1% | None |

SECTION E DETERMINATION OF FLAT VEGETATIVE COVER

Flat vegetation includes attached (rooted) vegetation or unattached vegetative debris lying on the surface with a predominant horizontal orientation that is not subject to movement by wind. Flat vegetation, which is dead but firmly attached, shall be considered equally protective as live vegetation. Stones or other aggregate larger than 1 centimeter in diameter shall be considered protective cover in the course of conduction the line transect test method. Where flat vegetation exists conduct the following line transect test method.

E.1 Line Transect Test Method. Stretch a 100 foot measuring tape across a survey area that represents a random portion of the overall conditions of the site. Firmly anchor both ends of the measuring tape into the surface using a tool such as a screwdriver, with the tape stretched taut and close to the soil surface. If vegetation exists in regular rows, place the tape diagonally (at approximately a 45° angle) away from a parallel or perpendicular position to the vegetated rows. Pinpoint an area the size of a 3/32 inch diameter brazing rod or wooden dowel centered above each 1 foot interval mark along one edge of the tape. Count the number of times that flat vegetation lies directly underneath the pinpointed area at 1 foot intervals. Consistently observe the underlying surface from a 90° angle directly above each pinpoint on one side of the tape. Do not count the underlying surface as vegetated if any portion of the pinpoint extends beyond the edge of the vegetation underneath in any direction. If clumps of vegetation or vegetative debris lie underneath the pinpointed area, count the surface as vegetated, unless bare soil is visible directly below the pinpointed area. When 100 observations have been made, add together the number of times a surface was counted as vegetated. This total represents the percent of flat vegetations cover (e.g., if 35 positive counts were made, then vegetation cover is 35%.) If the survey area that represents a random portion of the overall conditions of the site is too small for 100 observations, make as many observations as possible. Then multiply the count of vegetated surface areas by the appropriate conversion factor to obtain percent cover. For example, if vegetation was counted 20 times within a total of 50 observations, divide 20 by 50 and multiply by 100 to obtain a flat vegetation cover of 40%.

E.2 Conduct the line transect test method, as described in section E.1 of this appendix, an additional two times on areas that represent a random portion of the overall conditions of the site and average results.

SECTION F DETERMINATION OF STANDING VEGETATIVE COVER.

Standing vegetation includes vegetation that is attached (rooted) with a predominant vertical orientation. Standing vegetation, which is dead but firmly rooted, shall be considered equally protective as live vegetation. Conduct the following standing vegetation test method to determine if 30% cover or more exists. If the resulting percent cover is less than 30% but equal to or greater than 10%, then conduct the test in Section D; "Determination Of Threshold Friction Velocity (TFV,) of this appendix in order to determine if the site is stabilized, such that the standing vegetation cover is equal to or greater than 10%, where threshold friction velocity, corrected for non-erodible elements, is equal to or greater than 43cm/second.

F.1 For standing vegetation that consists of large, separate vegetative structures (e.g., shrubs and sagebrush,) select a survey area that represents a random portion of the overall conditions of the site that is the shape of a square with sides equal to at least 10 times the average height of the vegetative structures. For smaller standing vegetation, select a survey area of three feet by three feet.

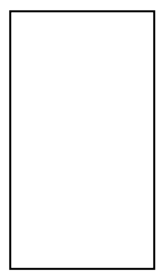
F.2 Count the number of standing vegetative structures within the survey area. Count vegetation, which grows in clumps as a single unit. Where different types of vegetation exist and/or vegetation of different height and width exists, separate the vegetative structures with similar dimensions into groups. Count the number of vegetative structures in each group within the survey area. Select an individual structure within each group that represents the average height and width of the vegetation in the group. If the structure is dense (e.g., when looking at it vertically from base to top there is little or zero open air space within its perimeter,) calculate and record its frontal silhouette area, according to Equation 6 of this appendix. Also, use Equation 6 of this appendix to estimate the average height and width of the vegetation if the survey area is larger than nine square feet. Otherwise, use the procedure in section F.3 of this appendix to calculate the frontal silhouette area. Then calculate the percent cover of standing vegetation according to Equations 7, 8, and 9 of this appendix.

| | |
|---|---|
| Frontal Silhouette Area =<br>(Average Height) x (Average Width) | Eq. 6 |
| Frontal Silhouette Area Of Group=<br>(Frontal Silhouette Area Of Individual Vegetative Structure) x (Number Of Vegetation Structures Per Group) | Eq. 7 |
| Total Frontal Silhouette Area =<br>Frontal Silhouette Area Of Group 1 + Frontal Silhouette Area Of Group 2 (etc.) | Eq. 8 |
| Percent Cover Of Standing Vegetation =<br>(Total Frontal Silhouette Area/Survey Area) x 100 | Eq. 9 |
| Percent Open Space =<br>[(Number Of Circled Gridlines Within The Outlined Area Counted That Are Not Covered By Vegetation/Total Number Of Gridline Intersections Within The Outlined Area) x 100] | Eq.10 |
| Percent Vegetative Density =<br>100 – Percent Open Space | Eq. 11 |
| Vegetative Density =<br>Percent Vegetative Density/100 | Eq. 12 |
| Frontal Silhouette Area =<br>[Max. Height x Max. Width] x [Vegetative Density/.04]o.5 | Eq. 13 |

Note: Ensure consistent units of measurement (e.g., square meters or square inches when calculating percent cover.)

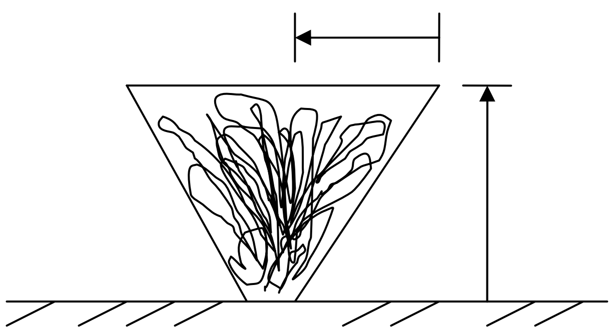
F.3. Vegetative Density Factor. Cut a single, representative piece of vegetation (or consolidated vegetative structure) to within 1cm of surface soil. Using a white paper grid or transparent grid over white paper, lay the vegetation flat on top of the grid (but do not apply pressure to flatten the structure.) Grid boxes of 1 inch or ½ inch squares are sufficient for most vegetation when conducting this procedure. Using a marker or pencil, outline the shape of the vegetation along its outer perimeter, according to Figure B, C, or D of this appendix, as appropriate. (Note: Figure C differs from Figure D primarily in that the width of vegetation in Figure C is narrow at its base and gradually broadens to its tallest height. In Figure D, the width of the vegetation generally becomes narrower from its midpoint to its tallest height.) Remove the vegetation, count and record the total number of gridline intersections within the outlined area, but do not count gridline intersections that connect with the outlined shape. There must be at least 10 gridline intersections within the outlined area and preferably more than 20, otherwise, use smaller grid boxes. Draw small circles (no greater than a 3/32 inch diameter) at each gridline intersection counted within the outlined area. Replace the vegetation on the grid within its outlined shape. From a distance of approximately 2 feet directly above the grid, observe each circled gridline intersection. Count and record the number of circled gridline intersections that are not covered by any piece of the vegetation. To calculate percent vegetative density, use Equations 10 and 11 of this appendix. If percent vegetative density is equal to or greater than 30, use an equation (one of the equations-Equations 16, 17, or 18 of this appendix) that matches the outline used to trace the vegetation (Figure B, C, or D) to calculate its frontal silhouette area. If percent vegetative density is less than 30, use Equations 12 and 13 of this appendix to calculate the frontal silhouette area.

Figure B. Cylinder



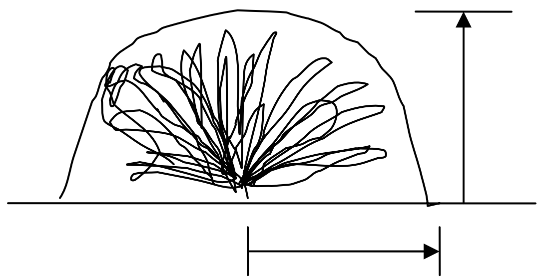
Frontal Silhouette Area = Maximum Height x Maximum Width Eq.16

Figure C. Inverted Cone



Frontal Silhouette Area = Maximum Height x ½ Maximum Width Eq. 17

Figure D. Upper Sphere



Frontal Silhouette Area = (3.14 x Maximum Height x ½ Maximum Width)/2 Eq.18

SECTION G ROCK TEST METHOD

The Rock Test Method, which is similar to Section D, Test Methods For Stabilization-Determination Of Threshold Friction Velocity (TFV) of this appendix, examines the wind-resistance effects of rocks and other non-erodible elements on disturbed surfaces. Non-erodible elements are objects larger than 1 centimeter (cm) in diameter that remain firmly in place even on windy days. Typically, non-erodible elements include rocks, stones, glass fragments, and hardpacked clumps of soil lying on or embedded in the surface. Vegetation does not count as a non-erodible element in this method. The purpose of this test method is to estimate the percent cover of non-erodible elements on a given surface to see whether such elements take up enough space to offer protection against windblown dust. For simplification, the following test method refers to all non-erodible elements as ‘rocks.”

G.1 Select a 1 meter by 1 meter survey area that represents the general rock distribution on the surface. A 1 meter by 1 meter area is slightly greater than a 3 foot by 3 foot area. Mark-off the survey area by tracing a straight, visible line in the dirt along the edge of a measuring tape or by placing short ropes, yard sticks, or other straight objects in a square around the survey area.

G.2 Without moving any of the rocks or other elements, examine the survey area. Since rocks >3/8 inch (1cm) in diameter are of interest, measure the diameter of some of the smaller rocks to get a sense of which rocks need to be considered.

G.3 Mentally group the rocks >3/8 inch (1cm) diameter lying in the survey area into small, medium, and large size categories. Or, if the rocks are all approximately the same size, simply select a rock of average size and typical shape. Without removing any of the rocks from the ground, count the number of rocks in the survey area in each group and write down the resulting number.

G.4 Without removing rocks, select one or two average-size rocks in each group and measure the length and width. Use either metric units or standard units. Using a calculator, multiply the length times the width of the rocks to get the average dimensions of the rocks in each group. Write down the results for each rock group.

G.5 For each rock group, multiply the average dimensions (length times width) by the number of rocks counted in the group. Add the results from each rock group to get the total rock area within the survey area.

G.6 Divide the total rock area, calculated in section G.5 of this appendix, by two (to get frontal area.) Divide the resulting number by the size of the survey area (make sure the units of measurement match,) and multiply by 100 for percent rock cover. For example, the total rock area is 1,400 square centimeters divide 1,400 by 2 to get 700. Divide 700 by 10,000 (the survey area is 1 meter by 1 meter, which is 100 centimeters by 100 centimeters or 10,000 centimeters) and multiply by 100. The result is 7% rock cover. If rock measurements are made in inches, convert the survey area from meters to inches (1 inch = 2.54 centimeters.)

G.7 Select and mark-off two additional survey areas and repeat the procedures described in section G.1 through section G.6 of this appendix. Make sure the additional survey areas also represent the general rock distribution on the site. Average the percent cover results from all three survey areas to estimate the average percent of rock cover.

G.8 If the average rock cover is greater than or equal to 10%, the surface is stable. If the average rock cover is less than 10%, follow the procedures in section G.9 of this appendix.

G.9 If the average rock cover is less than 10%, the surface may or may not be stable. Follow the procedures in Section D.3 Determination Of Threshold Friction Velocity (TFV) of this rule and use the results from the rock test method as a correction (i.e., multiplication) factor. If the rock cover is at least 1%, such rock cover helps to limit windblown dust. However, depending on the soil's ability to release fine dust particles into the air, the percent rock cover may or may not be sufficient enough to stabilize the surface. It is also possible that the soil itself has a high enough TFV to be stable without even accounting for rock cover.

G.10 After completing the procedures described in Section G.9 of this appendix, use Table 2 of this appendix to identify the appropriate correction factor to the TFV, depending on the percent rock cover.

# RULE 801. CONSTRUCTION AND EARTHMOVING ACTIVITIES
(Adopted 11/08/2005)

## A. Purpose

The purpose of this rule is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from Construction and other Earthmoving Activities by requiring actions to prevent, reduce, or mitigate PM-10 emissions.

## B. Applicability

This rule applies to any Construction and other Earthmoving Activities, including, but not limited to, land clearing, excavation related to construction, land leveling, grading, cut and fill grading, erection or demolition of any structure, cutting and filling, trenching, loading or unloading of bulk materials, demolishing, drilling, adding to or removing bulk of materials from open storage piles, weed abatement through disking, back filling, travel on-site and travel on access roads to and from the site.

## C. Definitions

The definition~~s~~ of terms found in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM-10) shall apply to this rule.

## D. Exemptions

In addition to the exemptions listed in Rule 800, Section E, the following exemptions are established for this rule:

D.1 Construction or demolition at existing single family residential dwellings.

D.2 The 20% opacity limit of Sections E.1.a and E.2.b shall not apply when Wind Gusts exceed 25 miles per hour, provided that at least one of the following control measures is implemented for each applicable Fugitive Dust source type:

D.2.a Cease dust generating activities for a period of one hour after Wind Gusts last exceed the threshold. If operations cease for the remainder of the day, stabilization measures must be implemented.

D.2.b Apply water or dust Suppressants once per hour.

D.2.c Apply water to maintain 12% soil moisture content.

D.2.d Construct fences 3-5 feet high with 50% or less porosity, and must be done in conjunction with another measure, as above.

E. Requirements

E.1 Construction sites and Earthmoving Activities:

E.1.a All Persons who own or operate a Construction site shall comply with the requirements of Section F.1 so as to limit VDE to 20% opacity and comply with the conditions for a Stabilized Surface when applicable.

E.1.b. All Persons who perform any Earthmoving Activities shall comply with the requirements of Section F.1 so as to limit VDE to 20% opacity.

E.1.c All Persons who own or operate a Construction site of 10 acres or more in size for residential developments or 5 acres or more for non-residential developments shall develop a dust control plan. The dust control plan shall be made available to the APCD upon request. The dust control plan shall comply with the requirements of Section F.

E.1.d The owner or operator required to develop a dust control plan shall provide written notification to the APCD within 10 days prior to the commencement of any Construction activities via fax or mail. The requirement to develop a dust control plan shall apply to all such activities conducted for residential and non-residential (e.g., commercial, industrial, or institutional) purposes or conducted by any governmental entity. Regardless of whether a dust control plan is in place or not the owner or operator is still subject to comply with all requirements of the applicable rules under Regulation VIII at all times.

F. Best Available Control Measures for Fugitive Dust (PM-10)

F.1 Construction and Earthmoving Activities shall comply with the following requirements:

F.1.a Pre-Activity:

F.1.a.1 Pre-water site sufficient to limit VDE to 20% opacity, and

F.1.a.2 Phase work to minimize the amount of disturbed surface area at any one time.

F.1.b During Active Operations:

F.1.b.1 Apply water or Chemical Stabilization as directed by product manufacturer to limit VDE to 20% opacity, or

F.1.b.2 Construct and maintain wind barriers sufficient to limit VDE to 20% opacity. If utilizing wind barriers, control measure F.1.b.1

above shall be implemented.

F.1.b.3 Apply water or Chemical Stabilization as directed by product manufacturer to unpaved haul/access roads and Unpaved Traffic Areas sufficient to limit VDE to 20% opacity and meet the conditions of a Stabilized Unpaved Road.

F.1.c Temporary Stabilization During Periods of Inactivity:

F.1.c.1 Restrict vehicular access to the area by fencing or signage; and

F.1.c.2 Apply water or Chemical Stabilization, as directed by product manufacturer, sufficient to comply with the conditions of a Stabilized Surface. If an area having 0.5 acres or more of disturbed surface area remains unused for seven or more days, the area must comply with the conditions for a Stabilized Surface area.

F.1.d Track Out/Carry Out of Bulk Materials at the site shall be mitigated in compliance with Rule 803.

F.1.e Unpaved Roads and Unpaved Traffic Areas at the site shall comply with Rule 805.

F.1.f Bulk Material handling operations at the site shall comply with Rule 802.

F1.g Material transport of Bulk Material to, from, or around the site shall comply with Rule 802.

F.1.h Haul trucks transporting Bulk Material to, from, or around the site shall comply with Rule 802.

F.2 Dust Control Plan:

F.2.a Retain a copy of the dust control plan at the project site.

F.2.b Comply with the requirements of the approved dust control plan.

F.2.c A dust control plan shall contain all of the following information:

1. Name, address, and phone number of the Person responsible for the preparation, submittal, and implementation of the dust control plan and responsible for the project site.

2. A plot plan which shows the type and location of each project.

3. The total area of land surface to be disturbed, estimated daily

throughput volume of earthmoving in cubic yards, and total area in acres of the entire project site.

4. The expected start and completion dates of dust generating and soil disturbance activities to be performed on the site.

5. The actual and potential sources of Fugitive Dust emissions on the site and the location of Bulk Material handling and storage areas, Paved and Unpaved Roads, entrances and exits where Track Out/Carry Out may occur, and Unpaved Traffic Areas.

6. Dust Suppressants to be applied, including: product specifications; manufacturer's usage instructions (method, frequency, and intensity of application); type, number, and capacity of application equipment; and information on environmental impacts and approvals or certifications related to appropriate and safe use for ground application.

7. Specific surface treatment(s) and/or control measures utilized to control Track Out/Carry Out, and sedimentation where unpaved and/or access points join paved public access roads.

8. The dust control plan should describe all Fugitive Dust control measures to be implemented before, during, and after any dust generating activity.

G. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. For control measures which require multiple daily applications, recording the frequency of application will fulfill the recordkeeping requirements of this rule (i.e., water being applied three times a day and the date) Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

H. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII.

RULE 802. BULK MATERIALS
(Adopted 11/08/2005)

A. Purpose

The purpose of this regulation is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from outdoor handling, storage, and transport of Bulk Material by requiring actions to prevent, reduce, or mitigate PM-10 emissions.

B. Applicability

This rule applies to the outdoor handling, storage, and transport of Bulk Material, including, but not limited to, earth, rock, silt, sediment, sand, gravel, soil, fill, Aggregate Materials, dirt, mud, debris, and other organic and/or inorganic material consisting of or containing Particulate Matter with five percent or greater silt content.

C. Definitions

The definitions of terms found in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM-10) shall apply to this rule.

D. Exemptions

In addition to the exemptions listed in Rule 800, Section E, the following exemptions are established for this rule:

D.1 Outdoor storage, transport, or handling of Bulk Materials (including, but not limited to, organic or inorganic fertilizer, grains, seed, soil amendments, and feed) which would be damaged by wetting with water or by the application of Chemical Stabilization/Suppression, provided owners/operators demonstrate to the satisfaction of the APCO that none of the control measures required by this rule can be implemented to limit VDE to 20% opacity or provide a Stabilized Surface, as defined in Rule 800.

D.2 Outdoor storage or handling of any Bulk Material at a single site where no material is actively being added or removed at the end of the workday or overnight and where the total material stored is less than 100 cubic yards.

D.3 Transport of a Bulk Material in an outdoor area for a distance of twelve feet or less with the use of a chute or conveyor device.

D.4 Transport/hauling of Bulk Materials when conducted within the boundaries of a premises, are exempt from the requirements specified in Sections F.3.a and F.3.d.

E. Requirements

E.1 Bulk Material handling: no Person shall cause, suffer, allow or engage in any Bulk Material handling operation including, but not limited to stacking, loading, unloading, conveying and reclaiming of Bulk Material, for industrial or commercial purposes without complying with one or more of the requirements of Section F.1 so as to limit VDE to 20% opacity.

E.2 Bulk Material storage: no Person shall cause, suffer, allow or engage in any Bulk Material storage, for industrial or commercial purposes without complying with one or more of the requirements of Section F.2 so as to limit VDE to 20% opacity.

E.3 Material transport: no Person shall cause, suffer, allow or otherwise engage in the transportation of Bulk Materials for industrial or commercial purposes, without complying with all of the requirements of Section F.3 so as to limit VDE to 20% opacity.

E.4 Haul Trucks: no Person shall cause, suffer, allow or otherwise engage in the use or operation of any Haul Truck, for industrial or commercial purposes, of transporting or storing Bulk Material without complying with all of the requirements of Section F.3 so as to limit VDE to 20% opacity.

F. Best Available Control Measures for Fugitive Dust (PM-10)

F.1 BULK MATERIAL HANDLING/TRANSFER:

F.1.a Spray with water prior to handling and/or at points of transfer; or.

F.1.b Apply and maintain Chemical Stabilization, or

F.1.c Protect from wind erosion by sheltering or enclosing the operation and transfer line.

F.2 BULK MATERIAL STORAGE

F.2.a When storing Bulk Materials, comply with the conditions for a Stabilized Surface; or

F.2.b Cover Bulk Materials stored outdoors with tarps, plastic, or other suitable material and anchor in such a manner that prevents the cover from being removed by wind action, or

F.2.c Construct and maintain barriers with less than 50% porosity. If utilizing fences or wind barriers, apply water or chemical/organic stabilizers/suppressants, or

F.2.d Utilize a 3-side structure with a height at least equal to the height of the storage pile and with less than 50% porosity.

F.3. MATERIAL TRANSPORT/HAULING:

F.3.a Completely cover or enclose all Haul Truck loads of Bulk Material.

F.3.b Haul Trucks transporting loads of Aggregate Materials shall not be required to cover their loads if the load, where it contacts the side, front, and back of the cargo container area remains six inches from the upper area of the container area, and if the load does not extend, at its peak, above any part of the upper edge of the cargo container area (As defined in Section 23114 of the California Vehicle Code for both public and private roads).

F.3.c The cargo compartment(s) of all Haul Trucks are to be constructed and maintained so that no spillage and loss of Bulk Material can occur from holes or other openings in the cargo compartment's floor, side, and/or tailgate. Seals on any openings used to empty the load including, but not limited to, bottom-dump release gates and tailgates to be properly maintained to prevent the loss of Bulk Material from those areas.

F.3.d The cargo compartment of all Haul Trucks is to be cleaned and/or washed at delivery site after removal of Bulk Material.

G. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. For control measures which require multiple daily applications, recording the frequency of application will fulfill the recordkeeping requirements of this rule (i.e., water being applied three times a day and the date) Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

H. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII.

RULE 803. CARRY-OUT AND TRACK-OUT
(Adopted 11/08/2005)

A. Purpose

The purpose of this regulation is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from Track-Out and Carry-Out by requiring actions to prevent, reduce, or mitigate PM-10 emissions.

B. Applicability

This rule applies to all sites that are subject to Regulation VIII where Track-Out or Carry-Out has occurred or may occur on paved public roads or the paved shoulders of a paved public road.

C. Definitions

The definitions of terms found in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM-10) shall apply to this rule.

D. Exemptions:

In addition to the exemptions listed in Rule 800, Section E, the following exemptions are established for this rule:

D.1 Agricultural Operation Sites defined in and subject to Rule 806, Conservation Management Practices, are exempt from the requirements specified in Sections F.1.b and F.1.c.

D.2 Any operation site that operates no more than 10 days within a 90 days period at each location is exempt from the requirements specified in Sections F.1.b and F.1.c.

E. Requirements

E.1 Track Out/Carry Out: any Person who causes the deposition of Bulk Material by tracking out or carrying out onto a Paved Road surface shall comply with the requirements of Section F.1, as specified, to prevent or mitigate such deposition.

F. Best Available Control Measures for Fugitive Dust (PM-10)

F.1 TRACK OUT/CARRY OUT:

F.1.a. Clean up any Bulk Material tracked out or carried out onto a Paved Road on the following time-schedule:

(1) Within urban areas, immediately, when Track-Out or Carry-Out extends a cumulative distance of 50 linear feet or more; and

(2) At the end of the workday, for all other Track-Out or Carry-Out.

F.1.b In addition to F.1.a, all sites with access to a Paved Road and with 150 or more Average Vehicle Trips per Day, or 20 or more Average Vehicle Trips per Day by vehicles with three or more axles shall install one or more Track-Out Prevention Devices or other APCO approved Track-Out control device or wash down system at access points where unpaved traffic surfaces adjoin Paved Roads; or

F.1.c In addition to F.1.a, all sites with access to a Paved Road and with 150 or more Average Vehicle Trips per Day, or 20 or more Average Vehicle Trips per Day by vehicles with three or more axles shall apply and maintain paving, Chemical Stabilizeation, or at least 3 inch depth of Gravel (using Gravel or other low Silt (<5%) content material), for a distance of 50 or more consecutive feet at access points where Unpaved Roads adjoin Paved Roads.

G. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

H. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII.

RULE 804 OPEN AREAS
(Adopted 11/08/2005)

A. Purpose

The purpose of this regulation is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from Open Areas by requiring actions to prevent, reduce, or mitigate PM-10 emissions.

B. Applicability

This rule shall apply to any open area having 0.5 acres or more within urban areas, or 3.0 acres or more within rural areas; and contains at least 1000 square feet of disturbed surface area.

C. Definitions

The definitions of terms found in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM-10) shall apply to this rule.

D. Exemptions

In addition to the exemptions listed in Rule 800, Section E, the following exemptions are established for this rule:

D.1 Agricultural Operation Sites defined in and subject to Rule 806, Conservation Management Practices.

E. Requirements

E.1 Open Areas: all Persons who own or otherwise have jurisdiction over an Open Area shall comply with one or more of the requirements of Section F.1 to comply with the conditions of a Stabilized Surface at all times and limit VDE to 20% opacity.

E.2 Vehicle use in Open Areas: within 30 days following initial discovery of evidence of trespass, a Person who owns or otherwise has jurisdiction over an Open Area shall prevent unauthorized vehicle access by posting "No Trespassing" signs or installing physical barriers such as fences, gates, posts, and/or appropriate barriers to effectively prevent access to the area.

F. Best Available Control Measures for Fugitive Dust (PM-10)

F.1 OPEN AREAS

F.1.a Apply and maintain water or dust suppressant(s) to all unvegetated areas.

F.1.b Establish vegetation on all previously disturbed areas.

F.1.c Pave, apply and maintain Gravel, or apply and maintain Chemical Stabilizers/Suppressants.

G. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. For control measures which require multiple daily applications, recording the frequency of application will fulfill the recordkeeping requirements of this rule (i.e., water being applied three times a day and the date) Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.-

H. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII.

RULE 805 PAVED AND UNPAVED ROADS
(Adopted 11/08/2005)

A. Purpose

The purpose of this regulation is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from new or existing public or private Paved or Unpaved Road, road construction project, or road modification project by requiring actions to prevent, reduce, or mitigate PM-10 emissions.

B. Applicability

This rule applies to any new or existing public or private Paved or Unpaved Road, road construction project, or road modification project.

C. Definitions

The definitions of terms found in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM-10) shall apply to this rule.

D. Exemptions

In addition to the exemptions listed in Rule 800, Section E, the following exemptions are established for this Rule:

D.1 Paved and unpaved driveways serving one single family residential dwelling.

D.2 Agricultural Operation Sites defined in and subject to Rule 806, Conservation Management Practices.

E. Requirements

E.1 Unpaved Haul/Access Roads: No Person shall cause, suffer or allow the operation, use, or maintenance of any unpaved Haul/Access Road without complying with one or more of the requirements of Section F.1 so as to limit VDE to 20% opacity.

E.2 Unpaved Roads: On any Unpaved Road segment with 50 or more Average Vehicle Trips per Day, the owner/operator shall limit VDE to 20% opacity, as determined by the test methods for "Visual Determination of Opacity" in Rule 800, Appendix A, and comply with the requirements of a Stabilized Unpaved Road by application and/or maintenance of at least one of the requirements of Section F.1.

E.3 The construction of any new Unpaved Road is prohibited within any area with a population of 500 or more unless the road meets the definition of a Temporary

Unpaved Road. The Temporary Unpaved Road shall meet the definition of a Stabilized Unpaved Road as determined by the test methods in Rule 800, Appendix B, Section C, and where VDE is limited to 20% opacity.

E.4 Canal Roads: all Persons who cause, suffer or allow the operation, use or maintenance of any Canal Road with 20 or more Average Vehicle Trips per Day shall comply with one or more of the requirements of Section F.1 to comply with the requirements of a Stabilized Unpaved Road and limit VDE to 20% opacity, as determined by the test methods in Rule 800, Appendix A, and shall also comply with one or more of the requirements of Section F.2.

E.5 Unpaved Traffic Areas: All Persons who cause, suffer or allow the operation, use or maintenance of any Unpaved Traffic Area larger than one (1) acre and with 75 or more Average Vehicle Trips per Day shall comply with one or more of the requirements of Section F.3 and limit VDE to 20% opacity.

E.6 Paved Roads: any new or Modified Paved Roads shall comply with the requirements of section F.4.

E.7 Requirements for Existing Unpaved Public Roads in City and Rural Areas:

Each city or county agency with primary responsibility for any existing Unpaved Road shall take the following actions:

E.7.a By January 1, 2006 provide the APCD with a list of all Unpaved Roads under its jurisdiction in any city or Rural area(s), including data on length of, and Average Vehicle Trips per Day on, each Unpaved Road segment.

E.7.b By March 31, 2006 the County Public Works Department shall provide the APCD with a compliance plan. The compliance plan shall include a compliance schedule indicating that during the period 2006 through 2015 a 10% per each fiscal year, beginning July 1 and ending June 30, of all Unpaved Roads subject to the requirements of this rule will comply with a 20% VDE and comply with the requirements of a Stabilized Unpaved Road (Treatment in excess of the annual requirement can be credited toward future year requirements). The plan shall identify the control measures implemented or that will be implemented at each Unpaved Road segment with 50 or more Average Vehicle Trips per Day.

E.7.c By July 31 of each year, 2007 through 2016, the County Public Works Department shall submit to the APCD the total number of Unpaved Road miles which were mitigated during the previous fiscal year, and the percentage of cumulative miles relative to the schedule provided pursuant to Section E.7.b.

F. Best Available Control Measures for Fugitive Dust (PM-10)

F.1 UNPAVED ROADS, INCLUDING UNPAVED HAUL AND ACCESS ROADS:

F.1.a Pave.

F.1.b Apply Chemical Stabilization as directed by product manufacturer to control dust on Unpaved Roads.

F.1.c Apply and maintain Gravel, recrushed/recycled asphalt or other material of low Silt (<5%) content to a depth of three or more inches.

F.1.d Wetting. Apply water one or more times daily

F.1.e Permanent road closure

F.1.f Restrict unauthorized vehicle access.

F.1.g Any other method that effectively limits VDE to 20% opacity and meets the conditions of a Stabilized Unpaved Road.

F.2 CANAL ROADS:

F.2.a Stocking of Triploid Grass Carp in canals to reduce maintenance vehicle trips along Canal Banks to mechanically remove aquatic weeds.

F.2.b Installation of remote control delivery gates to eliminate manual gate operation by maintenance personnel in vehicles along Canal Banks.

F.2. c Implement Silt removal program to delay grading of spoil piles deposited on Canal Bank after cleaning operations until the next cleaning operation to eliminate vehicle access to Canal Bank.

F.2.d Permanent road closure.

F.2.e Conversion of open canals to pipeline.

F.2.f Lining canals to eliminate maintenance for Silt/weed control.

F.2.g Canal Bank surface maintenance.

F.3 UNPAVED TRAFFIC AREAS:

F.3.a Pave.

F.3.b Apply Chemical Stabilization as directed by product manufacturer to control dust on Unpaved Roads.

F.3.c Apply and maintain Gravel, recrushed/recycled asphalt or other material of low silt (<5%) content to a depth of three or more inches.

F.3.d Wetting. Apply water one or more times daily.

F.4. NEW OR MODIFIED PAVED ROADS

Any Person having jurisdiction over, or ownership of, public or private Paved Roads shall construct, or require to be constructed, all new or Modified Paved Roads in conformance with the Imperial County Public Works Department guidelines for width of shoulders and median shoulders as specified below:

F.4.a New arterial roads or streets or modifications to existing arterial roads or streets shall be constructed with paved shoulders that meet following widths:

| Annual Average Daily Vehicle Trips | Minimum Paved or Stabilized Shoulder Width in Feet |
|---|---|
| 1-2000 | 2 |
| Greater than 2000 | 6 |

F.4.b New or modified collector roads or streets or local roads or streets shall be constructed with paved shoulders that meet following widths:

| Annual Average Daily Vehicle Trips | Minimum Paved or Stabilized Shoulder Width in Feet |
|---|---|
| 1-2000 | 2 |
| Greater than 2000 | 4 |

F.4.c A curbing adjacent to and contiguous with the travel lane or paved shoulder or a road may be constructed, in lieu of meeting the paved shoulder width standard listed in Sections F.4.a and F.4.b. Any road paving projects constructing curbing in County road right of ways shall be approved by the Director of Public Works Department prior to construction.

F.4.d Intersections, auxiliary entry lanes, and auxiliary exit lanes may be constructed adjacent to and contiguous with the roadway, in lieu of meeting the paved shoulder width standard in Sections F.4.a and F.4.b.

F.4.e New Paved Road construction or modifications to an existing Paved Road that are required to comply with California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) determinations regarding environmental, cultural, archeological, historical, or other considerations addressed in such documents, are exempt from the paved shoulder width requirements specified in Section F.4.a.

F.4.f Whenever any Paved Road which has projected Annual Average Daily Vehicle Trips of 500 or more is constructed, or modified with medians, the medians shall be constructed with paved shoulders having a minimum width of four feet adjacent to the traffic lanes unless:

F.4.f1 The medians of roads having speed limits set at or below 45 miles per hour are constructed with curbing; or

F.4.f2 The medians are landscaped and maintained with grass or other vegetative ground cover to comply with the definition of Stabilized Surface.

F.4.g In lieu of complying with the paving or vegetation requirements a Person may apply oils or other Chemical Stabilizers/Suppressants to the required width of shoulder and median areas as specified in Sections F.4.a and F.4.b. The material shall be reapplied and maintained to limit VDE to 20% opacity and fulfill conditions for a Stabilized Surface.

G. Record of Control Implementation

Any Person subject to the requirements of this rule shall compile and retain records that provide evidence of control measure application (i.e., receipts and/or purchase records). Such Person shall describe, in the records, the type of treatment or control measure, extent of coverage, and date applied. For control measures which require multiple daily applications, recording the frequency of application will fulfill the recordkeeping requirements of this rule (i.e., water being applied three times a day and the date) Records shall be maintained and be readily accessible for two years after the date of each entry and shall be provided to the APCD upon request.

H. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII.

# RULE 806 CONSERVATION MANAGEMENT PRACTICES
(Adopted 11/08/2005)

## A. Purpose

The purpose of this regulation is to reduce the amount of fine Particulate Matter (PM-10) entrained in the ambient air as a result of emissions generated from Agricultural Operation Sites by requiring Conservation Management Practices to prevent, reduce, or mitigate PM-10 emissions.

## B. Applicability

This rule applies to Agricultural Operation Sites located within the Imperial County. Effective on and after January 1, 2006, an owner/operator shall implement the applicable CMPs selected for each Agricultural Operation Site.

## C. Definitions

In addition to the definitions of terms in Rule 800 (General Requirements for Control of Fine Particulate Matter (PM-10), the following definitions shall govern the implementation of this rule:

C.1 AGRICULTURAL OPERATIONS: The growing and harvesting of crops for the primary purpose of earning a living.

C.2 AGRICULTURAL OPERATION SITE: One or more agricultural parcels that meet the following:

C.2.a Are under the same or common ownership or operation, or which are owned or operated by entities which are under common control; and

C.2.b Are located on one or more contiguous or adjacent properties wholly within Imperial County.

C.3 AGRICULTURAL PARCEL: A portion of real property used by an owner or operator for carrying out a specific agricultural operation. Roads, vehicle/equipment traffic areas, and facilities, on or adjacent to the cropland are part of the agricultural parcel.

C.4 ALTERNATIVE TILLING: Rotate tillage leaving residue on soil. Tilling alternative rows for weed management and wind blown dust allows for approximately 50% reduction in field activity in addition to stabilizing soil surface and reducing soil compaction.

C.5 BALING/LARGE BALES: Using balers to harvest crop. It reduces PM emissions from crops traditionally harvested by chopping, truck, passes and residue burning.

C.6 BED/ROW SIZE OR SPACING: Increase or decrease the size of the planting bed area (can be done for field and permanent crops). Spacing adjustments reduce the number of passes and soil disturbance by increasing plant density/canopy through reduction of row width to contain PM within the canopy.

C.7 CHEMIGATION/FERTIGATION: Application of chemicals through an irrigation system. Each application reduces the need to travel in the field for application purposes, thus reducing the number of passes and soil disturbance while increasing the efficiency of the application.

C.8 CHIPS/MULCHES, ORGANIC MATERIALS, POLYMERS, ROAD OIL & SAND: Application of any nontoxic chemical or organic dust suppressant that meets all specification required by any federal, state, or local water agency and is not prohibited for use by any applicable regulations.

C.9 COMBINED OPERATION: To combine equipment, to perform several operations during one pass. The reduction in the number of passes necessary to cultivate the land will result in fewer disturbances to the soil. Other benefits are reduction of soil compaction and time to prepare fields, both of which can be precursors to additional tillage requirements.

C.10 CONSERVATION IRRIGATION: To conserve the quantity of water use, e.g.: drip, sprinkler, buried/underground line. Conserving water reduces weed population, which in turn reduces the need for tillage as well as reduces soil compaction.

C.11 CONSERVATION MANAGEMENT PRACTICE (CMP): An activity or procedure that prevents, reduces, or mitigates PM-10 normally emitted by, or associated with, an agricultural activity.

C.12 CONSERVATION MANAGEMENT PRACTICES PLAN (CMP PLAN): A document prepared by the owner or operator of an Agricultural Operation site that lists the selected CMPs for implementation. The CMP Plan also contains, but is not limited to, contact information for the owner or operator, a description of the Agricultural Operation Site and locations of Agricultural Parcels, and other information describing the extent and duration of CMP implementation.

C.13 CONSERVATION TILLAGE (e.g.: no tillage, minimum tillage): Types of tillage that reduce loss of soil and water in comparison to Conventional Tillage. It reduces the number of passes and amount of soil disturbance. It improves soil because it retains plant residue and increases organic matter.

C.14 COVER CROPS: Use seeding or natural vegetation/regrowth of plants to cover soil surface. It reduces soil disturbance due to wind erosion and entrainment.

C.15 EQUIPMENT CHANGES/TECHNOLOGICAL IMPROVEMENTS: To modify the equipment such as tilling; increase equipment size; modify land planing and land leveling; matching the equipment to row spacing; granting to new varieties or other technological improvements. It reduces the number of passes during an operation, thereby reducing soil disturbance.

C.16 FALLOWING LAND: Temporary or permanent removal from production. Eliminates entire operation/passes or reduces activities.

C.17 GRAVEL: Placing a layer of Gravel with enough depth to minimize dust generated from vehicle movement and to dislodge any excess debris which can become entrained.

C.18 GREEN CHOP: The harvesting of a forage crop without allowing it to dry in the field. It reduces multiple equipment passes in-field as well as reduces soil disturbance and soil compaction.

C.19 HAND HARVESTING: Harvesting crop by hand. It reduces soil disturbance due to machinery passes.

C.20 INTEGRATED PEST MANAGEMENT: A decision process that uses a combination of techniques including organic, conventional and biological farming concepts to suppress pest problems. It creates beneficial insect habitat that reduces the use of herbicides/pesticides thereby reducing number of passes for spraying. It also reduces soil compaction and the need for additional tillage.

C.21 MECHANICAL PRUNING: Using a machine instead of hand labor to prune (Applies as an Unpaved Road CMP only). It reduces vehicle trips, thereby reducing PM emissions.

C.22 MULCHING: Applying or leaving plant residue or other material to soil surface. It reduces entrainment of PM due to winds as well as reduces weed competition thereby reducing tillage passes and compaction.

C.23 NIGHT FARMING: Operate at night, if practical, when moisture levels are higher and winds are lighter. It decreases the concentration of PM emissions during daytime and the increased ambient humidity reduces PM emissions during the night.

C.24 NIGHT HARVESTING: Implementing cultural practices at night, or at times or high humidity. It reduces PM by operating when ambient air is moist, thereby reducing PM emissions.

C.25 NO BURNING: Switching to a crop/system that would not require waste burning. It reduces emissions associated with burning.

C.26 NON TILLAGE/CHEMICAL TILLAGE: Use flail mower, low volume sprayers or heat delivery systems (as harvest pre-conditioner). It reduces soil compaction and stabilizes soil through elimination or reduction of soil tillage passes.

C.27 ORGANIC PESTICIDES: Use biological control methods or non-chemical control methods. It reduces chemical use, thereby reducing passes.

C.28 PAVING: To pave currently Unpaved Roads.

C.29 PRECISION FARMING (GPS): Using satellite navigation to calculate position in the field, therefore manage/treat selective area. It reduces overlap and allows operations to occur during inclement weather conditions and at night thereby generating less PM.

C.30 PRE-HARVEST SOIL PREPARATION: Applying a light amount of water or stabilizing material to soil prior to harvest (when possible). It reduces PM emissions at harvest.

C.31 RESTRICTED ACCESS: To restrict public access to private roads. It reduces vehicle traffic and thus reduces associated fugitive dust.

C.32 SHED PACKING: Packing commodities in a covered or closed area. It reduces field traffic, thereby reducing PM emissions.

C.33 SHUTTLE SYSTEM/LARGE CARRIER: Multiple bin/trailer. Haul multiple or larger trailers/bins per trip thereby reducing emissions through reduced passes.

C.34 SPEED LIMITS: Enforcement of speeds that reduce visible dust emissions. The dust emissions from unpaved roads are a function of speed meaning reducing speed reduces dust.

C.35 TRACK-OUT CONTROL: Minimize any and all material that adheres to and agglomerates on all vehicle and equipment from unpaved roads and falls onto a paved public road or the paved shoulder of a paved public road.

C.36. TRANSGENIC CROPS: Use of GMO or Transgenic crops such as "herbicide-ready." It reduces need for tillage or cultivation operations, as well as reduces soil disturbance. It can also reduce the number of chemical applications.

C.37 WATER APPLICATION: Application of water to unpaved roads and traffic areas.

C.38 WIND BARRIER: Artificial or vegetative wall/fence that disrupts the erosive flow of wind over unprotected land.

D. Requirements for Agricultural Operation Sites:

D.1 All Persons who own or operate an Agricultural Operation Site of forty (40) acres or more in size shall implement in each Agricultural Parcel at least one of the Conservation Management Practices listed in Section E.1 for each of the following categories:

D.1a Land preparation and cultivation;

D.1.b Harvest activities;

D.1.c Unpaved Roads;

D.1.d Unpaved Traffic Areas

D.2 The owner or operator of an Agricultural Operation Site may implement more than one Conservation Management Practices for one or more of the categories.

D.3 The owner or operator of an Agricultural Operation Site shall ensure that the implementation of each selected Conservation Management Practices does not violate any other local, state, or federal law.

D.4 The owner or operator of an Agricultural Operation Site may develop alternative CMPs. The owner or operator shall submit to the APCD a technical evaluation of the alternative CMPs, demonstrating that the alternative CMP achieves PM-10 emission reductions that are at least equivalent to other CMPs available for the applicable operation. The APCD will review the technical evaluation, and the alternative CMP must receive approval by the APCD before being included in the CMP Plan.

D.5 The owner or operator shall prepare a CMP Plan for each Agricultural Operation Site. The CMP Plan shall be made available to the APCD upon request. The CMP Plan shall be provided to the APCD within 72 hours of notice to the owner or operator.

E. Conservation Management Practices for Fugitive Dust (PM-10)

E.1 The owner or operator of an Agricultural Operation Site shall implement at least one of the following CMPs in each Agricultural Parcel to reduce PM10 emissions from land preparation and cultivation:

E.1.a Alternate Till,
E.1.b Bed/Row Size Spacing,
E.1.c Chemical/Fertigation,
E.1.d Combined Operations,
E.1.e Conservation Irrigation,

E.1.f Conservation Tillage,
E.1g Cover Crops,
E.1.h Equipment Changes/Technological Improvements,
E.1.i Fallowing Land,
E.1.j Integrated Pest Control,
E.1.k Mulching,
E.1.l Night Farming,
E.1.m Non Tillage /Chemical Tillage,
E.1.n Organic Pesticides,
E.1.o Precision Farming (GPS), or
E.1.p Transgenic Crops

E.2 The owner or operator of an Agricultural Operation Site shall implement at least one of the following CMPs in each Agricultural Parcel to reduce PM10 emissions from harvesting:

E.2.a Baling /Large Bales
E.2.b Combined Operations
E.2.c Equipment Changes/Technological Improvements
E.2.d Green Chop
E.2.e Hand Harvesting
E.2.f Fallowing Land
E.2.g Night Harvesting
E.2.h No Burning
E.2.i Pre-Harvesting Soil Preparation
E.2.j Shed Packing
E.2.k Shuttle System/Large Carrier

E.3 The owner or operator of an Agricultural Operation Site shall implement at least one of the following CMPs for each Unpaved Road to reduce PM10 emissions:

E.3.a Chips/Mulches, Organic Materials, polymers, road oil and sand,
E.3.b Gravel
E.3.c Paving,
E.3.d Restricted access
E.3.e Speed limit
E.3.f Track-out control
E.3.g Water
E.3.h Wind barrier

E.4 The owner or operator of an agricultural operation site shall implement at least one of the following CMPs for each unpaved traffic area to reduce PM10 emissions:

E.4.a Chips/Mulches, Organic Materials, Polymers, Road Oil and Sand,
E.4.b Gravel

E.4.c Paving,
E.4.d Restricted Access
E.4.e Speed Limit
E.4.f Track-Out Control
E.4.g Water
E.4.h Wind Barrier

F. CMP Plan Preparation

An owner or operator shall prepare a CMP Plan for each Agricultural Operation Site. Each CMP Plan shall include, but is not limited to, the following information:

F.1 The name, business address, and telephone number of the owner or operator responsible for the preparation and implementation of the CMP Plan.

F.2 The signature of the owner or operator and the date that the CPM Plan was signed.

F.3 The location of the Agricultural Operation Site: cross roads; canal and gate number.

F.4 The crop grown at each location covered by the CMP Plan, total acreage for each crop, the length (miles) of unpaved roads, and the total area (acres or square feet) of the unpaved equipment and traffic areas to be covered by the CMP Plan, and.

F.5 The CMPs implemented or planned for implementation.

F.6 Other relevant information as determined by the APCD.

G. Violations

Failure to comply with any provisions of this rule shall constitute a violation of Regulation VIII. Failure to comply with the provisions of a CMP Plan shall also constitute a violation of Regulation VIII.

H. Record of Control Implementation

Any Person subject to the requirements of this rule shall maintain a copy of the CMP Plan and any supporting documentation necessary to confirm implementation of the CMPs. An owner or operator implementing alterative CMPs shall maintain a copy of technical evaluation for alternative CMPs and documentation of APCD approval of alternative CMPs. Records shall be maintained for two years after the date of each entry and shall be provided to the APCD upon request.

# CONSERVATION MANAGEMENT PRACTICES PLAN

**Farm Name:__________________________________ Owner/Operator: _____________________Telephone:______________**
**Total Farm Acreage:__________________ Address:____________________________________________________________**
**Canal & Gate*:__________________________________Crossroads*:________________________________________________**

***List all canals & gates, as well as crossroads, associated to this agricultural operation site at the reverse of this page. In addition, the crop grown at each location covered by the CMP plan, total acreage for each crop, the length (miles) of unpaved roads, and the total area (acres or square feet) of the unpaved equipment and traffic areas to be covered by the CMP Plan.**

**Select one or more CMPs from each category:**

| **Land Preparation and Cultivation** | **Harvesting** | **Unpaved Roads** | **Unpaved Traffic Areas** |
|---|---|---|---|
| ☐ Alternative Till | ☐ Bailing/Large Bales | ☐ Dust Suppressants | ☐ Dust Suppressants |
| ☐ Bed/Row Size Spacing | ☐ Combined Operations | ☐ Gravel | ☐ Gravel |
| ☐ Chemical Fertigation | ☐ Equipment Changes | ☐ Paving | ☐ Paving |
| ☐ Combined Operations | ☐ Green Chop | ☐ Restricted Access | ☐ Restricted Access |
| ☐ Conservation Irrigation | ☐ Hand Harvesting | ☐ Speed Limit | ☐ Speed Limit |
| ☐ Cover Crops | ☐ Fallowing Land | ☐ Track-out Control | ☐ Track-out Control |
| ☐ Equipment Changes | ☐ Night Harvesting | ☐ Water | ☐ Water |
| ☐ Fallowing Land | ☐ Pre-Harvesting Land Prep | ☐ Wind Barriers | ☐ Wind Barriers |
| ☐ Integrated Pest Control | ☐ Shuttle System/Large Carrier | ☐ Other | ☐ Other |
| ☐ Mulching | ☐ Shed Packing | | |
| ☐ Night Farming | ☐ Other | | |
| ☐ Non-Tillage/Chemical Tillage | | | |
| ☐ Organic Pesticides | | | |
| ☐ Precision Farming (GPS) | | | |
| ☐ Transgenic Crops | | | |
| ☐ Other | | | |

I hereby certify that: I am the owner or operator of the agricultural operation site on which this CMP Plan will be implemented; I have a copy of Rule 806 and I will comply with it.

Signature:_____________________________________Date:_____________________________

# CONSERVATION MANAGEMENT PRACTICES PLAN

**Agricultural Parcel ID ____________________**

**Canal & Gate: ____________________________________________________________**
**Crossroads: ______________________________________________________________**
**Crop Grown: _____________________________________________________________**
**Total Acreage: ____________________________________________________________**
**Approx. Length (miles) of unpaved roads: ________________________________________**
**Approx. Unpaved Equipment Traffic Areas (acres or square feet): ___________________**
**CMPs Selected**:______________________________________________________________

**Agricultural Parcel ID ____________________**

**Canal & Gate: ____________________________________________________________**
**Crossroads: ______________________________________________________________**
**Crop Grown: _____________________________________________________________**
**Total Acreage: ____________________________________________________________**
**Approx. Length (miles) of unpaved roads: ________________________________________**
**Approx. Unpaved Equipment Traffic Areas (acres or square feet): ___________________**
**CMPs Selected**:______________________________________________________________

**Agricultural Parcel ID ____________________**

**Canal & Gate: ____________________________________________________________**
**Crossroads: ______________________________________________________________**
**Crop Grown: _____________________________________________________________**
**Total Acreage: ____________________________________________________________**
**Approx. Length (miles) of unpaved roads: ________________________________________**
**Approx. Unpaved Equipment Traffic Areas (acres or square feet): ___________________**
**CMPs Selected**:______________________________________________________________

**Agricultural Parcel ID ____________________**

**Canal & Gate: ____________________________________________________________**
**Crossroads: ______________________________________________________________**
**Crop Grown: _____________________________________________________________**
**Total Acreage: ____________________________________________________________**
**Approx. Length (miles) of unpaved roads: ________________________________________**
**Approx. Unpaved Equipment Traffic Areas (acres or square feet): ___________________**
**CMPs Selected**:______________________________________________________________

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# APPENDIX IV.B

## COST EFFECTIVENESS ANALYSIS OF ICAPCD REGULATION VIII RULES

Note: This cost-effectiveness analysis was originally presented in the 2005 BACM Report prepared in support of the November 2005 adoption of the Regulation VIII amendments.

# Appendix IV. B

## Cost Effectiveness of ICAPCD Regulation VIII Rules

Tables IV.B-1 though IV. B-6 of this appendix document the cost-effectiveness of the measures in each Regulation VIII rule. These estimates of cost-effectiveness for the individual control measures in Regulation VIII are based on the 2004 CARB staff report[1] for SB 656 and the 2003 San Joaquin Valley PM10 SIP[2]. Actual cost-effectiveness estimates for controls in Imperial County are expected to be the same or less cost-effective than those listed in the tables. Based on the rural nature of Imperial County, it would be expected that the emission reductions associated with these measures will be the same or smaller than those assumed in San Joaquin Valley and other areas. For example, activity levels associated with emissions (e.g., VMT for paved roads, ADVT for unpaved roads) will be lower in Imperial County than other areas, resulting in less emissions (and emission reductions) for these sources. Control costs in Imperial County may also be higher in some cases. More current information is available for Rule 805 implementation on county roads. Based on information from Imperial County's Public Works Department,[3] assuming that 10% of the 119 miles of applicable high ADT roads are treated per year for ten years, and a 4% interest rate, the cost-effectiveness of Rule 805 for county roads is approximately $795/ton. (The cost-effectiveness of paving would be approximately $7,100/ton, but the absolute cost ($2,600,000) is greater than the entire paved and unpaved road maintenance budget for Imperial County). These estimates are comparable to estimates in the SB 656 staff report ($344/ton to $12,300/ton for stabilizing, gravelling and paving)[4] and in other non-attainment area BACM analyses ($2,100/ton to $5,900/ton for paving in the San Joaquin Valley)[5].

Certain dust control measures, as identified in Senate Bill 656, are not included in proposed Regulation VIII amendments based on technical reasons such as the source is not present (e.g., winter non-skid sand) or the control cannot be applied effectively in Imperial County (e.g. $PM_{10}$-certified sweepers). These measures are identified in Table IV.B-7. No potential BACM measures have been excluded based on cost-effectiveness, although a cost-effectiveness analysis of Rule 805 provisions for unpaved parking lots and other traffic areas is being conducted.

[1] CARB Staff Report, Proposed List of Measures to Reduce Particulate Matter – $PM_{10}$and $PM_{2.5}$ (Implementation of Senate Bill 656, Sher 2003), October 18, 2004.
[2] SJVAPCD 2003 $PM_{10}$ SIP, Appendix G, BACM/T and RACM/T Demonstration for Sources of $PM_{10}$ and $PM_{10}$ Precursors in the San Joaquin Valley Air Basin, SJVAPCD, April 2003.
[3] Imperial County Public Works cost estimate of compliance, August 1, 2005.
[4] CARB Staff Report, Proposed List of Measures to Reduce Particulate Matter – $PM_{10}$and $PM_{2.5}$ (Implementation of Senate Bill 656, Sher 2003), October 18, 2004.
[5] Final BACM Technological and Economic Feasibility Analysis, SJVAPCD 2003 $PM_{10}$ SIP, April 2003.

**Table IV.B-1 Cost-effectiveness of measures in Proposed Rule 801 – Construction and Demolition[a]**

<table>
<tr><th></th><th>Rule 801</th><th>SB 656 Measure No.</th><th>SB 656 ($/ton)</th><th>SJVUAPCD ($/ton)</th></tr>
<tr><td>E.1.a-b</td><td>Limit VDE to 20% opacity for sites of > 1 acre</td><td>24-26.a</td><td>Watering $301/ton</td><td>See below</td></tr>
<tr><td>F1.a.</td><td>Pre-Activity: Pre-water site and phase work to reduce amount of distributed surface area</td><td rowspan="4">24-26.b,<br>39, and 40</td><td rowspan="4">RACM to BACM upgrade:<br>$197/ton<br>[NOTE: based on SCAQMD minor upgrades. Not appropriate comparison]</td><td rowspan="4">Apply water and/or dust suppressants at end of day: $7,222,000/ton<br>Prohibit Demolition activities when wind>25 mph: $847,000/ton<br>Dust Monitoring:<br>$231,000-$339,000/ton<br>12% soil moisture for earthmoving:<br>$21,600-$56,000/ton<br>15 mph speed limit $850/ton<br>posting of speed limit $2,940-$74,600/ton<br>Dust Control Plans:$17,2000-$31,500/ton<br>Require notification for earthmoving operations $2,480-$14,800/ton</td></tr>
<tr><td>F1.b</td><td>During Active Operation: apply water or chemical stabilizer; or construct and maintain a wind barrier</td></tr>
<tr><td>F.1.b.3</td><td>Apply water or chemical stabilizer to unpaved haul/access roads and unpaved vehicle/equipment traffic areas</td></tr>
<tr><td>F.1.c</td><td>Periods of Inactivity: restrict vehicular access; and apply water or chemical stabilizer. If area > 0.5 acres of disturbed surface area remains unused for $^{3}$ 7 days, area must comply with conditions for stabilized surface area</td></tr>
</table>

[a] Construction and demolition source categories are below the DM level.

**Table IV.B-2 Cost-effectiveness of measures in Proposed Rule 802 – Bulk Materials[a]**

| | Rule 802 | SB 656 Measure No. | SB 656 ($/ton) | SJVUAPCD ($/ton) |
|---|---|---|---|---|
| E | Limit VDE to 20% opacity for bulk material handling, material transport, and haul trucks | 28.a | $1,151/ton (handling) to $28,293/ton (storage) | None Reported |
| F.1.a | Spray with water prior | 28.b and 41a. | RACM to BACM upgrade: $197/ton | Require Construction of 3-sided enclosures with 50% porosity: $659,000/ton |
| F.1.b | Apply and maintain chemical stabilizer | | | |
| F.1.c | Protect from wind erosion by sheltering or enclosing the operation and transfer line | 28.a | See 28.a. above | |
| F.1.d | Cover bulk materials stored outdoors with tarps, plastic, or other material | 28.a | See 28.a. above | |
| F.2.a | Completely cover or enclose all Haul Truck loads of Bulk Material | 28.a | See 28.a. above | |
| F.2.b, c, d | Material transport: cover, freeboard, housekeeping | 28.b | See 28.b. above | |

[a] Bulk materials source categories are below the DM level.

**Table IV.B-3 Cost-effectiveness of measures in Proposed Rule 803 – Track-out and Carry-out[a]**

| | Rule 803 | SB 656 Measure No. | SB 656 ($/ton) | SJVUAPCD ($/ton) |
|---|---|---|---|---|
| F.1.a | Rapidly clean up any bulk material tracked out or carried out onto a paved road surface by the end of the day | 29-30 | Manual Sweeping: $3,54/ton<br><br>Control devices installed at access points to public roads: $13,700 to $322,000/ton<br><br>Length of paved interior roads: $7,930 to $186,000/ton | Impose Rule 8041 Requirements: $44,100-$387,000/ton<br><br>Require track-out control devices to be 25 ft long and road width: $13,700-$322,000/ton<br><br>Require paved interior roads to be 100 ft long and full road width: $7,930-$186,000/ton<br><br>Gravel pads: $27,000-$322,000/ton |
| | All sites with access to a paved road and with > 150 ADT, or > 20 ADT by vehicles with > 3 axles shall: | 29.b | <$100/ton | |
| F.1.b | Install one or more Track-Out Prevention Devices or wash down system at access points; or | | | |
| F.1.c | Apply and maintain paving, chemical stabilization, or gravel for a distance of 50 or more consecutive feet at access points | | | |

[a] Track-out and carry-out source categories are below the DM level.

**Table IV.B-4 Cost-effectiveness of measures in Proposed Rule 804 – Open Areas[a]**

| | Rule 804 | SB 656 Measure No. | SB 656 ($/ton) | SJVUAPCD ($/ton) |
|---|---|---|---|---|
| E.1 | Limit open areas to VDE of 20% opacity | 31.a | Watering: $7020/ton | None Reported |
| E.2 | Prevent unauthorized vehicle access by posting "No Trespassing" signs or installing physical barriers such as fences, gates, posts, and/or appropriate barriers to prevent access | 31.a | Watering: $7,020/ton | |
| F.1.a | Apply and maintain water or dust suppressant to all undefeated areas | 27, 31, and 42 | 27b. RACM to BACM upgrade: $197/ton<br><br>31a. Watering: $7,020/ton<br><br>31b. RACM to BACM upgrade: $197/ton<br><br>42. $697/ton | Impose Rule 8051 requirements on urban parcels of 0.5 acres or more that have a least 1,000 square feet of disturbed surface: $67,800/ton<br><br>Impose Rule 8051 requirements immediately after cessation of disturbance: $6,450-$33,600/ton |
| F.1.b | Establish vegetation on all previously disturbed areas | | | |
| F.1.c | Pave, apply and maintain gravel or apply and maintain chemical stabilizers/suppressants | | | |

[a] Open areas source categories are below the DM level.

**Table IV.B-5 Cost-effectiveness of measures in Proposed Rule 805 – Paved and Unpaved Roads[a]**

| | Rule 805 – Unpaved Roads | SB 656 Measure No. | SB 656 ($/ton) | SJVUAPCD ($/ton) |
|---|---|---|---|---|
| F.1.a | Pave or | 35-36 | 35. Apply water, gravel, chemical or dust suppressant, or pave: $344 to $12,293/ton<br><br>36a.<br>-Apply water, dust suppressant, gravel, pave: $56 to $1,481/ton<br>-Paving: $2,160 to $5,920/ton<br><br>36b. $958/ton | Limit speed to 25 mph: $1,080/ton<br><br>Require roads in urban areas to be paved: $2,160-$5,920/ton<br><br>Impose Rule 8071: $3,510/ton |
| F.1.b | Apply chemical stabilizers or | | | |
| F.1.c | Apply and maintain gravel, recrushed/recycled asphalt or other material of low silt content to a depth of > 3 inches or | | | |
| F.1.d | Apply water one or more time daily or | | | |
| F.1.F | Permanent road closure or | | | |
| F.1.f | Any other method to meet VDE of 20% opacity and meets conditions of a stabilized unpaved road | | | |
| F.2.a through g | Canal Roads measures | None | Not Estimated | None Reported |
| **Unpaved Traffic Areas** | | | | |
| F.3.a | Pave or | 35-36 | See 35-36 above | See 35-36 above |
| F.3.b | Apply chemical stabilizers or | | | |
| F.3.c | Apply and maintain gravel, recrushed/recycled asphalt or other material of low silt content to a depth of ³ 3 inches or | | | |
| F.3.d | Apply water one or more time daily | | | |

[a] The unpaved roads source category is above the DM level.

**Table IV.B-5 Cost-effectiveness of measures in Proposed Rule 805 – Paved and Unpaved Roads[a] (Continued)**

| | Rule 805 – New and Modified Paved Roads | SB 656 Measure No. | SB 656 ($/ton) | SJVUAPCD ($/ton) |
|---|---|---|---|---|
| F.4.1 | New or modified paved roads with projected ADT > 500 vehicles shall construct paved shoulders of 4 ft (500-3000 vehicle trips) or 8 ft (> 3000 vehicle trips) | 32 | 32a. 4 ft. Paved shoulder on 50% of highest ADT existing paved roads: $7,290-$11,300/ton<br><br>32b. Curb and Gutter road shoulder: $5577/ton | 4ft paved shoulders on all new/modified paved roads: $13,800-$508,000/ton<br><br>4ft paved shoulder on 50% highest ADT existing paved roads: $7,290-$11,300/ton<br><br>Require wind-or water-borne deposition to be cleaned up within 24 hrs: $2,850/ton |
| F.4.2 | In lieu of F.4.1, a curbing adjacent to and contiguous with the travel lane or paved shoulder or road may be constructed | 32 | | |
| F.4.3 | In lieu of F.4.1, intersections, auxiliary entry lanes and auxiliary exit lanes may be constructed adjacent to and contiguous with the roadway | 32 | | |
| F.4.4 | Medians shall be constructed with paved shoulders having a minimum width of 4 ft. adjacent to traffic lanes for projects ADT > 500, unless speed limit < 45 mph with curbing or landscaped medians | 32 | | |
| F.6 | In lieu of paving or vegetation requirement, may apply oils or other chemical stabilizers | 32 | | |

[a] The unpaved roads source category is above the DM level.

**Table IV.B-6 Cost-effectiveness of measures in Proposed Rule 806 – Conservation Management Practices[a]**

| | Rule 806 | SB 656 Measure No. | SB 656 ($/ton) | SJVUAPCD ($/ton) |
|---|---|---|---|---|
| D.1 | Shall implement at least one of the following practices if own/operate a commercial farm of > 40 acres: land preparation and cultivation; harvest activities; unpaved roads; or unpaved equipment operation yards. | 43.b | High-wind tilling prohibition and stabilization of fallow fields: $134/ton | Overall: $8 to $2,500/ton |
| D.4 | Prepare and submit a CMP application for each agricultural operation site | | | |
| E.1 | Land Preparation and Cultivation | 43.c | $8/ton | |
| E.2 | Harvesting | 43.b | None provided | |
| E.3 | Unpaved Farm Roads | 43.a and d | $958/ton | |
| E.4 | Equipment Traffic Areas | 43.d | $958/ton | |

[a] The tilling agricultural operations source category is above the DM level.

**Table IV.B -7 Senate Bill 656 Measures Not in the Proposed Regulation VIII Amended Rules**

| SB656 | | Cost-Effectiveness | Comment |
|---|---|---|---|
| 33 | Requires use of certified PM10 efficient street | $1,119/ton (1996$)<br><br>A Rule 1186-certified sweeper is $37,000 more expensive than a conventional sweeper. | As noted in the SJVUAPCD "BACM/BACT and RACM/RACT Demonstration for Sources of PM10 and PM10 Precursors in the San Joaquin Valley Air Basin," (dated April 28, 2003), "use of these units will result in safety problems on freeways and rural roads in flat terrain." The overwhelming majority of roads in Imperial County are freeways and rural roads in flat terrain. For maximum efficiency, sweepers must travel less than 5 mph. |
| 34 | Requires vacuum-street sweeping on roads to remove sand and cinders that are placed on the road during winter storms as an anti-skid material. . | $350/ton (1996$) (assumes 2,400 lb/day winter-day emission reductions) | This Great Basin Unified APCD measure does not apply to Imperial County, where anti-skid material is not used. |
| 37a. and 37b. | **Weed Abatement Activities**<br>Pre-activity Requirements: 1) Pre-watering to limit VDE opacity to 20%; or 2) phasing work to reduce amount of disturbed surface area.<br><br>Apply water during active operations to limit VDE to 20% opacity.<br><br>Apply water or chemical stabilizers to meet conditions of stabilized surface. | Not estimated | Emissions from this source are not quantified and considered de minimis. |
| 38 | Defines windblown dusts | NA | No specific requirements. |
| 41b. | Additional bulk material control requirements for Coachella Valley source | $352 - $462 /ton (1992 $) | Controls specific to Coachella Valley blowsand zone, which does not exist in Imperial County. |

# APPENDIX IV.C

# IMPERIAL COUNTY $PM_{10}$ EMISSIONS ACCOUNTING FOR REGULATION VIII FUGITIVE DUST CONTROLS

# Appendix IV.C

## Imperial County $PM_{10}$ Emissions Accounting for Regulation VIII Fugitive Dust Controls

Imperial County fugitive dust control rules (Regulation VIII rules) were adopted in November 2005 and became fully effective in January 2006—with the notable exception that Rule 805 allows the mitigation of unpaved roads to be phased over a 10-year schedule (Table IV.C-1). This Appendix reports best estimates/projections of the Imperial County "grown and controlled" $PM_{10}$ emission inventories for years 2006-2010 (Tables IV.C-2 to IV.C-4), calculated by subtracting emission reductions due to control and mitigation of $PM_{10}$ sources (described in Chapter 4 of the SIP document) from the "grown" emission inventories presented in Appendix III.A. For controlled $PM_{10}$ emissions from unpaved roads, entries in Tables IV.C-2 to IV.C-4 were calculated based on the expected implementation schedule of Rule 805 (Table IV.C-1).

**Table IV.C-1** Implementation Schedule Required by Rule 805 for Mitigation of Unpaved County/City Roads,[a] and Associated Reductions

| | 2006 | 2007 | 2008 | 2009 | 2010 | 2012 | 2015 |
|---|---|---|---|---|---|---|---|
| Unpaved road miles to be treated[b] | 19.9 | 39.8 | 59.7 | 79.6 | 99.5 | 139.3 | 199 |
| Expected reductions[c] (tpd) | 0.87 | 1.75 | 2.62 | 3.49 | 4.36 | 6.11 | 8.73 |

[a]Although Rule 805 also applies to unpaved canal roads with >20 ADVT, the Imperial Irrigation District has estimated that traffic is presently below that threshold on all canal roads. [b]Based on an estimate by the Imperial County Public Works Department of 199 miles of unpaved city/county roads (see Attachment A of Appendix III.A). [c]Based on a 60% composite control factor assuming graveling is chosen as the primary control option (ENVIRON, *Draft Final Technical Memorandum, Regulation VIII BACM Analysis,* prepared for the ICAPCD, October 2005, p. 42).

**Table IV.C-2** Imperial County PM10 "Grown and Controlled" Annual Average Emission Inventory[a] in 2006-2010 (tpd)

| **Source Category** | **2006** | **2007** | **2008** | **2009** | **2010** |
|---|---|---|---|---|---|
| Fuel Combustion | 0.42 | 0.42 | 0.42 | 0.42 | 0.43 |
| Waste Disposal | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cleaning/Surface Coatings | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Petroleum Production/Marketing | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Industrial Processes: | *2.70* | *2.74* | *2.77* | *2.84* | *2.87* |
| Mineral Processes | 2.54 | 2.57 | 2.61 | 2.67 | 2.71 |
| Food/Agriculture | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 |
| Solvent Evaporation | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Res Fuel Combustion | 0.09 | 0.09 | 0.09 | 0.09 | 0.10 |
| Farming: | *8.51* | *8.51* | *8.51* | *8.50* | *8.50* |
| Tilling | 5.10 | 5.10 | 5.10 | 5.09 | 5.09 |
| Harvest | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Cattle | 3.26 | 3.26 | 3.26 | 3.26 | 3.26 |
| Construction | 1.96 | 1.97 | 1.98 | 2.00 | 2.01 |
| Paved Road Dust | 3.19 | 3.40 | 3.61 | 3.81 | 3.64 |
| Entrained Unpaved Road Dust: | *55.74* | *54.93* | *54.13* | *53.33* | *52.52* |
| City/County | 23.78 | 22.98 | 22.17 | 21.37 | 20.56 |
| Canal | 29.57 | 29.57 | 29.57 | 29.57 | 29.57 |
| BLM/USFS | 1.34 | 1.34 | 1.34 | 1.34 | 1.34 |
| Farm | 1.05 | 1.05 | 1.05 | 1.05 | 1.05 |
| Windblown: | *208.52* | *208.45* | *208.37* | *208.30* | *208.22* |
| Open Areas-Urban | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Open Areas-Others[b] | 168.35 | 168.35 | 168.35 | 168.35 | 168.35 |
| Unpaved Roads | *29.43* | *29.36* | *29.29* | *29.22* | *29.15* |
| City/County | 7.75 | 7.68 | 7.61 | 7.55 | 7.48 |
| Canal | 16.32 | 16.32 | 16.32 | 16.32 | 16.32 |
| BLM/USFS | 0.37 | 0.37 | 0.37 | 0.37 | 0.37 |
| Farm | 4.90 | 4.90 | 4.90 | 4.90 | 4.90 |
| Non-Pasture Ag Lands | 8.81 | 8.81 | 8.80 | 8.80 | 8.79 |
| Pasture | 1.79 | 1.78 | 1.78 | 1.78 | 1.78 |
| Fires | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Waste Burning | 2.75 | 2.73 | 2.71 | 2.69 | 2.67 |
| Cooking | 0.06 | 0.06 | 0.06 | 0.06 | 0.07 |
| On-Road Mobile | 1.01 | 0.93 | 0.88 | 0.82 | 0.77 |
| Other Mobile | 0.98 | 0.96 | 0.95 | 0.95 | 0.94 |
| **Total** | **286** | **285** | **284** | **284** | **283** |

[a]Annual averages accounting for projected growth in emission-generating activities, but not for reductions due to control or mitigation of $PM_{10}$ sources. Entries corresponding to the summed contributions of subcategories are in italics. [b]Grasslands, dunes, and other barren lands (see Table 3.1 of the main document). As documented in Appendix III.B, emissions were estimated using available information on the conditions of the vacant lands (e.g., desert areas of barren, grass/shrubland, and dunes). Reported emissions also include the conservatively-estimated contributions due to soil disturbances caused by off-road vehicle usage.

**Table IV.C-3 Imperial County PM10 "Grown and Controlled" Winter Average Emission Inventory[a] in 2006-2010 (tpd)**

| Source Category | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| Fuel Combustion | 0.35 | 0.35 | 0.35 | 0.36 | 0.36 |
| Waste Disposal | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cleaning/Surface Coatings | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Petroleum Production/Marketing | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Industrial Processes: | *2.70* | *2.75* | *2.78* | *2.85* | *2.88* |
| Mineral Processes | 2.53 | 2.57 | 2.60 | 2.67 | 2.70 |
| Food/Agriculture | 0.17 | 0.18 | 0.18 | 0.18 | 0.18 |
| Solvent Evaporation | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Res Fuel Combustion | 0.16 | 0.16 | 0.17 | 0.17 | 0.17 |
| Farming: | *9.75* | *9.75* | *9.74* | *9.74* | *9.74* |
| Tilling | 6.30 | 6.30 | 6.30 | 6.30 | 6.29 |
| Harvest | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Cattle | 3.26 | 3.26 | 3.26 | 3.26 | 3.26 |
| Construction | 1.79 | 1.80 | 1.82 | 1.83 | 1.84 |
| Paved Road Dust | 3.11 | 3.32 | 3.52 | 3.72 | 3.56 |
| Entrained Unpaved Road Dust: | *33.05* | *32.58* | *32.10* | *31.62* | *31.15* |
| City/County | 14.10 | 13.62 | 13.15 | 12.67 | 12.19 |
| Canal | 17.54 | 17.54 | 17.54 | 17.54 | 17.54 |
| BLM/USFS | 0.79 | 0.79 | 0.79 | 0.79 | 0.79 |
| Farm | 0.62 | 0.62 | 0.62 | 0.62 | 0.62 |
| Windblown: | *219.51* | *219.47* | *219.42* | *219.38* | *219.33* |
| Open Areas-Urban | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Open Areas-Others[b] | 189.75 | 189.75 | 189.75 | 189.75 | 189.75 |
| Unpaved Roads | *17.45* | *17.41* | *17.37* | *17.33* | *17.29* |
| City/County | 4.60 | 4.56 | 4.52 | 4.47 | 4.43 |
| Canal | 9.68 | 9.68 | 9.68 | 9.68 | 9.68 |
| BLM/USFS | 0.22 | 0.22 | 0.22 | 0.22 | 0.22 |
| Farm | 2.91 | 2.91 | 2.91 | 2.91 | 2.91 |
| Non-Pasture Ag Lands | 10.76 | 10.76 | 10.75 | 10.75 | 10.74 |
| Pasture | 1.37 | 1.37 | 1.37 | 1.37 | 1.37 |
| Fires | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Waste Burning | 2.75 | 2.73 | 2.71 | 2.69 | 2.67 |
| Cooking | 0.06 | 0.06 | 0.06 | 0.06 | 0.07 |
| On-Road Mobile | 1.02 | 0.93 | 0.88 | 0.83 | 0.78 |
| Other Mobile | 0.94 | 0.91 | 0.91 | 0.90 | 0.90 |
| **Total** | **275** | **275** | **274** | **274** | **273** |

[a]Winter (November-April) averages accounting for projected growth in emission-generating activities, but not for reductions due to control or mitigation of $PM_{10}$ sources. Entries corresponding to the summed contributions of subcategories are in italics. [b]Grasslands, dunes, and other barren lands (see Table 3.1 of the main document). As documented in Appendix III.B, emissions were estimated using available information on the conditions of the vacant lands (e.g., desert areas of barren, grass/shrubland, and dunes). Reported emissions also include the conservatively-estimated contributions due to soil disturbances caused by off-road vehicle usage.

**Table IV.C-4 Imperial County PM10 "Grown and Controlled" Summer Average Emission Inventory[a] in 2006-2010 (tpd)**

| Source Category | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|
| Fuel Combustion | 0.48 | 0.49 | 0.49 | 0.49 | 0.49 |
| Waste Disposal | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cleaning/Surface Coatings | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Petroleum Production/Marketing | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Industrial Processes: | *2.69* | *2.73* | *2.76* | *2.83* | *2.86* |
| Mineral Processes | 2.55 | 2.58 | 2.61 | 2.68 | 2.71 |
| Food/Agriculture | 0.14 | 0.15 | 0.15 | 0.15 | 0.15 |
| Solvent Evaporation | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Res Fuel Combustion | 0.02 | 0.02 | 0.02 | 0.02 | 0.02 |
| Farming: | *7.27* | *7.27* | *7.27* | *7.27* | *7.27* |
| Tilling | 3.90 | 3.90 | 3.89 | 3.89 | 3.89 |
| Harvest | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Cattle | 3.26 | 3.26 | 3.26 | 3.26 | 3.26 |
| Construction | 2.12 | 2.14 | 2.15 | 2.16 | 2.18 |
| Paved Road Dust | 3.27 | 3.48 | 3.70 | 3.90 | 3.73 |
| Entrained Unpaved Road Dust: | *78.42* | *77.29* | *76.16* | *75.03* | *73.90* |
| City/County | 33.46 | 32.33 | 31.20 | 30.06 | 28.93 |
| Canal | 41.61 | 41.61 | 41.61 | 41.61 | 41.61 |
| BLM/USFS | 1.88 | 1.88 | 1.88 | 1.88 | 1.88 |
| Farm | 1.48 | 1.48 | 1.48 | 1.48 | 1.47 |
| Windblown: | *197.79* | *197.70* | *197.59* | *197.49* | *197.39* |
| Open Areas-Urban | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Open Areas-Others[b] | 147.30 | 147.30 | 147.30 | 147.30 | 147.30 |
| Unpaved Roads | *41.40* | *41.30* | *41.21* | *41.11* | *41.01* |
| City/County | 10.91 | 10.81 | 10.71 | 10.62 | 10.52 |
| Canal | 22.96 | 22.96 | 22.96 | 22.96 | 22.96 |
| BLM/USFS | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 |
| Farm | 6.90 | 6.90 | 6.90 | 6.90 | 6.90 |
| Non-Pasture Ag Lands | 6.89 | 6.89 | 6.88 | 6.88 | 6.87 |
| Pasture | 2.20 | 2.20 | 2.20 | 2.20 | 2.20 |
| Fires | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Waste Burning | 2.75 | 2.73 | 2.71 | 2.69 | 2.67 |
| Cooking | 0.06 | 0.06 | 0.06 | 0.06 | 0.07 |
| On-Road Mobile | 1.00 | 0.92 | 0.87 | 0.82 | 0.77 |
| Other Mobile | 1.03 | 1.00 | 1.00 | 0.99 | 0.99 |
| **Total** | **297** | **296** | **295** | **294** | **292** |

[a]Summer (May-October) averages accounting for projected growth in emission-generating activities, but not for reductions due to control or mitigation of $PM_{10}$ sources. Entries corresponding to the summed contributions of subcategories are in italics. [b]Grasslands, dunes, and other barren lands (see Table 3.1 of the main document). As documented in Appendix III.B, emissions were estimated using available information on the conditions of the vacant lands (e.g., desert areas of barren, grass/shrubland, and dunes). Reported emissions also include the conservatively-estimated contributions due to soil disturbances caused by off-road vehicle usage.

# APPENDIX V

# EXCEEDENCES OF THE 24-HOUR $PM_{10}$ NAAQS AT THE US-MEXICO BORDER: ANALYSIS OF THE IMPACT OF INTERNATIONAL EMISSIONS

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# 1 Introduction and Background

**Introduction.** Section 179B(d) of the federal Clean Air Act (CAA) provides that, notwithstanding any other provision of law, any State that establishes to the satisfaction of USEPA that a $PM_{10}$ nonattainment area in such State would have attained the $PM_{10}$ National Ambient Air Quality Standard (NAAQS) by the applicable attainment date but for emissions emanating from outside the United States shall not be subject to the provisions of CAA Section 188(b)(2). During the years 2006 to 2008 there were two days in Imperial County with recorded station concentrations in excess of the 24-hour NAAQS[1] (Table V.1). Exceedences on these days occurred at the Calexico-Grant monitor, which is less than 1 mile from the Mexican border. Note that the December 25, 2006 exceedence is the design value for this SIP.

**Table V.1 $PM_{10}$ Measurements in Excess of the 24-Hour NAAQS in Imperial County for the Time Period 2006-2008**

| Date | Monitor | Measurement (μg/m$^3$) |
|---|---|---|
| December 21, 2006 | Calexico Grant | 171 |
| December 25, 2006 | Calexico Grant | 248 |

The analysis conducted for these days indicates that $PM_{10}$ emissions from Mexico impacted US $PM_{10}$ monitors in Calexico, California. Research and analysis on the build up and transport characteristics of $PM_{10}$ emissions indicates that under stagnant and very light wind conditions, elevated $PM_{10}$ emissions from Mexican sources can contribute to $PM_{10}$ levels in Calexico due to "overflowing" of $PM_{10}$ across the border. This Appendix describes the tools used to analyze, both quantitatively and qualitatively, the impact of Mexican emissions on near-border Imperial County stations. Also included are detailed descriptions of the events of December 21, 2006 and December 25, 2006, as well as technical analyses of the international $PM_{10}$ transport contributions to the exceedences. The analyses show, through both quantitative and qualitative approaches, that concentrations at Calexico stations on each of these days would not have exceeded the NAAQS but for international transport of $PM_{10}$ from Mexico.

Although in 2006-2008 exceedences were only observed at the Grant station, we extend the scope of this Appendix to enable analysis of the impact of Mexicali emissions at the Calexico-Ethel station as well. The reasons for this are two-fold. First, an understanding of the impact of transported Mexicali PM at the Calexico-Ethel station is important in its own right (either for analysis of historical exceedences or for analysis of future elevated PM measurements at Ethel). Second, results at the Ethel station provide a valuable element of comparison for results at the Grant station.

[1] These are in addition to exceedences due to high winds exceptional events recorded on September 2, 2006, April 12, 2007, and June 5, 2007 (documented in separate reports). $PM_{10}$ in Imperial County is reported on a 1 day-in-6 schedule

**Background.** Imperial County is located at the southeastern corner of California and occupies 4,597 square miles. It borders Mexico to the south, Riverside County to the north, San Diego County to the west and the state of Arizona to the east. The area known as the Imperial Valley runs approximately northwest-southwest through the center of the county and extends into Mexico. In 2005, the total population for Imperial County was estimated at ~162,000 people, and its three most populated cities were El Centro (41,000 people), Calexico (36,200 people), and Brawley (24,000 people). Imperial County's population distribution and population growth in recent years are reported in Tables V.2 and V.3.

**Table V.2 Imperial County Population by Cities in January 2005**

| City/County | Population 1/1/2005 (in thousands) |
|---|---|
| Imperial County | 161.6 |
| Brawley | 24.0 |
| Calexico | 36.2 |
| Calipatria | 7.9 |
| El Centro | 41.0 |
| Holtville | 5.7 |
| Imperial | 9.6 |
| Westmorland | 2.4 |
| Balance of County | 34.8 |

Source: State of California, Department of Finance[2]

**Table V.3 Imperial County Population Growth Since 1999**

| Year | Population (July 1, in thousands) |
|---|---|
| 1999 | 140.8 |
| 2000 | 143.6 |
| 2001 | 146.2 |
| 2002 | 150.0 |
| 2003 | 154.8 |
| 2004 | 159.5 |
| 2005 | 164.3 |
| 2006 | 169.9 |

Source: State of California, Department of Finance[2]

Across the US-Mexico border from Calexico is the city of Mexicali, of estimated population >600,000 inhabitants.[2] As analyzed in Section 2.3.2, the potential for $PM_{10}$ emissions south of the border is expected to be high given the greater activity south of the border (since activity is generally a function of population) and existence of multiple fugitive dust sources, including vacant lands and significant areas with predominantly unpaved roads.

[2] Population Demographics for the Imperial and Mexicali Valleys, California Center for Border and Regional Economic Studies, CCBRES Bulletin, Vol. 8, No. 3 & 4, March/April 2007

**Description of Conditions Generally Characteristic of Transport Events.** Historical trends have demonstrated that the impacts of Mexicali emissions on Calexico air quality are highest under the following scenario:

- Emission levels in Mexicali are high;
- Stagnant atmospheric conditions result in low dispersion of pollution;
- $PM_{10}$ air concentrations in Mexicali reach high levels;
- Mexicali $PM_{10}$ "overflows" into Calexico and/or light winds from a generally southerly direction transport Mexicali pollution over short distances.

**Purpose.** The purpose of this Appendix is two-fold. First, it describes the "toolkit" used to assess the potential for international transport under specific meteorological conditions; second, it applies the tools to the identified exceedence episodes in 2005-2007 to determine both qualitatively and quantitatively the contribution of Mexican emissions to those exceedences. An attainment demonstration "but for" the contribution of Mexican emissions would require that none of the identified exceedences would have occurred but for emissions outside of the United States (US).

**Appendix Organization.** This Appendix is organized as follows:

- **Section 2** presents the toolkit used in the analyses of the potential transport events. The toolkit is based on the five approaches described in the 1994 Federal Register guidance regarding CAA Section 179B. For the first two approaches, this Appendix presents novel statistical analyses that produce a quantitative assessment of the minimal contribution of Mexican emissions to US-side $PM_{10}$ levels (Approach I) and the maximum expected impact on US-side $PM_{10}$ levels from US emissions (Approach II). These complementary approaches are used to quantitatively assess specific exceedence episodes as to whether they would have exceeded the NAAQS but for emissions from outside of the US. The other three approaches are qualitative assessments used to see if their results are consistent with the quantitative results of the first 2 approaches.

- **Section 3** presents a discussion and analysis of each exceedence that was potentially impacted by emissions outside of the US. For each exceedence episode, this section presents the following:

    - A description of the episode, including $PM_{10}$ measurements in Imperial County/Mexicali and meteorological conditions (surface winds, back trajectory analysis, and wind rose analysis);
    - Results of statistical analyses (Approaches I and II) to estimate the impacts of emissions originating from across the border and the impact of US emissions alone;
    - Additional evidence, including the results of the qualitative Approaches III, IV and V, as well as day-specific information on activity or emissions, if any; and

  - A Weight of Evidence (WOE) analysis of the exceedence to determine if it would have shown attainment of the NAAQS but for emissions from outside the US.

- **Section 4** presents the conclusions of this attainment demonstration.

# 2 Toolkit for Analysis of Potential International Transport Events

## 2.1 Introduction: USEPA Guidelines

For $PM_{10}$ nonattainment areas, section 179B(a) of the CAA provides that the USEPA must approve a SIP if (i) it meets all the applicable requirements under the Act other than the requirement to demonstrate attainment and maintenance of the $PM_{10}$ NAAQS by the applicable attainment date, and (ii) the state demonstrates to the satisfaction of the USEPA that the SIP would be adequate to attain and maintain the federal standard by the attainment date but for emissions emanating from outside the US. USEPA guidance[3] to demonstrate "but-for" attainment in State Implementation Plans involving international border areas describes the following 5 approaches:

1. "Evaluate and quantify…changes in monitored $PM_{10}$ concentrations [in the U.S., near the border] with predominant wind direction;"
2. "Demonstrate that local U.S. emissions … [do] not cause the NAAQS to be exceeded;"
3. "Analyze ambient sample filters for specific types of particles emanating from across the border;"
4. "Inventory…sources on both sides of the border and compare the magnitude of $PM_{10}$ emissions originating within the US to those emanating from outside the US;" and
5. "Perform air dispersion and/or receptor modeling to quantify the relative impacts [of US and international sources]."

The guidance further instructs that states may use any number of these approaches, or other techniques, "depending on their feasibility and applicability, to evaluate the impact of emissions emanating from outside the US on the nonattainment area." The following sections document our efforts to implement the 5 suggested approaches, to the extent possible, to the Calexico/Mexicali international area. We begin in Section 2.2 with statistical analyses designed to quantitatively assess the impact of both Mexican and US emissions based on historical patterns in meteorology and air quality (Approaches I and II). Sample filter analysis, relative emission inventories, and air dispersion modeling (Approaches III, IV, and V) are then addressed in Section 2.3.

NOTE: For ease of presentation, detailed plots and figures for this section are in Attachment A of this Appendix. Those plots and figures are referenced as Figure V.A.(figure number).

[3] State implementation plans for serious $PM_{10}$ nonattainment areas, and attainment date waivers for $PM_{10}$ nonattainment areas generally; Addendum to the general preamble for the implementation of Title I of the Clean Air Act Amendments of 1990, Federal Register, Vol. 59, No. 157, Tuesday, August 16, 1994, p. 41998

## 2.2 Statistical Analyses

### 2.2.1 Introduction

Approaches I and II are complementary analyses that rely on meteorology and $PM_{10}$ measurements for the exceedence days of interest and for days with similar characteristics to predict the impact of both US and Mexican emissions at Calexico monitors on exceedence days.

Algebraically, $PM_{10}$ concentrations on any given day at either one of the Calexico stations are the sum of impacts of both US and Mexican emissions (Equation 1). Each of those impacts has a component that can be predicted *based on historical patterns of meteorology and air quality using information about the day of interest and about days with similar characteristics*, and can be decomposed into an expected value[4] plus a term capturing the error of prediction (Equation 2).

$$PM_{10} \text{ at Calexico}_{day\ i} = \text{impact of US emissions at Calexico}_{day\ i} + \text{impact of Mexican emissions at Calexico}_{day\ i}$$

$$\text{i.e.,} \quad \mathrm{PM}_{Calexico,i} = Y_i + Z_i \tag{1}$$

$$\text{or} \quad \mathrm{PM}_{Calexico,i} = E[Y_i] + e_{Y,i} + E[Z_i] + e_{Z,i} \tag{2}$$

where *Y* and *Z* refer to the impact of US and Mexican emissions (respectively) at the Calexico station of interest, *E*[*Y*] and *E*[*Z*] are the predictable component of those impacts based on historical patterns and using information about the day of interest and about days with similar characteristics, and the terms $e_Y$ and $e_Z$ capture the errors of prediction for those impacts. The subscript *i* indicates that reference is made to parameter values for a specific day *i.*

Approach II estimates $E[Y_i]$ and a range for $Y_i$ using $PM_{10}$ measurements at other Imperial County stations *on the day of interest* as the explanatory variables (i.e. as predictor variables). Approach I estimates $E[Z_i]$ based on $PM_{10}$ measurements in Imperial County and Mexicali *on days with characteristics similar to the day of interest* (in terms of meteorology, and, to a lesser extent, Mexicali air quality). Thus, the two approaches are complementary both (i) because their results depend primarily on complementary data,[5] and (ii) because they focus on complementary components of $PM_{10}$ concentrations in Calexico.

### 2.2.2 Approach I: Statistical Analyses of Impact of Mexican Emissions

**Purpose and Introduction.** The first approach listed in the USEPA preamble is to "evaluate and quantify…changes in monitored $PM_{10}$ concentrations [in the US nonattainment area near

4 In the notation used throughout Approaches I and II, *E*[] refers to the expected value of the parameter within brackets. Note that *E*[] is a linear operator, i.e. *E*[A+B] = *E*[A] + *E*[B] for any variables A and B.

5 I.e., the day of interest in Approach II, and days similar to the day of interest in Approach I.

the international border] with changes in the predominant wind direction". Accordingly, this section presents the results of statistical analyses of $PM_{10}$ concentration data in Imperial County as a function of meteorological conditions (and to a lesser extent, $PM_{10}$ concentrations in Mexicali).

As stated in the previous section, $PM_{10}$ concentration at Calexico monitors on any given day is the sum of the impact of US emissions (*Y*) and of the impact of Mexican emissions (*Z*). The impact of Mexican emissions depends primarily on the following three factors: Mexicali emissions, atmospheric dispersion, and wind direction. We will use the 24-hour average wind speed at Calexico stations (denoted $V_C$) as a metric related to dispersion, and the Fraction of total cross-border air Mass Transport that is from the South[6] (*FMTS*) to quantify wind direction. Under stagnant conditions, $PM_{10}$ concentrations in Mexicali are expected to be a reasonable measure of Mexicali emissions. The present analysis is motivated by the expectation that, contrary to the impact of Mexican emissions at Calexico stations, the impact of US emissions at Imperial County stations does not depend strongly on wind direction,[7] all other things equal. For a given set of conditions:[8]

$$PM_{Calexico}\Big|_{V_C, FMTS, MexicaliPM_{10}} = Y\Big|_{V_C, FMTS} + Z\Big|_{V_C, FMTS, MexicaliPM_{10}} \quad (3)$$

If there is zero air flux from Mexico into the US, then there cannot be impact of Mexican emissions on Calexico monitors (except through simple diffusion), so $Z_{FMTS=0} \approx 0$. Therefore, the expected value of the impact of Mexican emissions at Calexico for a given set of conditions is approximately the difference:

$$\begin{aligned}
&E[PM_{Calexico}\Big|_{V_C, FMTS, MexicaliPM_{10}}] - E[PM_{Calexico}\Big|_{V_C, FMTS=0}] \\
&= E[Y\Big|_{V_C, FMTS}] + E[Z\Big|_{V_C, FMTS, MexicaliPM_{10}}] - E[Y\Big|_{V_C, FMTS=0}] - E[Z\Big|_{V_C, FMTS=0}] \\
&= E[Z\Big|_{V_C, FMTS, MexicaliPM_{10}}] + \left(E[Y\Big|_{V_C, FMTS}] - E[Y\Big|_{V_C, FMTS=0}]\right) \\
&\approx E[Z\Big|_{V_C, FMTS, MexicaliPM_{10}}]
\end{aligned} \quad (4)$$

where "expected values" refer to values obtained by averaging over a very large number of days with the specified characteristics. Note that in Equations 3 and 4 (and likewise in Equations 5-6

[6] *FMTS* is the fraction of the daily total cross-border air flux that corresponds to air flow from Mexico into IC. Cross-border air flux is directly proportional to the component of wind speed that is perpendicular to the border. Thus, if **n** is a unit vector perpendicular to the border and pointing toward Mexico, and **v** denotes the hourly average wind speed vector, *FMTS* = $(\sum_{\mathbf{v}\cdot\mathbf{n}>0} \mathbf{v}\cdot\mathbf{n})/\sum|\mathbf{v}\cdot\mathbf{n}|$, where the first sum is over all the hours of the day when the wind direction has some "southerly" component, and the second sum is over all hours of the day. Geometrical representations of the calculations are shown in Figures V.A.1 and V.A.2.

[7] *We show on page V.14 that this expectation is not strictly valid, but that the estimates of Z obtained by assuming that the impacts of US emissions are independent of wind direction are conservative.*

[8] In the notation that follows, vertical bars are used to indicate conditioning. Thus, the last term of Equation 3 refers to the impact of Mexican emissions under the set of conditions defined by specified values of the parameters $V_C$, *FMTS*, and Mexicali $PM_{10}$ concentrations.

below), $V_C$ and *FMTS* are calculated based on wind velocity measurements at the Calexico station of interest.

Thus, the impact of Mexicali emissions at Calexico monitors under specific conditions might be studied by comparing Calexico air quality for a set of days with the specified characteristics relative to days when *FMTS* = 0, all other things equal. However, a better approach is to study the differences in same-day $PM_{10}$ measurements between the Calexico stations and other Imperial County stations, rather than the absolute values of Calexico ambient air quality measurements. For example, for a specific set of conditions, the same-day difference in air quality measurements at Calexico and El Centro is:

$$(PM_{Calexico} - PM_{ElCentro})\Big|_{V_C, FMTS, MexicaliPM_{10}} = Y\Big|_{V_C, FMTS} + Z\Big|_{V_C, FMTS, MexicaliPM_{10}} - W\Big|_{V_C, FMTS} \quad (5)$$

where *W* is the impact of US emissions at El Centro (assumed here to be largely independent of both wind direction at Calexico and of  Mexicali air quality). Therefore, the expected value of the impact of Mexican emissions at Calexico for a given set of conditions can also be approximated by the difference:

$$\begin{aligned} & E[(PM_{Calexico} - PM_{ElCentro})\Big|_{V_C, FMTS, MexicaliPM_{10}}] - E[(PM_{Calexico} - PM_{ElCentro})\Big|_{V_C, FMTS=0}] \\ & = E[Z\Big|_{V_C, FMTS, MexicaliPM_{10}}] + \left(E[Y\Big|_{V_C, FMTS}] - E[Y\Big|_{V_C, FMTS=0}]\right) + \left(E[W\Big|_{V_C, FMTS=0}] - E[W\Big|_{V_C, FMTS}]\right) \quad (6) \\ & \approx E[Z\Big|_{V_C, FMTS, MexicaliPM_{10}}] \end{aligned}$$

The advantage of estimating $E[Z\Big|_{V_C, FMTS, MexicaliPM_{10}}]$ by using same-day $PM_{10}$ differences between stations rather than the difference in $PM_{10}$ measurements at the same Calexico station on different days is that better estimates are obtained for data sets of limited size.[9]

Our objective in the present approach is to estimate the contribution of Mexican emissions to Calexico $PM_{10}$ concentrations on December 21, 2006 and December 25, 2006, based on the pattern of $PM_{10}$ concentrations for historical days with similar characteristics. The analysis focuses on the difference in $PM_{10}$ measurements between the Calexico stations and the other Imperial County stations; these differences[10] are investigated as a function of (i) 24-hour average wind speed at Calexico ($V_C$), (ii) wind direction (*FMTS*), and (iii) $PM_{10}$ concentrations in Mexicali. The next subsection outlines data selection and availability. Following subsections document general results of the statistical analyses at the Calexico Grant and Calexico Ethel stations.

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[9] This is because the impact of Mexican emissions on Calexico air quality corresponds to a large fraction of the same-day $PM_{10}$ difference between Calexico and other IC stations, but to a smaller fraction of the absolute value of $PM_{10}$ concentrations at Calexico.

[10] That is, the differences of same-day measurements between the Calexico Grant (or the Calexico Ethel) station and any one of the El Centro, Brawley, Westmorland, or Niland stations.

**Data Selection and Availability.** The impact of Mexicali emissions at Calexico stations has evolved in time. Reasons for this include the tremendous growth of the city of Mexicali over the last decade, and increasing effects in recent years to control PM emissions in Mexicali (e.g., by increasing public awareness). It is probable that emission reductions in Mexicali have played an important role in attainment of the NAAQS at Calexico in 2008. Our goal is to analyze the December 2006 exceedences in the context of historical patterns descriptive of the actual time frame in which the exceedences occurred. As a result, there is a compromise to be made between the size of the database used in the statistical analysis (which database can be made larger by including increasingly older or more recent data) and the quality of the data in accurately representing the conditions of the December 2006 time period of interest. In this analysis, we choose to consider historical data for years 2001-2007. Within this group:

- Days for which $PM_{10}$ measurements were not available in Calexico were not included in the analysis;
- Given that the potential transport days in question for this analysis have very low wind speeds, days with high winds were not included in the analysis.[11] The $PM_{10}$ concentrations measured on these days are largely influenced by windblown dust in the Imperial Valley, and are not representative of the phenomenon of cross-border transport on low-wind days that we seek to understand and model.

Data availability is as follows:

- Wind direction data at the Grant station for a large fraction of 2002[12] were corrupt and thus unavailable;
- The Grant Station was decommissioned in August 2007; and
- Meteorological data for the Calexico-Ethel station in 2001 were not available.

We are therefore considering the time period from January 2001 to July 2007 at Calexico Grant, and from January 2002 to December 2007 at Calexico Ethel.

Our objectives are to obtain an understanding of the effects of wind speed, wind direction, and Mexicali $PM_{10}$ concentrations on the impact of Mexicali emissions at Calexico $PM_{10}$ monitors. Although we seek a qualitative understanding of these effects over a broad range of conditions, we are particularly interested in a quantitative understanding for stagnant atmospheric conditions in order to analyze the December 21, 2006 and December 25, 2006 episodes. Consequently, the following analyses are not intended to provide a comprehensive

[11] These included days for which abnormally high $PM_{10}$ measurements due to high winds were recorded at multiple stations far from the border (usually, two more 24-hr $PM_{10}$ measurements above 100 μg/m$^3$ at any of the El Centro, Brawley, Westmorland, and Niland stations, on days with concurrently high winds), as well as days when maximum hourly wind speed AND 24-hour average wind speed at either of the Calexico stations were in excess of 18 knots and 12 knots, respectively.

[12] The recorded wind direction data at the Grant station for the time intervals of May 2 to June 15, 2002, August 24 to September 12, 2002, and September 29, 2002 to January 15, 2003 are corrupt.

documentation of air quality trends under all conditions, but rather to place emphasis on results pertinent to days with low wind speeds.

**Analysis at the Grant Station**

Effects of Wind Speed on $PM_{10}$ at Calexico Grant. Wind speed is a key determinant of the level of atmospheric dispersion. Beginning with a simple analysis of the effect of wind speed alone (i.e., ignoring the effect of wind direction and of Mexicali emission levels), we find that on days with stagnant conditions in Calexico (i.e., 24-hour average wind speeds of 0 to 1 knots), $PM_{10}$ concentrations in Calexico are higher than those observed at other Imperial County stations (Table V.4). Plots of $PM_{10}$ concentrations differences vs. average speed show an inverse relationship between the excess $PM_{10}$ concentrations at Grant and the 24-hour average of wind speed at the Grant station (Figure V.A.3), so that the highest $PM_{10}$ concentration differences are typically measured on low wind speed days. Given that the $PM_{10}$ concentrations measured on low wind speed days are predominantly due to anthropogenic, activity-related sources rather than to windblown dust, the above results are consistent with our expectations that (i) there are more anthropogenic sources of $PM_{10}$ in Mexicali than in Imperial County, and that (ii) this difference in emissions density has a more pronounced impact at low levels of atmospheric dispersion.

**Table V.4 Effect of 24-Hour Wind Speed at the Grant Station (*FMTS* = 0-1)**

| average speed[a] range (knots) | [$PM_{10}$] difference between Grant and other IC stations[b] Brawley | El Centro | Niland | West. | # points in sampling |
|---|---|---|---|---|---|
| 0-1 | 57±51 | 61±47 | 64±39 | 53±38 | ≥24 |
| 1-1.5 | 36±33 | 42±36 | 55±40 | 45±38 | ≥40 |
| 1.5-2 | 30±23 | 30±25 | 38±27 | 28±23 | ≥50 |
| 2-3 | 23±22 | 22±23 | 23±26 | 16±20 | ≥59 |
| 3-5 | 19±25 | 20±21 | 18±29 | 11±26 | ≥69 |
| 5-10 | 14±28 | 17±18 | 21±29 | 12±27 | ≥48 |

[a]24-hour average wind speed at the Calexico Grant station. [b]Numbers on the left are sample averages of the daily differences in 24-hour $PM_{10}$ measurements at the Grant station and the other Imperial County station indicated, in $\mu g/m^3$. The numbers on the right correspond to the samples' standard deviations about the averages.

To test this understanding, it is useful to continue with an analysis of the effect of wind speed on days with predominantly northerly flow in Calexico/Mexicali (for which the impact of Mexicali emissions is minimized). Plots of the $PM_{10}$ difference between the Grant station and non-Calexico Imperial County stations as a function of average 24-hour wind speed at Grant on days with *FMTS* = 0-0.03 are given in Figure V.A.4. The plots clearly show downward trends, i.e., that "excess" $PM_{10}$ concentrations at Grant ($PM_{10}$ at Grant minus $PM_{10}$ at non-Calexico Imperial County stations) when *FMTS* ≈ 0 are higher at lower wind speeds. There are two potential explanations for this trend. First, if indeed US emissions are slightly higher at Calexico than throughout the remainder of Imperial County, then the impact of this difference will be higher at low atmospheric dispersion. Second, measurements of wind direction are not very accurate under very stagnant conditions, resulting in random errors in the calculation of *FMTS* at low wind speeds. In other words, the lower the 24-hour average wind speed at Grant, the more likely it is that there was actually some impact of Mexican emissions at Calexico Grant in spite of the calculated value of *FMTS* in the 0 to 0.03 range.

To find out the magnitude of the effect of 24-hour wind speed on the impact of US emissions alone, we investigated results at non-Calexico stations (control study). The plots of Figure V.A.5 show no clear or pronounced relationship between the average impact of US emissions at the non-Calexico monitors and the 24-hour average wind speed at the monitors (there is an downward trend at El Centro, but upward trends at Westmorland and Niland). Likewise, the difference in $PM_{10}$ concentrations between the Westmorland and Niland stations (which is ~10 $\mu g/m^3$ on average) does not seem to depend strongly on 24-hour average wind speed at Westmorland. These results at non-Calexico stations suggest that the difference in the impact of US emissions alone on Imperial County stations is largely insensitive to average wind speed, and that therefore the higher values of ($PM_{10}$ at Grant – $PM_{10}$ at other Imperial County stations) shown in Figure V.A.4 and in Table V.4 at low values of $V_C$ are predominantly the effect of the impact of Mexican emissions.

Effects of Wind Direction on $PM_{10}$ at Calexico Grant. Although the study of cross-border air transport focuses on the differences in air quality at Calexico resulting from changes in wind direction, the results of the previous subsection suggest that when assessing the ambient air quality in Calexico it is necessary to conduct a data analysis based on both wind direction AND wind speed. As stated previously, the fraction of total cross-border air mass transport that is from the south (*FMTS*) was used to quantify northerly/southerly wind direction. The effect of *FMTS* on the $PM_{10}$ concentration difference between Calexico Grant and other Imperial County stations is shown for different conditions of atmospheric dispersion in Tables V.5 and V.6. At higher *FMTS*, the difference becomes larger, which is consistent with the hypothesis that $PM_{10}$ concentrations at the Calexico Grant station are impacted by emissions from Mexicali. Also, the smaller the atmospheric dispersion, the greater the impact of Mexicali emissions can be (as evidenced by the higher values in Table V.6 compared to the values of Table V.5).

**Table V.5 Effect of Wind Direction on Days when Average Wind Speed at the Grant Station ≥1.5 Knots**

| south wind | [$PM_{10}$] difference between Grant and other IC stations | | | | # points in |
|---|---|---|---|---|---|
| (*FMTS*[a]) | Brawley | El Centro | Niland | West. | sampling |
| 0-0.03 | 1±19 | 12±12 | 11±19 | 2±20 | ≥31 |
| 0.03-0.9 | 22±25 | 22±23 | 25±29 | 17±25 | ≥141 |
| 0.9-1 | 32±20 | 28±19 | 34±27 | 23±21 | ≥46 |

[a]Calculated using wind direction and wind speed measurements at the Calexico Grant Station

**Table V.6 Effect of Wind Direction on Days when Average Wind Speed at the Grant station <1.0 Knots**

| south wind (*FMTS*[a]) | $[PM_{10}]$ difference between Grant and other IC stations | | | | # points in sampling |
|---|---|---|---|---|---|
| | Brawley | El Centro | Niland | West. | |
| 0-0.1 | 30±32 | 38±23 | 47±27 | 31±30 | ≥8 |
| 0.1-0.4 | 49±28 | 52±27 | 61±29 | 54±28 | 11 |
| 0.4-1 | 122±67 | 109±66 | 114±51 | 100±43 | ≥4 |

[a]Calculated using wind direction and wind speed measurements at the Calexico Grant Station

The differences in $PM_{10}$ measurements between the Calexico Grant and other Imperial County stations when *FMTS* is close to 0 are expected to largely represent the differences in the impact of US emissions alone on the several stations.[13] In other words, the results of the first row of Table V.5 indicate that on days when wind speed at Grant ≥1.5 knots, the impact of US emissions alone cause $PM_{10}$ at Grant to be higher than at non-Calexico stations by an average of 1-12 μg/m$^3$. This result suggests that US emissions are slightly higher in the areas surrounding Calexico than throughout the rest of Imperial County (although as stated in footnote 13, some of the 1-12 μg/m$^3$ excess may in reality be attributable to carried-over Mexican emissions).

Effects of $PM_{10}$ Concentrations in Mexicali on $PM_{10}$ at Calexico Grant. The cross-border transport of $PM_{10}$ into Imperial County is the result of cross-border transport of air containing $PM_{10}$ originating from Mexicali sources. We investigated the $PM_{10}$ concentrations in Mexicali and Calexico for correlations between air quality in Mexicali and air quality in Calexico. Our analysis in this subsection focuses on days when the highest impact of Mexican emissions at Calexico Grant is expected to occur, i.e., on days when average wind speed at Grant <1.0 knots (i.e., the days from which the entries of Table V.6 were derived). Relevant information for the 26 days of that data set is reported in Table V.7, where the days were sorted in ascending order based on the average difference of the $PM_{10}$ concentration at Grant relative to other non-Calexico Imperial County stations (the "excess" $PM_{10}$ concentration).

Correlations between $PM_{10}$ concentration in Mexicali and "excess" $PM_{10}$ concentrations at Grant (relative to other Imperial County stations) are visualized by plotting the "excess" $PM_{10}$ concentrations at Grant (i.e., the 2$^{nd}$ column of Table V.7) against the $PM_{10}$ concentrations at Mexicali monitoring sites (i.e., the last 6 columns of Table V.7). The data show a consistent trend such that higher $PM_{10}$ concentrations in Mexicali correspond to higher "excess" $PM_{10}$ concentrations at the Calexico Grant station, with significantly better correlations if the 8 days with *FMTS* <0.1 (i.e., mostly northerly flow) are omitted. Results are plotted in Figure V.A.6; for

[13] Note that this is conservative because there may in fact be some $PM_{10}$ from Mexican sources on the US side (e.g., transported the day prior) even when the calculated value of *FMTS* for the day of interest is ~0. For convenience, we use the term "impact of US emissions alone" in this document to refer to the conservative estimates of the contribution of US sources obtained from the statistical analyses when *FMTS* ~0.

reference the locations of Imperial County and Mexicali monitoring stations are shown in Figure V.A.7.

**Table V.7 Excess $PM_{10}$ Concentrations at Grant, $PM_{10}$ Concentrations in Mexicali, and Cross-Border Wind Direction on Days when Average Wind Speed at Grant <1.0 Knots**

| | Grant Station | | | [$PM_{10}$] at Mexicali Stations | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Date | excess $PM_{10}$[a] | wind speed[b] | FMTS | Cobach | Carretera | UABC | Progresso | ITM | Conalep |
| 1-Dec-06 | 9 | 0.8 | 0.05 | 160 | 112 | 72 | 372 | - | 174 |
| 19-Nov-06 | 11 | 0.9 | 0.09 | 179 | 103 | 69 | 436 | 47 | 161 |
| 27-Aug-06 | 15 | 0.8 | 0.07 | 244 | 63 | - | 192 | 44 | 152 |
| 26-Sep-06 | 16 | 0.9 | 0.04 | 138 | - | 82 | 241 | 64 | 162 |
| 12-Nov-05 | 18 | 0.7 | 0.17 | 147 | - | 67 | - | 46 | 104 |
| 13-Dec-06 | 24 | 0.6 | 0.04 | 191 | 94 | 91 | 336 | 72 | 268 |
| 25-Sep-05 | 25 | 0.8 | 0.13 | 113 | 56 | 58 | 274 | - | 68 |
| 18-Dec-05 | 26 | 0.6 | 0.14 | 190 | 84 | 113 | 221 | 108 | 131 |
| 10-Feb-06 | 28 | 0.6 | 0.29 | 218 | 101 | 159 | 373 | - | - |
| 24-Mar-06 | 39 | 1.0 | 0.07 | 145 | 39 | - | 194 | - | 89 |
| 31-Dec-06 | 52 | 0.9 | 0.62 | 252 | 113 | 188 | 429 | 102 | 127 |
| 5-Feb-07 | 55 | 0.8 | 0.11 | - | 63 | - | 421 | - | 97 |
| 11-Jan-06 | 57 | 0.7 | 0.21 | 214 | 120 | 106 | 401 | - | 137 |
| 6-Nov-05 | 62 | 0.6 | 0.37 | 218 | - | - | 366 | - | - |
| 30-Nov-05 | 63 | 0.7 | 0.02 | - | 114 | 138 | 366 | 100 | - |
| 6-Dec-05 | 65 | 0.9 | 0.17 | 210 | 74 | 102 | 399 | 78 | 136 |
| 7-Nov-06 | 69 | 0.4 | 0.07 | - | - | - | - | - | - |
| 13-Nov-06 | 76 | 1.0 | 0.64 | 198 | 156 | 197 | 297 | 68 | 97 |
| 24-Dec-05 | 77 | 0.6 | 0.23 | - | - | - | - | - | - |
| 1-Nov-06 | 78 | 0.5 | 0.27 | - | - | 106 | - | - | 213 |
| 19-Dec-06 | 79 | 0.9 | 0.06 | 138 | 55 | 75 | 287 | 48 | 116 |
| 30-Dec-05 | 104 | 0.6 | 0.56 | - | 87 | 117 | 310 | 72 | - |
| 4-Feb-06 | 106 | 0.9 | 0.32 | 246 | 119 | 159 | 405 | 103 | 125 |
| 21-Dec-06 | 117 | 0.4 | 0.85 | - | - | - | - | - | - |
| 12-Dec-05 | 156 | 0.6 | 0.97 | - | 147 | - | 391 | 139 | 130 |
| 25-Dec-06 | 223 | 0.5 | 0.41 | 437 | 266 | 240 | 466 | 274 | 305 |

[a]Reported numbers correspond to the difference between the 24-hour $PM_{10}$ measurement at the Grant station and the average of the 24-hour $PM_{10}$ measurements at the El Centro, Brawley, Westmorland, and Niland stations on the day of interest (in μg/m$^3$). [b]24-hour average wind speed at the Grant station (in knots).

Estimation of Mexicali's Contribution to Measured $PM_{10}$ Concentrations at Calexico Grant. According to Equation 6, the expected impact of Mexican emissions at Grant under a set of specific conditions may be expressed as:

$$E[Z|_{V_C,FMTS,MexicaliPM_{10}}] = E[(PM_{Calexico} - PM_{ElCentro})|_{V_C,FMTS,MexicaliPM_{10}}] - E[(PM_{Calexico} - PM_{ElCentro})|_{V_C,FMTS=0}] + \left(E[Y|_{V_C,FMTS=0}] - E[Y|_{V_C,FMTS}]\right) + \left(E[W|_{V_C,FMTS}] - E[W|_{V_C,FMTS=0}]\right)$$

where $W$ is the impact of US emissions at the El Centro station,[14] and $V_C$ and $FMTS$ are calculated based on wind velocity measurements at the Calexico Grant station.

[14] Similar equations can be written by reference to the Brawley, Westmorland, and Niland stations.

In the case of homogeneous surface density of $PM_{10}$ emissions in the areas surrounding a station, air quality at the station is expected to be independent of wind direction. Plots of $PM_{10}$ measurements at non-Calexico Imperial County stations as a function of wind direction (Figures V.A.8 and V.A.9) reveal instead that the impacts on air quality at the El Centro, Brawley, Westmorland, and Niland stations are higher for southerly flow than for northerly flow.[15] As a consequence, the term $E[W|_{V_C,FMTS}]-E[W|_{V_C,FMTS=0}]$ in the above equation is ≥0 for all values of *FMTS*. Furthermore, because there is only a very narrow band of US territory south of the Calexico stations, we expect the impact of US emissions at Calexico stations to be higher for northerly flow than for southerly flow.[16] Accordingly, we can reasonably expect $E[Y|_{V_C,FMTS=0}]-E[Y|_{V_C,FMTS}]$ ≥0 also, so that approximating the impacts of Mexican emissions at Grant using $E[Z|_{V_C,FMTS,MexicaliPM_{10}}]=E[(PM_{Calexico}-PM_{ElCentro})|_{V_C,FMTS,MexicaliPM_{10}}]-E[(PM_{Calexico}-PM_{ElCentro})|_{V_C,FMTS=0}]$ consistently **underestimates** the contribution of Mexico to PM pollution at Grant.

Next, we found in the previous subsection that the difference in the impact of US emissions alone on Imperial County stations is largely insensitive to average wind speed. Consequently, the difference[17] $E[(PM_{Grant}-PM_{Non\ Calexico\ IC\ station})|_{V_C,FMTS=0}]$ is largely independent of $V_C$.[18] As a result, we will use a single value to approximate the difference $E[(PM_{Grant}-PM_{Non\ Calexico\ IC\ station})|_{V_C,FMTS=0}]$ at all values of $V_C$. These single values are calculated in the present case by averaging the "excess" $PM_{10}$ at Calexico for all days with *FMTS* = 0-0.03 and $V_C$ >1.0 knots,[19] and are reported in Table V.8.

**Table V.8 Estimates of Excess $PM_{10}$ at Grant as a Result of US Emissions Alone (All Days with Average Wind Speed at the Grant Station ≥1.0 Knots)**

| south wind (*FMTS*[a]) | [$PM_{10}$] difference between Grant and other IC stations | | | | # points in sampling |
|---|---|---|---|---|---|
| | Brawley | El Centro | Niland | West. | |
| 0-0.03 | **2**±18 | **11**±12 | **11**±18 | **2**±19 | ≥35 |

[a]Calculated using wind direction and wind speed measurements at the Calexico Grant Station

[15] Note that the trends are less pronounced in Figure V.A.8 than in Figure V.A.9, consistent with the expectation that the influence of wind direction on *W* decreases with decreasing wind speed.

[16] The reasoning for this argument is the following: (i) outside of Calexico, there are no US sources to the south, but all of Imperial County to the north; (ii) within Calexico, inspection of Figure V.A.10 also shows more activity-related sources north of the stations (or at least a comparable number of sources north and south), and (iii) in the direct vicinity of the Grant station (where both the December 21 and December 25, 2006 exceedences were recorded), activity-related $PM_{10}$ emissions are once again expected to be comparatively lower south of the station, where the only source is the low-traffic Calexico airport (servicing only a handful of small planes that land and take-off daily on a paved runway) and other activities are limited. A more detailed analysis of the area south of the Grant station is presented in Attachment B of this Appendix.

[17] This difference is the expected difference of the impact of US emissions alone at the Grant station relative to the impact of US emissions alone and a non-Calexico station, at a specified value of $V_C$.

[18] Except at very low values of wind speeds when calculated values of *FMTS* are less accurate and the difference may include impacts of Mexicali emissions as well.

[19] This restriction is to minimize calculation errors resulting from less accurate calculated values of *FMTS* for $V_C$ <1.0 knots.

The following procedure is then used to get a **conservative** estimate of the **expected** impact of pollution coming from Mexico at the Grant station on any specified day:

1. Identify the subset of historical days with characteristics similar to the specific day of interest (in terms of $V_C$, *FMTS*, and if possible Mexicali $PM_{10}$ concentrations);
2. For each of the Brawley, El Centro, Niland, and Westmorland stations, approximate the expected value of the difference ($PM_{10}$ at Grant) – ($PM_{10}$ at non-Calexico station) for the specific day of interest as the historical average of these differences for the days with similar characteristics (this result corresponds to the expected excess $PM_{10}$ at Grant due to the impact of both US and Mexican emissions); and
3. Subtract the bolded values from Table V.8 (which correspond approximately—and conservatively—to excess $PM_{10}$ at Grant due to the impact of US emissions alone).

This procedure will be used in Section 3 to analyze whether the $PM_{10}$ exceedences measured on December 21, 2006 and December 25, 2006 would have occurred "but-for" emissions from Mexico.

**Analysis at the Calexico Ethel Station**

In this section, we pattern our analysis after the analysis conducted for the Calexico Grant station, but limit our discussion the effect of wind speed and wind direction on excess $PM_{10}$ concentrations at Ethel (relative to $PM_{10}$ concentrations at other non-Calexico stations).

Effects of Wind Speed on $PM_{10}$ at Calexico Ethel. $PM_{10}$ concentrations at the Calexico-Ethel station were also found to be much higher than those observed at other Imperial County stations on days with low atmospheric dispersion (Table V.9).[20] The plots of $PM_{10}$ concentrations differences vs. average speed (Figure V.A.11) again show the inverse relationship between excess ambient $PM_{10}$ in Calexico (relative to other Imperial County stations) and wind speed at Calexico. This relationship is consistent with that illustrated in the same plots for the Grant station (Figure V.A.3).

**Table V.9 Effect of Wind Speed at the Calexico Ethel station (*FMTS* = 0-1)**

| average speed[a] range (knots) | [$PM_{10}$] difference between Ethel and other IC stations | | | | # points in sampling |
|---|---|---|---|---|---|
| | Brawley | El Centro | Niland | West. | |
| 0-1.75 | 57±28 | 49±27 | 75±34 | 61±33 | ≥18 |
| 1.75-2.25 | 31±19 | 29±21 | 44±24 | 34±21 | ≥33 |
| 2.25-3 | 22±28 | 23±29 | 33±30 | 23±28 | ≥51 |
| 3-5 | 17±19 | 16±19 | 20±22 | 13±19 | ≥90 |
| 5-15 | 6±21 | 11±14 | 10±22 | 4±20 | ≥75 |

[a]24-hour average wind speed at the Calexico Ethel station.

[20] Note that wind speeds were generally higher at Calexico Ethel, so the intervals of wind speeds in the first column of Table V.9 and in subsequent analyses for the Ethel station were not chosen to match those for the Grant station.

Effects of Wind Direction on $PM_{10}$ at Calexico Ethel. The effect of *FMTS* on the $PM_{10}$ concentration differences between Calexico Ethel and non-Calexico Imperial County stations is shown for different conditions of atmospheric dispersion in Tables V.10 and V.11 below. Results are qualitatively similar to those at Grant.

**Table V.10 Effect of Wind Direction on Days when Average Wind Speed at Ethel ≥2.5 knots**

| south wind (*FMTS*[a]) | [$PM_{10}$] difference between Ethel and other IC stations | | | | # points in sampling |
|---|---|---|---|---|---|
| | Brawley | El Centro | Niland | West. | |
| 0 | -2±20 | 9±14 | 9±15 | -2±20 | ≥30 |
| 0-0.1 | 10±17 | 17±20 | 20±22 | 12±20 | ≥48 |
| 0.1-1 | 19±23 | 16±23 | 20±28 | 14±23 | ≥117 |

[a]Calculated using wind direction and wind speed measurements at the Calexico Ethel Station

**Table V.11 Effect of Wind Direction on Days when Average Wind Speed at Ethel <1.75 knots**

| south wind (*FMTS*[a]) | [$PM_{10}$] difference between Ethel and other IC stations | | | | # points in sampling |
|---|---|---|---|---|---|
| | Brawley | El Centro | Niland | West. | |
| 0-0.35 | 46±15 | 47±24 | 65±22 | 53±23 | ≥10 |
| 0.35-1 | 71±35 | 51±35 | 95±49 | 77±46 | ≥6 |

[a]Calculated using wind direction and wind speed measurements at the Calexico Ethel Station

Estimation of Mexicali's Contribution to Measured $PM_{10}$ Concentrations at Calexico Ethel. Following the reasoning outlined for analysis at the Grant station, we assess that the average "excess" $PM_{10}$ concentration at Ethel[21] *due to US emissions alone* is the average difference between same-day $PM_{10}$ measurements at Calexico Ethel and non-Calexico stations on days when *FMTS* ≈ 0 (and $V_C$ is sufficiently high for accurate estimates of *FMTS*). Because there were no days with calculated *FMTS* = 0 and average wind speed at Ethel <2.5 knots, and because ≥30 points is a reasonable sample size, the entries in the first row of Table V.10 (reproduced in Table V.12) will be used as an approximation for all values of $V_C$ of the excess $PM_{10}$ at Ethel due to US emissions alone (conservative).

**Table V.12 Estimates of Excess $PM_{10}$ at Ethel as a Result of US Emissions Alone (All Days in 2002-2007)**

| south wind (*FMTS*) | [$PM_{10}$] difference between Ethel and other IC stations | | | | # points in sampling |
|---|---|---|---|---|---|
| | Brawley | El Centro | Niland | West. | |
| 0 | **-2**±20 | **9**±14 | **9**±15 | **-2**±20 | ≥30 |

[21] That is, the difference between $PM_{10}$ measurements at Ethel and $PM_{10}$ measurements at non-Calexico Imperial County stations.

In order to **conservatively** estimate the **expected** impact of Mexicali emission sources at the Ethel station on any specified day of interest, the following steps may be repeated at Ethel:

1. Identify the subset of historical days with meteorological conditions at Ethel similar to those on the specific day of interest (in terms of $V_C$ and *FMTS* at Ethel);
2. For each of the Brawley, El Centro, Niland, and Westmorland stations, approximate the expected value of the difference ($PM_{10}$ at Ethel) – ($PM_{10}$ at non-Calexico station) for the specific day of interest as the historical average of these differences for the days with similar meteorology (this result corresponds to the expected excess $PM_{10}$ at Ethel due to the impact of both US and Mexican emissions); and
3. Subtract the bolded values from Table V.12 (which correspond approximately to excess $PM_{10}$ at Ethel due to the impact of US emissions alone).

### 2.2.3 Approach II: Statistical Analyses of the Impact of US Emissions

**Discussion of the Approach.** The second approach listed in the USEPA preamble is to "demonstrate that the impact of [US sources alone] on the nonattainment area… does not cause the NAAQS to be exceeded," after accounting for the influx of background $PM_{10}$ into the area. The USEPA guidelines suggest beginning with a comprehensive inventory of $PM_{10}$ emissions within the U.S. in the vicinity of the nonattainment area. With an emissions inventory, air dispersion modeling can be used to estimate the impact of these emissions on air quality. The use of dispersion modeling to evaluate whether US emissions alone would have caused exceedences is discussed in Approach V. In this section, the emissions inventory is analyzed in conjunction with the monitoring data collected throughout Imperial County to determine if US emissions alone would have led to the measured exceedances at the Calexico Grant and Ethel stations. This approach (without modeling)[22] is consistent with USEPA guidance.

**Analysis of the Imperial County Emission Inventory: Spatial Distribution of US Emission Sources.** The air quality measured by any monitor is primarily a function of two sets of inputs. These are the levels of emissions and the meteorology within the areas surrounding the monitor (the latter governs the build-up and transport of pollution). In general, the impact of emission sources on the monitor decrease with increasing distance from the monitor: for the Imperial County stations, "background" US $PM_{10}$ concentrations are the impact of sources from within Imperial County (and in some cases from surrounding US counties as well), while the greater portion of $PM_{10}$ concentrations measured at any station is likely the result of local sources.

Because of the flat terrain and geographical proximity among the several Imperial County monitoring stations, meteorological conditions relevant to air quality at one Imperial County station are generally comparable to meteorological conditions relevant to air quality at another Imperial County station (this approximation is of course better for stations within close proximity,

[22] EPA has stated (Federal Register, Volume 66, Number 203, October 19, 2001, p. 53107) that implementation of their second approach was intended to be conducted without modeling.

such as the Westmorland and Brawley stations, or the Calexico and El Centro stations). Furthermore, US emissions within the populated portion of the Imperial County (this populated portion is clearly distinguishable from the desert portion on satellite photographs such as Figure V.A.12) are also relatively evenly distributed throughout the county. This is so because the dominant sources of $PM_{10}$ emissions within the populated area of the Imperial Valley (accounting for ~ 89% of emissions[23] according to the 2005 Imperial County Emission Inventory, Table V.13) are unpaved roads and agricultural lands, and these sources are distributed evenly throughout the populated portion of Imperial County.

**Table V.13 $PM_{10}$ Emission Inventory for Imperial County in 2005**

| Source Category | Annual Average (tpd) |
|---|---|
| Fuel Combustion | 0.41 |
| Waste Disposal | 0.00 |
| Cleaning/Surface Coatings | 0.00 |
| Petroleum Production/Marketing | 0.00 |
| Industrial Processes | 2.79 |
| Solvent Evaporation | 0.00 |
| Res Fuel Combustion | 0.09 |
| Farming | 9.88 |
| Construction | 2.20 |
| Paved Road Dust | 3.38 |
| Entrained Unpaved Road Dust | 56.85 |
| Windblown Dust | 212.67 |
| Open Areas—Urban | 0.01 |
| Open Areas—Grasslands, Dunes, Barren Lands | 169.54 |
| Unpaved Roads | 30.52 |
| Non-Pasture Ag Lands | 10.81 |
| Pasture | 1.79 |
| Fires | 0.00 |
| Waste Burning | 2.77 |
| Cooking | 0.06 |
| On-Road Mobile | 1.05 |
| Other Mobile | 0.99 |
| **Total excluding windblown $PM_{10}$ from Grasslands, Dunes, and Other Barren Lands** | **136** |

Therefore, we expect that $PM_{10}$ concentrations on any given day would be more or less equal at the six Imperial County stations (located in the suburban/rural areas of the Imperial Valley, as shown in Figure V.A.12) if Mexicali had emission levels similar to Imperial County (e.g. excluding excess Mexican emissions). Random differences between same-day $PM_{10}$ concentrations at the several stations are expected to occur as a result of the spatial differences in meteorology and as a result of random fluctuations in local emissions about their local averages. Systematic differences between same-day $PM_{10}$ concentrations at any two stations may also exist if local emissions are on average comparatively higher or lower in the general areas surrounding one of the stations. For example, we expect $PM_{10}$ concentrations at Niland to

[23] According to Table V.13: Farming, Entrained Unpaved Road Dust, and Windblown Dust from Unpaved Roads and Agricultural lands (pasture and non-pasture) account for 110 tpd or 89% of the 124 tpd total Imperial County $PM_{10}$ inventory after exclusion of windblown dust from grasslands, dunes, and other barren lands (which are outside of the populated part of the Imperial Valley).

be generally somewhat lower than $PM_{10}$ concentrations at other Imperial County stations, as a result of lower levels of activity in the area (there is essentially no agricultural activity to the North, East, or West of Niland, and the area is very sparsely populated).

The above arguments outline the logic for the following two key concepts. First, air quality at Imperial County stations on any day and except for excess Mexican emissions is expected to be more or less the same, although there may be some systematic differences. Second, $PM_{10}$ concentrations at Imperial County stations are expected to be correlated. This implies that the measurement at any station can be predicted to some extent by the values of the measurements at other stations. The nature of these correlations and the implications are analyzed below. Analyses involved the same set of $PM_{10}$ data used in Approach I, except that Calexico $PM_{10}$ measurements characteristic of strong impact from Mexico were also excluded[24] (this is because in this approach we seek to find correlations in the impact of US emissions alone at the several Imperial County stations).

**Analysis of Historical $PM_{10}$ Measurements: Comparative Analysis for Non-Calexico Stations.** We begin by conducting a comparative analysis of daily measurements at the El Centro, Brawley, Westmorland, and Niland stations. Because the impact of Mexicali $PM_{10}$ emissions is expected to be small at these stations (in comparison to their impact on Calexico monitors), this analysis will be used to test/validate the expectations derived in the previous subsection (i.e., expectations derived from analysis of the Imperial County Emission Inventory).

Plots of $PM_{10}$ concentration at one station vs. $PM_{10}$ concentration at another are given in Figures V.A.13-V.A.16. We find positive correlations ($R^2$ values ranging from 0.32-0.56) in all cases, with correlations generally decreasing with increasing distance between stations,[25] as expected. Note that except for regressions between Niland and El Centro or between Niland and Brawley, all correlations had $R^2$ values ≥0.49.

Our interest is to capture as much information as possible in predicting $PM_{10}$ concentrations at a specified location based on ambient air quality measurements at nearby stations. Because this task must be accomplished in a manner that will be useful later in our analysis of Calexico stations, multiple linear regression is not a good choice here. For the sake of simplicity, we suggest instead the averaging of measured $PM_{10}$ concentrations at nearby stations.[26]

[24] Calexico $PM_{10}$ measurements were excluded for the following days: January 7, 2001, November 3, 2001, November 21, 2001, January 14, 2002, February 13, 2002, November 22, 2002, December 29, 2003, March 11, 2005, December 12, 2005, December 21, 2006, and December 25, 2006. For the above days in 2001-2003, an analysis of cross-border transport was described in the November 2004 report "*Technical support document: exclusion of $PM_{10}$ measurements in excess of the 24-hour $PM_{10}$ NAAQS for Imperial County from 2001 through 2003 due to natural events and emissions from Mexico*" prepared by ENVIRON for the ICAPCD.

[25] For example, $R^2$ values for correlations with the El Centro station decrease as we progress northward from Brawley to Westmorland and Niland. The closest station (Brawley) exhibited the strongest correlation ($R^2$ = 0.53), while the most distant station (Niland) exhibited the worst ($R^2$ = 0.32).

[26] The motivation for predicting $PM_{10}$ concentration at a specified location (station A) using the average of $PM_{10}$ measurements at nearby stations (for example, let us refer to the closest two stations as stations B and C) is outlined as follows. ¶Correlation in same-day $PM_{10}$ measurements for any pair of Imperial County stations simply

Regression of $PM_{10}$ concentrations at a specified location on the average of concentrations at the two closest stations (Figures V.A.17-V.A.20) gave improved correlations in all cases (except at Niland). Note however that regression on the average of $PM_{10}$ concentrations at the three closest stations was not a further improvement.

Figures V.A.17-V.A.20 also show that the relationships are well described[27] by direct linear proportionality—a relationship simple enough to enable convenient analysis of the impact of US emissions at Calexico stations. The slope of the linear fits (i.e., the proportionality coefficients) indicate that local emissions in the areas surrounding the El Centro and Brawley stations are approximately the same, with slightly higher emissions impacting the Westmorland station (~10% higher), and slightly lower emissions impacting the Niland station (~20% lower).

The scatter of the right-side plots of Figures V.A.17-V.A.20 represents the limitations, due to random processes affecting meteorology differences and emission differences, in accurately predicting $PM_{10}$ concentration at a given station based on the average of same-day $PM_{10}$ concentrations at its two nearest stations. The inaccuracy in prediction is <25 $\mu g/m^3$ in >95% of cases[28] and <40 $\mu g/m^3$ in >99% of cases. The use of the regressions of Figures V.A.17-V.A.20 in predicting $PM_{10}$ concentrations if $PM_{10}$ air quality data is only available at one of the two nearest stations results in slightly higher residuals, as expected (Figure V.A.21): the error of prediction becomes <30 $\mu g/m^3$ in >95% of cases[29] and <50 $\mu g/m^3$ in >99% of cases.

Comparative analysis of $PM_{10}$ measurements at non-Calexico stations therefore validates the expectations of the previous section, i.e., that air quality at all Imperial County stations <u>on any day and except for excess Mexican emissions</u> is more or less the same, and that because of correlation the measurement at any station can be predicted to a large degree by the values of the measurements at other stations. Even though these expectations have only been validated for the non-Calexico stations, based on similarity at Calexico we expect that they would hold as well for the Calexico stations in the absence of Mexican emissions.

implies that $PM_{10}$ concentrations at one station tend to be lower (or higher) than average if same-day $PM_{10}$ concentrations at the other station are lower (or higher) than average. Given that the yearly averages of $PM_{10}$ air quality are comparable at all non-Calexico IC stations, the result is that same-day $PM_{10}$ concentrations for any two non-Calexico stations are comparable. The difference in same-day $PM_{10}$ concentrations between non-IC stations has a predictable component (for example, Niland tends to have slightly better air quality while Westmorland tends to have slightly poorer air quality), as well as a non-predictable or random component. Extreme random differences in $PM_{10}$ concentrations between stations A and B primarily occur when unusual local activity impacts one of the stations. If this is the case at station B, then according to the laws of probability is it unlikely that an extreme random difference also concurrently exists between $PM_{10}$ concentrations at stations A and C, so that in general we expect fewer, less extreme random differences between the measurement at station A and the average of same-day measurements at station B and C. This in indeed what we observe (i.e., better correlations for all stations except at Niland).

[27] This is confirmed both by the high correlation coefficients and by the homogeneous distribution of the scatter about the linear fits through the origin (this did not hold at Niland as well as it did at the El Centro, Brawley, and Westmorland stations).

[28] The standard deviations of the residuals in Figures V.A.17-V.A.20 are 10-13 $\mu g/m^3$.

[29] The standard deviations of the residuals in Figure V.A.21 are 12-16 $\mu g/m^3$.

**Analysis of Historical $PM_{10}$ Measurements: Comparative Analysis of Calexico Air Quality Relative to Non-Calexico Air Quality.** Plots of $PM_{10}$ concentrations at the Grant station vs. same-day $PM_{10}$ concentrations at non-Calexico stations are shown in Figure V.A.22, and similar plots for the Ethel station are given in Figure V.A.23. Linear regressions analysis (in parallel manner to that conducted above) reveals important similarities and differences compared with the results for non-Calexico stations. As before, we find that correlations improve with decreasing distance between stations,[30] and that scatter is evenly distributed on both sides of the linear fits through the origin for regression of $PM_{10}$ at Grant or Ethel on the average of $PM_{10}$ measurements at the closest two non-Calexico stations (Figure V.A.24). On the other hand, we find that:

- scatter around the linear regressions is far more pronounced, and therefore the correlation coefficients are much lower (i.e. $R^2$ values are in the range of 0.09-0.43, rather than 0.32-0.56); and
- the relationships deviate significantly from 1:1 (i.e., $PM_{10}$ concentration at Grant and Ethel are generally 59% and 47% greater than the average of same-day measurements at El Centro and Brawley as shown on Figure V.A.24).

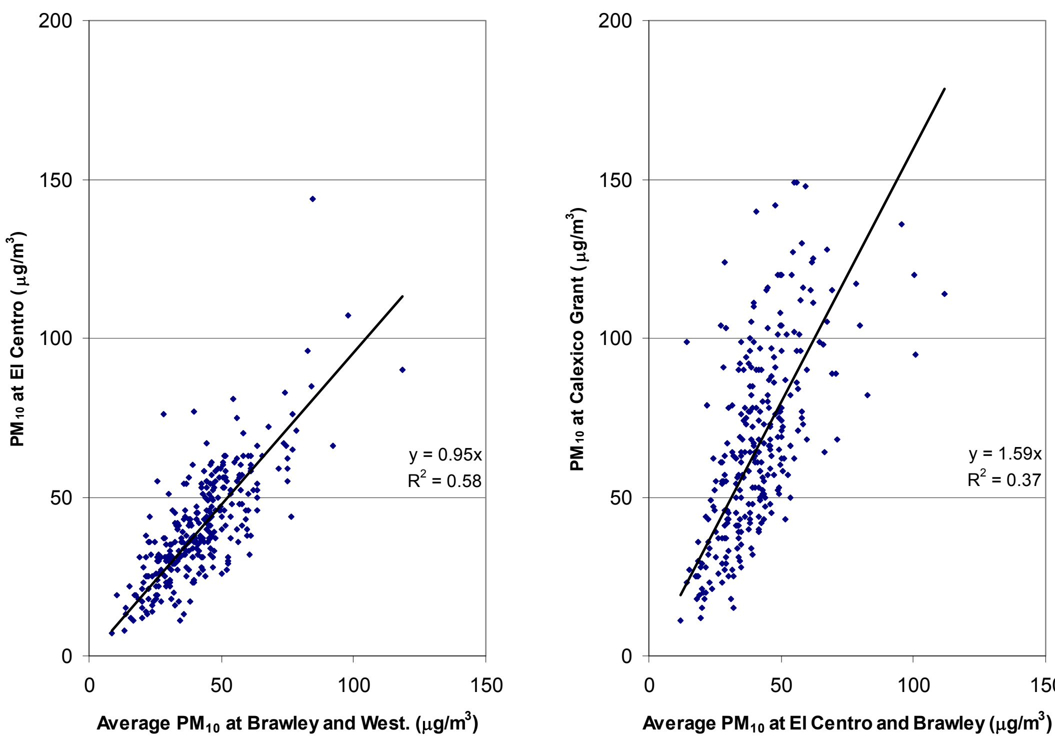


**Figure V.1 Plot of $PM_{10}$ concentrations at the El Centro station vs. average $PM_{10}$ concentrations at the Brawley and Westmorland stations (left), and plot of $PM_{10}$ concentrations at the Grant station vs. average $PM_{10}$ concentrations at the El Centro and Brawley stations (right).**

[30] For both Calexico Grant and Calexico Ethel, values of $R^2$ are significantly greater with El Centro than with Brawley or Westmorland, and significantly lower with Niland (see Figures V.A.22-V.A.23).

Both these differences, illustrated in Figure V.1 above (using the Grant and the El Centro stations as examples), are predominantly the result of the impact of Mexicali emissions. However, we determined in Section 2.2.2 that a portion of the incremental $PM_{10}$ concentrations at Calexico stations (relative to non-Calexico stations) is due to US emissions alone. Conservative estimates of the impact of US emissions alone (assuming no carry-over of Mexican $PM_{10}$) can be obtained by analysis of days with *FMTS* ≈ 0, as before. For the group of days referenced in Table V.8, we find that the average of $PM_{10}$ concentrations at the Grant station is 23 % higher (39.8 μg/m³) than the average of all $PM_{10}$ measurements at the El Centro and Brawley stations (32.4 μg/m³). Likewise, for the group of days referenced in Table V.12, we find that the average of $PM_{10}$ concentrations at the Ethel station is 10 % higher (38.8 μg/m³) than the average of all $PM_{10}$ measurements at the El Centro and Brawley stations (35.4 μg/m³).[31] Using the notation introduced earlier,

$$\mathrm{PM}_{Calexico,i} = E[Y_i] + e_{Y,i} + E[Z_i] + e_{Z,i}\,,$$

we therefore conservatively expect the impact of US emissions at Calexico and the error of prediction to be:

$$E[Y_i] = 1.23 X_i \quad \text{and} \quad \text{-40 μg/m}^3 < e_{Y,i} < 40\ \text{μg/m}^3\ \text{at Grant}$$
$$E[Y_i] = 1.10 X_i \quad \text{and} \quad \text{-40 μg/m}^3 < e_{Y,i} < 40\ \text{μg/m}^3\ \text{at Ethel}$$

where $X_i$ is the average of same-day $PM_{10}$ measurements at the El Centro and Brawley stations. Note that the errors of prediction in the above expressions (± 40 μg/m³) were taken to be the same as those observed for similar predictions of $PM_{10}$ concentrations at any non-Calexico station.[32]

The decomposition of the total $PM_{10}$ measurements at Calexico stations ($PM_{Grant,i} = 1.59\ X_i + e_i$, with -75 μg/m³ $< e_i <$ 75 μg/m³ in 99% of cases, and $PM_{Ethel,i} = 1.47\ X_i + e_i$, with -75 μg/m³ $< e_i <$ 75 μg/m³ in 99% of cases, as shown in Figure V.A.24) are then:[33]

$$\begin{aligned} Y_{Grant,i} &= 1.23 X_i + e_{YGrant,i} \quad \text{with} \quad \text{-40 μg/m}^3 < e_{YGrant,i} < 40\ \text{μg/m}^3 \\ Z_{Grant,i} &= 0.36 X_i + e_{ZGrant,i} \end{aligned} \tag{7}$$

[31] Measurements at the Niland and Westmorland stations were not included in these calculations to allow consistent comparison with the regressions of Figures V.A.17-V.A.20.
[32] The rationale for this assumption is that there would be no large dissimilarity between the Calexico area and areas surrounding other Imperial County monitors in the absence of emissions from Mexico.
[33] Note that no information can be deduced about the error of prediction for the impact of Mexican emissions ($e_{Z,i}$) since Z and *Y* are not expected to be uncorrelated variables. Both experience and good judgment however indicate that this error term can be *very* large on days when favorable meteorological conditions combine with high emission levels in Mexicali to cause high PM10 cross-border transport into Calexico.

$$Y_{Ethel,i} = 1.10 X_i + e_{YEthel,i} \quad \text{with} \quad -40\ \mu g/m^3 < e_{YEthel,i} < 40\ \mu g/m^3$$
$$Z_{Ethel,i} = 0.37 X_i + e_{ZEthel,i} \tag{8}$$

To summarize, it is the impact of Mexican emissions at Calexico stations that causes the slopes of the linear regressions of Figures V.A.24 to deviate so significantly from 1. In addition, the scatter around the linear fits is greater than seen in Figures V.A.17-V.A.20 (as evidenced by lower values of $R^2$) because of the component of Mexican impacts that doesn't correlate with $PM_{10}$ concentrations at El Centro or Brawley (i.e., the part $e_{Z,i}$ of $Z_i$ that doesn't correlate with $X_i$).

**Method for Analysis of Potential "But-For" Exceedences.** Estimates of $Y_{Grant}$ and $Y_{Ethel}$ on exceedance days will be made using information about same-day measurements at other stations (using Equations 7 or 8). Based on relationships in $PM_{10}$ measurements between non-Calexico stations (page V.20), the prediction errors will be assumed to be ± 40 µg/m$^3$ if the average of measurements at El Centro and Brawley is used, and ± 50 µg/m$^3$ if measurements at only one of these two stations are available for prediction.

## 2.3 Other Analyses

### 2.3.1 Approach III: Analysis of Sample Filters

**Background and Limitations.** USEPA guidelines suggest analysis of ambient sample filters for specific types of particles emanating from across the border. The most common method of source apportionment relies on elemental analysis of filter samples (i.e. analysis of the concentrations of chemical constituents, such as nitrate, chloride, or sulfur). This is referred to as receptor modeling and it applies chemical mass balances to apportion observed levels of pollutants in a sample to several independent sources of known emission characteristics (referring to the composition of emissions from these sources).

A 1992-1993 Cross Border Transport Study performed receptor modeling for analysis of the particles collected in areas within Imperial County where exceedences have been recorded.[34] Important results of this study are summarized here (Note: the page numbering in this subsection corresponds to that of a final report by the Desert Research Institute):[35]

[34] Chow J.C., Watson J.G., Green C.M., Lowenthal D.H., Bates B., Oslund W., Torres G., Cross-border transport and spatial variability of suspended particles in Mexicali and California's Imperial Valley, *Atmospheric Environment*, **34**, 2000, p. 1833-1843.

[35] Draft Final Report "Imperial Valley/Mexicali Cross-Border $PM_{10}$ Transport Study", prepared by Chow J.C. and Watson J.G., Desert Research Institute, for Bates B., USEPA, Region IX, April 21, 1995. Report available from the USEPA website at http://www.epa.gov/ttncatc1/cica/other2_e.html.

1. The study showed that it was possible to conduct source apportionment of ambient $PM_{10}$ to the extent that contributions could generally[36] be determined from source categories exhibiting sufficient differences, such as (i) geological dust, (ii) motor vehicle exhaust, (iii) vegetative burning, (iv) charbroil cooking, (v) marine aerosol, (vi) various industrial sources, and (vii) secondary aerosol. On the other hand, source sub-types within these categories typically "could not be distinguished by commonly measured chemical species…For example, within the geological dust category, it [was] not possible to distinguish contributions from resuspended road dust, windblown dust, and agricultural tilling from each other" (p. 3-1).

2. The study determined that geological dust (70-90%), motor vehicle exhaust (10-15%), and vegetative burning (4-8%) accounted for the highest contribution of $PM_{10}$ concentrations. Contributions from primary marine aerosol, secondary ammonium nitrate, and secondary ammonium sulfate were distinguishable but low (2-3% each). Although the relative source mix for both Mexicali and Calexico ambient air was similar on average, the absolute $PM_{10}$ mass concentrations and source contributions in Mexicali were approximately twice as high (on average, but up to 3-7 times higher in December/January, see p. 5-6, 7-11, and 9-5).

3. One important tracer that was hoped to help apportion ambient $PM_{10}$ into international contributions from Imperial County and from Mexico was lead. This was so because transportation fuel sold in Mexico still contained lead at the time of the study (leaded gasoline appears to have been completely phased out in Mexico in 1998),[37] while on the other hand there was no source of lead in Imperial County. Average ambient concentrations of lead in Calexico were found to be 0.038 ± 0.048 $\mu g/m^3$, approximately half of those in Mexicali (0.097 ± 0.074 $\mu g/m^3$, p. 5-4). These high Pb concentrations in Calexico provide strong evidence of cross-border PM transport from Mexico into Imperial County.

4. However, although there was no lead in Calexico that originated (initially) from the US side of the border, the presence of lead in any given air sample from Calexico could not be directly connected to international transport <u>on the day the sample was taken</u>. This is because $PM_{10}$ emissions arising from transportation activity (i.e. motor vehicle exhaust and entrained/re-suspended road dust) on the US side also contained lead. Results of the study showed that the difference in the lead content for Mexicali (0.10 ± 0.3% $\mu g/m^3$) vs. Imperial County (0.06 ± 0.06% $\mu g/m^3$) motor vehicle exhaust profiles[38] were too small to use both profiles in the same CMB analysis.

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[36] We note that even these source profiles could not easily be differentiated in all cases. For instance, it was often difficult to distinguish motor vehicle emissions from vegetative burning emissions because both types of emissions were composed mainly of elemental and organic carbon. Ibid, p. 7-11.

[37] http://economicsbulletin.vanderbilt.edu/2008/volume18/EB-08R00002A.pdf

[38] Source profiles for motor vehicle exhaust were constructed from ground-based roadside sampling at various traffic intersections and highway on/off ramps. In this way, it was hoped that automotive source profiles which

The implications of the findings of the 1992-1993 Cross-Border Transport Study for international apportionment of $PM_{10}$ in the Mexicali/Calexico area are the following:

1. The gradient of ambient lead concentration from Mexicali to northern Imperial County can serve to provide some evidence concerning the depth of intrusion of Mexican emissions into Imperial County. The study found that lead was present in ~2 times smaller concentrations in Calexico air samples relative to Mexicali air samples, in lower concentrations still at El Centro and Holtville, and only in trace amounts at Brawley and Niland (p. 5-13). We conclude that the impacts of Mexicali activity-related PM decrease strongly with distance[39] and are negligible over ranges >15-20 km. Given however that the distance between Calexico stations and the US-Mexicali border is <1 mile, the potential impacts of Mexicali emissions at Calexico monitors under conditions favorable to stagnation and cross-border transport are very significant.
2. Although it is possible to apportion ambient $PM_{10}$ in both Calexico and Mexicali to source categories such as geological dust or vegetative burning, it was not possible to apportion ambient $PM_{10}$ to source sub-categories classified by international origin. In other words, it was not possible to distinguish, for example, between geological dust from Imperial County vs. geological dust from Mexico, or to accurately apportion motor vehicle exhaust PM into contributions from Mexican and US sources *in spite of the difference in fuel lead content.* This finding (i.e., that the chemical profiles of emission sources on both sides of the border do not differ enough to accurately predict what portion of the $PM_{10}$ captured on Imperial County filters originates in Mexico) was confirmed in another study led by CARB in 2001.[40]

**Filter Analysis for Source Apportionment in the Present "But-For" Transport Analysis.** Color photographs of SSI filters corresponding to Calexico measurements on December 21, 2006 and December 25, 2006 are shown in Attachment C. Visual analysis reveals a higher loading of organic/elemental carbon on these filters than is usually observed, consistent with high levels of combustion-source PM. Given the very limited use that filter analysis can serve in apportioning ambient PM to Mexicali versus Imperial County sources, chemical analyses of the filter loadings were not conducted.[41] Consequently, analysis of filters will not be part of the weight of evidence in the present attainment demonstration.

represented the actual mixture of vehicles in operation were obtained. This method was chosen because of the inherent difficulty of measuring mobile source particulate emissions. Note that these profiles are unavoidably affected by vehicle-related suspended road dust.

[39] This is of course explained by increasing dispersion of pollution with distance. We can then also infer that high impacts associated with long-range transport (which we know occurs during e.g. high wind events) can only result from levels of emissions *much* higher than those due to human activity.

[40] As part of the year 2001 Imperial County SIP development, CARB performed chemical mass balance receptor modeling using 1995-1996 PM data and new source profiles for U.S. versus Mexico gasoline combustion sources (which differ mainly in sulfur contents). Even using the new source profiles, the difference in the relative contributions between gasoline combustion sources in the United States and Mexico could not be identified.

[41] Technical limitations preclude speciation analyses on these filters.

### 2.3.2 Approach IV: Comparison of Emission Inventories on Both Sides of the Border

USEPA guidelines suggest the comparison of $PM_{10}$ emission levels on both sides of the international border to determine the relative impact of international and domestic sources on air quality at the border. A qualitative comparison of emission sources on both sides of the border for the Calexico/Mexicali area reveals that the potential for $PM_{10}$ emissions is expected to be far greater south of the border. This is a consequence of (i) greater activity south of the border (since activity is generally a function of population), and (ii) the existence of a large number of fugitive dust sources such as vacant lands and unpaved roads in Mexicali (Figure V.A.25).

Because the only violations of the $PM_{10}$ NAAQS in Imperial County during 2006-2008 occurred on days with extremely low wind speeds (refer to Sections 3.1.1 and 3.2.1 for a description of the December 21 and December 25, 2006 episodes), windblown emissions sources are expected to have made insignificant contributions to these violations. Therefore, a comparative analysis of windblown PM sources north and south of the US/Mexico border would not be relevant. Note also that on days with little-to-no wind, farming sources contribute < 20% of the total winter emissions in Imperial County (Table V.14). Because emissions from the remaining source categories are related to human activity, in the absence of an accurate gridded emission inventory for the Mexicali area[42] we use population as a metric to estimate the relative magnitude of cumulative emissions originating from US and international sources.

**Table V.14 Imperial County Winter $PM_{10}$ Emission Inventory (2005)[a]**

| Source Category | Winter Average (tpd) |
|---|---|
| Fuel Combustion | 0.35 |
| Industrial Processes | 2.79 |
| Res Fuel Combustion | 0.16 |
| Farming | 11.55 |
| Construction | 2.01 |
| Paved Road Dust | 3.30 |
| Entrained Unpaved Road Dust | 33.71 |
| Windblown Dust | 223.79 |
| Open Areas—Urban | 0.02 |
| Open Areas—Others[b] | 191.09 |
| Unpaved Roads | 18.10 |
| Non-Pasture Ag Lands | 13.21 |
| Pasture | 1.37 |
| Waste Burning | 2.77 |
| Cooking | 0.06 |
| On-Road Mobile | 1.06 |
| Other Mobile | 0.95 |
| **Total excluding Windblown** | **59** |

[a]Source categories contributing less than 0.01 tpd were excluded from this table.
[b]Sources of dust from grasslands, dunes, and other barren lands undisturbed by humans.

[42] A new gridded inventory of the emissions of several air pollutants in Mexicali is in progress (2005 Mexicali Emission Inventory, Draft Final Report, Eastern Research Group, Inc., February 27, 2009).

In 2005, Imperial County had a total population of 164,000 people (Background Section, Table V.3) and a total winter $PM_{10}$ emission inventory (excluding windblown $PM_{10}$) of 59 tpd (Table V.14). In comparison, the Mexicali municipality[43] had a population of 878,000[44] and a total $PM_{10}$ emission inventory (excluding windblown $PM_{10}$) of 147 tpd.[45] These numbers correspond to Mexicali municipality:Imperial County ratios of 5.4:1 for population, 2.5:1 for total $PM_{10}$ emissions, and 1:2.2 for activity-related $PM_{10}$ emissions per capita (Table V.15).

**Table V.15 Imperial County vs. Mexicali Municipality Population and $PM_{10}$ emissions (2005)**

| | Imperial County | Mexicali Municipality | Mexicali:Imperial |
|---|---|---|---|
| Population | 164,000 | 878,000 | 5.4:1 |
| $PM_{10}$ emissions* (tons/day) | 59 | 147 | 2.5:1 |
| Per capita emissions* (tons/year) | 0.13 | 0.061 | 1:2.2 |

* Except windblown dust emissions

If we now assume that:

1. impacts at the Calexico-Grant station were dominated by emissions originating within a disc of radius $R$ centered around the station;[46]
2. the greater average distance to the Grant station for Mexicali sources (owing to the fact that the station is ~ 1 mile north of the border) was offset by the slight southerly wind flows observed on the days of interest;[47] and
3. the ratio of US to Mexicali emissions within the $R$-mile radius can be estimated using the ratio of populations and the 1:2.2 activity-related PM emissions per capita proportion derived for the entire Mexicali Municipality and Imperial County area;

then we can estimate the relative impact of US and Mexicali emissions at the Calexico Grant station on December 21, 2006 and December 25, 2006 simply as the weighted ratio of US and Mexican populations within the circle of radius $R$. For stagnant atmospheric conditions and slight southerly wind flow such as those observed on December 21 and 25, 2006, it is reasonable to expect that a disc of radius $R$ = 2-4 miles captures the majority of emissions pertinent to air quality at Calexico-Grant. Given that the 2005 populations of Calexico and Mexicali (cities) were 37,000 and 632,000, population estimates (based on a map of population density such as Figure V.A.27) within circles of radii ranging from $R$ = 2 miles to $R$ =5 miles are given in Table V.16. The relative impact of US and Mexicali emissions at the Grant station estimated using this approach and based on the population estimates of Table V.16 ranges from ~2:1 to ~3.5:1 for $2 \leq R$ (miles)$\leq 4$ miles. We note that this result is consistent with best estimates derived in Section 3 for the December 21, and December 25, 2006 exceedences.

[43] The distinction between the city and the municipality of Mexicali is shown in Figure V.A.26
[44] Population Demographics for the Imperial and Mexicali Valleys, California Center for Border and Regional Economic Studies, CCBRES Bulletin, Vol. 8, No. 3 & 4, March/April 2007
[45] 2005 Mexicali Emission Inventory, Final Report, Eastern Research Group, February 27, 2008.
[46] As a result of the fact that emission impacts decrease with increasing distance from the source for relatively stagnant atmospheric conditions.
[47] Again, refer to the description of the December 21 and December 25, 2006 episodes in Sections 3.1.1 and 3.2.1

**Table V.16 Population within distance *R* of the Calexico Grant Station (2005), and Associated Relative Impacts at Calexico Grant**

| *R* (miles) | US Population | Mexican Population | Mexicali:Imperial Impacts |
|---|---|---|---|
| 2 | 30,000 | 632,000 × 0.2 | 1.9:1 (~65:35) |
| 3 | 38,000 | 632,000 × 0.3 | 2.3:1 (~70:30) |
| 4 | 40,000 | 632,000 × 0.5 | 3.6:1 (~80:20) |
| 5 | 42,000 | 632,000 × 0.75 | 5.1:1 (~85:15) |

### 2.3.3 Approach V: Discussion of Dispersion Modeling Results

**Scope of the Approach.** The fifth example of analysis that states may use in a 179B "but-for" attainment demonstration is to "perform air dispersion and/or receptor modeling to quantify the relative impacts on the nonattainment area of sources located within the US and of foreign sources of $PM_{10}$ emissions." This approach involves the use of an international emission inventory coupled with information gathered from meteorological stations, air quality monitoring stations, and analysis of filters.

Because of very high technical challenges, the use of receptor modeling to determine the contribution from Mexican sources to Imperial County $PM_{10}$ exceedences is limited. Therefore, receptor modeling of the transport episodes will not be part of the weight of evidence in the present attainment demonstration.

Air dispersion modeling was conducted in 2001[48] to assess the maximum impact of US emissions on $PM_{10}$ ambient concentrations in Imperial County in 1992-1994 and 1999. Our objective here will be to show that the results the 2001 modeling exercise can be used to provide supporting evidence that, in the absence of some unusual occurrence(s) resulting in unusually high levels of US-emissions (i.e., well beyond that reflected in the best inventory available to us), emissions from Imperial County would not have been sufficient to cause the observed $PM_{10}$ exceedences that occurred on December 21, 2006 and December 25, 2006.

**Description of the 2001 Modeling Analysis.** A brief summary of the 2001 modeling analysis is as follows:

- Modeling was conducted using CALMET/CALPUFF;
- Information about emissions in Imperial County relied on the SCOS inventory (1997 emissions) with 2-km and 5-km resolutions (that inventory was adjusted for seasonal variations and scaled up according to population increases; USEPA [49] found this scaling to be adequate);

[48] Imperial County $PM_{10}$ Attainment Demonstration, ENVIRON report prepared for the ICAPCD, July 2001. Included as Attachment D of this Appendix.
[49] *Clean air Act Finding of Attainment; California-Imperial Valley Planning Area; Particulate Matter of 10 Microns or less*. Federal Register **66** (203) October 19, 2001, p. 53108.

- The Mexicali inventory was found to be grossly inadequate, therefore it was not included in the modeling;
- $PM_{10}$ background concentration of 25 μg/m$^3$ were assumed in all cases (USEPA[50] also found this to be conservative);
- Modeling was conducted for each day for which exceedences were recorded in Imperial County in 1992-1994, and for 4 full years (1992, 1993, 1994, and 1999). Reported results included yearly maximums and yearly averages of $PM_{10}$ concentration at each station for each of the above 4 years.

**Limitations of the 2001 Modeling Analysis.** USEPA found that the modeling inventory used was inadequate to find the maximum 24-hour $PM_{10}$ concentrations resulting from US emissions alone. This is because all calculations were performed based on seasonal-average emissions. Therefore, the analysis did not demonstrate that on peak days—when emissions might be significantly greater than the seasonal average—the NAAQS would not have been exceeded in the absence of emissions from Mexico. (Note here that the greatest variations from the average inventory are in wind-related emissions, and that all Calexico exceedences currently under consideration are low-wind days.)

Given the sensitivity of the 24-hour $PM_{10}$ NAAQS to the modeling inputs, and the small margin in demonstrating attainment (i.e., the maximum predicted 24-hour $PM_{10}$ concentration in 1994 was 140.5 μg/m$^3$ at Grant),[51] USEPA concluded that the 2001 modeling analysis could not be confidently relied upon for a conservative estimate of the maximum 24-hour $PM_{10}$ concentration in the 4-year time period modeled.

**Implications of the Results of the 2001 Modeling Analysis in the Present But-For Demonstration.** In spite of the above limitation, USEPA found that the 2001 modeling procedure was adequate to assess the annual average $PM_{10}$ concentration in Imperial County from US emissions.[52] The reason for this different position was that USEPA found that the US-inventory used in the model was "the best available inventory and information at [the] time" to represent annual average $PM_{10}$ emissions.

We infer that USEPA seemed satisfied with the 2001 modeling results obtained when using an acceptable US emission inventory. That implies that the 2001 modeling approach itself provides acceptable predictions of reality "but-for" Mexican emissions given a sufficiently accurate set of inputs.

[50] *Clean air Act Finding of Attainment; California-Imperial Valley Planning Area; Particulate Matter of 10 Microns or less*. Federal Register **66** (203) October 19, 2001, p. 53108.
[51] In other words, the maximum predicted $PM_{10}$ concentration at Calexico Grant in 1994 might have exceeded the federal standard if emission inputs as little as 8% higher had been used.
[52] *Clean air Act Finding of Attainment; California-Imperial valley Planning Area; Particulate Matter of 10 Microns or less*. Federal Register **66** (203) October 19, 2001, p. 53108. EPA stated that "the use of [the modeling inventory developed for the 2001 modeling] to represent average annual $PM_{10}$ concentrations is an acceptable approach."

Let us now consider US-emissions in Imperial County on the exceedence days under consideration (December 21, 2006 and December 25). As discussed previously, wind speeds on these days were very low.[53] Even if we assume that windblown dust emissions on these days were ~25% of the seasonal winter average (when in reality windblown emissions were likely zero), then the total levels of emissions on these days were <115 tons/day according to Table V.14. We base the argument below on the observation that the levels of emissions on the 4 exceedence days of present interest were therefore less than those used for any day modeled in the 2001 exercise (>147 tons/day of $PM_{10}$ for winter days, and >339 tons/day of $PM_{10}$ for summer days).

Assume that meteorological conditions of December 21, 2006 were similar to meteorological conditions on any one of the days modeled in the 2001 exercise (denoted as Day X); this seems reasonable given the nearly 1500 days covered by the 4 full years of modeling. Given that the level of emissions on December 21, 2006 was less than the level of emissions on Day X, we conclude that an acceptable prediction of the December 21, 2006 ambient air quality has lower $PM_{10}$ concentrations at the Imperial County monitors than values predicted by the 2001 modeling exercise for Day X. Because $PM_{10}$ concentrations predicted by the 2001 modeling for all days modeled (including day X) were below 150 µg/m$^3$ at all Imperial County stations,[54] we can conclude that acceptable dispersion modeling predictions for December 21, 2006 would not exceed the NAAQS in the absence of Mexican emissions.[55] The same argument also holds for December 25, 2006.

[53] For example, maximum hourly wind speeds at the Calexico Grant station on December 21, 2006,and December 25, 2006 were 2 and 1 knots, respectively (with 24-hour averages of 0.4 and 0.5 knots); and maximum hourly wind speeds at the Calexico Ethel station were 2 and 3 knots, respectively (with 24-hour averages of 1.1 and 1.4 knots).

[54] The highest predictions of 24-hour $PM_{10}$ concentrations in the 4-year period were 86 µg/m$^3$, 131 µg/m$^3$, 141 µg/m$^3$, 113 µg/m$^3$, and 100 µg/m$^3$ at the Brawley, Calexico-Ethel, Calexico-Grant, El Centro, Niland, and Westmorland stations, respectively.

[55] Note that this conclusion has been reached without additional modeling, relying only on the following 3 assumptions: (i) the 2001 model itself produces acceptable predictions of air quality in IC "but-for" Mexican emissions given sufficiently accurate meteorological and emissions input data, (ii) there is at least one of the nearly 1500 days modeled that has meteorological conditions similar to those of December 21, 2006, and (iii) the emission inventory in Imperial County on December 21, 2006 was lower than the inventory for day X.

# 3 Discussion and Analysis of Potential Transport Episodes

## 3.1 December 21, 2006

### 3.1.1 Description of the Episode

On December 21, 2006, one filter-based monitor in the ICAPCD recorded an exceedence of the $PM_{10}$ NAAQS of 150 µg/m³. Because SSI measurements for that day were only acquired at the Calexico-Grant and the El Centro station,[56] 24-hour average BAM $PM_{10}$ results at the Niland, Westmorland, and Brawley stations are also reported here (Table V.17). It should be noted that at the present time, BAM data is polled by the CARB for inclusion into the Air Quality Index for forecasting purposes only.

**Table V.17 $PM_{10}$ air quality at Mexicali monitors on December 21, 2006**

| Monitor | AIRS No. | SSI Monitor (µg/m³) | BAM monitor (µg/m³) |
|---|---|---|---|
| Niland | 60254004 | - | 25 |
| Westmorland | 60254003 | - | 52 |
| Brawley | 60250007 | - | 55 |
| El Centro | 60251003 | 54 | - |
| Calexico-Grant | 60250004 | **171** | - |

The entries in Table V.17 are arranged to visually demonstrate the gradient of $PM_{10}$ concentrations from north to south. As can be seen, the measurement registered at Calexico Grant is at least seven times as high than the measurement recorded at the most northerly monitoring station of Niland, and three times as high as the measurement recorded a few miles north at the El Centro station. The measurements recorded at all non-Calexico stations are in the range of 25-55 µg/m$^3$ and do not indicate that there was a county-wide $PM_{10}$ problem on December 21, 2006.

Because December 21, 2006 was not a scheduled run day, no SSI measurements were acquired at Mexicali stations, and the only information about Mexicali air quality on that day is a 10-hour BAM reading of 262 µg/m³ at the UABC monitor. However, SSI measurements acquired on December 19, 2006 (115, 137, and 286 µg/m³ at the Conalep, Cobach, and Progresso monitors) reveal that $PM_{10}$ air quality levels in Mexicali were elevated just two days earlier. The spatial distribution of the 24-hour $PM_{10}$ concentrations that were measured at Imperial County and Mexicali monitoring sites on December 21, 2006 is shown in Figure V.2. The strong $PM_{10}$ concentration gradient from south to north provides strong evidence of $PM_{10}$ transport from Mexico into Imperial County.

[56] On occasion, scheduled filter runs are voided due to operational malfunctions. These missing data points require the acquisition of “make-up” measurements on days that fall outside the normal one-in-six day schedule. December 21, 2006 was such a “make-up” day.

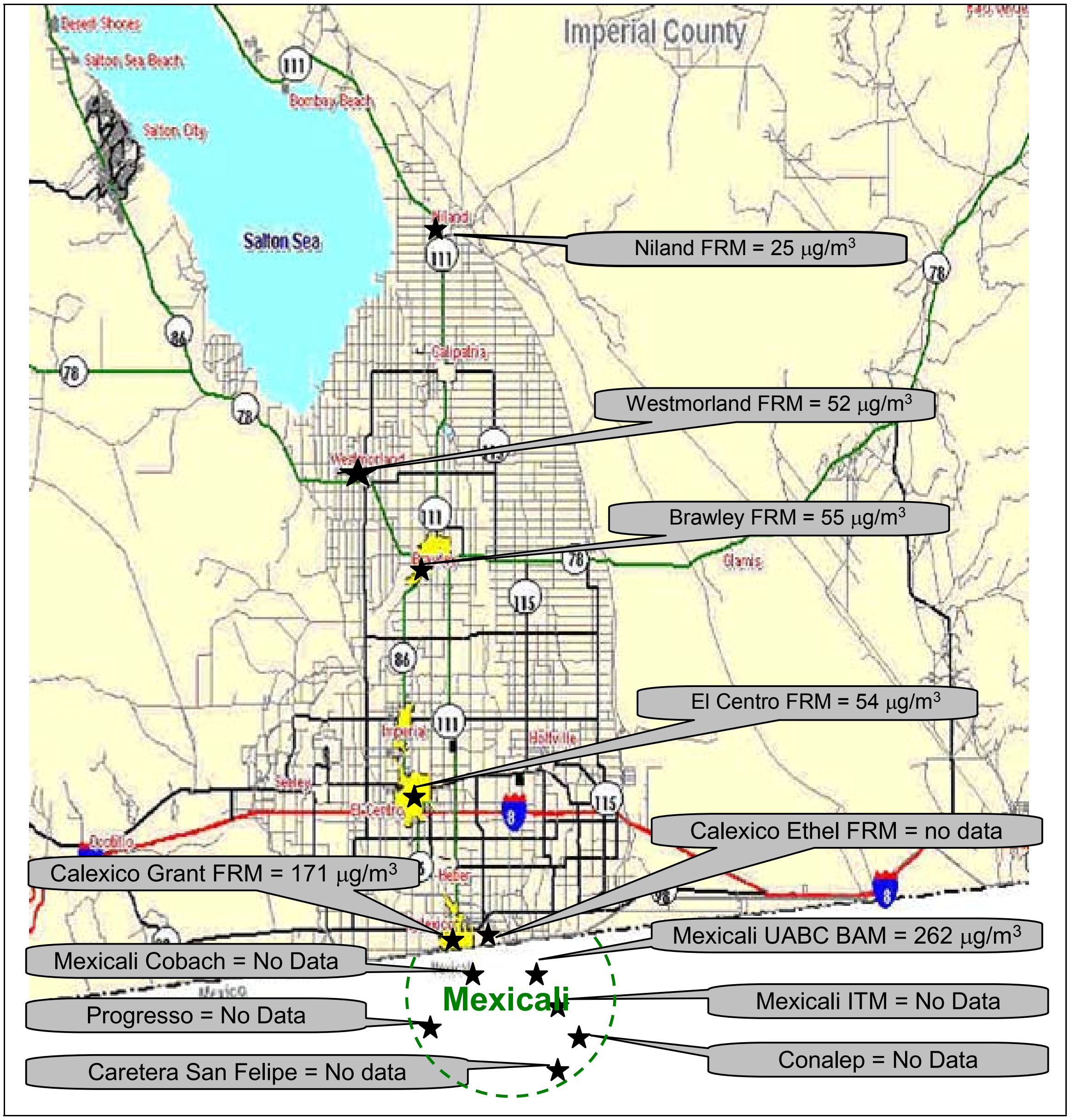


**Figure V.2 Spatial Distribution of 24-Hour PM$_{10}$ Concentrations in Imperial County and Mexicali for December 21, 2006**

**Meteorological Data: Surface Winds.** Hourly wind data collected on December 21, 2006 at the Imperial Airport and at Calexico monitoring stations are presented in Table V.18, while surface wind data recorded in Mexicali are reported in Table V.19. The information in these tables confirms that stagnant and light winds were prevalent on that day, with 24-hour average wind speeds in Calexico <1.5 knots and similarly low-wind conditions in Mexicali. Combined with air flow from the south (as discussed below), these were ideal meteorological conditions in the border region to cause PM$_{10}$ pollution in Mexicali to impact Calexico monitors.

**Table V.18 Hourly Wind Speeds (WS, knots) and Wind Directions (WD) at US stations near Calexico on December 21, 2006**

| | Imperial Airport | | Calexico-Grant | | Calexico-Ethel | |
|---|---|---|---|---|---|---|
| Time | WS | WD | WS | WD | WS | WD |
| 0 | 0 | Calm | 0.1 | SE | 1 | S |
| 1 | 0 | Calm | 0.1 | N | 1 | NW |
| 2 | 3 | SW | 0.1 | ESE | 1 | WNW |
| 3 | 0 | Calm | 0.1 | WD | 1 | SSW |
| 4 | 3 | West | 1 | WD | 2 | WSW |
| 5 | 0 | Calm | 0.1 | ENE | 0.1 | SW |
| 6 | 0 | Calm | 0.1 | N | 1 | NW |
| 7 | 0 | Calm | 0.1 | SE | 1 | SE |
| 8 | 0 | Calm | 0.1 | SW | 1 | WSW |
| 9 | 0 | Calm | 0.1 | SW | 1 | WSW |
| 10 | 0 | Calm | 0.1 | SSE | 1 | E |
| 11 | 0 | Calm | 0.1 | SW | 1 | NE |
| 12 | 0 | Calm | 1 | S | 1 | NW |
| 13 | 0 | Calm | 0.1 | WSW | 0.1 | N |
| 14 | 0 | Calm | 1 | SW | 1 | NW |
| 15 | 4 | East | 0.1 | W | 1 | E |
| 16 | 0 | Calm | 0.1 | NNE | 2 | ENE |
| 17 | 0 | Calm | 1 | ENE | 2 | E |
| 18 | 0 | Calm | 0.1 | ESE | 1 | NE |
| 19 | 0 | Calm | 0.1 | SW | 1 | SW |
| 20 | 2 | SW | 0.1 | SE | 1 | SSE |
| 21 | 0 | Calm | 2 | ESE | 1 | ESE |
| 22 | 0 | Calm | 1 | E | 1 | SSE |
| 23 | 0 | Calm | 0.1 | NNW | 1 | SW |
| **24-hr avg** | **0.5** | | **0.4** | | **1.1** | |

**Table V.19 Hourly Wind Speeds (WS, in knots) and Wind Directions (WD) recorded in Mexicali on December 21, 2006**

| | Mexicali Airport | | Mexicali-UABC | | Mexicali-Cobach | | Mexical-ITM | | Mexicali-Carretera | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time | WS | WD | WS | WD | WS | WD | WS | WD | WS | WD |
| 0 | 0 | - | 2 | - | 1 | ENE | 3 | SSW | 0 | - |
| 1 | 0 | - | 1 | - | 1 | NE | 1 | ESE | 0 | - |
| 2 | 3 | S | 1 | - | 2 | ENE | 2 | WSW | 0 | - |
| 3 | 0 | - | 1 | - | 2 | SSE | 2 | WSW | 0 | - |
| 4 | 0 | - | 2 | - | 2 | E | 2 | W | 1 | - |
| 5 | 0 | - | 1 | - | 1 | NE | 2 | NW | 1 | - |
| 6 | 0 | - | 2 | - | 1 | NE | 2 | ENE | 1 | - |
| 7 | 0 | - | 1 | - | 1 | ENE | 2 | SE | 0 | - |
| 8 | 0 | - | 1 | - | 2 | WNW | 1 | W | 1 | - |
| 9 | 0 | - | 2 | - | 3 | WNW | 1 | NW | 1 | - |
| 10 | 0 | - | 2 | - | 2 | ESE | 3 | ENE | 2 | - |
| 11 | - | - | 2 | - | 2 | ESE | 2 | WNW | 1 | - |
| 12 | 0 | - | 3 | - | 3 | ESE | 2 | WNW | 1 | - |
| 13 | 0 | - | 2 | - | 3 | SW | 3 | WNW | 1 | - |
| 14 | 0 | - | 3 | - | 3 | NNE | 3 | NW | 1 | - |
| 15 | - | - | 2 | - | 2 | ENE | 3 | NE | 0 | - |
| 16 | - | - | 2 | - | 2 | NE | 3 | NNE | 0 | - |
| 17 | - | - | 3 | - | 2 | NE | 3 | ENE | 0 | - |
| 18 | - | - | 2 | - | 1 | E | 3 | ESE | 0 | - |
| 19 | - | - | 2 | - | 1 | ESE | 2 | SSW | 0 | - |
| 20 | - | - | 2 | - | 1 | ENE | 2 | S | 1 | - |
| 21 | - | - | 2 | - | 2 | E | 3 | ESE | 0 | - |
| 22 | - | - | 1 | - | 2 | ENE | 2 | SE | 0 | - |
| 23 | 0 | - | 2 | - | 2 | NNW | 1 | NE | 0 | - |
| **24-hr avg** | **0.2** | | **1.8** | | **1.8** | | **2.2** | | **0.7** | |

**Meteorological Conditions: Back Trajectory Analysis.** 36-hour back trajectories arriving at the Calexico Grant station at 6 am, 12 pm, 6 pm, and 12 am PST were created for December 21, 2006. Examination of these trajectories shows very similar paths, so only the back trajectory ending at 12 pm is included here (Figure V.3). The figure indicates that the air parcel that "arrived" at Calexico Grant at 12 pm on December 21, 2006 was carried by winds of low speeds and variable direction in a circle around Calexico and along the border between Calexico and Mexicali. The relatively short length of the trajectory line provides a strong sign of stagnation, consistent with the measured wind data presented above. The winds of low speed and variable direction allowed $PM_{10}$ emissions to accumulate within the Calexico/Mexicali area, thereby causing high $PM_{10}$ ambient concentration in both areas.

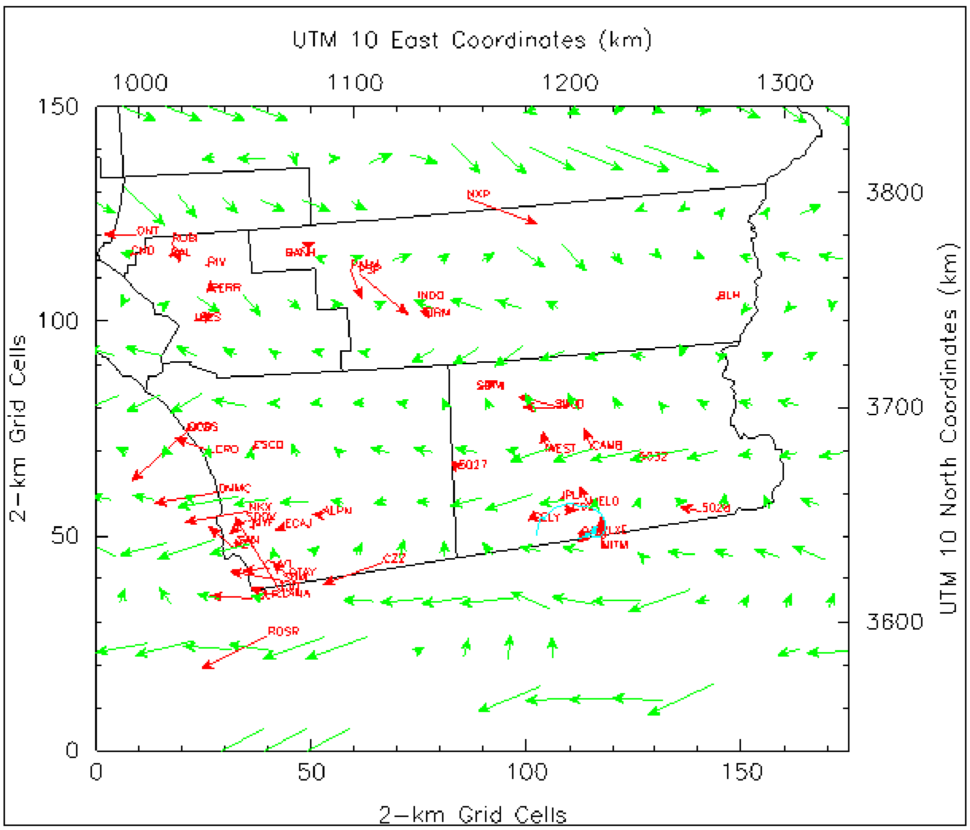


**Figure V.3 Calexico-Grant 36-hour back trajectory ending at 12 pm PST on December 21, 2006**

**Meteorological Conditions: Wind Rose Analysis.** A wind rose of hourly surface wind speeds and directions measured at the Calexico Grant station on December 21, 2006 was also created (Figure V.4). The figure shows that the prevailing wind directions on that day were SW, W, and SE. Winds of direction with a northerly component only accounted for a total of 6 hours, while winds having the potential to carry emissions from Mexico into Imperial County[57] prevailed for

[57] Of direction ranging from 85 to 265 (E to WSW) based on the location of the border.

15 hours (>60% of the day). Combined with low atmospheric dispersion resulting from low wind speeds, this result strongly supports the hypothesis that elevated $PM_{10}$ concentrations in Mexicali on that day were transported (by overflow and advection) across the US/Mexico border to impact Calexico monitors.

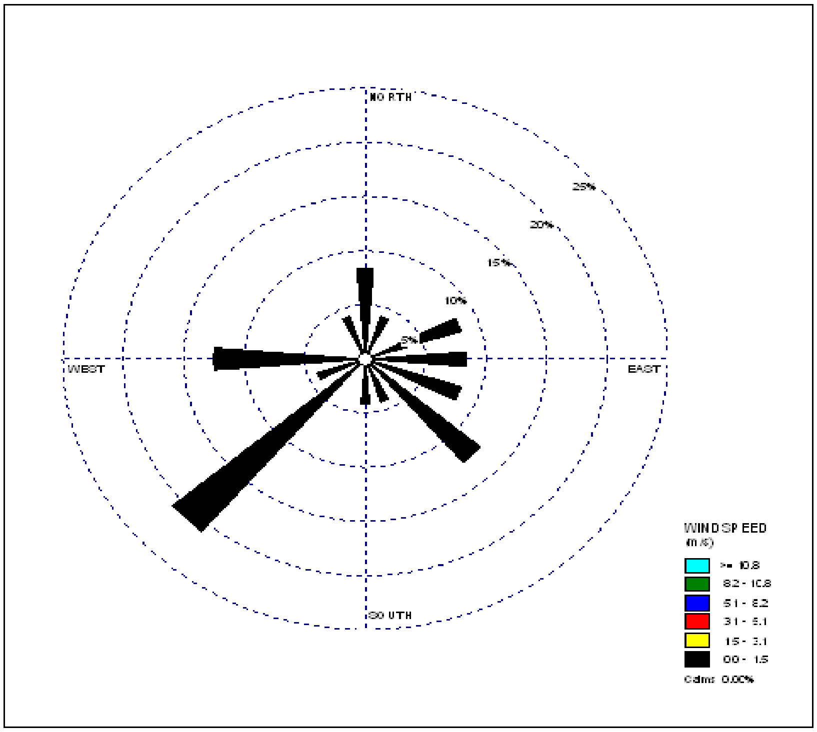


**Figure V.4 Calexico-Grant Wind Rose Analysis for December 21, 2006**

### 3.1.2 Statistical Analyses

**Approach I.** Meteorological conditions on December 21, 2006 were conducive to extremely low dispersion (the average and maximum wind speeds at the Calexico Grant station were 0.4 knots and 2 knots, respectively), and to significant transport from Mexico (*FMTS* = 0.85 at Grant). The 24-hour $PM_{10}$ measurement at Grant was 171 μg/m$^3$; therefore the station reading would not have exceeded the NAAQS but-for international emissions if the Mexicali contribution was ≥17 μg/m$^3$.

Because the number of days with meteorological conditions similar to those of December 21, 2006 is extremely small (cf. third row of Table V.6), we choose to analyze this exceedence in the context of the larger subset of days with 24-hr wind speeds at Grant <1.0 knots (first row of Table V.4, Table V.7). For that subset, the expected value of the contribution from Mexico to air quality at the Grant station is (by subtracting the bolded values from Table V.8 from the first row of Table V.4) in the range of 50-55 μg/m$^3$.

By inspection of the information in Table V.7, we observe that:

- 24-hour average wind speed at the Grant station on December 21, 2006 was the lowest of all days within the group;
- *FMTS* (or southerly flow) at the Grant station on December 21, 2006 was the second highest in the group; and
- Although the only available measurement of $PM_{10}$ concentration in Mexicali on that day was a 10-hour average BAM monitor recording of 262 μg/m$^3$ at the UABC station, that measurement is the highest within its category for all the days in the table.

All three of these factors would cause the impact of $PM_{10}$ pollution from Mexicali on December 21, 2006 to be significantly higher than the 50-55 μg/m$^3$ average for this group of days, consistent with the results of the third row of Table V.6 (pertaining to days with 24-hour average wind speeds < 1.0 knots *and FMTS* > 0.4). Note that a prediction of "excess" $PM_{10}$ concentrations at the Grant station (relative to other Imperial County stations) given the 10-hour BAM 262 μg/m$^3$ measurement at UABC and using the linear regression of Figure V.A.6 is ~160 μg/m$^3$.

Based on this information, we conclude that the position of the December 21, 2006 measurement in Table V.7 does not seem out of order, and that the "excess" $PM_{10}$ at Grant on that day was therefore in the range of ~110-150 μg/m$^3$ (corresponding to the range of "excess" $PM_{10}$ for days most similar to December 21, 2006 according to the table). After subtracting the bolded values from Table V.8,[58] this assessment results in a best estimate (according to Approach I) of the impact of Mexicali emissions to the December 21, 2006 exceedence in the range of ~100-150 μg/m$^3$. This expected international contribution is far in excess of the 17 μg/m$^3$ that the Calexico-Grant station reading was above the NAAQS.

**Approach II.** The 24-hour $PM_{10}$ measurement at Calexico Grant was 171 μg/m$^3$ on December 21, 2006. The only other Imperial County measurement available on that day is at El Centro (54 μg/m$^3$), so we will use that number to predict the impact of US emissions. The resulting predicted value of $Y_{Grant}$ for December 21, 2006 using Equation 7 with $|e_{Y,Grant}|$ <50 μg/m$^3$ is 66 ± 50 μg/m$^3$ (so up to 116 μg/m$^3$). According to this conservative analysis, US emissions alone would not have been sufficient to exceed the 24-hour $PM_{10}$ NAAQS on December 21, 2006.

### 3.1.3 Additional Evidence

**The Season of Festivals in Mexico.** From December 16th through December 24th, the country of Mexico celebrates a deeply rooted religious and social reenactment of the birth of Jesus for nine consecutive nights called "Las Posadas." This yearly Christian tradition reenacts the trials and tribulations experienced by Mary and Joseph on their travel back to Jerusalem where

[58] Which correspond to excess $PM_{10}$ at Grant due to the impact of US emissions alone, as explained in Section 2.2.2.

ultimately Jesus would be born. These festivals (Posadas) are celebrated by thousands throughout Mexicali in rural and urban neighborhoods where whole communities host atypical dinner-parties with strong religious and social intonations involving very familiar symbols such as piñatas, bonfires, fireworks and food for the nine consecutive nights.

These “Posadas” are purposely celebrated at night to allow for maximum community participation. Bonfires, as mentioned above, are provided by the host of each Posada to help keep guests warm, and are created by the burning of wood, coal, and tires. In addition to bonfires, heavy usage of legal and illegal fireworks is very common throughout the duration of the Posadas. These activities, combined with the seasonally heavy vehicular traffic created by the Christmas Season on unpaved roads in Mexicali, are major contributors to elevated $PM_{10}$ emission levels in the Mexicali/Calexico area. When stagnant and light wind conditions occur, such as those experienced on December 21, 2006, these $PM_{10}$ emissions accumulate to reach levels capable of causing high impact at neighboring Calexico monitors. Historical trends show that this occurs in the concurrent presence of stagnant conditions and/or light, southerly winds.

Figure V.5 is a photograph published in Mexicali’s *La Crónica* newspaper on December 23, 2006. The caption below the photograph expresses concern over the growing amount of dust created by the lack of watering of unpaved roads in Mexicali. The article directly correlates the lack of visibility and diminished breathing capabilities to the increased amounts of dust particles.

**DIÁLOGO DIRECTO**

Si usted desea señalar algún problema, llame a los teléfonos: 557-03-33 ó 557-48-01 Ext. 2500, de 09:00 a 14:00 y de 16:00 a 19:00 horas, de lunes a viernes, fax 557-04-24, correo electrónico: dialogo@lacronica.com

066 TELÉFONO DE EMERGENCIA

LaCrónica

SÁBADO 23 de diciembre del 2006, Mexicali, B.C. 4|A

**MÁS QUE ANTES**

Oscar Martínez Martínez, avecindado desde hace 20 años en el fraccionamiento el cóndor, en la zona oriente de la ciudad.

Comenta que después de dos décadas de vivir sin contaminación ambiental, hoy tendrá que vender su casa para cambiarse a otra área de Mexicali en donde cuando menos exista pavimento, dijo que ante la falta de regadío de las calles de tierra y el continuo trafico vehicular ocasionan que se hagan grandes polvaderas que impiden respirar con facilidad y la visibilidad, en la calle Hilario Ruelas al Oriente de la calle Novena en la delegación de González Ortega.

**Figure V.5 Dust emissions being created in Mexicali due to lack of paving.**

### 3.1.4 Weight of Evidence

Both Approach I and Approach II independently confirm that the impact of US emissions alone at the Calexico Grant station would not have been sufficient to cause an exceedence (see previous sections). Note that the best estimate from Approach II (i.e., US contribution = 66 $\mu g/m^3$, corresponding to a Mexican contribution of 171 $\mu g/m^3$ - 66 $\mu g/m^3$ = 105 $\mu g/m^3$) is consistent with more conservative estimates from Approach I (which predicted a Mexican contribution in the range of 100-150 μg/m$^3$). Based on this information, our best estimate of the fractional contribution of Mexicali emissions to the December 21, 2006 Calexico Grant measurement is 1 – 66/171 = 61%; this number is used in the analysis of the significance of emission source categories as outlined in Section 3.2 of the main SIP document.

All qualitative analyses and evidence presented in this report are consistent with the conclusions of the above quantitative estimates. The occurrence of intense Mexican holiday celebrations is supportive evidence of abnormally high levels of $PM_{10}$ emissions in Mexicali on December 21, 2006. Also, comparative analysis of Calexico vs. Mexicali emission inventories (Approach IV) and information derived from previous modeling analyses (Approach V) add further evidence to support claims (i) of high impacts of Mexicali emissions on Calexico air quality, and (ii) that Calexico-Grant station reading would not have exceeded the 24-hour $PM_{10}$ NAAQS at Calexico monitors but-for Mexican sources.

## 3.2 December 25, 2006

### 3.2.1 Description of the Episode

On December 25, 2006, one filter-based monitor in Imperial County recorded an exceedence of the 24-hour $PM_{10}$ NAAQS (Table V.20). Note that because SSI measurements for that day were not acquired at the Westmorland or Niland stations, 24-hour BAM $PM_{10}$ results at these two stations are reported instead.

**Table V.20 $PM_{10}$ air quality at Imperial County monitors on December 25, 2006**

| Monitor | AIRS No. | SSI Monitor (μg/m³) | BAM Monitor (μg/m³) |
|---|---|---|---|
| Niland | 60254004 | | 12 |
| Westmorland | 60254003 | | 27 |
| Brawley | 60250007 | 27 | |
| El Centro | 60251003 | 24 | |
| Calexico-Ethel | 60250005 | 110 | |
| Calexico-Grant | 60250004 | **248** | |

The entries in Table V.20 are arranged to visually demonstrate the change in $PM_{10}$ concentrations from north to south. The measurements recorded at stations from El Centro to Niland (in the range of 12 to 27 μg/m$^3$) do not indicate that there was a county-wide $PM_{10}$ problem on December 25, 2006. Rather, evidence of cross-border transport of $PM_{10}$ to account for the remarkably high measurements at Calexico stations can be inferred from inspection of air quality measurements recorded in Mexicali on that day (Table V.21).

**Table V.21 $PM_{10}$ air quality at Mexicali SSI monitors on December 25, 2006**

| Monitor | AIRS No. | Concentration (µg/m³) |
|---|---|---|
| Mexicali-UABC | 00020012 | **240** |
| Mexicali-Cobach | 00020014 | **437** |
| Mexicali-ITM | 00020010 | **274** |
| Mexicali-Progresso | 00020015 | **466** |
| Mexicali Conalep | 00020011 | **305** |
| Mexicali-Carretera | 00020018 | **266** |

**Spatial Plot.** Figure V.6 visually demonstrate the spatial distribution of the $PM_{10}$ concentrations measurements acquired on December 25, 2006. The average $PM_{10}$ concentration at Mexicali stations was 344 µg/m$^3$, with a maximum at the Progresso station >85% higher than the highest Imperial County measurement of 248 µg/m$^3$ at Calexico-Grant, and a minimum at the UABC station >115% higher than the 110 µg/m$^3$ measurement at the Calexico-Ethel station. Note also that within Imperial County, $PM_{10}$ measurements recorded at the Calexico-Grant and Calexico-Ethel stations were 11 times and 5 times as high, respectively, as the average of measurements at non-Calexico stations. This strong $PM_{10}$ concentration gradient from Mexicali to El Centro provides strong evidence of cross-border $PM_{10}$ transport from Mexico into Imperial County.

**Meteorological Data: Surface Winds.** Hourly wind data collected on December 25, 2006 at the Imperial Airport and at Calexico monitoring stations are presented in Table V.22, while surface wind data recorded in Mexicali are reported in Table V.23. The information in these tables confirms that stagnant and light winds were prevalent on that day, with 24-hour average wind speeds in Calexico <1.5 knots and similarly low-wind conditions in Mexicali. Combined with air flow from the south (as discussed below), these were ideal meteorological conditions in the border region to cause $PM_{10}$ pollution in Mexicali to impact Calexico monitors.

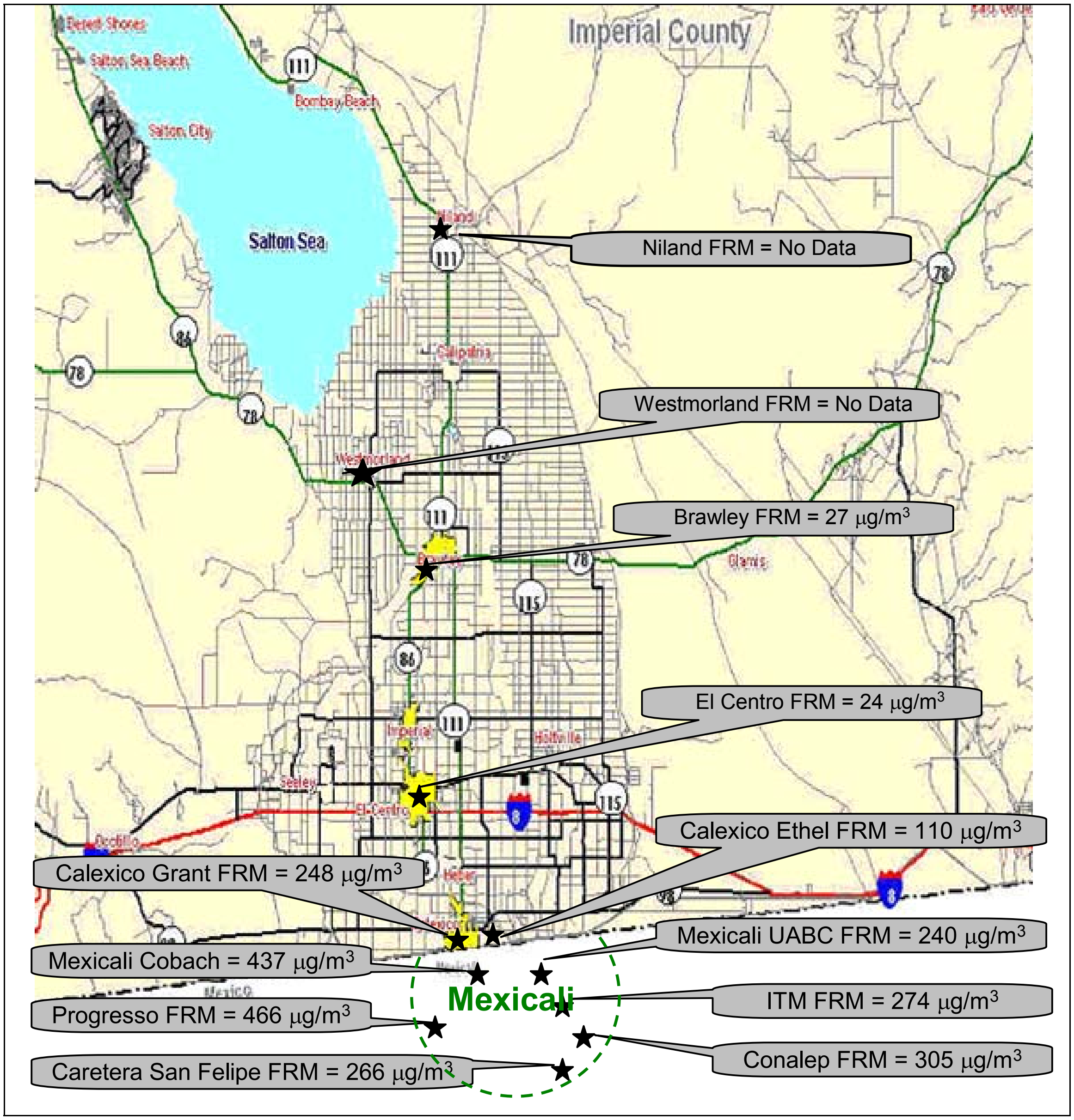


**Figure V.6 Spatial Distribution of 24-Hour $PM_{10}$ Concentrations in Imperial County and Mexicali for December 25, 2006**

**Table V.22 Hourly Wind Speeds (WS, knots) and Wind Directions (WD) at US stations near Calexico on December 25, 2006**

| | Imperial Airport | | Calexico-Grant | | Calexico-Ethel | |
|---|---|---|---|---|---|---|
| Time | WS | WD | WS | WD | WS | WD |
| 0 | 0 | Calm | 0.1 | W | 2 | W |
| 1 | 4 | West | 1 | SW | 2 | WSW |
| 2 | 3 | West | 1 | WSW | 2 | WSW |
| 3 | 0 | Calm | 0.1 | W | 3 | WNW |
| 4 | 3 | WSW | 0.1 | E | 2 | W |
| 5 | 0 | Calm | 1 | ESE | 1 | SSE |
| 6 | 0 | Calm | 1 | ESE | 1 | SSW |
| 7 | 4 | WSW | 1 | ENE | 2 | E |
| 8 | 0 | Calm | 0.1 | ESE | 2 | E |
| 9 | 0 | Calm | 0.1 | N | 0.1 | NW |
| 10 | 0 | Calm | 0.1 | W | 1 | W |
| 11 | 0 | Calm | 0.1 | NNW | 1 | WNW |
| 12 | 0 | Calm | 0.1 | NW | 1 | NE |
| 13 | 4 | East | 1 | ENE | 1 | E |
| 14 | 4 | SE | 0.1 | NE | 2 | NE |
| 15 | 0 | Calm | 1 | NNE | 2 | ENE |
| 16 | 0 | Calm | 1 | N | 2 | NE |
| 17 | 0 | Calm | 0.1 | NE | 1 | NNE |
| 18 | 3 | West | 0.1 | ESE | 1 | ESE |
| 19 | 3 | NNE | 1 | SSW | 1 | SW |
| 20 | 0 | Calm | 0.1 | N | 1 | NNE |
| 21 | 4 | WSW | 0.1 | E | 1 | NNE |
| 22 | 3 | WSW | 1 | W | 0.1 | SSW |
| 23 | 5 | West | 1 | WNW | 2 | WSW |
| **24-hr avg** | **1.7** | | **0.5** | | **1.4** | |

**Table V.23 Hourly Wind Speeds (WS, in knots) and Wind Directions (WD) recorded in Mexicali on December 25, 2005**

| | Mexicali Airport | | Mexicali-UABC | | Mexicali-Cobach | | Mexical-ITM | | Mexicali-Carretera | |
|---|---|---|---|---|---|---|---|---|---|---|
| Time | WS | WD | WS | WD | WS | WD | WS | WD | WS | WD |
| 0 | 0 | - | 2 | - | 1 | NE | 3 | WNW | 0 | - |
| 1 | 0 | - | 2 | - | 1 | ESE | 3 | SW | 0 | - |
| 2 | 0 | - | 2 | - | 1 | ENE | 3 | W | 1 | - |
| 3 | 0 | - | 2 | - | 1 | ENE | 2 | WSW | 0 | - |
| 4 | 0 | - | 1 | - | 1 | E | 2 | ESE | 0 | - |
| 5 | - | - | 1 | - | 2 | ESE | 3 | ESE | 0 | - |
| 6 | 0 | - | 1 | - | 1 | ENE | 2 | SSE | 0 | - |
| 7 | 0 | - | 2 | - | 1 | ENE | 3 | NE | 0 | - |
| 8 | - | - | 2 | - | 1 | ENE | 2 | E | 0 | - |
| 9 | - | - | 2 | - | 2 | NE | 2 | NNW | 0 | - |
| 10 | 6 | W | 2 | - | 2 | NNW | 2 | W | 1 | - |
| 11 | 0 | - | 2 | - | 2 | NNW | 2 | W | 1 | - |
| 12 | 0 | - | 2 | - | 3 | WNW | 3 | NW | 1 | - |
| 13 | 0 | - | 3 | - | 3 | N | 4 | NNE | 1 | - |
| 14 | - | - | 3 | - | 2 | E | 3 | NE | 1 | - |
| 15 | 5 | NNW | 2 | - | 2 | NE | 3 | NE | 0 | - |
| 16 | 0 | - | 2 | - | 2 | NE | 3 | ENE | 0 | - |
| 17 | - | - | 2 | - | 1 | ENE | 2 | E | 0 | - |
| 18 | - | - | 1 | - | 1 | E | 2 | NNW | 0 | - |
| 19 | - | - | 2 | - | 1 | E | 3 | W | 0 | - |
| 20 | - | - | 1 | - | 1 | E | 2 | WSW | 0 | - |
| 21 | 0 | - | 3 | - | 2 | ENE | 2 | NNE | 1 | - |
| 22 | - | - | 1 | - | 2 | WNW | 2 | NNE | 1 | - |
| 23 | 0 | - | 2 | - | 2 | E | 2 | WNW | 0 | - |
| **24-hr avg** | **0.7** | | **1.9** | | **1.7** | | **2.5** | | **0.5** | |

**Meteorological Conditions: Back Trajectory Analysis.** As before, 36-hour back trajectories arriving at the Calexico Grant station at 6 am, 12 pm, 6 pm, and 12 am PST were created for December 25, 2006. Examination of these trajectories shows very similar paths, so only the back trajectory ending at 12 pm is included here (Figure V.7). The figure indicates that the air parcel that "arrived" at Calexico Grant at 12 pm on December 25, 2006 was carried by winds of low speeds and variable direction. The major transport mechanism for this episode was high levels of Mexicali $PM_{10}$ "overflowing" into Calexico. The relatively short length of the trajectory line provides a strong sign of stagnation, consistent with the above analysis of wind speed data. The winds of low speed and variable direction allowed $PM_{10}$ emissions to accumulate within the Calexico/Mexicali area, thereby causing high $PM_{10}$ ambient concentrations.

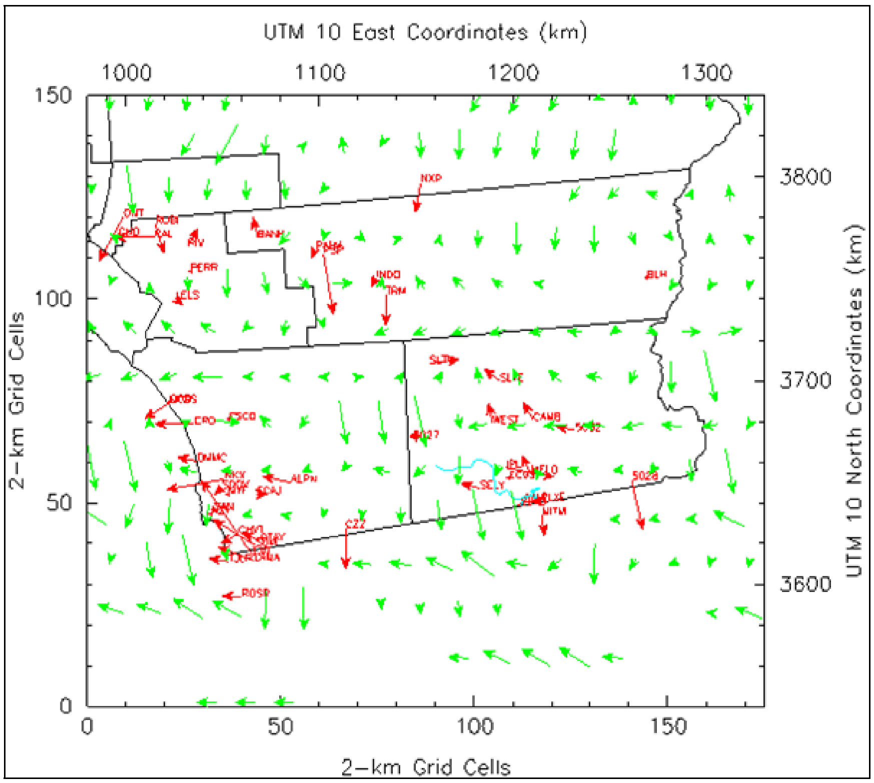


**Figure V.7 Calexico-Grant 36-hour back trajectory ending at 12 pm PST on December 25, 2006**

**Meteorological Conditions: Wind Rose Analysis.** A wind rose of hourly surface wind speeds and directions measured at the Calexico Grant station on December 25, 2006 was also created (Figure V.8). The figure shows that the prevailing wind directions on that day were ESE and W, although wind direction varied greatly. Consequently, the low wind speeds and varying wind directions allowed $PM_{10}$ emissions to drift from Mexicali to other areas including Calexico. The major transport mechanism for this episode was high levels of Mexicali $PM_{10}$ "overflowing" into Calexico.

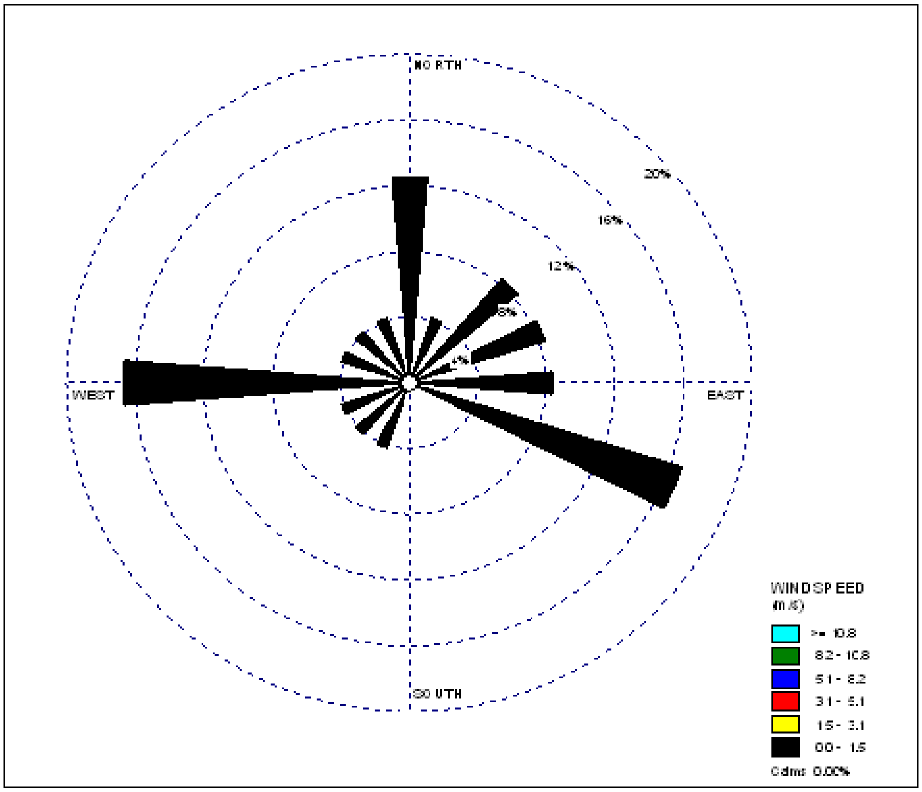


**Figure V.8 Calexico-Grant Wind Rose Analysis for December 25, 2006**

### 3.2.2 Statistical Analyses

**Approach I.** Meteorological conditions on December 25, 2006 were conducive to extremely low dispersion (the average and maximum wind speeds at the Grant station were 0.5 knots and 1 knots, respectively), and to considerable transport from Mexico (*FMTS* = 0.41 at Grant). The 24-hour $PM_{10}$ measurement at Grant was 248 μg/m$^3$; therefore if the Mexicali contribution was ≥94 μg/m$^3$ then the station would not have exceeded the NAAQS but for Mexican emissions.

The analysis for this day is similar to the analysis for the December 21, 2005 Grant measurement. By inspection of the information of Table V.7, we observe that (i) 24-hour average wind speed at the Grant station on December 25, 2006 was low relative to values for other days in this group, and (ii) southerly flow at the Grant station on December 25, 2006 was higher than that for most days within this group, and (iii) $PM_{10}$ concentrations at all Mexicali stations on December 25, 2006 were remarkably higher than those observed on all other days within the group. All these factors would cause the impact of $PM_{10}$ pollution from Mexicali on December 25, 2006 to be significantly higher than the 50-55 μg/m$^3$ average for the group of days represented in Table V.7. For example, predictions of "excess" $PM_{10}$ concentrations at the Grant station (relative to other Imperial County stations) given measured $PM_{10}$ concentrations in

Mexicali on December 25, 2006 using the linear regressions of Figure V.A.6 and are in the range of 125 μg/m$^3$-225 μg/m$^3$ (with an average of 185 μg/m$^3$).[59]

Our best prediction of the impact of Mexican emissions to the December 25, 2006 Grant measurement using the present analysis is thus in the range of 150 μg/m$^3$-200 μg/m$^3$. This is far in excess of the 94 μg/m$^3$ that the station reading was above the NAAQS.

**Approach II.** The 24-hour $PM_{10}$ measurement at Calexico Grant was 248 μg/m$^3$ on December 25, 2006. Measurements at the El Centro and Brawley stations were 24 μg/m$^3$ and 27 μg/m$^3$, so we will use their average as the best available predictor of US impacts at Calexico. The resulting predicted value of $Y_{Grant}$ for December 25, 2006 using Equation 7 is 31 ± 40 μg/m$^3$ (so up to 71 μg/m$^3$). According to this conservative analysis, US emissions alone would not have been sufficient to exceed the 24-hour $PM_{10}$ NAAQS on December 25, 2006.

### 3.2.3 Additional Evidence

**Christmas Holiday.** On December 25, 2006, the United States and Mexico celebrated Christmas. Unlike the US, Mexico begins its seasonal celebration several days before with the cultural traditions of Las Posadas. As mentioned in Section 3.1.3, the traditional celebrations begin nine days before Christmas and continue on with finale accentuations on Christmas Eve and Christmas Day. The events are chronicled in newspapers on both sides of the border. Published articles in Mexicali not only describe the deteriorating condition of air quality, but also provide evidence of the volume of fireworks and burning that takes place during these festive times. For example, every year articles are published depicting Mexican authorities confiscating voluminous amounts of illegal fireworks during the holiday season. For every illegal firework that is confiscated there are hundreds more that are not. It is not uncommon to see heavy clouds of white smoke covering Mexicali and Calexico the morning after Christmas Eve and Christmas Day. The large amount of fireworks and traditional bonfires associated with the celebrations of the Las Posadas has caused a rippling effect on Mexicali's air quality over the last couple of decades. Figures V.9 and V.10 are copies of newspaper articles published by *La Voz de la Frontera* on December 24$^{th}$ and December 25$^{th}$, respectively. The article depicted in Figure V.9 is a public announcement by the Governor of Baja California, Eugenio Walther, requesting the community to not burn tires or fireworks in order to help reduce air quality impacts. The article depicted by Figure V.10 reports that the burning of tires, wood and the setting of fireworks contributed directly to the poor air quality for Christmas day. The article further explains that the visible dense white cloud covering Mexicali during the early morning hours was a direct result of the activities associated with the previous night. The sharp contrast between the recorded concentrations of $PM_{10}$ emissions in Mexicali and those of the Imperial County suggest that

[59] Of course, the December 25, 2006 Mexicali $PM_{10}$ concentrations corresponds to highly influential points in a number of cases. A more conservative approach might use leave-one-out cross-validation: it gives a range of 90 μg/m$^3$-240 μg/m$^3$ and an average of 145 μg/m$^3$ for the "excess" $PM_{10}$ concentration at Grant.

emissions created in Mexicali were transported into Imperial County, with greatest impact in the Calexico area.

**Mexicali**
**Una Navidad limpia, pide el gobernador**

La Voz de la Frontera
24 de diciembre de 2006

Por José MERCADO

El licenciado Eugenio Elorduy Walther, gobernador del estado, hizo un llamado a la ciudadanía para que en esta navidad no lleven a cabo la quema de llantas o cohetes por los problemas de contaminación que provocan, y que procuren no exponerse a las balas perdidas por el peligro que significan.

"Todos queremos llegar a esta navidad y el año nuevo", indicó el mandatario estatal y añadió a la lista de recomendaciones evitar el viajar en auto con una persona que haya consumido alcohol "porque el mayor número de muertes violentas en el estado lo provocan los accidentes de tránsito".

Entrevistado después de la toma de protesta del nuevo secretario de Educación y Bienestar Social del Estado, licenciado Óscar Ortega Vélez, que sustituye a José Gabriel Posada Gallego, Elorduy Walther comentó de la necesidad de conservar la armonía de la familia en estas fechas de fin de año.

"Es importante hacer un llamado especial para los automovilistas para que si toman procuren mejor no manejar por el peligro que significa para ellos, su familia y la sociedad en general. Y las personas, que si ven a alguien que insiste en manejar si se encuentra tomado, mejor no se suban al auto".

**Figure V.9 Mexicali Newspaper article published on December 24, 2006**

**Mexicali**
**Una Navidad "Casi Blanca": Elorduy**

La Voz de la Frontera
26 de diciembre de 2006

Por José MERCADO

En lo que consideró una Nochebuena "casi blanca", el gobernador del Estado licenciado Eugenio Elorduy Walther dijo tener conocimiento de 258 accidentes de tránsito en toda la entidad, con dos personas muertas en Mexicali y Rosarito.

Indicó que afortunadamente no se registraron ejecuciones, aunque reconoció que esta ciudad amaneció el día 25 con un marcado nivel de contaminación, provocada por la quema de llantas, leña o cohetes. Al amanecer se apreciaba una nube densa de humo, indicó.

Referente a los accidentes de tránsito, indicó que solamente en las ciudades de Mexicali y Rosarito hubo resultados funestos, pero el resto del estado se mantuvo dentro de un nivel de aceptabilidad.

Recordó del llamado que se hizo a la población bajacaliforniana, cuando se les advirtió que lo más importante de la familia es lo que no se compra en la botica, como es el caso de mantener una buena relación de familia.

En relación a los niveles de contaminación, el titular del Ejecutivo, se refirió, a quienes llevaron a cabo la quema de llantas o cohetes, como personas que no se dan cuenta de que es el mismo aire que respiramos todos y que a final de cuentas nos afecta en la salud por igual a todos.

Indicó que afortunadamente durante la noche del 24 y para amanecer el día 25, "al menos hasta el momento en que recibí esta información", dijo, no se presentaron problemas por ejecuciones en toda la entidad, lo que es un buen síntoma.

**Figure V.10 Mexicali Newspaper article published on December 25, 2006**

### 3.2.4 Weight of Evidence

Both Approach I and Approach II independently confirm that the impact of US emissions alone at the Calexico Grant station would not have been sufficient to cause an exceedence on December 25, 2006 (see previous sections). Note that the most conservative estimate from Approach II (i.e., US contribution = 71 $\mu g/m^3$, corresponding to a Mexican contribution of 248 $\mu g/m^3$ - 71 $\mu g/m^3$ = 177 $\mu g/m^3$) is consistent with the best estimates from Approach I (which predicted a Mexican contribution in the range of 150-200 $\mu g/m^3$). Based on this information, our best estimate of the fractional contribution of Mexicali emissions to the December 25, 2006 Calexico Grant measurement is 1 – 71/248 = 71%; this number is used in the analysis of the significance of emission source categories as outlined in Section 3.2 of the main SIP document.

All qualitative analyses and evidence presented in this report are consistent with the conclusions of the above quantitative estimates. The occurrence of intense Mexican holiday celebrations is supportive evidence of abnormally high levels of $PM_{10}$ emissions in Mexicali on December 25, 2006. Also, comparative analysis of Calexico vs. Mexicali emission inventories (Approach IV) and information derived from previous modeling analyses (Approach V) add further evidence to support claims (i) of high impacts of Mexicali emissions on Calexico air quality, and (ii) that the Calexico-Grant station reading would not have exceeded the 24-hour $PM_{10}$ NAAQS at Calexico monitors but-for Mexican sources.

# 4 Conclusion

The primary purpose of a SIP is to outline a plan designed to improve air quality in an area and to demonstrate how that plan provides for attainment of air quality standards as expeditiously as possible (this is referred to as an attainment demonstration). In international areas, the SIP attainment requirements are designed so that only attainment "but-for" international emissions is required. USEPA guidelines[60] state that "for $PM_{10}$ nonattainment areas, section 179B(a) [of the CAA] provides that EPA must approve [a $PM_{10}$] SIP if (i) the SIP meets all the applicable requirements under the Act other than a requirement that such plan or revision demonstrate attainment and maintenance of the $PM_{10}$ NAAQS by the applicable attainment date, and (ii) the State demonstrates to EPA's satisfaction that the SIP would be adequate to attain and maintain the $PM_{10}$ NAAQS by the attainment date but for emissions emanating from outside the US."

An attainment demonstration for the present Imperial County 2009 $PM_{10}$ SIP therefore requires analyses to determine the contribution of international emissions to the 2006-2008 Imperial County exceedences (Table V.1). This appendix described the tools developed and used to analyze, both quantitatively and qualitatively, the impact of Mexicali emissions on near-border Imperial County stations. The results demonstrate that ambient air quality on December 21, 2006 and December 25, 2006 would have attained the 24-hour $PM_{10}$ NAAQS in the absence of impact contributions from Mexicali emissions. Given that there were no other exceedences of the $PM_{10}$ NAAQS in 2006-2008,[61] the transport analyses of the present appendix are therefore sufficient to meet the attainment demonstration requirements of the Imperial County 2009 $PM_{10}$ SIP.

[60] State Implementation Plans for Serious $PM_{10}$ Nonattainment Areas, and Attainment Date Waivers for $PM_{10}$ Nonattainment Areas Generally; Addendum to the General Preamble for the Implementation of Title I of the Clear Air Act Amendments of 1990; *Federal Register*, August 16, 1994, p. 42000

[61] After exclusion of measurements recorded on September 2, 2006, April 12, 2007, and June 5, 2007. As these measurements were strongly affected by high-wind exceptional events, the ICAPCD has submitted to the USEPA documentation seeking exclusion of these $PM_{10}$ data from regulatory determinations, as allowed by the March 2007 USEPA Exceptional Event rule (Treatment of Data Influenced by Exceptional Events; Final Rule, 40 CFR Parts 50 and 51; *Federal Register*, March 22, 2007, p. 13560) .

# Attachment A

# Supporting Figures for Appendix V

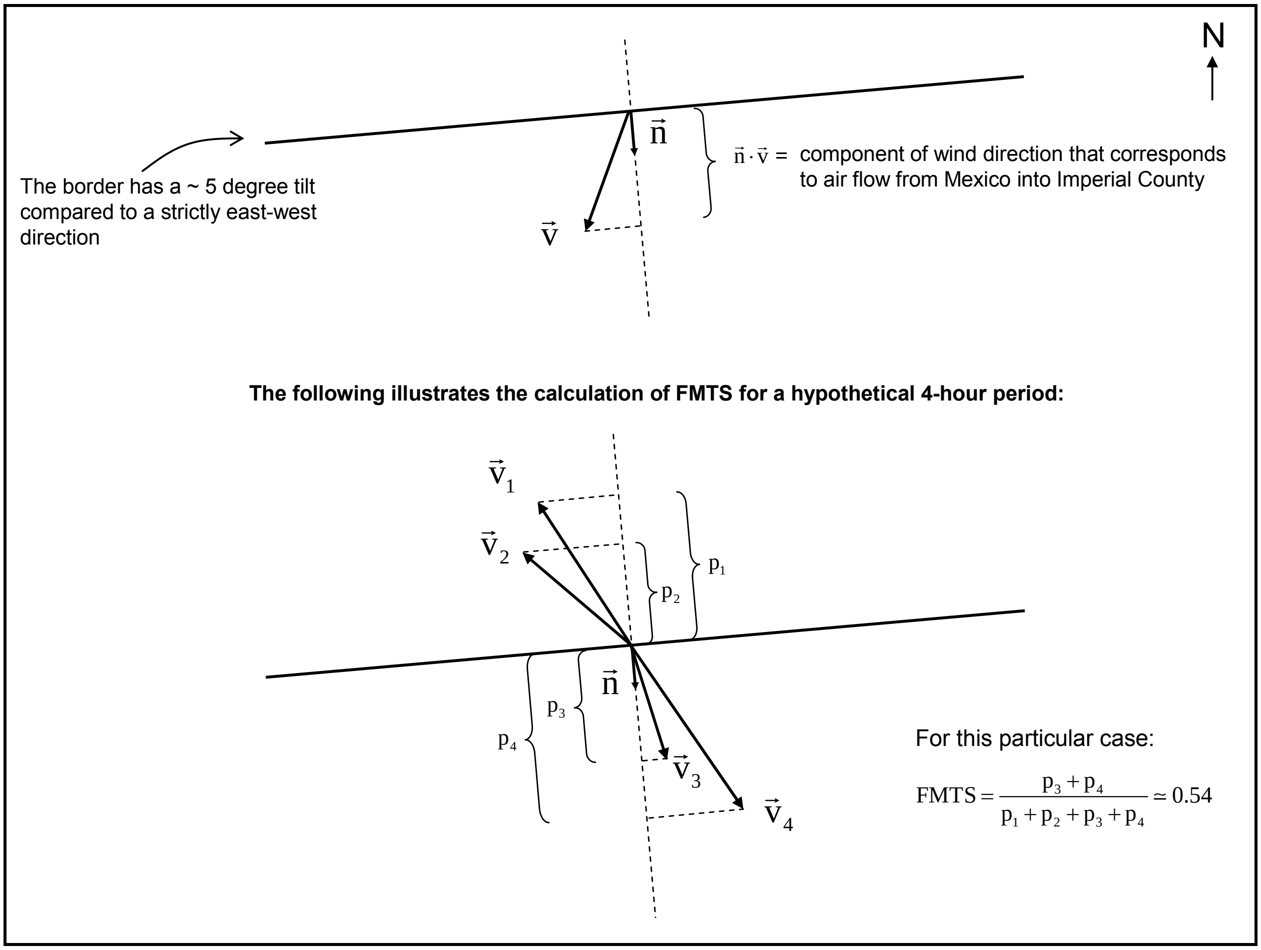


**Figure V.A.1 Graphical representation and illustration of the calculation of FMTS.** Error! Objects cannot be created from editing field codes. **is an hourly wind direction vector (pointing in the direction from which the wind in coming), and** Error! Objects cannot be created from editing field codes. **is a normal unit vector perpendicular to the US-Mexico border and pointing toward Mexicali.**

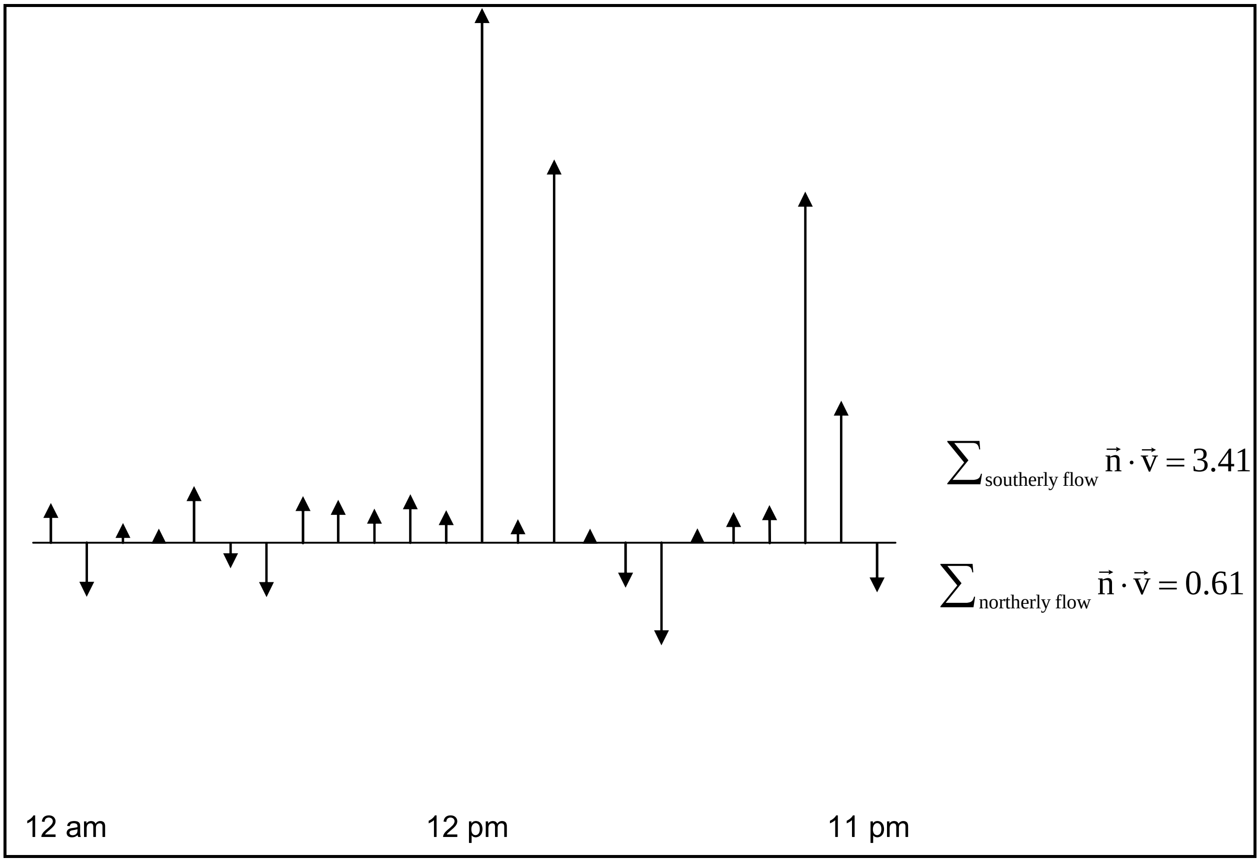


**Figure V.A.2 Example calculation of FMTS for using wind data at the Calexico Grant station acquired on December 21, 2006. The arrows are hourly values of the cross-border flow of air (i.e.** Error! Objects cannot be created from editing field codes. **in Figure V.A.1) representing the extent of both southerly (arrows pointing upward) and northerly (arrows pointing downward) air flow. On December 21, 2006, FMTS = 3.41/(3.41 + 0.61) = 0.85.**

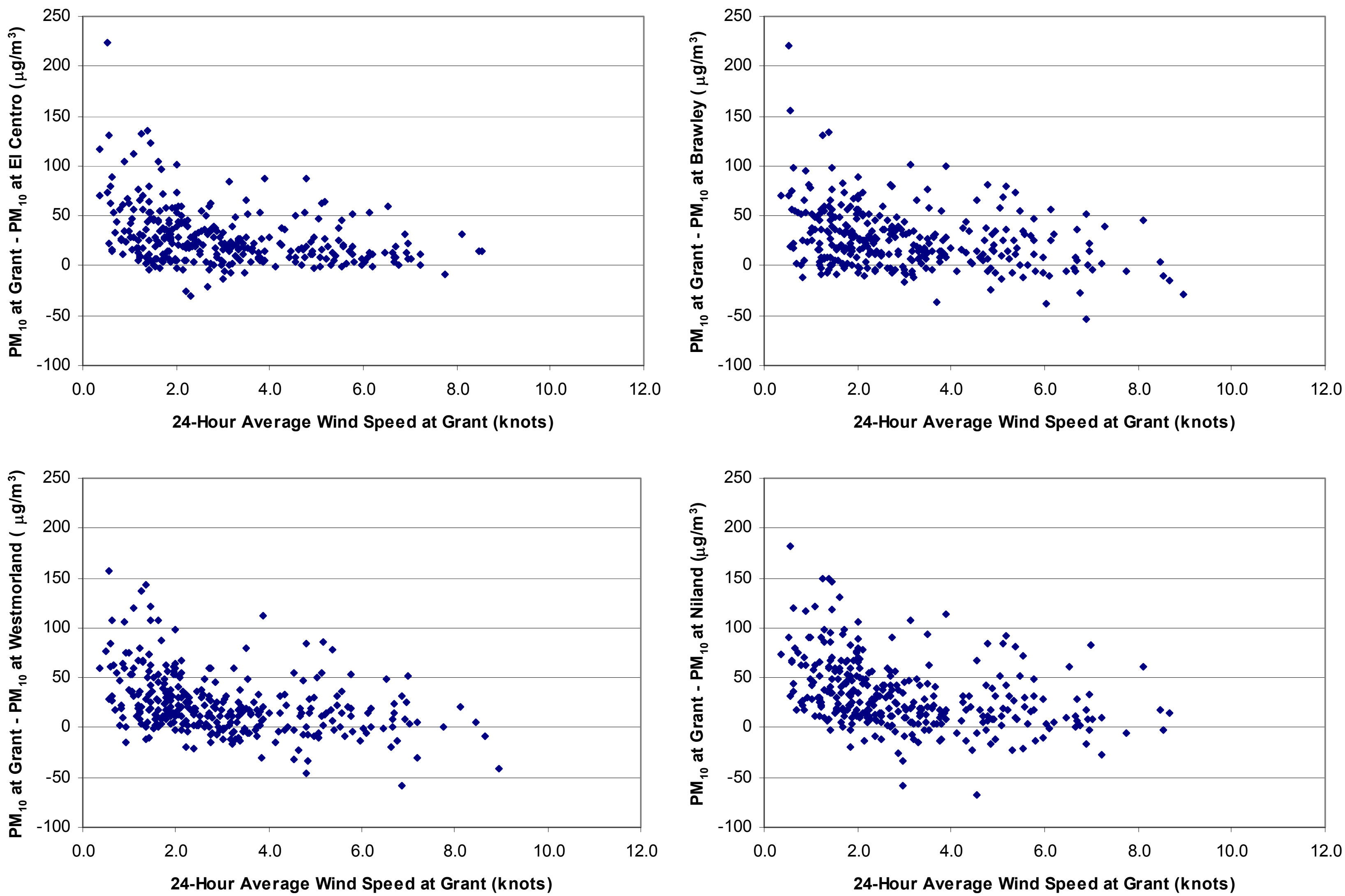


**Figure V.A.3 Effect of wind speed on excess $PM_{10}$ concentration at the Calexico Grant station (2001-2007 data).**

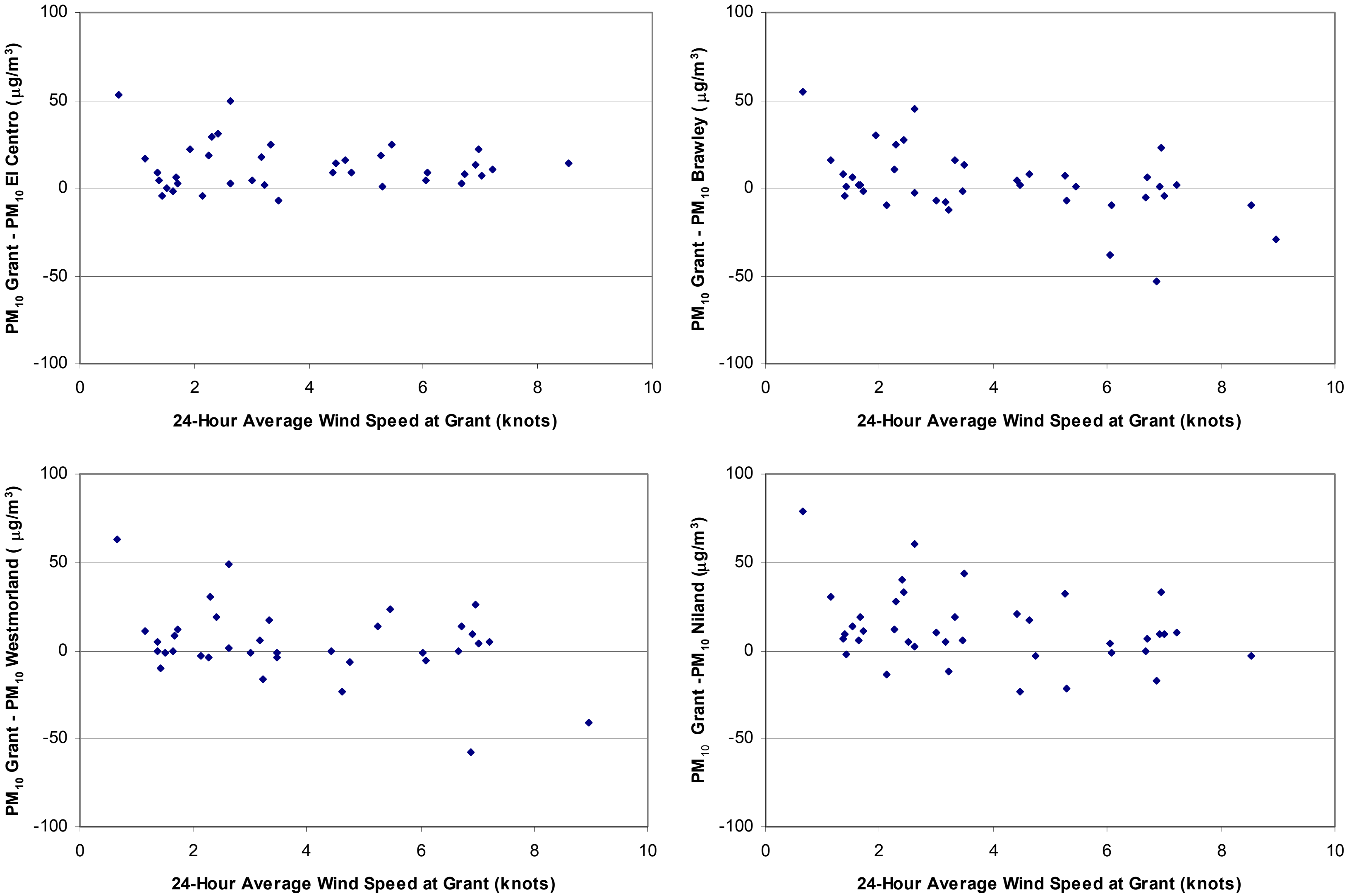


**Figure V.A.4 Effect of wind speed on excess $PM_{10}$ concentration at the Calexico Grant station when FMTS = 0-0.03 (2001-2007 data).**

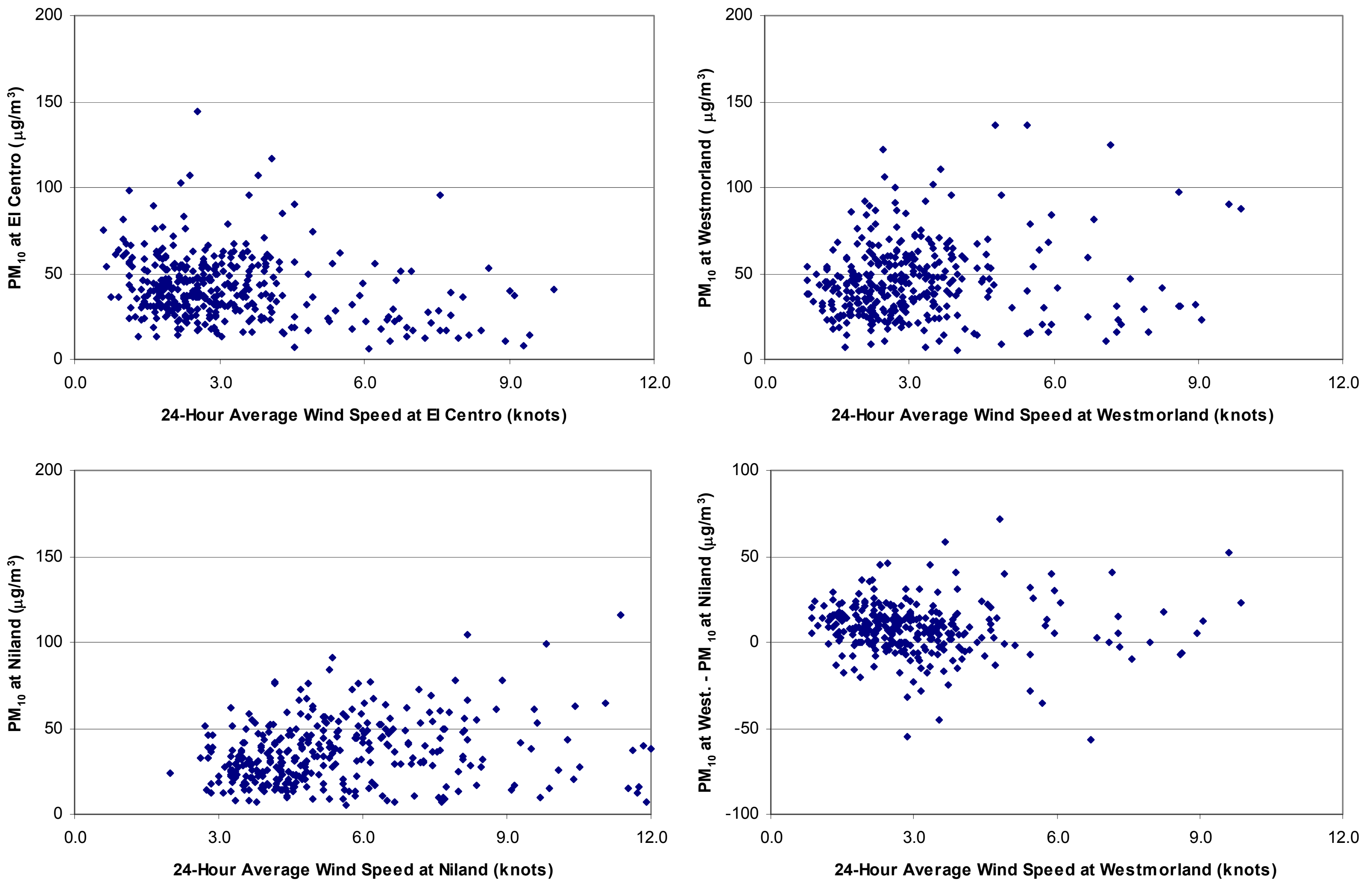


**Figure V.A.5 Effect of wind speed on the impact (or relative impact) of US emissions at non-Calexico Imperial County monitors (2001-2007 data)**

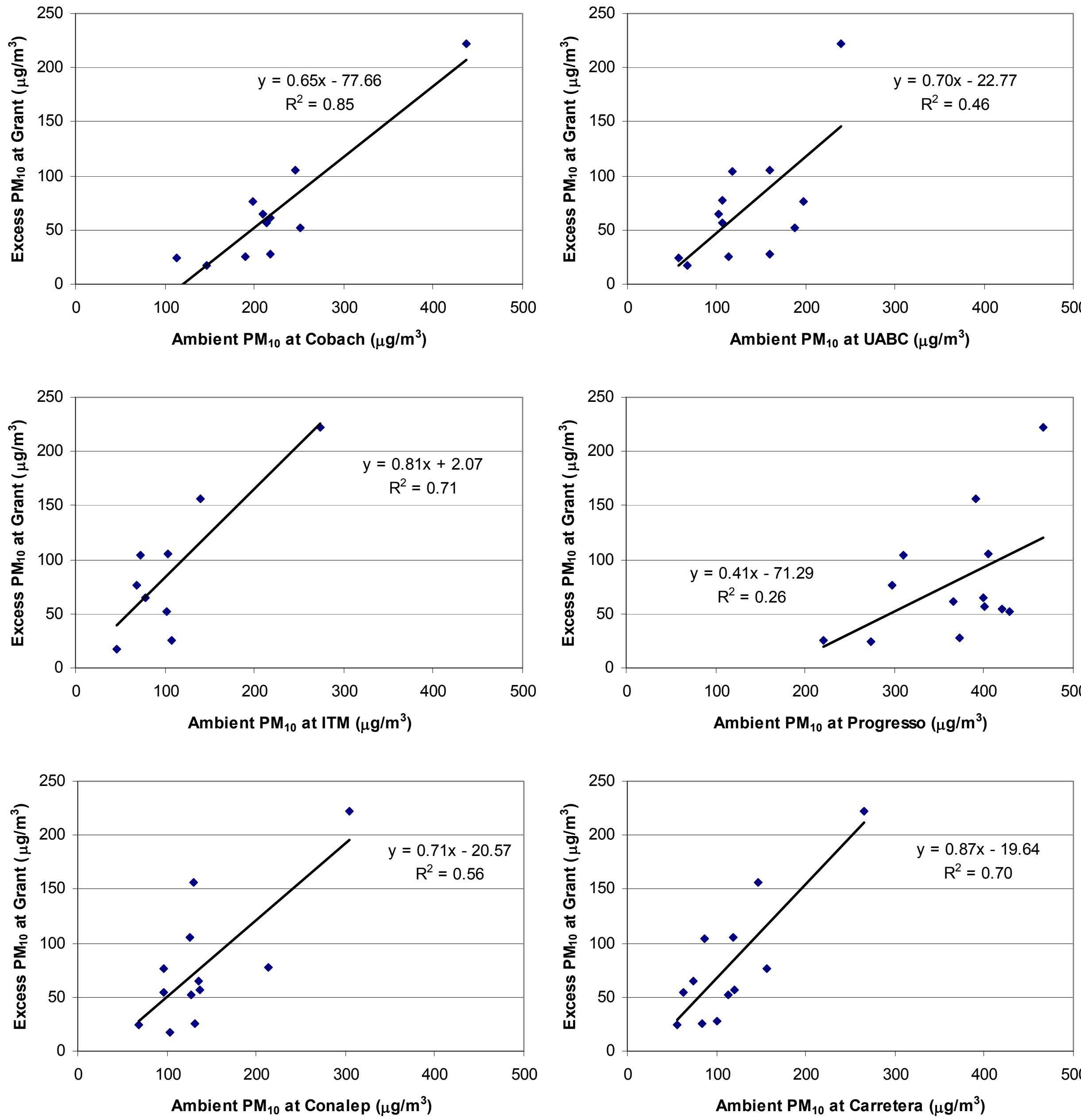


**Figure V.A.6 Plot of excess $PM_{10}$ concentration at Calexico Grant (relative to other Imperial County stations) vs. ambient $PM_{10}$ concentration at the Mexicali Cobach, UABC, ITM, and Progresso stations on days when the 24-hour average wind speed at Grant is <1.0 knot/hour and there is some southerly wind flow (FMTS >0.1).**

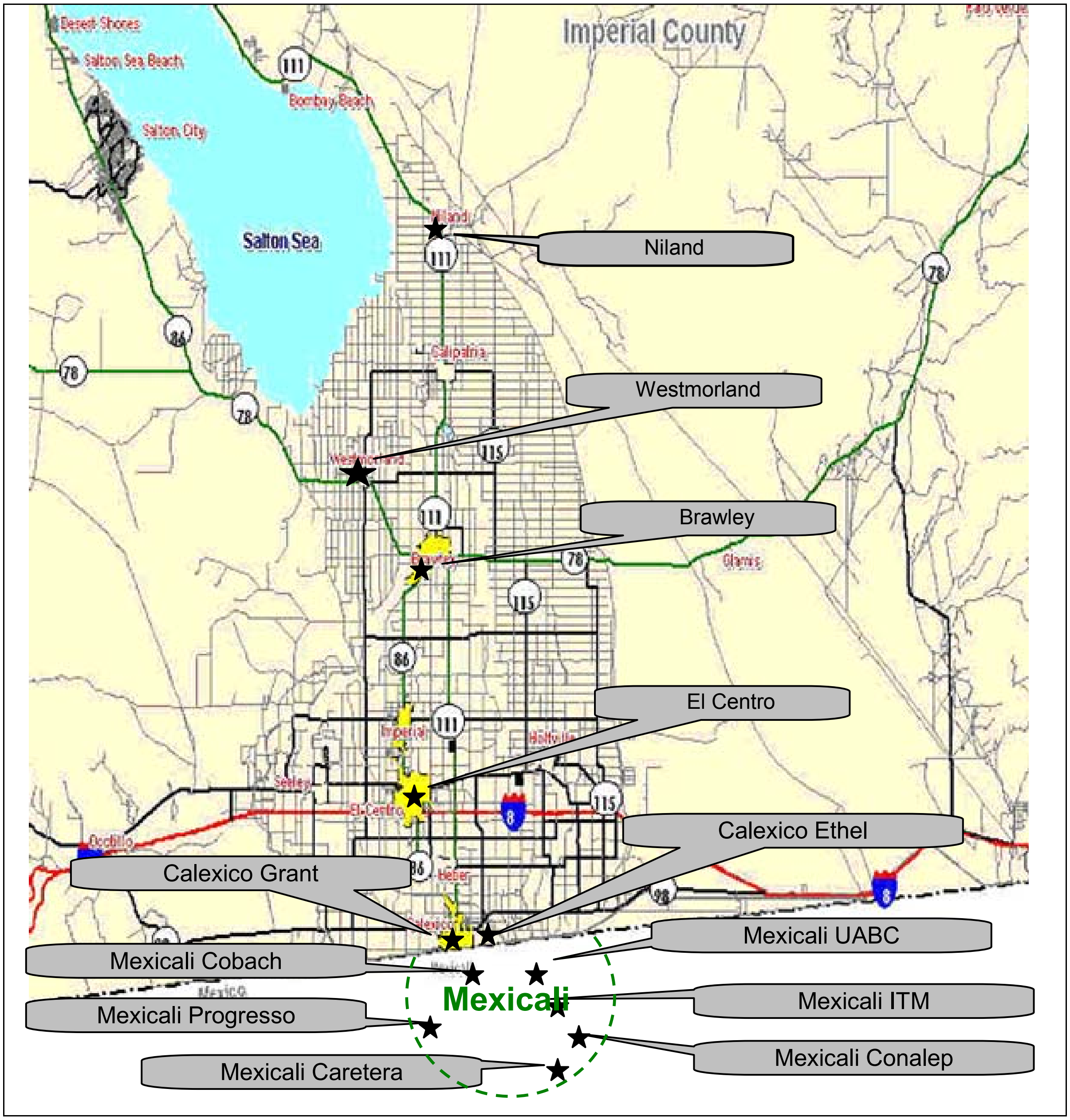


**Figure V.A.7 Map of Imperial County showing the location of Imperial County and Mexicali $PM_{10}$ monitoring sites.**

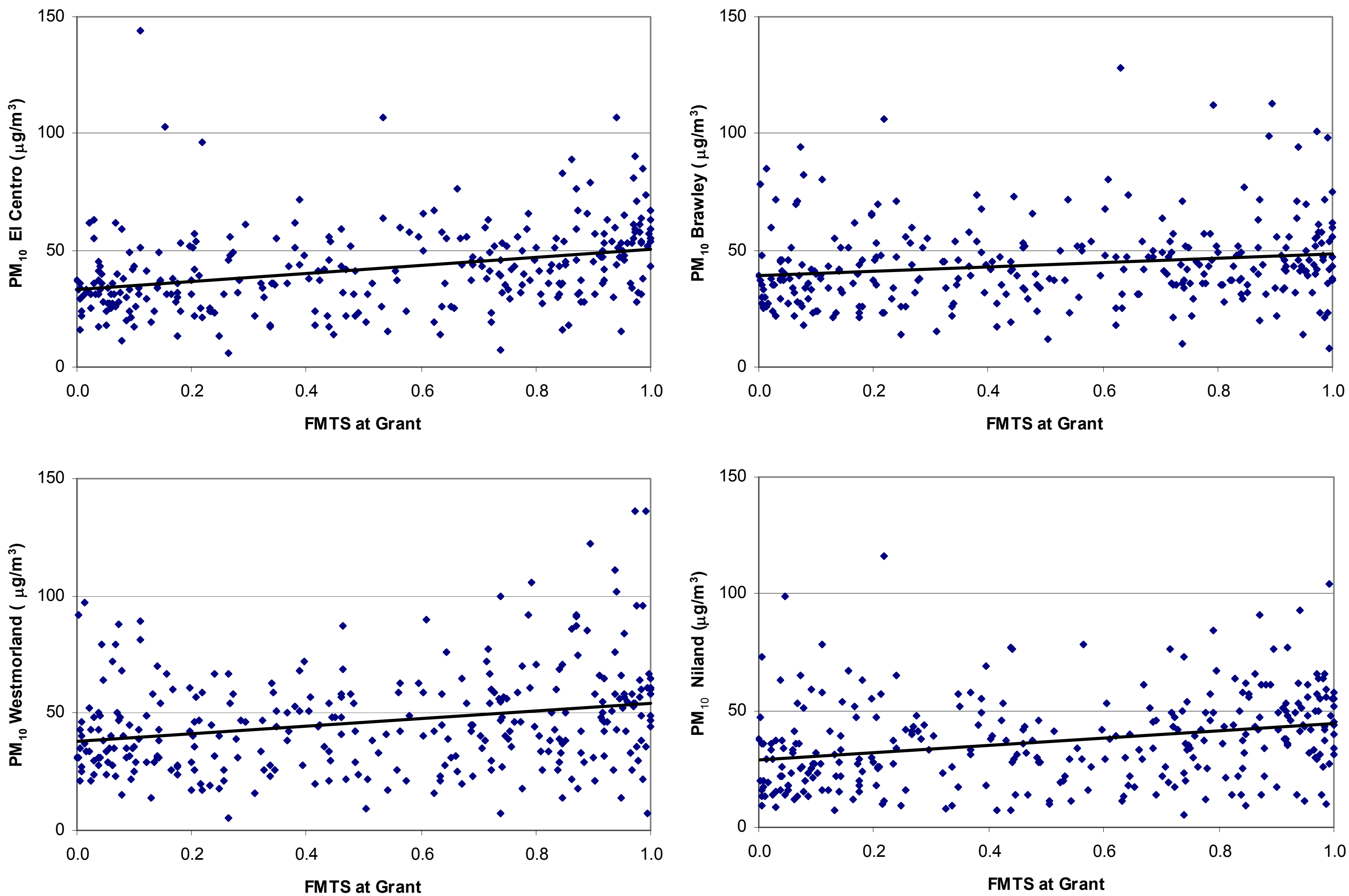


**Figure V.A.8 Plot of $PM_{10}$ concentration at non-Calexico Imperial County stations vs. wind direction at the Calexico Grant station (2001-2007 data).**

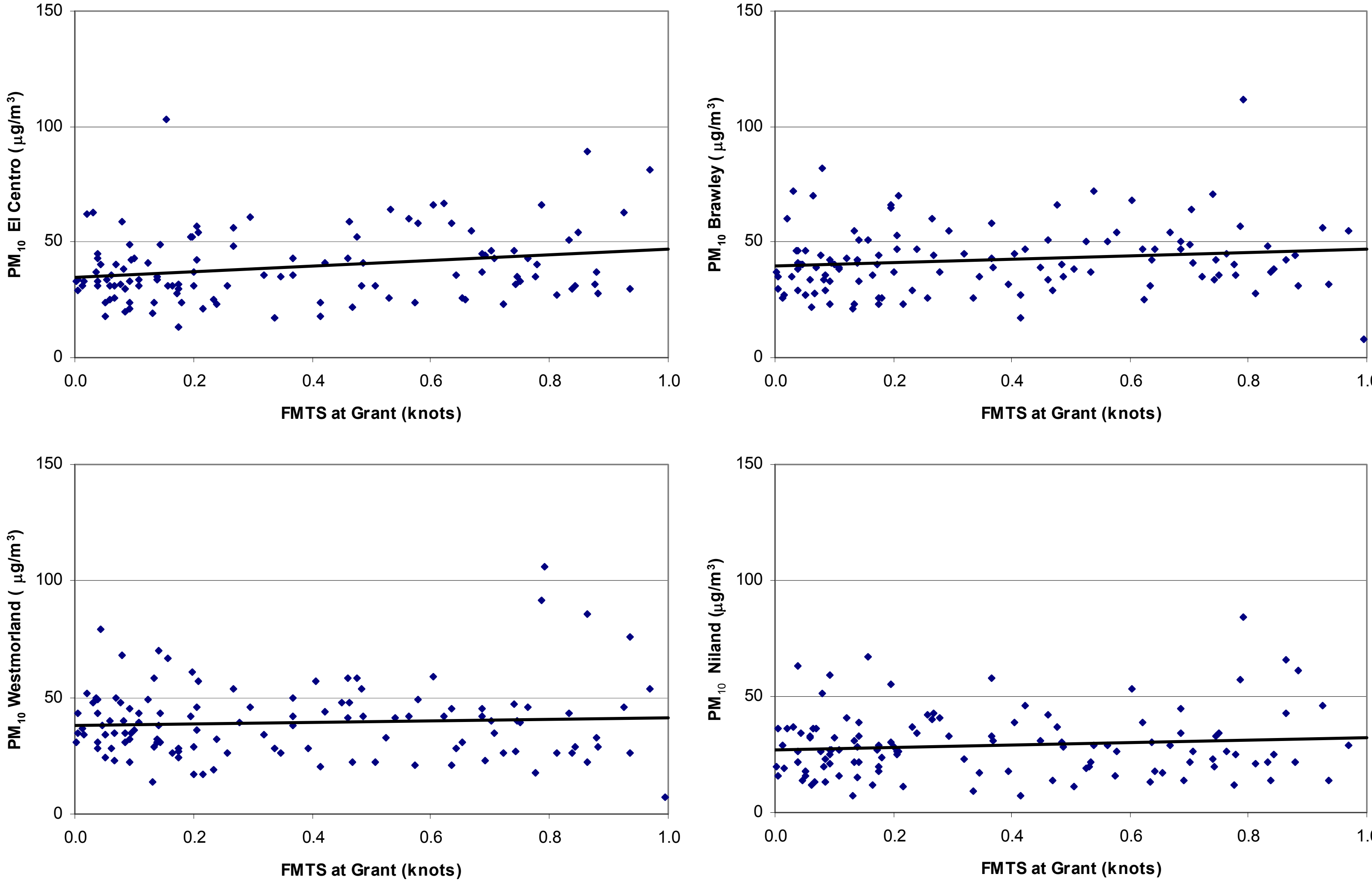


**Figure V.A.9 Plot of $PM_{10}$ concentration at non-Calexico Imperial County stations vs. wind direction at the Calexico Grant station, on days when 24-hour average wind speed at the Grant station was ≤ 2 knots (2001-2007 data).**

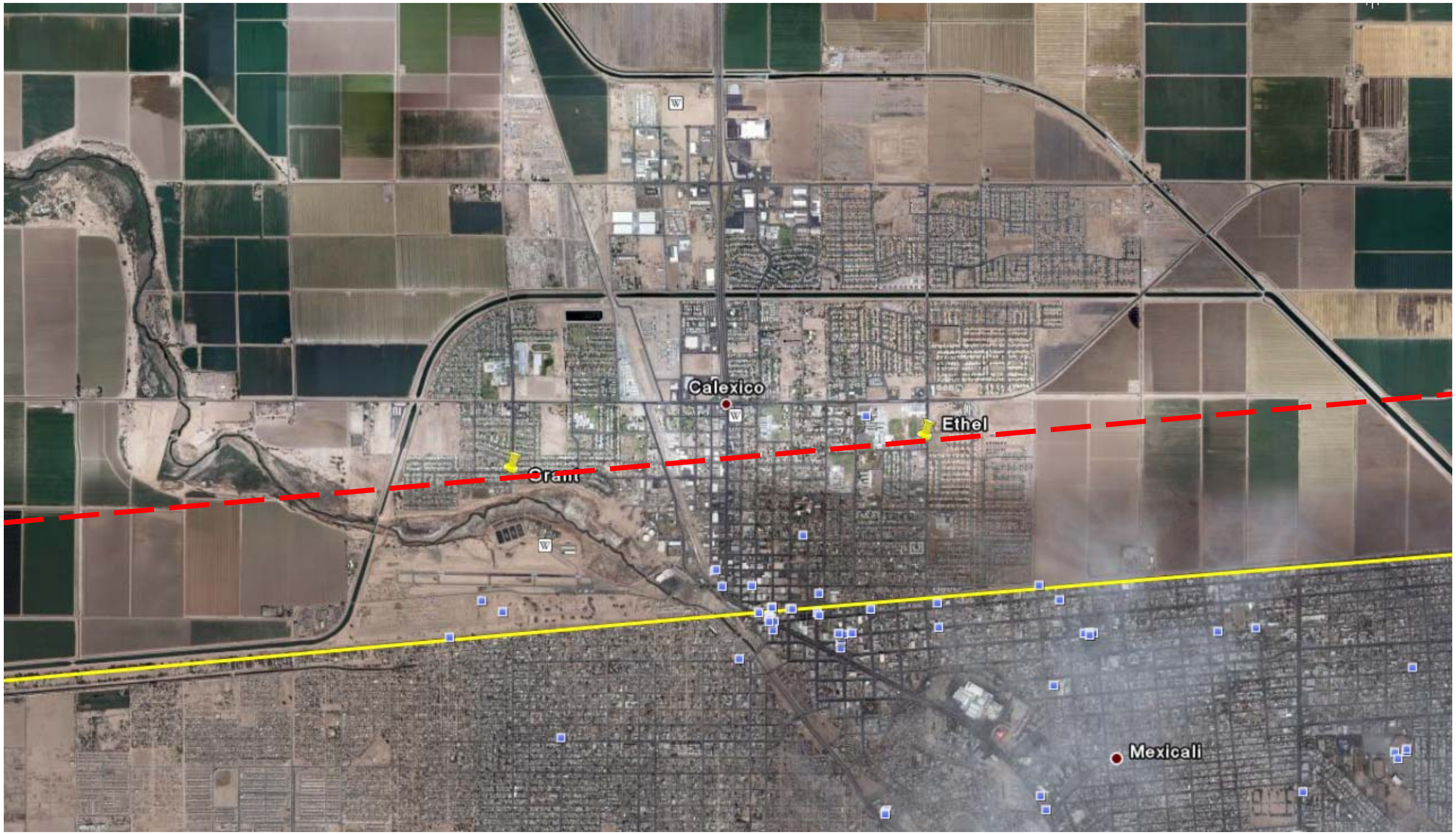


**Figure V.A.10 Satellite image showing the location of the Calexico Grant and Calexico Ethel air monitoring stations within Calexico and relative to the US/Mexico border. The dashed red line is parallel to the border and separates US areas south and north of Calexico stations.**

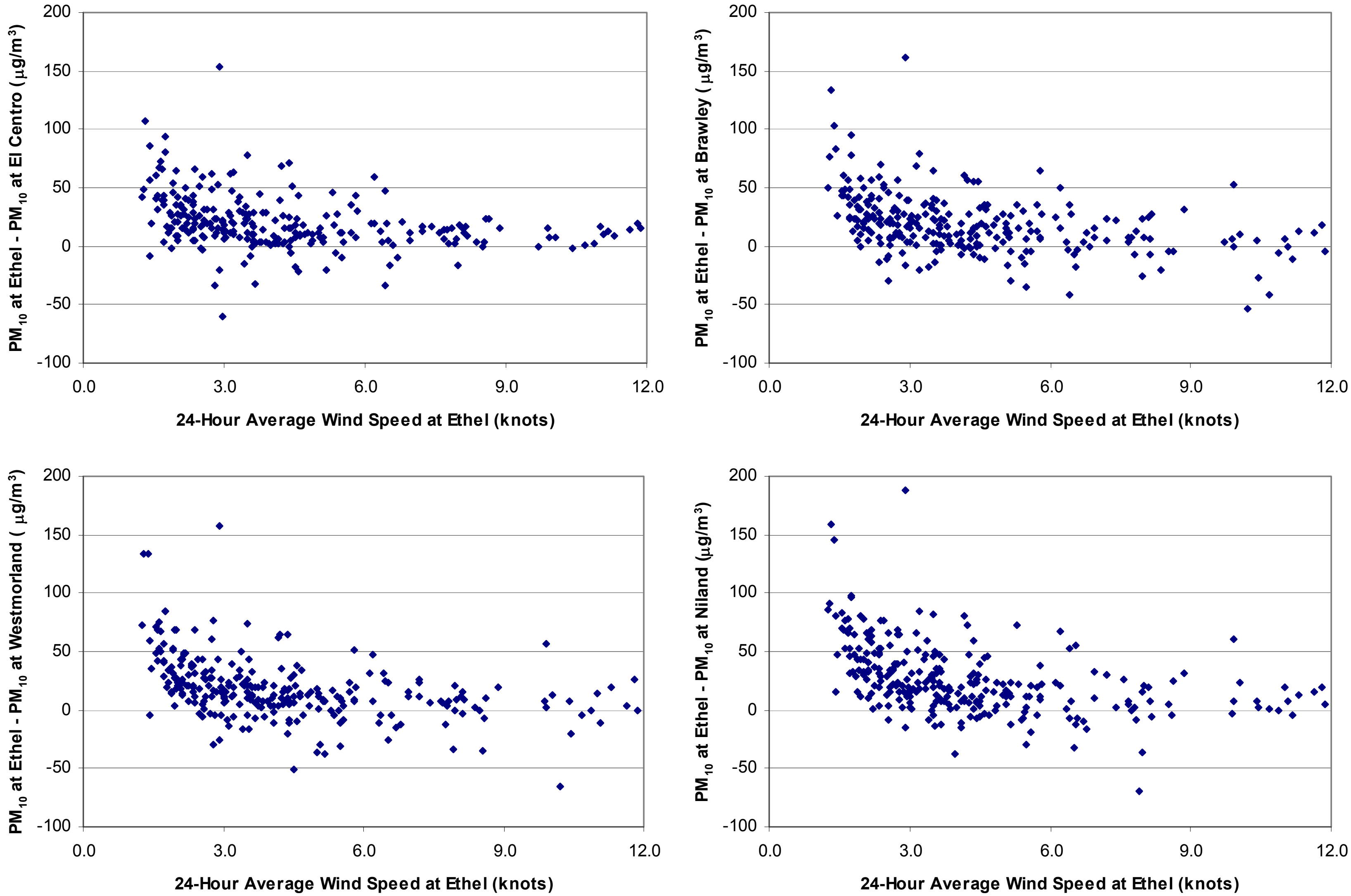


**Figure V.A.11 Effect of wind speed on excess $PM_{10}$ concentration at the Calexico Ethel station (2002-2007 data).**


**Figure V.A.12 Satellite image showing land use in Imperial County (an interactive map of the area is available online at http://www.wikimapia.org/#lat=32.910721 &lon=-115.5267334&z=10&l=0&m=a). The green arrows represent the location of $PM_{10}$ monitors.**

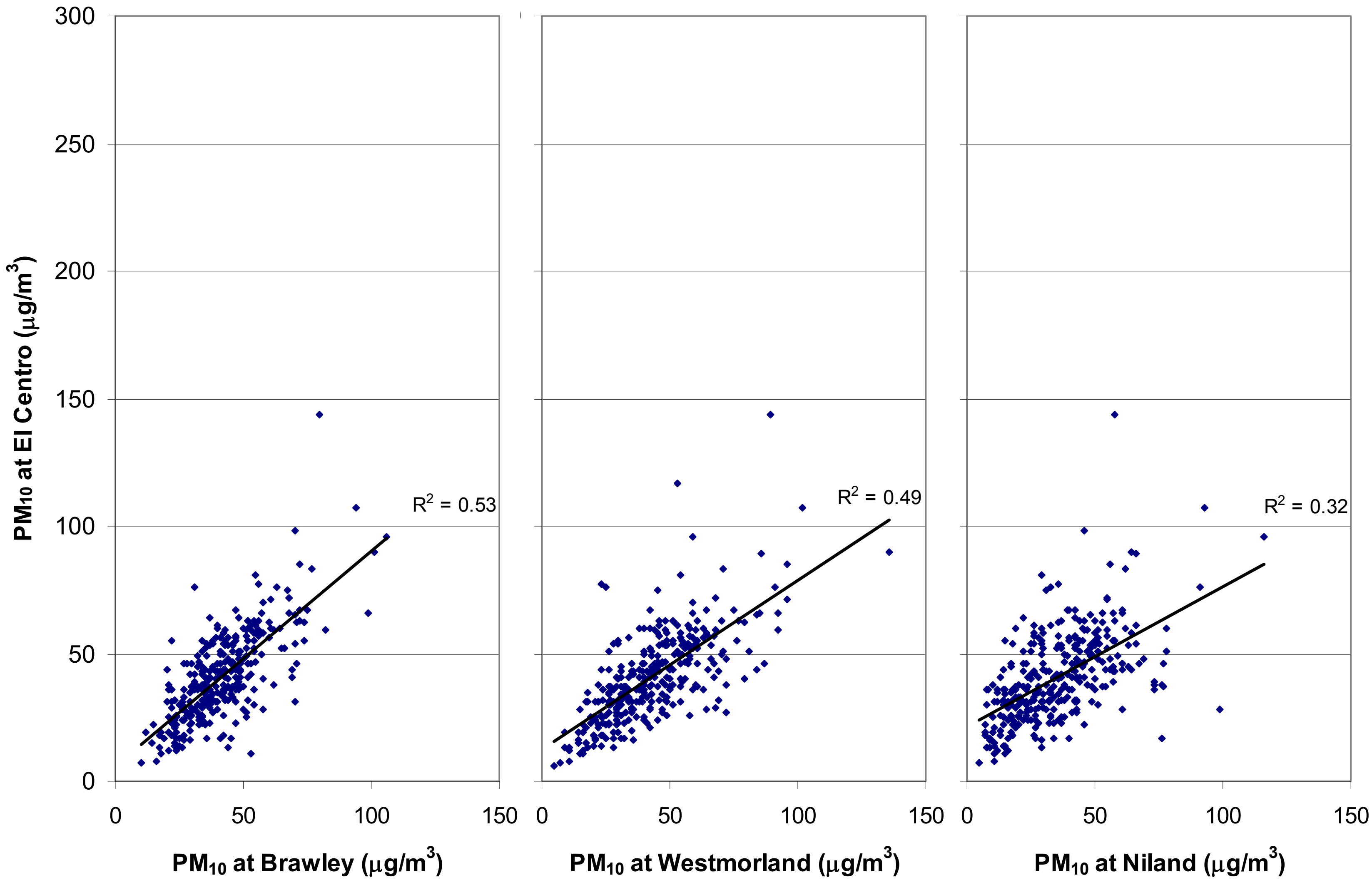


**Figure V.A.13 Plots of $PM_{10}$ concentrations at the El Centro station vs. same-day $PM_{10}$ concentrations at Brawley, Westmorland, and Niland (2001-2007 data)**

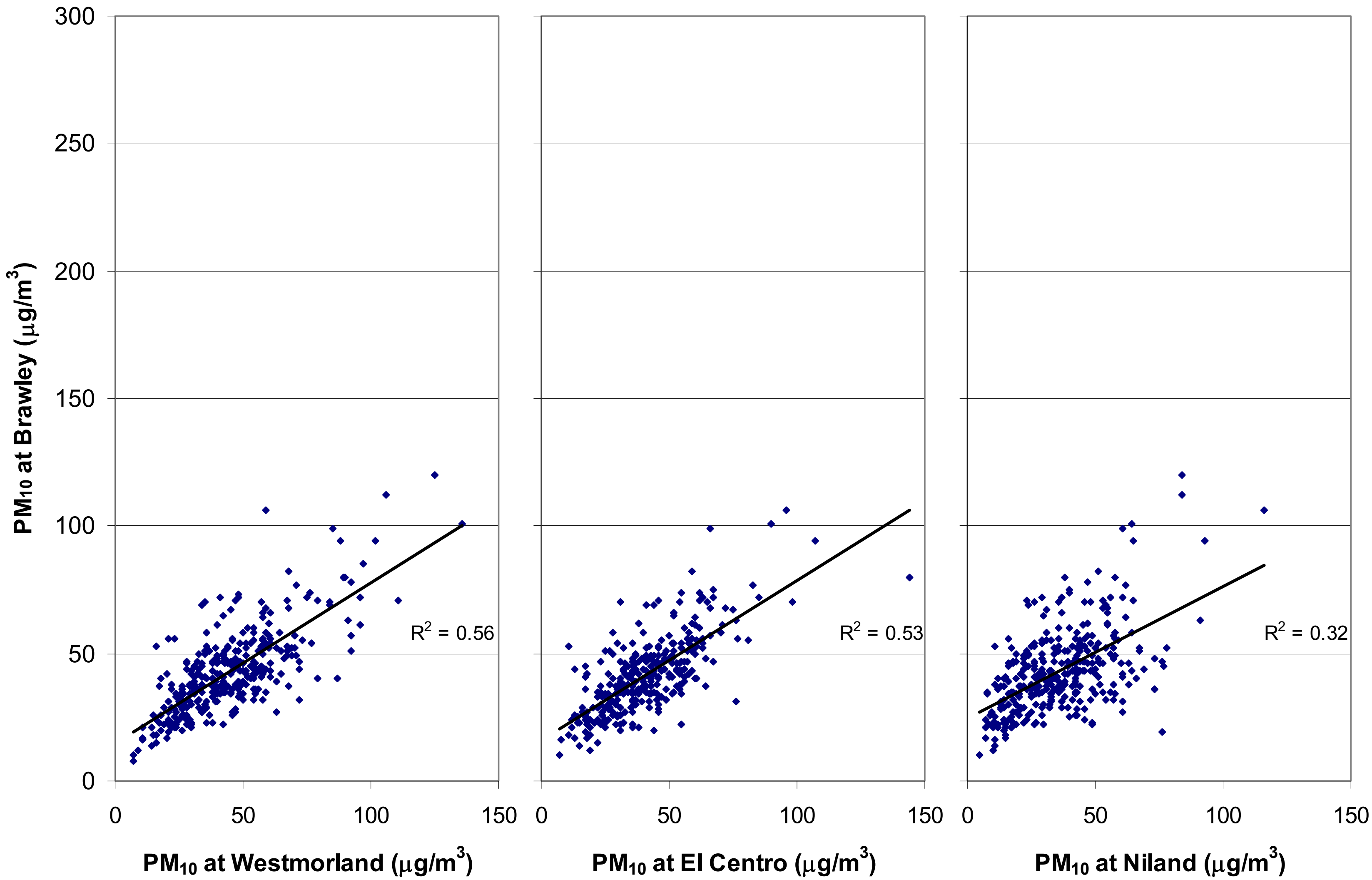


**Figure V.A.14 Plots of $PM_{10}$ concentrations at the Brawley station vs. same-day $PM_{10}$ concentrations at Westmorland, El Centro, and Niland (2001-2007 data)**

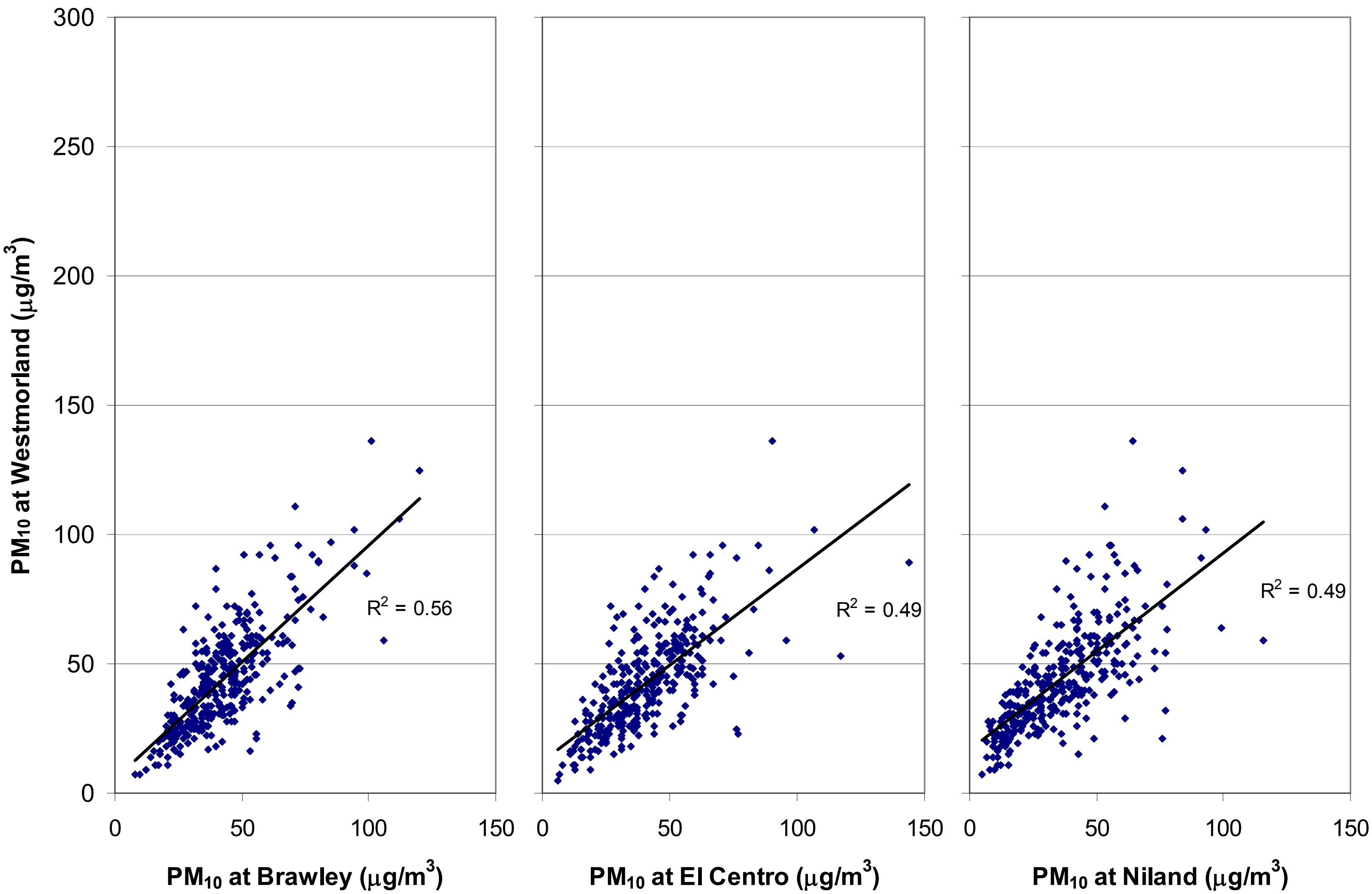


**Figure V.A.15 Plots of $PM_{10}$ concentrations at the Westmorland station vs. same-day $PM_{10}$ concentrations at Brawley, El Centro, and Niland (2001-2007 data)**

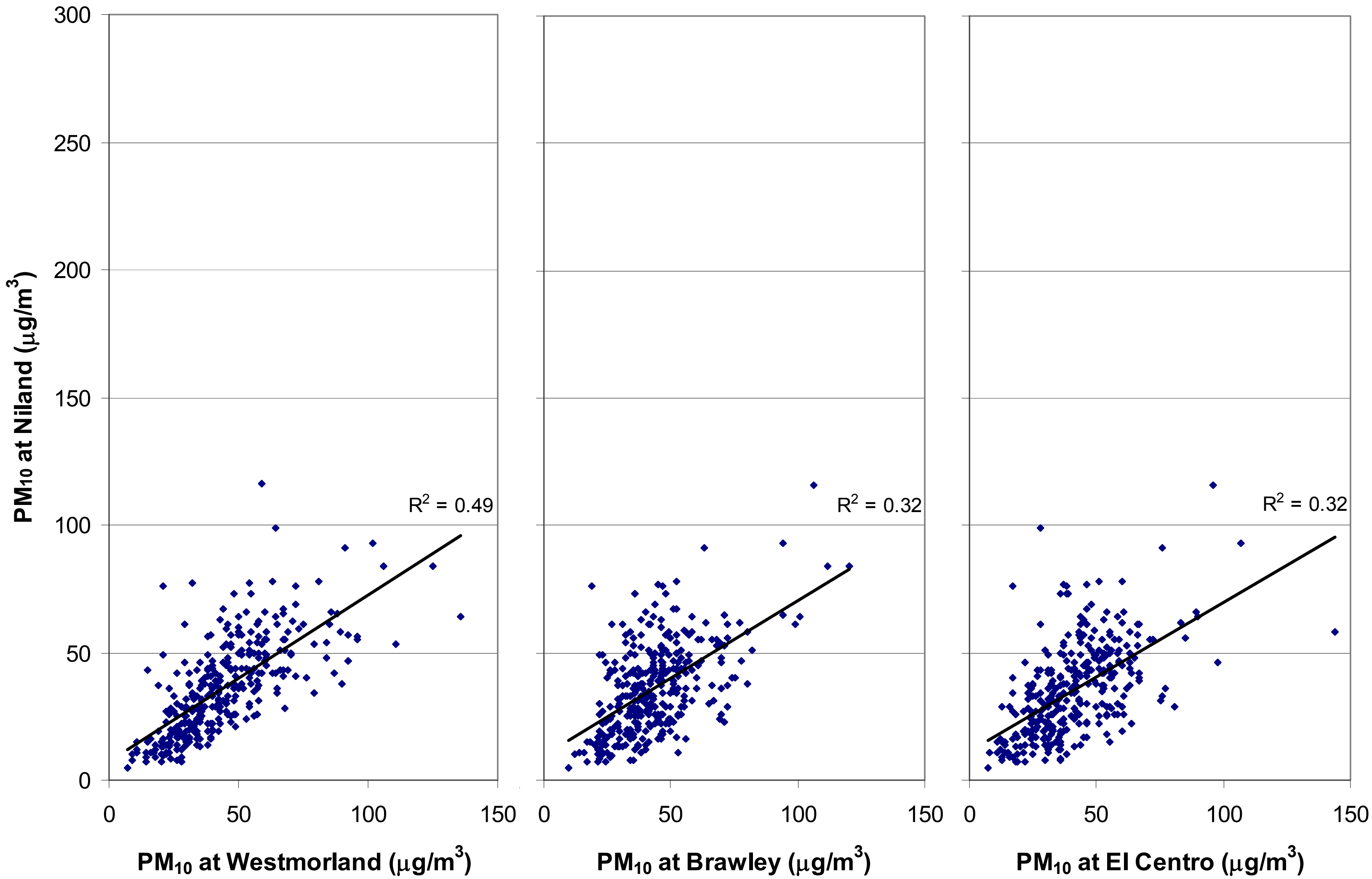


**Figure V.A.16 Plots of $PM_{10}$ concentrations at the Niland station vs. same-day $PM_{10}$ concentrations at Westmorland, Brawley, and El Centro (2001-2007 data)**

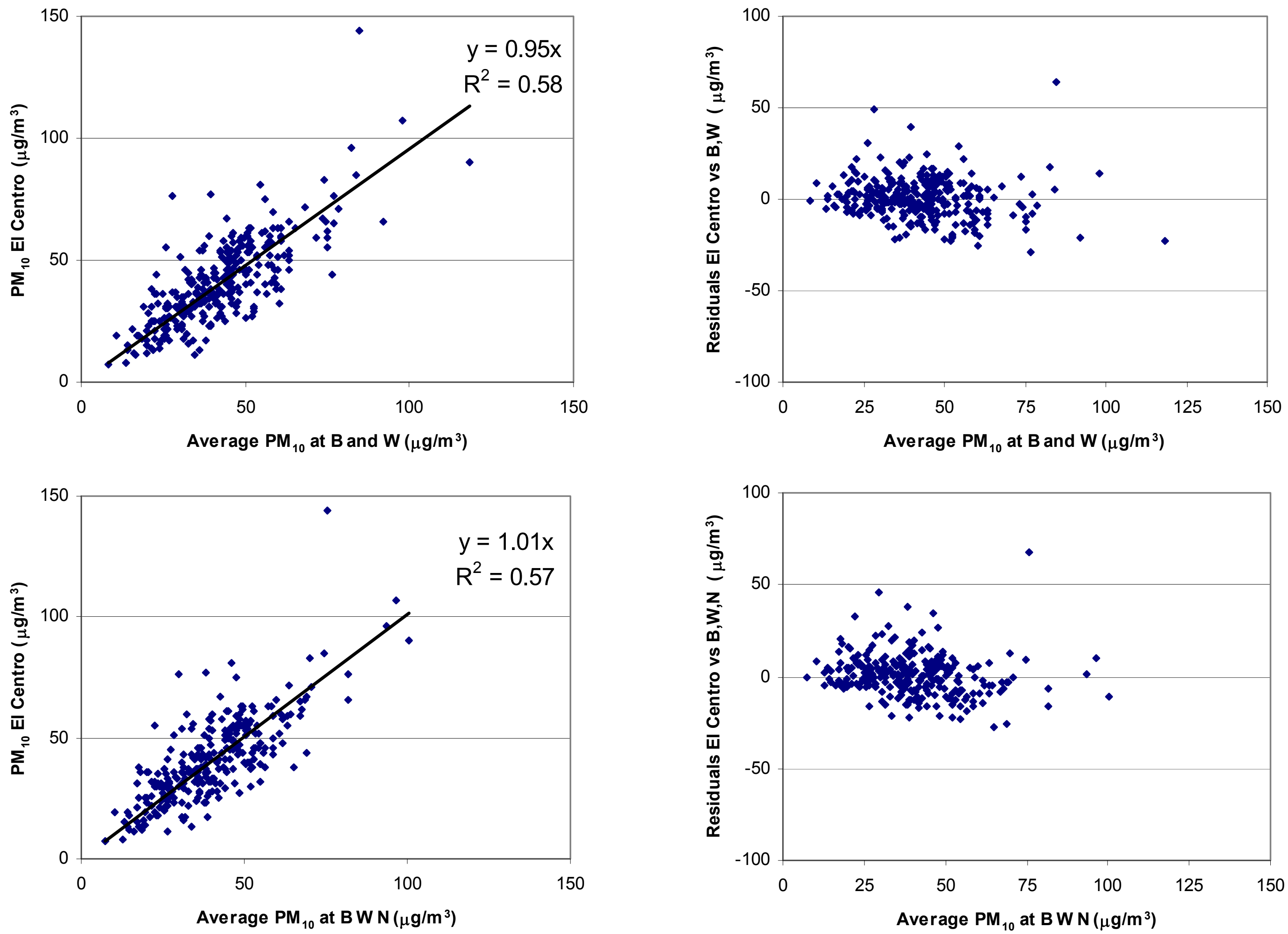


**Figure V.A.17 Plots of $PM_{10}$ concentration at the El Centro station vs. the average of same-day $PM_{10}$ concentrations at neighboring stations (left plots). The plots on the right are the residuals of the plots on the left. (2001-2007 data.)**

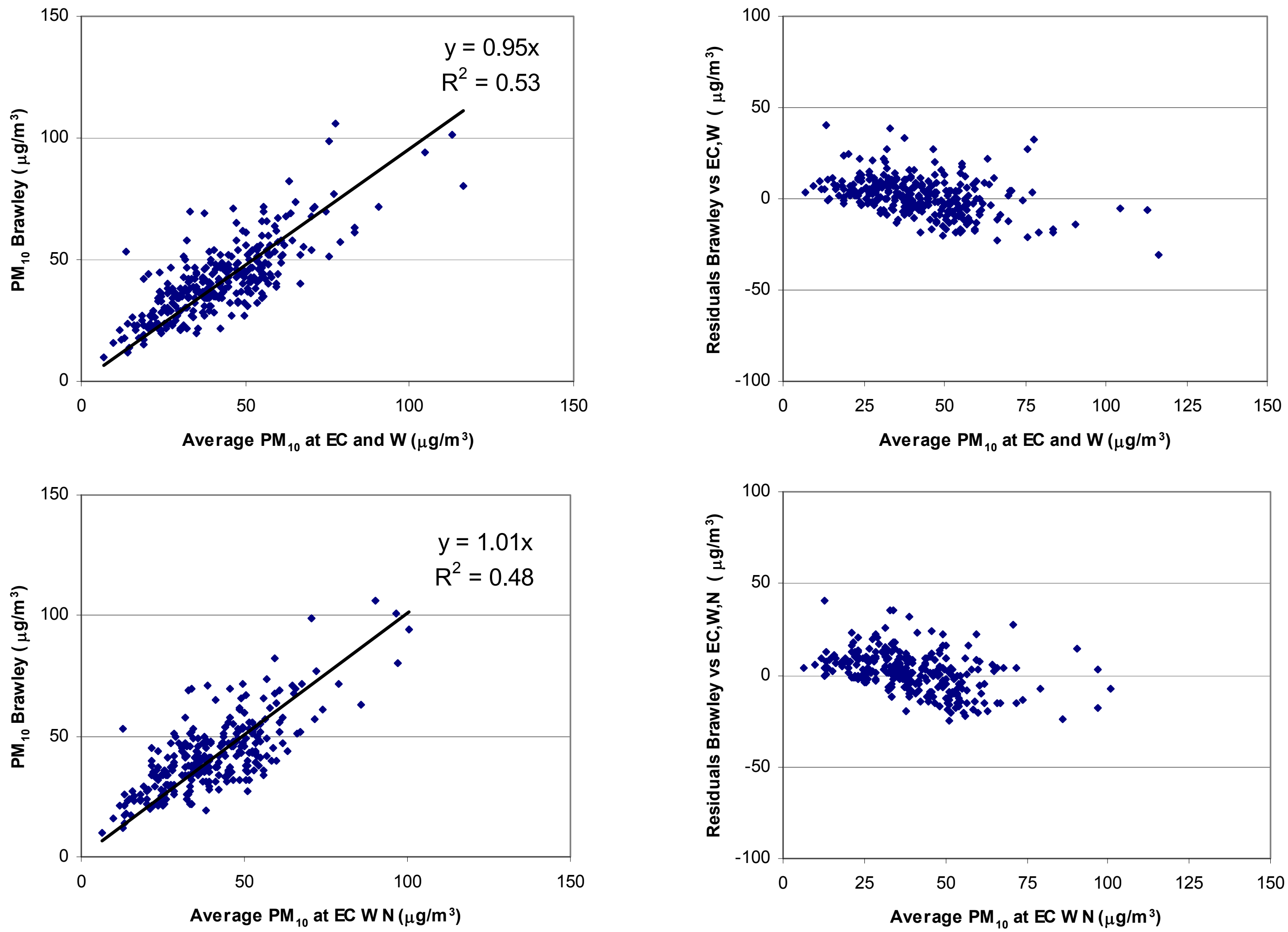


**Figure V.A.18 Plots of $PM_{10}$ concentration at the Brawley station vs. the average of same-day $PM_{10}$ concentrations at neighboring stations (left plots). The plots on the right are the residuals of the plots on the left. (2001-2007 data.)**

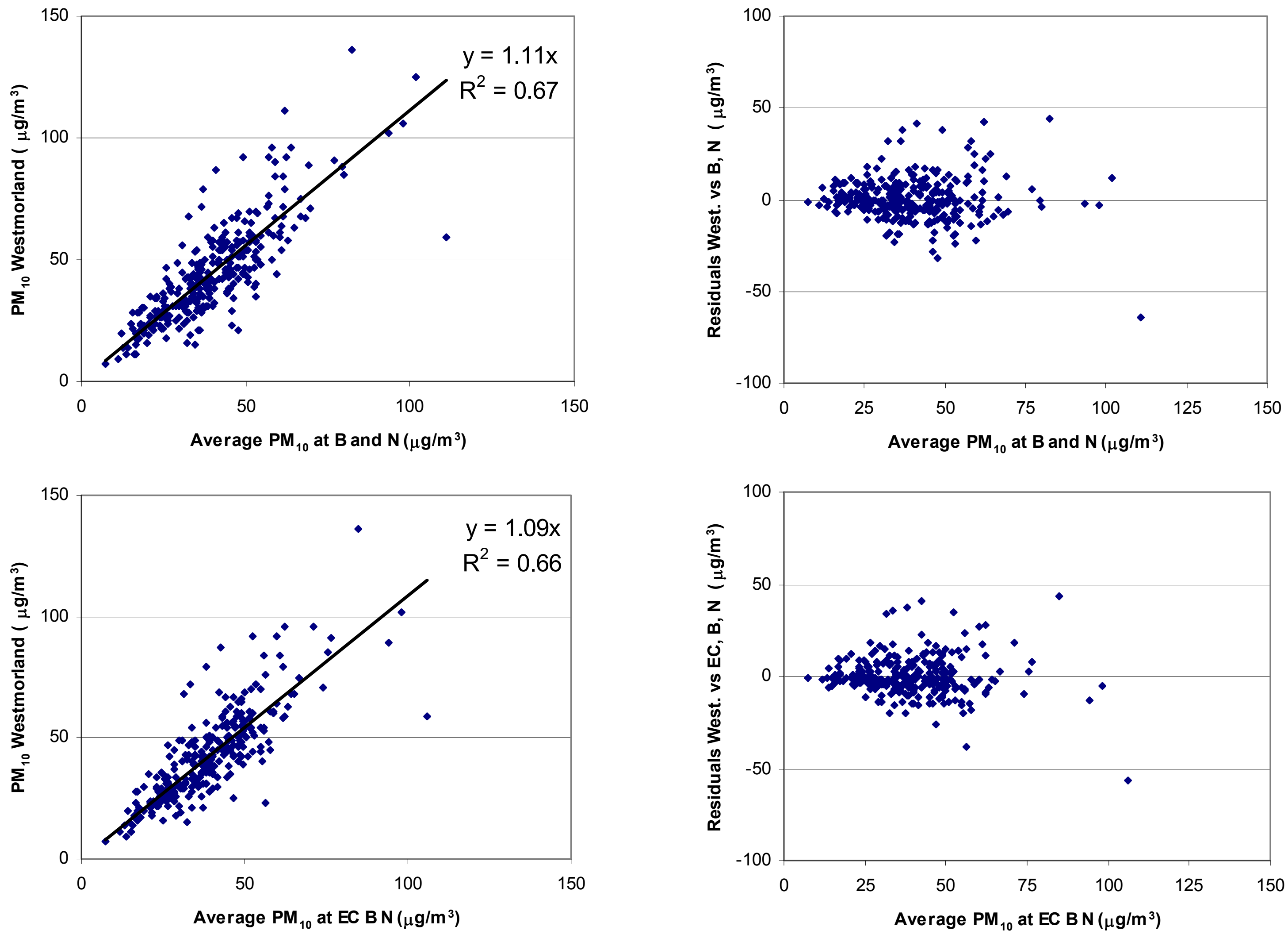


**Figure V.A.19 Plots of $PM_{10}$ concentration at the Westmorland station vs. the average of same-day $PM_{10}$ concentrations at neighboring stations (left plots). The plots on the right are the residuals of the plots on the left. (2001-2007 data.)**

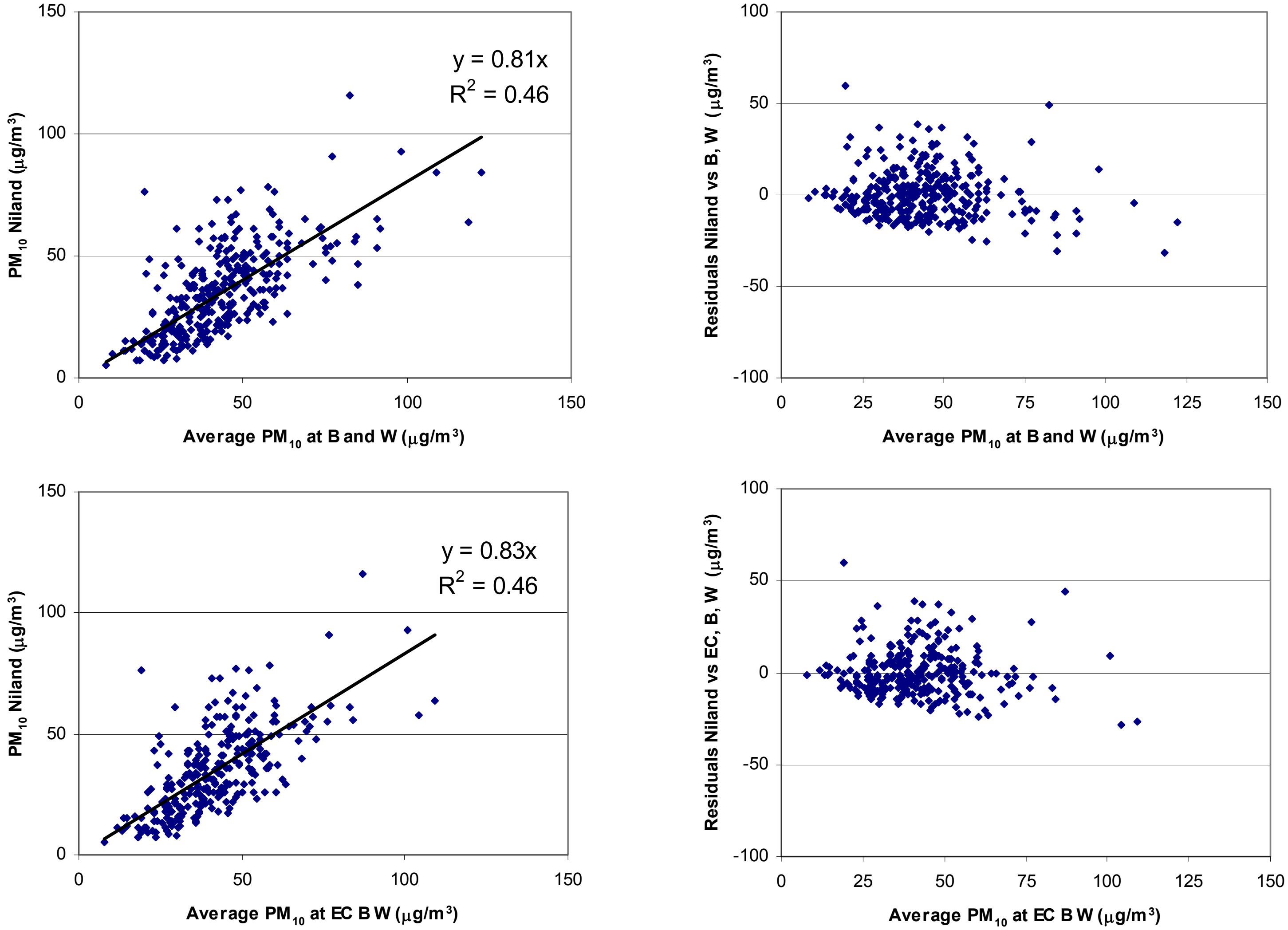


**Figure V.A.20 Plots of $PM_{10}$ concentration at the Niland station vs. the average of same-day $PM_{10}$ concentrations at neighboring stations (left plots). The plots on the right are the residuals of the plots on the left. (2001-2007 data.)**

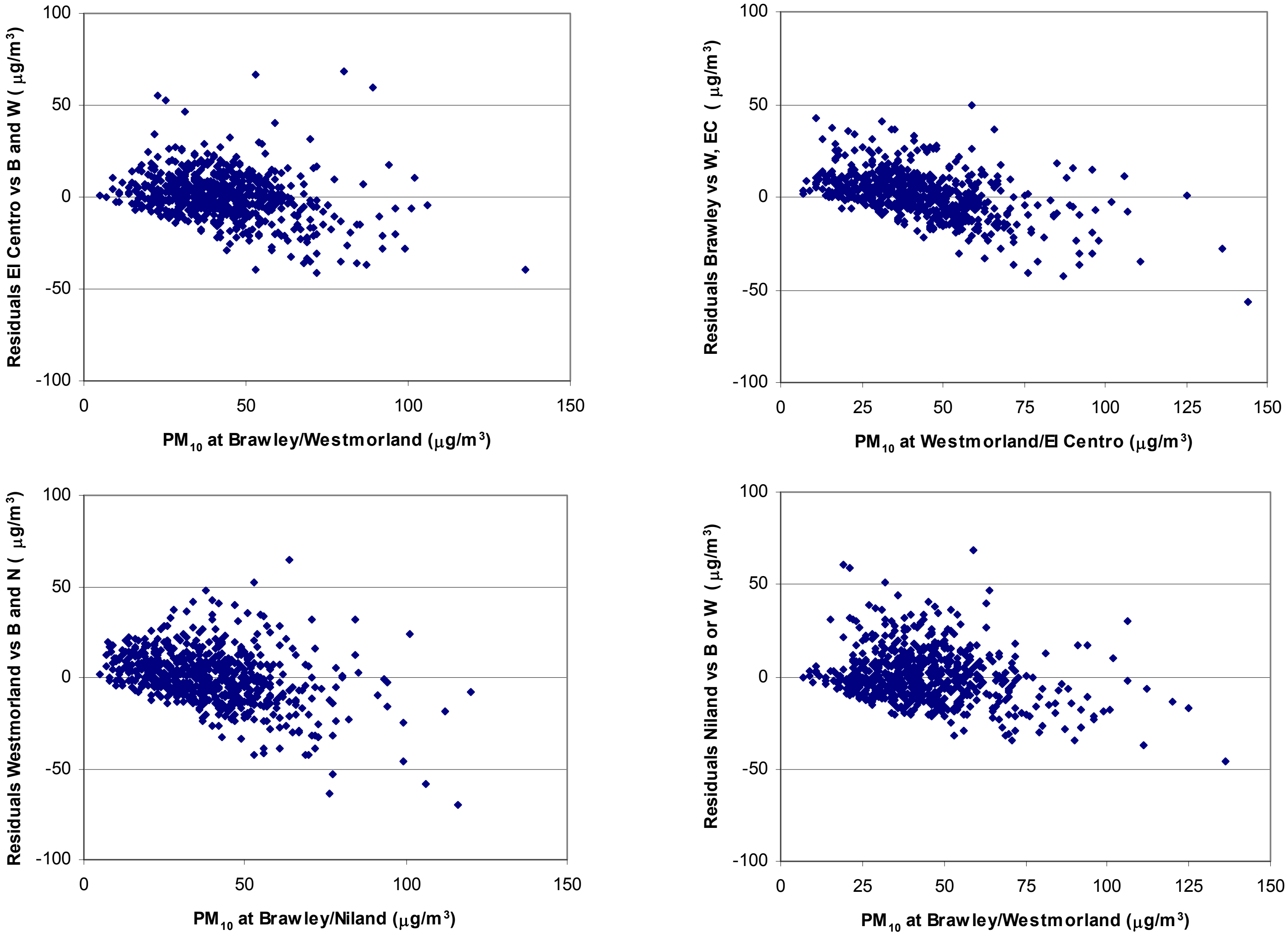


**Figure V.A.21 Residual plots: Measured $PM_{10}$ values minus $PM_{10}$ values predicted from measurements at only one neighboring station using the correlations of the top plots of Figures V.A.17-V.A.20 (2001-2007 data)**

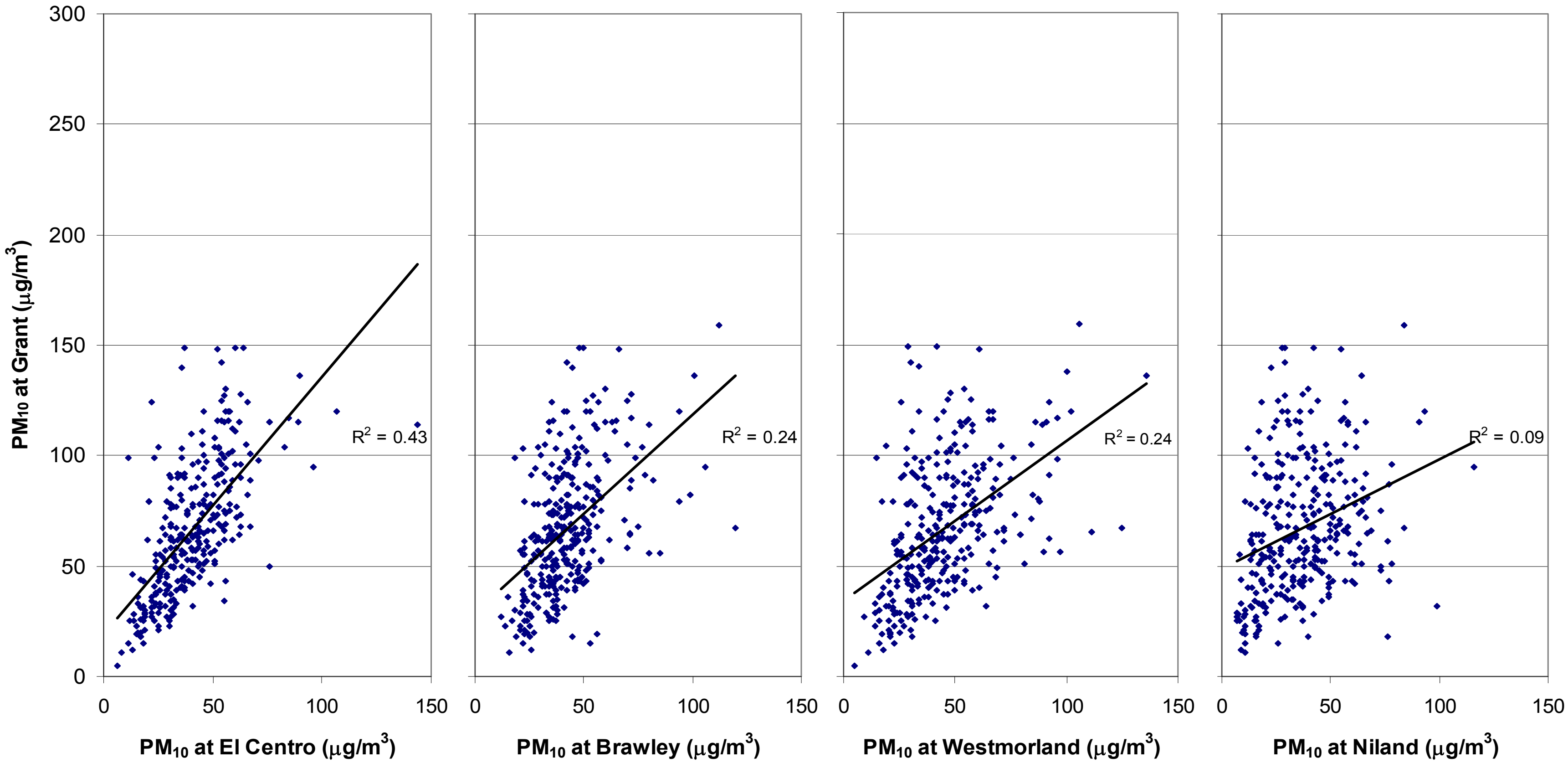


**Figure V.A.22 Plots of $PM_{10}$ concentrations at the Calexico Grant station vs. same-day $PM_{10}$ concentrations at El Centro, Brawley, Westmorland, and Niland (2001-2007 data)**

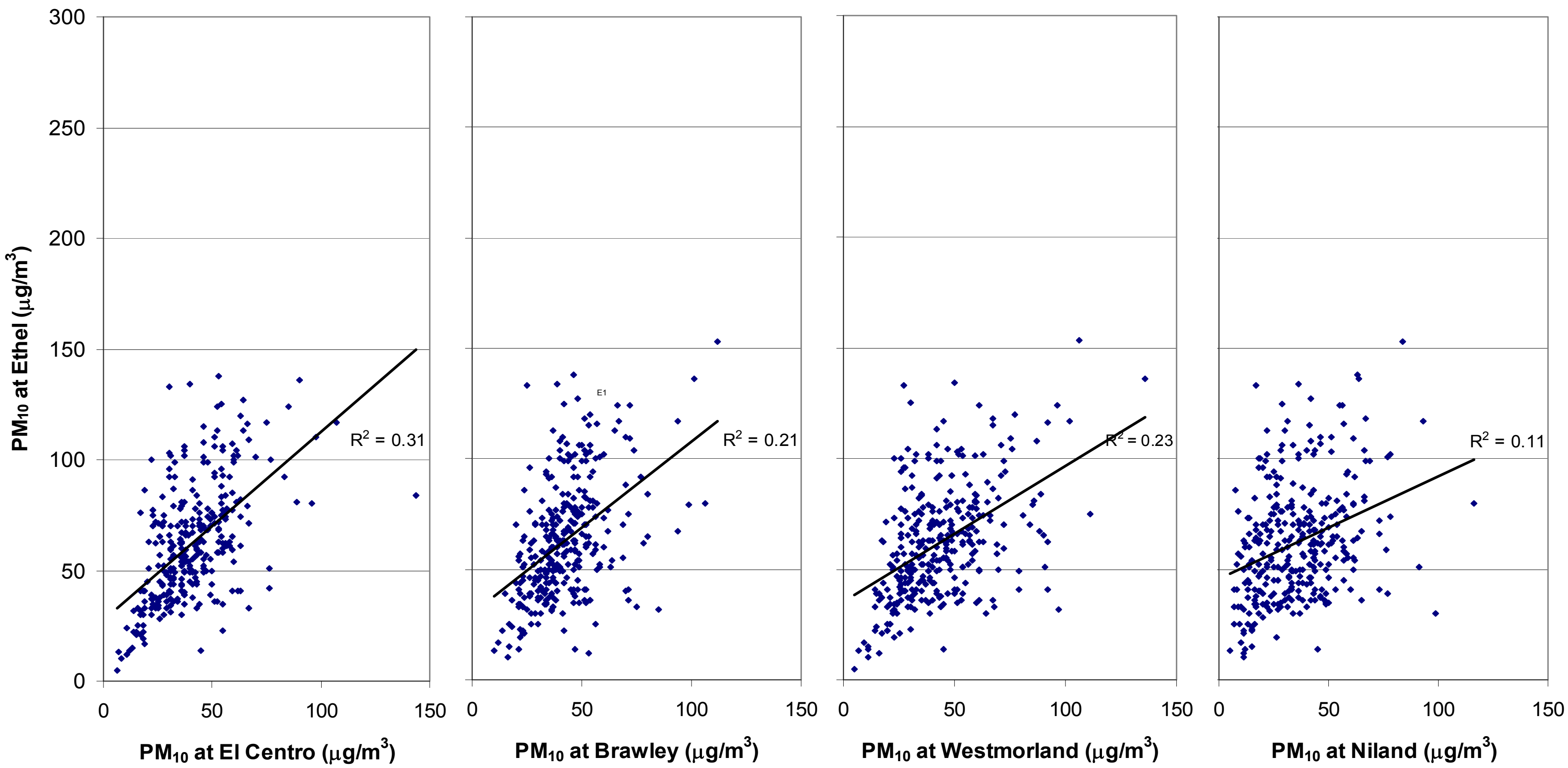


**Figure V.A.23 Plots of $PM_{10}$ concentrations at the Calexico Ethel station vs. same-day $PM_{10}$ concentrations at El Centro, Brawley, Westmorland, and Niland (2001-2007 data)**

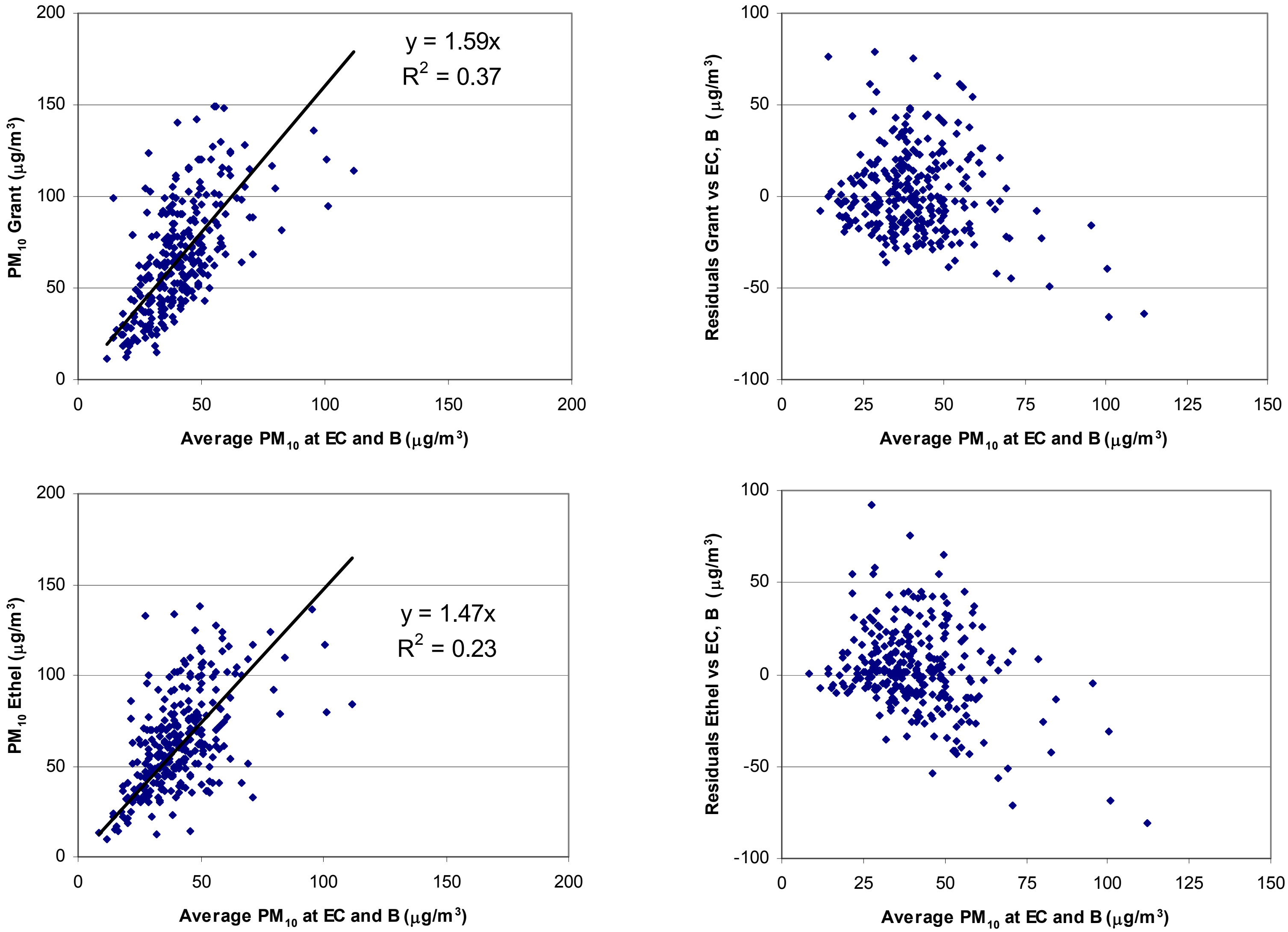


**Figure V.A.24 Plots of $PM_{10}$ concentrations at the Calexico Grant and Calexico Ethel stations vs. the average of same-day $PM_{10}$ concentrations at El Centro and Brawley (left plots). The plots on the right are the residuals of the plots on the left. (2001-2007 data.)**

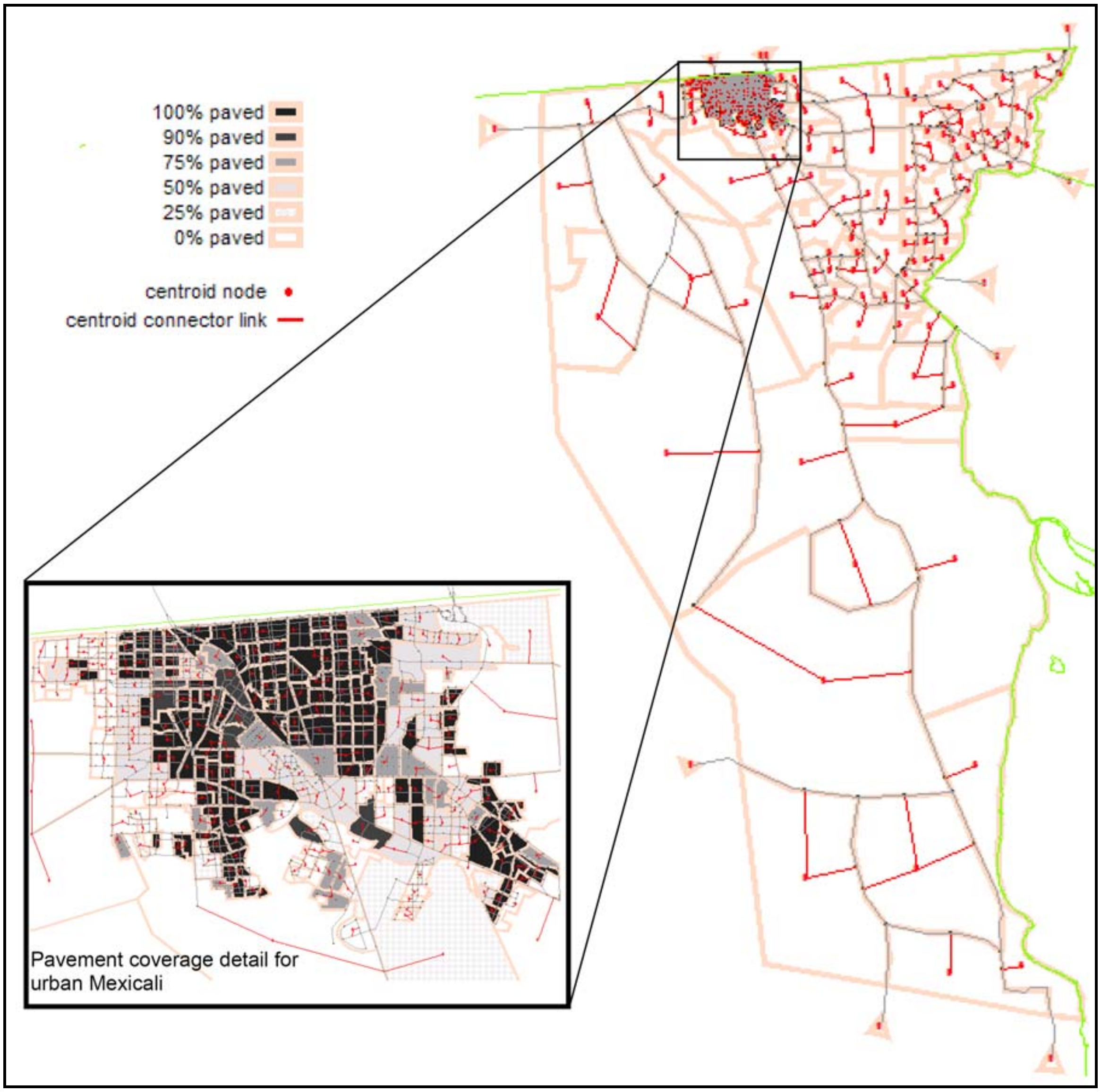


**Figure V.A.25 Pavement Coverage of Mexicali Roads, according to the ERG 2005 Mexicali Emission Inventory Report.**

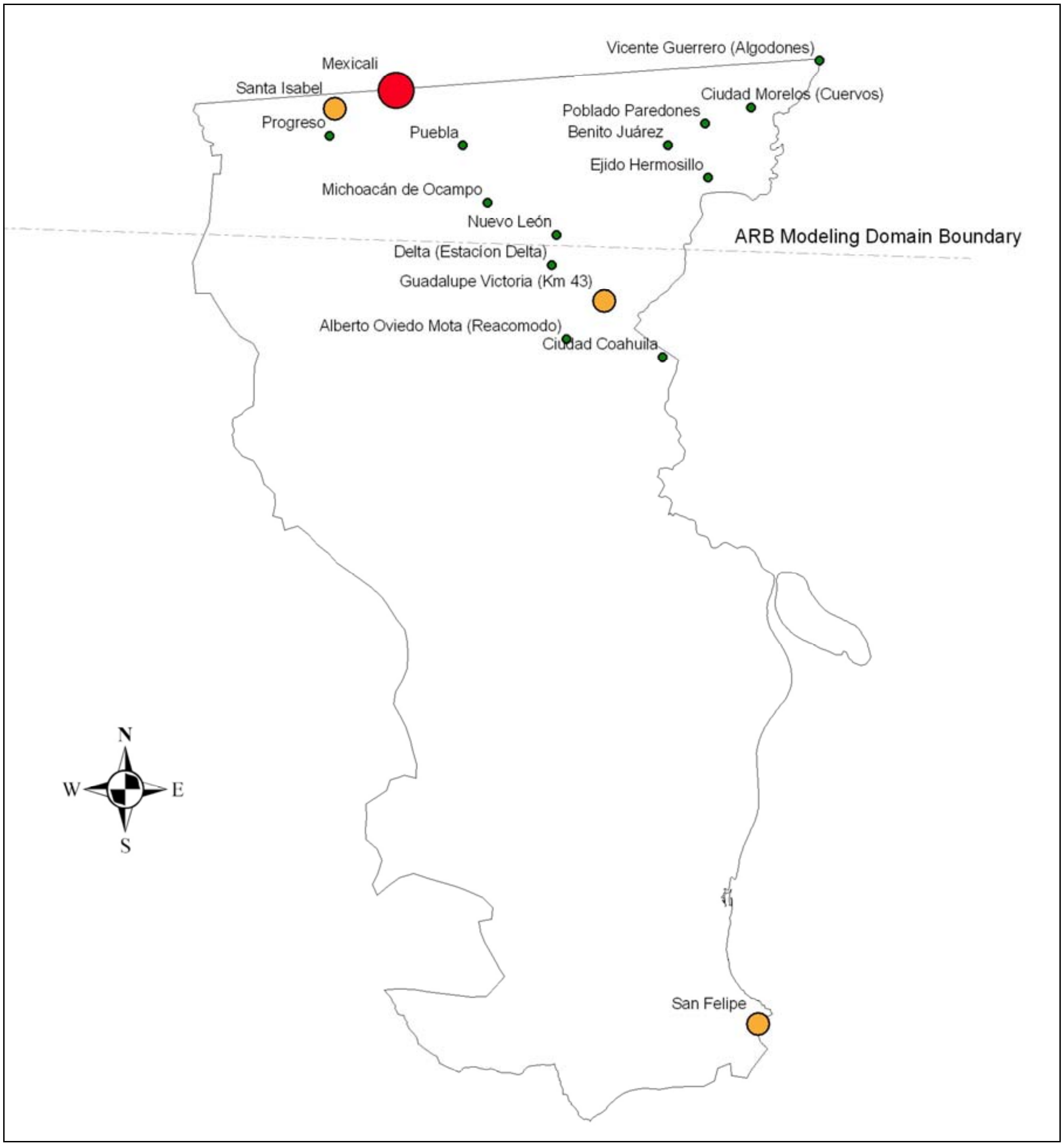


**Figure V.A.26 Municipality of Mexicali (~5,300 square miles, 120 miles from North to South)**

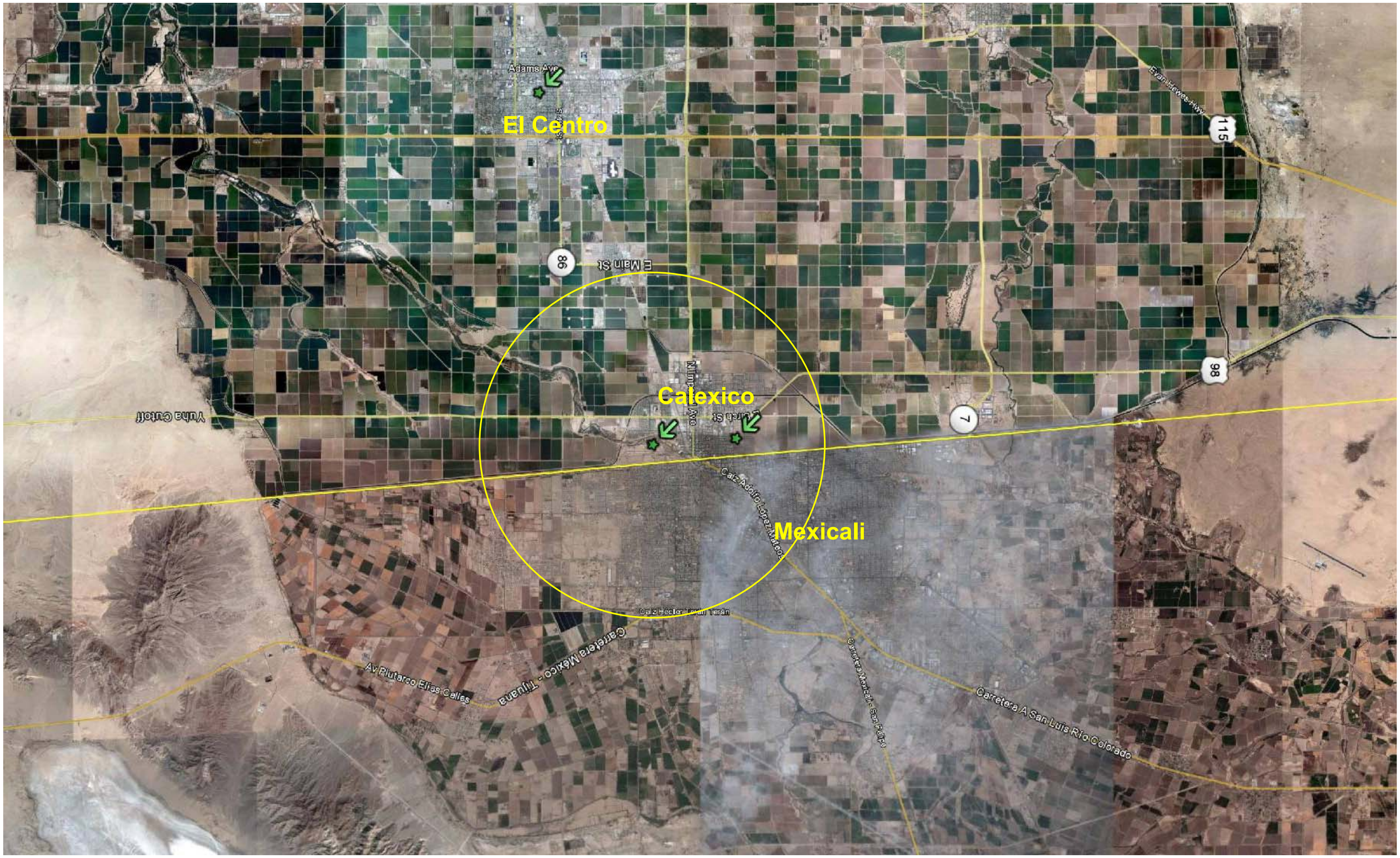


**Figure V.A.27 Satellite image showing the proximity and relative sizes of Calexico and Mexicali (an interactive map of the area is available online at http://wikimapia.org/#lat=32.6347491&lon=-115.4796982&z=12&l=0&m=a&v=2). The green arrows represent the location of $PM_{10}$ monitors. In this figure, the yellow circle centered at the Calexico-Grant station has a radius of 4 miles.**

# Attachment B

## US Area Directly South of the Calexico Grant Station

Satellite images of Calexico/Mexicali reveal the presence of an open area directly south of the Calexico Grant station that appears as though it may have the potential to generate high levels of fugitive dust. A high resolution satellite image (Figure V.B.1) shows that this area is the location of the Calexico International Airport. The airport site covers ~305 acres of land and includes a single east-west runway 4670 feet long and 75 feet wide.[62] Owned and operated by the City of Calexico, the airport site is situated within the southwest portion of the city limits directly along the US-Mexican border, and is only separated from the border by a ~0.2 mile × 1.5 mile strip of land guarded by the US border patrol.

In order to develop a qualitative understanding of the role that the open area directly south of Grant may have played in the 24-hour $PM_{10}$ exceedences recorded on December 21, 2006 and December 25, 2006, we note the following:

1. Public access to the airport area is limited to vehicular traffic on paved roads to and from the airport terminal. For security reasons, the airport area is surrounded by a fence (Figure V.B.2) intended to prevent public access to other parts of the airport area. On December 21 and 25, 2006, the airport had air traffic; therefore, normal security procedures were in place. The only activity-based emissions from the airport area thus corresponded to vehicular/airplane traffic on paved roadways/runways;
2. There is no evidence of unusual activity by the border patrol on the border strip; and
3. Because of *very low* wind speeds in Calexico (and indeed throughout the Imperial Valley) on December 21 and 25, 2006, windblown dust from the Calexico airport area and from the border patrol area south of the airport would not have been a significant source contributor.

For December 21 and 25, 2006, activity-based emissions and windblown fugitive dust emissions from the open area directly south of the Calexico Grant station are therefore expected to have been negligible relative to activity-based emissions throughout the remainder of Calexico, and more particularly relative to activity-based emissions throughout Mexicali.

[62] http://www.calexico.ca.gov/index.php?option=com_content&task=view&id=60&Itemid=90.


**Figure V.B.1 Satellite image showing an enlarged view of the area directly south of the Calexico Grant station. The airport is fenced in within the boundaries delineated by the orange line.**


**Figure V.B.2 Photographs of the boundary limits of the Calexico International Airport documenting the presence of fencing to restrict public access.**

# Attachment C

## Photographs of $PM_{10}$ Filters

Color photographs of SSI filters corresponding to Calexico-Grant measurements acquired December 21, 2006 and December 25, 2006 are shown in Figures V.C.1 and Figures V.C.2. As references in the visual analysis of these samples, photographs of Calexico-Grant filters corresponding days with average $PM_{10}$ air quality are also given in Figures V.C.1 and V.C.2. The December 21 and 25, 2006 filters appear dirtier, with higher surface coarseness and darker hue, as a consequence of a higher loading of organic/elemental carbon consistent with high levels of combustion-source PM.

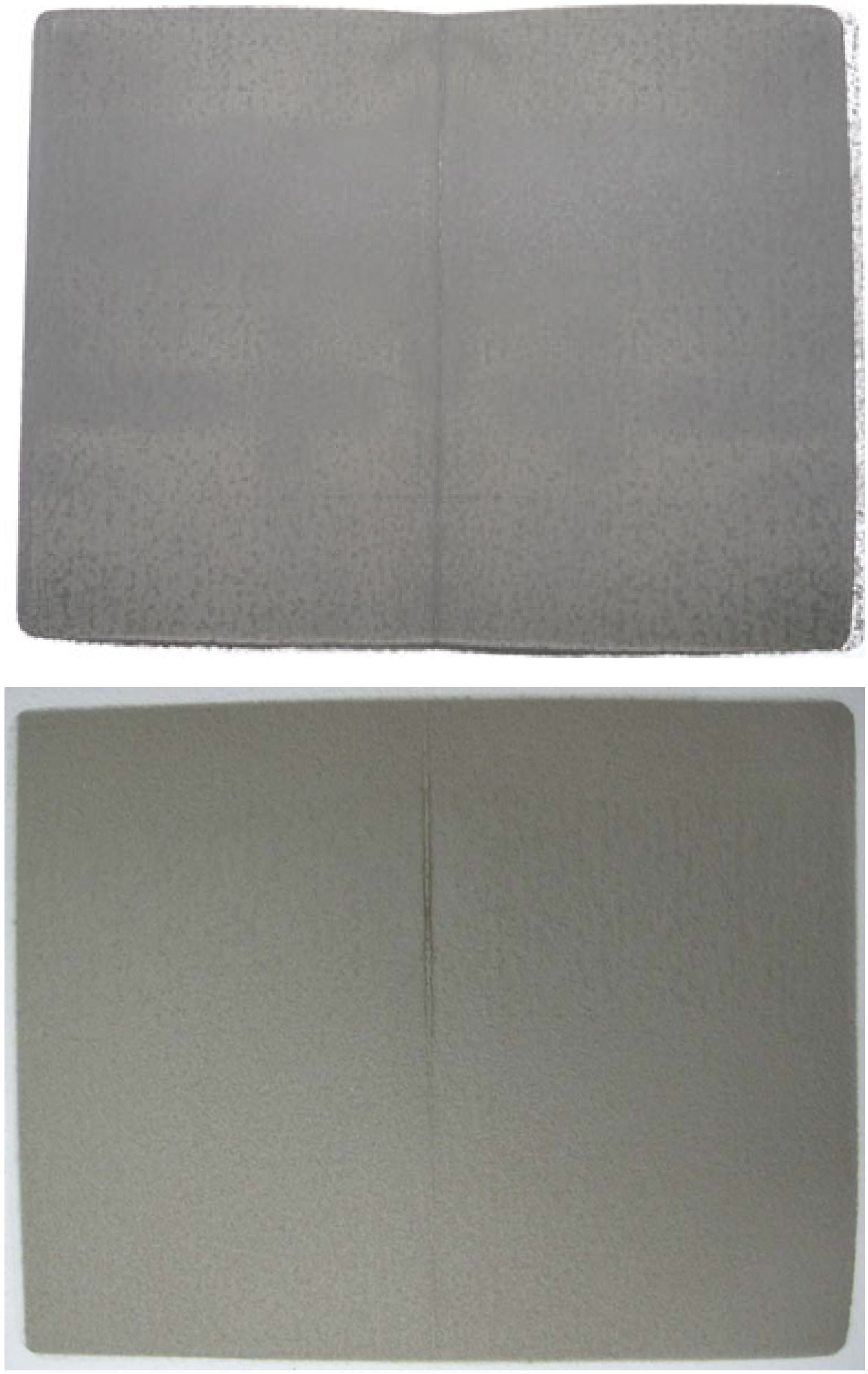

**Figure V.C.1 Color photograph of 24-hour SSI filters used at the Calexico Grant station: 12-21-06 (171 $\mu g/m^3$, top) compared with 6-15-05 (53 $\mu g/m^3$, bottom)**

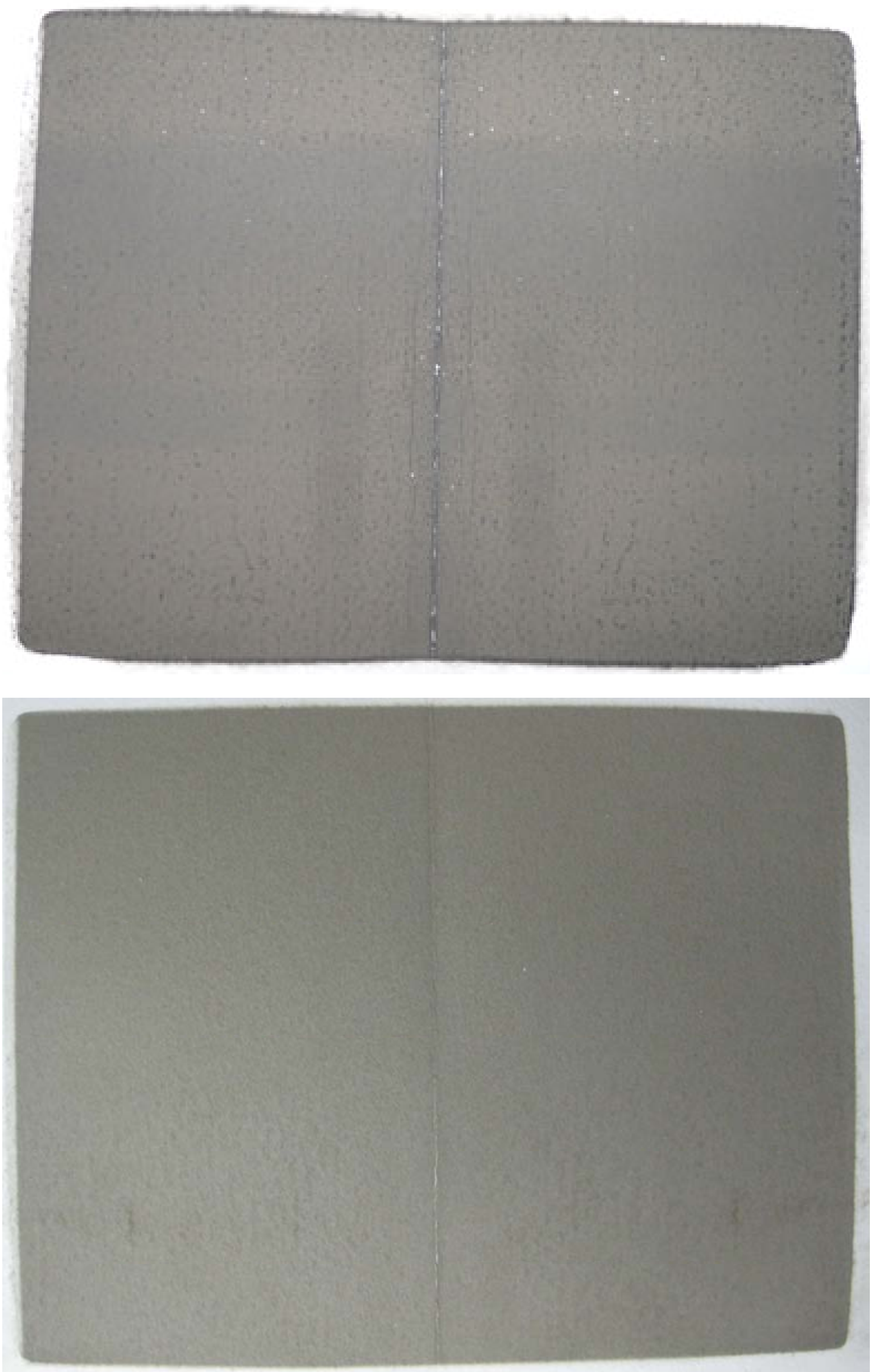

**Figure V.C.2 Color photograph of 24-hour SSI filters used at the Calexico Grant station: 12-25-06 (248 $\mu g/m^3$, top) compared with 9-7-05 (68 $\mu g/m^3$, bottom)**

# Attachment D

# Imperial County $PM_{10}$ 2001 Attainment Demonstration

This attachment is the report documenting the air dispersion modeling conducted by ENVIRON in 2001 to assess the maximum impact of US emissions on $PM_{10}$ ambient concentrations in Imperial County in 1992-1994 and 1999.

# Imperial County

# $PM_{10}$ Attainment Demonstration

Prepared for:

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July 2001

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**TABLES**

# ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| BLM | U.S. Department of Interior Bureau of Land Management |
| CAA | Federal Clean Air Act |
| CARB | California Air Resources Board |
| CMB | chemical mass balance |
| CRP | Conservation Reserve Program of the Food Security Act of 1985 |
| DPW | Department of Public Works |
| EPA | U.S. Environmental Protection Agency |
| IC | Imperial County |
| ICAPCD | Imperial County Air Pollution Control District |
| IID | Imperial Irrigation District |
| LAER | Lowest Achievable Emissions Rate |
| NAA | nonattainment area |
| NAAS | Naval Auxiliary Air Station |
| NAAQS | National Ambient Air Quality Standards |
| NCDC | National Climatic Data Center |
| $NO_3$ | nitrates |
| $NO_x$ | nitrogen oxides |
| NSR | New Source Review |
| NWCG | National Wildlife Coordinating Group |
| PM | particulate matter |
| $PM_{10}$ | particulate mater less than 10 μm in aerodynamic diameter |
| RACM | Reasonably Available Control Measure |
| RACT | Reasonably Available Control Technology |
| SCS | U.S. Department of Agriculture Soil Conservation Service |
| SFS | sequential filter sampler |
| SIP | State Implementation Plan |
| $SO_2$ | sulfur dioxide |
| $SO_4$ | sulfates |
| SSI | size-selective inlet |
| TSP | total suspended particulates (less than 30 μm in aerodynamic diameter) |
| μg/m | microgram per cubic meter |
| μm | micron or micrometer |
| VMT | vehicle miles traveled |

## I. Modeling Overview

The CAA (in Section 172) requires that Imperial County must have attained the $PM_{10}$ standard by 1994. The CAA also allows (in Section 179B) that an area may demonstrate that it would have attained a NAAQS but for emissions which originate outside the United States. In accordance with these provisions, this attainment plan demonstrates that Imperial County would have been in attainment by 1994 (design years 1992-1994), but for international transport of $PM_{10}$ emissions emanating from Mexico. The CALMET/CALPUFF modeling system was applied in order to make this demonstration over the time period of interest.

The modeling conducted in this demonstration only includes emissions generated within Imperial County. This limitation resulted from deficiencies in the quality and availability of data representing sources located in Mexicali, the closest Mexican urban area to the border with Imperial County. EPA has previously allowed states to demonstrate attainment of the $PM_{10}$ NAAQS but for emissions transported from Mexico using only emissions generated within the United States. In 1993, EPA approved the $PM_{10}$ attainment plan for El Paso, Texas in which only emissions generated on the U.S. side of the border were modeled.

All exceedance days between 1992 and 1994 were modeled in order to show that Imperial has attained the $PM_{10}$ standard but for emissions from Mexico. That is, all days over a three-year period in which Imperial County monitors measured $PM_{10}$ concentrations exceeding the NAAQS standard were modeled. There were 9 such days during this time period.

In addition to the exceedance days, complete year model runs were performed for 1992, 1993, 1994, and 1999. These complete year runs were performed for two reasons: (1) to have a more complete meteorological time frame including the 5:6 days when $PM_{10}$ data are not available with which to demonstrate that the $PM_{10}$ exceedances in Imperial County would not have occurred but for emissions from Mexico; and (2) the 1999 year was used for a CALMET/CALPUFF model performance evaluation to evaluate the adequacy of the Imperial County and Mexicali emissions inventory.

## II. Models

$PM_{10}$ exceedances in the Imperial Valley are mainly attributable to primary $PM_{10}$ due to geological dust (~60%), followed by carbon (~25%) (Chow and Watson, 1997). There are also small components due to secondary PM (sulfate, nitrate, and organics). Exceedances of the $PM_{10}$ standard sometimes occur under stagnation conditions. Thus, a model for simulating PM in the Imperial Valley needs to have the following attributes:

- Ability to simulate the impacts of primary $PM_{10}$ under stagnant as well as more organized transport conditions;
- Ability to treat point and area sources, and primary and secondary PM; and
- Ability to perform source attribution to identify the contributions of United States versus Mexican sources.

For treating just primary PM, the ISC and AERMOD steady-state Gaussian plume models are the EPA-recommended tools. However, these models do not treat stagnation conditions nor do they treat secondary PM. There are no recommended models for treating secondary PM/stagnation conditions. We considered using an advanced three-dimensional grid model such as UAM-AERO, UAM-AERO/LT, CMAQ, or CAMx, but these models have high data and resource requirements and are difficult to use for source attribution. To meet the above attributes we chose the CALMET/CALPUFF modeling system as the most appropriate model that can meet the SIP submittal time constraints imposed by the present litigation against EPA.

We also investigated the possibility of using receptor models, such as the Chemical Mass Balance (CMB) model. The 1992-1993 Cross Border Transport Study performed receptor modeling and found geological dust the highest contributor (70-90%) followed by motor vehicle exhaust (10-15%) with vegetative burning sometimes contributing also (10%). As part of the year 2001 Imperial County SIP development, CARB performed CMB receptor modeling using 1995-1996 PM data and new source profiles for U.S. versus Mexico gasoline combustion sources (which differ mainly in sulfur contents). According to CARB, the latest Imperial County CMB receptor modeling indicated that a vast majority of the PM is due to geological material (Woodhouse, 2000; personal communication). Even using the new source profiles, the difference in the relative contributions between gasoline combustion sources in the United States and Mexico could not be identified.

## III. Model Input Data

This section describes the input data used in the modeling performed for this attainment demonstration. For each data type, the source of the input data is discussed, along with any modifications to this data that were required for its use in this demonstration.

### III.A. Meteorological Data

Meteorological data was obtained from a variety of sources. Surface data archived by the National Climatic Data Center (NCDC) was obtained for Imperial Airport. Upper air data was also obtained from NCDC for the San Diego (Miramar) and Tucson areas. Additional surface data was acquired from the CARB for stations located at Calexico-Ethel, Calexico-East, CBTIS, COBACH, ITM, and UABC. The latter four of these sites are located in Mexicali, Mexico. Table 7-1 shows the sources of all meteorological data used in the modeling in this attainment demonstration. Missing data substitutions were performed using methods developed by Atkinson and Lee (Atkinson and Lee, 1992).

**Table 7-1.** Sources of meteorological data.

| Station Name | Start | End |
|---|---|---|
| Imperial Airport | 1992 | 2000 |
| Calexico-Ethel[a] | 1995 | 1999 |
| Calexico-East | 1996 | 2000 |
| CBTIS | 1997 | 2000 |
| COBACH | 1997 | 2000 |
| ITM | 1997 | 2000 |
| UABC | 1997 | 2000 |

Notes:
[a] Meteorological data is available for 2000 at this site, but it was not obtained in time to incorporate it into the modeling.

### III.B. Modeling Emissions Inventory

The modeling inventory is updated less frequently than the inventory used for planning purposes, since emissions must be separated by source type (i.e., point sources, area sources, and mobile sources), and then entered into a geographic grid to account for the location of each source. The most recent gridded modeling inventory available was prepared by CARB as part of the Southern California Ozone Study (SCOS), using 1997 emissions data. CARB hired a SCOS emissions inventory contractor who has prepared a gridded emissions inventory for a domain including the Imperial Valley at 2-km and 5-km resolutions.

The 1997 modeling inventory used in this analysis has a 5-km resolution and included all of western Imperial County and Mexicali. The CARB SCOS modeling inventory was for a typical summer day in 1997 and included TSP, NOx, SOx, VOC, and CO (the VOC and CO emissions were not used in this study). This modeling inventory was adjusted for use in the SIP analysis. First, since this inventory contained emissions of total suspended particulate (TSP), all emissions were adjusted down to represent only $PM_{10}$. The ratio used in this adjustment was 1.93, which was calculated by dividing the total TSP emissions to total $PM_{10}$ emissions from Imperial County in 1995 (see Table 7-2).

The 1997 inventory was also prepared for a typical summer day, which is not appropriate when modeling days in other seasons. Summer months in Imperial County experience the highest winds, and hottest and driest days, so higher levels of $PM_{10}$ are most likely during these months. In order to account for this, 1995 emissions were compared for the summer and winter seasons. The ratio of these emissions was used to scale the modeling inventory for use in winter months. For the spring and fall months, the inventory was adjusted assuming that emissions during these months are an average of summer day and winter day emissions. Thus, the total adjustment factor for any day is the product of the factor for converting TSP to $PM_{10}$ and the factor used to convert from a summer day to the day of interest. The adjustment factors used in this analysis, along with the 1995 Imperial County emissions used to determine these, are listed in Table 7-2.

The NOx and SOx SCOS inventories obtained from CARB were included in this modeling demonstration to account for the formation of secondary particulate. Please note that the NOx and SOx emissions exhibited much less seasonal variation and were a much smaller component to the Imperial County PM concentrations, so no scaling of the SOx and NOx SCOS modeling inventories were performed.

**Table 7-2**. Determination of modeling inventory adjustment factors.

| Season | 1995 TSP (tons/day) | 1995 $PM_{10}$ (tons/day) | Adjustment Factor: TSP to $PM_{10}$ | Adjustment Factor: Seasonal |
|---|---|---|---|---|
| Annual[a] | 468.00 | 243.36 | -- | -- |
| Summer[a] | 654.43 | 339.17 | 1.93 | 1 |
| Winter[a] | 282.28 | 147.93 | 1.93 | 2.29 |
| Spring/Fall[b] | 468.36 | 243.55 | 1.93 | 1.39 |

Notes:
[a] 1995 emissions inventory obtained from CARB website (www.arb.gov/app/emsinv). Results using the 2000 CARB emissions produce almost identical scaling factors.
[b] Emissions for spring/fall day calculated as the average of summer and winter day emissions

An additional adjustment was required to allow the use of the 1997 gridded emissions data for all years between 1992 and 2000. In order to account for the change in emissions over time, the 1997 inventory has been scaled using changes in population. Thus, we assume that the change in emissions is roughly proportional to the change in population over time. This should be a reasonable assumption since the vast majority of $PM_{10}$ emissions in Imperial County are from area sources such as unpaved roads, paved roads, and agriculture. Thus, changes in population are more likely to affect overall $PM_{10}$ emissions than would be the case if the emissions were mainly from industrial sources.

Population data used to scale emissions was obtained from three different sources, as shown in Table 7-3. For years 1990 and 1999, where multiple data points were available, the average of all data was used. For years where no data was available, the population for that year was interpolated assuming steady population growth of 3.3%.

**Table 7-3**. Imperial County population data, 1990-2000.

| Year | CCBRES[a] | CDOF[b] | U.S. Census[c] | Average |
|---|---|---|---|---|
| 1990 | 110,934 | -- | 109,303 | 110,119 |
| 1991 | -- | -- | -- | 112,899 |
| 1992 | -- | -- | -- | 116,613 |
| 1993 | -- | -- | -- | 120,450 |
| 1994 | -- | -- | -- | 124,413 |
| 1995 | -- | -- | -- | 128,506 |
| 1996 | -- | -- | -- | 132,734 |
| 1997 | -- | -- | -- | 137,101 |
| 1998 | 144,051 | -- | -- | 142,831 |
| 1999 | 145,287 | 144,500 | 145,287[d] | 145,025 |
| 2000 | -- | 145,300 | -- | 147,683 |

Notes:
[a] Data from California Center for Border and Regional Economic Studies (http://www.ccbres.sdsu.edu)
[b] Data from California Department of Finance (http://www.dof.ca.gov)
[c] Data from U.S. Census Bureau (http://www.census.gov)
[d] When the model runs were started, 2000 U.S. Census data was not available, so the Census' 1999 projected population was used. The 2000 Census population for Imperial County is 142,361, so the population estimates used in the modeling are conservative, since higher population gives higher emissions estimates.

The 1997 SCOS modeling inventory also contained emissions for Mexicali. During 1998, a joint U.S.-Mexico study was performed to prepare a quality-assured inventory for Mexicali (Radian, 1999). Although the Radian Mexicali emissions inventory represented the best emissions database ever prepared for Mexicali, the emissions still appear low compared to emissions from U.S. cities, especially given the much larger number of unpaved roads and higher silt loadings on the streets in Mexicali. The SCOS 1997 summer baseline emissions inventory for the Mexicali portion of the domain was compared to the Radian Mexicali inventory. The SCOS Mexicali $PM_{10}$ and NOx emissions were half of those in the Radian inventory, and the SCOS SOx Mexicali emissions were only a quarter of what was in the Radian inventory.

After some investigation, we discovered that the SCOS Mexicali inventory was based on an old 1990 placeholder database that was projected to 1997. Mexicali has undergone significant amounts of growth over the last decade, particularly to the west. When the 1999 CALMET/CALPUFF model evaluation run was performed, the observed $PM_{10}$ concentrations at the Progresso site in western Mexicali were underpredicted by more than a factor of three (Morris, Lu, and Tai, 2001). Thus, the SCOS Mexicali inventory was judged to be inadequate for use in the SIP modeling.

### III.C. Receptor Locations

In modeling runs performed for this analysis, receptors were placed at all existing $PM_{10}$ State and local monitoring sites in the Imperial County Air Basin, including those located in Mexicali.

### III.D. Background Concentrations

A background $PM_{10}$ concentration must be added to the CALPUFF modeling results. Ideally, monitoring sites within the modeling domain that are upwind of all emission sources should be used to obtain a background concentration. Unfortunately, none of the monitors in Imperial County can be classified over a 24-hour period as being upwind of all emission sources.

In order to determine an approximate $PM_{10}$ background concentration, the frequency distribution of observed $PM_{10}$ concentrations at all Imperial and Mexicali monitors from 1992 to 2000 were analyzed. Table 7-4 summarizes the observed $PM_{10}$ concentrations in the lowest percentiles (5% to 30%). Assuming that background levels accounts for about half of the lowest measured concentrations, a clean background could be approximated as 10 $\mu g/m^3$. Our modeling results, however, will be based on an annual and 24-hr background concentration of 25 $\mu g/m^3$ in order to be conservative. (Bohnenkamp, 2001)

**Table 7-4**. Lowest percentiles of a distribution of observed $PM_{10}$ data

| Percentile | Monitor Value ($\mu g/m^3$) |
|---|---|
| 5% | 19 |
| 10% | 25 |
| 15% | 29 |
| 20% | 32 |
| 25% | 36 |
| 30% | 39 |

### III.E. Design Value Determination

Based on the 1:6 day sampling schedule for 1994, Imperial County is required to show that all exceedances can fall under the ‘but for’ exemption for that year. Thus, all days that showed an exceedance at any monitor were modeled. All other exceedance dates between 1992 and 1994 were also modeled to show that Imperial County has maintained attainment but for emissions from outside the U.S. The modeling results from 1992, 1993, 1994, and 1999 were also used to show attainment of the annual NAAQS standard.

## IV. Modeling Results

### IV.A. Full-Year Modeling Results

Full-year model runs were performed for the years 1992, 1993, 1994, and 1999. The predicted maximum 24-hr and annual average concentrations were below the NAAQS at all monitoring sites for each of these years. The CALPUFF modeling results for these years are summarized in Table 7-5. For the years 1992, 1993, and 1994, the maximum 24-hour and annual averages were predicted at the Calexico-Grant monitoring site. The highest 24-hr concentration modeled at this site during this period was 140.4 $\mu g/m^3$. The annual average at Calexico-Grant, calculated as the average of the quarterly averages for a period of three years (1992-1994), was 41.6 $\mu g/m^3$. For 1999, the maximum predicted 24-hr concentration was 111.6 $\mu g/m^3$ at the El Centro site. The annual average for 1999 was 43.8 $\mu g/m^3$ at Calexico-Grant.

**Table 7-5.** Predicted concentrations at Imperial County monitors for full-year runs ($\mu g/m^3$)

| Year | Averaging Time | Brawley | Calexico-Ethel | Calexico-Grant | El Centro | Niland | Westmorland |
|---|---|---|---|---|---|---|---|
| 1992 | Max. 24-hr | 69.7 | 87.8 | 92.4 | 86.2 | 61.2 | 80.2 |
| | Annual | 34.2 | 39.7 | 40.5 | 40.0 | 30.5 | 35.8 |
| 1993 | Max. 24-hr | 80.5 | 101.7 | 102.3 | 94.2 | 77.7 | 80.2 |
| | Annual | 34.0 | 41.9 | 42.8 | 41.9 | 30.0 | 35.2 |
| 1994 | Max. 24-hr | 85.9 | 131.3 | 140.5 | 112.9 | 100.3 | 89.2 |
| | Annual | 34.9 | 40.8 | 41.6 | 41.0 | 31.9 | 36.9 |
| 1999 | Max. 24-hr | 77.7 | 102.5 | 108.4 | 111.7 | 65.7 | 76.1 |
| | Annual | 33.8 | 42.6 | 43.8 | 42.1 | 30.3 | 35.5 |

Note: modeling assumes a background concentration of 25 $\mu g/m^3$.

### IV.B. Exceedance Day Modeling Results

Each day between 1992 and 1994 that had observed exceedances of the 24-hr NAAQS was modeled using only Imperial County emissions. The results show that the predicted concentrations are below the 24-hr $PM_{10}$ NAAQS for every exceedance day during this period. Table 7-6 shows the predicted values for each exceedance day. The highlighted values show monitors that measured an exceedance on a given day. For comparison, the actual values measured on these days can be found in Table 7-7.

The maximum predicted 24-hour concentrations for Brawley, Calexico-Ethel, Calexico-Grant, Niland, and Westmorland are 79.7 μg/m$^3$, 101.7 μg/m$^3$, 102.1 μg/m$^3$, 124.0 μg/m$^3$, 62.3 μg/m$^3$, and 88.7 μg/m$^3$, respectively. These results confirm that Imperial County would be in attainment of the NAAQS standards but for emissions originating outside the United States.

**Table 7-6.** Predicted concentrations for exceedance days between 1992 and 1994.

| | Predicted concentration (μg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|
| **Date** | **Brawley** | **Calexico-Ethel** | **Calexico-Grant** | **El Centro** | **Niland** | **Westmorland** |
| 10/9/92 | 20.5 | 37.9 | 38.3 | 45.5 | 2.3 | 18.2 |
| 1/19/1993 | 30.3 | 48.1 | 49.6 | 43.8 | 26.2 | 29.5 |
| 1/25/1993 | 26.3 | 30.4 | 30.8 | 28.5 | 25.8 | 25.9 |
| 8/23/1993 | 45.8 | 101.7 | 102.1 | 91.8 | 31.6 | 43.7 |
| 1/20/94 | 8.5 | 18.8 | 20.7 | 22.6 | 1.3 | 6.4 |
| 7/7/1994 | 56.4 | 53.3 | 53.8 | 65.8 | 31.6 | 54.4 |
| 8/6/1994 | 46.3 | 31.3 | 31.5 | 37.8 | 56.0 | 54.9 |
| 10/17/1994 | 31.7 | 49.4 | 52.7 | 47.0 | 26.9 | 32.0 |
| 12/16/1994 | 26.6 | 34.1 | 35.6 | 30.6 | 25.3 | 26.4 |

**Table 7-7**. Imperial County 24-hour $PM_{10}$ exceedance days, 1992-1994 (D – dichotomous sampler).

| | Observed concentration (μg/m$^3$) | | | | | |
|---|---|---|---|---|---|---|
| **Date** | **Brawley** | **Calexico-Ethel** | **Calexico-Grant** | **El Centro** | **Niland** | **Westmorland** |
| 10/9/92 | 78 | | 208 D | | | |
| 01/19/93 | 162 | | | | | |
| 01/25/93 | 175 | | | | | |
| 08/23/93 | 98 | | 253 D | 166, 168 D | | |
| 1/20/94 | 88 | | 156 D | 55 D | | |
| 07/07/94 | 58 | | 165 | 62 | | 62 |
| 08/06/94 | 126 | 258 | 182 | 119 | | 73 |
| 10/17/94 | 44 | 113 | 159 | 49 | | |
| 12/16/94 | 60 | 153 | 56 | 37 | | |

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# Appendix A

# Supporting analyses for the determination that attainment would have been achieved but for emissions originating outside of the U.S.

## I. Introduction

In the main report, the results of dispersion modeling of $PM_{10}$, $SO_X$, and emissions from Imperial County were reported. These results suggest that emissions from Imperial County were insufficient to cause the observed $PM_{10}$ exceedances that occurred in Imperial County between 1992 and 1994. For reasons discussed in the main report and summarized below, only the emission sources in Imperial County were included in the dispersion modeling. Performing dispersion modeling using U.S. sources alone to demonstrate that $PM_{10}$ exceedances would not have occurred "but for" contributions from International sources has been demonstrated in the past as an adequate and sufficient test for an EPA approvable "but for"$PM_{10}$ attainment demonstration (TACB, 1991). The modeling results presented in the main report fulfill the standard set by the aforementioned $PM_{10}$ attainment demonstration. Qualitative information and analyses that support the conclusion that Imperial County would attain the $PM_{10}$ standard "but for" contributions from international transport are presented here in Appendix A.

One of the difficulties in making the "but for" determination is that there is limited monitoring and emissions inventory data available in Imperial County and even less data for the areas just south of the border in Mexico. And although the number of monitoring sites and the emissions inventory have been improving over the last 5 years in Imperial County and Mexicali, further improvements would yield a more precise quantification of the impacts on $PM_{10}$ concentrations in Imperial County due to emissions from Mexico. In the original Imperial County Data Analysis and Modeling Protocol, dispersion modeling using both U.S. and Mexican emissions was proposed in order to apportion the U.S. versus Mexico contributions to each $PM_{10}$ exceedance to make the "but for" determination. Emissions data were to be based on the California Air Resources Board's (CARB) extensive and resource intensive emissions updates performed as part of the Southern California Ozone Study (SCOS). However, the database received in Spring 2001 was based on a 1990 placeholder inventory, not the more recent 1996 emissions inventory for Mexicali (Radian, 2000). This database was determined to be unsuitable for modeling. Thus, in order to perform dispersion modeling of both U.S. and Mexican sources, the redevelopment of a modeling inventory for Mexico would be required.

Multiple data analysis techniques, that qualitatively show that emissions from Mexico contribute to concentrations measured on Imperial County's exceedance days, have been developed to support the quantitative dispersion modeling results of U.S emission sources. These data analysis results are less quantitative than the modeled attainment demonstration in the main report of the main report. The analyses, however, do offer corroborative qualitative evidence to the dispersion modeling that the $PM_{10}$ exceedances in Imperial County would not have occurred "but for" contributions from Mexico. The results of the analyses are grouped by exceedance day at the end of this appendix.

## II. Procedures

The series of data analysis techniques developed to illustrate whether or not emissions from Mexico contribute to exceedances of the 24-hour $PM_{10}$ NAAQS in Imperial County include the following:

- Comparison of $PM_{10}$ emissions and population in all of Imperial County with those just in the city of Mexicali, Mexico;
- Emissions uncertainty analysis that analyzes whether the dispersion modeling suggests that violations of the $PM_{10}$ standard could be attributable to Imperial County sources if the emissions were varied within their range of uncertainties;
- Spatial maps of 24-hour $PM_{10}$ concentrations on Imperial County exceedance days from which the potential transport paths can be inferred based on concentration-gradients. For Imperial County, the monitors are aligned such that only a strict south to north transport path can be shown;
- Wind roses of 24-hour hourly wind speeds and wind directions at the closet surface meteorological site to the Imperial County $PM_{10}$ exceedance site. Transport from Mexico can be inferred when southerly wind components are present;
- Back trajectory analysis showing the synoptic air flow over the last 36-hours. The plots show the likely geographic source of the $PM_{10}$ emissions that contributed to the exceedance based on upper-level winds; and
- Meteorological stagnation classification. Under stagnant conditions, the wind rose and back trajectory analyses are less reliable than other periods with stronger winds.

By themselves, each of these data analysis techniques has limitations and uncertainties and only provides qualitative supporting evidence. However, taken in total along with the dispersion modeling provided in the main report, the analyses provide a weight of evidence that the $PM_{10}$ exceedances in Imperial County would not have occurred “but for” contributions due to emissions that originated in Mexico.

### Imperial County versus Mexicali Emission Inventory Comparisons

The dispersion modeling presented in the main report suggests that emissions from Imperial County are insufficient by themselves to cause the observed $PM_{10}$ exceedances that occurred in Imperial County from 1992 to 1994. In this section, the possible sources that may have led to the high $PM_{10}$ concentrations measured in Imperial County are discussed. The other potential explanations for the $PM_{10}$ exceedances are:

1. Contamination or other monitoring artifacts leading to false positive exceedances;
2. Undocumented or episodic emission sources in the U.S.;
3. Transport from U.S. emission sources outside of Imperial County; and/or
4. Contributions of emissions from Mexico.

$PM_{10}$ monitoring is an inexact science with many more possibilities of contamination, interference, or other phenomena leading to false positive exceedances than other criteria pollutants (e.g., ozone, $SO_2$, etc.). Thus, isolated exceedances, without supporting evidence from the other $PM_{10}$ observations that elevated $PM_{10}$ concentrations were present in the area, must be considered with caution.

The dispersion modeling showed that emissions in Imperial County are insufficient to cause exceedances of the $PM_{10}$ standard suggesting that there must be other emission sources either non-routine episodic emissions (e.g., upsets) or emissions originating outside of Imperial County (in the U.S. or outside the U.S.). Within Imperial County, the following episodic emissions could contribute to $PM_{10}$ concentrations:

- Vegetative burning;
- Wind blown dust due to high winds; and
- Fugitive dust due to INS tire dragging operations

A correlation between $PM_{10}$ exceedances in the Imperial County and agricultural burning or wildfires in the Imperial Valley, however, could not be determined. The ICAPCD agricultural burning records show that of the 159 days with $PM_{10}$ monitoring data between 1999 and 2000, there are 128 days with agricultural burning in the county; and only 31 days without. Out of the 17 exceedance days in this period, 12 had some type of agricultural burning, 5 did not. Of the 142 days with monitoring data that did not show an exceedance, 116 had some type of agricultural burning, only 26 did not. These results suggest that there is no correlation between exceedance days and agricultural burning taking place in Imperial County.

Furthermore, if extremely high winds produced sufficient wind blown dust to cause $PM_{10}$ exceedances at Imperial County monitors, it is likely that high $PM_{10}$ concentrations would be measured throughout the Imperial Valley. As discussed in more detail below, such wide spread high $PM_{10}$ occurrences tend to only occur when winds are from the south, where emissions from Mexico are most likely impacting the measured concentrations.

Finally, the fugitive dust emissions due to the INS tire dragging operations are sufficiently far away from the Calexico Grant and Ethel sites and are expected to have a minimal impact at these sites, and at other sites further north in Imperial County.

If U.S. sources outside of Imperial County contributed significantly to PM exceedances in Imperial County, then such sources would likely cause severe local exceedances, outside of Imperial County also. There is no evidence of this.

The largest emissions source outside of the U.S. that is not accounted for in the dispersion modeling is the City of Mexicali. Radian compiled a 1996 emissions inventory for Mexicali that represents the best current estimate of Mexicali emissions (Radian, 2000). However, it is also recognized that this inventory is much lower quality than that available for the U.S. sources and that the emissions in Mexicali are underreported. Table A-1 below compares $PM_{10}$ emissions and other pertinent parameters in Imperial County with those in the City of Mexicali. In 1996, emissions within the City of Mexicali itself exceed those in all of Imperial County. The emissions density in Mexicali is 20 times greater than that of Imperial County.

Based on the data from the Radian report, one of the largest $PM_{10}$ emissions source in the Imperial Valley is the City of Mexicali. This emissions source is not accounted for in the dispersion modeling and is the most logical source that would lead to the Imperial County exceedances.

**Table A-1.** Comparison of Imperial County and Mexicali Emissions

| | **Imperial County** | **City of Mexicali** |
|---|---|---|
| 1996 $PM_{10}$ Emissions (tons/day)[1] | 246 | 257 |
| Population (2000)[2] | 142,361 | 622,617 |
| Area ($mi^2$)[3] | 4060 | 200 |
| Growth Rate (1990-2000)[2] | 30% | 42% |

1. Air Resources Board emissions inventory and Radian, 2000.
2. US CENSUS bureau and Radian, 2000.
3. CERES and Topographic Maps.

**Emission Uncertainties**

The dispersion modeling results presented in the main report suggest that emissions from the U.S. alone are insufficient to cause $PM_{10}$ exceedances in Imperial County. However, the Imperial County emissions inventory has a degree of uncertainty. This is especially true for the fugitive dust $PM_{10}$ emission sources (e.g., unpaved roads, agricultural, etc.) that dominate the Imperial County $PM_{10}$ emissions inventory. For some emission sources (e.g., combustion), however, emission uncertainties are fairly low and well known.

The Imperial County dispersion modeling results from 1992 to 1994 were examined in order to determine the level of emissions uncertainty necessary for emissions from Imperial County alone to cause a $PM_{10}$ exceedance and a violation of the $PM_{10}$ standard. Ideally, the Imperial County emissions should be varied within their range of uncertainties and a Monte Carlo or other statistical technique should be used to estimate the probability that emissions from Imperial County alone could cause an exceedance or violation of the $PM_{10}$ standard. However, since such emissions uncertainty bounds are not currently available, a simple worst case analysis was performed to estimate the level of emissions increase necessary for Imperial County emissions alone to cause an exceedance or violation of the $PM_{10}$ standard.

For the 24-hour $PM_{10}$ NAAQS and a 25 $\mu g/m^3$ background, the Imperial County $PM_{10}$ emissions inventory would have to be biased 86%, 62%, and 8% higher in order to cause a $PM_{10}$ exceedance during, 1992, 1993, and 1994, respectively. Note that the 25 $\mu g/m^3$ background, itself, is conservatively high.

For the annual $PM_{10}$ NAAQS and a 25 $\mu g/m^3$ background, the Imperial County $PM_{10}$ emissions inventory would have to be biased 61%, 40%, and 50% higher in order to cause a violation in 1992, 1993, and 1994, respectively. Using the modeling results from 1992 to 1994, the Imperial County emissions inventory would have to be biased 50% high in order to have a violation of the 24-hour $PM_{10}$ NAAQS.

In summary, although the uncertainty in the Imperial County emissions inventory is not quantified, the analysis presented above indicates that a 46% and 50% positive bias of the Imperial County $PM_{10}$ emissions inventory is required in order to show a violation of the annual and 24-hour $PM_{10}$ NAAQS, respectively, due to emissions from Imperial County. Since the procedures used to generate the Imperial County emissions inventory are the same as those used throughout California, it is unlikely that the Imperial County emissions inventory possess such a large bias. Thus, the emissions uncertainty analysis supports the finding that the Imperial County emissions alone are insufficient to cause violations of the $PM_{10}$ NAAQS.

## Spatial Plots

Spatial plots were prepared showing the spatial distribution of 24-hour $PM_{10}$ concentrations that were measured at each Imperial County monitoring site, as well as sites in Mexicali when available, for each Imperial County exceedance day from 1992 through 1994. On days in which transport is from the south and is aligned along the Mexicali-Imperial County $PM_{10}$ monitoring network then a $PM_{10}$ concentration gradient from south to north provides evidence of transport from Mexico.

On many of these exceedance days, spatial plots provide evidence that the Imperial County exceedance was likely caused by emissions emanating from Mexico. Strong evidence includes days where concentrations are concurrently high in Mexicali (or higher than) and in Imperial County or days where there is a decreasing concentration gradient as one moves from south to north. The spatial plots show the following for Imperial County 24-hour $PM_{10}$ exceedance days from 1992 to 1994:

- The spatial plots for 7 out of 9 days show spatial $PM_{10}$ concentration gradients going from higher to lower as one moves from south to north;
- Zero out of nine exceedance days show concurrent high $PM_{10}$ concentrations in both Mexicali and in Imperial County (no data was available in Mexicali between 1992 and 1994);
- Only 2 out of 9 days do not show a south to north increasing concentration gradient; Both of these days have only have one data point so no trend can not be determined.

On some exceedance days, the spatial plots do not conclusively show that transport from Mexicali is contributing to the Imperial County $PM_{10}$ exceedances. In these cases, however, the potential for emissions from Mexico impacting Imperial County monitors still exists for three reasons. First, the Mexicali monitoring network is very sparse and there is a large area directly to the south of Calexico in Mexicali without any monitors. This gap allows the possibility that the Mexicali monitors may miss significant emission sources in Mexicali. Second, emissions may circumvent the sparse monitoring network and circle around to impact only northern Imperial County. Third, there are emission sources outside the U.S. not in Mexicali that can also impact the Imperial County monitors without recording high $PM_{10}$ concentrations in Mexicali (e.g., Laguna Salada).

## Wind Rose Analysis

Wind roses of hourly surface wind speed and direction from the closest meteorological station to the monitor showing an exceedance for the 24-hour exceedance day are also included. These wind roses provide evidence of potential transport from Mexico during all Imperial County $PM_{10}$ exceedance days. An hourly wind direction was classified as having the potential of carrying emissions from Mexico into Imperial County if it has a southerly component (i.e. wind direction ranging from 90 degrees thru 270 degrees).

Every exceedance day had at least 14 hours where the measured wind direction indicated that emissions from Mexico would be carried into Imperial County. That is, all Imperial County $PM_{10}$ exceedance days had a fraction of the time where winds are out of the south from Mexico. On average, each exceedance day had 16 hours of wind that would carry emissions from outside of the U.S. into Imperial County (i.e., on average, on Imperial County exceedance days, over half of the day exhibited hourly wind directions that implied transport from Mexico). These results overwhelmingly support the hypothesis that emissions from Mexico are impacting Imperial County monitors and are significantly contributing to $PM_{10}$ concentrations on $PM_{10}$ exceedance days.

## Back Trajectory Analysis

Back trajectories, showing the most likely source of origination of air parcels that arrived at the Imperial County monitor during the 24-hour $PM_{10}$ exceedance day, were also created for each exceedance date. These were created using the HYSPLIT model on the Air Resources Laboratory (ARL) of the National Oceanic and Atmospheric Administration (NOAA) website. Based on user input information (date, time, location, wind heights), the model calculates and plots the back trajectory using wind fields developed by National Weather Service (NWS). These wind fields were based on the initialization portion of the NWS weather forecast models and represent synoptic flow regimes. Thus, local surface wind variations are likely not be present in these analyses. The 36-hour back trajectory plots were generated for each exceedance day in four hour increments from the location of the Imperial County monitor measuring the highest $PM_{10}$ concentration of the day. The trajectories demonstrate 1) when the air passes through Mexico and then into Imperial County; 2) when the air might have circumvented the monitors in Calexico and impacted the northern monitors in Imperial County; and 3) when air may have come from Mexico, but not necessarily through Mexicali.

## Stagnation Classification

Wang and Angell (1999) have developed procedures to classify days as having stagnant air. They define a major air pollution episode day as a stagnation event if it lies in a 4-day period when the average sea-level geostrophic wind speed is less than 8 m/s. Wang and Angell equate this to a surface wind speed (10 m above ground level) of less than 3.2 m/s. Using Wang and Angell's criteria, our exceedance days were classified as stagnation events if the average wind speed for the day was less than 3.2 m/s. The 4-day criterion was excluded because the exceedance days were not required to be major pollution episodes. A listing of exceedance days for Imperial County and the corresponding surface wind speeds on those days can be found in Table A-2.

Under stagnant air conditions, low wind speeds lead to poor dispersion of pollutants such as $PM_{10}$. Furthermore, the extrapolation of low local wind speeds to a regional level is not necessarily as accurate as that made for higher local wind speeds. Therefore, wind roses and back trajectories for exceedance days that can be classified as a stagnation event should be analyzed with more care. During stagnation events, it is possible that the wind rose and/or back trajectory may not accurately represent the impact of emissions from Mexico on Imperial County.

For all of the exceedance days where the back trajectories do not show air coming from Mexico, the day can be classified as a stagnant air event. All exceedance dates showed a fraction of hours with winds blowing from the south towards the north. There are 5 out of 9 exceedance dates where the back trajectories did not indicate air being carried from outside the U.S. into Imperial County. Each of these 5 dates could be classified as stagnant air days (1/19/93, 1/25/93, 1/20/94, 10/17/94, 12/16/94). Under these conditions, the dispersion modeling is probably the best indicator of which sources contributed to the exceedances since dispersion modeling can address both stagnant and non-stagnant conditions.

Table A-2. Wind speeds for each exceedance day, 1992-1994.

| Sampling Date | Average Wind Speed (m/s) | Meteorological Station |
|---|---|---|
| 10/9/92 | 2.3 | Imperial Airport |
| 1/19/93 | 1.8 | Imperial Airport |
| 1/25/93 | 2.8 | Imperial Airport |
| 8/23/93 | 4.0 | Imperial Airport |
| 1/20/94 | 1.9 | Imperial Airport |
| 7/7/94 | 2.5 | Imperial Airport |
| 8/6/94 | 3.9 | Imperial Airport |
| 10/17/94 | 1.5 | Imperial Airport |
| 12/16/94 | 2.8 | Imperial Airport |

## III. Results

The spatial plot, wind rose, and back trajectory analyses results provide an indication that emissions from outside the U.S. impact monitors in Imperial County. Four out of the nine exceedance dates had positive indicators from all three of these analyses. The results for the remaining five Imperial County exceedance days from the three data analysis techniques (spatial maps, wind roses, and back trajectories) were not as explicit, but the analyses still suggest that on all exceedance days, emission sources from outside the U.S. contributed to the $PM_{10}$ exceedances measured in Imperial County. These results combined with the dispersion modeling results in the main report, which suggest that emissions from the U.S. alone were insufficient to cause the $PM_{10}$ exceedance, provide a weight of evidence that the 24-hour PM exceedances in Imperial

County would not have occurred "but for" the contributions of emissions originating from Mexico. A general summary is given below followed by a detailed account for each exceedance day.

There were 7 out of 9 spatial plots that suggest that Imperial County monitors were being impacted by emissions coming from outside the U.S. Of the remaining two plots, both (1/19/93, 1/25/93) had only one data point (i.e., only one monitor recorded a concentration on each of these dates). All 9 exceedances dates show at least 14 hours with wind directions that could have carried emissions from Mexico to the impacted Imperial County monitor. Four out of nine exceedance dates have back trajectories that show air passing through Mexico and being carried to the impacted Imperial County monitor. Of the remaining five days, they can be classified as stagnant air days.

**Listing by exceedance day**

<u>October 9, 1992 (208 μg/m$^3$ at Calexico-Grant dichotomous sampler)</u>
There is a high value along the border and a lower value at the more northerly Brawley monitor. The wind rose shows that there are 14 out of 24 hours with southerly wind directions that have the potential to carry emissions from Mexico into Imperial County. The back trajectories suggest that air passes through Mexicali and then into Imperial County. The day, however, is classified as a stagnant air day. The proximity to the border, the spatial distribution, wind rose, and back trajectory suggest that emissions from Mexico contribute to this exceedance.

<u>January 19, 1993 (162 μg/m$^3$ at Brawley)</u>
There is only one data point for the spatial plot (Brawley). The wind rose shows that there are 15 out of 24 hours with southerly wind directions that have the potential to carry emissions from Mexico into Imperial County. The back trajectories based on upper-air synoptic wind data suggest much higher winds and back trajectories that do not pass through Mexicali. The day is classified as a stagnant air day, therefore there is more separation between the surface winds and the winds aloft and greater weight is given to the surface data. The wind rose suggests that emissions from Mexico contributed to the concentration measured at Brawley. Because the $PM_{10}$ exceedance on this day occurs when only one site was operating, there is insufficient information to draw any additional conclusions. However, given the closeness of the exceedance to the standard and the presence of surface winds with a southerly wind component for over half the day, it appears likely that this exceedance would not have occurred but for transport from Mexico.

<u>January 25, 1993 (175 μg/m$^3$ at Brawley)</u>
There is only one data point for the spatial plot (Brawley). The wind rose shows that there are 14 out of 24 hours with wind directions that have the potential to carry emissions from Mexico into Imperial County. The back trajectories suggest very high wind speeds that are obviously decoupled from the surface winds, which are very low. The day is classified as a stagnant air day. The wind rose suggests that emissions from Mexico contributed to the concentration measured at Brawley. This day is very similar in character with January 23, 1993 and the same conclusions apply.

August 23, 1993 (166 μg/m$^3$ at El Centro, 168 μg/m$^3$ at El Centro dichotomous sampler, 253 μg/m$^3$ at Calexico-Grant dichotomous sampler)

The spatial plot only has two data points at El Centro and Brawley but the more southerly monitor (El Centro) shows a much higher concentration. The dichotomous sampler in Calexico-Grant shows an even higher value. The wind rose shows that there are 19 out of 24 hours with wind directions that have the potential to carry emissions from Mexico into Imperial County and the back trajectory also shows that winds aloft carried air from Mexico into Imperial County. The day is not classified as a stagnation day suggesting that the wind rose and back trajectory are accurate. All analyses suggest that emissions from Mexico are impacting monitors in Imperial County.

January 20, 1994 (156 μg/m$^3$ at Calexico-Grant dichotomous sampler)

There is a high value along the border and a lower value at the more northerly El Centro and Brawley monitors. The wind rose shows that there are 15 out of 24 hours with southerly wind directions that have the potential to carry emissions from Mexico into Imperial County. The back trajectories suggest that air does not pass through Mexico. The day, however, is classified as a stagnant air day. The proximity to the border, the spatial distribution, and wind rose, suggest that emissions from Mexico contribute to this exceedance.

July 7, 1994 (165 μg/m$^3$ at Calexico-Grant)

The spatial plot shows an exceedance at Calexico-Grant that is more than two times higher than any monitor in Imperial County. The wind rose shows that there are 17 out of 24 hours with wind directions that have the potential to carry emissions from Mexico into Imperial County and the back trajectory also shows that winds aloft carried air from Mexico into Imperial County. The day is classified as a stagnation day suggesting that the wind rose and back trajectory should be interpreted cautiously. The analyses, however, still strongly suggest that emissions from Mexico are impacting monitors in Imperial County.

August 6, 1994 (258 μg/m$^3$ and 182 μg/m$^3$ at Calexico-Ethel and Calexico-Grant, respectively)

The spatial plot shows exceedances at Calexico-Ethel and Grant, one of which is more than double the concentrations measured at more northerly sites in Imperial County. The wind rose shows that there are 18 out of 24 hours with wind directions that have the potential to carry emissions from Mexico into Imperial County and the back trajectory also shows that winds aloft carried air from Mexico into Imperial County. The day is not classified as a stagnation day. All analyses suggest that emissions from Mexico are impacting monitors in Imperial County.

October 17, 1994 (159 μg/m$^3$ at Calexico-Grant)

The spatial plot shows decreasing concentrations moving north from Calexico. The wind rose shows that there are 14 out of 24 hours with wind directions that have the potential to carry emissions from Mexico into Imperial County. The back trajectories do not show air being carried from outside of the U.S. to the impacted location. The day, however, is classified as a stagnant air day, therefore there is more separation between the surface winds and the winds aloft and greater weight is given to the surface data. The single high $PM_{10}$ concentration at Calexico-Grant, close proximity to Mexico, and wind rose strongly suggest that this exceedance is likely due to emissions from Mexico.

December 16, 1994 (153 µg/$m^3$ at Calexico-Ethel)

The spatial plot shows decreasing concentrations moving north from Calexico. The wind rose shows that there are 14 out of 24 hours with wind directions that have the potential to carry emissions from Mexico into Imperial County. The back trajectories do not show air being carried from outside of the U.S. to the impacted location. The day, however, is classified as a stagnant air day, therefore there is more separation between the surface winds and the winds aloft and greater weight is given to the surface data. The single high $PM_{10}$ concentration at Calexico-Ethel, close proximity to Mexico, and wind rose suggest that this exceedance is potentially due to emissions from Mexico.

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