4.0 Analyses of Individual Nonattainment Area

4.9 Region 9 Nonattainment Areas

4.9.2 California

California Area Designations For the
24-Hour Fine Particle National Ambient Air Quality Standard

Note: As a basic introduction, the following is a summary table listing ALL areas and counties proposed for nonattainment in the State. The technical analyses for each individual area then follow.

The table below identifies the counties in California that EPA has designated as not attaining the 2006 24-hour fine particle ($PM_{2.5}$) standard.[1] A county (or part thereof) is designated as nonattainment if it has an air quality monitor that is violating the standard or if the county is determined to be contributing to the violation of the standard.

Area	California Recommended Nonattainment Counties	EPA's Final Designated Nonattainment Counties
Butte County	Butte County - Partial	Butte County - Partial
Imperial County	Imperial County - Partial	Imperial County- Partial
Sacramento County	Sacramento	Sacramento County Yolo County - Partial Placer County – Partial El Dorado County – Partial Solano County - Partial
San Francisco Bay Area	Sonoma County – Partial Napa County Marin County San Francisco County Contra Costa County Alameda County Santa Clara County San Mateo County Solano County - Partial	Sonoma County – Partial Napa County Marin County San Francisco County Contra Costa County Alameda County Santa Clara County San Mateo County Solano County - Partial

[1] EPA designated nonattainment areas for the 1997 fine particle standards in 2005. In 2006, the 24-hour $PM_{2.5}$ standard was revised from 65 micrograms per cubic meter (average of 98^{th} percentile values for 3 consecutive years) to 35 micrograms per cubic meter; the level of the annual standard for $PM_{2.5}$ remained unchanged at 15 micrograms per cubic meter (average of annual averages for 3 consecutive years).

San Joaquin Valley Air Basin	San Joaquin County Stanislaus County Merced County Madera County Fresno County Kings County Tulare County Kern County - Partial	San Joaquin County Stanislaus County Merced County Madera County Fresno County Kings County Tulare County Kern County - Partial
South Coast Air Basin	Los Angeles County – Partial San Bernardino County Partial Riverside County – Partial Orange County	Los Angeles County – Partial San Bernardino County Partial Riverside County – Partial Orange County
Yuba County Sutter County	Yuba County – Partial Sutter County - Partial	Yuba County – Partial Sutter County

EPA has designated the remaining counties in the state as "attainment/unclassifiable." EPA designated a county as "unclassifiable" when: one or more of its monitors recorded a violation in 2004-2006; all monitors in the county with complete 2005-2007 data showed attainment; and one or more other monitors in the county had 2005-2007 monitoring data that was not complete and could not be used for determining compliance with the standard.

EPA Technical Analysis for Chico (Butte County

Introduction

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those nearby areas that contribute to violations. This technical analysis for Butte identifies the counties with monitors that violate the 24-hour $PM_{2.5}$ standard and evaluates nearby counties for contributions to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

Figure 1 is a map of the counties in the area and other relevant information such as the locations and design values of air quality monitors, the metropolitan area boundary, and counties recommended as nonattainment by the State. Figure 2 shows the designated PM 2.5 nonattainment area within Butte County.

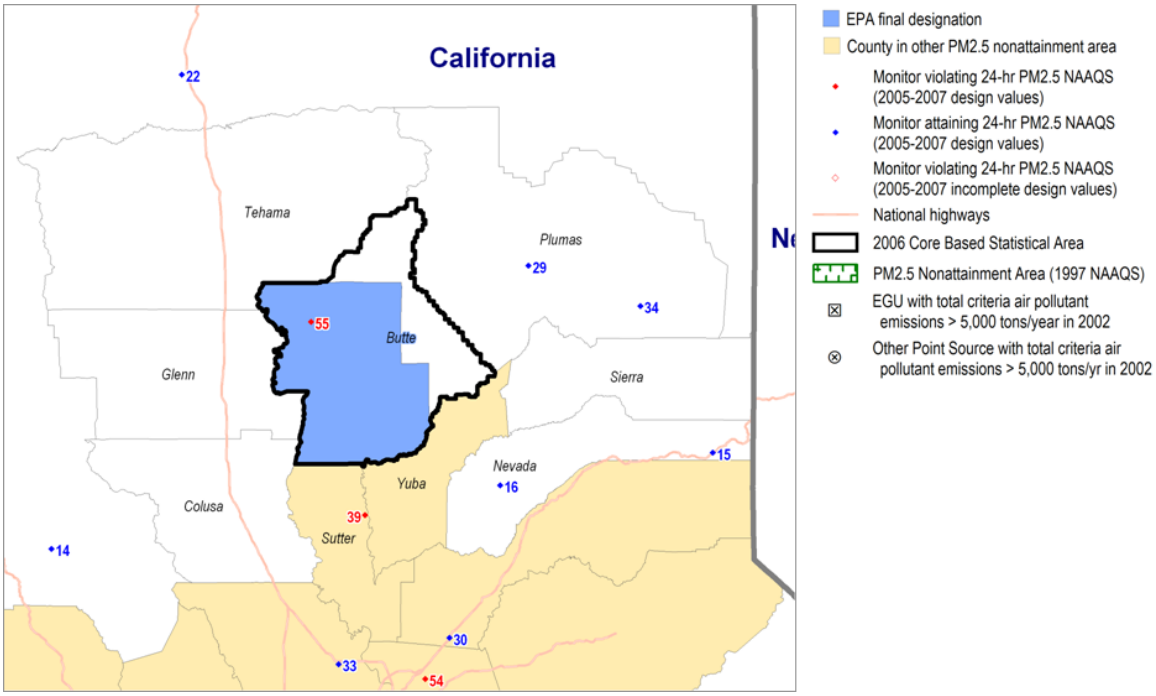


Figure 1.

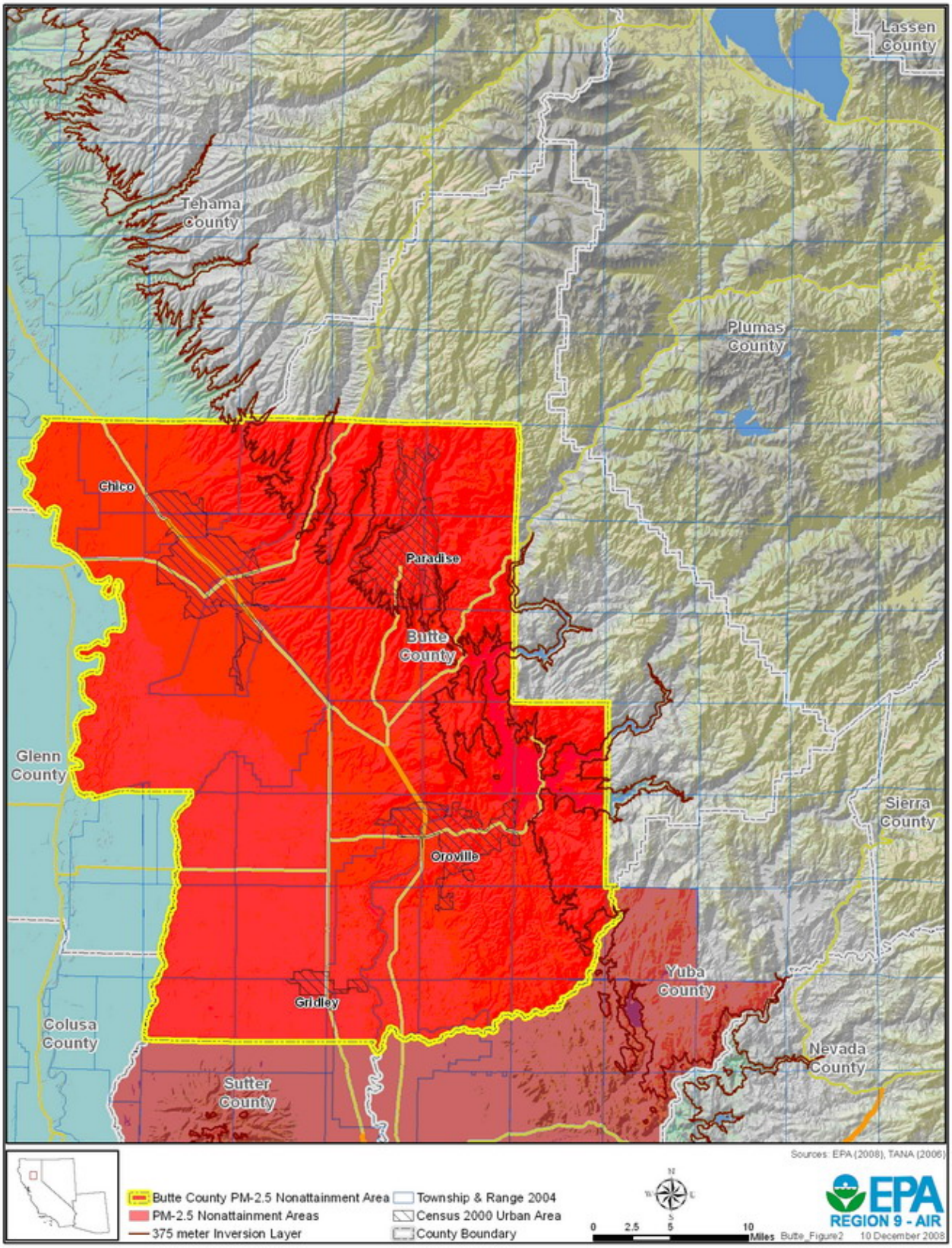

Lassen County
Tehama County
Plumas County
Chico
Paradise
Butte County
Glenn County
Sierra County
Oroville
Yuba County
Gridley
Colusa County
Nevada County
Sutter County
Sources: EPA (2008), TANA (2006)
Butte County PM-2.5 Nonattainment Area
PM-2.5 Nonattainment Areas
375 meter Inversion Layer
Township & Range 2004
Census 2000 Urban Area
County Boundary
0 2.5 5 10 Miles
Butte_Figure2 10 December 2008
EPA
REGION 9 - AIR

Figure 2

The California Air Resources Board (CARB), sent a letter to EPA, dated December 17, 2007 recommending that the City of Chico in Butte County be designated as "nonattainment" for the 2006 24-hour $PM_{2.5}$ standard based on air quality data from 2004-2006. These data are from Federal Reference Method (FRM) monitors located in the state.

In August 2008, EPA notified California of its intended designations. In this letter, EPA also requested that if California wished to provide comments on EPA's intended designation, it should do so by October 20, 2008. EPA stated that it would consider any additional information (e.g., on power plants or partial county areas) provided by the state in making final decisions on the designations.

Air quality monitoring data on the composition of fine particle mass are available from the EPA Chemical Speciation Network and the IMPROVE monitoring network, as well as from the Chico monitoring site. Analysis of these data indicates that the days with the highest fine particle concentrations occur predominantly in the cold season, and the average chemical composition of the highest days is characterized by high levels of organic carbon (e.g., 75%).

Based on EPA's technical analysis described below and currently available information, EPA has designated a portion of Butte County as nonattainment for the 24-hour $PM_{2.5}$ air-quality standard.

Butte County Area	California Recommended Nonattainment Counties	EPA's Final Designated Nonattainment Counties
Butte County	Butte County (partial)	Butte County (partial)

The following is a technical analysis for Butte County, California.

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown on the template or data spreadsheet as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html.

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive manner for considering data for these factors. A summary of the CES is included in Attachment 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the Butte County. Counties are listed in descending order by CES.

Table 1. PM 2.5 24-hour Component Emissions, and CES.

County	State Recommended Nonattainment?	CES	$PM_{2.5}$ total	SOx	NOx	Carbon $PM_{2.5}$	$PM_{2.5}$ other	VOCs	NH_3
Butte	Yes (P)	100	2,974	2,115	8,486	1,513	1,461	9,754	1,757
Tehama	No	19	1,443	2,087	3,936	823	620	4,150	782
Glenn	No	14	1,851	1,347	3,882	833	1,017	4,392	2,139

P = partial

Additional data considered in EPA's analysis of this factor are summarized in the following table derived from the California Air Resources Board Almanac of Emissions and Air Quality Data (http://www.arb.ca.gov/Aqd/almanac/almanac.htm). The following table further defines, in tons per day, the type of area sources contributing to $PM_{2.5}$ emissions in Butte County. Area sources include residential fuel combustion, farming operations, construction/demolition, paved road dust, unpaved road dust, fugitive windblown dust, fires, managed burning and disposal and cooking. Area sources represent the dominant emission source category for direct PM2.5 emissions in Butte County, with approximately 70% of the total. Based on Table 2, within the area source category, residential wood burning is the dominant source of $PM_{2.5}$. This is consistent with the speciation data discussed below.

Table 2. Area Source Emission (tons per day)

SOURCE	$PM_{2.5}$
Residential Fuel Combustion	2.65
Farming Operations	0.82
Construction/Demolition	0.11
Paved Road Dust	0.53
Unpaved Road Dust	0.76
Fugitive Windblown Dust	0.04
Fires	0.01
Managed Burning & Disposal	1.4
Cooking	0.07
Total Area Wide	6.4

Area Wide percent of total	68%
Total All	9.9
Source: ARB Almanac website (2006) http://www.arb.ca.gov/ei/maps/statemap/cntymap.htm	

Given the significance of NOx emissions in the formation of the $PM_{2.5}$, EPA also considered emissions provided in the CARB Recommendation letter under this factor, along with the NOx data from NEI summarized in Table 1. Table 3 summarizes NOx emissions from stationary, area, and mobile source categories for 2006, 2010, and 2020.

Table 3. NOx Winter Emissions for Butte County (tons per day)

Source Category	**2006**	**2010**	**2020**
Stationary Sources	1.4	1.4	1.4
Area Sources	1.7	1.7	1.7
Mobile Sources	23.3	19.9	11.3
Source: California Air Resources Board in their letter of December 17, 2007			

The CES shown in Table 1 describes the relative contribution of emissions from surrounding counties to the high emission days based on a broad analysis of NOAA HYSPLIT trajectories linking county-wide emissions from Butte and the surrounding counties and speciated air monitoring data on high days. The CES clearly demonstrates a connection between pollution levels in Chico and sources throughout Butte County. The CES shows less of a link between $PM_{2.5}$ levels in Chico and neighboring Tehama and Glenn Counties.

Speciation data from the Chico air monitoring station was considered in evaluating this factor, as a way to link emission sources to high $PM_{2.5}$ levels. As shown in the pie chart below (Figure 3), monitored $PM_{2.5}$ in Chico is 75% organic carbon, for which the major source is residential wood burning. Since this source category is associated with population density, this data supports including urbanized areas and their surroundings within the nonattainment area.

In addition, 16% of the $PM_{2.5}$ is ammonium nitrate, formed from precursor NOx emissions. Both Table 1 and 3 describe NOx emissions data for Butte County; mobile sources are the dominant source of NOx emissions. As discussed below under Factor 4: Traffic and commuting patterns, most of these emissions are along the roughly north-south State Route 99 corridor, with substantial additional contribution from commuting between Chico and the more eastern cities of Paradise and Oroville.

In light of the commuting patterns discussed under Factor 4 and illustrated in Figure 3, and in light of the spatial scale of nitrate formation, mobile source emissions in Butte County are contributing to the $PM_{2.5}$ exceedances measured in Chico.

Emission levels and CES values support designation of Butte County as a 24-hour $PM_{2.5}$ nonattainment area. However, it does not appear that the surrounding counties are significantly contributing to the pollution levels in Butte County. With respect to the CES values, Butte County has the highest CES score of 100, followed distantly by Glenn and Tehama Counties, at 14 and 19 respectively. Glenn and Tehama Counties are located west of Butte County, over 40 miles away. These counties have limited populations and no commuting pattern with Butte County. There is no evidence that these counties contribute to the $PM_{2.5}$ air quality problems in

Butte County . We have eliminated these counties from further consideration given these facts.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values in micrograms per cubic meter ($\mu g/m^3$) for air quality monitors in Butte County based on data for the 2004-2006 and 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standards are met when the 3-year average of a monitor's 98^{th} percentile values are 35 $\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met.

The 24-hour $PM_{2.5}$ design values for Butte County are shown in Table 2.

Table 4. Air Quality Data

County/ City	State Recommended Nonattainment	24-hour $PM_{2.5}$ Design Values 2004-06 ($\mu g/m^3$)	24-hour $PM_{2.5}$ Design Values 2005-07 ($\mu g/m^3$)
Butte County, CA City of Chico	Yes	56	55

The violating monitor for 2004–2006 and 2005-2007 is located in the City of Chico in Butte County. Therefore, Butte County is a candidate for designation as a nonattainment area. Tehama and Glenn counties have no $PM_{2.5}$ monitors , and consequently no data showing violations. Given the air quality data, including consideration of CES values, and the State's recommendations, Tehama and Glenn Counties were not further considered as nonattainment areas under this factor.

EPA considered the chemical composition (speciation) of $PM_{2.5}$ in evaluating this factor. As shown in the pie chart below (Figure 3), the chemical makeup of $PM_{2.5}$ in Chico is dominated by organic carbon, at 75% of the total. This reflects emissions from residential wood burning. There is also a large ammonium nitrate contribution. The highest concentrations occur during the winter months (i.e., November through February). As discussed above, the carbon portion supports nonattainment designation of at least the urban areas and their surroundings, while the nitrate portion supports at least a large proportion of the county.

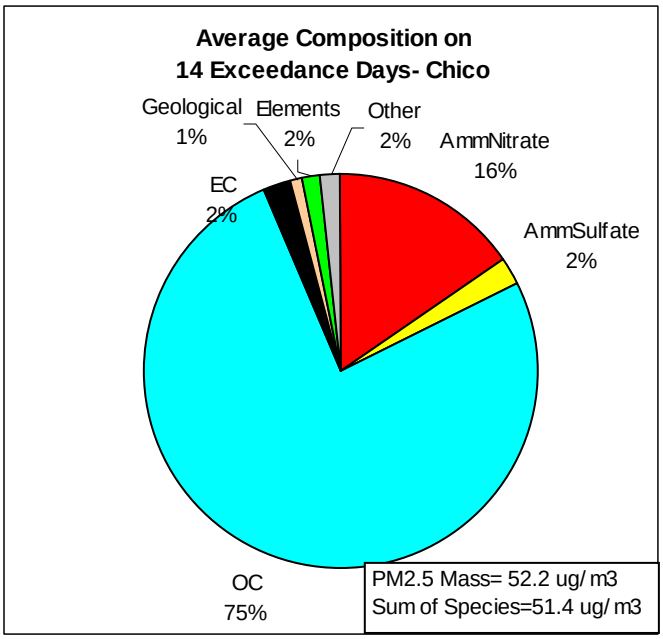


Figure 3

In summary, the air quality factor supports nonattainment designation of at least large portions of Butte County. $PM_{2.5}$ speciation data support the idea that localized residential wood burning on stagnant winter nights is what pushes the monitor into violation, but also support a larger area that includes sources contributing to the ammonium nitrate portion of violations.

Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with an FRM. All data from Special Purpose Monitors (SPM) using an FRM is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr $PM_{2.5}$ NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Population data are relevant in defining the boundaries of the $PM_{2.5}$ nonattainment area given the correlation between population and the emission sources contributing to $PM_{2.5}$ exceedances (i.e., residential wood burning and mobile sources), as well as the population exposed to high $PM_{2.5}$ levels. Table 6 shows the 2005 population for each county in the area being evaluated, as well as the population density for each county in that area. Population data gives an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour $PM_{2.5}$ standards.

Table 6. Population

County	State Recommended Nonattainment	2005 Population	2005 Population Density (pop/sq mi)
Butte	Yes (P)	214,153	128
Tehama	No	60,932	21
Glenn	No	27,683	21

P= partial

According to Table 3, Butte County has the highest population and population density. Tehama County has the next highest population of the adjacent counties, but significantly below Butte (also in terms of population density). Population centers in Butte County include Chico (population of 59,444 per 2000 US Census), Paradise (population of 26408 per 2000 US Census) and Oroville (population of 13004 per 2000 US Census). Tehama and Glenn County have the same population density of 21 people per square mile, which is extremely low, compared to Butte County at 128. Both Butte and Glenn counties experienced a 5% population growth from 2000-2005, while Tehama County saw slightly higher growth at 8%. However, the small populations and moderate growth in Tehama and Glenn counties further supports elimination of these counties from consideration as nonattainment areas. The presence of population centers outside of Chico supports EPA's recommendation to include these other population centers in the nonattainment area. Relatively little population lives in the eastern high elevation portions of the county.

Attachment 3 has a chart that shows the area, population, car traffic and truck traffic for Butte County for the county as a whole, as well as just for the nonattainment area. The numbers clearly reflect that the population and traffic numbers are very high, and that most of the population and traffic is captured within the nonattainment area.

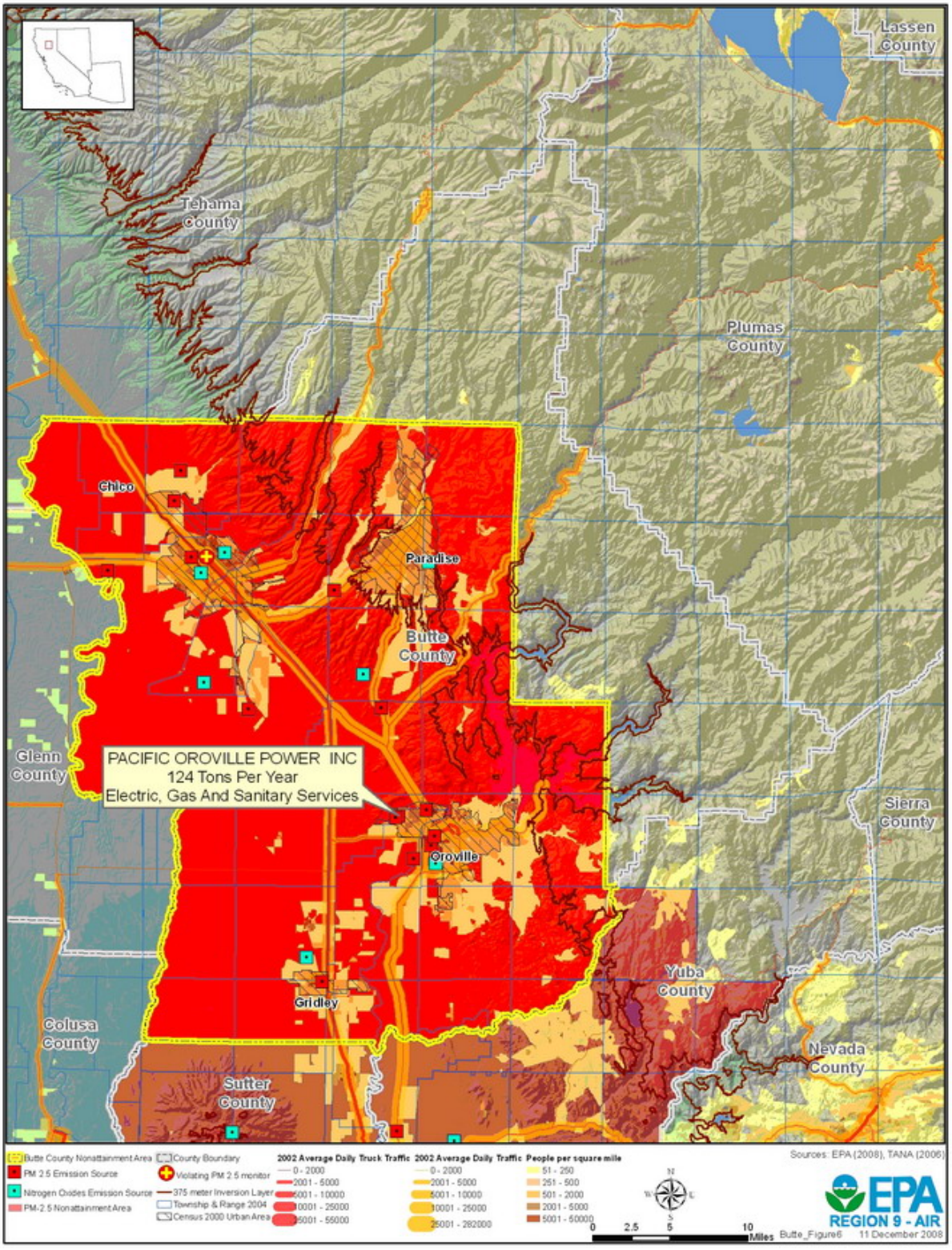

Lassen County
Tehama County
Plumas County
Chico
Paradise
Butte County
Glenn County
PACIFIC OROVILLE POWER INC
124 Tons Per Year
Electric, Gas And Sanitary Services
Sierra County
Oroville
Yuba County
Gridley
Colusa County
Nevada County
Sutter County
Butte County Nonattainment Area
PM 2.5 Emission Source
Nitrogen Oxides Emission Source
PM-2.5 Nonattainment Area
County Boundary
Violating PM 2.5 monitor
375 meter Inversion Layer
Township & Range 2004
Census 2000 Urban Area
2002 Average Daily Truck Traffic
0 - 2000
2001 - 5000
5001 - 10000
10001 - 25000
25001 - 55000
2002 Average Daily Traffic
0 - 2000
2001 - 5000
5001 - 10000
10001 - 25000
25001 - 282000
People per square mile
51 - 250
251 - 500
501 - 2000
2001 - 5000
5001 - 50000
Sources: EPA (2008), TANA (2006)
0 2.5 5 10 Miles
Butte_Figure6 11 December 2008
EPA
REGION 9 - AIR

Figure 4

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to Butte County, the percent of total commuters in each county who commute to Butte County, as well as the total Vehicle Miles Traveled (VMT) for each county in millions of miles (see Table 5). A county with numerous commuters is generally an integral part of an urban area and is likely contributing to fine particle concentrations in the area. Such an area could be an appropriate county for implementing mobile source emission control strategies, thus warranting inclusion in the nonattainment area.

Table 5. Traffic and Commuting Patterns

County	State Rec. NA	2005 VMT (millions	Number Commuting to any violating counties	Percent Commuting to any violating counties	Number Commuting into statistical area	Percent Commuting into statistical area
Butte County	Yes (P)	2,078	74,510	91%	73,000	91%
Tehama County	No	599	1,170	6%]	1,140	6%
Glenn County	No	330	1,770	17%	1,770	17%

P = partial

According to the data in Table 8, Butte County has a significantly larger number of commuters commuting into the violating area, 75,510 or 92%. Butte County has a large number of commuters traveling to and from Chico, the location of the violating monitor. There is also significant traffic into and out of Chico from the Cities of Paradise (on Highway 91) and to Oroville (on Highway 149).

In addition to the contribution of Butte County to traffic levels in the City of Chico, average daily truck traffic on Highway 162 is in the range of 5001 to 10,000. This highway travels from Sutter County to Butte County beyond the city limits of Chico. The daily car and truck traffic from Chico to Paradise, and from Chico to Oroville is much lower, in the range of 0 to 2000, but shows a daily traffic pattern.

Factor 4 further supports eliminating Tehama, and Glenn Counties from consideration as a nonattainment area. However, Butte County has significant commuter and truck traffic which argues for including most of Butte County as a nonattainment area. Figure 4 shows the traffic patterns in and around Chico. There is relatively little traffic in the eastern high elevation portions of the county.

The 2005 VMT data used for tables 5 and 6 of the technical analysis have been derived using methodology such as that described in "Documentation for the 2005 Mobile

National Emissions Inventory, Version 2," December 2008, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: ftp://ftp.epa.gov/EmisInventory/2005_nei/mobile_sector/documentation/2005_mobile_nei_version_2_report.pdf

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in vehicle miles traveled for 1996-2005 for Butte County and the surrounding counties, as well as patterns of population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and likely to be contributing to fine particle concentrations in the area.

Table 8 below shows population, population growth, VMT and VMT growth for counties that are in the area adjacent to Butte County. Counties are listed in descending order based on VMT growth between 2000 and 2005.

Table 6. Population and VMT Growth and Percent Change

County	Population (2005)	Population Density	Population % change (2000 - 2005)	2005 VMT (millions)	% VMT change (% 2000-2005
Butte	214,153	128	5%	2,078	61%
Tehama	60,932	21	8%	485	(41)%
Glenn	27,683	21	5%	253	(40)%

According to Table 6, Butte County has the highest population and population density. Tehama County has the next highest population of the adjacent counties, but significantly below Butte (also in terms of population density). Tehama and Glenn County have the same population density of 21 pop/sq mi, compared to Butte County at 128. Both Butte and Glenn counties experienced a 5% population growth from 2000-2005, while Plumas and Tehama counties also saw slightly higher growth at 8%. Glenn and Tehama Counties, while having a relatively small increase in population from 2000 to 2005, also experienced a decline in VMT growth from 2000 to 2005.

Based on the analysis under Factor 5, Tehama and Glenn Counties, while experiencing modest growth in population, also had significant decreases in VMT which further supports elimination of these counties from consideration as nonattainment areas. Plumas County also had slight growth in population, but saw increased VMT. However, the total numbers for Plumas are still very low further supporting its elimination from consideration as a nonattainment area. Butte County has the largest population, by far, and also the most significant growth in VMT.

Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered data from National Weather Service instruments in the area. Wind direction and wind speed data for 2004-2006 were analyzed, with an emphasis on "high $PM_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM or Federal Equivalent Method (FEM) air quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values, or were 24-hr values exceeded 35.1 $\mu g/m^3$.

For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. Figure 4 identifies 24-hour $PM_{2.5}$ values by color; days exceeding 35 ug/m3 are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

The pollution rose for Butte County, shown below, indicates that the elevated levels of the $PM_{2.5}$ 24-hour values for the Chico monitoring site occur primarily when the wind is from the south, and occasionally when the wind is from the north. The pollutant rose for Butte County also indicates that elevated $PM_{2.5}$ 24-hour values occur during the cool season, during time periods of low wind speeds.

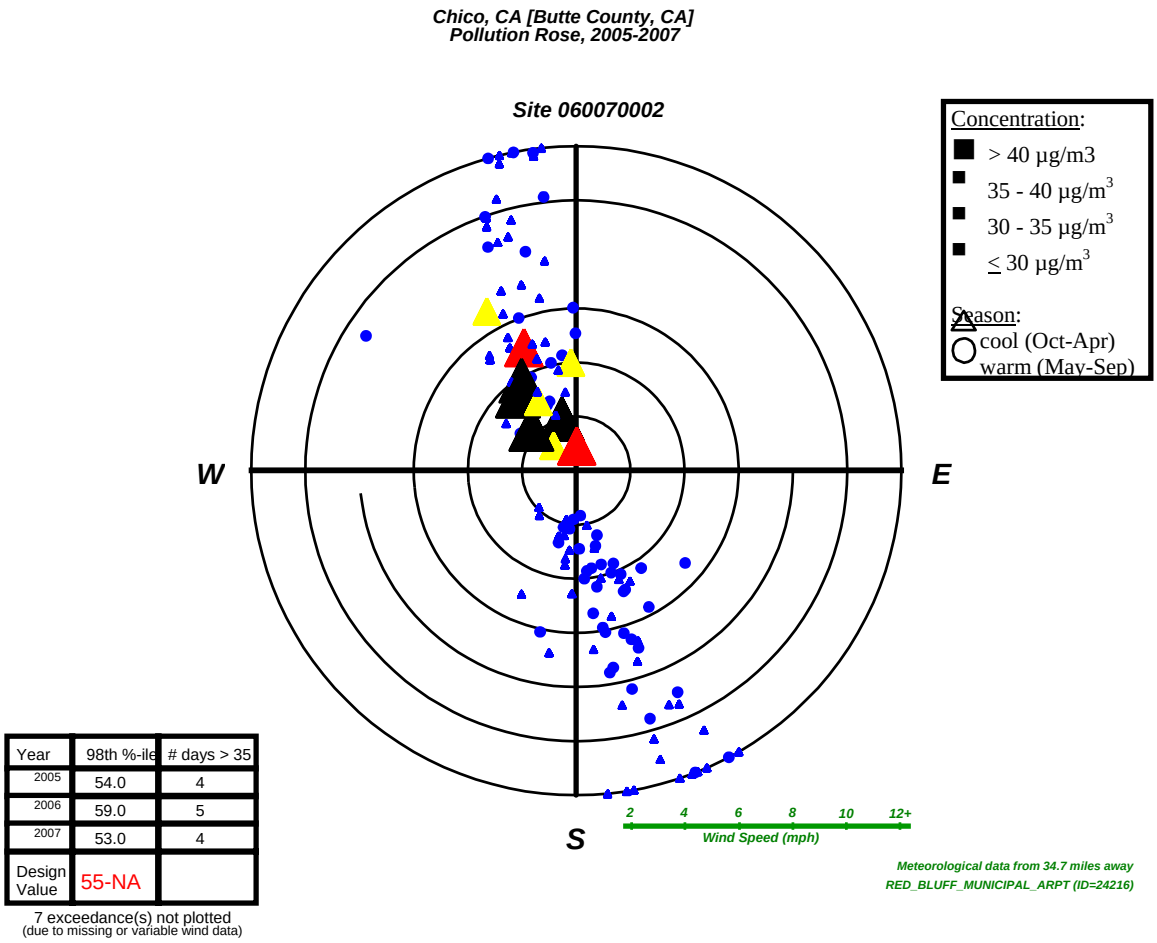


Figure 5

These data are consistent with the analysis provided by California, and may also support the CARB position that the organic carbon portion of the particulate matter problem is localized. However, as discussed in Factor 2: Air Quality, above, based on the nitrate portion, emissions from a larger area contribute to $PM_{2.5}$ violations. This factor, together with Factor 2, supports the inclusion of at least major portions of Butte County in the nonattainment area.

Note: the meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high $PM_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the airshed and, therefore, on the distribution of $PM_{2.5}$ within Butte County.

Butte County is part of the larger Northern Sacramento Valley Air Basin (NSVAB), which includes the counties of Butte, Colusa, Glenn, Shasta, and Tehama. The NSVAB is bounded on north and west by the Coastal Mountain Range and on the east by the southern portion of the Cascade Mountain Range and the northern portion of the Sierra Nevada Mountains. These mountain ranges reach heights in excess of 6,000 feet with peaks rising much higher. This provides a substantial physical barrier to locally created pollution.

For the areas under consideration, high $PM_{2.5}$ concentrations mostly occur during stagnant conditions during winter, with radiation inversions. The cooling of the ground, as heat is radiated away, creates an inversion, since air near the ground is cooler than that above. This inhibits mixing and confines pollutants to a relatively shallow layer near the ground. EPA considered radar wind profiler data collected at Chico during CRPAQS study, and analyzed by CARB to derive mixing heights for the area. A typical value for maximum mixing height during high $PM_{2.5}$ conditions is 300 m (984 ft) AGL (above ground level). EPA recognizes that an inversion height is not a rigid boundary extending through a fixed elevation. In reality the inversion would be partly terrain-following, and the degree of stagnation would be subject to additional influences at the foothill edges, such as strong diurnal slope flows. In any case, mixing heights vary by site and date, so any single height can provide only a scale for comparison, not a definitive value. Nevertheless, the inversion height provides an indicator of the area over which inversions may be enhancing pollution concentrations, and of the extent of the area that may be contributing to NAAQS violations.

Because the Butte area has topographical features higher the typical daytime height of the inversion layer, to help determine an appropriate eastern boundary EPA considered the inversion height to estimate the size of the area likely to have similar pollution conditions and to contribute to NAAQS violations. The eastern portion of Butte County extends into the foothills of the Sierra Nevada Mountains. For Chico, the 300 m AGL (984 ft) inversion layer thickness translates to an elevation contour of 375 m (1221 ft) MSL (above Mean Sea Level). Much of eastern portion Butte County is above this elevation, as shown in Figure 6 below. The urbanized area of Paradise is right about at this line.

In summary, topography is an important factor for Butte given that the inversion layer, which can lead to winter $PM_{2.5}$ exceedances in the Sacramento Valley, is blocked by the Sierra foothills. In addition to affecting the City of Chico, similar pollution conditions are expected throughout Butte County, and areas below or near the inversion height could contribute to $PM_{2.5}$ violations.

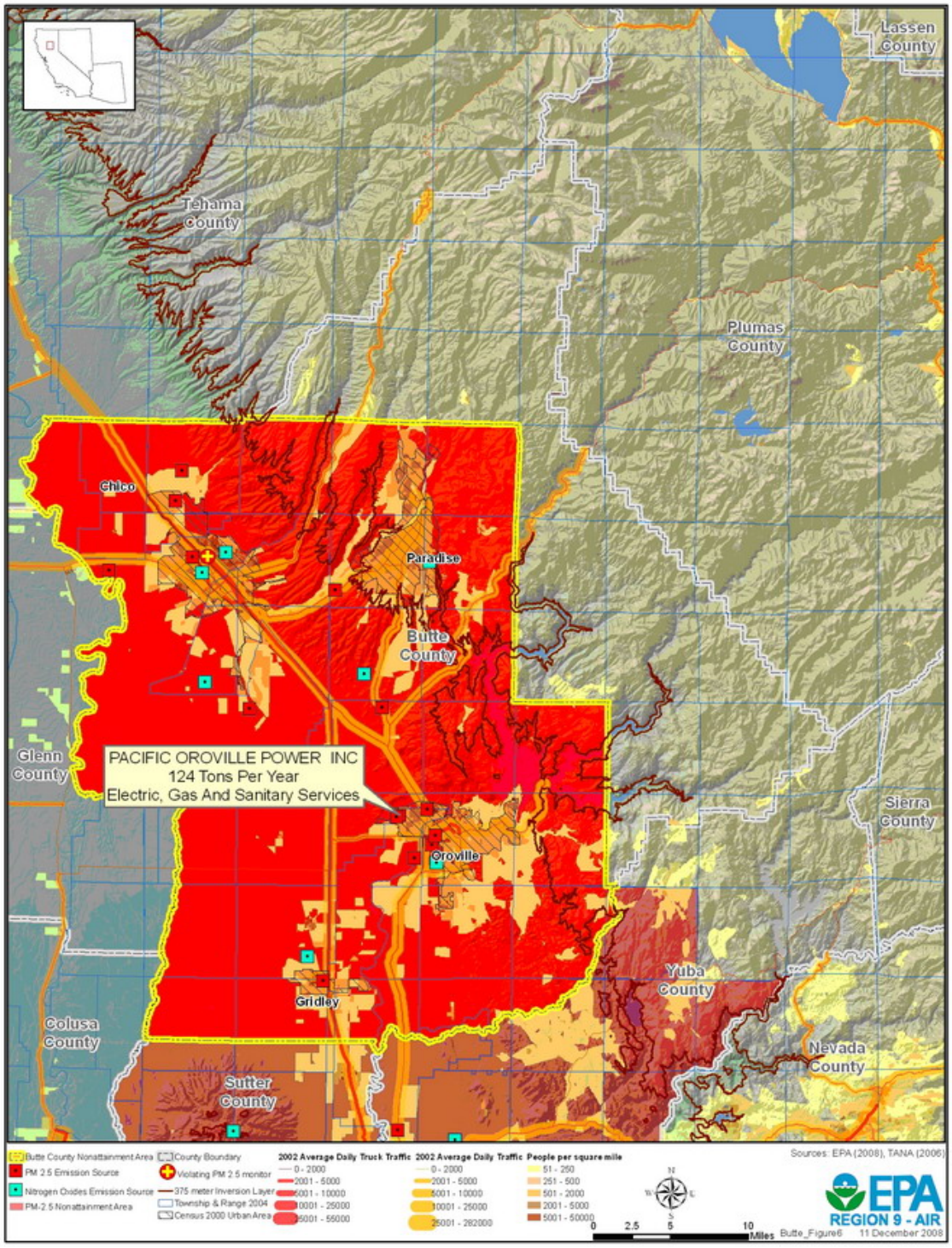

Lassen County
Tehama county
Plumas County
Chico
Paradise
Butte County
Glenn County
PACIFIC OROVILLE POWER INC
124 Tons Per Year
Electric, Gas And Sanitary Services
Sierra County
Oroville
Yuba County
Gridley
Colusa County
Nevada County
Sutter County
Butte County Nonattainment Area
PM 2.5 Emission Source
Nitrogen Oxides Emission Source
PM-2.5 Nonattainment Area
County Boundary
Violating PM 2.5 monitor
375 meter Inversion Layer
Township & Range 2004
Census 2000 Urban Area
2002 Average Daily Truck Traffic
0 - 2000
2001 - 5000
5001 - 10000
10001 - 25000
25001 - 55000
2002 Average Daily Traffic
0 - 2000
2001 - 5000
5001 - 10000
10001 - 25000
25001 - 282000
People per square mile
51 - 250
251 - 500
501 - 2000
2001 - 5000
5001 - 50000
Sources: EPA (2008), TANA (2006)
0 2.5 5 10 Miles
Butte_Figure6 11 December 2008
EPA
REGION 9 - AIR

Figure 6

Factor 8: Jurisdictional boundaries (e.g., existing PM and ozone areas)

EPA believes consideration also should be given to existing boundaries and organizations as they may facilitate air quality planning and the implementation of control measures to attain the standard. Areas already designated as nonattainment represent important boundaries for state air quality planning. To the degree appropriate based upon violations and contribution to violations of the respective NAAQS, EPA believes it can be helpful for air planning purposes and for attainment of both NAAQS for ozone and PM2.5 nonattainment area boundaries to be consistent.

As compared to EPA's original intention, the final designation places little emphasis on the ozone nonattainment area boundary, especially in setting the boundary within Butte County. Instead, more weight was placed on the areas generating pollution likely to contribute to NAAQS violations and on the topographic barrier of the Sierras. The lower elevation portions of Butte County is being recommended for a nonattainment designation for $PM_{2.5}$ and is under the jurisdiction of the Butte County Air Quality Management District (AQMD).

Factor 9: Level of control of emission sources

This factor considers emission controls currently implemented for major sources in Butte County. There are no large contributing sources that have been excluded from the Sacramento nonattainment area. Figure 6 identifies both NOx and PM 2.5 sources within Butte County, as well as their emissions levels.

The emission estimates in Table 1 (under Factor 1) include any control strategies implemented by Butte County area before 2005 that may influence emissions of any component of $PM_{2.5}$ emissions (i.e., total carbon, SO_2, NOx, and crustal $PM_{2.5}$).

Conclusion

EPA is designating the lower elevation portions of Butte County as nonattainment for the $PM_{2.5}$ NAAQS. The chosen area boundaries are supported by most of the factors EPA considered. Butter County contains a violating $PM_{2.5}$ monitor, and the cities of Paradise and Oroville are connected by traffic distributions. These cities have substantial residential wood smoke emissions of carbon, by far the largest component of $PM_{2.5}$ violations. Despite evidence that the effect of these sources is relatively localized, these sources are not limited to the city boundaries, nor is their influence. Also, ammonium nitrate, mainly from mobile source NOx emissions, is an important $PM_{2.5}$ component; its larger spatial scale justifies including relatively large portions of the counties within the nonattainment area. The winter inversions that lead to $PM_{2.5}$ NAAQS exceedances limit the vertical extent of pollution, as reflected in additional data provided by CARB. The Sierra foothills to the east provide a corresponding topographic barrier. This and the relatively small population and emissions in eastern Butte County justify excluding it from the nonattainment area.

Additional information regarding responses to specific State comments can be found in EPA's Response to Comments document at http://www.epa.gov/pmdesignations/2006standards/tech.htm.

Attachment 2

Description of the Contributing Emissions Score

The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Using this methodology, scores were developed for each county in and around the relevant metro area. The county with the highest contribution potential was assigned a score of 100, and other county scores were adjusted in relation to the highest county. The CES represents the relative maximum influence that emissions in that county have on a violating county. The CES, which reflects consideration of multiple factors, should be considered in evaluating the weight of evidence supporting designation decisions for each area.

The CES for each county was derived by incorporating the following significant information and variables that impact PM2.5 transport:

- Major PM2.5 components: total carbon (organic carbon (OC) and elemental carbon (EC)), SO2, NOx, and inorganic particles (crustal).
- PM2.5 emissions for the highest (generally top 5%) PM2.5 emission days (herein called "high days") for each of two seasons, cold (Oct-Apr) and warm (May-Sept)
- Meteorology on high days using the NOAA HYSPLIT model for determining trajectories of air masses for specified days
- The "urban increment" of a violating monitor, which is the urban PM2.5 concentration that is in addition to a regional background PM2.5 concentration, determined for each PM2.5 component
- Distance from each potentially contributing county to a violating county or counties

A more detailed description of the CES can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C

Attachment 3: Population and Traffic Data

County	County Area (sq. miles)	Nonattainment Area (sq. miles)
Butte	1,677.50	1,158.33
El Dorado	1,787.99	620.92
Imperial	4,481.67	690.54
Placer	1,501.86	432.38
Sacramento	992.04	992.04
Sutter	608.39	608.39
Yolo	1,023.36	698.67
Yuba	643.57	482.77
Solano (SV)	470.55	470.55
Solano (SF)	419.01	419.01
County	County Population	Nonattainment Area Population
Butte	203,171.00	196,300.00
El Dorado	156,299.00	110,528.00
Imperial	142,361.00	122,775.00
Placer	248,399.00	207,156.00
Sacramento	1,223,499.00	1,223,499.00
Sutter	78,930.00	78,930.00
Yolo	168,660.00	163,193.00
Yuba	60,219.00	56,293.00
Solano (SV)	120,697.00	120,697.00
Solano (SF)	273,845.00	273,845.00
County	County Annual Non-truck Traffic	Nonattainment Area Annual Non-truck Traffic
Butte	2,237,170.00	2,225,913.00
El Dorado	1,573,738.00	1,547,018.00
Imperial	1,677,333.00	1,229,867.00
Placer	4,777,401.00	4,548,701.00
Sacramento	33,510,398.00	33,510,398.00
Sutter	361,416.00	361,416.00
Yolo	4,677,258.00	4,671,958.00
Yuba	426,377.00	422,677.00
Solano (SV)	3,988,735.00	3,988,735.00
Solano (SF)	12,301,618.00	12,301,618.00
County	County Annual Truck Traffic	Nonattainment Area Annual Truck Traffic
Butte	169,932.00	169,280.00
El Dorado	86,212.00	84,588.00
Imperial	229,338.00	139,186.00
Placer	422,876.00	400,706.00
Sacramento	2,515,749.00	2,515,749.00
Sutter	33,714.00	33,714.00
Yolo	614,874.00	614,512.00
Yuba	23,724.00	23,036.00
Solano (SV)	369,035.00	369,035.00
Solano (SF)	933,605.00	933,605.00

Sources: U.S. Census Department (2000), Federal Highway Administration (2002), EPA (2008)

EPA Technical Analysis for Imperial County

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those areas that contribute to violations. This technical analysis for Imperial County identifies the monitor that violates the 24-hour $PM_{2.5}$ standard and evaluates the county contribution to fine particle concentrations in the area. EPA has evaluated Imperial County based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

EPA also used analytical tools and data such as pollution roses, fine particle composition monitoring data, back trajectory analyses, and the contributing emissions score (CES) to evaluate these areas. (See additional discussion of the CES under Factor 1 below.)

Figure 1 is a map of the nonattainment area and other relevant information such as the locations of NOx and PM 2.5 sources, the cities included in the nonattainment area, the transportation network, the county boundary in relationship to other counties in California and Arizona, and the county boundary in relationship to Mexico.

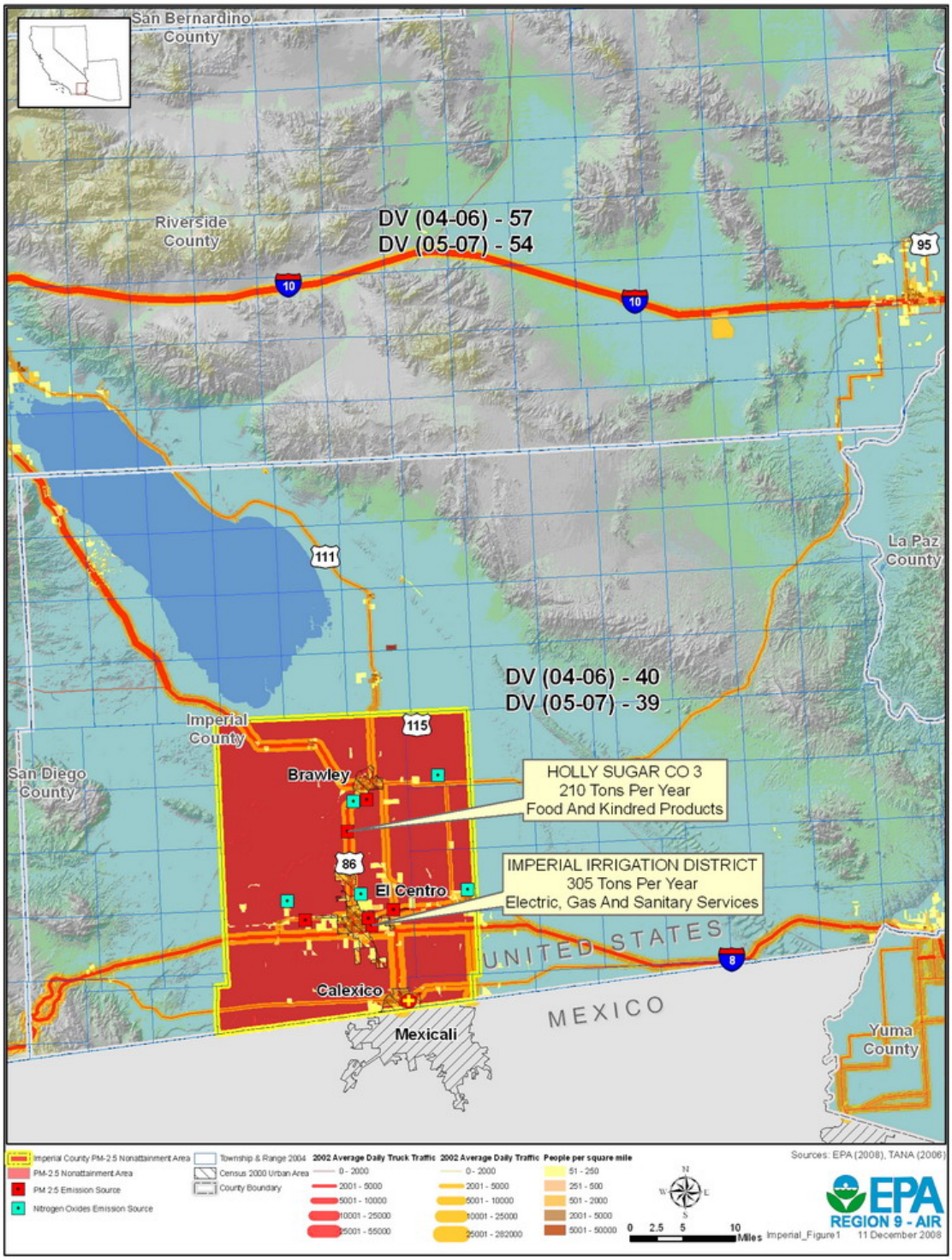

San Bernardino County
Riverside County
DV (04-06) - 57
DV (05-07) - 54
10
10
95
111
La Paz County
DV (04-06) - 40
DV (05-07) - 39
Imperial County
115
San Diego County
Brawley
HOLLY SUGAR CO 3
210 Tons Per Year
Food And Kindred Products
86
El Centro
IMPERIAL IRRIGATION DISTRICT
305 Tons Per Year
Electric, Gas And Sanitary Services
UNITED STATES
8
Calexico
MEXICO
Mexicali
Yuma County
Imperial County PM-2.5 Nonattainment Area
PM-2.5 Nonattainment Area
PM-2.5 Emission Source
Nitrogen Oxides Emission Source
Township & Range 2004
Census 2000 Urban Area
County Boundary
2002 Average Daily Truck Traffic
0 - 2000
2001 - 5000
5001 - 10000
10001 - 25000
25001 - 55000
2002 Average Daily Traffic
0 - 2000
2001 - 5000
5001 - 10000
10001 - 25000
25001 - 282000
People per square mile
51 - 250
251 - 500
501 - 2000
2001 - 5000
5001 - 50000
N
W
E
S
0 2.5 5 10 Miles
Sources: EPA (2008), TANA (2006)
EPA
REGION 9 - AIR
Imperial_Figure1 11 December 2008

Figure 1

The California Air Resources Board (CARB) sent a letter to EPA , dated December 17, 2007, recommending that only the City of Calexico in Imperial County be designated as "nonattainment" for the 2006 24-hour $PM_{2.5}$ standard based on air quality data from 2004-2006. These data are from Federal Reference Method (FRM) monitors located in the state.

In August 2008, EPA notified California of its intended designations. EPA notified California that it was modifying the state's initial designation to designate all of Imperial County as a nonattainment area. In this letter, EPA also requested that if California wished to provide comments on EPA's intended designation, it should do so by October 20, 2008. EPA stated that it would consider any additional information (e.g., on power plants or partial county areas) provided by the state in making final decisions on the designations.

Air quality monitoring data on the composition of fine particle mass are available from the EPA Chemical Speciation Network and the IMPROVE monitoring network. Analysis of these data indicates that the days with the highest fine particle concentrations occur predominantly in the winter, and the average chemical composition of the highest days is typically characterized by high levels of organic carbon and nitrate.

Based on EPA's technical analysis described below, and currently available information, EPA has designated part of Imperial County as nonattainment for the 24-hour $PM_{2.5}$ air-quality standard. The rectangular nonattainment boundary shown in Figure 1 (consisting of townships) covers the sources of PM2.5-related emissions in and around the cities of Calexico, El Centro, and Brawley, and also covers a significant portion of the major roadway sources in the southern portion of Imperial County. EPA estimates that this area accounts for approximately 86% of Imperial County's population (and thus the emissions associated with population-based activity), and captures 73% of the car traffic and 61% of the truck traffic for the entire County (and thus the majority of the mobile source emissions).

Area	State Recommended Nonattainment Counties	EPA's Final Designated Nonattainment Counties
Imperial	Imperial County (P)	Imperial County (P)

The following is the technical analysis for Imperial County.

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown on the template or data spreadsheet as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental

carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html.

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive manner for consideration of data for these factors. A summary of the CES is included in Attachment 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for Imperial County.

Table 1. $PM_{2.5}$ 24-hour Component Emissions, and CES.

County	State Recommended Non-attainment	CES	$PM_{2.5}$ emissions total	$PM_{2.5}$ emissions carbon	$PM_{2.5}$ emissions other	SO_2	NOx	VOCs	NH_3
Imperial	Yes (P)	100	3,422	831	2,592	2,171	12,445	11,885	18,992
P = partial. Data for emissions apply to the whole County.									

Imperial County has 3,422 tpy of total $PM_{2.5}$., most of which is $PM_{2.5}$ other than organic carbon. Imperial County has high levels of $PM_{2.5}$ precursors relative to total $PM_{2.5}$. The nitrogen oxides (NOx), volatile organic compounds (VOC) and ammonia (NH_3) emission levels in Imperial County are substantial while the organic carbon emissions are much lower. CARB states that the two key components of $PM_{2.5}$ in the Calexico area are ammonium nitrate, which is a regional pollutant primarily derived from reactions with NOx emissions from mobile source activity, and organic carbon, which is a more localized pollutant related to burning.

With respect to CES values, Imperial County has a score of 100. In this instance, this score reflects that Imperial County itself has a violating monitor. Imperial County is bordered by San Diego and Riverside Counties in California and Yuma and La Paz Counties in Arizona and Mexicali in Baja California, Mexico. San Diego, Yuma and La Paz are attaining the $PM_{2.5}$ standard. Their CES values are 41, 2, and 0 respectively. Of these San Diego's CES is the highest, however, it is located about 100 miles to the west, suggesting that it is not, relative to other areas, nearby the violating monitor. Riverside has a CES of 19. Riverside is located in the South Coast area which is nonattainment for the 1997 $PM_{2.5}$ standard and has been recommended as nonattainment for the 2006 $PM_{2.5}$ standard as part of the separate South Coast Air Basin nonattainment area, and therefore is not further assessed here. Based on emissions levels and

CES values, Imperial County, or some portion thereof, is an appropriate focus of further analysis to assess contribution to the violating monitor.

CARB argues that "the Calexico city level nonattainment boundary is appropriate due to the unique international pollutant transport problem between Calexico and Mexicali, Mexico." CARB also states that Calexico is distinct from the rest of Imperial County based on the distribution and nature of emission sources. California's letter recommending that the City of Calexico be designated as nonattainment, states that "Calexico exceedances of the federal $PM_{2.5}$ standards are the result of urban activity associated with the densely populated international Calexico/Mexicali border region." While EPA believes that Mexicali likely has substantial impacts on violations of the NAAQS in Calexico and to ambient levels throughout portions of Imperial County, there are other possible sources of PM2.5-related emissions located in Imperial County which could contribute to exceedances at monitoring sites in the County.

Table 2. Area Source Emissions (Tons per day)

IMPERIAL COUNTY **Source: ARB Almanac website (2007)**	
SOURCE	$PM_{2.5}$ **%**
Residential Fuel Combustion	0.09
Farming Operations	3.86
Construction/Demolition	0.2
Paved Road Dust	0.65
Unpaved Road Dust	3.41
Fugitive Windblown Dust	26.63
Fires	0
Managed Burning & Disposal	2.63
Cooking	0.04
Total Area Wide	92%
Area Wide percent of total	68%
Total All	40.59%

This table indicates that for the entire Imperial County, fugitive windblown dust is a major portion of direct $PM_{2.5}$ emissions in the County's inventory, followed by farming operations, unpaved road dust and managed burning and disposal. CARB argues that this chart does not reasonably reflect the sources of direct $PM_{2.5}$ emissions in the more urban area of Calexico, and that many of the source categories of $PM_{2.5}$ emissions for Calexico are much lower than in the more rural areas in the rest of the County. Since some of these source categories are associated with residential and commercial activity, they occur in locations of relatively high population density. Other categories, like windblown dust, unpaved road dust, and farming operations would be a lower proportion of the emissions contributing to the monitored violations in Calexico.

The pie chart below shows the average $PM_{2.5}$ composition for the City of Calexico on exceedance days at the Calexico Ethel Street site. It indicates that organic carbon represents 48% of the total followed by ammonium nitrate at 22%. CARB states that the sources affecting

Calexico are waste and wood burning plus vehicle exhaust from the large amount of vehicle traffic at the border. EPA notes that sources of organic carbon and NOx (nitrate) include vehicles, residential wood combustion, agricultural and prescribed burning, and stationary combustion sources, and all of these sources are present on both sides of the border. However, it is clear the major portion of the contributing emissions is from wood burning, with additional smaller contribution from NOx sources, such as vehicles. This suggests the nonattainment boundary should account for the nearby population as an indicator of sources of wood burning emissions, and nearby roadways as an indicator of NOx emissions from both local vehicle traffic and in-transit long-distance vehicle traffic.

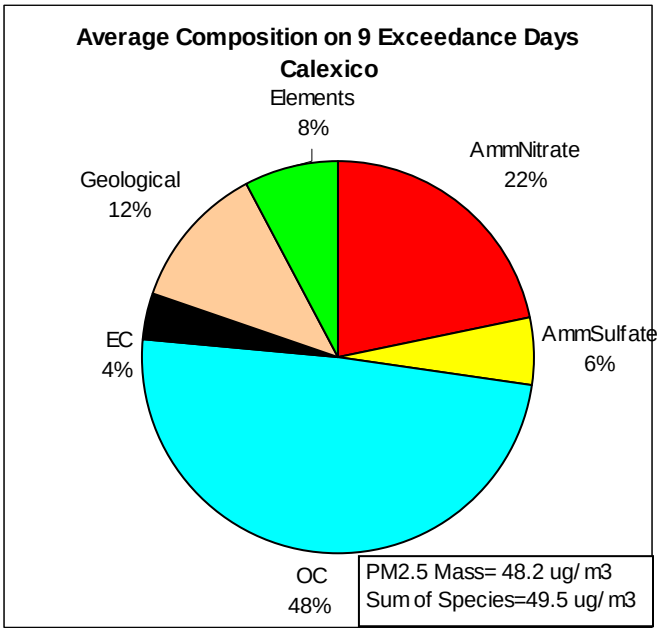


Figure 2

Attachment 3 includes a chart that shows area, population, car and truck traffic for the entire County, as well as for the area that EPA is designating nonattainment. EPA's area designation consists of the townships around Calexico, El Centro, and Brawley, and includes 86% of Imperial County's population (and thus the population-associated emissions), as well as all major nearby highways and stationary sources. The nonattainment area captures 73% of the car traffic and 61% of the truck traffic for the entire County (and thus a substantial amount of nearby mobile source emissions).

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values in micrograms per cubic meter ($\mu g/m^3$) for air quality monitors in counties in Imperial County based on data for the 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standards are met when the 3-year average of a monitor's 98^{th} percentile values are 35 $\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met.

The 24-hour $PM_{2.5}$ design values for Imperial County are shown in Table 3.

Table 3. Air Quality Data

County	State Recommended Nonattainment	24-hr $PM_{2.5}$ Design Values 2004-06 ($\mu g/m^3$)	24-hr $PM_{2.5}$Design Values 2005-07 ($\mu g/m^3$)
Imperial County	Yes (P)	40	39
P = partial			

The violating monitor in Imperial County is located in the City of Calexico at Ethel Street. There are two other monitoring sites in Imperial County, in the cities of El Centro and Brawley, which are located north of Calexico. Monitors in these cities are not in violation of the $PM_{2.5}$ standard. CARB argues that a nonattainment area including just the City of Calexico would be appropriate given that the other two monitors did not record violations of the standard. However, concentrations at the other locations are near the level of the NAAQS, and emissions from all three nearby cities and their surroundings potentially contribute to the NAAQS violations. CARB did provide additional evidence that concentrations generally decline toward the north, and that periods of high $PM_{2.5}$ concentrations are generally correlated with southerly winds. This is consistent with the relative scarcity of relevant $PM_{2.5}$-related emissions sources in the rest of the county to the north of Calexico.

Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with a FRM or FEM monitor. All data from Special Purpose Monitors (SPM) using an FRM, FEM, or Alternative Reference Method (ARM) which has operated for more than 24 months is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr $PM_{2.5}$ NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Table 4 shows the 2005 population for Imperial County, as well as the population density. Population data gives an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour $PM_{2.5}$ standards.

Table 4. Population

County/City	State Recommended	2005 Population	2005 Population Density (pop/sq

	Nonattainment		mi)
Imperial	Yes (P)	155,862	39

Figure 3, "Imperial County. Population Density, Truck and Commuting Traffic" indicates that population density in Imperial County is very sparse, averaging only 39 people per square mile. However, the population density for the City of Calexico is between 3,501 and 5,000 people per square mile.

EPA believes that the size, density, and location of population is indicative of emissions activity that can contribute to violations of the NAAQS in an area. Based solely on this factor, certain portions of Imperial County would not be considered for designation as nonattainment given their low population. Although areas with low population can nonetheless have activities that result in high emissions that do contribute, EPA believes that the majority of PM2.5-related emissions activities in Imperial County occur within that portion of the County that is more urbanized (see Factor 1). Calexico, El Centro and Brawley include most of the population in Imperial County. This factor argues for a partial county designation that includes these three cities but not the rest of the county.

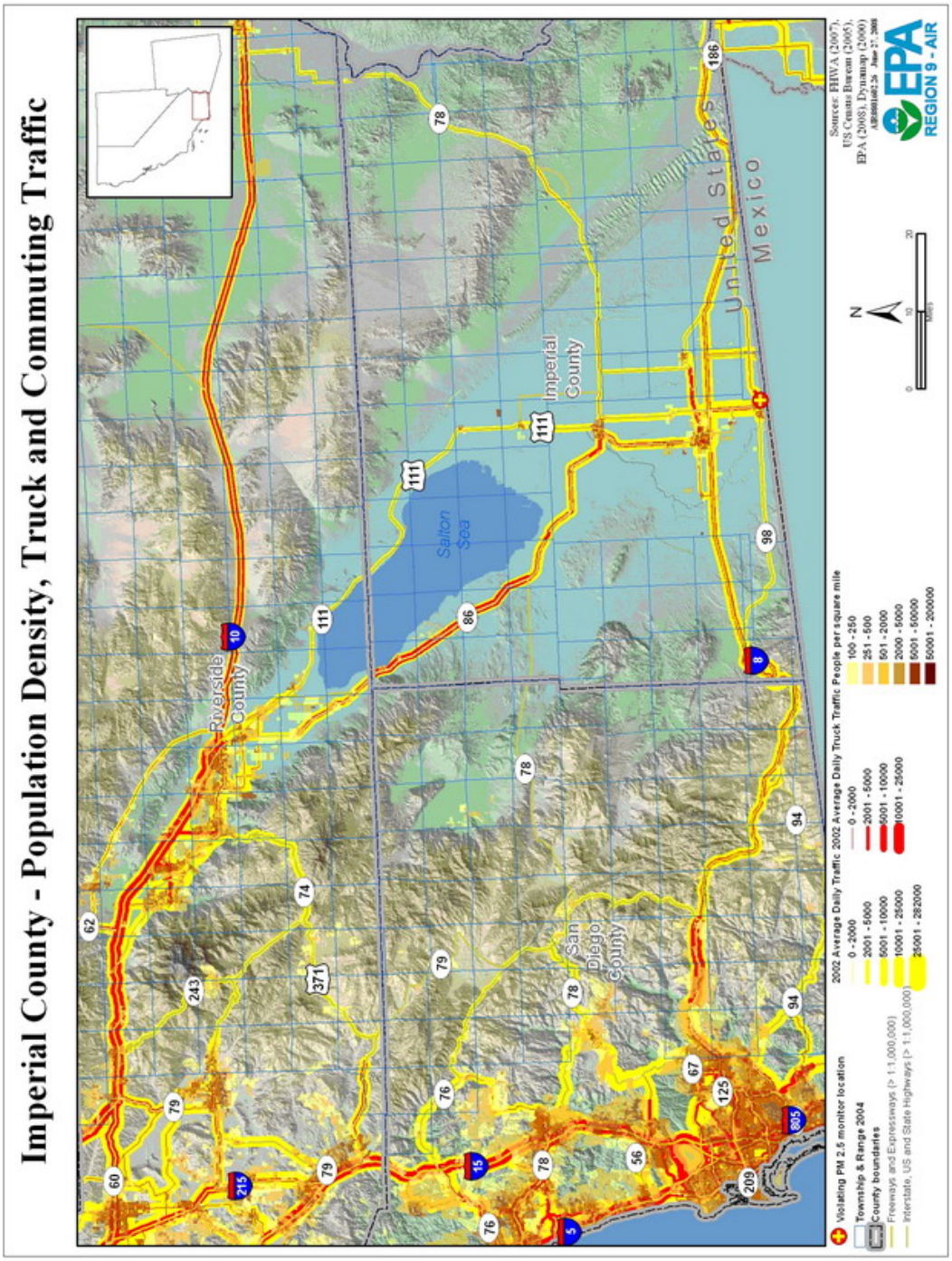


Figure 3

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to Imperial County, the percent of total commuters in each county who commute to Imperial County, as well as the total

Vehicle Miles Traveled (VMT) for Imperial County in millions of miles (see Table 5). A county with numerous commuters is generally an integral part of an urban area and is likely contributing to fine particle concentrations in the area.

Figure 3 above shows both the average daily traffic and average daily truck traffic within Imperial County.

Table 5. Traffic and Commuting Patterns

County	State Recommended Non-attainment	2005 VMT (Millions)	Number of cars commuting to any violating counties	Percent Commuting to any violating counties
Imperial County	Yes (P)	2,189	40,870	95 %
P = partial				

Interstate 8 carries traffic from Arizona all the way to San Diego through Imperial County**.** Interstate 8 carries approximately 10.4 million cars per year, or 28,500 cars per day, and 534,000 trucks per year, or nearly 1,500 trucks per day. Trucks coming from Mexico are permitted to travel 20 miles into Imperial County which accounts for the heavy truck traffic indicated on the map from Calexico to El Centro.

By designating the townships around Calexico, El Centro, and Brawley (which includes the high-traffic border area) as nonattainment for $PM_{2.5}$, EPA includes all major traffic routes and the motor vehicle emissions from the associated car and truck traffic, including the border traffic, which has been identified as contributing to $PM_{2.5}$ levels. See Attachment 3.

The 2005 VMT data used for tables 5 and 6 of the technical analysis have been derived using methodology such as that described in "Documentation for the 2005 Mobile National Emissions Inventory, Version 2," December 2008, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: ftp://ftp.epa.gov/EmisInventory/2005_nei/mobile_sector/documentation/2005_mobile_nei_version_2_report.pdf

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in vehicle miles traveled for 2000-2005 for Imperial County. A county with rapid population or VMT growth is generally an integral part of an urban area and likely to be contributing to fine particle concentrations in the area.

Table 6 below shows population, population growth, VMT and VMT growth for Imperial County.

Table 6. Population and VMT Growth and Percent Change.

County	Population (2005)	Population Density (2005)	Population % change (2000 - 2005)	2005 VMT (millions)	VMT % Change (2000 -2005)
Imperial County	155,862	39	9%	2,189	(1)

Imperial County is primarily a rural, agricultural area with few people except in the cities of Calexico, El Centro and Brawley. The County grew 9% in the years 2000-2005. Between 2005 and 2010, the population of Imperial County is projected to increase another 9%. The City of Calexico is projected to grow about 50% from 2000-2010, and had an estimated population of about 62,000 in 2005. The population estimates for the cities of El Centro (the county seat) and Brawley are 41,000 and 22,000 respectively. CARB states that the growth in Imperial is small compared to the growth on the Mexican side of the border. Mexicali had approximately 922,000 residents in 2006 and is expected to have over 1,045,000 residents in 2010 which is a 13% growth rate. EPA agrees that this suggests a significant potential for increasing future population-based emissions from Mexico. By designating the townships around the three main cities of the County as nonattainment for $PM_{2.5}$, EPA includes the rapidly growing City of Calexico along with other urban centers such as El Centro and Brawley that also contribute to violations on the U.S. side of the border.

Factor 6: Meteorology (weather/transport patterns)

Climatic conditions in the Salton Sea Air Basin are governed by the large-scale sinking and warming air in the subtropical high-pressure center of the Pacific Ocean. The high pressure ridge blocks most mid-latitude storms except in the winter when the high-pressure ridge is weakest and farther south. Similarly, the coastal mountains prevent the intrusion of any cool damp marine air from the coast. Because of the weakened storms and the mountainous barrier, the Salton Sea Air Basin has hot summers, mild winters, and little rainfall. The flat terrain of the Valley and the strong temperature differentials, created by intense solar heating produces moderate winds and deep thermal convection.

EPA analysis of wind trajectories on days with high levels of $PM_{2.5}$ in Calexico confirms that on many days there is a potential contribution from emissions from the Mexican side of the border. The NOAA HYSPLIT back trajectories for January 8, 2006 and January 17, 2006, shown below, also indicate that there is a potential contribution from emissions from throughout Imperial County to the elevated $PM_{2.5}$ levels at the Calexico Ethel Street monitor on those days. However, as discussed above, wind blown fugitive dust is the major portion of county-wide $PM_{2.5}$ emissions, whereas the dust (geological) component of $PM_{2.5}$ exceedances is only 12%; this indicates a relatively low level of county-wide contribution to exceedances. In addition, CARB presented additional trajectory evidence (Figure 6 below) for January 8, 2006 showing that NAAQS exceedances can occur under stagnant conditions, with little or no contribution from the more distant areas of the county. By designating the townships around the three largest cities of the County as nonattainment for $PM_{2.5}$, EPA includes the relevant $PM_{2.5}$-related emissions from nearby upwind areas identified as potential contributors to high $PM_{2.5}$ levels.

The meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high $PM_{2.5}$ days.

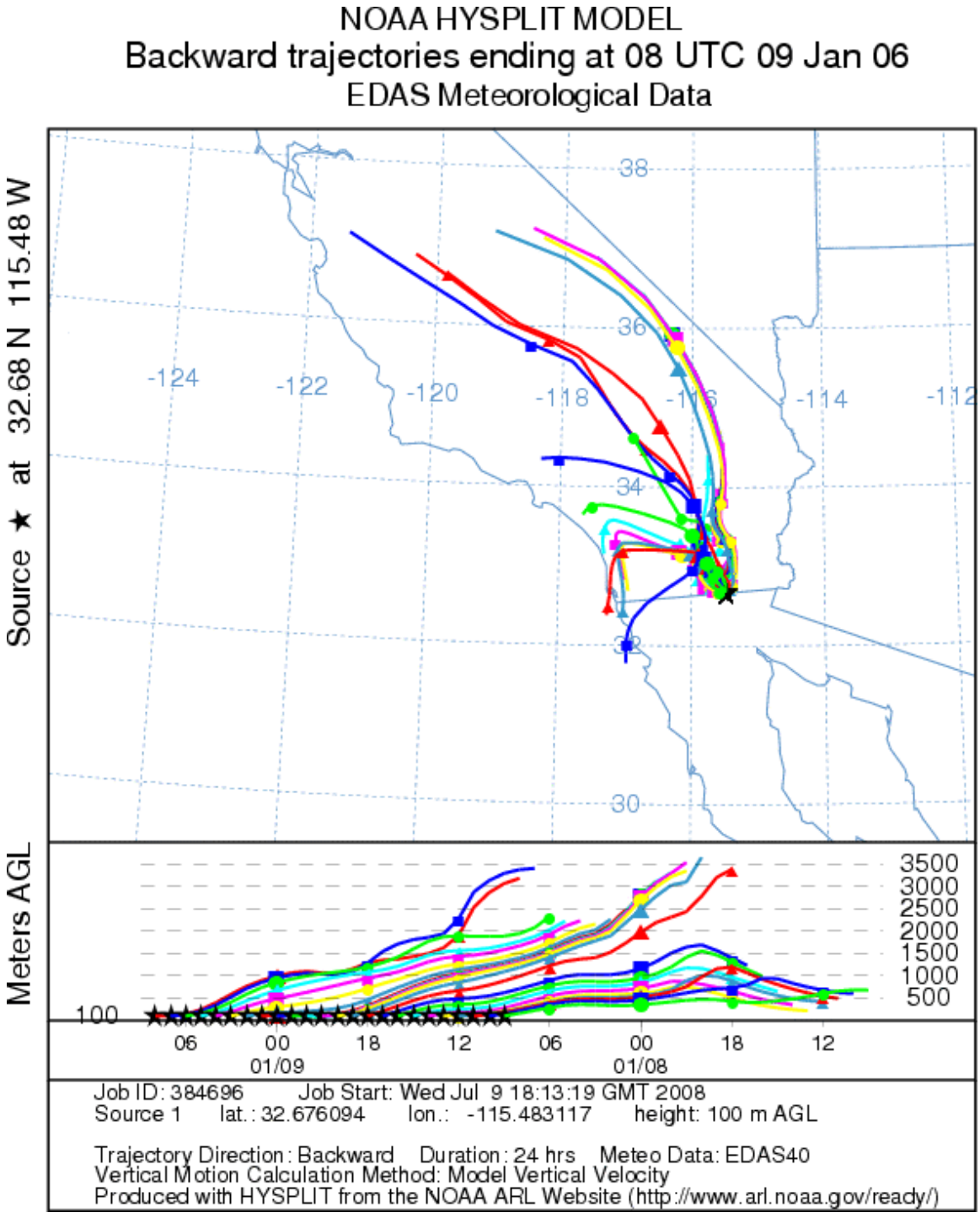


Figure 4

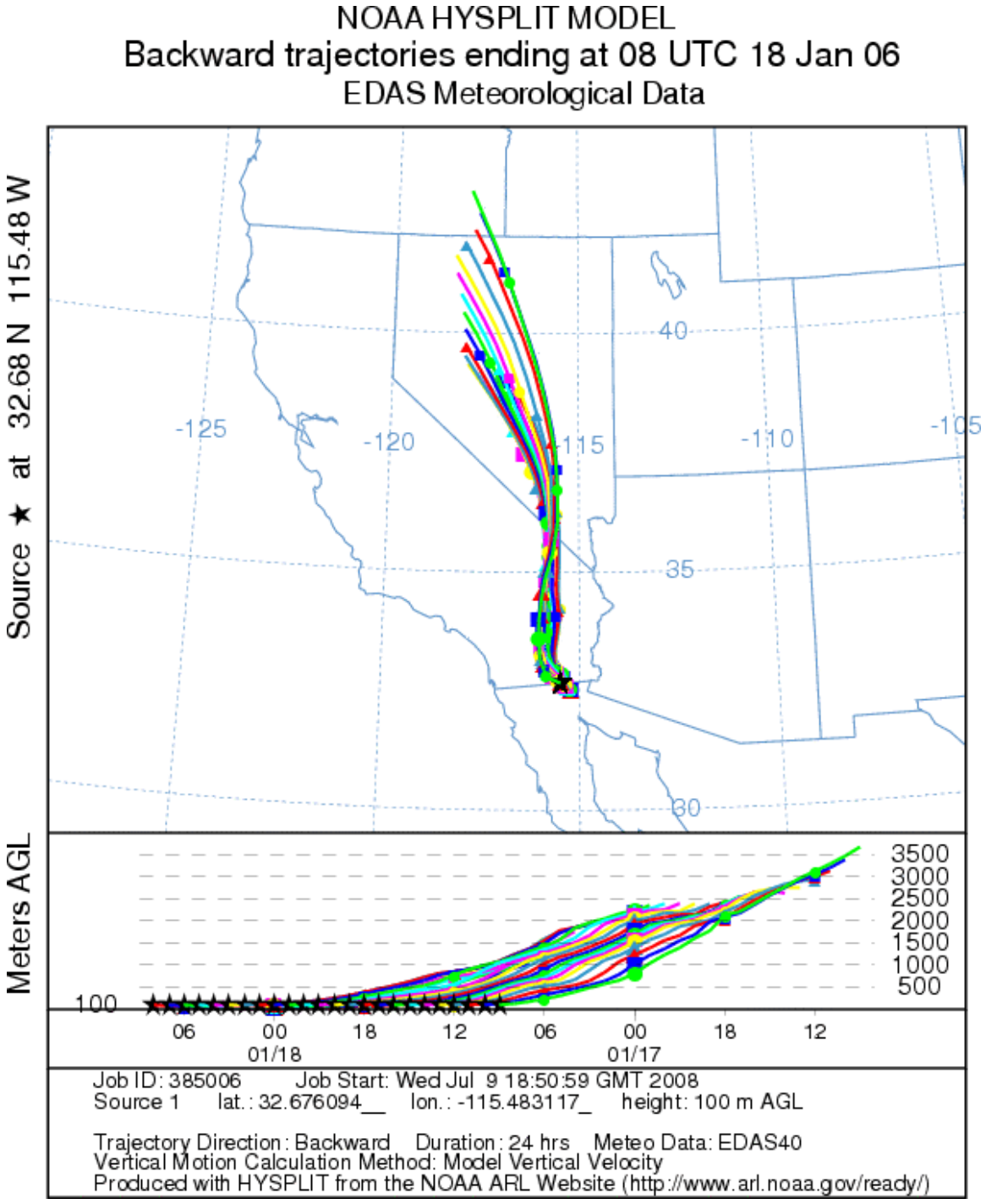

NOAA HYSPLIT MODEL
Backward trajectories ending at 08 UTC 18 Jan 06
EDAS Meteorological Data
Source ★ at 32.68 N 115.48 W
-125
-120
-115
-110
-105
40
35
30
Meters AGL
3500
3000
2500
2000
1500
1000
500
100
06
00
18
12
06
00
18
12
01/18
01/17
Job ID: 385006 Job Start: Wed Jul 9 18:50:59 GMT 2008
Source 1 lat.: 32.676094__ lon.: -115.483117_ height: 100 m AGL
Trajectory Direction: Backward Duration: 24 hrs Meteo Data: EDAS40
Vertical Motion Calculation Method: Model Vertical Velocity
Produced with HYSPLIT from the NOAA ARL Website (http://www.arl.noaa.gov/ready/)

Figure 5

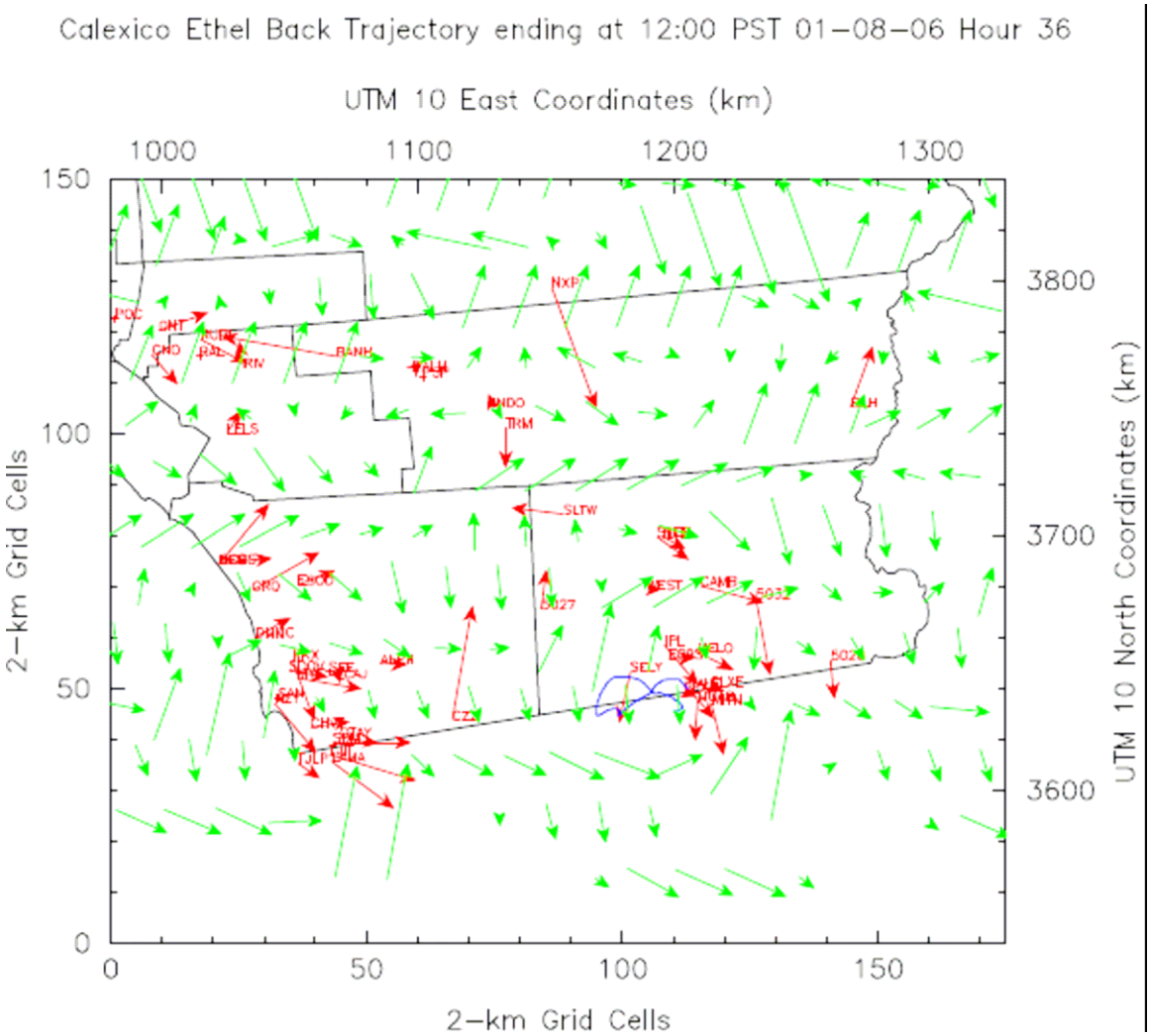


Figure 6. 2-D Wind Trajectory Model Results, Calexico-Ethel, Imperial County

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the air shed and, therefore, on the distribution of $PM_{2.5}$ over Imperial County.

Imperial Valley is located within the Salton Sea Air Basin along with the desert portion of Riverside County. Imperial County consists of 4,175 square miles, bordering Mexico to the south, Riverside County to the north, San Diego County to the west, and the State of Arizona on the east. The Imperial Valley is a part of the larger Salton Trough. Also included in the Salton Trough is the western half of the Mexicali Valley and the Colorado River delta in Mexico. This trough is a very flat basin (see Figure 7) surrounded by mountains: the Peninsular Ranges to the west, the Chocolate, Orocopia and Cargo Muchacho Mountains to the east. Most of the trough is below sea level and is predominantly desert with agricultural land. Imperial Valley does not have any geographical or topographical barriers significantly limiting air-pollution transport within its airshed. The Salton Sea covers about 7% of the land area in Imperial County, and as seen in Figure 8, is a physical barrier to locating significant sources of emissions or emissions generating

activity. There are no topographical barriers to separate the City of Calexico from the rest of Imperial County, and aside from considerations of the area occupied by the Salton Sea, this factor does not provide a clear rationale for a specific partial county designation. Instead, EPA has designated those portions of Imperial County that encompass the emissions sources and activities that contribute to the violations in this area.

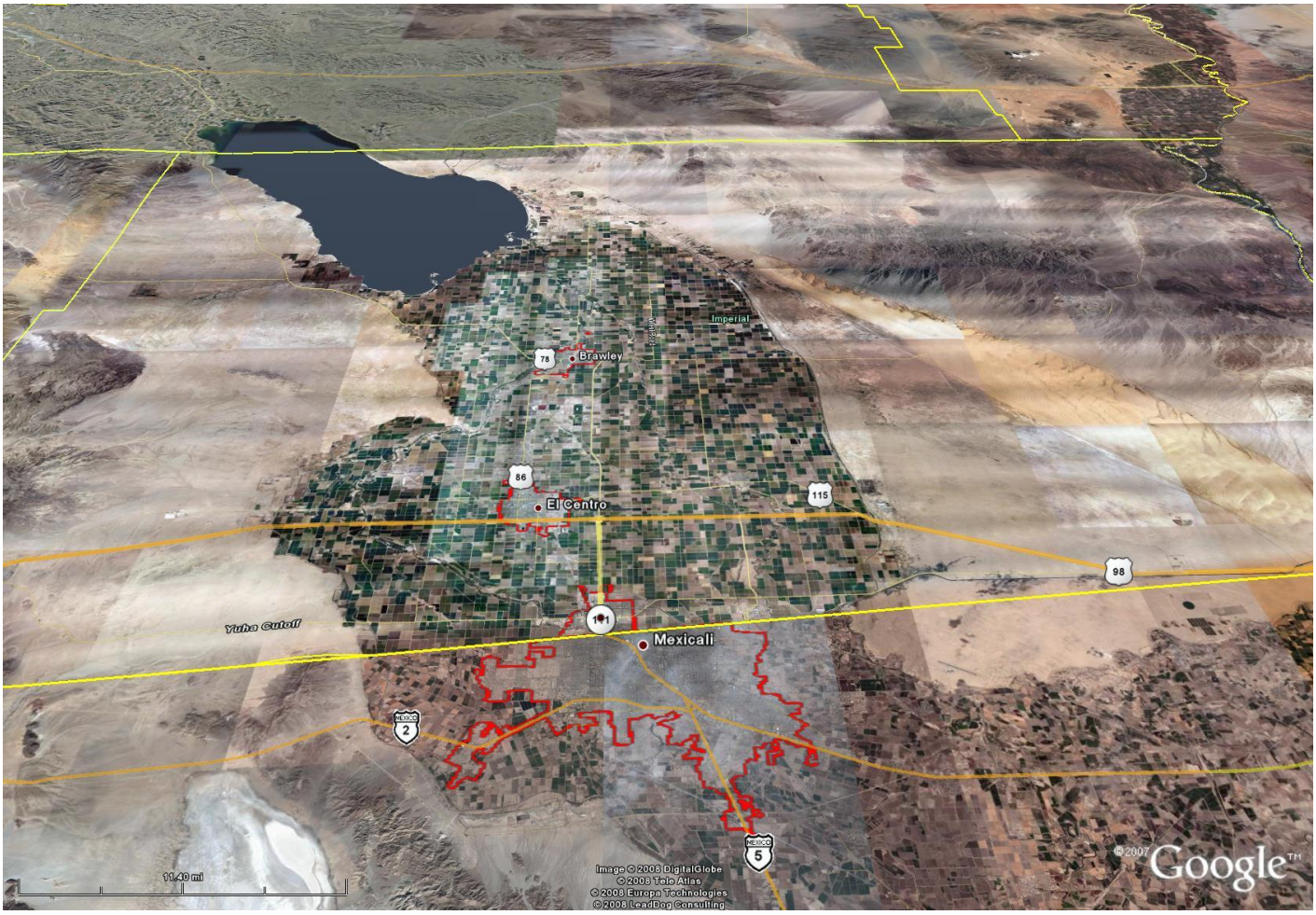


Figure 7

Factor 8: Jurisdictional boundaries (e.g., existing PM and ozone areas)

The analysis of jurisdictional boundaries considered the planning and organizational structure of Imperial County to determine if the implementation of controls in a potential nonattainment area can be carried out in a cohesive manner.

The major jurisdictional boundary in Imperial County is the Imperial County Air Pollution Control District (APCD). Imperial County APCD will be responsible for developing the $PM_{2.5}$ State Implementation Plan and required control strategies. The entirety of Imperial County is a

nonattainment area for 8-hour ozone. Imperial County has a partial PM_{10} nonattainment area that is bound by mountains to the east. The Imperial County APCD is responsible for developing plans for these pollutants.

For the 2006 24 hour PM2.5 NAAQS, EPA believes that an area smaller than the entire county is appropriate based on the other factors addressed in this document. EPA has designated those portions of Imperial County that encompass the emissions sources and activities that contribute to the violations in this area.

Factor 9: Level of control of emission sources

This factor considers emission controls currently implemented for major sources in Imperial County. The emission estimates on Table 1 (under Factor 1) include any control strategies implemented by California in Imperial County before 2005 that may influence emissions of any $PM_{2.5}$–related emissions. EPA is not aware of any additional information on emissions controls that is relevant to assessing sources contributing to the monitored violation. EPA has designated those portions of Imperial County that encompass the emissions sources and activities that contribute to the violations in this area.

Conclusion

EPA is designating the townships around Calexico, El Centro, and Brawley in Imperial County as nonattainment for $PM_{2.5}$. EPA believes that emissions information, air quality data, meteorology, population, and traffic patterns all support establishing a smaller nonattainment area than the whole county EPA originally suggested. The major portion of contributing emissions are from wood burning, with additional smaller contribution from NOx sources, such as vehicles. EPA has designated those portions of Imperial County that encompass the emissions sources and activities that contribute to the violations in this area. The designation area includes 86% of Imperial County's population and population-associated emissions that lead to NAAQS violations, as well as all major nearby highways and stationary sources.

Additional information regarding responses to specific State comments can be found in EPA's Response to Comments document at
http://www.epa.gov/pmdesignations/2006standards/tech.htm

Attachment 3: Population and Traffic Data

County	County Area (sq. miles)	Nonattainment Area (sq. miles)
Butte	1,677.50	1,158.33
El Dorado	1,787.99	620.92
Imperial	4,481.67	690.54
Placer	1,501.86	432.38
Sacramento	992.04	992.04
Sutter	608.39	608.39
Yolo	1,023.36	698.67
Yuba	643.57	482.77
Solano (SV)	470.55	470.55
Solano (SF)	419.01	419.01
County	County Population	Nonattainment Area Population
Butte	203,171.00	196,300.00
El Dorado	156,299.00	110,528.00
Imperial	142,361.00	122,775.00
Placer	248,399.00	207,156.00
Sacramento	1,223,499.00	1,223,499.00
Sutter	78,930.00	78,930.00
Yolo	168,660.00	163,193.00
Yuba	60,219.00	56,293.00
Solano (SV)	120,697.00	120,697.00
Solano (SF)	273,845.00	273,845.00
County	County Annual Non-truck Traffic	Nonattainment Area Annual Non-truck Traffic
Butte	2,237,170.00	2,225,913.00
El Dorado	1,573,738.00	1,547,018.00
Imperial	1,677,333.00	1,229,867.00
Placer	4,777,401.00	4,548,701.00
Sacramento	33,510,398.00	33,510,398.00
Sutter	361,416.00	361,416.00
Yolo	4,677,258.00	4,671,958.00
Yuba	426,377.00	422,677.00
Solano (SV)	3,988,735.00	3,988,735.00
Solano (SF)	12,301,618.00	12,301,618.00
County	County Annual Truck Traffic	Nonattainment Area Annual Truck Traffic
Butte	169,932.00	169,280.00
El Dorado	86,212.00	84,588.00
Imperial	229,338.00	139,186.00
Placer	422,876.00	400,706.00
Sacramento	2,515,749.00	2,515,749.00
Sutter	33,714.00	33,714.00
Yolo	614,874.00	614,512.00
Yuba	23,724.00	23,036.00
Solano (SV)	369,035.00	369,035.00
Solano (SF)	933,605.00	933,605.00

Sources: U.S. Census Department (2000), Federal Highway Administration (2002), EPA (2008)

EPA Technical Analysis for Sacramento

Introduction

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those nearby areas that contribute to violations. This technical analysis for the Sacramento identifies the counties with monitors that violate the 24-hour $PM_{2.5}$ standards and evaluates nearby counties for contributions to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance, and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

Figure 1 is a map of the counties in the nonattainment area, in addition to other relevant information, such as the metropolitan area boundaries.

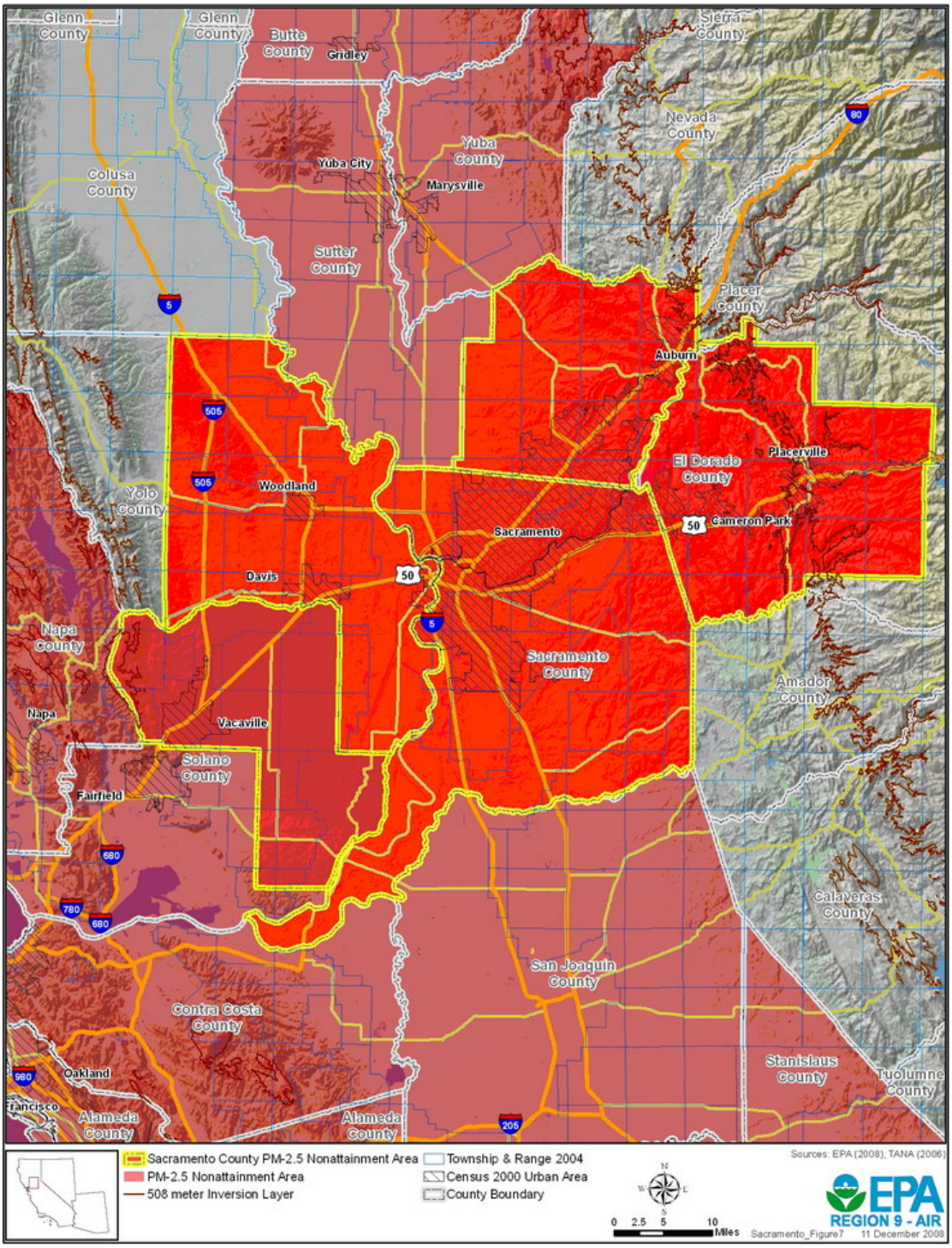


Figure 1

The California Air Resources Board (CARB) sent a letter to EPA, dated December 17, 2008, recommending that Sacramento County be designated as "nonattainment" for the 2006 24-hour $PM_{2.5}$ standard based on air quality data from 2004-2006. These data are from Federal Reference Method (FRM) monitors located in the state.

In August 2008, EPA notified California of its intended designations. In this letter, EPA also requested that, if California wished to provide comments on EPA's intended designation, it should do so by October 20, 2008. EPA stated that it would consider any additional information (e.g., on power plants or partial county areas) provided by the state in making final decisions on the designations.

Based on EPA's technical analysis described below, and currently available information, EPA has designated five (one whole and four partial) counties as nonattainment for the 24-hour $PM_{2.5}$ NAAQS as part of the Sacramento nonattainment area. These counties are listed in the table below. Several factors led EPA to recommend a significantly larger $PM_{2.5}$ nonattainment area than recommended by California.

County	State-Recommended Nonattainment Counties	EPA-Designated Nonattainment Counties
Sacramento	Sacramento County	Sacramento, Solano (partial) Yolo (partial) El Dorado (partial) Placer (partial)

A significant consideration in expanding the nonattainment area recommended by California was that the State relied on future mobile source controls at a statewide level to address NOx emissions and, therefore, discounted mobile sources as an important consideration in their analysis. This was a misinterpretation of EPA's guidance regarding emission controls, which is intended to take into account current, federally-enforceable controls on large point sources (e.g., electric generating units), but not intended to cover future controls on sources nor to cover controls or emission reductions that are not federally enforceable. Furthermore, the recommended boundary by California does not include both the area violating the 24-hour $PM_{2.5}$ NAAQS and the nearby areas contributing to the violation. (e.g., emissions from mobile sources within the relatively flat, valley floor of the Sacramento Valley).

Sutter and Yuba County are not included in the Sacramento nonattainment area. They are being designated nonattainment for the 2006 24-hour $PM_{2.5}$ NAAQS as part of a separate and distinct $PM_{2.5}$ nonattainment area associated with California's recommendation to designate Yuba City and Marysville as a separate and distinct nonattainment area. The western portion of Solano County is being included in the State's recommendation for the San Francisco Bay Area's 9-county nonattainment area and, therefore, only the remaining eastern portion of Solano County is being included in the Sacramento nonattainment area. It is also noted that the Sacramento Metropolitan Statistical Area (MSA) includes the counties of El Dorado, Placer, Yolo and Sacramento.

The following is the technical analysis for Sacramento.

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown on the template or data spreadsheet as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html.

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive manner for considering data for these factors. A summary of the CES is included in Attachment 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the Sacramento Area.

Table 1. Summary of $PM_{2.5}$ Component Emissions and CESs.

County	State Rec. NA	CES	$PM_{2.5}$ total	$PM_{2.5}$ carbon	$PM_{2.5}$ other	SO_2	NOx	VOCs	NH_3
Sacramento	Yes	100	4,240	2,255	1,985	3,307	33,183	26,828	5,786
Placer	No	85	2,310	1,329	982	915	11,595	10,528	862
El Dorado	No	25	2,784	1,668	1,116	513	4,831	8,369	430
Yolo	No	16	2,014	818	1,196	585	11,101	6,537	2,099
Solano	No	73[a]	1,750	834	915	8,335	15,009	12,093	1,579

Source: 2005 National Emissions Inventory
a. CES is based on Solano County contributing to $PM_{2.5}$ levels in the Bay Area and not Sacramento.

The CES shown in Table 1 describe the relative contribution of emissions from surrounding counties to the high emission days based on a broad analysis of NOAA HYSPLIT trajectories linking county-wide emissions from Sacramento and the surrounding counties and speciated air monitoring data on high days. With respect to this factor, the CES clearly demonstrates a connection between pollution levels in Sacramento County and sources in Placer County. The CES shows less of a link between Sacramento County and sources located in El Dorado, Solano and Yolo Counties. However, the scores are high enough to consider including these counties based on other emissions data and other factors.

Additional data considered in EPA's analysis of this factor are summarized in Table 2 derived from the California Air Resources Board Almanac of Emissions and Air Quality Data (http://www.arb.ca.gov/Aqd/almanac/almanac.htm). The following table further defines, in tons per day, the type of area sources emitting direct $PM_{2.5}$ in Sacramento and the surrounding counties. Area sources include residential fuel combustion, farming operations, construction/demolition, paved road dust, unpaved road dust, fugitive windblown dust, fires, managed burning and disposal and cooking. In each of the counties, area sources represent the largest percentage of primary $PM_{2.5}$ emissions (e.g., > 70%) and the balance is divided between stationary and mobile sources.

Table 2. Summary of Area Source Emissions (Tons per day)

Area Sources	Sacramento	Placer	El Dorado	Yolo	Solano
Residential Fuel Combustion	4.86	3.64	5.34	0.55	1.26
Farming Operations	0.32	0.08	0	0.92	0.64
Construction/Demolition	0.75	0.45	0.11	0.96	0.29
Paved Road Dust	2.31	0.86	0.68	0.41	0.85
Unpaved Road Dust	0.74	0.61	0.87	0.22	0.22
Fugitive Windblown Dust	0.07	0.02	0.02	0.58	0.48
Fires	0.05	0	0	0.01	0.01
Managed Burning & Disposal	0.33	1.37	0.23	0.34	0.33
Cooking	0.58	0.06	0.05	0.04	0.11
Total Area Wide	10.02	7.11	7.29	4.01	4.22
Grand Total of All $PM_{2.5}$	13.94	9.33	8.10	6.41	7.18
% Area Wide to Total $PM_{2.5}$	**72%**	**76%**	**90%**	**63%**	**59%**
Source: ARB Almanac website (2006) http://www.arb.ca.gov/ei/maps/statemap/cntymap.htm					

Given the significance of NOx emissions in the formation of the $PM_{2.5}$, EPA also considered emissions provided in the CARB recommendation letter under this factor, along with the NOx data from NEI summarized in Table 1. Table 3 summarizes NOx emissions from stationary, area, and mobile source categories for 2006, 2010, and 2020.

Table 3. NOx Winter Emissions for Sacramento and Surrounding Counties (tons per day)

Sacramento County	**2006**	**2010**	**2020**
Stationary Sources	3.9	3.9	4.3
Area Sources	4.0	4.0	4.1
Mobile Sources	75.1	62.5	34.5
Placer County			
Stationary Sources	4.5	4.7	5.1
Area Sources	1.6	1.6	1.6
Mobile Sources	28.2	23.4	13.7
El Dorado County			
Stationary Sources	0.4	0.4	0.4
Area Sources	1.3	1.3	1.4
Mobile Sources	8.8	7.4	4.3
Yolo County			
Stationary Sources	3.0	2.9	2.8
Area Sources	0.7	0.7	0.7
Mobile Sources	21.3	17.3	9.9
Solano County	NA	NA	NA
Stationary Sources	6.3	6.5	7.1
Area Sources	1.6	1.7	1.7
Mobile Sources	42.4	36.0	21.8
Source: California Air Resources Board in their letter of December 17, 2007			

As shown in Table 1, area sources are the dominant $PM_{2.5}$ emissions source category in Sacramento and the surrounding counties. Based on Table 2, within the area source category, residential wood combustion is the dominant source of direct $PM_{2.5}$ emissions in Sacramento, Placer, El Dorado and Solano Counties. In Yolo County, emissions data indicate that "Construction/Demolition" and "Farming Operations" are the most significant area sources.

For NOx, Sacramento County has the most emissions, followed by Solano, Placer, Yolo and El Dorado Counties. As shown in Table 3, mobile sources are the dominant source of NOx emissions in all of the counties. In light of the commuting patterns discussed under Factor 4 and illustrated in Figure 5, mobile source emissions in Sacramento and the surrounding counties contribute to $PM_{2.5}$ exceedances measured in Sacramento.

Speciation data from the Sacramento air monitoring stations were considered in evaluating this factor, as a way to identify the likely types of emission sources contributing to high measured $PM_{2.5}$ levels. As shown in the pie chart below (Figure 3), monitored $PM_{2.5}$ in Sacramento is up to 48% organic carbon, for which the dominant source during wintertime exceedances is residential wood combustion. Since this source category is associated with population density, the data support including urbanized areas and their surroundings within the nonattainment area.

In addition, 42% of the $PM_{2.5}$ is ammonium nitrate. This is secondary $PM_{2.5}$, formed from precursor NOx emissions, on a time scale of several hours or more, and a spatial scale correspondingly larger that for directly emitted organic carbon. Table 1 and 3 show that mobile sources are the dominant source of NOx emissions for these counties. As discussed below under Factor 4: Traffic and commuting patterns, and illustrated in Figure 4, these emissions are related to commuting and other travel between the urbanized areas of Sacramento and the surrounding

counties. In light of this and of the spatial scale of nitrate formation, mobile source emissions in surrounding counties are likely contributors to $PM_{2.5}$ levels in the Sacramento area on days with exceedances of the 24-hour $PM_{2.5}$ NAAQS.

In summary, for these counties, emissions and speciation data suggest that residential wood combustion is the most important source of directly emitted $PM_{2.5}$ (except for Yolo County), and that mobile source emissions are the most important sources of emissions of NOx, a precursor to secondarily formed $PM_{2.5}$. Emissions from residential wood combustion suggest that urbanized areas and their surroundings contribute to Sacramento NAAQS violations. The mobile source emissions, combined with the commuting patterns discussed below, suggest that emissions from the surrounding counties contribute to violations of the 24-hour $PM_{2.5}$ NAAQS in Sacramento.

EPA's area designation consists of the County of Sacramento plus the partial counties of Placer, El Dorado, Yolo and Solano. Attachment 3 includes a chart that shows area, population, car and truck traffic for Sacramento County, as well as for the partial counties that EPA is designating nonattainment. This area includes the majority of the population in the Sacramento metropolitan area and, thus, the population-associated emissions. In addition, the nonattainment area captures all major highways and stationary sources and, thus, the majority of the mobile source emissions.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values in micrograms per cubic meter ($\mu g/m^3$) derived from air-quality monitors in Sacramento and the surrounding counties for the 2004-2006 and 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air-quality standard. The 24-hour $PM_{2.5}$ standards are met when the 3-year average of a monitor's 98^{th} percentile values are $35\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met. The 24-hour $PM_{2.5}$ design values for Sacramento County are shown in Table 4.

Table 4. 24-hour $PM_{2.5}$ Design Values

County	State Recommended Nonattainment	Design Values 2004-06 ($\mu g/m^3$)	Design Values 2005-07 ($\mu g/m^3$)
Sacramento County	Yes	49	54
Placer County	No	31	30
El Dorado County	No	No data	No data
Yolo County	No	30	33
Solano County	No	No data	No data

Three monitoring sites throughout Sacramento County monitor for $PM_{2.5}$; however, only two sites, Del Paso Manor and Stockton Boulevard, have complete data for 2005–2007. The design value monitor in Sacramento County is at Del Paso Manor.
Placer County showed a violation based on 2004–2006 data, but meets the standard based on 2005–2007 data. Yolo County was in attainment for both the 2004–2006 and 2005–2007 periods, although it is noted that levels appears to be increasing based on the 2005-2007 design value. Air quality data were not available for El Dorado and Solano Counties. Based on

monitoring data for 2005–2007, Sacramento is the only county with one or more violating monitors.

EPA also considered the chemical composition (speciation) of $PM_{2.5}$ in evaluating this factor. As shown in the pie chart below (Figure 3), the chemical composition of $PM_{2.5}$ in Sacramento on days with exceedances of the 2006 24-hour $PM_{2.5}$ NAAQS is dominated by organic carbon, at up to 48% of the total. This reflects emissions primarily from residential wood combustion. There is also a large ammonium nitrate contribution, in the range of approximately 20-45%. The highest concentrations occur during the winter months (i.e., November through February). As discussed above, these data provide support for a nonattainment area that includes the urban areas and their surroundings, as well as a large proportion of Sacramento County and neighboring counties.

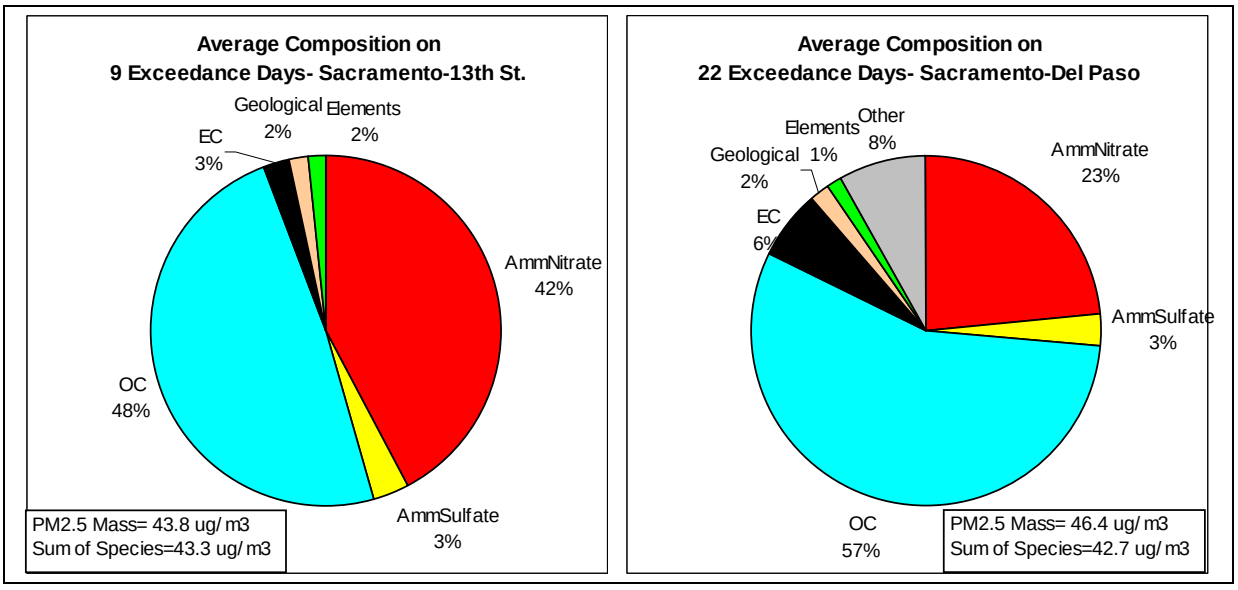


Figure 3. $PM_{2.5}$ composition at Sacramento monitors (CARB)

In summary, the air quality factor supports nonattainment designation of Sacramento County and at least substantial portions of El Dorado, Placer, Solano, and Yolo Counties. $PM_{2.5}$ speciation data support the idea that localized residential wood burning in and near urbanized areas on stagnant winter nights is what pushes the monitor into violation, but also support a larger area that includes the mobile sources contributing to the ammonium nitrate portion of violations.

Note: Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with a FRM or FEM monitor. All data from Special Purpose Monitors (SPM) using an FRM, FEM, or Alternative Reference Method (ARM) which has operated for more than 24 months is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr $PM_{2.5}$ NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Table 5 shows the 2005 population and population density for each County in the area being evaluated. Population data give an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour $PM_{2.5}$ standards. Population density and distribution are also illustrated in Figure 4.

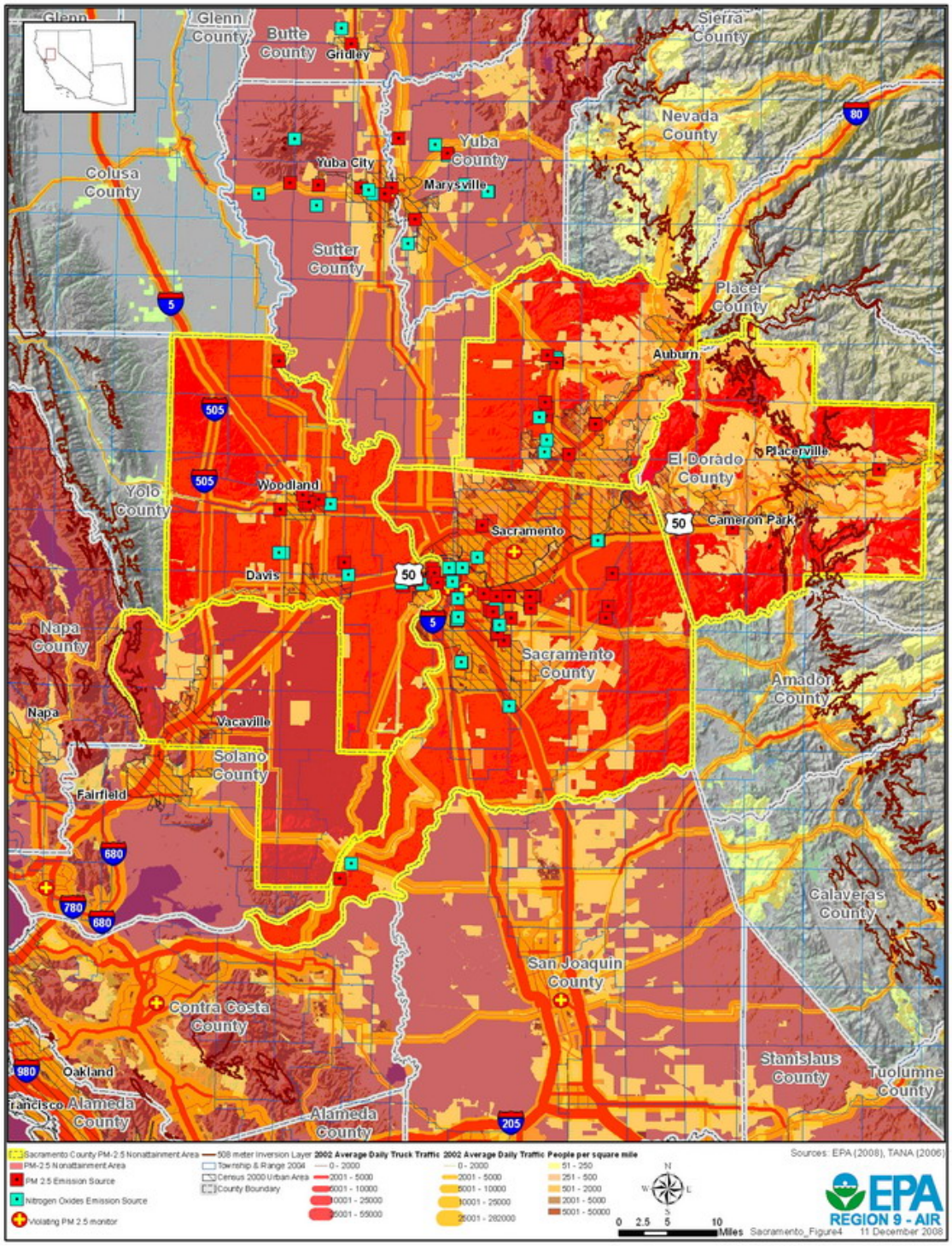


Figure 4

Table 5. Population

County	**State Recommended**	**2005 Population**	**2005 Population Density (pop/sq mi)**

	nonattainment		
Sacramento County	Yes	1,363,423	1,370
Placer County	No	316,868	211
El Dorado County	No	176,319	99
Yolo County	No	185,091	181
Solano County	No	410,786	463
Source: 2005 National Emissions Inventory Note: Figures given for entire county. Western Solano has been recommended as nonattainment as part of the Bay Area nonattainment area			

Sacramento County has the highest population density, followed by Solano, Placer, Yolo and El Dorado Counties. Population data is a relevant factor in defining the boundaries of the Sacramento nonattainment area given the association between population and the emission sources contributing to violations (i.e., residential wood combustion and mobile sources). As illustrated in Figure 4, "Sacramento Valley – Population Density, Truck and Commuting Traffic", the populations associated with the City of Sacramento clearly extend into Placer, El Dorado, Solano, and Yolo Counties. For Yolo County, though, greater than 97 % of the population is located in the eastern two-thirds of the County, between Interstate 505 and the eastern boundary of Yolo County, so the western portion of Yolo is not included in the nonattainment area.

This factor supports a Sacramento nonattainment area that includes at least these counties' urbanized areas, and their environs, since they likely contribute to NAAQS violations via their wood burning and mobile source emissions.

Attachment 3 shows the area, population, car traffic and truck traffic for Sacramento County and all the surrounding counties for the counties as a whole, as well as just for the nonattainment area. In addition, the Solano County data are split between the western portion and the eastern portion of the county. The numbers clearly reflect that the population and traffic numbers are very high, and that most of the population and traffic is captured within the nonattainment area.

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the Sacramento area, the percent of total commuters in each county who commute to other counties within the Sacramento area, as well as the total Vehicle Miles Traveled (VMT) for each county in thousands of miles (see Table 6). A county with numerous commuters is generally an integral part of an urban area and is likely contributing to fine particle concentrations in the area.

This factor also considers the number of commuters in each county who drive to another county adjacent to Sacramento County, the percent of total commuters in each county who commute to other counties adjacent to Sacramento County, as well as the total Vehicle Miles Traveled (VMT) for each county in millions of miles (see Table 7). The listing of counties in Table 7 reflects a ranking based on the number of people commuting to other counties. A county with numerous commuters is generally an integral part of an urban area and could be an appropriate

county for implementing mobile-source emission control strategies, thus warranting inclusion in the nonattainment area. Figure 4 further illustrates the traffic and commuting patterns associated with the Sacramento metropolitan area and the surrounding counties.

Table 6. Traffic and Commuting Patterns

County	State Recommended NA	2005 VMT (millions)	Number Commuting to any violating counties	Percent Commuting to any violating counties	Number Commuting into statistical area	Percent Commuting into statistical area
Sacramento	Yes	11,821	464,260	87%	507,270	95%
Placer	No	3,406	36,310	37%	109,390	94%
El Dorado	No	1,695	19,760	27%	23,690	33%
Yolo	No	2,350	20,800	28%	68,780	92%
Solano	No	NA	NA	NA	NAna	na

The listing of counties on Table 6 reflects a ranking based on the number of people commuting to other counties

The number of commuters into Sacramento County from Yolo, Placer, and El Dorado counties is significant. In addition to the commuter traffic, Sacramento County has a large number of highways traversing the area which carry high levels of daily truck traffic. For example, Highway 99 extends through Sacramento and Placer County. Based on 2002 transportation data, the average daily truck traffic for Highway 99 ranges from approximately 10,000 to 25,000 trucks per day. Highway 80 and Interstate 5 from the cities of Davis and Woodland in Yolo County, each carry 10,001 to 25,000 trucks per day. The significance of commuting and truck traffic is illustrated in Figures 3 and 4.

Based on the number of commuters and the significant truck traffic, Sacramento, Placer, El Dorado and Yolo Counties are considered to be contributing to $PM_{2.5}$ exceedances measured in Sacramento County. There is an insignificant amount of traffic west of Interstate 505, however. EPA views mobile source emissions as a significant component of regional PM2.5 levels in the Sacramento Valley, and it appears that the combination of this regional pollution and local wood combustion emissions in the Sacramento area lead to violations of the PM2.5 standard, particularly during stagnant conditions.

The 2005 VMT data used for table 6 and 7 of the 9-factor analysis have been derived using methodology such as that described in "Documentation for the 2005 Mobile National Emissions Inventory, Version 2," December 2008, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: ftp://ftp.epa.gov/EmisInventory/2005_nei/mobile_sector/documentation/2005_mobile_nei_version_2_report.pdf

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in vehicle miles traveled for Sacramento County and counties adjacent to Sacramento County, as well as patterns of population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and could be an appropriate county for implementing mobile-source and other emission-control strategies, thus warranting inclusion in the nonattainment area.

Table 7 below shows population, population growth, VMT and VMT growth for Sacramento County and counties that are adjacent to Sacramento County. Counties are listed in descending order based on VMT growth between 2000 and 2005.

Table 7. Population, population growth, VMT and VMT growth

County	Population (2005)	Population % change (2000 - 2005)	2005 VMT (millions)	% VMT Growth (1996 to 2005)
Sacramento	1,363,423	11%	11,821	22%
Placer	316,868	26%	3,406	20%
El Dorado	176,319	12%	757	23%
Yolo	185,091	9%	2,350	37%
Solano	NA	NA	NA	19

Sacramento, Placer, El Dorado, Solano, and Yolo Counties all had an increase in population from 2000 to 2005. These same counties had substantial increases in VMT for the same time period. Both the population and VMT numbers are significant, indicating that the area is experiencing substantial growth and that the counties under consideration are an integral part of the Sacramento metropolitan area. Therefore all of these candidates are included as part of the designated $PM_{2.5}$ nonattainment area.

Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered data from National Weather Service instruments in the area. Wind direction and wind speed data for 2004-2006 were analyzed, with an emphasis on "high $PM_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM or FEM air quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values, or where 24-hr values exceeded 35 $\mu g/m^3$.

For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. The figure identifies 24-hour $PM_{2.5}$ values by color; days exceeding 35 $\mu g/m_3$ are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

The pollution rose for the Sacramento County area, below, shows that the 24-hour $PM_{2.5}$ concentrations above 35 micrograms per cubic meter ($\mu g/m^3$) are more likely when the prevailing wind directions are from the northwest and southeast. The pollution roses indicate the $PM_{2.5}$ levels above 35 $\mu g/m^3$ generally occurred during time periods with a wind speed of 4 miles per hour or less. The pollutant roses also indicate that the majority of days with high $PM_{2.5}$ in the Sacramento area are in the "cold" season. Additional pollutant roses for the Sacramento area are included in Attachment 4.

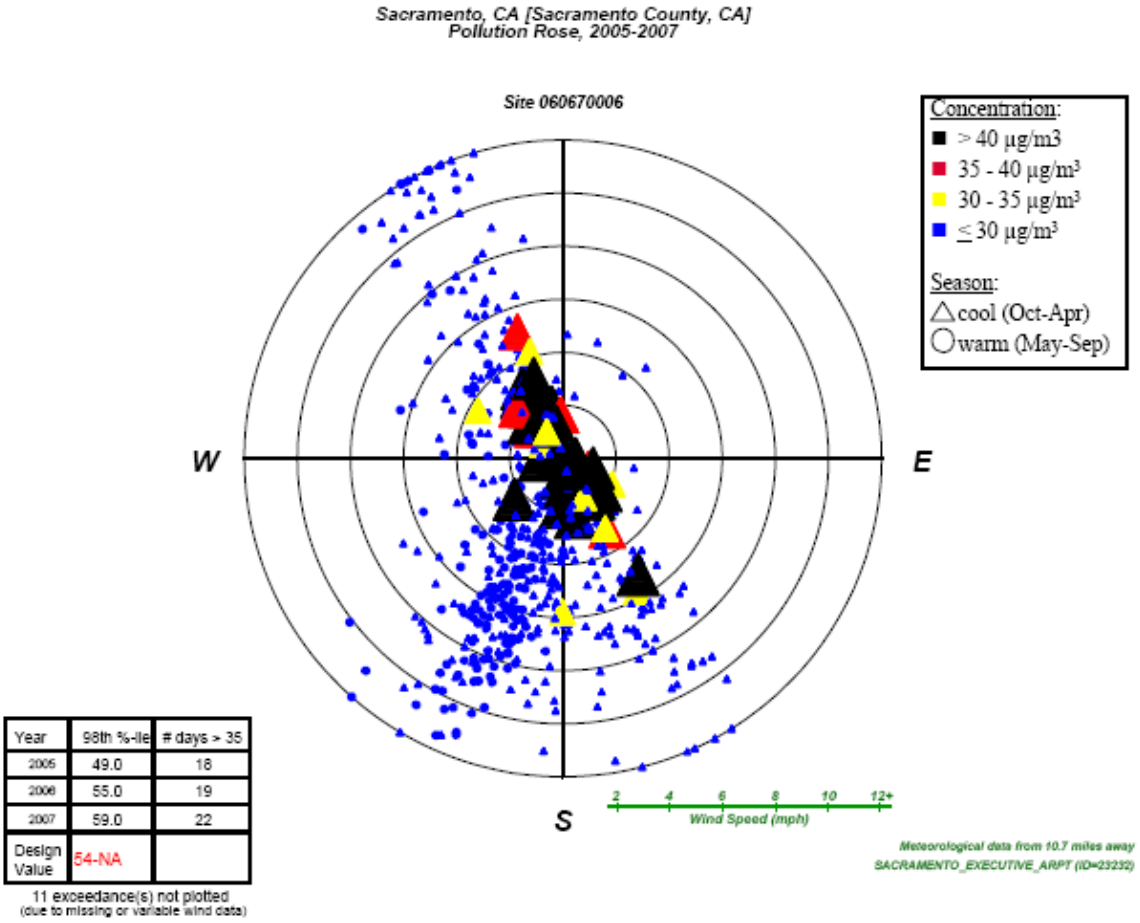


Figure 5: Pollution Rose for Sacramento County

California's recommendation letter indicates that "High $PM_{2.5}$ concentrations in the Sacramento area appear to be dependent upon calm-to-light winds and not as dependent on wind direction. This suggests that there is enough activity within the Sacramento area to generate high $PM_{2.5}$

concentrations under many conditions, and that high concentrations are not being caused by adjacent areas such as Placer, Sutter and Yolo Counties."

EPA agrees with California that high $PM_{2.5}$ concentrations in the Sacramento area appear to be dependent upon calm-to-light winds and are not as dependent on wind direction. While activity in the Sacramento area may be sufficient to generate high $PM_{2.5}$ concentrations under many conditions, EPA believes that adjacent areas are likely contributing to high concentrations in the Sacramento area, at least for ammonium nitrate. The meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high $PM_{2.5}$ days. The Contributing Emissions Scores CES (above) indicate that during days with high levels of $PM_{2.5}$ (winter days with calm-to-light winds), back trajectories show that nearby counties have the potential to contribute to high concentrations in the Sacramento area.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

Sacramento County is bounded by the Sierra Nevada foothills to the northeast and the Sacramento-San Joaquin River Delta to the southwest. The lower Sacramento Valley extends through the western and central portions of the county. Elevations range from sea level in the southwest to approximately 400 feet above sea level in the eastern areas of the county. There are no distinguishing topographic features that would exclude any part of the Yolo or Solano counties to the west. The eastern portions of Placer and El Dorado County counties extend beyond the ridge of the Sierra Nevada Mountains.

Because the Sacramento area has topographical features higher the typical daytime height of the inversion layer, EPA considered the inversion height to estimate the size of the area likely to have similar pollution conditions and to contribute to NAAQS violations, and to help determine an appropriate eastern boundary.

For the areas under consideration, high $PM_{2.5}$ concentrations mostly occur during stagnant conditions during winter, with radiation inversions. The cooling of the ground, as heat is radiated away, creates an inversion, since air near the ground is cooler than that above. This inhibits mixing and confines pollutants to a relatively shallow layer near the ground. Ferreria and Shipp examined the meteorology of San Joaquin Valley $PM_{2.5}$ and PM_{10} episodes, including inversion heights, typically based on aircraft temperature soundings. ("Historical Meteorological Analysis in Support of the 2003 San Joaquin Valley PM10 State Implementation Plan: Final Report", Shawn R. Ferreria, Evan M. Shipp, San Joaquin Valley Air Pollution Control District, January 24, 2005) During CRPAQS, radio acoustic sounding system (RASS) data were also available. A typical value for maximum mixing height during high $PM_{2.5}$ conditions is 500 m (1635 ft) AGL (above ground level). EPA recognizes that an inversion height is not a rigid boundary extending through a fixed elevation. In reality the inversion would be partly terrain-following, and the degree of stagnation would be subject to additional influences at the foothill edges, such as strong diurnal slope flows. In any case, mixing heights vary by site and date, so any single height can provide only a scale for comparison, not a definitive value. Nevertheless, the inversion height provides an indicator of the area over which inversions may be enhancing

pollution concentrations, and of the extent of the area that may be contributing to NAAQS violations.

For Sacramento, the 500 m AGL (1635 ft) inversion layer thickness translates to an elevation contour of 508 m (1666 ft) MSL (above Mean Sea Level). Much of eastern portions of Placer and El Dorado Counties are above this elevation, as shown in Figure 5 below. This factor supports excluding the eastern portions of Placer and El Dorado from the Sacramento nonattainment area.

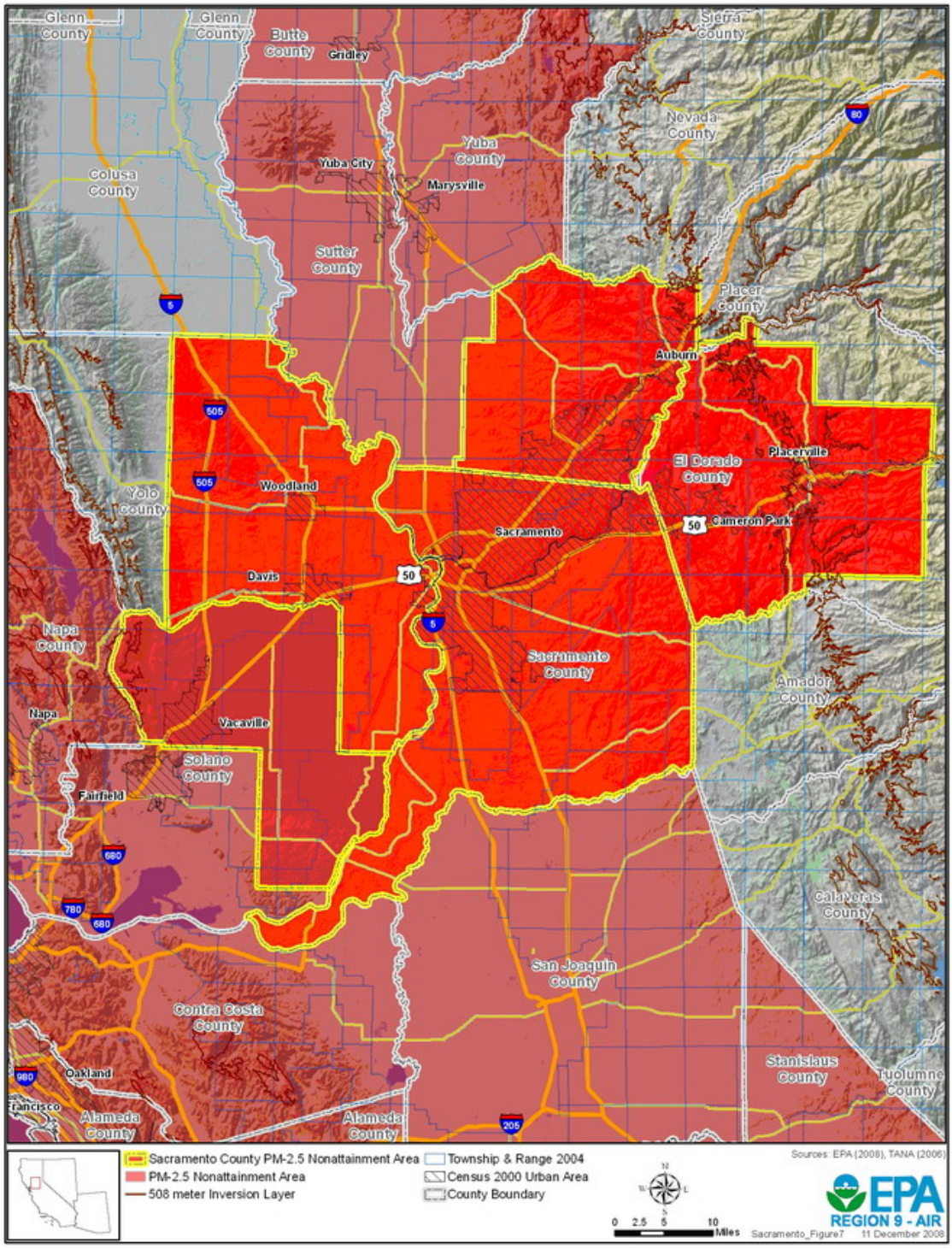


Figure 6

Factor 8: Jurisdictional boundaries (e.g., existing PM and ozone areas)

EPA believes consideration also should be given to existing boundaries and organizations as they may facilitate air quality planning and the implementation of control measures to attain the standard. Areas already designated as nonattainment represent important boundaries for state air quality planning.

The local jurisdictional boundaries for counties that have been considered for the Sacramento nonattainment area are:

- Sacramento County – the Sacramento Metro Air Quality Management District;
- Placer County – the Placer County Air Pollution Control District;
- El Dorado – El Dorado County Air Quality Management District;
- Yolo County – the Yolo Solano Air Quality Management District.
- Solano County (eastern portion) – the Yolo Solano Air Quality Management District

These are classified as attainment for the 1997 $PM_{2.5}$ NAAQS and for PM_{10}. All of these are within the existing Sacramento 8-hour ozone nonattainment area, which also includes the southern part of Sutter County.

EPA's final designation places little emphasis on the ozone nonattainment area boundary. Instead, more weight was placed on the areas generating pollution likely to contribute to NAAQS violations. Consequently, EPA is designating the violating County, Sacramento, along with the contributing partial counties of Placer, El Dorado, Solano and Yolo. The western part of Solano County, which is under the jurisdiction of the Bay Area Air Quality Management District, is being designated as nonattainment for the 2006 24-hour $PM_{2.5}$ NAAQS and is included in the San Francisco Bay Area nonattainment area. The remaining eastern part of Solano County is being designated nonattainment as part of the Sacramento nonattainment area. This portion of Solano County is under the jurisdiction of the Yolo/Solano Air Quality Management District.

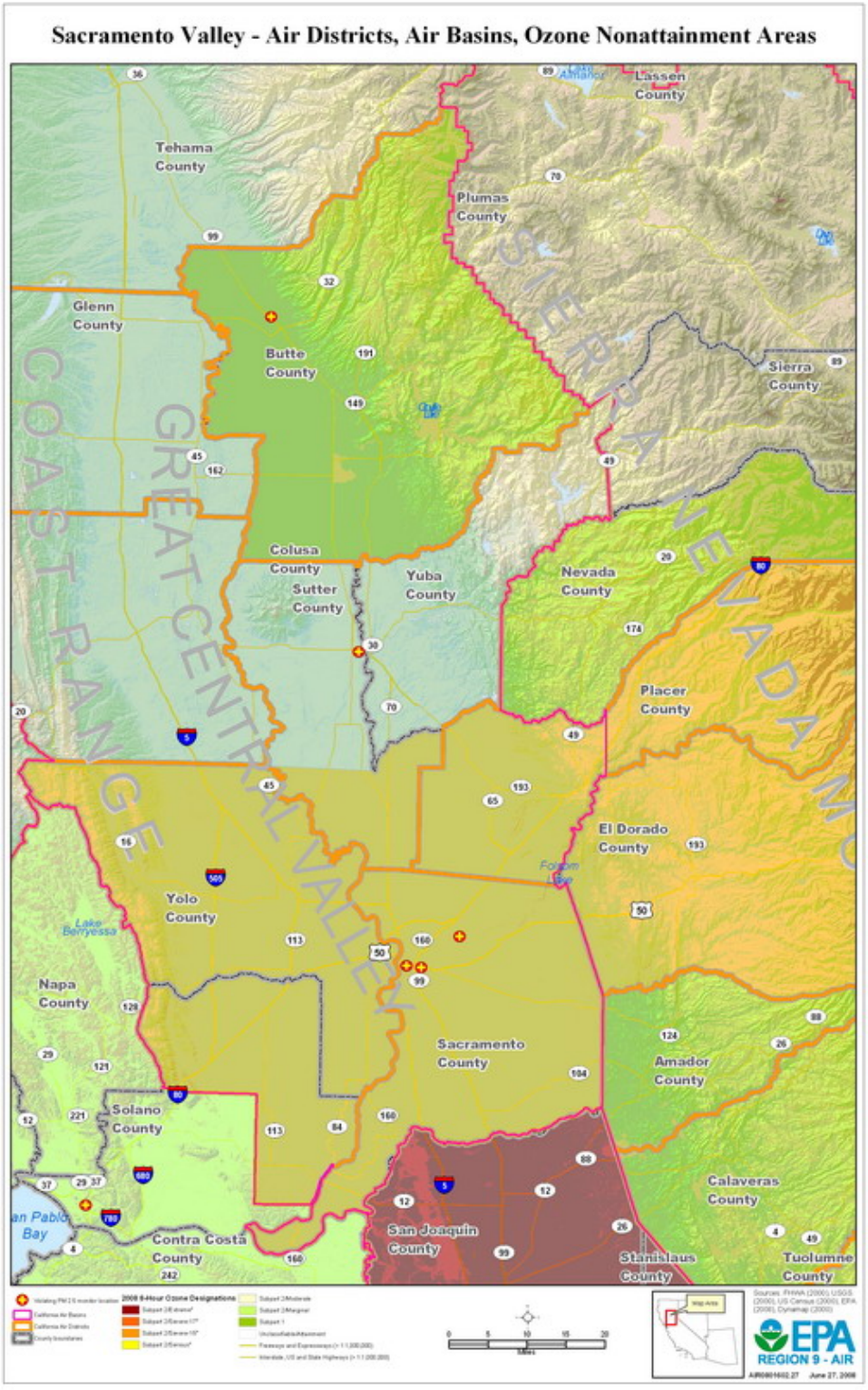

Sacramento Valley - Air Districts, Air Basins, Ozone Nonattainment Areas
Tehama County
Lassen County
Plumas County
Glenn County
Butte County
Sierra County
Colusa County
Sutter County
Yuba County
Nevada County
Placer County
El Dorado County
Yolo County
Napa County
Sacramento County
Amador County
Solano County
Calaveras County
Contra Costa County
San Joaquin County
Stanislaus County
Tuolumne County
COAST RANGE
GREAT CENTRAL VALLEY
SIERRA NEVADA MO
Lake Berryessa
San Pablo Bay
EPA
REGION 9 - AIR

Figure 7

Factor 9: Level of control of emission sources

This factor considers emission controls currently implemented for major sources in the Sacramento $PM_{2.5}$ nonattainment area. In considering county-level emissions, EPA used data from the 2005 National Emissions Inventory version 1, the most current version of the national inventory available at the beginning of the designations process in late 2007. However, EPA recognized that for certain counties, emissions may have changed significantly since 2005. For example, certain power plants or large sources of emissions in or near an area may have installed emission controls or otherwise significantly reduced emissions since 2005.

For the Sacramento nonattainment area, there are no large contributing sources for which this factor would apply. The State of Calfornia did not provide information on any significant changes in emissions from large sources since 2005.

In their designation recommendation, the State did, however, rely on future mobile source controls at a statewide level to address NOx emissions and, therefore, discounted mobile sources as an important consideration in their analysis. This was a misinterpretation of EPA's guidance regarding emission controls, which is intended to take into account current, federally-enforceable controls on large point sources (e.g., electric generating units), but not intended to cover future controls on sources nor to cover controls or emission reductions that are not federally enforceable.

EPA did not consider State strategies for current or future emission reductions for mobile sources to be appropriate for consideration, in this context, for the purpose of area designation determinations for the 2006 24-hour $PM_{2.5}$ NAAQS. These can be considered in the State implementation planning for the 24-hour $PM_{2.5}$ nonattainment area.

Thus, in considering mobile source emissions, based on currently available data, as well as other factors, EPA expanded the nonattainment area recommended by California

Conclusion

EPA is designating the whole of Sacramento County, the eastern portion of Solano County, and the eastern portion of Yolo County, and the western, low-elevation portions of Placer and El Dorado Counties, as nonattainment for the 2006 24-hour $PM_{2.5}$ NAAQS as part of the Sacramento nonattainment area. The boundaries include all violating monitors, and the emission sources contributing to violations, principally residential wood combustion in urbanized areas and their surroundings, and mobile sources connected with Sacramento.

EPA's technical analysis supports the boundaries for the Sacramento nonattainment area. Sacramento County has three air quality monitors violating the $PM_{2.5}$ NAAQS. There are relatively large emissions of directly emitted $PM_{2.5}$ throughout Sacramento county, especially from wood burning, which is associated with relatively densely populated areas and their surroundings. Residential wood combustion contributes a large organic carbon component to monitored values, and pushes the area into nonattainment on stagnant winter nights. The organic carbon is relatively localized, but its sources and influence are not limited to city boundaries.

The county also has substantial mobile source NOx emissions throughout, which contribute to secondarily formed $PM_{2.5}$, in the form of ammonium nitrate. The nitrate occurs on a larger spatial scale than the carbon, and further justifies a relatively large area for inclusion.

Similar conclusions apply to the emissions and pollution of the neighboring counties of Solano, El Dorado, Placer, and Yolo. They are all connected to Sacramento by strong commuting and other traffic patterns, by population density, by similar emissions sources, and by wind patterns. Emissions from each of these were determined to be contributing to the $PM_{2.5}$ mass measured on days with exceedances of the 24-hour $PM_{2.5}$ NAAQS. The Sacramento Valley-based wintertime inversions coincide with NAAQS exceedances. Since the high-elevation eastern portions of Placer and El Dorado Counties are above the wintertime inversion layer, and since these portions of Placer and El Dorado Counties are unlikely to contribute to the NAAQS violations, due to topography, as well as low emitting activity (e.g., commuting), these portions are not included in the Sacramento nonattainment area. The boundary for Yolo County includes nearly all of the population and population-oriented emissions (e.g., mobile source emissions). The western portion of Solano County is included in the San Francisco Bay Area $PM_{2.5}$ nonattainment area, so is excluded from the Sacramento nonattainment area.

Additional information regarding responses to specific State comments can be found in EPA's Response to Comments document at:
http://www.epa.gov/pmdesignations/2006standards/tech.htm
.

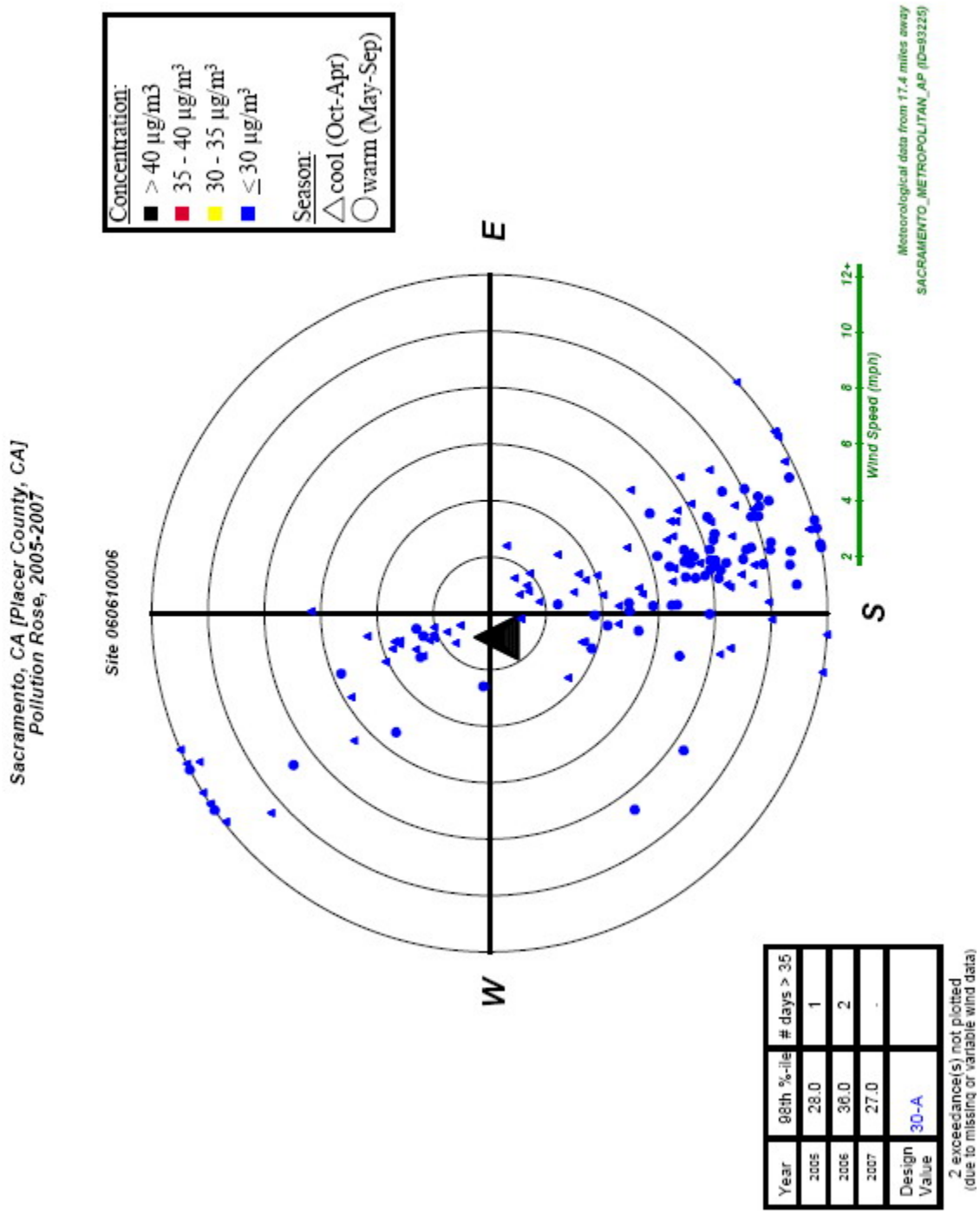
Attachment 3: Population and Traffic Data

County	County Area (sq. miles)	Nonattainment Area (sq. miles)
Butte	1,677.50	1,158.33
El Dorado	1,787.99	620.92
Imperial	4,481.67	690.54
Placer	1,501.86	432.38
Sacramento	992.04	992.04
Sutter	608.39	608.39
Yolo	1,023.36	698.67
Yuba	643.57	482.77
Solano (SV)	470.55	470.55
Solano (SF)	419.01	419.01
County	County Population	Nonattainment Area Population
Butte	203,171.00	196,300.00
El Dorado	156,299.00	110,528.00
Imperial	142,361.00	122,775.00
Placer	248,399.00	207,156.00
Sacramento	1,223,499.00	1,223,499.00
Sutter	78,930.00	78,930.00
Yolo	168,660.00	163,193.00
Yuba	60,219.00	56,293.00
Solano (SV)	120,697.00	120,697.00
Solano (SF)	273,845.00	273,845.00
County	County Annual Non-truck Traffic	Nonattainment Area Annual Non-truck Traffic
Butte	2,237,170.00	2,225,913.00
El Dorado	1,573,738.00	1,547,018.00
Imperial	1,677,333.00	1,229,867.00
Placer	4,777,401.00	4,548,701.00
Sacramento	33,510,398.00	33,510,398.00

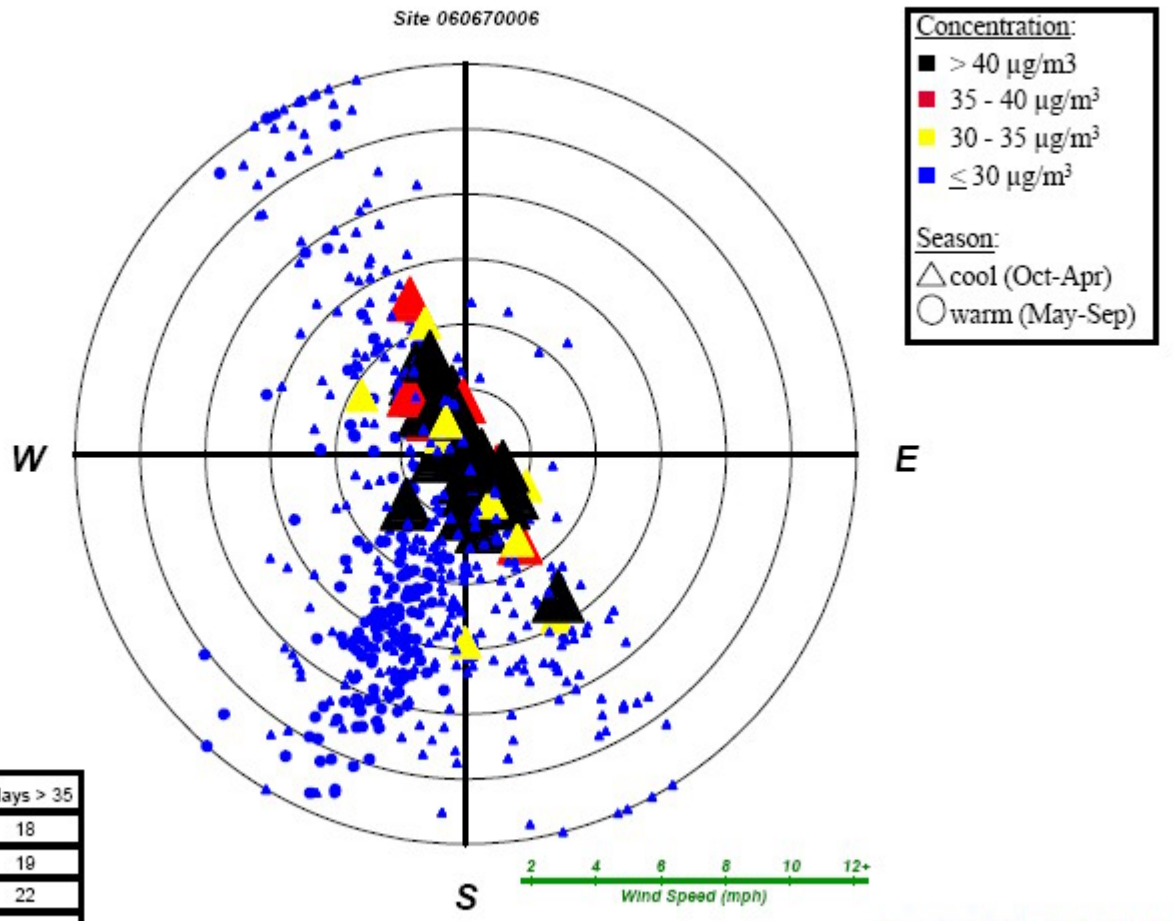
Sutter	361,416.00	361,416.00
Yolo	4,677,258.00	4,671,958.00
Yuba	426,377.00	422,677.00
Solano (SV)	3,988,735.00	3,988,735.00
Solano (SF)	12,301,618.00	12,301,618.00
County	County Annual Truck Traffic	Nonattainment Area Annual Truck Traffic
Butte	169,932.00	169,280.00
El Dorado	86,212.00	84,588.00
Imperial	229,338.00	139,186.00
Placer	422,876.00	400,706.00
Sacramento	2,515,749.00	2,515,749.00
Sutter	33,714.00	33,714.00
Yolo	614,874.00	614,512.00
Yuba	23,724.00	23,036.00
Solano (SV)	369,035.00	369,035.00
Solano (SF)	933,605.00	933,605.00

Sources: U.S. Census Department (2000), Federal Highway Administration (2002), EPA (2008)

Attachment 4. Pollution Roses for Sacramento Area

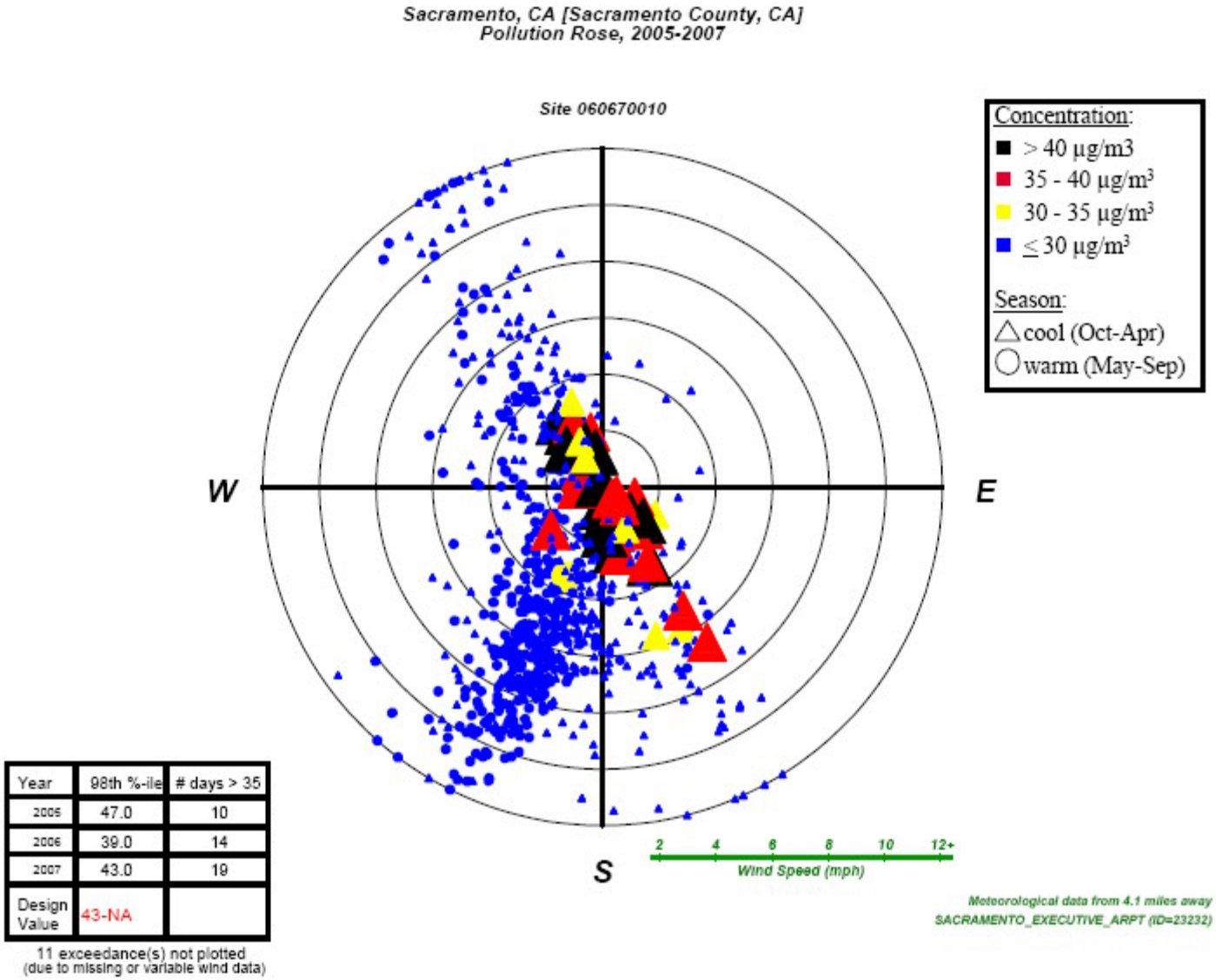


Sacramento, CA [Sacramento County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	49.0	18
2006	55.0	19
2007	59.0	22
Design Value	54-NA	

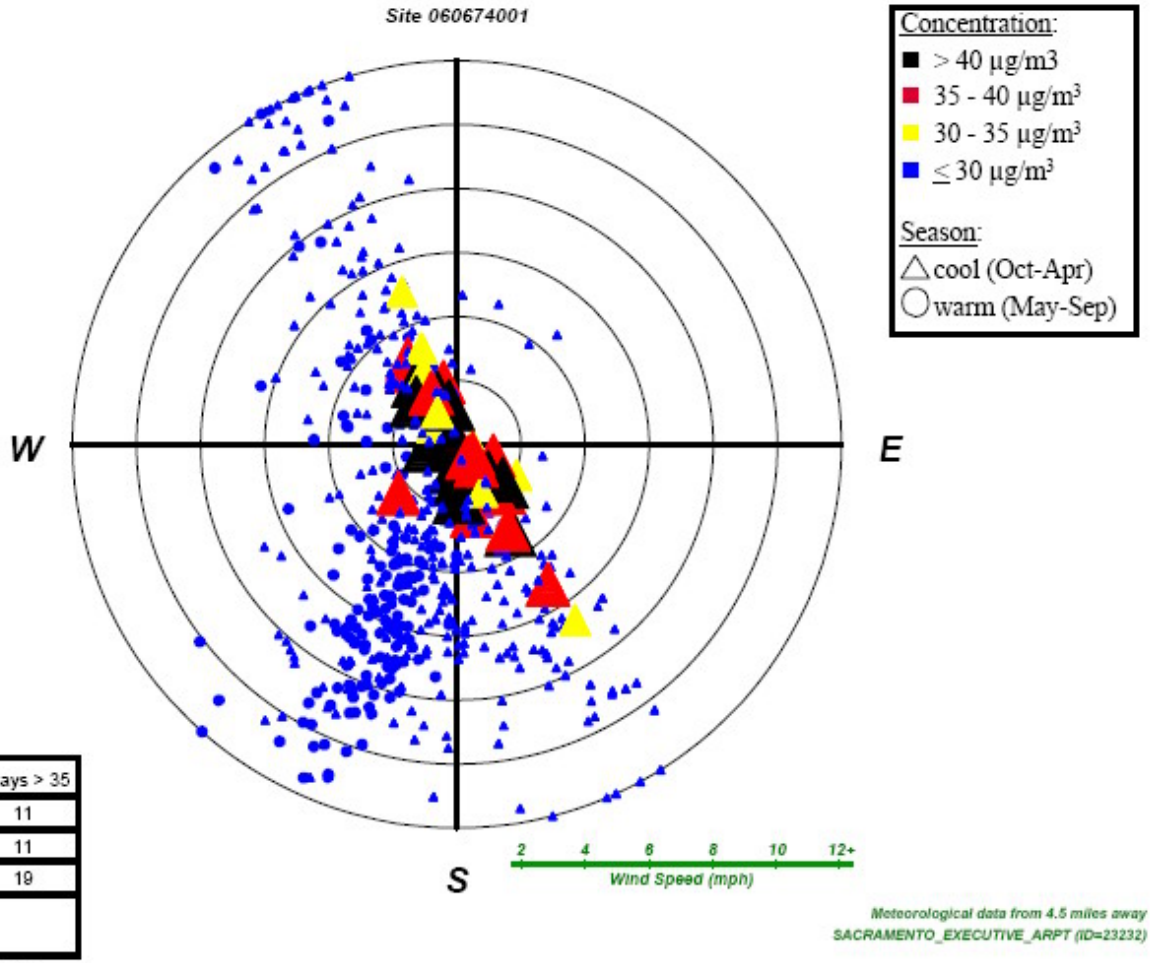
11 exceedance(s) not plotted
(due to missing or variable wind data)



Year	98th %-ile	# days > 35
2005	47.0	10
2006	39.0	14
2007	43.0	19
Design Value	43-NA	

11 exceedance(s) not plotted
(due to missing or variable wind data)

Sacramento, CA [Sacramento County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	42.0	11
2006	39.0	11
2007	46.0	19
Design Value	42-NA	

9 exceedance(s) not plotted
(due to missing or variable wind data)

EPA Technical Analysis for San Francisco Bay Area

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those areas that contribute to violations. This technical analysis for the San Francisco Bay area identifies the counties with monitors that violate the 24-hour PM2.5 standard and evaluates the counties that potentially contribute to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

Figure 1 is a map of the counties in the nonattainment area and other relevant information such as the locations and design values of air quality monitors, and the metropolitan area boundary.

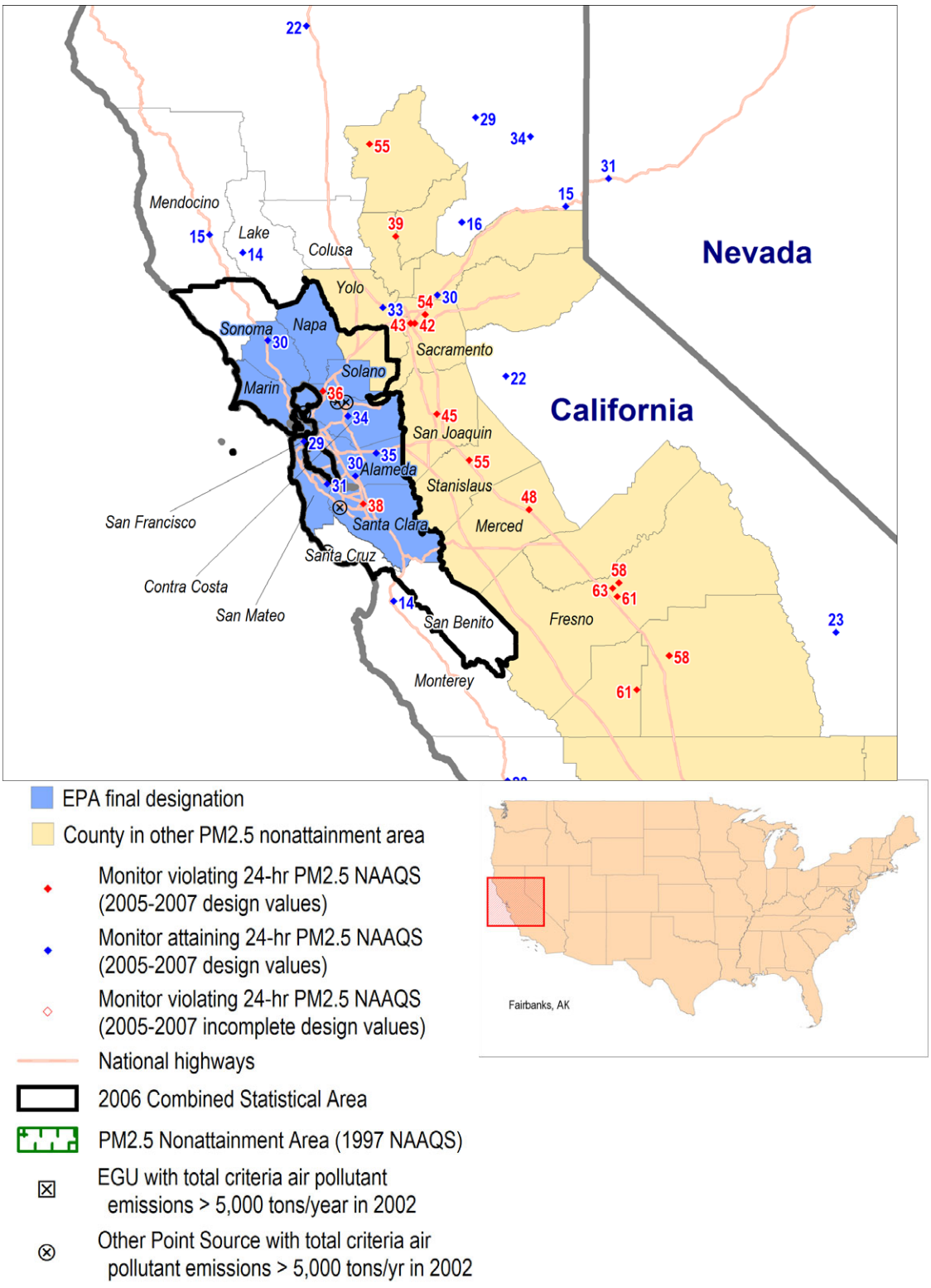


Figure 1. San Francisco Bay Area, CA 24-hr PM2.5 Nonattainment Area

The California Air Resources Board sent a letter to EPA, dated December 17, 2008, recommending that southern Sonoma, Napa, Marin, Contra Costa, San Francisco, Alameda, San Mateo, Santa Clara and the western part of Solano Counties be designated as "nonattainment" for the 2006 24-hour $PM_{2.5}$ standard based on air quality data from 2004-2006. These data are from Federal Reference Method (FRM) monitors located in the state.

In August 2008, EPA notified California of its intended designations. In this letter, EPA also requested that if the State wished to provide comments on EPA's intended designation, it should do so by October 20, 2008. EPA stated that it would consider any additional information (e.g., on power plants or partial county areas) provided by the state in making final decisions on the designations.

Air quality monitoring data on the composition of fine particle mass are available from the EPA Chemical Speciation Network and the IMPROVE monitoring network. Analysis of these data indicates that the days with the highest fine particle concentrations occur predominantly in the winter, and the average chemical composition of the highest days (13% sulfate, 54% carbonaceous PM2.5, 30% nitrate, 3% other components) is typically characterized by high levels of organic carbon and nitrate.

Based on EPA's 9-factor analysis described below, and currently available information, EPA believes that part or all of nine counties in California should be designated nonattainment for the 24-hour $PM_{2.5}$ air-quality standard as part of the San Francisco Bay Area nonattainment area. These counties are listed in the table below. A portion of Solono County which is not included in the San Francisco Air Basin is separately designated in the Sacramento 2006 PM2.5 nonattainment area. The San Francisco Bay area nonattainment area is a new nonattainment area for PM2.5. This area did not violate the 1997 $PM_{2.5}$ NAAQS.

Area	State-Recommended Nonattainment Counties	EPA-Designation Nonattainment Counties
San Francisco Bay Area	Sonoma (P), Napa, Marin, Contra Costa, San Francisco, Alameda, San Mateo, Santa Clara and the western part of Solano (P) Counties	Sonoma (P), Napa, Marin, Contra Costa, San Francisco, Alameda, San Mateo, Santa Clara and the western part of Solano (P) Counties

P = Partial

The following is the 9-factor analysis for the San Francisco Bay Area.

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted

directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown on the template or data spreadsheet as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive way for consideration of data for these factors. A summary of the CES is included in Attachment 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the San Francisco Bay Area. The emissions data indicate that all counties have some level of PM2.5-related emissions that have the potential to contribute to violations of the standard. Chemical speciation data for the area indicate that carbonaceous PM2.5 and nitrate comprise, on average, 84% of observed fine particle mass on high days. Sulfate accounts for about 13%. Emissions of NOx, a nitrate particle precursor, and carbonaceous PM2.5 are highest in Contra Costa, Santa Clara, and Alameda Counties, and lowest in Napa and Marin Counties. Emissions of SO2, a sulfate particle precursor, are highest in Contra Costa. Santa Clara, Solano, and Alameda have similar but lower SO2 emissions

Table 1. $PM_{2.5}$ 24-hour Component Emissions, and CES Values.

County	State Rec. NA?	CES	$PM_{2.5}$ emissions total (tpy)	$PM_{2.5}$ emission carbon (tpy)	$PM_{2.5}$ emissions other (tpy)	SO_2 (tpy)	NOx (tpy)	VOCs (tpy)	NH_3 (tpy)
Contra Costa	Yes	100	4,061	1,999	2,061	18,115	44,059	27,508	3,149
Santa Clara	Yes	100	5,284	2,372	2,912	7,008	44,714	36,471	2,234
Solano	Yes P	66	1,750	834	915	8,335	15,009	12,093	1,579
Alameda	Yes	54	4,640	2,302	2,339	6,932	43,685	32,094	1,705
San Francisco	Yes	16	2,362	1,388	975	1,979	22,711	13,511	570
San Mateo	Yes	10	2,195	1,103	1,092	2,585	20,888	16,141	1,059
Napa	Yes	7	611	329	282	1,132	4,251	4,199	600
Sonoma	Yes P	5	2,179	1,224	955	2,851	15,064	13,411	2,697
Marin	Yes	4	833	468	365	973	6,514	7,250	861

P =partial. Data given is for entire County

The CES values indicate that all counties contribute at some level to the high PM2.5 days in the San Francisco Bay area. Sonoma, Napa and Marin Counties have the lowest CES values, suggesting they contribute the least of the 9 counties to high PM2.5 days However, all these Counties are part of the San Francisco metropolitan area and part of the Bay Area Air Quality Management District, and the State of California has recommended that these areas be included in the PM2.5 nonattainment area as nearby areas contributing to the violating areas.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values (in $\mu g/m^3$) for air quality monitors in counties in the San Francisco Bay Area based on data for the 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standards are met when the 3-year average of a monitor's 98^{th} percentile values are 35 $\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met.

The 24-hour $PM_{2.5}$ design values for counties in the San Francisco Bay Area are shown in Table 2, listed in order of 2007 design value.

Table 2. Air Quality Data

County	State Recommended Nonattainment?	Design Values 2004-06 ($\mu g/m^3$)	Design Values 2005-07 ($\mu g/m^3$)
Santa Clara, CA	Yes	39	39
Solano, CA	Yes P	36	36
Alameda, CA	Yes	34	35
Contra Costa, CA	Yes	35	34
San Mateo, CA	Yes	29	31
Sonoma, CA	Yes P	29	30
San Francisco, CA	Yes	31	29
Napa, CA	Yes	No data	No data
Marin, CA	Yes	No data	No data
P = partial			

In the San Francisco Bay Area, Solano and Santa Clara Counties show a violation of the 24-hour $PM_{2.5}$ standard. Solano is in the northern portion of the Bay Area, and Santa Clara is in the southern portion. Alameda and Contra Costa Counties have monitored design values approaching, but still meeting the standard. Design values in this range suggest, but do not alone conclude, that emissions and meteorological conditions throughout the area have the potential to generate elevated PM2.5 levels.

Note: Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with an FRM monitor. All data from Special Purpose Monitors (SPM) using an FRM is eligible for comparison to the relevant

NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr PM2.5 NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Figure 2 shows the population density in all the Bay Area counties. All 9 counties contain areas of high population density characteristic of urbanized areas. Urbanized areas are associated with population-oriented PM2.5-related emissions (e.g., NOx from vehicles) that can contribute to violations of the standard.

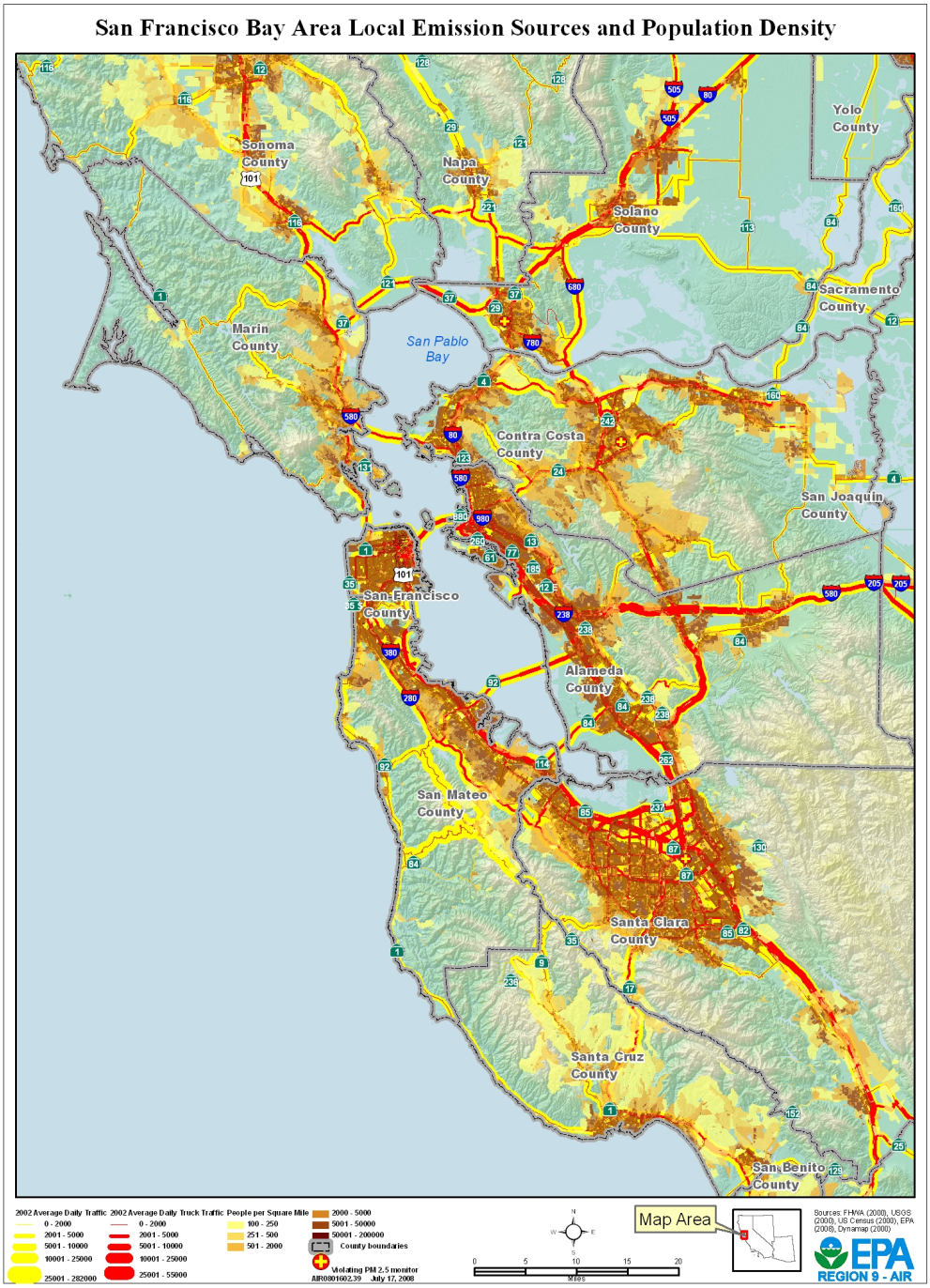


Figure 2. San Francisco Bay Area Traffic Density and Population Density

Table 3 shows the 2005 population for each county in the area being evaluated, as well as the population density for each county in that area. Population data gives an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour $PM_{2.5}$ standards. The population is significant in each of the counties.

Table 3. Population

County	State Recommended Nonattainment	2005 Population	2005 Population Density (pop/sq mi)
Santa Clara	Yes	1,705,158	1313
Alameda	Yes	1,451,065	1933
Contra Costa	Yes	1,017,644	1341
San Francisco	Yes	741,025	15,700
San Mateo	Yes	701,175	1535
Sonoma	Yes P	466,970	294
Solano	Yes P	410,786	463
Marin	Yes	247,103	456
Napa	Yes	132,516	167
P = partial. Data given is for entire County			

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the San Francisco Bay Area, the percent of total commuters in each county who commute to other counties within the San Francisco Bay Area, as well as the total Vehicle Miles Traveled (VMT) for each county in millions of miles. A county with numerous commuters is generally an integral part of an urban area and is likely contributing to fine particle concentrations in the area.

Table 4. Traffic and Commuting Patterns

County	State Recommended Nonattainment	2005 VMT (millions)	No. Commuting to any violating counties	Percent Commuting to any violating counties	No. commuting into and within the statistical area	Percent commuting into and within the statistical area
Santa Clara	Yes	15,087	729,340	88 %	822,670	99%
Solano	Yes P	4,173	105,850	61%	163,780	94%
Alameda	Yes	9,732	74,150	11 %	671,970	99%
San Mateo	Yes	6,820	56,070	16 %	351,830	99%
Contra Costa	Yes	8,437	19,680	4%	435,250	99%
San Francisco	Yes	3,657	16,630	4%	414,740	99%
Napa	Yes	1,212	4,380	8%	56,500	99%
Sonoma	Yes P	4,761	2,770	1%	222,400	99%
Marin	Yes	2,272	1,850	1%	125,180	99%
P = Partial. Data given is for entire County.						

Table 4 lists the Bay Area counties in order by number commuting into violating counties. Santa Clara, Solano, Alameda, and San Mateo Counties have the highest number of commuters into the violating areas of Santa Clara and Solano. All of the Counties in the San Francisco Bay Area have substantial commuting to any statistical County indicating a very high degree of interrelated activity across the collective area manifested in PM2.5-related mobile source emissions that contribute to observed area-wide PM2.5 levels.

Note: The 2005 VMT data used for Tables 4 and 5 of the 9-factor analysis has been derived using methodology similar to that described in "Documentation for the final 2002 Mobile National Emissions Inventory, Version 3, September 2007, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: ftp://ftp.epa.gov/EmisInventory/2002finalnei/documentation/mobile/2002_mobile_nei_version_3_report_092807.pdf. The 2005 VMT data were taken from documentation which is still draft, but which should be released in 2008.

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in vehicle miles traveled for 1996-2005 for counties in the San Francisco Bay Area, as well as patterns of population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and likely to be contributing to fine particle concentrations in the area.

Table 5 below shows population, population change, VMT and VMT growth for counties that are included in the San Francisco Bay area.

Table 5. Population and VMT Growth and Percent Change.

County	Population (2005)	Population % change (2000 - 2005)	2005 VMT (millions)	VMT Growth (% 2000 to 2005)
Napa	132,516	(1%)	1,212	46%
Contra Costa	1,017,644	7%	8,437	32%
San Mateo	701,175	(1%)	6,820	27%
Sonoma	466,970	1%	4,761	26%
Solano	410,786	3%		19%
Marin	247,103	No data	2,272	14%
Santa Clara	1,705,644	1%	15,087	10%
Alameda	1,451,065	3%	9,732	(9%)
San Francisco	1,705,158	(5%)	3,657	(38%)
P = partial. Data are for entire counties.				

Napa, San Francisco and San Mateo Counties had a decrease in population from 2000 to 2005. While San Francisco had a corresponding decrease in VMT growth from 2003 – 2005, San Mateo County had a significant (27%) increase in VMT as did Napa County (46%). The

increase in VMT growth in suburban counties, coupled with the decrease in VMT for San Francisco and Alameda, indicate there has been a shift from the major population centers to the suburbs.

Based on these statistics, it would appear that, although there are shifting populations among the Counties in the San Francisco Bay Area, both the population and VMT estimates for the collection of areas continue to highlight the degree of interrelated activity across the area manifested in PM2.5-related population-based (including mobile source) emissions that contribute to observed area-wide PM2.5 levels.

Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered data from National Weather Service instruments in the area. Wind direction and wind speed data for 2004-2006 were analyzed, with an emphasis on "high $PM_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM air quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values, or where 24-hr values exceeded 35 $\mu g/m^3$.

For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. The figure identifies 24-hour PM2.5 values by color; days exceeding 35 ug/m3 are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

The pollution rose for Santa Clara County, site 060850005, shown below, indicates that elevated levels of particulate matter occur during the cool season during time periods when prevailing winds are light, consistent with inversions that result in a buildup of emissions. During these periods emissions from PM2.5-related sources throughout the Bay Area can contribute to elevated PM2.5 levels. The additional pollutant roses for the San Francisco Bay Area, included in Appendix A, indicate similar conclusions.

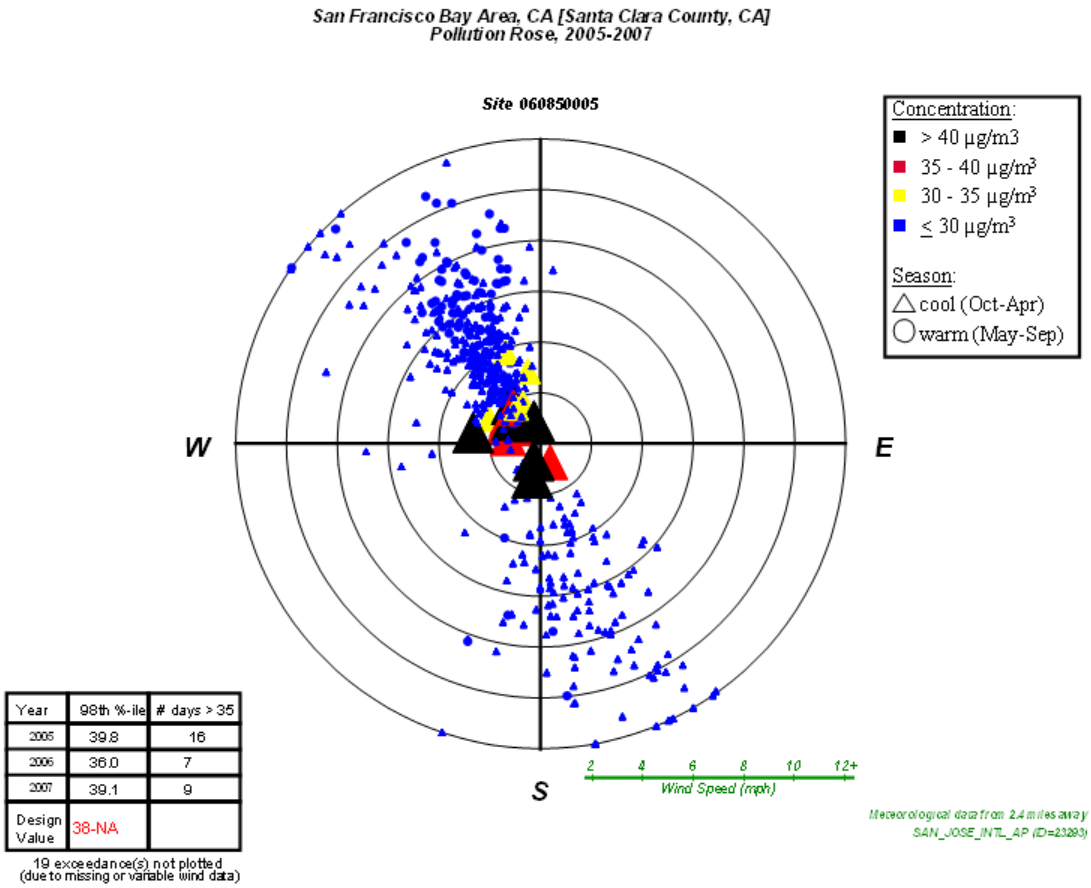


Figure 3: Pollutant Rose for Santa Clara County

This assessment is consistent with the analysis submitted by California. The letter from the California Air Resources Board to EPA states that:

> The coastal zones tend to be more windy and cooler in the summer than the hotter drier interior regions with a reversal in the winter months. Precipitation is characterized with dry summers and wet winters. The summer climate is dominated by a high pressure center over the Pacific Ocean. Storms rarely affect the coast during the summer, thus the conditions that persist during the summer are a northwest air flow and negligible precipitation. A thermal low pressure area from the Sonoran – Mojave Desert also causes air to flow onshore over the San Francisco Bay Area much of the summer.
>
> Air flow over cool Pacific Ocean temperatures produces condensation therefore a high incidence of fog and stratus clouds are common along the coast in summer.
>
> In winter, the Pacific High weakens and shifts southward, winter storms become frequent. Almost all of the Bay Area's annual precipitation takes place in the November through April period. During the winter rainy periods, inversions are weak or nonexistent, winds are often moderate and air pollution potential is very low. During winter periods when the Pacific High becomes dominant, inversions become strong,

winds are light and pollution potential is high. These periods are characterized by winds that flow out of the Central Valley into the Bay Area and often include tule fog.

Note: the meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high $PM_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the air shed and, therefore, on the distribution of $PM_{2.5}$ over the San Francisco Bay Area. The San Francisco Air Basin encompasses approximately 5,430 square miles and consists of all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo and Santa Clara counties, the southern half of Sonoma County and the southwestern portion of Solano County. The region is characterized by complex terrain, consisting of coastal mountain ranges, rugged hillsides, and inland valleys and bays. Elevations range from sea level to 1500 feet. These terrain features can be seen in Figures 2 and 4. Within the 9-county Bay Area, these terrain features do not isolate significant areas of PM2.5-related emissions, preventing these emissions from contributing to area-wide PM2.5 levels.

Sonoma County does not contain a monitor violating the PM2.5 NAAQS. The northern half of Sonoma County is not within the San Francisco Bay air basin as defined by California for air quality planning purposes based on meteorology and topography. It is topographically distinct from the southern portion, having rugged mountainous terrain that leads to different air flow characteristics than the southern portion. It has lower population density and population-related emissions in comparison to the southern half. In addition, 35 miles and a spur of the Coastal Range mountains separates southern half of the county's valley and its air flow from the location of the violating monitor in Vallejo in Solano County. Some 70 miles separate it from the other violating monitor, in San Jose in Santa Clara County. In view of these facts and the low-wind stagnant conditions leading to PM2.5 exceedances, EPA believes that this portion of the county does not contribute to PM2.5 NAAQS violations, and has not included it n the San Francisco nonattainment area.

Factor 8: Jurisdictional boundaries (e.g., existing PM and ozone areas)

The 9 Counties in the San Francisco Bay Area are part of the Bay Area Air Quality Management District (BAAQMD), which is responsible for air quality planning and management for the area. These 9 counties were previously designated nonattainment for the 1997 ozone standards. The state has recommended the identical area be designated nonattainment for the 2006 24-hr PM2.5 standard (see Figure 4). EPA agrees that BAAQMD area is a useful boundary for identifying the air basin and PM2.5-related sources therein that contribute to PM2.5 violations within the area.

Figure 4. San Francisco Bay Area–Air Districts, Air Basins, ozone Nonattainment Areas

Factor 9: Level of control of emission sources

Under this factor, the existing level of control of emission sources is taken into consideration. The Bay Area, like many areas in California, has implemented various emissions control measures for NOx and VOC for the purposes of attaining and maintaining the ozone NAAQS and independent state standards for fine particles.
The emissions data used by EPA in this technical analysis and provided in Table 1 (under Factor 1) represent emissions levels taking into account any control strategies implemented in the San Francisco Bay Area before 2005 on stationary, mobile, and area sources. Data are presented for PM2.5 components that are directly emitted (carbonaceous PM2.5 and crustal PM2.5) and for pollutants which react in the atmosphere to form fine particles (e.g. SO2, NOx, VOC, and ammonia). The Bay Area PM2.5 nonattainment area includes relevant sources of these emissions.

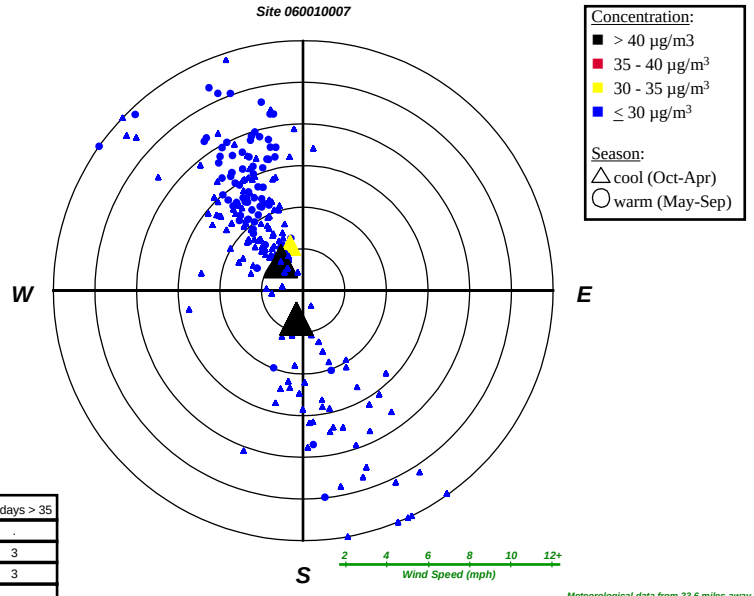
Conclusion

The State of California recommended that the entire San Francisco Bay Area be designated as a PM 2.5 nonattainment area based on violating monitors in Solano and Santa Clara Counties plus the contributing emissions from the remaining counties. EPA's technical analysis shows that the emissions data, population data, growth patterns, traffic and commuting patterns, and meteorology all support the State's recommendation. In addition, the recommended PM 2.5 nonattainment area is consistent with the existing ozone nonattainment area and the jurisdictional boundaries of the Bay Area Air Quality Management District. EPA and the State of California are in agreement regarding the designation for the San Francisco Bay area.

Appendix A. Pollutant Roses for San Francisco Bay Area

San Francisco Bay Area, CA [Alameda County, CA]
Pollution Rose, 2005-2007

Site 060010007



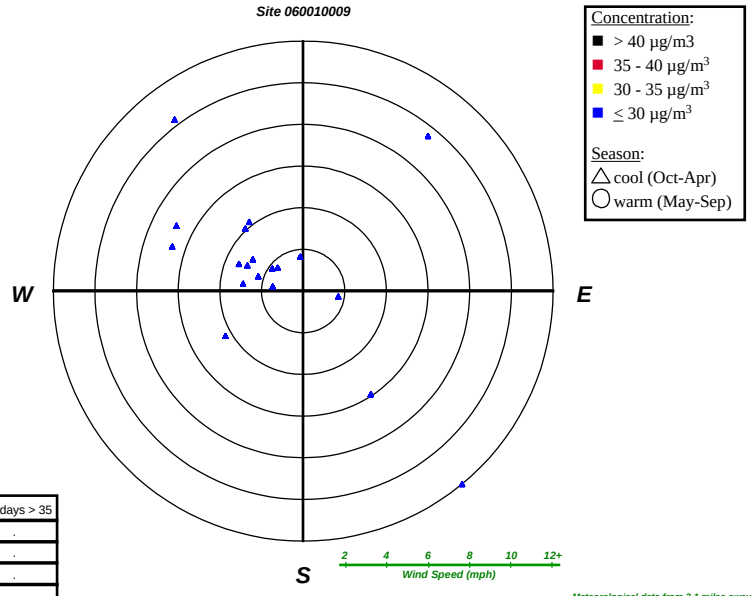
Meteorological data from 23.6 miles away
SAN_JOSE_INTL_AP (ID=23293)

Year	98th %-ile	# days > 35
2005	28.7	.
2006	36.6	3
2007	39.2	3
Design Value	35-A	

4 exceedance(s) not plotted
(due to missing or variable wind data)

San Francisco Bay Area, CA [Alameda County, CA]
Pollution Rose, 2005-2007

Site 060010009

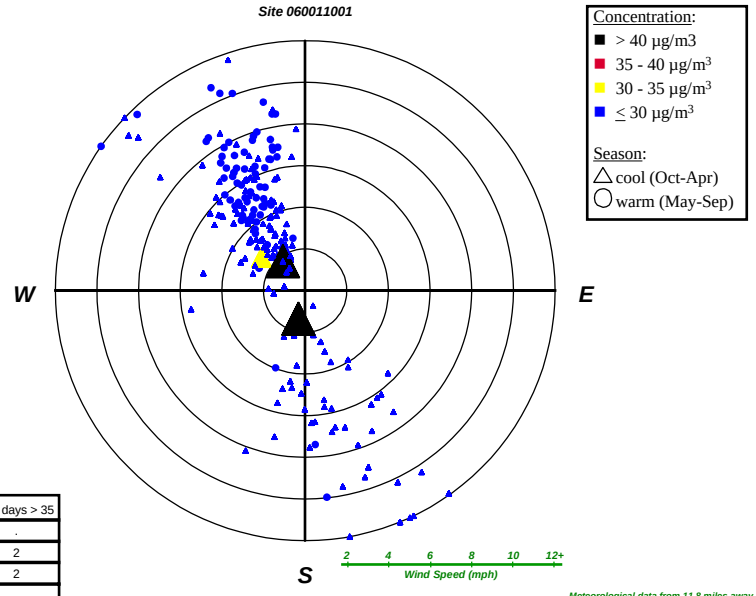


Meteorological data from 3.1 miles away
OAKLAND_METROPOLITAN_ARPT (ID=23230)

Year	98th %-ile	# days > 35
2005	.	.
2006	.	.
2007	22.8	.
Design Value	23-inc-a	

No exceedances

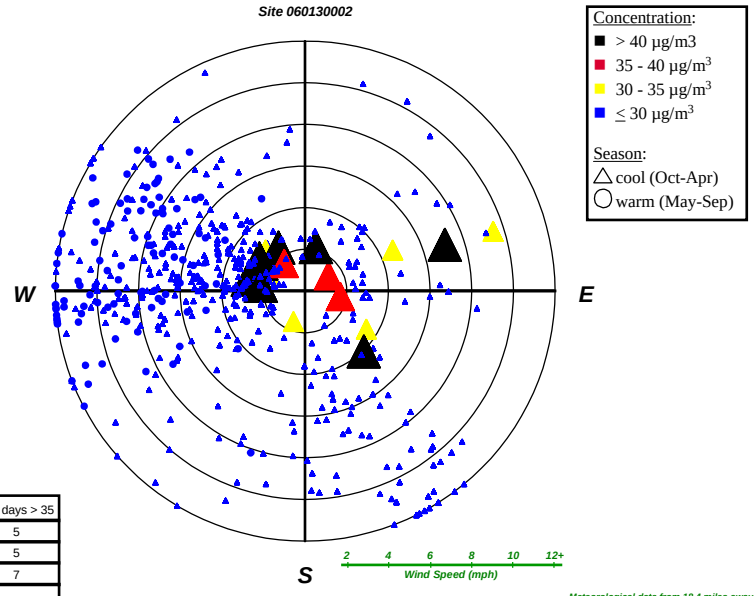
San Francisco Bay Area, CA [Alameda County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	27.6	.
2006	30.4	2
2007	33.3	2
Design Value	30-A	

2 exceedance(s) not plotted
(due to missing or variable wind data)

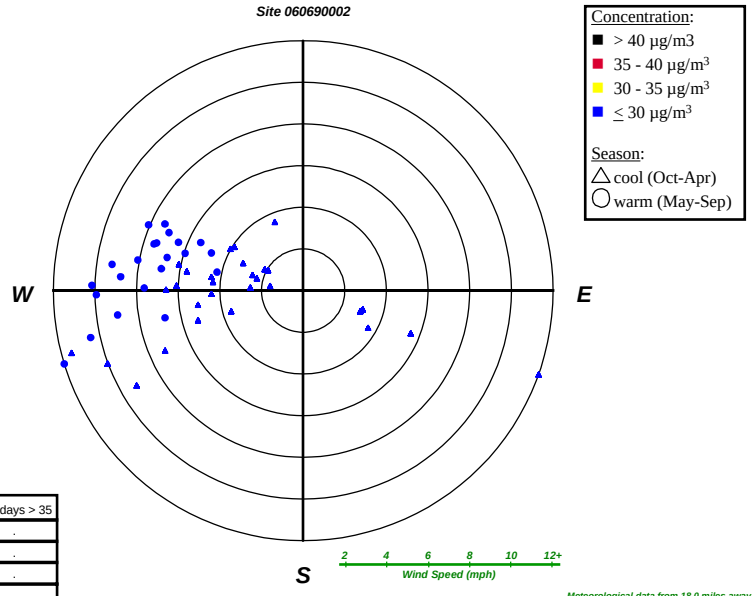
San Francisco Bay Area, CA [Contra Costa County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	33.4	5
2006	33.6	5
2007	34.9	7
Design Value	34-A	

6 exceedance(s) not plotted
(due to missing or variable wind data)

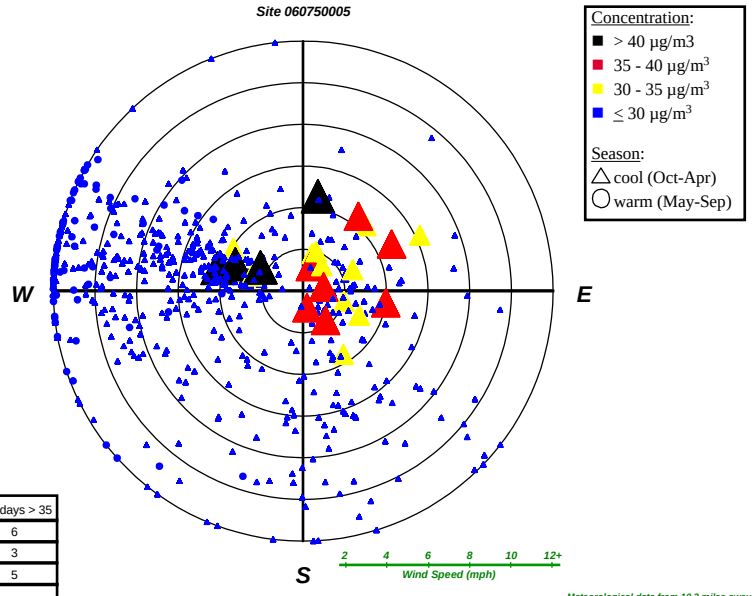
an Francisco Bay Area, CA [San Benito County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	.	.
2006	.	.
2007	19.4	.
Design Value	19-inc-a	

No exceedances

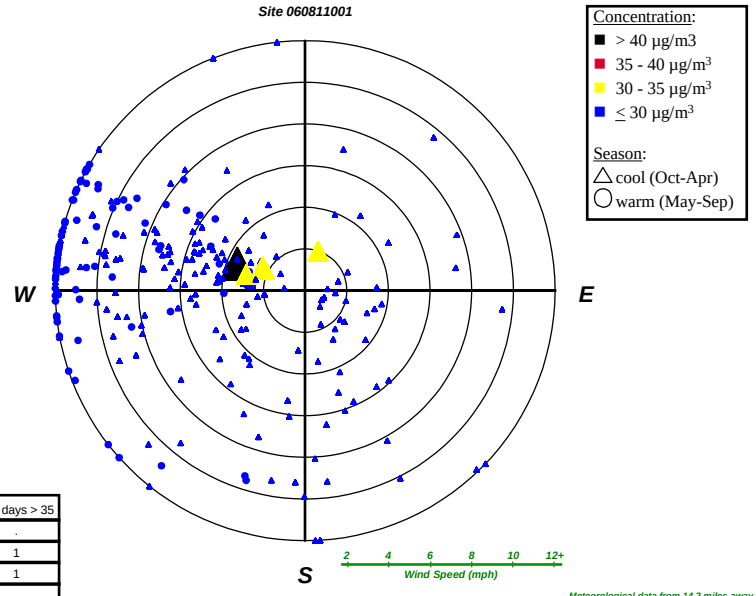
San Francisco Bay Area, CA [San Francisco County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	32.6	6
2006	27.8	3
2007	27.4	5
Design Value	29-A	

3 exceedance(s) not plotted
(due to missing or variable wind data)

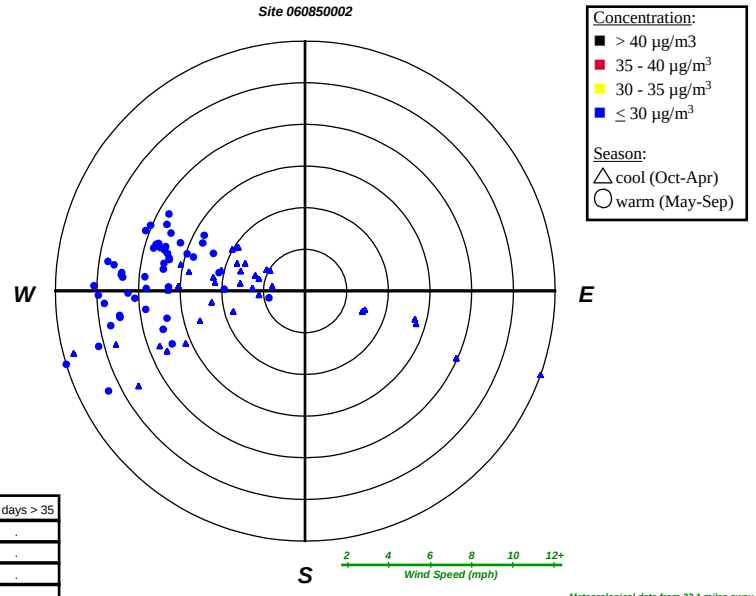
San Francisco Bay Area, CA [San Mateo County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	29.4	.
2006	30.9	1
2007	32.8	1
Design Value	31-A	

1 exceedance(s) not plotted
(due to missing or variable wind data)

San Francisco Bay Area, CA [Santa Clara County, CA]
Pollution Rose, 2005-2007

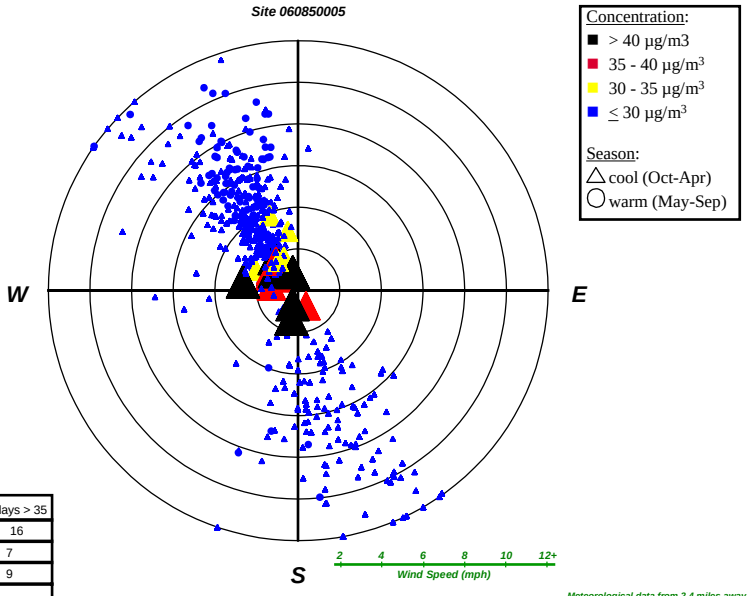


Year	98th %-ile	# days > 35
2005	.	.
2006	.	.
2007	16.2	.
Design Value	16-inc-a	

No exceedances

San Francisco Bay Area, CA [Santa Clara County, CA]
Pollution Rose, 2005-2007

Site 060850005



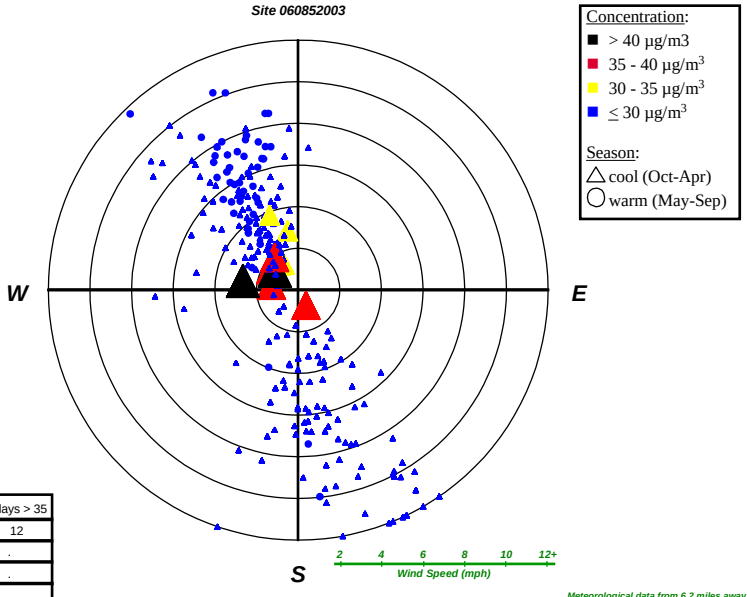
Meteorological data from 2.4 miles away
SAN_JOSE_INTL_AP (ID=23293)

Year	98th %-ile	# days > 35
2005	39.8	16
2006	36.0	7
2007	39.1	9
Design Value	38-NA	

19 exceedance(s) not plotted
(due to missing or variable wind data)

San Francisco Bay Area, CA [Santa Clara County, CA]
Pollution Rose, 2005-2007

Site 060852003

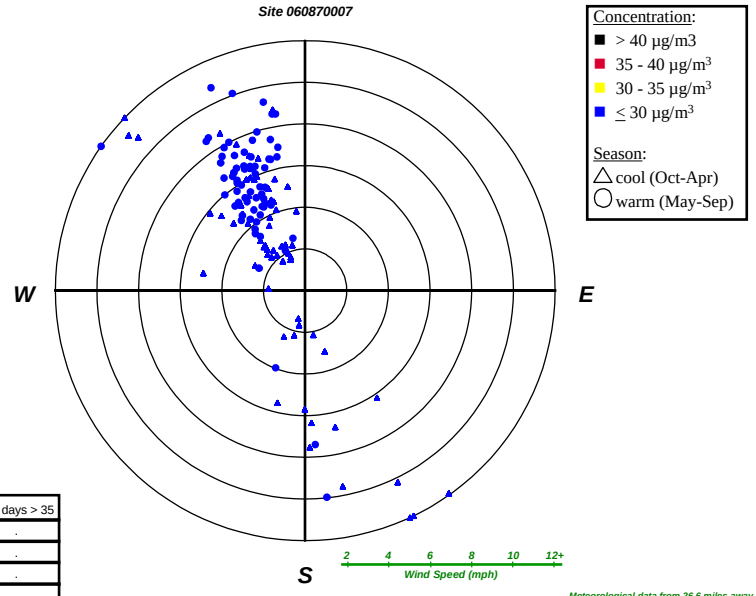


Meteorological data from 6.2 miles away
SAN_JOSE_INTL_AP (ID=23293)

Year	98th %-ile	# days > 35
2005	38.7	12
2006	23.8	.
2007	.	.
Design Value	31-inc-a	

6 exceedance(s) not plotted
(due to missing or variable wind data)

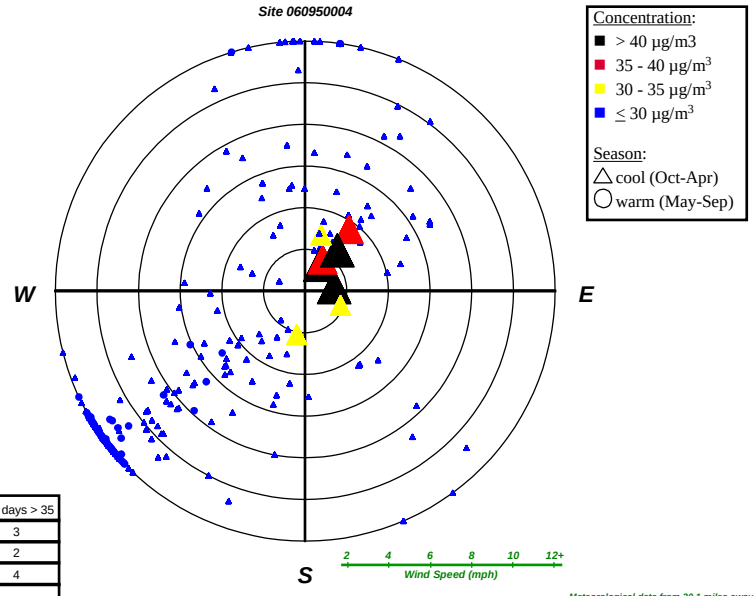
an Francisco Bay Area, CA [Santa Cruz County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	21.7	.
2006	12.5	.
2007	15.7	.
Design Value	17-inc-a	

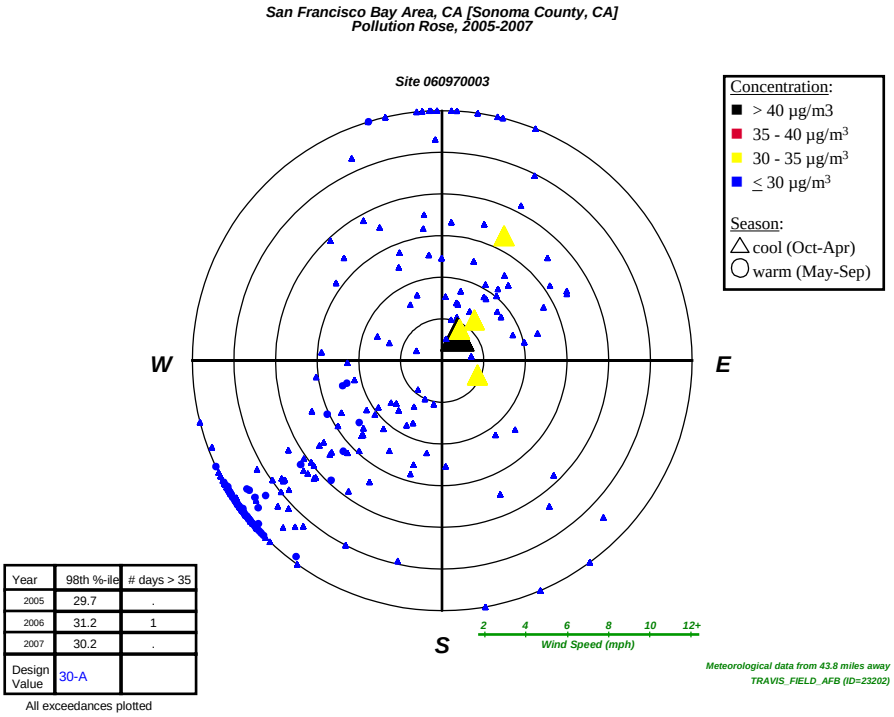
No exceedances

San Francisco Bay Area, CA [Solano County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	35.6	3
2006	34.3	2
2007	38.6	4
Design Value	36-NA	

4 exceedance(s) not plotted
(due to missing or variable wind data)



Year	98th %-ile	# days > 35
2005	29.7	.
2006	31.2	1
2007	30.2	.
Design Value	30-A	

All exceedances plotted

EPA Technical Analysis for San Joaquin Valley Air Basin

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those areas that contribute to violations. This technical analysis for the San Joaquin Valley Air Basin identifies the counties with monitors that violate the 24-hour PM2.5 standard and evaluates the counties that potentially contribute to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

Figure 1 is a map of the counties in the nonattainment area and other relevant information such as the locations and design values of air quality monitors, and the metropolitan area boundary.

For this area, EPA previously established PM2.5 nonattainment boundaries for the 1997 $PM_{2.5}$ NAAQS that included seven full counties and one partial county, all located in the State of California.

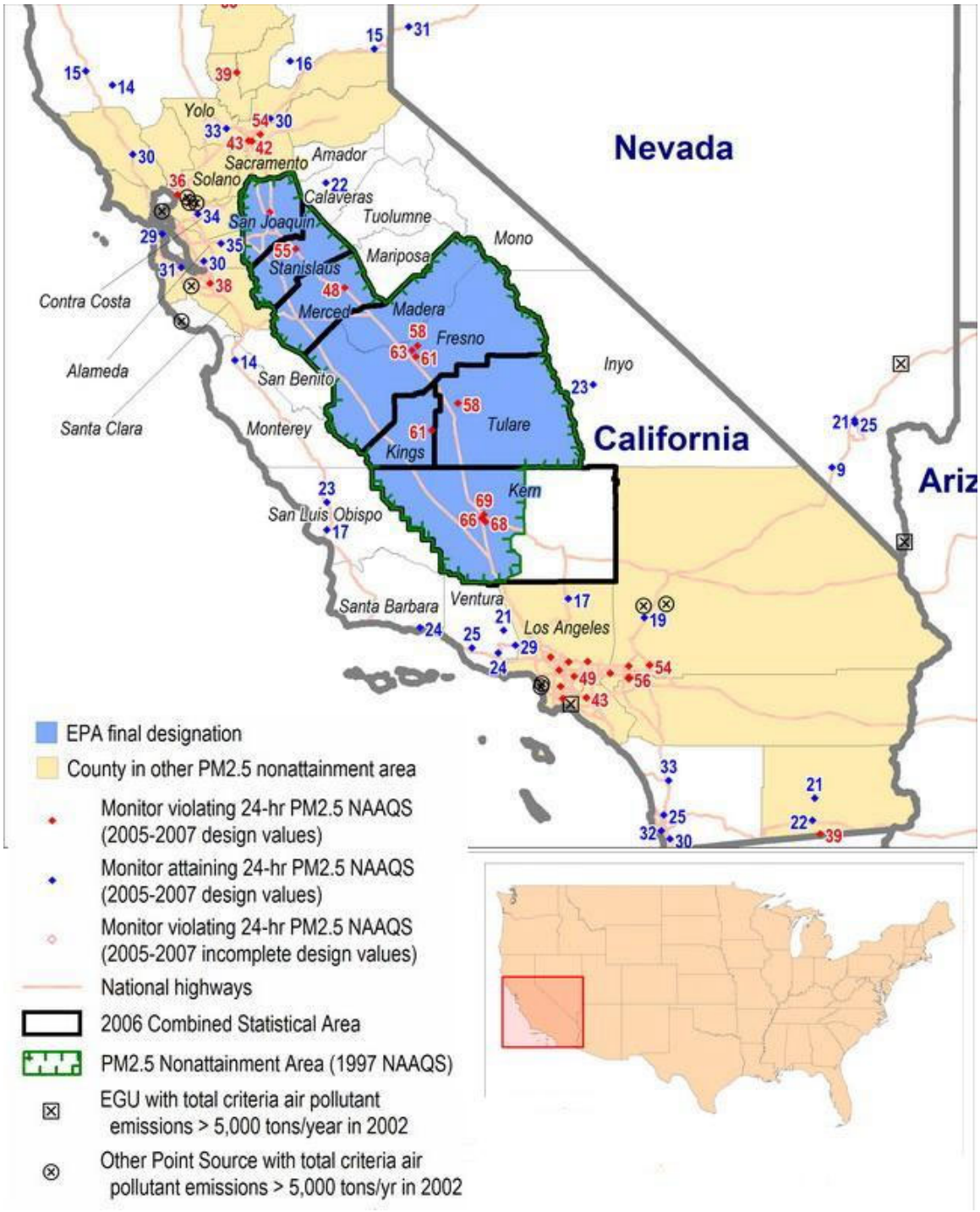


Figure 1. San Joaquin Valley, CA 24-hr PM2.5 Nonattainment Area

For this area, EPA previously established PM2.5 nonattainment boundaries for the 1997 $PM_{2.5}$ NAAQS that included 8 full and partial counties. The full counties are San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, and Tulare. Kern is the only partial county. The San Joaquin

Valley is hemmed in by mountain ranges and is very flat. All of the counties with the exception of Kern are fully included in the existing San Joaquin PM 2.5 nonattainment area. Western Kern County is associated with developed areas (e.g., Bakersfield, CA) and is located within the flat valley area so it is included in the existing PM2.5 nonattainment area. Eastern Kern County is separated from western Kern County by the mountains to the east, so eastern Kern is not included in the existing nonattainment area.

In a letter to EPA dated December 17, 2007, the California Air Resources Board (CARB) recommended that the same counties be designated as "nonattainment" for the 2006 24-hour $PM_{2.5}$ standard based on air quality data from 2004-2006. These data are from Federal Reference Method (FRM) monitors located in the state.

In August 2008, EPA notified California of its intended designations. In this letter, EPA also requested that if the State wished to provide comments on EPA's intended designation, it should do so by October 20, 2008. EPA stated that it would consider any additional information (e.g., on power plants or partial county areas) provided by the state in making final decisions on the designations.

Air quality monitoring data on the composition of fine particle mass are available from the EPA Chemical Speciation Network and the IMPROVE monitoring network. Analysis of these data indicates that the days with the highest fine particle concentrations occur predominantly in the winter, and the average chemical composition of the highest days is typically characterized by high levels of nitrate (61%) followed by organic carbon (29%).

Based on EPA's technical analysis described below, EPA believes that 7 full counties and part of one county in California, the same counties as previously designated for PM2.5, should be designated nonattainment for the 24-hour $PM_{2.5}$ air-quality standard as part of the San Joaquin Valley Air Basin nonattainment area, based upon currently available information. These counties are listed in the table below.

Area	State-Recommended Nonattainment Counties	EPA Final Designated Nonattainment Counties
San Joaquin Valley Air Basin	San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings,Tulare, Kern (P) counties	San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings,Tulare, Kern (P) counties

P = partial

The following is the technical analysis for the San Joaquin Valley Air Basin.

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate

(SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown in Table 1 as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive way for consideration of data for these factors. A summary of the CES is included in Attachment 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the San Joaquin Valley Air Basin.Counties that are part of the San Joaquin Valley Air Basin nonattainment area for the 1997 $PM_{2.5}$ NAAQS are shown in boldface. Counties are listed in descending order by CES.

Table 1. $PM_{2.5}$ Related Emissions (tons per year) and Contributing Emissions Score

County	State Recom-mended Non-attain ment	CES	$PM_{2.5}$ emissio ns total	$PM_{2.5}$ emissi ons carbon	$PM_{2.5}$ emissions other	SO_2	NOx	VOCs	NH_3
Fresno	Yes	100	8,491	4,523]	3,968	5,698	36,411	39,369	18,182
Kern	Yes (P)	100	6,437	3,184	3,251	3,428	61,191	39,039	9.881
Merced	Yes	100	1,926	823	1,104	998	13,427	11,285	10,251
San Joaquin	Yes	100	3,308	1,577	1,730	3,087	29,663	19,051	20,262
Stanislaus	Yes	92	2,260	1,069	1,191	2,125	19,006	17,251	15,580
Kings	Yes	70	1,268	457	811	600	6,772	6,678	7,102
Tulare	Yes	56	3,682	1,833	1,849	1,476	17,881	19,465	18,871
Madera	Yes	43	2,074	1,071	1,003	768	10,772	8,672	4,469
Data provided in Table 1 applies to entire Counties. In the case of Kern County, although the State recommended only part of the County, the data is given for the entire County.									

Fresno, Kern, Merced and San Joaquin Counties had violating monitors which makes them candidates for a $PM_{2.5}$ nonattainment designation. Stanislaus, Kings, Tulare and Madera Counties have relatively high CES values, even though the data for their $PM_{2.5}$ emission components are lower than the other counties.

Based on emissions levels and CES values, all the Counties in the San Joaquin Valley Air Basin are candidates for a 24-hour $PM_{2.5}$ nonattainment designation and, therefore, require further analysis.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values in micrograms per cubic meter ($\mu g/m^3$) for air quality monitors in counties in the San Joaquin Valley Air Basin based on data for the 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standards are met when the 3-year average of a monitor's 98^{th} percentile values are 35 $\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met.

The 24-hour $PM_{2.5}$ design values for counties in the San Joaquin Valley are shown in Table 2.

Table 2. Air Quality Data

County	State Recommended Nonattainment	24-hr PM 2.5 Design Valu 2004-06 ($\mu g/m^3$)	24-hr PM 2.5 Design Values 2005-07 ($\mu g/m^3$)
Fresno County	Yes	59	63
Kern County	Yes (P)	64	69
Merced County	Yes	45	48
San Joaquin County	Yes	41	45
Stanislaus County	Yes	51	55
Kings County	Yes	58	61
Tulare County	Yes	56	58
Madera County	Yes	No data available	No data available
Data provided in Table 1 applies to entire Counties. In the case of Kern County, although the State recommended only part of the County, the data is given for the entire County.			

P = partial

Fresno, Kern, Merced, San Joaquin, Stanislaus, Kings and Tulare Counties in California show a violation of the 24-hour $PM_{2.5}$ standard. Therefore, these counties, which represent most of the counties in the San Joaquin Air Basin, are candidates for inclusion in the San Joaquin Valley Air Basin nonattainment area. There is no data for Madera County. These high design values argue for keeping all the counties in the San Joaquin Valley Air Basin within the nonattainment area.

Note: Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with an FRM monitor. All data from Special Purpose Monitors (SPM) using an FRM is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr PM2.5 NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Table 3 and Figure 2 shows the 2005 population for each county in the area being evaluated, as well as the population density for each county in that area. Population data gives an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour $PM_{2.5}$ standards.

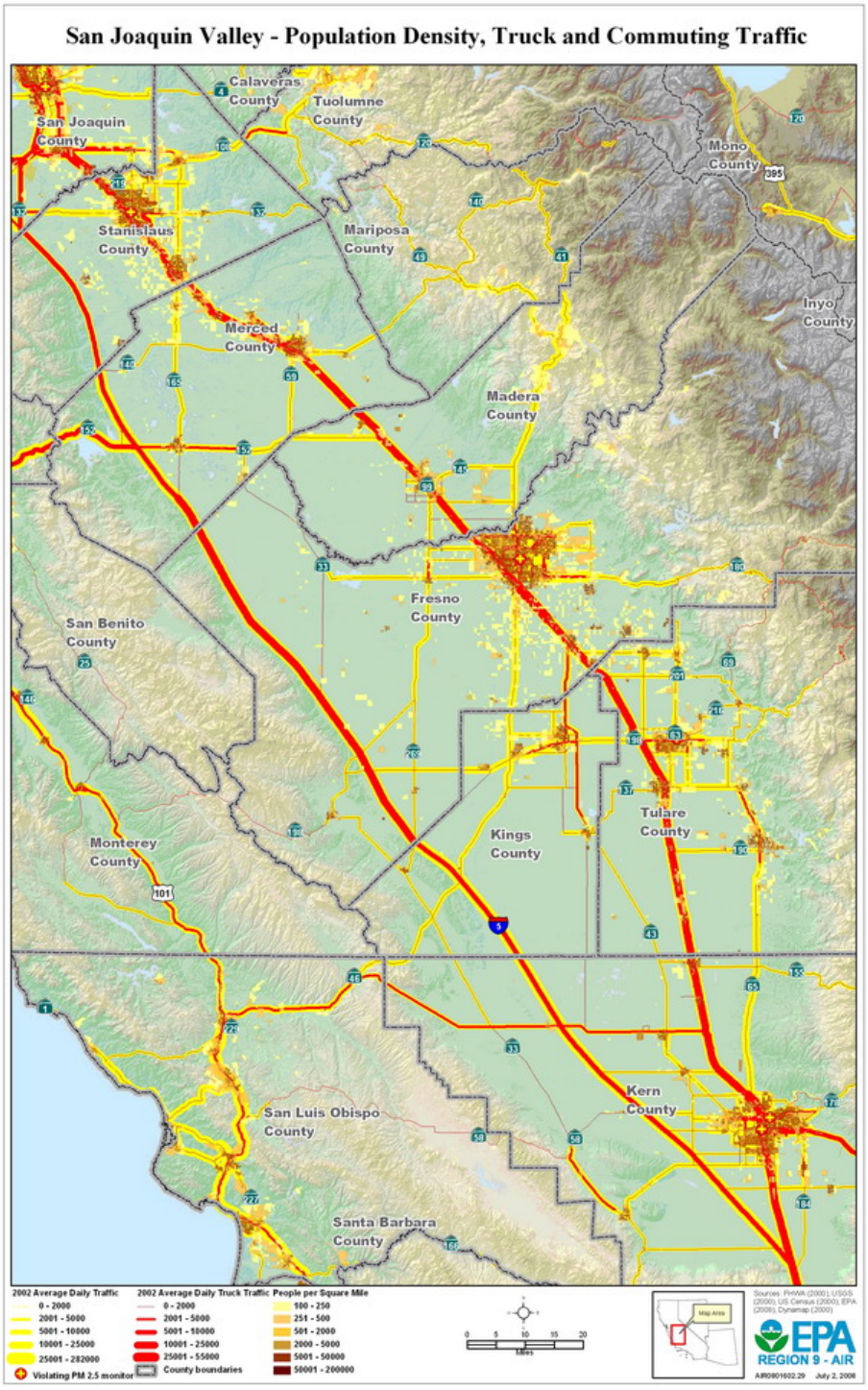

San Joaquin Valley - Population Density, Truck and Commuting Traffic
Calaveras County
Tuolumne County
San Joaquin County
Mono County
Stanislaus County
Mariposa County
Inyo County
Merced County
Madera County
Fresno County
San Benito County
Monterey County
Tulare County
Kings County
Kern County
San Luis Obispo County
Santa Barbara County
2002 Average Daily Traffic
0 - 2000
2001 - 5000
5001 - 10000
10001 - 25000
25001 - 282000
Violating PM 2.5 monitor
2002 Average Daily Truck Traffic
0 - 2000
2001 - 5000
5001 - 10000
10001 - 25000
25001 - 55000
County boundaries
People per Square Mile
100 - 250
251 - 500
501 - 2000
2000 - 5000
5001 - 50000
50001 - 200000
Miles
EPA
REGION 9 - AIR

Figure 2

Table 3. Population

County	State Recommended Nonattainment	2005 Population	2005 Population Density (pop/sq mi)
Fresno	Yes	878,089	146
Kern	Yes (P)	756,981	93
Merced	Yes	242,249	123
San Joaquin	Yes	664,796	466
Stanislaus	Yes	505,492	334
Kings	Yes	143,467	103
Tulare	Yes	411,131	85
Madera	Yes	142,530	66

P = partial

As shown in this table and the map in Figure 2, Fresno County has the largest population in the Basin, although it does not have the highest population density. San Joaquin has a high population density, along with dense population. Kern and Tulare Counties, while having a high population, have relatively small population densities. Since population density per square mile may relate to the size of the County, the population numbers shown does not rule out any of the counties as a candidate for a PM 2.5 nonattainment status. Population growth has caused the San Joaquin Valley to rank with Los Angeles and Houston in most measures of air pollution.

Based on the combination of population and population density numbers above, all of the Counties in the San Joaquin Valley Air Basin should be included as candidates for the PM 2.5 nonattainment designation

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the San Joaquin Valley Air Basin, the percent of total commuters in each county who commute to other counties within the San Joaquin Valley Air Basin , as well as the total Vehicle Miles Traveled (VMT) for each county in millions of miles (see Table 4). A county with numerous commuters is generally an integral part of an urban area and is likely contributing to fine particle concentrations in the area.

Table 4. Traffic and Commuting Patterns

County	State Recommended Nonattainment	2005 VMT (millions)	Number commuting into and within the statistical area	Percent commuting into and within the statistical area
Fresno	Yes	8,038	284,230	96%
Kern	Yes (P)	8,929	225,500	98%
Merced	Yes	3,064	69,950	95%
San Joaquin	Yes	6,334	184,720	95%
Stanislaus	Yes	4,519	158,710	98%
Kings	Yes	2,069	40,800	98%

Tulare	Yes	4,221	129,360	99%
Madera	Yes	1,571	11,590	97%
P = partial				

The listing of Counties on Table 4 reflects a ranking based on the number of people commuting to other Counties. The data in Table 4 indicate that there is significant daily commuting among the Counties in the San Joaquin Valley Air Basin. In addition, there is significant daily truck traffic throughout the Basin.

Interstate 5 (I-5) and State Route 99 (SR 99) each run along the entire length of the San Joaquin Valley. I-5 runs in the western valley, bypassing major population centers (including Fresno, currently the largest U.S. city without an Interstate highway), while SR 99 runs through them.

SR 58 is a freeway in Bakersfield. Along most of its route until its terminus in Barstow, SR 58 is an extremely important and very heavily traveled route for truckers from the valley and the Bay Area to cross the Sierra Nevada and leave California (by way of I-15 or I-40) without having to climb Donner Pass or contend with the traffic congestion in Los Angeles.

Other important highways in the valley include SR 46 and SR 41, which respectively link the California Central Coast with Bakersfield and Fresno; SR 33, which runs south to north along the valley's western rim and provides a connection to Ventura and Santa Barbara over the Santa Ynez Mountains; and SR 152, an important commuter route linking Silicon Valley with its fast-growing exurbs such as Los Banos.

Given the significant amount of commuting within the San Joaquin Valley Air Basin, and the heavily traveled truck routes, all of the counties within the San Joaquin Valley Air Basin are candidates for a PM 2.5 nonattainment status.

The listing of counties on Table 5 reflects a ranking based on the number of people commuting to other counties.

The 2005 VMT data used for tables 4 and 5 of the technical analysis have been derived using methodology such as that described in "Documentation for the 2005 Mobile National Emissions Inventory, Version 2," December 2008, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: ftp://ftp.epa.gov/EmisInventory/2005_nei/mobile_sector/documentation/2005_mobile_nei_version_2_report.pdf

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and growth in vehicle miles traveled for 2000-2005 for counties in the San Joaquin Valley Air Basin, as well as patterns of population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and likely to be contributing to fine particle concentrations in the area.

Table 5 below shows population, population growth, VMT and VMT growth for counties that are included in the San Joaquin Valley Air Basin .

Table 5. Population and VMT Growth and Percent Change.

County	Population (2005)	Population Density 2005	Population % change (2000 - 2005)	2005 VMT (millions)	%VMT Growth (2000 to 2005)
Fresno	878,089	146	9%	8,038	21%
Kern	756,981	93	14%	8,929	59%
Merced	242,249	123	14%	3,064	63%
San Joaquin	664,796	466	17%	6,334	35%
Stanislaus	505,492	334	12%	4,519	35%
Kings	143,467	103	10%	2,069	47%
Tulare	411,131	85	11%	4,211	38%
Madera	142,530	66	15%	1,571	42%

All of the counties had population increases during the years 2000 – 2005. In all cases, the percentage increase of VMT during the same period is significantly higher.

Given the growth in population and the significant increase in VMT, all of the counties are candidates for a PM 2.5 nonattainment designation based on this factor.

Factor 6: Meteorology (weather/transport patterns)

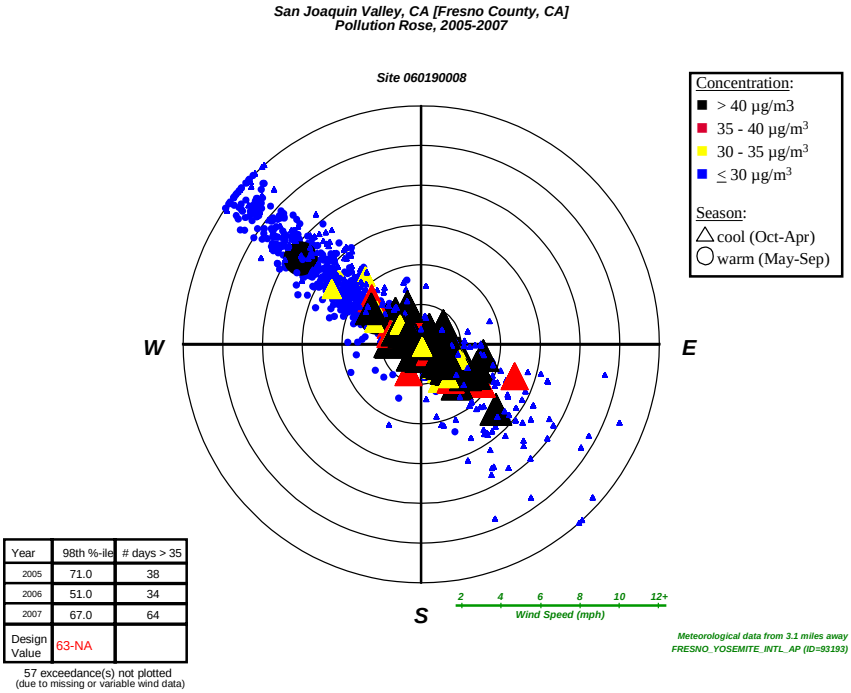
The San Joaquin Valley has hot, dry summers and cool winters characterized by dense Tule fog. The rainy season occurs from November through April. The San Joaquin Valley is hemmed in by mountains and rarely has strong winds to disperse smog or other pollutants.

For this factor, EPA considered data from National Weather Service instruments in the area. Wind direction and wind speed data for 2004-2006 were analyzed, with an emphasis on "high $PM_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM air quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values, or where 24-hr values exceeded 35.1 $\mu g/m^3$.

For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. The figure identifies 24-hour PM2.5 values by color; days exceeding
35 ug/m3 are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

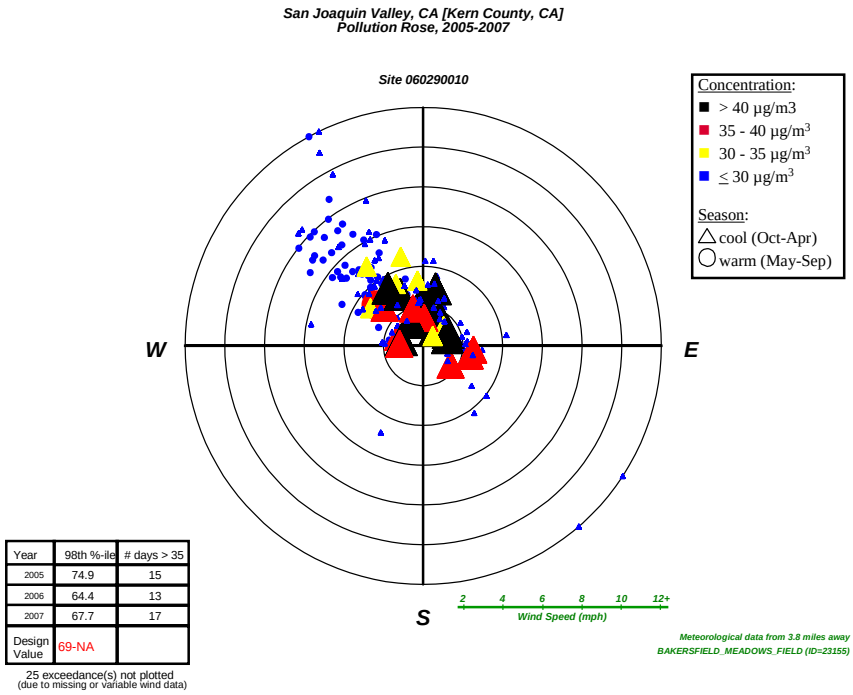
The pollution rose for Fresno County site 060190008 and Kern County, site 060290014, shown in Figures 3 and 4, indicates that elevated levels of particulate matter occur predominately during the cool season during time periods when prevailing winds are light and from the northwest or southeast. The additional pollutant roses for the San Joaquin Valley Air Basin, included in

Appendix A, show similar results. The meteorology for San Joaquin Valley supports the inclusion of all the counties in the PM2.5 nonattainment area.



Year	98th %-ile	# days > 35
2005	71.0	38
2006	51.0	34
2007	67.0	64
Design Value	63-NA	

57 exceedance(s) not plotted
(due to missing or variable wind data)



Figures 3 & 4. Fresno County Pollution Rose (above)
Kern County Pollution Rose (below)

Note: The meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high $PM_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The San Joaquin Valley extends from the Sacramento-San Joaquin Delta in the north to the Tehachapi Mountains in the south, and from the various California coastal ranges (from the Diablo in the north to the Santa Ynez in the south) in the west to the Sierra Nevada in the east (see Figure 2).

The San Joaquin Valley is hemmed in by mountains and rarely has strong winds to disperse smog and other pollutants. The San Joaquin Valley has long suffered from some of the United States' worst air pollution This pollution, exacerbated by stagnant weather, comes mainly from diesel- and gasoline-fueled vehicles and agricultural operations such as dairies and field tilling.

The nonattainment area includes San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, and Tulare Counties. Kern is the only partial county. All of the counties with the exception of Kern are fully included in the existing San Joaquin PM 2.5 nonattainment area. Western Kern County is associated with developed areas (e.g., Bakersfield, CA) and is located within the flat valley area so it is included in the existing PM2.5 nonattainment area. Eastern Kern County is separated from western Kern County by the mountains to the east, so eastern Kern is not

included in the existing nonattainment area. Due to topography it is appropriate to include only the western portion of Kern County in the nonattainment area.

Consideration of this factor supports the nonattainment boundary for the San Joaquin Valley.

Factor 8: Jurisdictional boundaries (e.g., existing PM and ozone areas)

In evaluating the jurisdictional boundary factor, EPA gave special consideration to areas that were already designated nonattainment in 2005 for violating the 1997 fine particle standards. Analysis of chemical composition data in these areas indicates that the same components that make up most of the PM2.5 mass in the area on an annual average basis (such as sulfate and direct PM2.5 carbon in many eastern areas) also are key contributors to the PM2.5 mass on days exceeding the 24-hour PM2.5 standard. These data indicate that in many cities, the same source categories that contribute to violations of the annual standard also contribute to exceedances of the 2006 24-hour standard.

Most areas that were originally designated nonattainment for the PM2.5 standards, such as San Joaquin Valley, still have not attained the standards. Thus, EPA has generally concluded that counties that were designated as having emissions sources contributing to fine particle concentrations which continue to exceed the 1997 standards (all areas violated the annual standard, two also violated the previous 24-hour standard—South Coast and San Joaquin Valley) also contribute to fine particle concentrations on the highest days. For this reason, EPA believes that for most existing nonattainment areas, the nonattainment area for the 2006 24-hour standard should be the same. Consideration also should be given to existing boundaries and organizations as they may facilitate air quality planning and the implementation of control measures to attain the standard. Areas already designated as nonattainment represent important boundaries for state air quality planning.

To the degree appropriate based upon violations and contribution to violations of the respective NAAQS, EPA believes it can be helpful for air planning purposes and for attainment of both NAAQS for ozone and PM2.5 nonattainment area boundaries to be consistent. In evaluating the jurisdictional boundary factor for San Joaquin Valley, consideration was given to existing boundaries and organizations that may facilitate air quality planning and the implementation of control measures to attain the standard. Areas designated as nonattainment (e.g for PM2.5 or 8-hour ozone standard) represent important boundaries for state air quality planning. See Figure 5.

The analysis of jurisdictional boundaries considered the planning and organizational structure of the San Joaquin Valley to determine if the implementation of controls in a potential nonattainment area can be carried out in a cohesive manner.

The major jurisdictional boundary in the San Joaquin Valley is the San Joaquin Valley Air Pollution Control District (SJVAPCD) which has jurisdiction over all of Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare, and the western portion of Kern counties. Counties

with air-quality monitors that violate the 1997 $PM_{2.5}$ NAAQS include Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus, and Tulare.

Areas designated as 8-hour ozone nonattainment areas are also important boundaries for State air-quality planning. Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus, Tulare, and the western portion of Kern Counties were included in the 8-hour ozone nonattainment area associated with the San Joaquin Valley Air Basin. These are the same counties that are being considered for a PM 2.5 nonattainment designation.

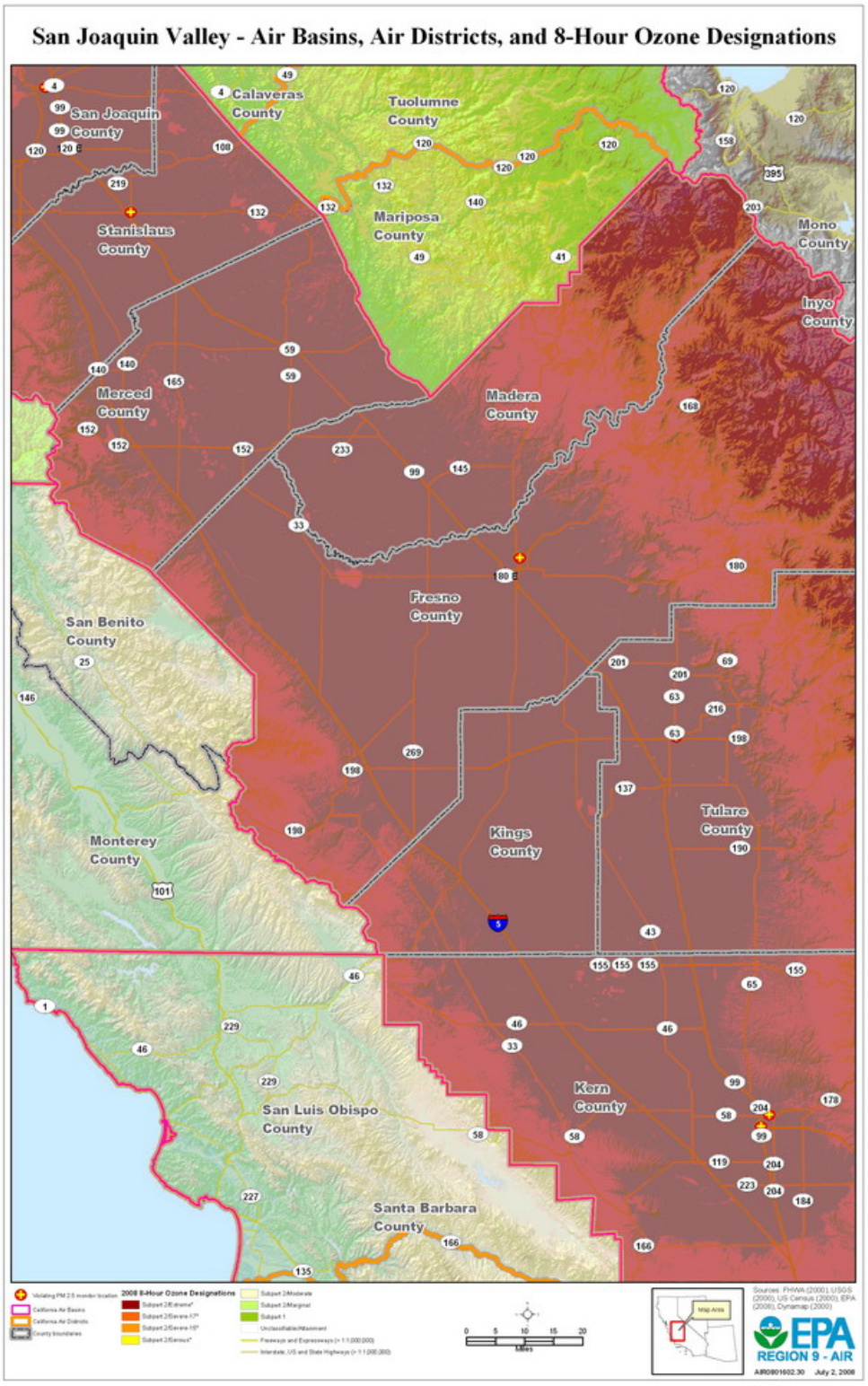

San Joaquin Valley - Air Basins, Air Districts, and 8-Hour Ozone Designations
San Joaquin County
Calaveras County
Tuolumne County
Stanislaus County
Mariposa County
Mono County
Inyo County
Merced County
Madera County
Fresno County
San Benito County
Monterey County
Kings County
Tulare County
Kern County
San Luis Obispo County
Santa Barbara County
2008 8-Hour Ozone Designations
EPA
REGION 9 - AIR

Figure 5

Factor 9: Level of control of emission sources

This factor considers emission controls currently implemented for major sources in the San Joaquin Valley Air Basin.

The emission estimates on Table 1 (under Factor 1) include any control strategies implemented by the states in the San Joaquin Valley Air Basin before 2005 that may influence emissions of any component of $PM_{2.5}$ emissions (i.e., total carbon, SO_2, NOx, and crustal $PM_{2.5}$).

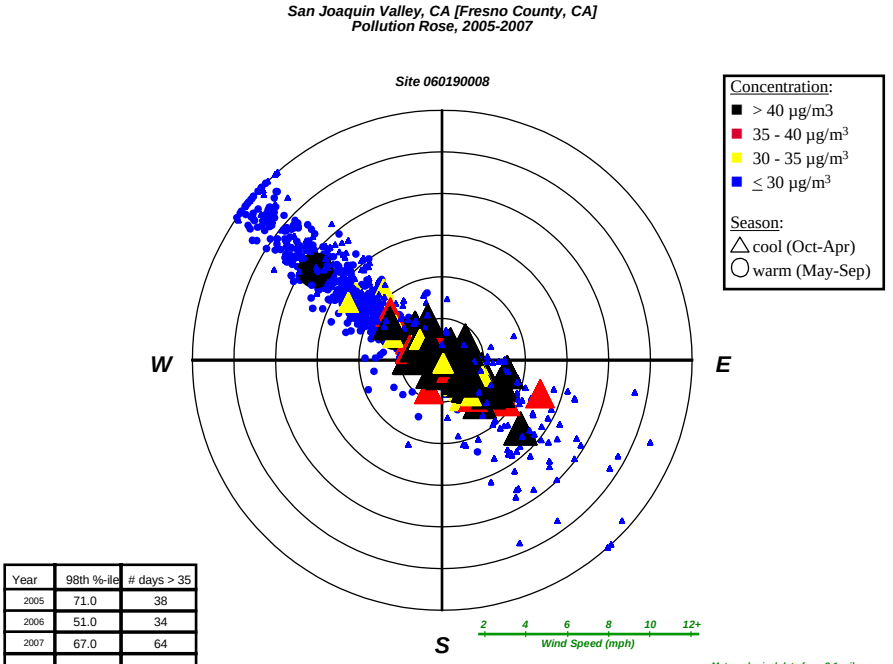
There are five coal-fired electric generating units (EGUs) in San Joaquin Valley, all of which are located within the proposed PM 2.5 nonattainment boundaries and have existing controls which are accounted for in Table 1.

Conclusion

The State of California recommended that the entire San Joaquin Valley Air Basin be designated as a PM 2.5 nonattainment area based on violating monitors in Kern, Merced, San Joaquin, Stanislaus, Kings and Tulare Counties. Madera County has no data, but is being included as part of the San Joaquin Valley. EPA's technical analysis shows that the emissions data, population data, growth patterns, traffic and commuting patterns, and meteorology all support the State's recommendation. In addition, the recommended PM 2.5 nonattainment area is consistent with the existing PM2.5 and ozone nonattainment areas and the jurisdictional boundaries of the San Joaquin Valley Air Pollution Control District. EPA and the State of California are in agreement regarding the PM 2.5 nonattainment designation for the San Joaquin Valley Air Basin..

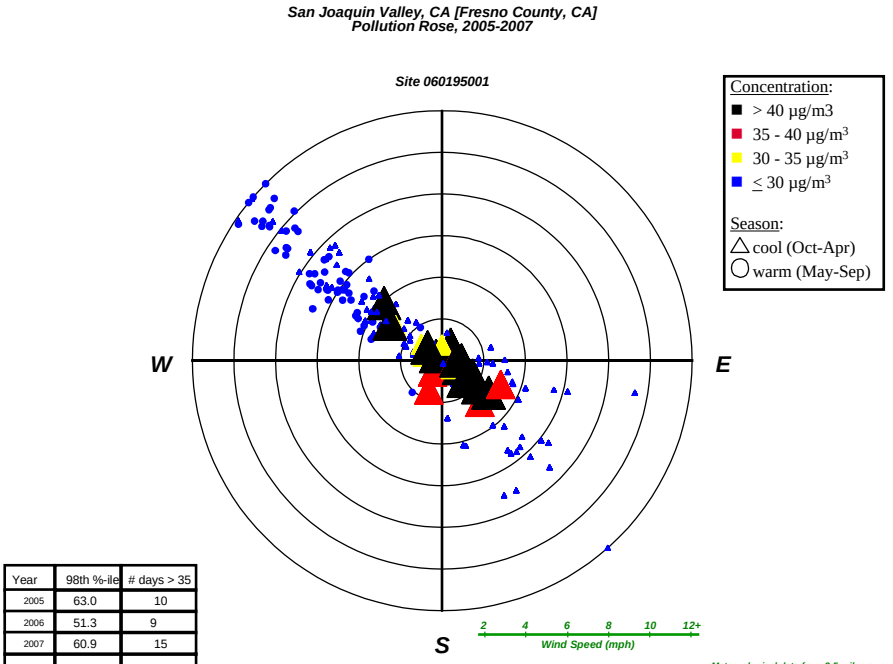
Additional information regarding responses to specific State comments can be found in EPA's Response to Comments document at
http://www.epa.gov/pmdesignations/2006standards/tech.htm

Appendix A. Pollution Roses for San Joaquin Valley Area



Year	98th %-ile	# days > 35
2005	71.0	38
2006	51.0	34
2007	67.0	64
Design Value	63-NA	

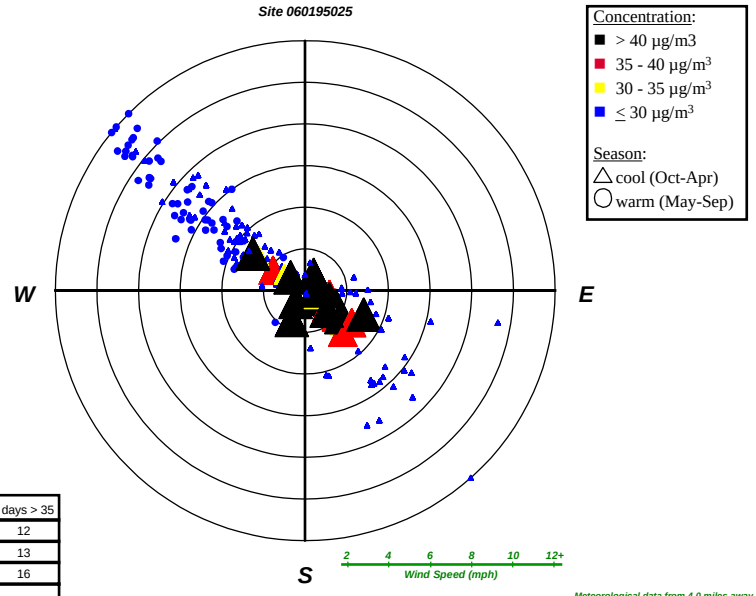
57 exceedance(s) not plotted
(due to missing or variable wind data)



Year	98th %-ile	# days > 35
2005	63.0	10
2006	51.3	9
2007	60.9	15
Design Value	58-NA	

15 exceedance(s) not plotted
(due to missing or variable wind data)

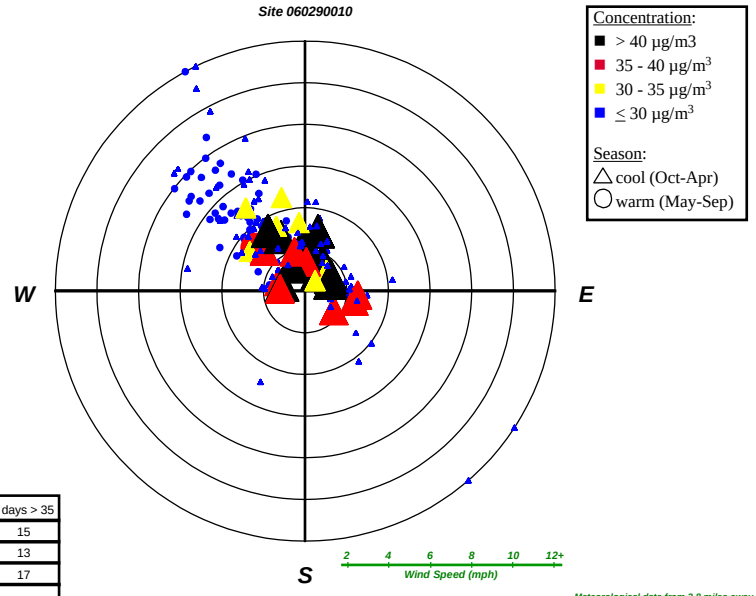
San Joaquin Valley, CA [Fresno County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	71.2	12
2006	55.0	13
2007	57.4	16
Design Value	61-NA	

19 exceedance(s) not plotted
(due to missing or variable wind data)

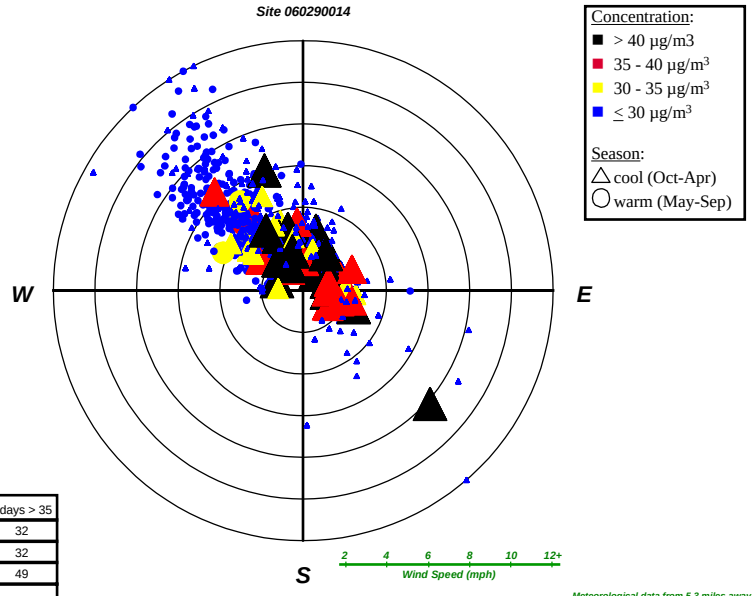
San Joaquin Valley, CA [Kern County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	74.9	15
2006	64.4	13
2007	67.7	17
Design Value	69-NA	

25 exceedance(s) not plotted
(due to missing or variable wind data)

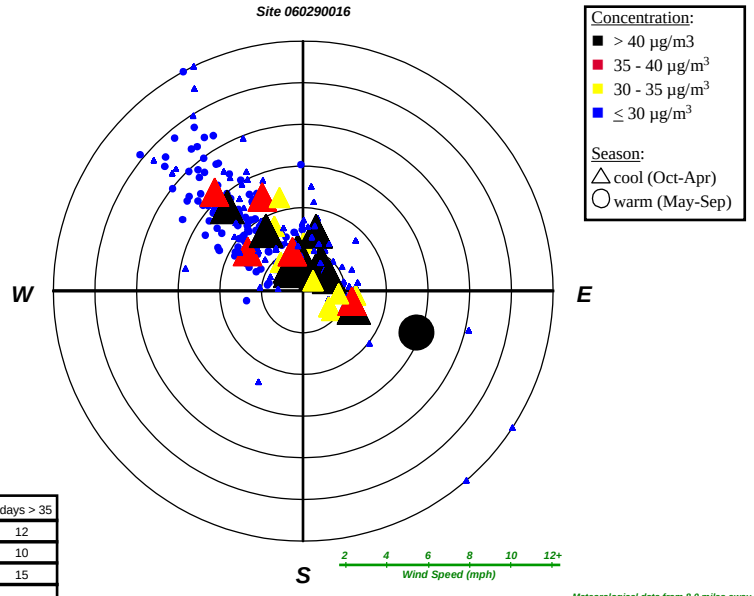
San Joaquin Valley, CA [Kern County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	63.2	32
2006	60.5	32
2007	73.0	49
Design Value	66-NA	

68 exceedance(s) not plotted
(due to missing or variable wind data)

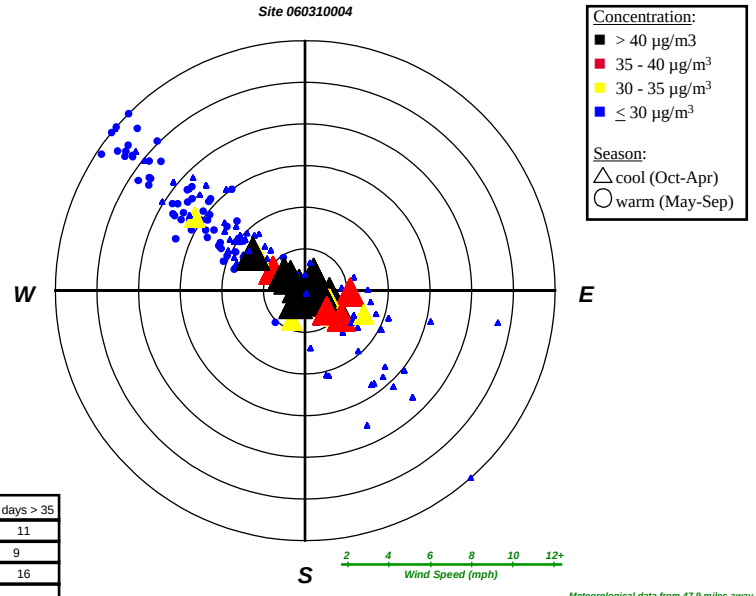
San Joaquin Valley, CA [Kern County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	66.4	12
2006	64.7	10
2007	72.2	15
Design Value	68-NA	

20 exceedance(s) not plotted
(due to missing or variable wind data)

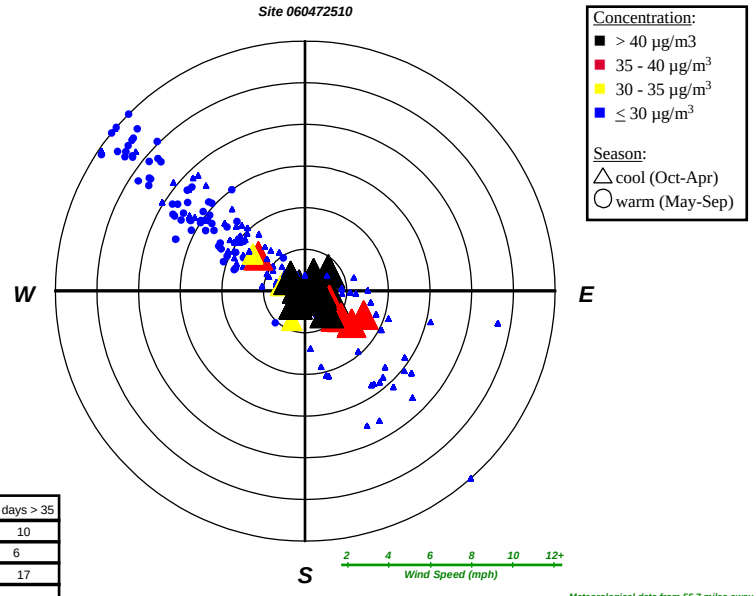
San Joaquin Valley, CA [Kings County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	74.5	11
2006	50.1	9
2007	57.9	16
Design Value	61-NA	

16 exceedance(s) not plotted
(due to missing or variable wind data)

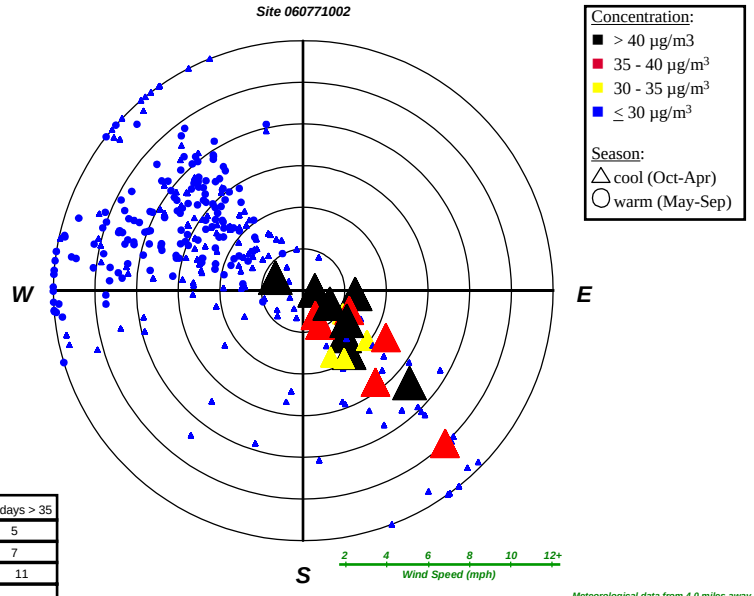
San Joaquin Valley, CA [Merced County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	48.3	10
2006	43.8	6
2007	52.7	17
Design Value	48-NA	

14 exceedance(s) not plotted
(due to missing or variable wind data)

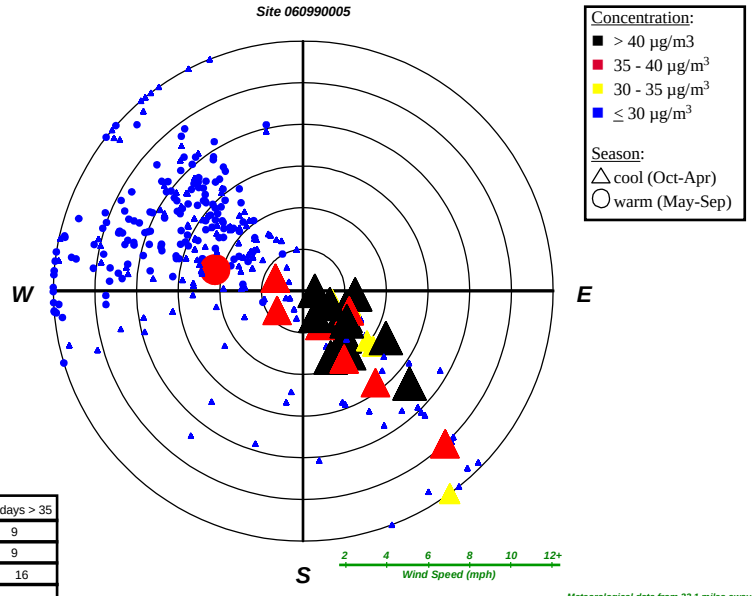
San Joaquin Valley, CA [San Joaquin County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	44.0	5
2006	42.0	7
2007	48.0	11
Design Value	45-NA	

9 exceedance(s) not plotted
(due to missing or variable wind data)

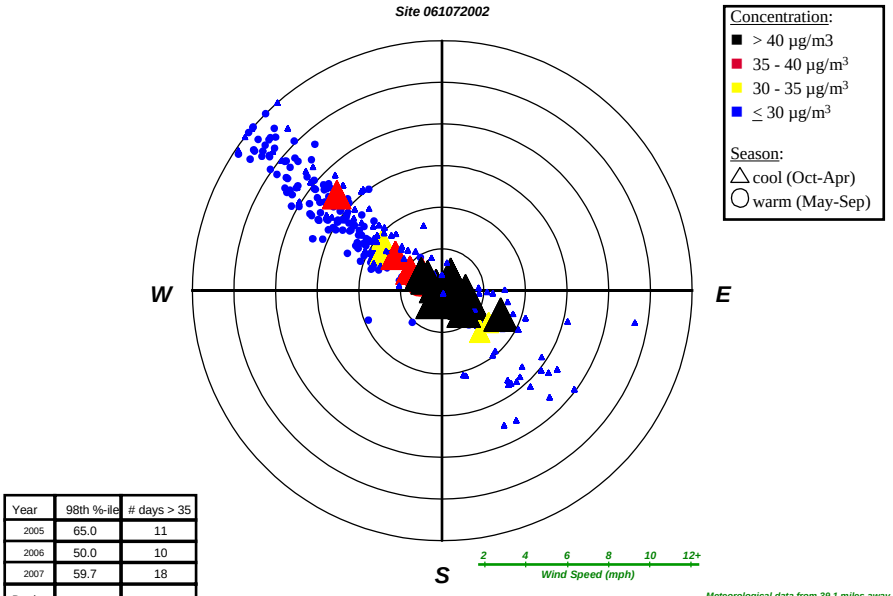
San Joaquin Valley, CA [Stanislaus County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	55.0	9
2006	52.0	9
2007	57.4	16
Design Value	55-NA	

13 exceedance(s) not plotted
(due to missing or variable wind data)

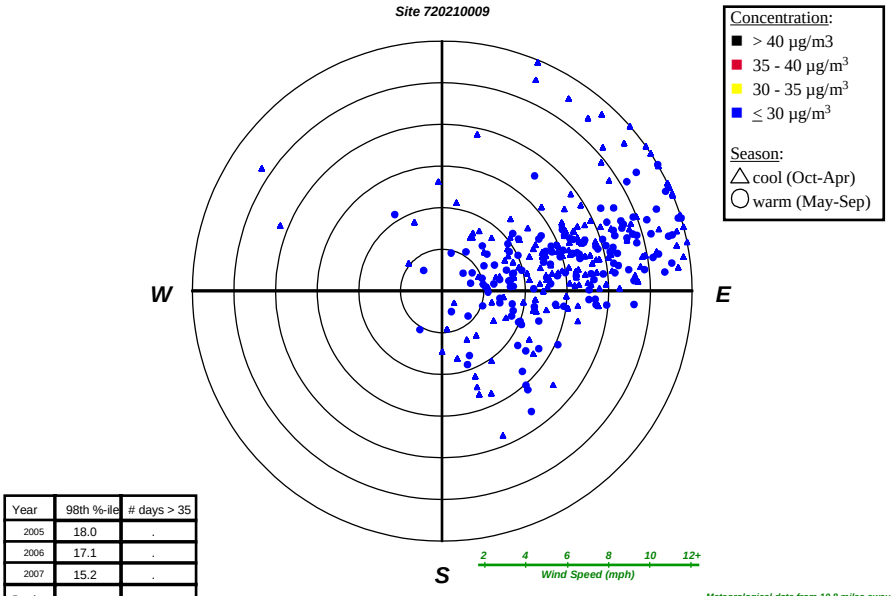
San Joaquin Valley, CA [Tulare County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	65.0	11
2006	50.0	10
2007	59.7	18
Design Value	58-NA	

17 exceedance(s) not plotted
(due to missing or variable wind data)

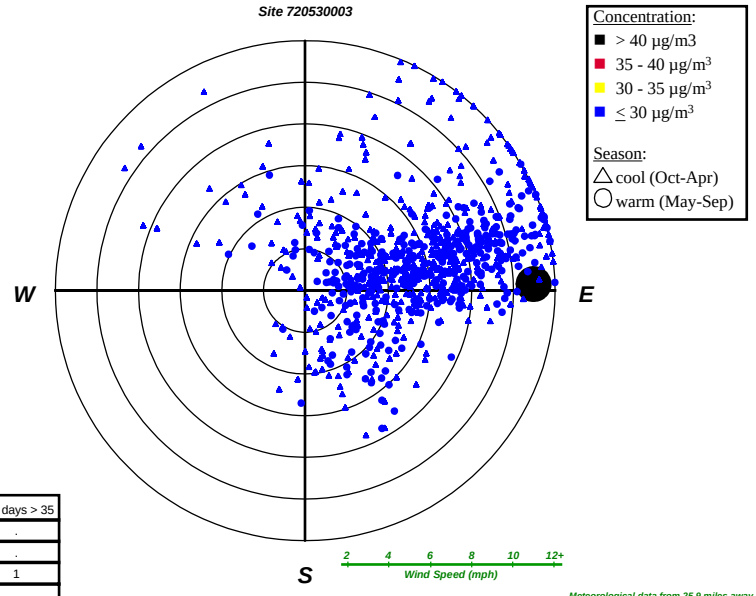
San Joaquin Valley, CA [Bayamon County, PR]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	18.0	.
2006	17.1	.
2007	15.2	.
Design Value	17-A	

No exceedances

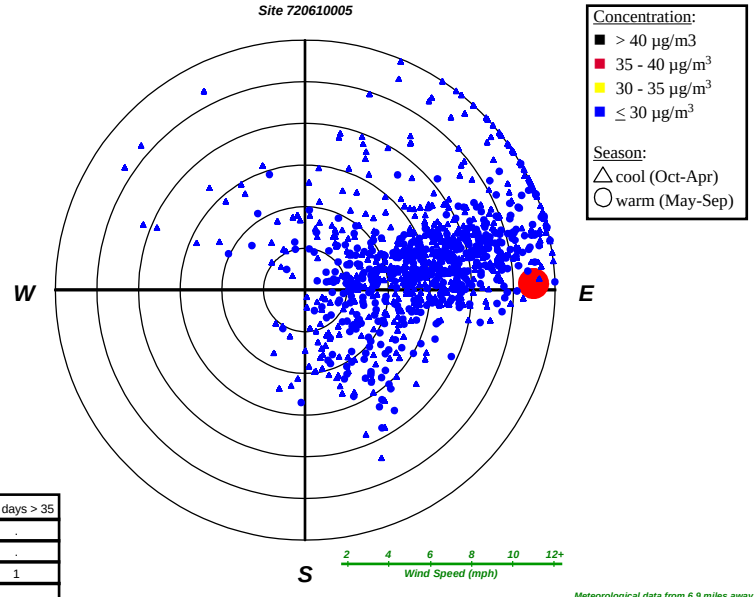
San Joaquin Valley, CA [Fajardo County, PR]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	14.8	.
2006	14.0	.
2007	15.0	1
Design Value	15-inc-a	

All exceedances plotted

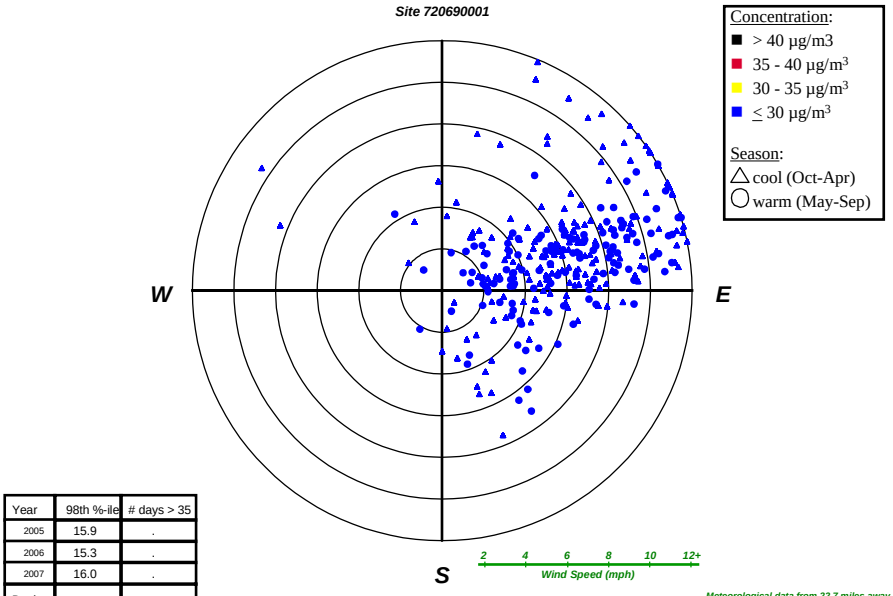
San Joaquin Valley, CA [Guaynabo County, PR]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	19.3	.
2006	17.5	.
2007	16.2	1
Design Value	18-A	

All exceedances plotted

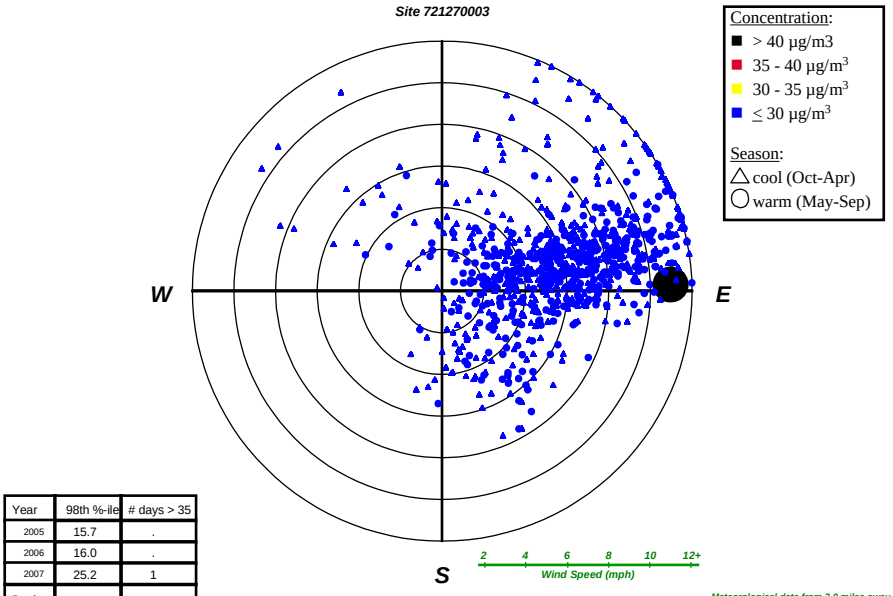
San Joaquin Valley, CA [Humacao County, PR]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	15.9	.
2006	15.3	.
2007	16.0	.
Design Value	16-A	

No exceedances

San Joaquin Valley, CA [San Juan County, PR]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	15.7	.
2006	16.0	.
2007	25.2	1
Design Value	19-A	

All exceedances plotted

EPA Technical Analysis for the South Coast Air Basin

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those areas that contribute to violations. This technical analysis for South Coast Air Basin identifies the counties with monitors that violate the 24-hour PM2.5 standard and evaluates the counties that potentially contribute to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

Figure 1 is a map of the counties in the nonattainment area and other relevant information such as the locations and design values of air quality monitors, and the metropolitan area boundary.

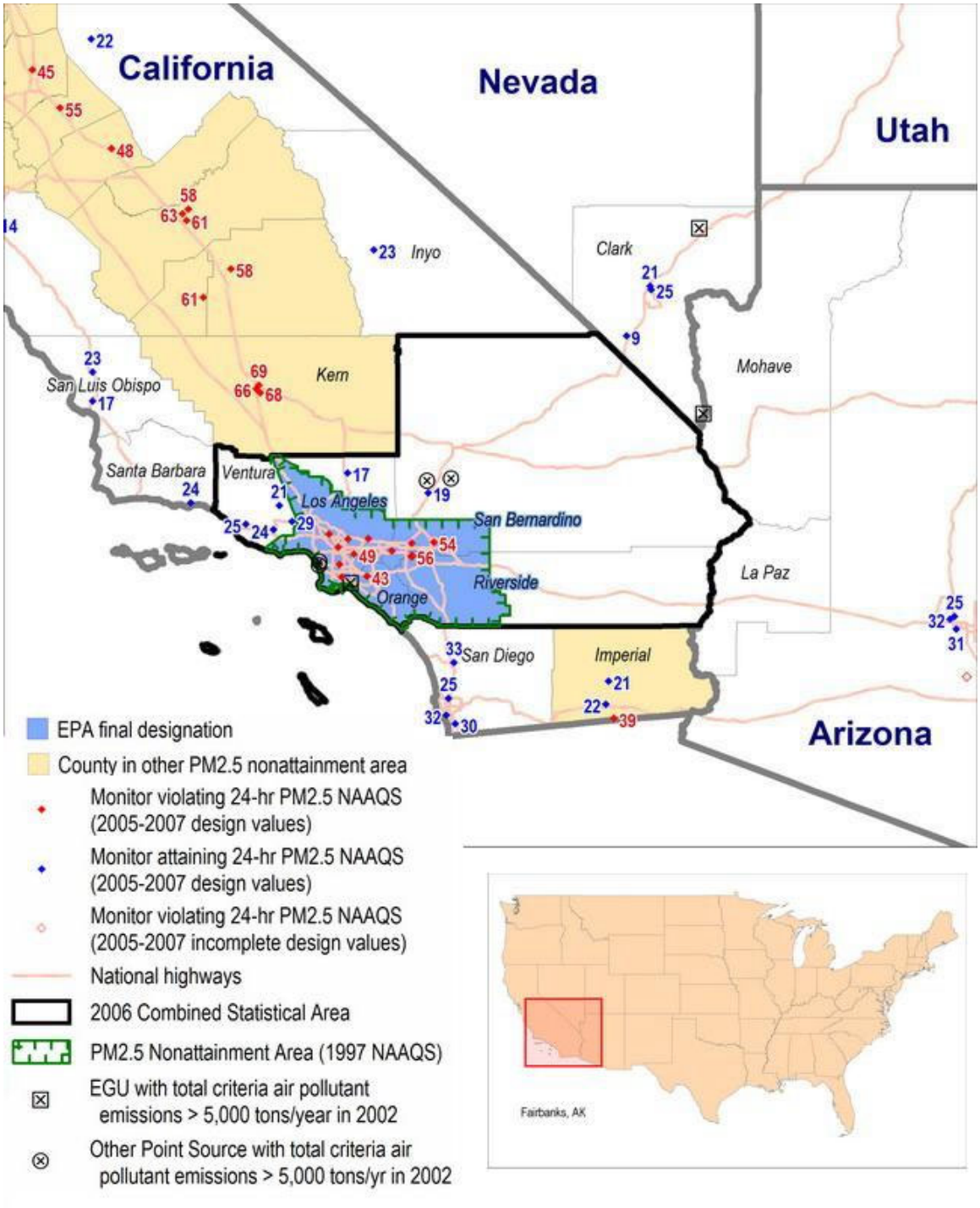


Figure 1. Los Angeles-South Coast Air Basin, CA 24-hr PM2.5 Nonattainment Area

For this area, EPA previously established $PM_{2.5}$ nonattainment boundaries for the 1997 $PM_{2.5}$ NAAQS that included 4 full and partial counties. Orange County is included in its entirety. Parts of Los Angeles, San Bernardino and Riverside Counties are included. This area is consistent

with the jurisdiction of the South Coast Air Quality Management District which oversees air quality in the Los Angeles metropolitan area. This area does not include the more rural eastern portions of Los Angeles, San Bernardino and Riverside Counties, which are separated from the western portion of these counties by mountain ranges.

The California Air Resources Board (CARB) sent a letter to EPA, dated December 17, 2007, recommending that the same counties be designated as "nonattainment" for the 2006 24-hour $PM_{2.5}$ standard based on air quality data from 2004-2006. These data are from Federal Reference Method (FRM) monitors located in the state

In August 2008, EPA notified California of its intended designations. In this letter, EPA also requested that if the State wished to provide comments on EPA's intended designation, it should do so by October 20, 2008. EPA stated that it would consider any additional information (e.g., on power plants or partial county areas) provided by the state in making final decisions on the designations.

Air quality monitoring data on the composition of fine particle mass are available from the EPA Chemical Speciation Network and the IMPROVE monitoring network. Analysis of these data indicates that the days with the highest fine particle concentrations occur both in the warm season and cold seasons. In the warm season, the average chemical composition of the highest days is nitrate (44%), carbon (28%) and sulfate (26%). In the cold season, the average chemical composition of the highest days is nitrate (60%), carbon (23%) and sulfate (15%).

Based on EPA's technical analysis described below, and currently available information, EPA believes that portions of Los Angeles, Riverside, San Bernardino counties and Orange county, all located in the state of California, the same counties as previously designated for $PM_{2.5}$ should be designated nonattainment for the 24-hour $PM_{2.5}$ air-quality standard as part of the Los Angeles South Coast Air Basin nonattainment area. This recommendation is consistent with CARB's recommendation. These counties are listed in the table below.

Area	State-Recommended Nonattainment Counties	EPA Final Designated Nonattainment Counties
South Coast Air Basin	Riverside (P), San Bernardino (P), Los Angeles (P) and Orange Counties	Riverside (P), San Bernardino (P), Los Angeles (P) and Orange Counties
P = partial		

The following is the technical analysis for the South Coast Air Basin.

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate

(SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown in Table 1 as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive way for consideration of data for these factors. A summary of the CES is included in Attachment 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the Los Angeles/South Coast Air Basin. Counties are listed in descending order by CES.

Table 1. $PM_{2.5}$ Related Emissions (tons per year) and Contributing Emissions Score

County	State Recommended Nonttainment	CES	$PM_{2.5}$ emissions Total	$PM_{2.5}$ emissions carbon	$PM_{2.5}$ emissions other	SO_2	NOx	VOCs	NH_3
Los Angeles	Yes P	100	16,764	10,780	5,984	31,620	272,971	191,280	12,156
Orange County	Yes	73	4,960	3,265	1,694	9,149	63,417	64,446	3,.444
Riverside	Yes P	16	5,314	2,899	2,415	4,451	58,229	38,262	4,733
San Bernardino	Yes P	14	12,043	5,055	6,988	3,792	96,578	51,873	3,592
P = partial. Data given is for entire County.									

Los Angeles has the highest CES value and the highest PM 2.5 emissions, and precursor emissions, by far. Orange County has a CES of 73 which argues for it being included as a candidate for a $PM_{2.5}$ nonattainment designation. San Bernardino and Riverside Counties, while having lower CES values, have significant PM 2.5 emissions. Based on both emissions levels and CES values, parts of Los Angeles, Riverside, San Bernardino Counties and all of Orange County in California are candidates for a 24-hour $PM_{2.5}$ nonattainment designation and, therefore, require further analysis.

Table 1 indicates that there are significant emissions of nitrogen oxides (NOx) and volatile organic compounds (VOCs) in these counties. These pollutants are precursors to the formation of PM2.5. On-road vehicles,and the associated Vehicle Miles Traveled (VMT) are the largest emission sources of these two pollutants. Data included in the "2006 Estimated Annual Average Emissions Inventories", from the California Air Resources Board, indicate that for all the counties in the South Coast Air Basin, mobile sources constitute a major portion of the PM 2.5 emissions total.

Based on emission levels and CES values, Riverside, San Bernardino, Los Angeles and Orange Counties are candidates for a 24-hour $PM_{2.5}$ nonattainment designation.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values in micrograms per cubic meter ($\mu g/m^3$) for air quality monitors in counties in the Los Angeles South Coast Air Basin, based on data for the 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air quality standard. The 24-hour $PM_{2.5}$ standards are met when the 3-year average of a monitor's 98^{th} percentile values are 35 $\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met.

The $PM_{2.5}$ violating monitors in the South Coast Air Basin are shown in Figure 2. Los Angeles has four violating monitors, Orange County has one, San Bernardino County has two and Riverside County has three. The 24-hour $PM_{2.5}$ design values for counties in the South Coast Air Basin are shown in Table 2.

Table 2. Air Quality Data

County	State Recommended Nonattainment	24-hr **$PM_{2.5}$** Design Values 2004-06 ($\mu g/m^3$)	24-hr **$PM_{2.5}$** Design Values 2005-07 ($\mu g/m^3$)
Los Angeles	Yes (P)	50	49
Orange	Yes	44	40
Riverside	Yes (P)	57	52
San Bernardino	Yes (P)	55	46
P = partial			

Parts of Los Angeles, Riverside, San Bernardino and all of Orange County show a violation of the 24-hour $PM_{2.5}$ standard. Although the design values of all four of these counties decreased from the 2004 – 2006 to 2005 – 2007 periods, they are still above the $PM_{2.5}$ standard. Based on the data, these counties have the worst air quality for $PM_{2.5}$ in the country. Therefore, these counties are candidates for inclusion in the South Coast Air Basin nonattainment area.

Note: Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with an FRM monitor. All data

from Special Purpose Monitors (SPM) using an FRM is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr PM2.5 NAAQS for designation purposes.

Factor 3: Population density and degree of urbanization (including commercial development)

Table 3 shows the 2005 population for each county in the area being evaluated, as well as the population density for each county in that area. Population data gives an indication of whether it is likely that population-based emissions might contribute to violations of the 24-hour $PM_{2.5}$ standards. See Figure 2.

Table 3. Population

County	State Recommended Nonattainment	2005 Population	2005 Population Density (pop/sq mi)
Los Angeles	Yes P	9,941,197	2,429
Orange	Yes	2,992,642	3,738
Riverside	Yes P	1,945,392	266
San Bernardino	Yes P	1,964,511	98
P = partial. Data given is for entire County			

As shown on the attached map, this area is one of the most densely populated areas in the western United States. The 2005 population is extremely high for all four counties. Los Angeles County is densely populated with 2,429 people per square mile. Orange County has even more people, with 3,738 people per square mile. Southwestern San Bernardino County and western Riverside Counties are densely populated near the metropolitan area, but due to large rural areas show less population density.

Western Los Angeles, Orange County, southwestern San Bernardino County and western Riverside County are high-ranking counties for a nonattainment designation based on this factor and are also high-ranking counties based on Factors 1 and 2 and the CES.

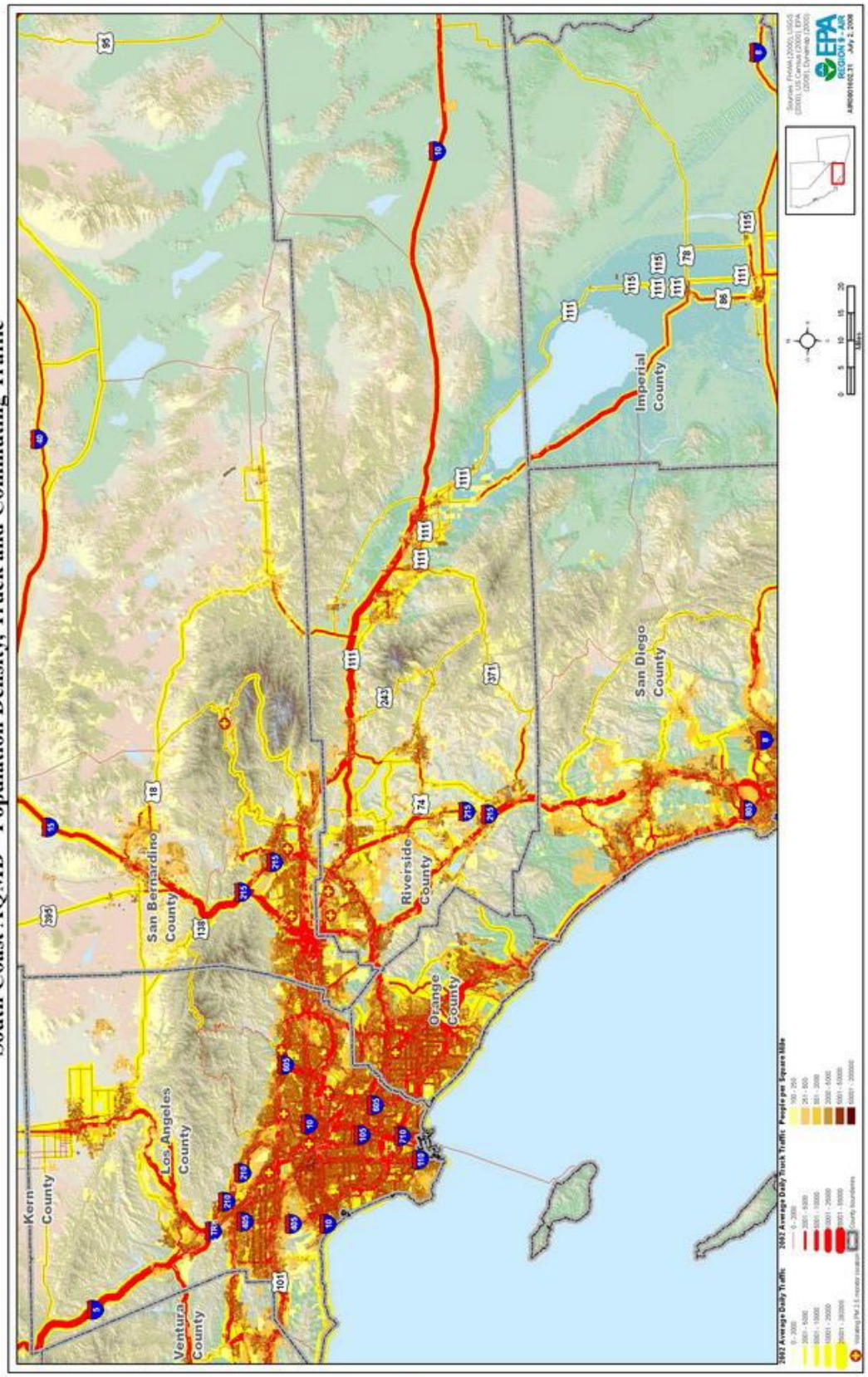

South Coast AQMD - Population Density, Truck and Commuting Traffic
Kern County
Los Angeles County
San Bernardino County
Riverside County
Orange County
San Diego County
Imperial County
Ventura County
2002 Average Daily Traffic
2002 Average Daily Truck Traffic
People per Square Mile

Figure 2

Figure 2

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the Los Angeles/South Coast Air Basin, the percent of total commuters in each county who commute to other counties within the Los Angeles/South Coast Air Basin, as well as the total Vehicle Miles Traveled (VMT) for each county in millions of miles (see Table 5). A county with numerous commuters is generally an integral part of an urban area and is likely contributing to fine particle concentrations in the area.

Table 4. Traffic and Commuting Patterns

County	State Recommended Non-attainment	2005 VMT (millions)	Number commuting into and within the statistical area	Percent commuting into and within the statistical area
Los Angeles	Yes (P)	69,539	3,793,620	98%
Orange	Yes	23,466	1,297,190	99%
Riverside	Yes (P)	19,731	566,630	96%
San Bernardino	Yes (P)	17,810	650,210	99%

The listing of counties on Table 4 reflects a ranking based on the number of people commuting to other counties. The counties that are in the nonattainment area for the 1997 $PM_{2.5}$ NAAQS are shown in boldface.

All four counties have heavy commuter traffic constituting between 96% and 99% commuting to violating counties. The VMT numbers are extremely large for the entire area. As shown on the attached map, average daily truck traffic is also heavy, from 25,000 to 55,000 trucks on the highways in all four counties.

Based on this Factor and Factors 1, 2 and 3, the counties in the South Coast Air Basin are candidates for a PM2.5 designation.

The 2005 VMT data used for tables 4 and 5 of the technical analysis have been derived using methodology such as that described in "Documentation for the 2005 Mobile National Emissions Inventory, Version 2," December 2008, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: ftp://ftp.epa.gov/EmisInventory/2005_nei/mobile_sector/documentation/2005_mobile_nei_version_2_report.pdf

Factor 5: Growth rates and patterns

This factor considers population growth for 2000-2005 and vehicle miles traveled for 2000-2005 for counties in the Los Angeles/South Coast Air Basin, as well as patterns of population and VMT growth. A county with rapid population or VMT growth is generally an integral part of an urban area and likely to be contributing to fine particle concentrations in the area.

Table 5 below shows population, population growth, VMT and VMT growth for counties that are included in the South Coast Air Basin area.

Table 5. Population and VMT Growth and Percent Change.

County	Population (2005)	Population Density (2005)	Population % change (2000 - 2005)	2005 VMT (millions)	%VMT Growth 2000 to 2005
Los Angeles (P)	9,941,197	2,429	4%	69,539	(8)
Orange	2,992,642	3,738	5%	23,466	15%
Riverside (P)	1,945,392	266	25%	19,731	49%
San Bernardino (P)	1,964,511	98	14%	17,810	7%
P = partial. Data given for entire County					

Based on the data in Table 5, Riverside County had a high percentage of population change from 2000 to 2005, and an extremely high percentage of VMT change from 2000-2005. San Bernardino County had a significant increase in population from 2000-2005 with an increase in VMT for 2000-2005. While Los Angeles and Orange Counties had a small population increase during the 2000 – 2005 period, Orange County had a significant increase in VMT while Los Angeles had a decrease for the period 2000-2005.

The South Coast Air Basin has a heavy concentration of industrial facilities, several airports, two major international ports, and a dense freeway and surface street network. Approximately 43% of all Californians live in this area, and drive 40% of all the vehicle miles traveled in the state. Overall, the area is experiencing increasing population growth and traffic volumes, so all counties in the South Coast Air Basin are candidates for a PM 2.5 nonattainment designation for this factor.

Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered data from National Weather Service instruments in the area. Wind direction and wind speed data for 2004-2006 were analyzed, with an emphasis on "high $PM_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM air quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values, or where 24-hr values exceeded 35 $\mu g/m^3$. See Figure 3.

For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. The figure identifies 24-hour PM2.5 values by color; days exceeding 35 ug/m3 are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the

day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

The pollution rose for Los Angeles County, site 060370002, shown below in Figure 3, indicates that elevated levels of particulate matter occur predominately during the cool season during time periods when prevailing winds are light. The additional pollution roses for the South Coast Air Basin, included in Appendix A, show similar results.

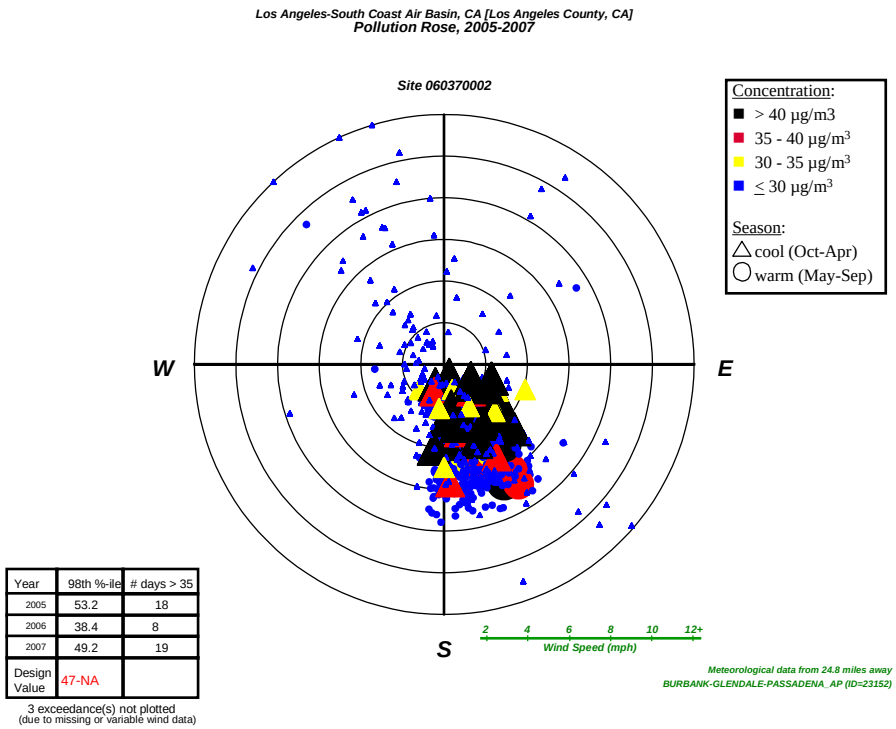


Figure 3

The meteorology indicates that all four counties should be included in the South Coast Air Basin nonattainment area. Consideration of this factor supports the recommended nonattainment area for the South Coast area.

Note: The meteorology factor is also considered in each county's Contributing Emissions Score (CES) because the method for deriving this metric included an analysis of trajectories of air masses for high $PM_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the air shed and, therefore, on the distribution of $PM_{2.5}$ over the South Coast Air Basin.

The South Coast Air Basin forms a low plain, bordered on the west by the Pacific Ocean, and surrounded on the other sides by mountains which channel and confine the airflow. The San Gabriel Mountains lie to the north; the San Bernardino Mountains lie to the north and east, the San Jacinto Mountains to the southeast and the Santa Ana Mountains to the south. The mountain ranges confine the PM 2.5 emissions to the more urbanized areas, which are located on the low plain. Consideration of this factor supports the South Coast nonattainment area as recommended by the State of California..

Orange County is included in its entirety. Parts of Los Angeles, San Bernardino and Riverside Counties are included. This area is consistent with the jurisdiction of the South Coast Air Quality Management District which oversees air quality in the Los Angeles metropolitan area. This area does not include the more rural eastern portions of Los Angeles, San Bernardino and Riverside Counties, which are separated from the western portion of these counties by mountain ranges.Therefore it is appropriate to include only portions of Los Angeles, San Bernardino, and Riverside Counties in the nonattainment area.

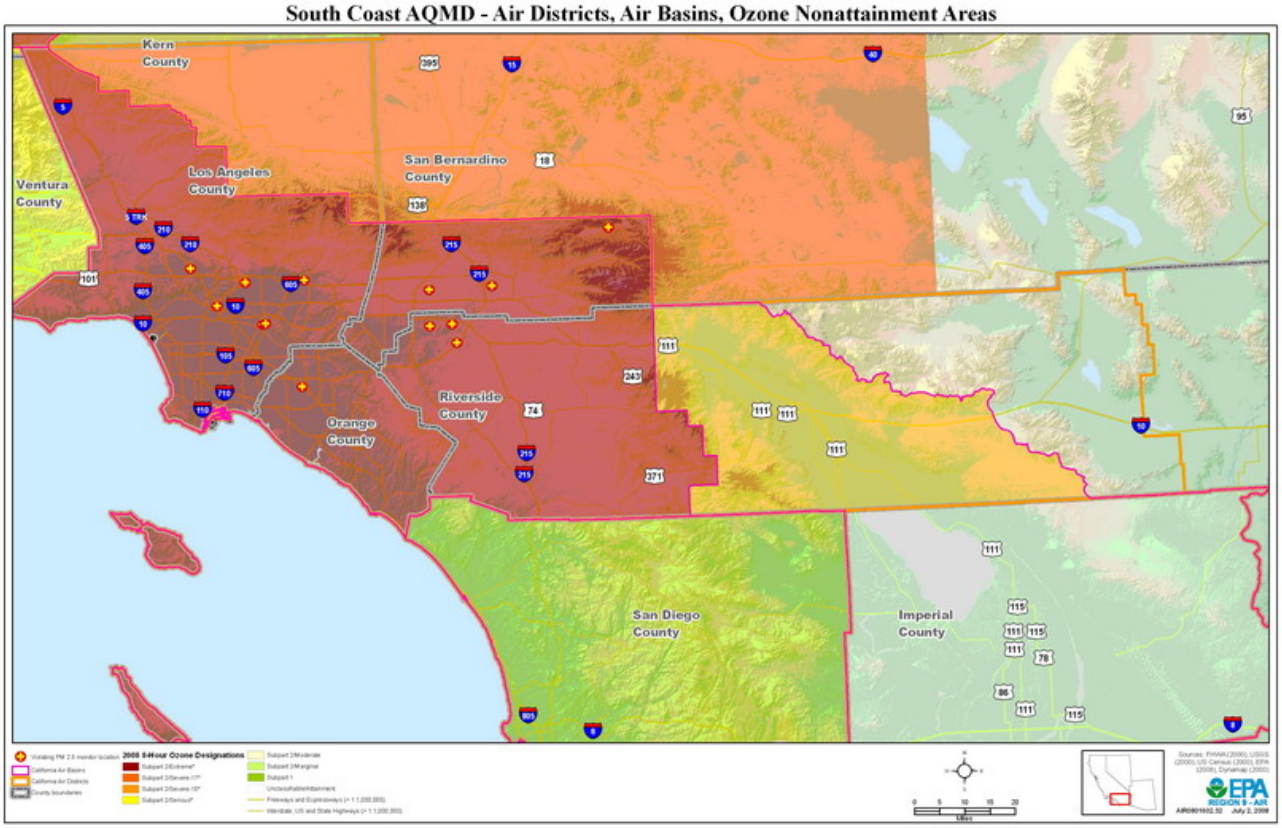
Factor 8: Jurisdictional boundaries (e.g., existing PM and ozone areas)

In evaluating the jurisdictional boundary factor, EPA gave special consideration to areas such as the South Coast area that were already designated nonattainment in 2005 for violating the 1997 fine particle standards. Analysis of chemical composition data in these areas indicates that the same components that make up most of the PM2.5 mass in the area on an annual average basis (such as sulfate and direct PM2.5 carbon in many eastern areas) also are key contributors to the PM2.5 mass on days exceeding the 24-hour PM2.5 standard. These data indicate that in many cities, the same source categories that contribute to violations of the annual standard also contribute to exceedances of the 24-hour standard.

Most areas, including the South Coast area, that were originally designated nonattainment for the PM2.5 standards still have not attained the standards. Thus, EPA has generally concluded that counties that were designated as having emissions sources contributing to fine particle concentrations which continue to exceed the 1997 standards (all areas violated the annual standard, two also violated the previous 24-hour standard—South Coast and San Joaquin Valley) also contribute to fine particle concentrations on the highest days. For this reason, EPA believes that for most existing nonattainment areas, the nonattainment area for the 2006 24-hour standard should be the same. Consideration also should be given to existing boundaries and organizations as they may facilitate air quality planning and the implementation of control measures to attain

the standard. Areas already designated as nonattainment represent important boundaries for state air quality planning.

To the degree appropriate based upon violations and contribution to violations of the respective NAAQS, EPA believes it can be helpful for air planning purposes and for attainment of both NAAQS for ozone and PM2.5 nonattainment area boundaries to be consistent. The major jurisdictional boundary in the South Coast Air Basin, which is currently nonattainment for both the 1997 $PM_{2.5}$ and 8-hour ozone standards, is the South Coast Air Quality Management District (SCAQMD) (See Figure 4).. SCAQMD includes Orange County, and parts of Los Angeles, Riverside and San Bernardino Counties. Since SCAQMD will be the responsible planning agency for all three standards. EPA is designating the locations within the existing nonattainment boundaries for SCAQMD as a $PM_{2.5}$ nonattainment area.



. Figure 4

Factor 9: Level of control of emission sources

This factor considers emission controls currently implemented for major sources in the Los Angeles/South Coast Air Basin area.

Under this factor, the existing level of control of emission sources is taken into consideration. The emissions data used by EPA in this technical analysis and provided in Table 1 (under Factor

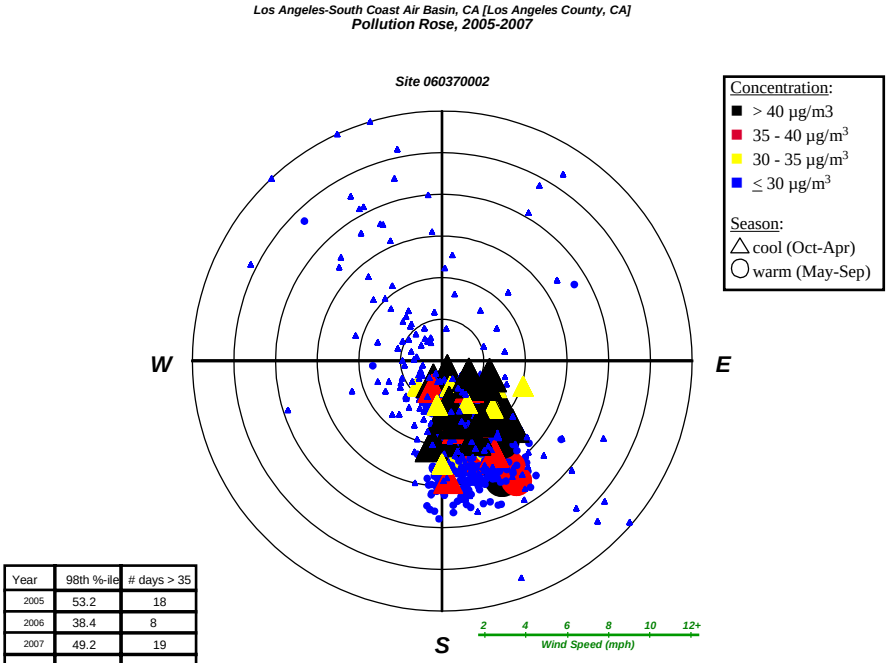
1) represent emissions levels taking into account any control strategies implemented in the South Coast Air Basin before 2005 on stationary, mobile, and area sources. Data are presented for PM2.5 components that are directly emitted (carbonaceous PM2.5 and crustal PM2.5) and for pollutants which react in the atmosphere to form fine particles (e.g. SO2, NOx, VOC, and ammonia). In addition,
there are no large contributing sources that have been excluded from the South Coast Air Basin nonattainment area.

Conclusion

The State of California recommended that the entire South Coast Air Basin be designated as a 24-hour PM 2.5 nonattainment area based on violating monitors in Orange, Los Angeles, Riverside and San Bernardino Counties. All of the Counties in the air basin are violating the 24-hour PM 2.5 standard and should be included in the nonattainment area. EPA's technical analysis shows that the emissions data, population data, growth patterns, traffic and commuting patterns, and meteorology all support the State's recommendation. In addition, the recommended PM 2.5 nonattainment area is consistent with the existing ozone nonattainment area and the jurisdictional boundaries of the South Coast Air Quality Management District. EPA and the State of California are in agreement regarding the designation for the South Coast Air Basin.

Additional information regarding responses to specific State comments can be found in EPA's Response to Comments document at
http://www.epa.gov/pmdesignations/2006standards/tech.htm

Appendix A. Pollutant Roses for South Coast—Los Angeles Area

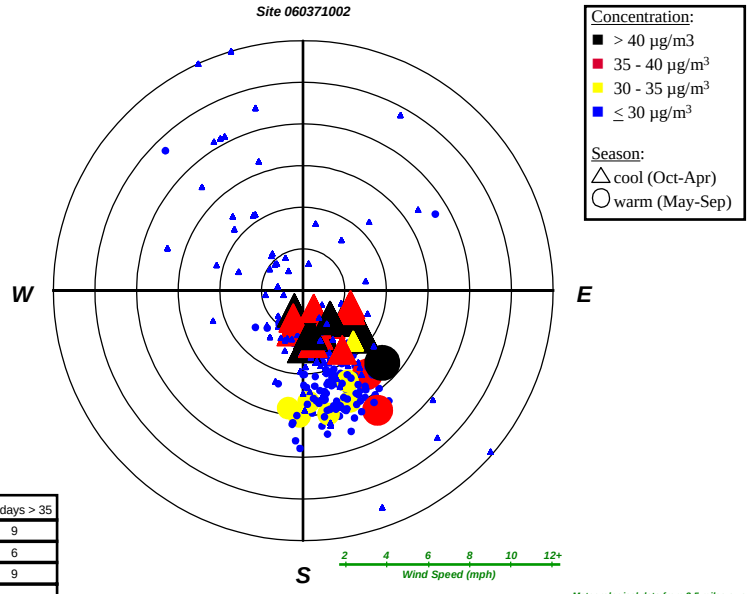


Year	98th %-ile	# days > 35
2005	53.2	18
2006	38.4	8
2007	49.2	19
Design Value	47-NA	

3 exceedance(s) not plotted
(due to missing or variable wind data)

Los Angeles-South Coast Air Basin, CA [Los Angeles County, CA]
Pollution Rose, 2005-2007

Site 060371002



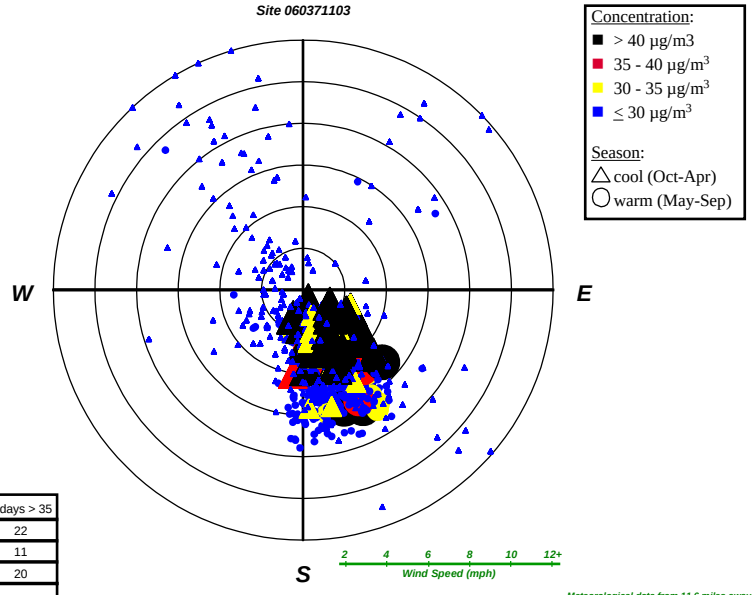
Year	98th %-ile	# days > 35
2005	50.5	9
2006	43.4	6
2007	50.3	9
Design Value	48-NA	

3 exceedance(s) not plotted
(due to missing or variable wind data)

Meteorological data from 2.5 miles away
BURBANK-GLENDALE-PASSADENA_AP (ID=23152)

Los Angeles-South Coast Air Basin, CA [Los Angeles County, CA]
Pollution Rose, 2005-2007

Site 060371103



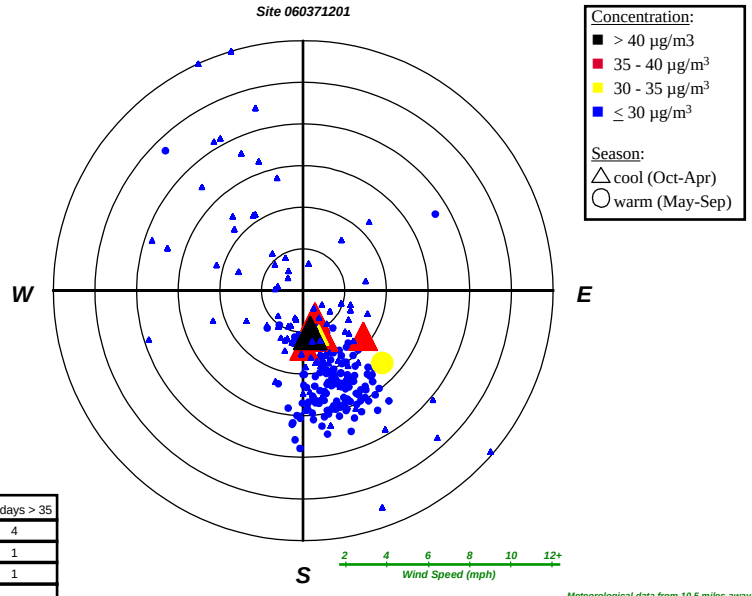
Year	98th %-ile	# days > 35
2005	53.3	22
2006	38.9	11
2007	51.2	20
Design Value	48-NA	

8 exceedance(s) not plotted
(due to missing or variable wind data)

Meteorological data from 11.6 miles away
BURBANK-GLENDALE-PASSADENA_AP (ID=23152)

Los Angeles-South Coast Air Basin, CA [Los Angeles County, CA]
Pollution Rose, 2005-2007

Site 060371201



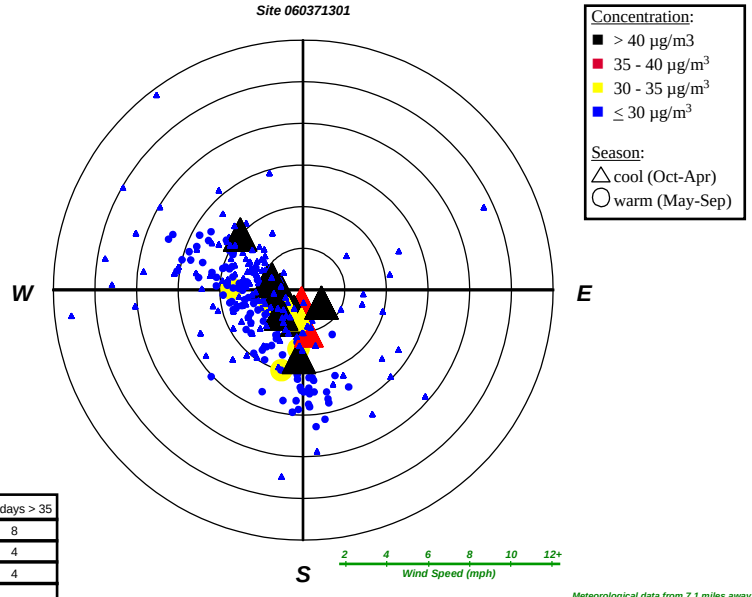
Year	98th %-ile	# days > 35
2005	35.7	4
2006	31.9	1
2007	33.3	1
Design Value	34-inc-a	

1 exceedance(s) not plotted
(due to missing or variable wind data)

Meteorological data from 10.5 miles away
BURBANK-GLENDALE-PASSADENA_AP (ID=23152)

Los Angeles-South Coast Air Basin, CA [Los Angeles County, CA]
Pollution Rose, 2005-2007

Site 060371301

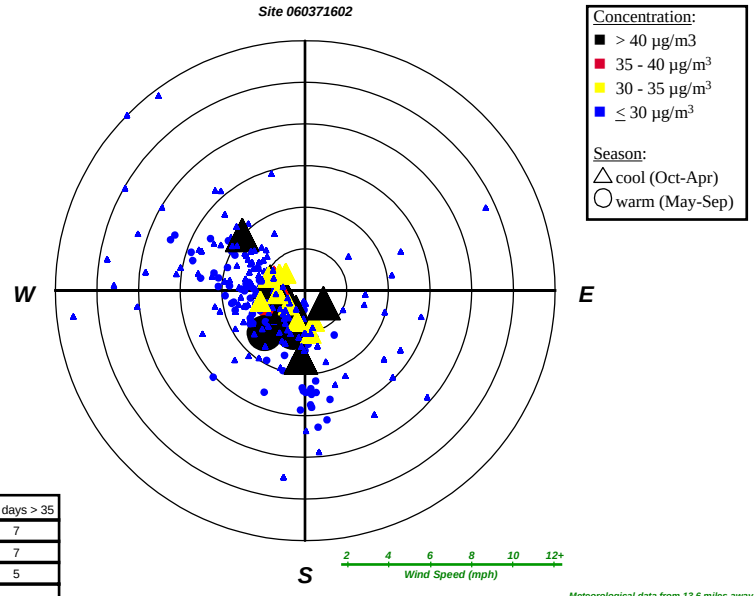


Year	98th %-ile	# days > 35
2005	48.4	8
2006	44.4	4
2007	46.0	4
Design Value	46-NA	

4 exceedance(s) not plotted
(due to missing or variable wind data)

Meteorological data from 7.1 miles away
LONG_BEACH_DAUGHERTY_FLD (ID=23129)

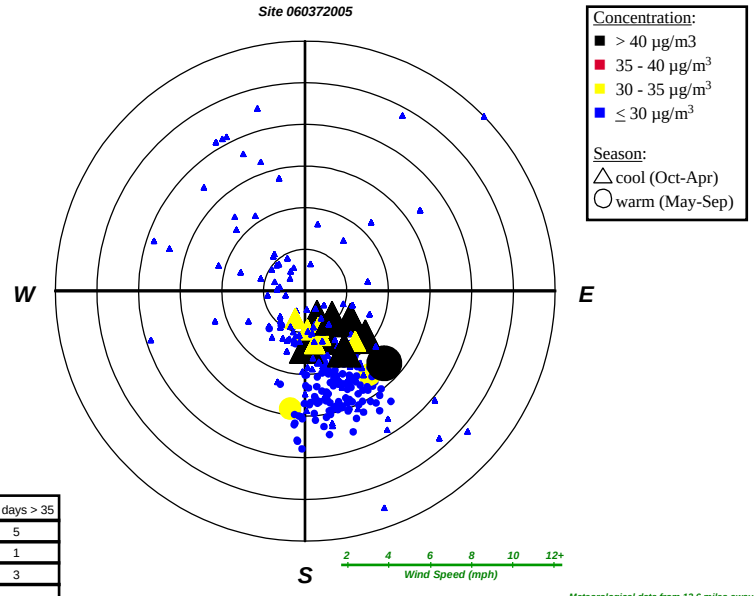
Los Angeles-South Coast Air Basin, CA [Los Angeles County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	53.9	7
2006	43.0	7
2007	49.5	5
Design Value	49-NA	

7 exceedance(s) not plotted
(due to missing or variable wind data)

Los Angeles-South Coast Air Basin, CA [Los Angeles County, CA]
Pollution Rose, 2005-2007

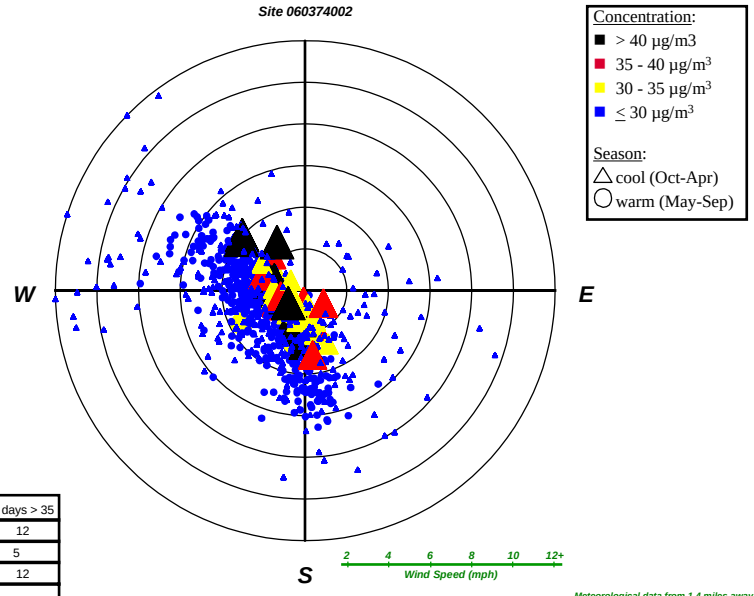


Year	98th %-ile	# days > 35
2005	43.0	5
2006	32.0	1
2007	45.4	3
Design Value	40-NA	

1 exceedance(s) not plotted
(due to missing or variable wind data)

Los Angeles-South Coast Air Basin, CA [Los Angeles County, CA]
Pollution Rose, 2005-2007

Site 060374002



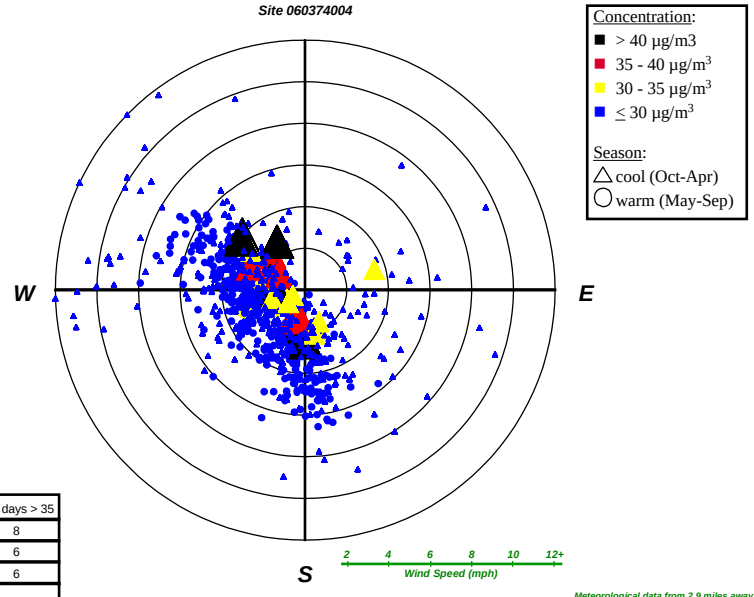
Meteorological data from 1.4 miles away
LONG_BEACH_DAUGHERTY_FLD (ID=23129)

Year	98th %-ile	# days > 35
2005	41.4	12
2006	34.9	5
2007	40.7	12
Design Value	39-NA	

7 exceedance(s) not plotted
(due to missing or variable wind data)

Los Angeles-South Coast Air Basin, CA [Los Angeles County, CA]
Pollution Rose, 2005-2007

Site 060374004

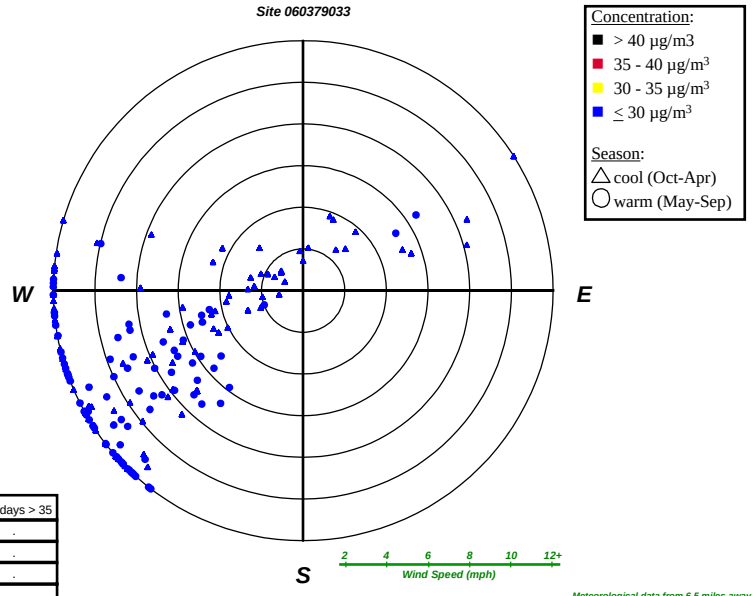


Meteorological data from 2.9 miles away
LONG_BEACH_DAUGHERTY_FLD (ID=23129)

Year	98th %-ile	# days > 35
2005	37.7	8
2006	35.2	6
2007	33.7	6
Design Value	36-NA	

5 exceedance(s) not plotted
(due to missing or variable wind data)

Los Angeles-South Coast Air Basin, CA [Los Angeles County, CA]
Pollution Rose, 2005-2007

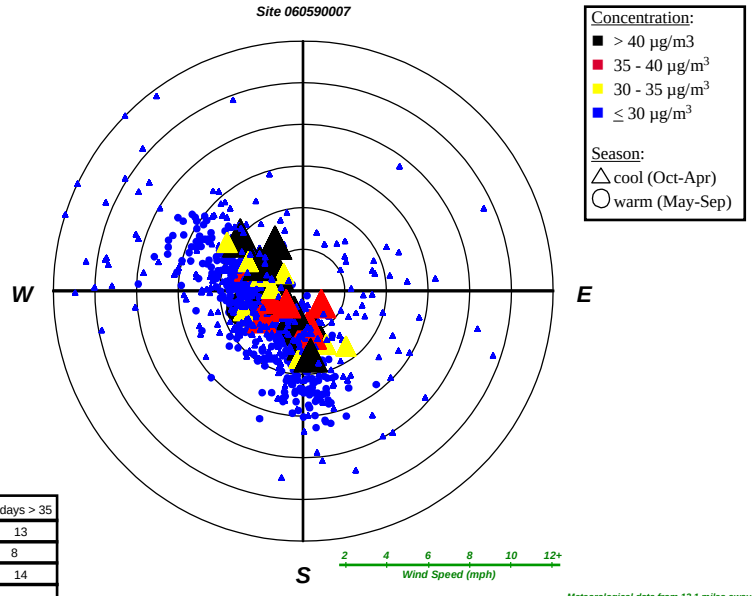


Meteorological data from 6.5 miles away
LANCASTER_GEN_WM_FOX_FIELD (ID= 3159)

Year	98th %-ile	# days > 35
2005	17.0	.
2006	13.0	.
2007	20.0	.
Design Value	17-A	

No exceedances

Los Angeles-South Coast Air Basin, CA [Orange County, CA]
Pollution Rose, 2005-2007

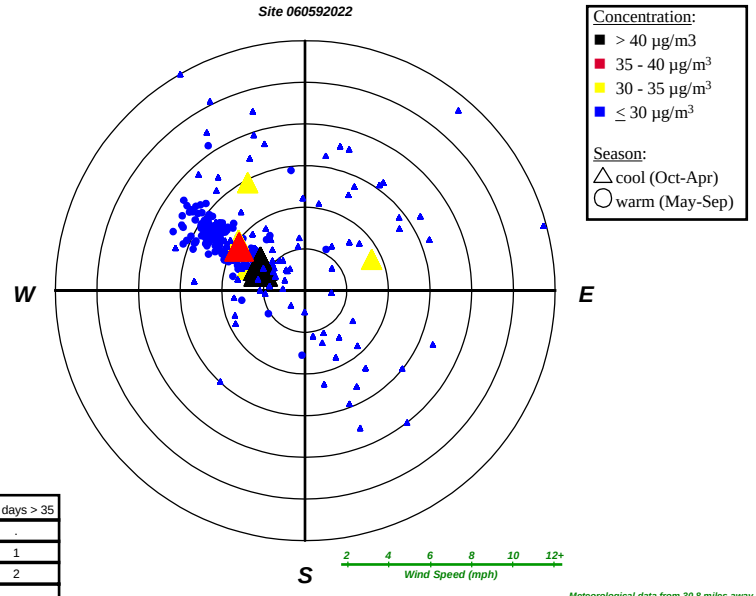


Meteorological data from 13.1 miles away
LONG_BEACH_DAUGHERTY_FLD (ID=23129)

Year	98th %-ile	# days > 35
2005	41.8	13
2006	40.5	8
2007	46.5	14
Design Value	43-NA	

7 exceedance(s) not plotted
(due to missing or variable wind data)

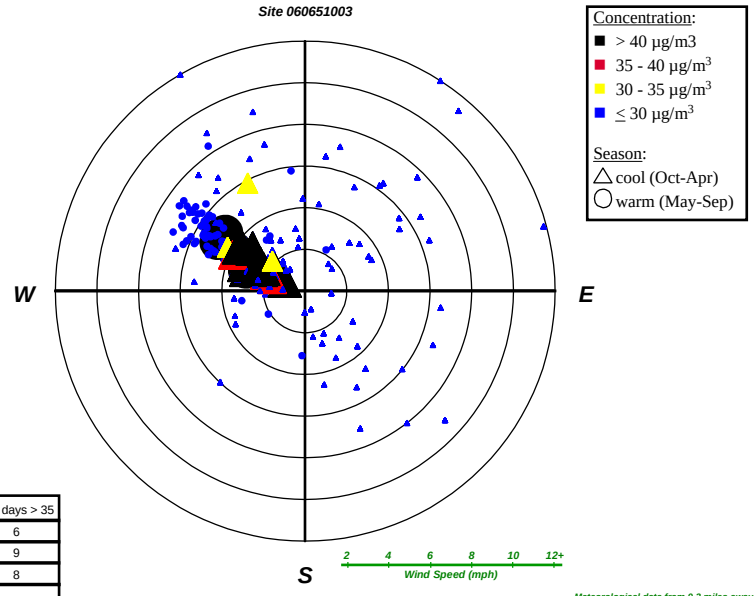
Los Angeles-South Coast Air Basin, CA [Orange County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	31.4	.
2006	25.7	1
2007	35.7	2
Design Value	31-inc-a	

All exceedances plotted

Los Angeles-South Coast Air Basin, CA [Riverside County, CA]
Pollution Rose, 2005-2007

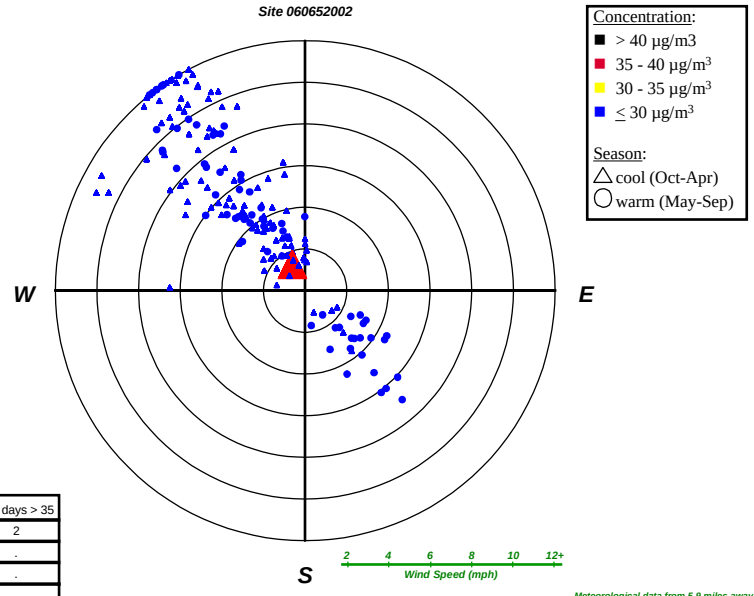


Year	98th %-ile	# days > 35
2005	41.0	6
2006	47.7	9
2007	58.0	8
Design Value	49-NA	

3 exceedance(s) not plotted
(due to missing or variable wind data)

Los Angeles-South Coast Air Basin, CA [Riverside County, CA]
Pollution Rose, 2005-2007

Site 060652002



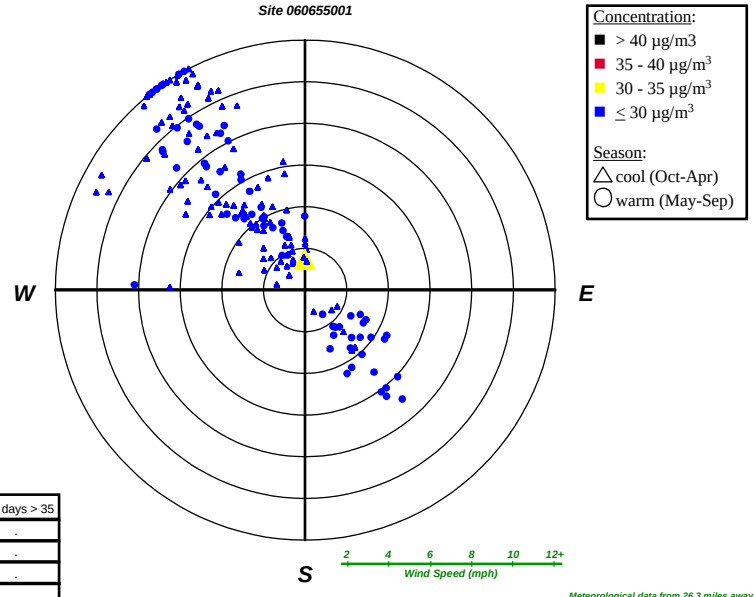
Meteorological data from 5.9 miles away
PALM_SPRINGS_THERMAL_AP (ID= 3104)

Year	98th %-ile	# days > 35
2005	25.0	2
2006	19.0	.
2007	26.5	.
Design Value	24-A	

1 exceedance(s) not plotted
(due to missing or variable wind data)

Los Angeles-South Coast Air Basin, CA [Riverside County, CA]
Pollution Rose, 2005-2007

Site 060655001



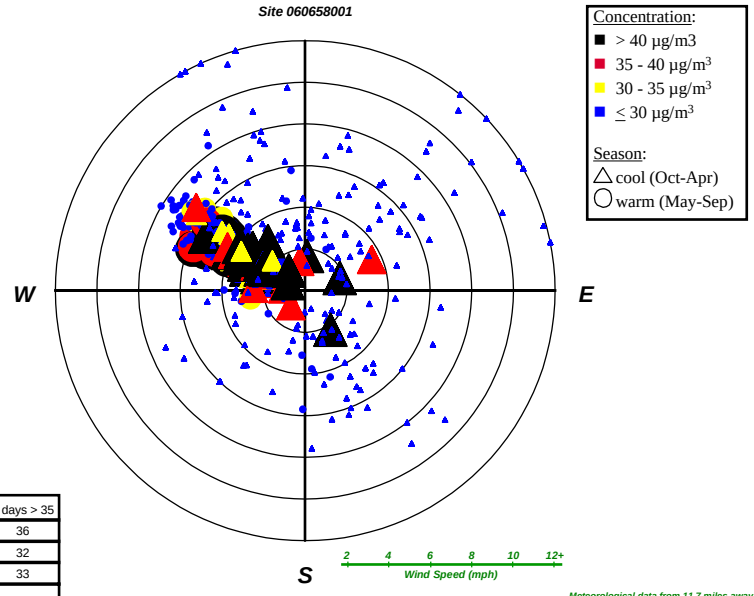
Meteorological data from 26.3 miles away
PALM_SPRINGS_THERMAL_AP (ID= 3104)

Year	98th %-ile	# days > 35
2005	25.0	.
2006	15.8	.
2007	20.5	.
Design Value	20-inc-a	

No exceedances

Los Angeles-South Coast Air Basin, CA [Riverside County, CA]
Pollution Rose, 2005-2007

Site 060658001



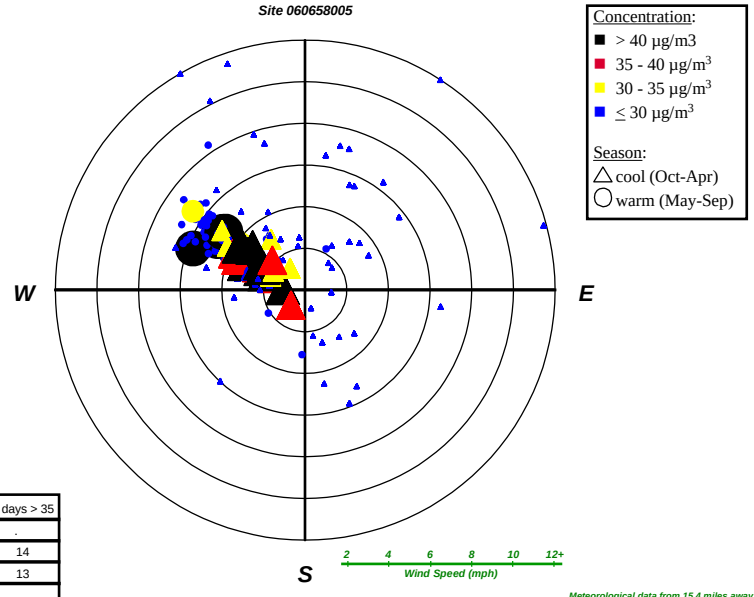
Meteorological data from 11.7 miles away
MARCH_AFB (ID=23119)

Year	98th %-ile	# days > 35
2005	58.3	36
2006	53.7	32
2007	54.3	33
Design Value	55-NA	

20 exceedance(s) not plotted
(due to missing or variable wind data)

Los Angeles-South Coast Air Basin, CA [Riverside County, CA]
Pollution Rose, 2005-2007

Site 060658005



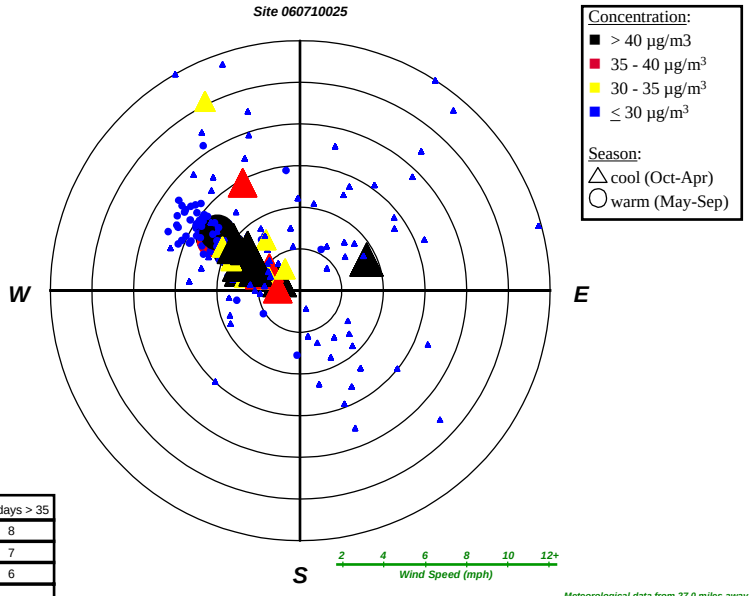
Meteorological data from 15.4 miles away
MARCH_AFB (ID=23119)

Year	98th %-ile	# days > 35
2005	.	.
2006	52.5	14
2007	60.0	13
Design Value	56-inc-na	

4 exceedance(s) not plotted
(due to missing or variable wind data)

Los Angeles-South Coast Air Basin, CA [San Bernardino County, CA]
Pollution Rose, 2005-2007

Site 060710025



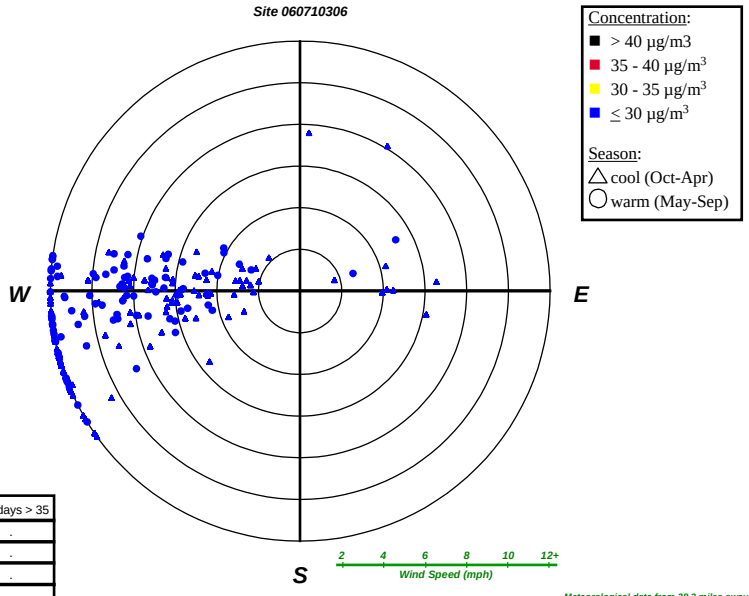
Meteorological data from 27.0 miles away
MARCH_AFB (ID=23119)

Year	98th %-ile	# days > 35
2005	49.5	8
2006	41.5	7
2007	48.9	6
Design Value	47-NA	

3 exceedance(s) not plotted
(due to missing or variable wind data)

Los Angeles-South Coast Air Basin, CA [San Bernardino County, CA]
Pollution Rose, 2005-2007

Site 060710306



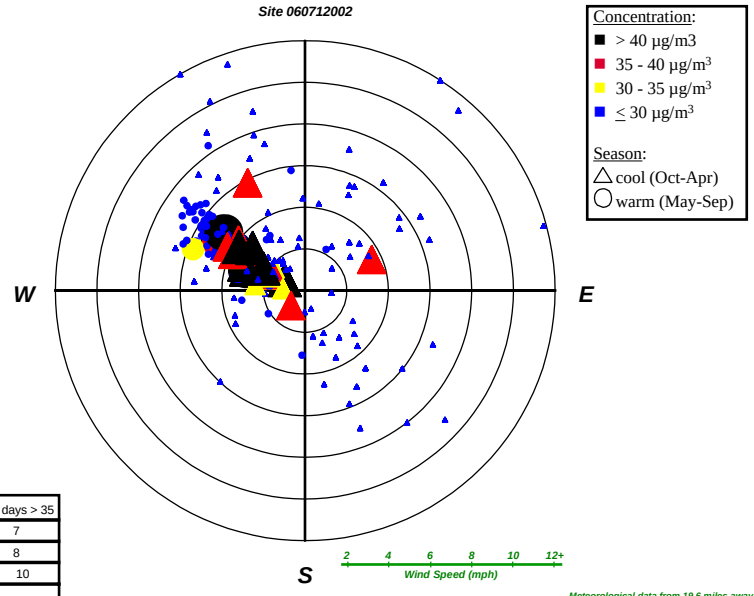
Meteorological data from 38.2 miles away
DAGGETT_BARSTOW-DAGGETT_AP (ID=23161)

Year	98th %-ile	# days > 35
2005	20.0	.
2006	19.0	.
2007	19.0	.
Design Value	19-A	

No exceedances

Los Angeles-South Coast Air Basin, CA [San Bernardino County, CA]
Pollution Rose, 2005-2007

Site 060712002



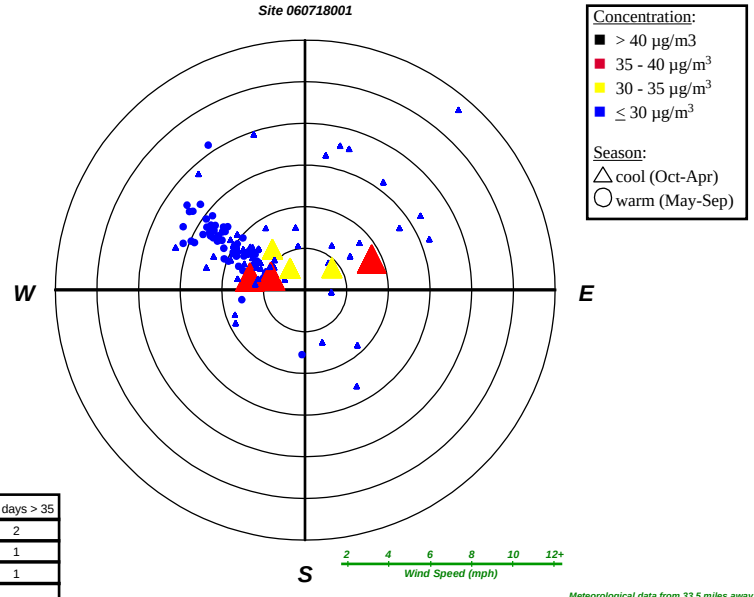
Meteorological data from 19.6 miles away
MARCH_AFB (ID=23119)

Year	98th %-ile	# days > 35
2005	48.2	7
2006	43.7	8
2007	64.9	10
Design Value	52-NA	

2 exceedance(s) not plotted
(due to missing or variable wind data)

Los Angeles-South Coast Air Basin, CA [San Bernardino County, CA]
Pollution Rose, 2005-2007

Site 060718001

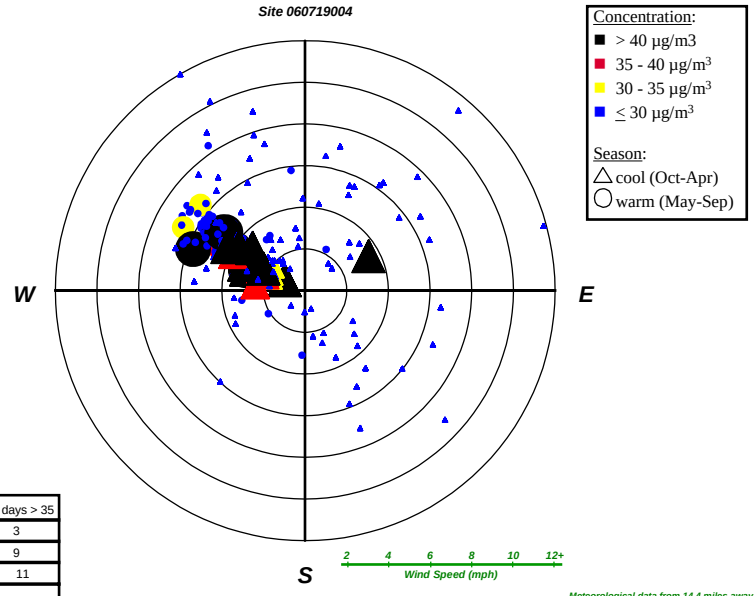


Meteorological data from 33.5 miles away
MARCH_AFB (ID=23119)

Year	98th %-ile	# days > 35
2005	38.7	2
2006	40.0	1
2007	34.0	1
Design Value	38-NA	

1 exceedance(s) not plotted
(due to missing or variable wind data)

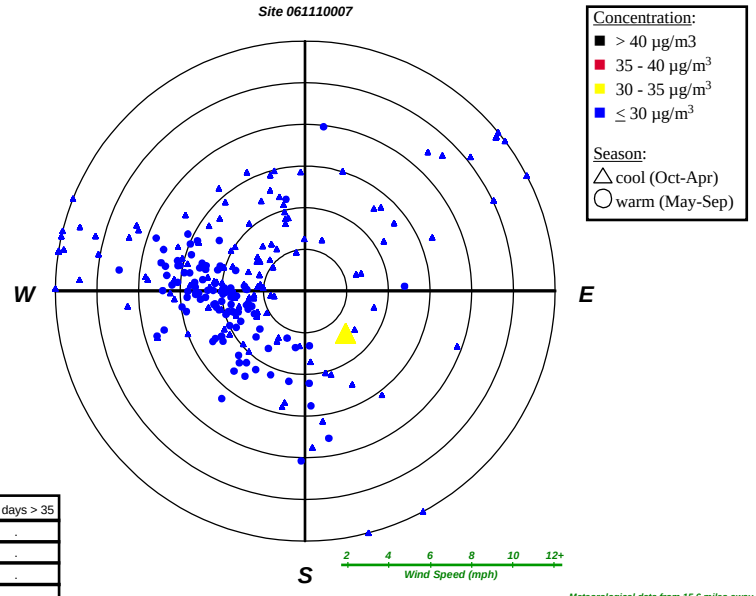
Los Angeles-South Coast Air Basin, CA [San Bernardino County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	43.4	3
2006	47.7	9
2007	70.7	11
Design Value	54-NA	

2 exceedance(s) not plotted
(due to missing or variable wind data)

Los Angeles-South Coast Air Basin, CA [Ventura County, CA]
Pollution Rose, 2005-2007

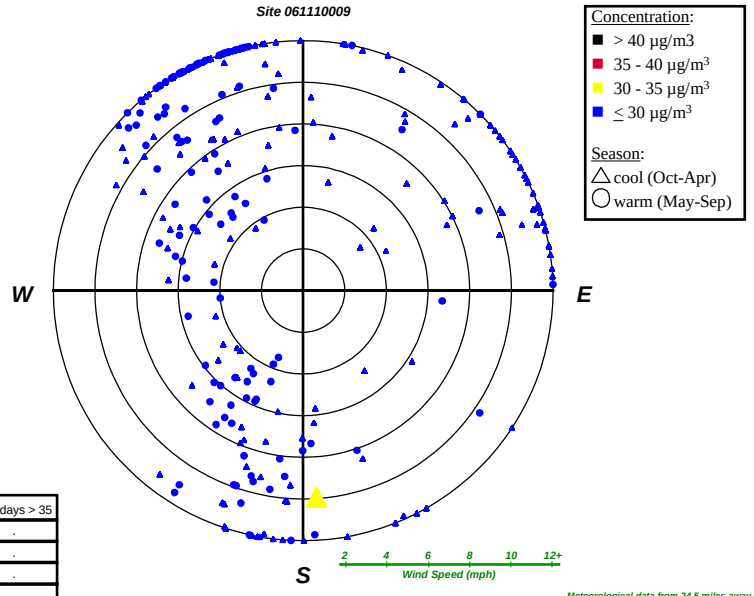


Year	98th %-ile	# days > 35
2005	22.5	.
2006	23.4	.
2007	24.9	.
Design Value	24-A	

No exceedances

Los Angeles-South Coast Air Basin, CA [Ventura County, CA]
Pollution Rose, 2005-2007

Site 061110009



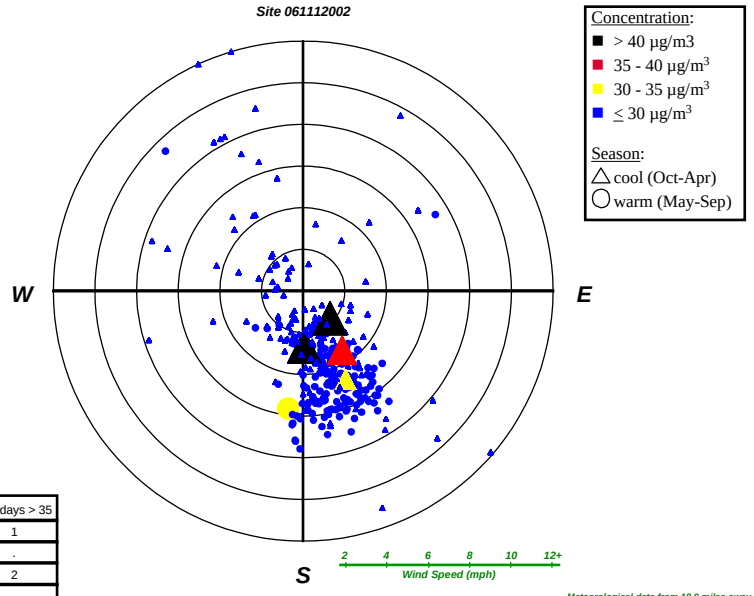
Meteorological data from 24.5 miles away
SANDBERG (ID=23187)

Year	98th %-ile	# days > 35
2005	20.3	.
2006	21.4	.
2007	22.3	.
Design Value	21-A	

No exceedances

Los Angeles-South Coast Air Basin, CA [Ventura County, CA]
Pollution Rose, 2005-2007

Site 061112002

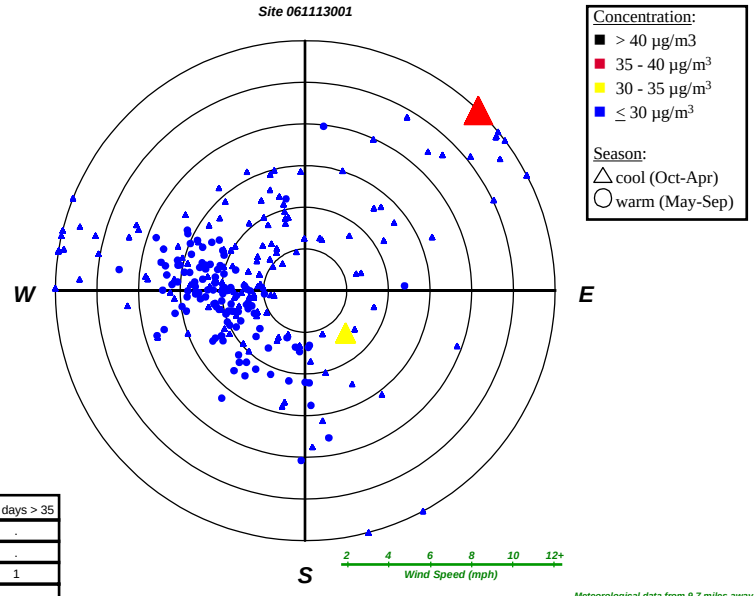


Meteorological data from 19.9 miles away
BURBANK-GLENDALE-PASSADENA_AP (ID=23152)

Year	98th %-ile	# days > 35
2005	26.3	1
2006	27.6	.
2007	31.8	2
Design Value	29-A	

All exceedances plotted

Los Angeles-South Coast Air Basin, CA [Ventura County, CA]
Pollution Rose, 2005-2007



Year	98th %-ile	# days > 35
2005	23.8	.
2006	23.5	.
2007	27.5	1
Design Value	25-A	

All exceedances plotted

Meteorological data from 9.7 miles away
POINT_MUGU_NF (ID=93111)

EPA Technical Analysis for the Yuba City-Marysville 24-Hour $PM_{2.5}$ Nonattainment Area and Sutter Counties

Introduction

Pursuant to section 107(d) of the Clean Air Act, EPA must designate as nonattainment those areas that violate the NAAQS and those nearby areas that contribute to violations. This technical analysis for the Yuba City-Marysville area identifies the counties with monitors that violate the 24-hour $PM_{2.5}$ standard and evaluates nearby counties for contributions to fine particle concentrations in the area. EPA has evaluated these counties based on the weight of evidence of the following nine factors recommended in EPA guidance and any other relevant information:

- pollutant emissions
- air quality data
- population density and degree of urbanization
- traffic and commuting patterns
- growth
- meteorology
- geography and topography
- jurisdictional boundaries
- level of control of emissions sources

Figure 1 is a map of the counties in the nonattainment area and other relevant information such as the metropolitan area boundaries.

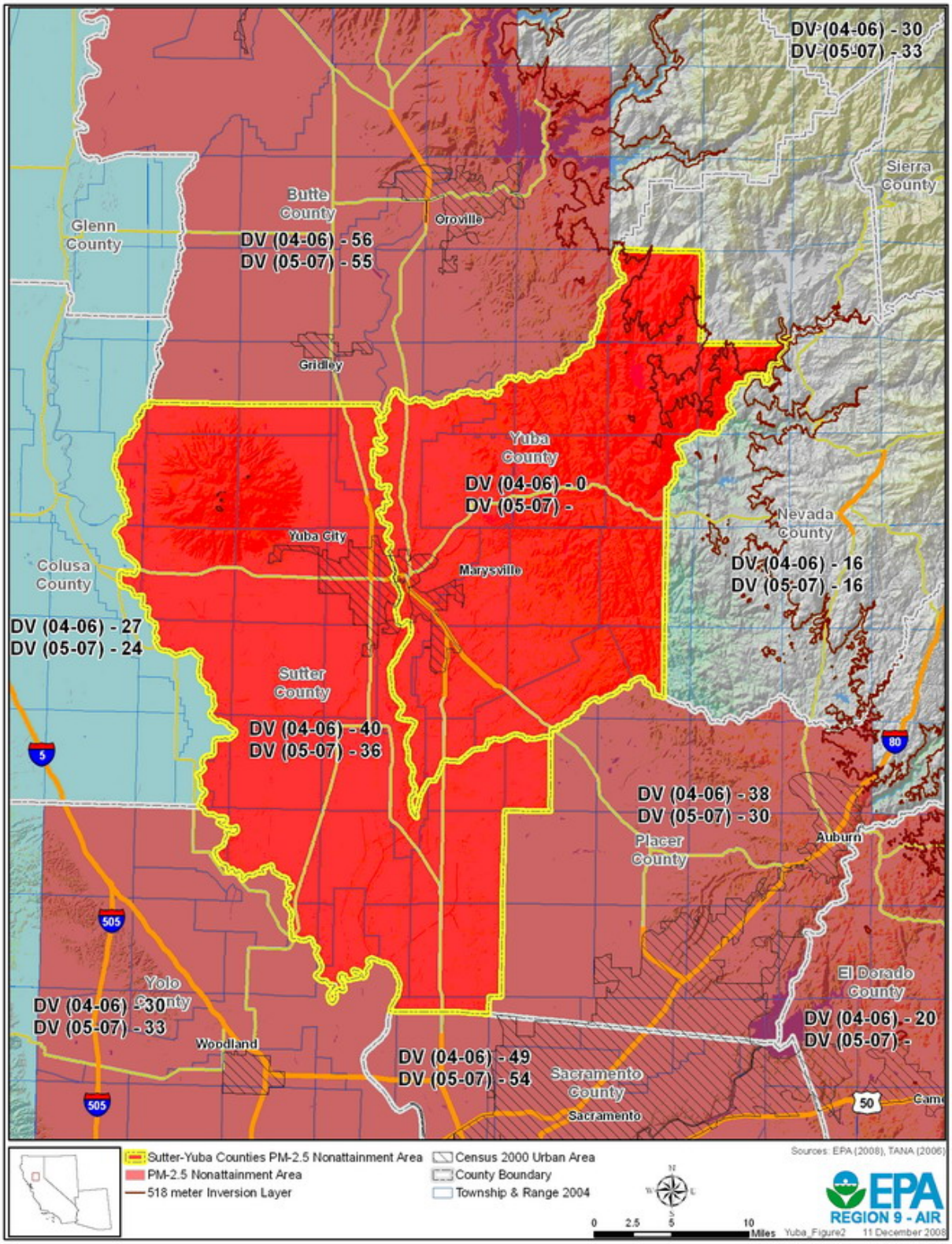

DV (04-06) - 30
DV (05-07) - 33
Sierra County
Butte County
Glenn County
Oroville
DV (04-06) - 56
DV (05-07) - 55
Gridley
Yuba County
DV (04-06) - 0
DV (05-07) -
Nevada County
DV (04-06) - 16
DV (05-07) - 16
Yuba City
Marysville
Colusa County
DV (04-06) - 27
DV (05-07) - 24
Sutter County
DV (04-06) - 40
DV (05-07) - 36
DV (04-06) - 38
DV (05-07) - 30
Placer County
Auburn
Yolo County
DV (04-06) - 30
DV (05-07) - 33
Woodland
DV (04-06) - 49
DV (05-07) - 54
Sacramento County
Sacramento
El Dorado County
DV (04-06) - 20
DV (05-07) -
Sutter-Yuba Counties PM-2.5 Nonattainment Area
PM-2.5 Nonattainment Area
518 meter Inversion Layer
Census 2000 Urban Area
County Boundary
Township & Range 2004
Sources: EPA (2008), TANA (2006)
EPA REGION 9 - AIR
0 2.5 5 10 Miles
Yuba_Figure2 11 December 2008

Figure 1

California sent a letter to EPA, dated December 17, 2007, recommending that Yuba City and the City of Marysville be designated as "nonattainment" for the 2006 24-hour $PM_{2.5}$ standard based on the most recent three years of air quality data, from 2004 – 2006 that were available in December 2007. These data are from a Federal Reference Method (FRM) monitor located in Yuba City, California.

In August 2008, EPA notified California of its intended designations. In this letter, EPA also requested that if California wished to provide comments on EPA's intended designation, it should do so by October 20, 2008. EPA stated that it would consider any additional information (e.g., on power plants or partial county areas) provided by the state in making final decisions on the designations.

Based on EPA's technical analysis described below and currently available information, EPA has designated Sutter County and a portion of Yuba County as nonattainment for the 24-hour $PM_{2.5}$ air-quality standard. These counties are listed in the table below.

Yuba City-Marysville Area	State-Recommended Nonattainment Counties	EPA-Final Designated Nonattainment Counties
California	Sutter County (partial)	Sutter County
California	Yuba County (partial)	Yuba County (partial)

The following is the technical analysis for the of the Yuba City-Marysville 24-hour $PM_{2.5}$ nonattainment area.

Factor 1: Emissions data

For this factor, EPA evaluated county level emission data for the following $PM_{2.5}$ components and precursor pollutants: "$PM_{2.5}$ emissions total," "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other," "SO_2," "NO_x," "VOCs," and "NH_3." "$PM_{2.5}$ emissions total" represents direct emissions of $PM_{2.5}$ and includes: "$PM_{2.5}$ emissions carbon," "$PM_{2.5}$ emissions other", primary sulfate (SO_4), and primary nitrate. (Although primary sulfate and primary nitrate, which are emitted directly from stacks rather than forming in atmospheric reactions with SO_2 and NO_x, are part of "$PM_{2.5}$ emissions total," they are not shown on the template or data spreadsheet as separate items). "$PM_{2.5}$ emissions carbon" represents the sum of organic carbon (OC) and elemental carbon (EC) emissions, and "$PM_{2.5}$ emissions other" represents other inorganic particles (crustal). Emissions of SO_2 and NO_x, which are precursors of the secondary $PM_{2.5}$ components sulfate and nitrate, are also considered. VOCs (volatile organic compounds) and NH_3 (ammonia) are also potential $PM_{2.5}$ precursors and are included for consideration.

Emissions data were derived from the 2005 National Emissions Inventory (NEI), version 1. See http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html.

EPA also considered the Contributing Emissions Score (CES) for each county. The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Note that this metric is not the exclusive manner for considering data for these factors. A summary of the

CES is included in Attachment 2, and a more detailed description can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.

Table 1 shows emissions of $PM_{2.5}$ and precursor pollutants components (given in tons per year) and the CES for violating and potentially contributing counties in the Yuba City-Marysville area.

Table 1. $PM_{2.5}$ 24-hour Component Emissions, and CES

County	State Recommended NA	CES	$PM_{2.5}$ emissions Total	$PM_{2.5}$ emission Carbon	$PM_{2.5}$ Emissio other	SOx	NOx	VOCs	NH_3
Yuba	Yes (P)	18	677	372	305	372	3,342	3,357	3,342
Sutter	Yes (P)	100	1,805	801	1,004	189	5,878	4,314	1,590
Butte	Yes (P)	27	2,974	2,115	8,486	1,513	1,461	9,754	1,757
Glenn	No	5	1,851	1,347	3,882	833	1,017	4,392	2,139
Nevada	No	3							
Sacra-mento	Yes	24	4,240	2,255	1,985	3,307	33,183	26,828	5,786
San Joaquin	Yes	5	3,308	1,577	1,730	3,087	29,663	19,051	20,262
Yolo	Yes (P)	4	2,014	818	1,196	585	11,101	6,537	2,099

P = partial

Butte, Sacramento, San Joaquin, and Yolo Counties are already included within other nonattainment areas, so were not considered further for the Yuba-Marysville area. Glenn and Nevada counties have very low CES scores and low emissions, so were not considered further.

Additional data considered in EPA's analysis of this factor are summarized in the following table derived from the California Air Resources Board Almanac of Emissions and Air Quality Data (http://www.arb.ca.gov/Aqd/almanac/almanac.htm). The following table further defines, in tons per day, the types of area sources contributing to $PM_{2.5}$ emissions in Yuba and Sutter Counties. Area sources include residential fuel combustion, farming operations, construction/demolition, paved road dust, unpaved road dust, fugitive windblown dust, fires, managed burning and disposal and cooking. As is indicated, area sources represent the largest percentage of primary $PM_{2.5}$ emissions (approximately 70%) and the balance is divided between stationary and mobile sources.

Table 2. Area Source $PM_{2.5}$ Emissions (Tons per day)

SOURCE	Sutter County	Yuba County
Residential Fuel Combustion	0.63	0.62
Farming Operations	0.78	0.22
Construction/Demolition	0.06	0.02
Paved Road Dust	0.23	0.17
Unpaved Road Dust	0.23	0.28
Fugitive Windblown Dust	0.18	0.03
Fires	0.00	0.00
Managed Burning & Disposal	0.60	0.63
Cooking	0.03	0.02

Total Area Wide	2.75	2.00
Area Wide percent of total	64%	78%
Total All	4.31	2.55
Source: ARB Almanac website (2006) http://www.arb.ca.gov/ei/maps/statemap/cntymap.htm		

Given the significance of NOx emissions in the formation of the $PM_{2.5}$, EPA also considered emissions provided in the CARB recommendation letter under this factor, along with the NOx data from the NEI summarized in Table 1. The following table summarizes NOx emissions from stationary, area, and mobile source categories for 2006, 2010 and 2020.

Table 3. NOx Winter Emissions for Yuba and Sutter Counties (tons per day)

Sutter County	**2006**	**2010**	**2020**
Stationary Sources	3.6	3.9	3.9
Area Sources	0.9	0.8	0.8
Mobile Sources	14.3	12.9	6.9
Yuba County			
Stationary Sources	0.7	0.7	0.7
Area Sources	0.5	0.5	0.5
Mobile Sources	6.2	6.6	4.9
Source: California Air Resources Board in their letter of December 17, 2007			

The CES shown in Table 1 describe the relative contribution of emissions from Sutter County to the high emission days in Yuba County based on a broad analysis of NOAA HYSPLIT trajectories linking county-wide emissions from Sutter County and Yuba County and speciated air monitoring data on high days. With respect to this factor, the CES does not show a significant link between the two counties even though the major cities within each county are part of the same metropolitan statistical area.

$PM_{2.5}$ speciation data from the Yuba air monitoring station was considered in evaluating this factor as a way to link emission sources to high $PM_{2.5}$ levels. EPA originally relied on data for Chico, a similar city to the north, but CARB subsequently supplied data for the Yuba City monitor. As shown in the pie chart below (Figure 2), the chemical composition of $PM_{2.5}$ in Yuba City is dominated by organic carbon, for which the source is residential wood burning. There is also a large ammonium nitrate contribution. This is discussed further below, under Factor 2: Air quality data.

NOx emissions were considered, since NOx is a precursor to the ammonium nitrate portion of $PM_{2.5}$. According to the $PM_{2.5}$ speciation data in Figure 3, as much as 38% of the $PM_{2.5}$ composition can be nitrates and is thereby related to NOx sources in the winter. Both Table 1 and 3 describe NOx emissions data for Yuba and Sutter Counties and, as shown in Table 3, mobile sources are the dominant source of NOx emissions. In light of the commuting patterns discussed under Factor 4 and illustrated in Figure 5, there appears to be a clear link between mobile source emissions and the $PM_{2.5}$ exceedances measured in Yuba City.

In summary, $PM_{2.5}$ exceedances most often occur in Yuba City during the winter months and $PM_{2.5}$ speciation data suggest that residential wood combustion and mobile source emissions are the most important sources. Area source data show that residential wood combustion is the

dominant source of $PM_{2.5}$ and therefore is a principal cause of $PM_{2.5}$ exceedances measured in Yuba City. With respect to mobile sources, both Yuba and Sutter Counties have relatively significant mobile source emissions which, combined with the commuting patterns, suggest a link between exceedances in Yuba City and emissions from both counties.

Factor 2: Air quality data

This factor considers the 24-hour $PM_{2.5}$ design values in micrograms per cubic meter ($\mu g/m^3$) for air quality monitors based on data for the 2004-2006 and 2005-2007 period. A monitor's design value indicates whether that monitor attains a specified air-quality standard. The 24-hour $PM_{2.5}$ standards are met when the 3-year average of a monitor's 98^{th} percentile values are 35 $\mu g/m^3$ or less. A design value is only valid if minimum data completeness criteria are met.

The violating monitor in the Yuba City-Marysville area is located in Yuba City in Sutter County, with a design value of 39$\mu g/m^3$ for 2005-2007. The 24-hour $PM_{2.5}$ design values for counties in the Yuba City-Marysville area are shown in Table 5.

Table 5. Air Quality Data

County/ City	State Recommended Nonattainment	CES	24-hr $PM_{2.5}$ Design Values 2004-06 ($\mu g/m^3$)	24-hr $PM_{2.5}$ Design Values 2005-07 ($\mu g/m^3$)
Sutter County	Yes (P)	100	40	39
Yuba County	Yes (P)	18	No data	No data
P = Partial County				

Based on factor 2, Sutter County is a candidate for a $PM_{2.5}$ nonattainment designation. Although there is no monitor in Yuba County, it is important to note that the city of Marysville in Yuba County is part of a single urban area with Yuba City, and there are no topographic features that separate or distinguish the two cities. Consequently, both counties are candidates for $PM_{2.5}$ nonattainment status.

EPA considered the chemical composition (speciation) of $PM_{2.5}$ in evaluating this factor. EPA originally relied on data for Chico, a similar city to the north, but CARB subsequently supplied speciation data for the Yuba City monitor. As shown in the pie chart below (Figure 2), the chemical makeup of $PM_{2.5}$ in Yuba City is dominated by organic carbon, for which the source is residential wood burning. There is also a large ammonium nitrate contribution. The highest concentrations occur during the winter months (i.e., November through February), as shown in the time series chart below (Figure 3).

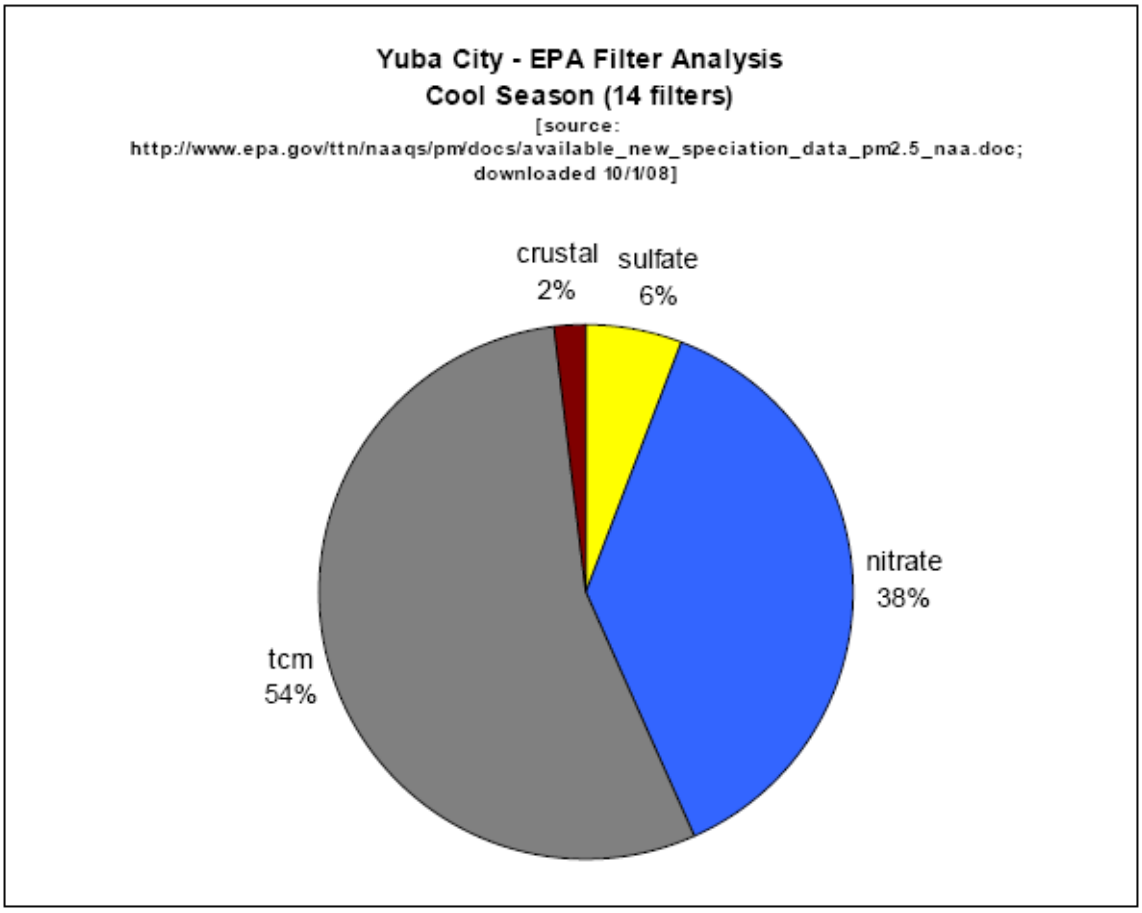


Figure 3. $PM_{2.5}$ Composition, Yuba City, Sutter County (CARB)

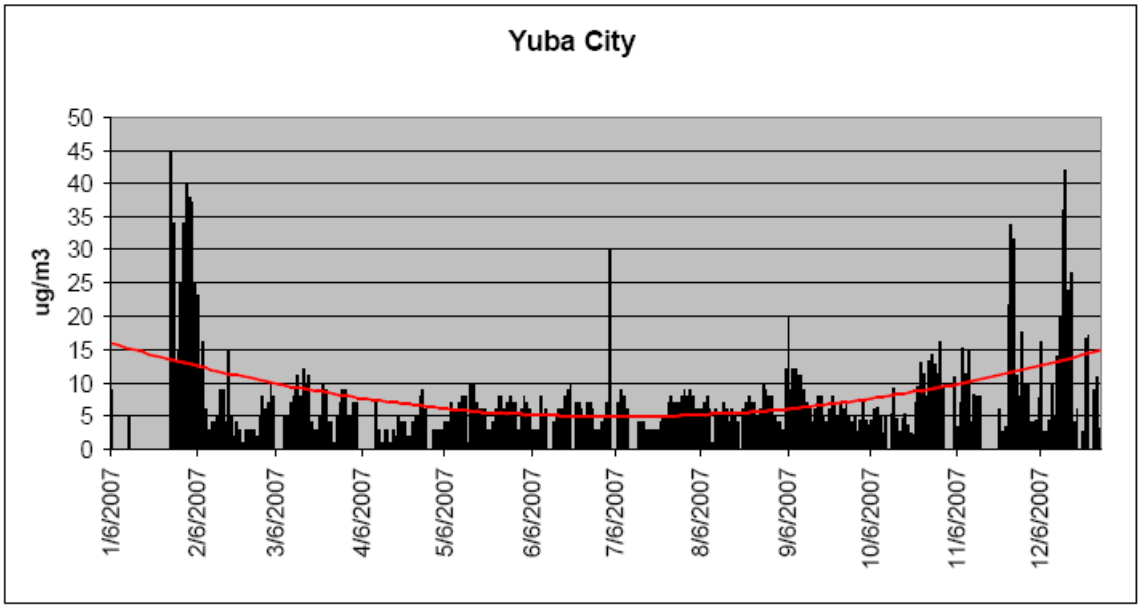


Figure 4. Seasonal Pattern of PM2.5, Yuba City, Sutter County (CARB)

These data support the CARB conclusion that residential wood combustion is the dominant source of $PM_{2.5}$. As much as 54% of the $PM_{2.5}$ composition is carbon which can be attributed to residential wood combustion during the winter months. However, there is also a large nitrate contribution. Ammonium nitrate is formed in the atmosphere from precursor NOx emissions on a time scale of several hours or more, and so has a correspondingly larger spatial scale as the wind moves the pollutant during those hours. This supports designating a larger area than just the city boundaries, since NOx emissions from a larger area contribute to the ammonium nitrate portion of $PM_{2.5}$ violations.

In summary, the air quality factor supports nonattainment designation of Sutter County, which contains the violating monitor, and also at least large portions of Yuba County. $PM_{2.5}$ speciation data support the idea that localized residential wood combustion on stagnant winter nights is what pushes the monitor into violation, but also support a larger area that includes sources contributing to the ammonium nitrate portion of violations.

Eligible monitors for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) at population-oriented locations with an FRM monitor. All data from Special Purpose Monitors (SPM) using an FRM is eligible for comparison to the relevant NAAQS, subject to the requirements given in the October 17, 2006 Revision to Ambient Air Monitoring Regulations (71 FR 61236). All monitors used to provide data must meet the monitor siting and eligibility requirements given in 71 FR 61236 to 61328 in order to be acceptable for comparison to the 24-hr $PM_{2.5}$ NAAQS for designation purposes.]

Factor 3: Population density and degree of urbanization (including commercial development)

Population data are relevant in defining the boundaries of the $PM_{2.5}$ nonattainment area given the correlation between population and the emission sources contributing to $PM_{2.5}$ exceedances (i.e., residential wood combustion and mobile sources), as well as the population exposed to high $PM_{2.5}$ levels. Table 6 summarizes 2005 population and population density data (population per square mile) for each county in the area being evaluated and Figure 5 below shows the distribution of populations in Sutter and Yuba County.

Table 6. Population

County	State Recommended Nonattainment	2005 Population	2005 Population Density (pop/sq mi)	% Population Change (2000-2005)
Sutter	Yes (P)	89,005	146	12%
Yuba	Yes (P)	67,144	104	11%
Glenn	No	27,683	21	
Nevada	No			

P = partial

Both Sutter and Yuba Counties have moderate population numbers and a relatively high population density. In addition to the recommended area of Yuba City-Marysville, Figure 5 indicates there is significant population in areas outside the boundaries of these two cities, radiating out from the center, but entirely within Yuba and Sutter counties. This factor supports a

larger nonattainment area than California recommended, to capture these surrounding populations.

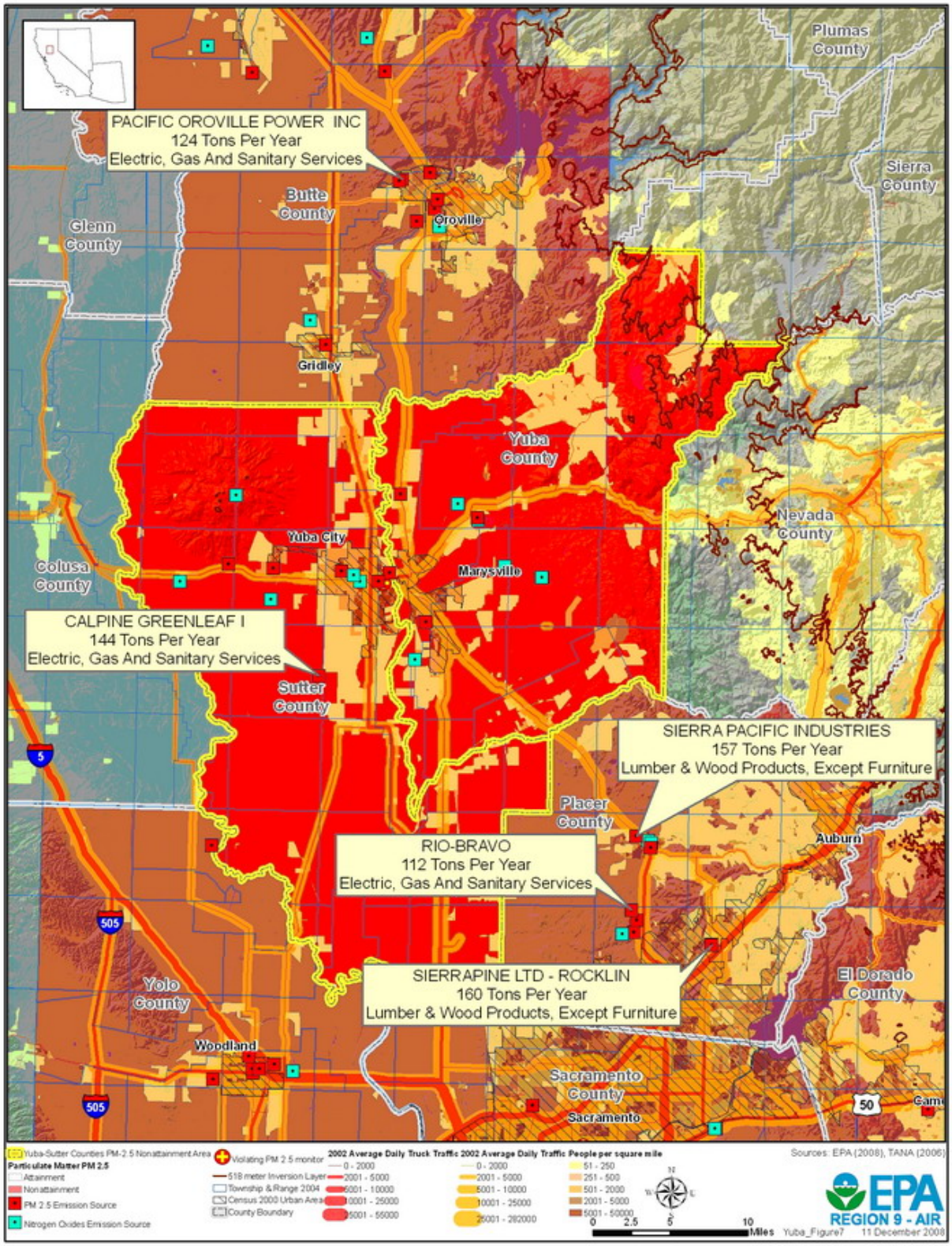

PACIFIC OROVILLE POWER INC
124 Tons Per Year
Electric, Gas And Sanitary Services
CALPINE GREENLEAF I
144 Tons Per Year
Electric, Gas And Sanitary Services
SIERRA PACIFIC INDUSTRIES
157 Tons Per Year
Lumber & Wood Products, Except Furniture
RIO-BRAVO
112 Tons Per Year
Electric, Gas And Sanitary Services
SIERRAPINE LTD - ROCKLIN
160 Tons Per Year
Lumber & Wood Products, Except Furniture
Plumas County
Sierra County
Butte County
Glenn County
Oroville
Gridley
Yuba County
Nevada County
Yuba City
Marysville
Colusa County
Sutter County
Placer County
Auburn
El Dorado County
Yolo County
Woodland
Sacramento County
Sacramento
5
505
50
Yuba-Sutter Counties PM-2.5 Nonattainment Area
Particulate Matter PM 2.5
Attainment
Nonattainment
PM 2.5 Emission Source
Nitrogen Oxides Emission Source
Violating PM 2.5 monitor
518 meter Inversion Layer
Township & Range 2004
Census 2000 Urban Area
County Boundary
2002 Average Daily Truck Traffic
2002 Average Daily Traffic
People per square mile
Sources: EPA (2008), TANA (2006)
EPA
REGION 9 - AIR
Miles
Yuba_Figure7
11 December 2008

Figure 5.

Attachment 3 has a chart that shows the area, population, car traffic and truck traffic for Yuba and Sutter Counties as a whole, as well as just for the nonattainment area. The numbers clearly reflect that the population and traffic numbers are substantial, and that most of the population and traffic is captured within the nonattainment area.

Factor 4: Traffic and commuting patterns

This factor considers the number of commuters in each county who drive to another county within the Yuba City-Marysville area, the percent of total commuters in each county who commute to other counties within the Yuba City-Marysville area, as well as the total Vehicle Miles Traveled (VMT) for each county in millions of miles (see Table 7). A county with numerous commuters is generally an integral part of an urban area and is likely contributing to fine particle concentrations in the area.

Table 7. Traffic and Commuting Patterns

County	State Recommended Non-attainment	2005 VMT (millions)	Number Commuting to any violating counties	Percent Commuting to any violating counties	Number Commuting into & within statistical area	Percent Commuting into & within statistical area
Sutter County, CA	Yes (P)	757	20,410	67 %	22,760	75%
Yuba County, CA	Yes (P)	497	6,420	29 %	16,750	77%

Although Yuba County's contribution to traffic levels in Sutter County is small (29%), these data may not adequately take into account heavy-duty diesel truck traffic. Highway 99 traverses both Yuba and Sutter Counties with daily average truck traffic in the range of 5001 to 10,000 trucks. In addition, Highway 65 crosses Yuba County with daily average traffic ranging from 10,001 to 25,000 cars. Therefore, both counties have a high level of traffic not associated with commuting, which could also contribute to $PM_{2.5}$ emissions in this area.

The 2005 VMT data used for table 6 and 7 of the 9-factor analysis have been derived using methodology such as that described in "Documentation for the 2005 Mobile National Emissions Inventory, Version 2," December 2008, prepared for the Emission Inventory Group, U.S. EPA. This document may be found at: ftp://ftp.epa.gov/EmisInventory/2005_nei/mobile_sector/documentation/2005_mobile_nei_version_2_report.pdf

Factor 5: Growth rates and patterns

This factor looks at expected population for 2000-2005 and growth in vehicle miles traveled (VMT) for 2000-2005 for Yuba and Sutter Counties. Table 8 lists counties in descending order based on VMT growth between 2000 and 2005.

Table 7 Population Growth

County	Population (2005)	2005 Population Density (pop/sq mi)	Population Growth (2000 - 2005)	Population % change (2000 - 2005)	2005 VMT (1000s mi)	VMT % change from 2000-2005
Sutter	89,005	146	10,680	12%	757	23
Yuba	67,144	104	7,385	11%	497	(6)

While both Sutter and Yuba Counties experienced population growth from 2000 to 2005, only Sutter County had a growth in VMT (23%) for the years 1996 to 2005 while Yuba County experienced a decrease of 6% during the years 1996 to 2002.

Based on the amount of population growth from 2000 to 2005, and despite the decrease in VMT from 1996 to 2005, Yuba County is a candidate for $PM_{2.5}$ nonattainment status. Sutter County is a candidate due to increases in population growth and VMT.

Factor 6: Meteorology (weather/transport patterns)

For this factor, EPA considered data from National Weather Service instruments in the area. Wind direction and wind speed data for 2004-2006 were analyzed, with an emphasis on "high $PM_{2.5}$ days" for each of two seasons (an October-April "cold" season and a May-September "warm" season). These high days are defined as days where any FRM or FEM air quality monitors had 24-hour $PM_{2.5}$ concentrations above 95% on a frequency distribution curve of $PM_{2.5}$ 24-hour values, or were 24-hr values exceeded 35 $\mu g/m^3$.

For each air quality monitoring site, EPA developed a "pollution rose" to understand the prevailing wind direction and wind speed on the days with highest fine particle concentrations. The figure identifies 24-hour $PM_{2.5}$ values by color; days exceeding 35 $\mu g/m^3$ are denoted with a red or black icon. A dot indicates the day occurred in the warm season; a triangle indicates the day occurred in the cool season. The center of the figure indicates the location of the air quality monitoring site, and the location of the icon in relation to the center indicates the direction from which the wind was blowing on that day. An icon that is close to the center indicates a low average wind speed on that day. Higher wind speeds are indicated when the icon is further away from the center.

The pollution rose for Sutter County below (Figure 6) indicates that the elevated levels of the $PM_{2.5}$ 24-hour values for the Yuba City monitoring site occur primarily when the wind is from the south, and occasionally when the wind is from the north. The pollutant rose for Sutter County also indicates that elevated $PM_{2.5}$ 24-hour values occur during the cool season, during time periods of low wind speeds.

Figure 6

The analysis provided by California stated that for Yuba City/Marysville:

> ". . . cool temperatures, low windspeeds, low inversion layers, and high humidity during the late fall and winter favor the formation of ammonium nitrate, while sunny warmer conditions during the spring and summer favor the formation of ammonium sulfate, as well as the formation of secondary organic aerosols."

The pollutant rose data are consistent with the analysis provided by California, and may also support the CARB position that the organic carbon portion of the particulate matter problem is localized. However, as discussed in Factor 2: Air Quality, above, locations at least 5 – 10 miles beyond the city boundaries could experience high $PM_{2.5}$ concentrations and which could contribute to $PM_{2.5}$ violations.

This factor, together with Factors 1 and 2, supports the EPA designation of all of Sutter County and large portions of Yuba County as a nonattainment area for the 24-hour $PM_{2.5}$ NAAQS.

Note: the meteorology factor is also considered in each county's Contributing Emissions Score because the method for deriving this metric included an analysis of trajectories of air masses for high $PM_{2.5}$ days.

Factor 7: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis looks at physical features of the land that might have an effect on the airshed and, therefore, on the distribution of $PM_{2.5}$ over the Yuba City-Marysville area.

As shown in the maps, Yuba City (with the violating monitor) is in Sutter County, while Marysville is directly across the Feather River in Yuba County. Together, the two counties encompass 1,252 square miles. The Feather River Air Quality Management District (AQMD), which is the local jurisdiction for both cities, is part of the larger Northern Sacramento Valley Air Basin (NSVAB). The NSVAB is bounded on the north and west by the Coastal Mountain Range and on the east by the southern portion of the Cascade Mountain Range and the northern portion of the Sierra Nevada Mountains. Although a significant area of the NSVAB is above 100 feet sea level, the majority of the Feather River AQMD is located in the relatively flat, valley floor and foothill regions. The valley is often subjected to inversion layers that, coupled with geographic barriers and high summer temperatures, create a high potential for air pollution problems.

For the areas under consideration, high $PM_{2.5}$ concentrations mostly occur during stagnant conditions during winter, with radiation inversions. The cooling of the ground, as heat is radiated away, creates an inversion, since air near the ground is cooler than that above. This inhibits mixing and confines pollutants to a relatively shallow layer near the ground. Ferreria and Shipp examined the meteorology of San Joaquin Valley $PM_{2.5}$ and PM_{10} episodes, including

inversion heights, typically based on aircraft temperature soundings. ("Historical Meteorological Analysis in Support of the 2003 San Joaquin Valley PM10 State Implementation Plan: Final Report", Shawn R. Ferreria, Evan M. Shipp, San Joaquin Valley Air Pollution Control District, January 24, 2005) During CRPAQS, radio acoustic sounding system (RASS) data were also available. A typical value for maximum mixing height during high $PM_{2.5}$ conditions is 500 m (1635 ft) AGL (above ground level) . EPA recognizes that an inversion height is not a rigid boundary extending through a fixed elevation. In reality the inversion would be partly terrain-following, and the degree of stagnation would be subject to additional influences at the foothill edges, such as strong diurnal slope flows. In any case, mixing heights vary by site and date, so any single height can provide only a scale for comparison, not a definitive value. Nevertheless, the inversion height provides an indicator of the area over which inversions may be enhancing pollution concentrations, and of the extent of the area that may be contributing to NAAQS violations.

Because the Yuba area has topographical features higher than the typical daytime height of the inversion layer, to help determine an appropriate eastern boundary EPA considered the inversion height to estimate the size of the area likely to have similar pollution conditions and to contribute to NAAQS violations. The eastern portion of Yuba County extends into the foothills of the Sierra Nevada Mountains. For Yuba, the 500 m AGL (1635 ft) inversion layer thickness translates to an elevation contour of 518 m (1699 ft) MSL (above Mean Sea Level). Much of eastern portion Yuba County is above this elevation, as shown in Figure 7 below.

To the west, there is no topographic barrier. Thus, all of Sutter county may be experiencing and contributing to $PM_{2.5}$ violations.

The geography/topography factor supports including most of Yuba County and all of Sutter County in the $PM_{2.5}$ nonattainment area.

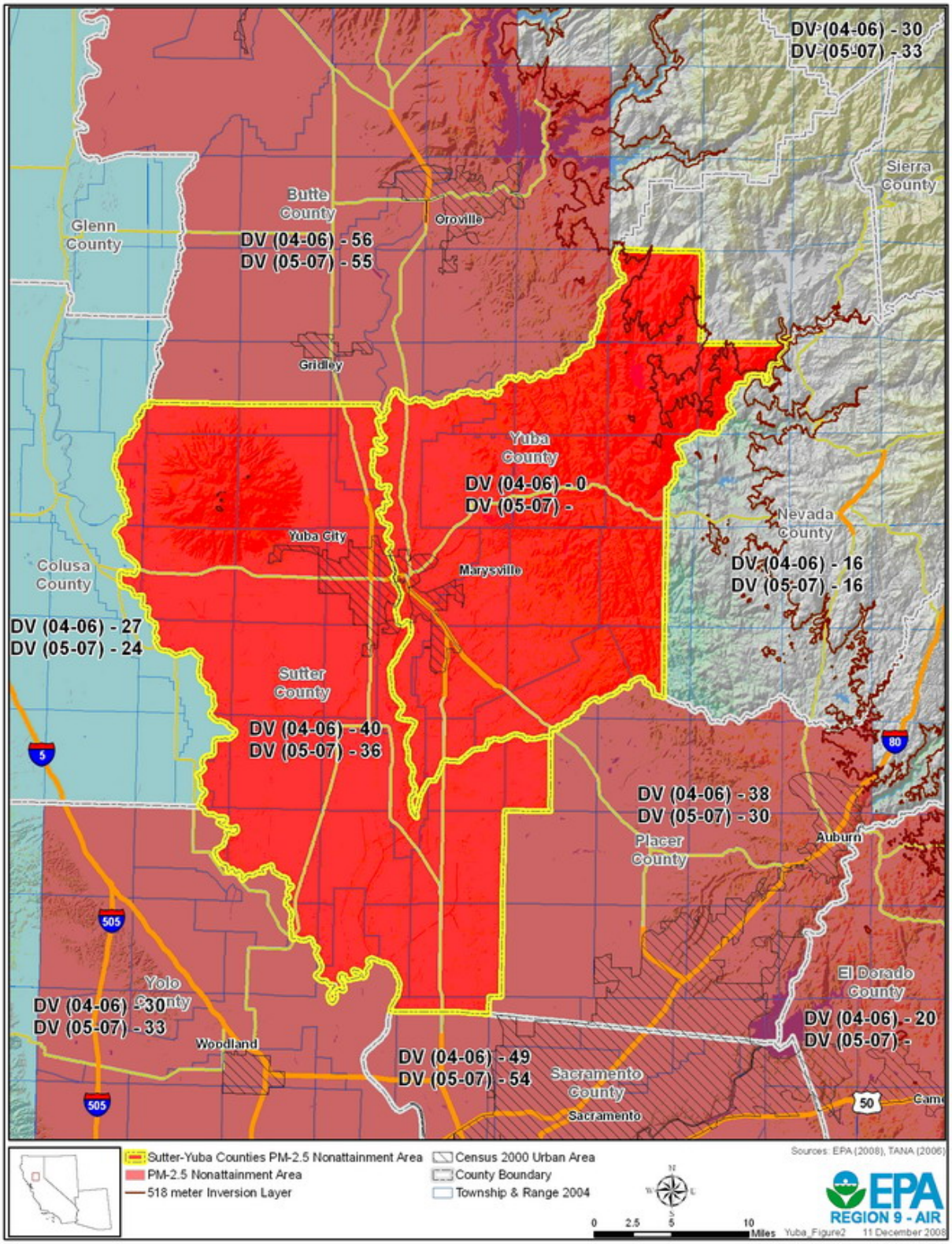

DV (04-06) - 30
DV (05-07) - 33
Sierra County
Butte County
Oroville
Glenn County
DV (04-06) - 56
DV (05-07) - 55
Gridley
Yuba County
DV (04-06) - 0
DV (05-07) -
Nevada County
DV (04-06) - 16
DV (05-07) - 16
Yuba City
Marysville
Colusa County
DV (04-06) - 27
DV (05-07) - 24
Sutter County
DV (04-06) - 40
DV (05-07) - 36
DV (04-06) - 38
DV (05-07) - 30
Placer County
Auburn
Yolo County
DV (04-06) - 30
DV (05-07) - 33
Woodland
El Dorado County
DV (04-06) - 20
DV (05-07) -
DV (04-06) - 49
DV (05-07) - 54
Sacramento County
Sacramento
Sutter-Yuba Counties PM-2.5 Nonattainment Area
PM-2.5 Nonattainment Area
518 meter Inversion Layer
Census 2000 Urban Area
County Boundary
Township & Range 2004
Sources: EPA (2008), TANA (2006)
EPA
REGION 9 - AIR
0 2.5 5 10 Miles
Yuba_Figure2 11 December 2008

Figure 7

Factor 8: Jurisdictional boundaries (e.g., existing PM and ozone areas)

EPA believes consideration also should be given to existing boundaries and organizations as they may facilitate air quality planning and the implementation of control measures to attain the standard. Yuba City-Marysville is classified as attainment for the 1997 $PM_{2.5}$ NAAQS and for PM_{10}, and the southern portion of Sutter County is included in the 8-hour ozone Sacramento nonattainment area. The analysis of jurisdictional boundaries considered the planning and organizational structure of the Yuba City-Marysville area to determine if the implementation of controls in a potential nonattainment area can be carried out in a cohesive manner.

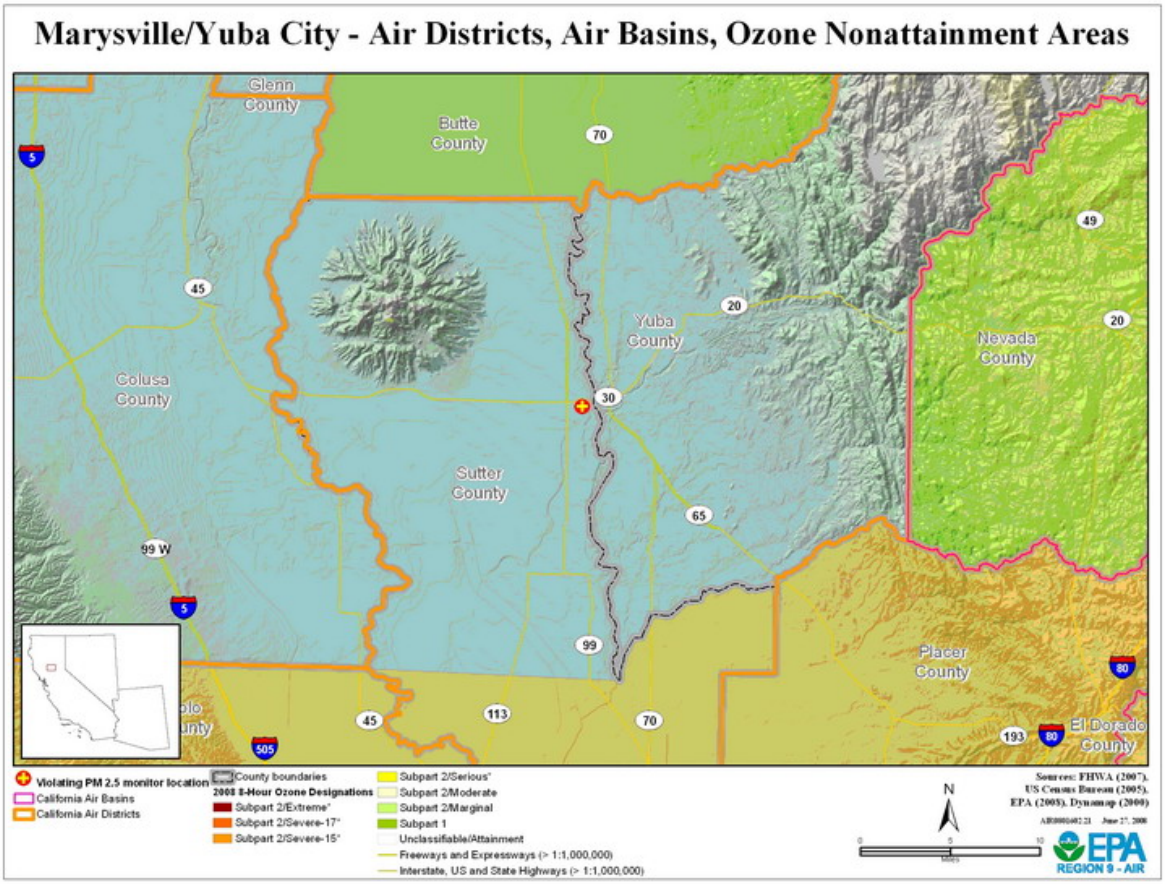


Figure 8

EPA's final designation places little emphasis on existing nonattainment boundaries, especially in setting the boundary for Yuba and Sutter Counties. Instead, more weight was placed on the areas generating pollution likely to contribute to NAAQS violations. Both Yuba and Sutter counties are located in the Northern Sacramento Valley Air Basin and share the same meteorology and topography. The Feather River Air Quality Management District (AQMD) includes Sutter and Yuba Counties in their entirety. Despite the fact that only Sutter County has a violating monitor, both counties are candidates for the $PM_{2.5}$ nonattainment status based on the shared meteorology and geography, and they both are under the jurisdiction of the Feather River AQMD.

Factor 9: Level of control of emission sources

This factor considers emission controls currently implemented for major sources in Yuba and Sutter Counties. There are no large contributing sources that have been excluded from the Sacramento nonattainment area.

The emission estimates on Table 1 (under Factor 1) include any control strategies implemented by Yuba and Sutter Counties before 2005 that may influence emissions of any component of $PM_{2.5}$ emissions (i.e., total carbon, SO_2, NOx, and crustal $PM_{2.5}$).

Conclusion

EPA is designating the whole of Sutter County, and the lower elevation portions of Yuba County, as nonattainment for the $PM_{2.5}$ NAAQS. The nonattainment area boundaries are supported by the overall weight-of-evidence after evaluation of all of the relevant factors. EPA considered. Sutter County contains a violating $PM_{2.5}$ monitor, located in Yuba City. The cities of Marysville in Yuba County and Yuba City in Sutter County constitute a single urban area, connected by population and traffic distributions. Both cities have substantial residential wood combustion emissions of carbon, the largest component of $PM_{2.5}$ violations. Despite evidence that the effect of these sources is relatively localized, these sources are not limited to the city boundaries, nor is their influence. Also, ammonium nitrate, mainly from mobile source NOx emissions, is an important $PM_{2.5}$ component; its larger spatial scale justifies including relatively large portions of the counties within the nonattainment area. There is no topographic barrier to the west, so high concentrations and contributing emissions may be occurring throughout Sutter County. By contrast, the winter inversions that lead to $PM_{2.5}$ NAAQS exceedances limit the vertical extent of pollution, and the Sierra foothills to the east provide a corresponding topographic barrier to the east. This and the relatively small population and emissions in eastern Yuba County justify excluding it from the Yuba City-Marysville 24-hour $PM_{2.5}$ nonattainment area.

Additional information regarding responses to specific State comments can be found in EPA's Response to Comments document at http://www.epa.gov/pmdesignations/2006standards/tech.htm.]

Attachment 2

Description of the Contributing Emissions Score

The CES is a metric that takes into consideration emissions data, meteorological data, and air quality monitoring information to provide a relative ranking of counties in and near an area. Using this methodology, scores were developed for each county in and around the relevant metro area. The county with the highest contribution potential was assigned a score of 100, and other county scores were adjusted in relation to the highest county. The CES represents the relative maximum influence that emissions in that county have on a violating county. The CES, which reflects consideration of multiple factors, should be considered in evaluating the weight of evidence supporting designation decisions for each area.

The CES for each county was derived by incorporating the following significant information and variables that impact $PM_{2.5}$ transport:

- Major $PM_{2.5}$ components: total carbon (organic carbon (OC) and elemental carbon (EC)), SO_2, NO_x, and inorganic particles (crustal).
- $PM_{2.5}$ emissions for the highest (generally top 5%) $PM_{2.5}$ emission days (herein called "high days") for each of two seasons, cold (Oct-Apr) and warm (May-Sept)
- Meteorology on high days using the NOAA HYSPLIT model for determining trajectories of air masses for specified days
- The "urban increment" of a violating monitor, which is the urban $PM_{2.5}$ concentration that is in addition to a regional background $PM_{2.5}$ concentration, determined for each $PM_{2.5}$ component
- Distance from each potentially contributing county to a violating county or counties

A more detailed description of the CES can be found at http://www.epa.gov/ttn/naaqs/pm/pm25_2006_techinfo.html#C.

Attachment 3: Population and Traffic Data

County	County Area (sq. miles)	Nonattainment Area (sq. miles)
Butte	1,677.50	1,158.33
El Dorado	1,787.99	620.92
Imperial	4,481.67	690.54
Placer	1,501.86	432.38
Sacramento	992.04	992.04
Sutter	608.39	608.39
Yolo	1,023.36	698.67
Yuba	643.57	482.77
Solano (SV)	470.55	470.55
Solano (SF)	419.01	419.01
County	County Population	Nonattainment Area Population
Butte	203,171.00	196,300.00
El Dorado	156,299.00	110,528.00
Imperial	142,361.00	122,775.00
Placer	248,399.00	207,156.00
Sacramento	1,223,499.00	1,223,499.00
Sutter	78,930.00	78,930.00
Yolo	168,660.00	163,193.00
Yuba	60,219.00	56,293.00
Solano (SV)	120,697.00	120,697.00
Solano (SF)	273,845.00	273,845.00
County	County Annual Non-truck Traffic	Nonattainment Area Annual Non-truck Traffic
Butte	2,237,170.00	2,225,913.00
El Dorado	1,573,738.00	1,547,018.00
Imperial	1,677,333.00	1,229,867.00
Placer	4,777,401.00	4,548,701.00
Sacramento	33,510,398.00	33,510,398.00
Sutter	361,416.00	361,416.00
Yolo	4,677,258.00	4,671,958.00
Yuba	426,377.00	422,677.00
Solano (SV)	3,988,735.00	3,988,735.00
Solano (SF)	12,301,618.00	12,301,618.00
County	County Annual Truck Traffic	Nonattainment Area Annual Truck Traffic
Butte	169,932.00	169,280.00
El Dorado	86,212.00	84,588.00
Imperial	229,338.00	139,186.00
Placer	422,876.00	400,706.00
Sacramento	2,515,749.00	2,515,749.00
Sutter	33,714.00	33,714.00
Yolo	614,874.00	614,512.00
Yuba	23,724.00	23,036.00
Solano (SV)	369,035.00	369,035.00
Solano (SF)	933,605.00	933,605.00

Sources: U.S. Census Department (2000), Federal Highway Administration (2002), EPA (2008)