CALIFORNIA:

Imperial County, Los Angeles-South Coast Air Basin, Plumas County, San Joaquin Valley Area Designations

for the

2012 Primary Annual $PM_{2.5}$ National Ambient Air Quality Standard

Technical Support Document

1.0 Summary

In accordance with Section 107(d) of the Clean Air Act (CAA), the EPA must promulgate designations for all areas of the country. In particular, the EPA must identify those areas that are violating a National Ambient Air Quality Standard (NAAQS) or contributing to a violation of the NAAQS in a nearby area. The EPA must complete this process within 2 years of promulgating a new or revised NAAQS, or may do so within 3 years under circumstances not relevant to these designations.[1] This technical support document (TSD) describes the areas in California the EPA is designating as nonattainment for the 2012 primary annual fine particle NAAQS (2012 annual $PM_{2.5}$ NAAQS).[2]

Under section 107(d), states are required to submit area designation recommendations to the EPA for the 2012 annual $PM_{2.5}$ NAAQS no later than 1 year following promulgation of the standard, or by December 13, 2013. In November 2013, California recommended that the counties and partial counties identified in Table 1 be designated as "nonattainment" for the 2012 annual $PM_{2.5}$ NAAQS based on air quality data from 2010-2012. As also reflected in Table 1, California amended its recommendation for Plumas County on July 2, 2014 based on preliminary air quality data from 2011-2013. Tribes are also able to submit area designations under section 107(d), on a similar timeline as States, and designation of a State area may also impact Indian country. More information on tribal designations for the 2012 annual $PM_{2.5}$ NAAQS is below.

After considering these recommendations and based on the EPA's technical analysis as described in this TSD, the EPA is designating the areas listed in Table 1 as nonattainment for the 2012 annual $PM_{2.5}$ standard. The EPA must

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[1] Section 107(d) of the CAA requires the EPA to complete the initial designation process within 2 years of promulgation of a new or revised NAAQS, unless the Administrator has insufficient information to make initial designation decisions in the 2-year time frame. In such circumstances, the EPA may take up to 1 additional year to make initial area designation decisions (i.e., no later than 3 years after promulgation of the standard).

[2] On December 14, 2012, the EPA promulgated a revised primary annual $PM_{2.5}$ NAAQS (78 FR 3086, January 15, 2013). In that action, the EPA revised the primary annual $PM_{2.5}$ standard, strengthening it from 15.0 micrograms per cubic meter ($\mu g/m^3$) to 12.0 $\mu g/m^3$.

designate an area nonattainment if it has an air quality monitoring site[3] that is violating the standard or if it has sources of emissions that are contributing to a violation of the NAAQS in a nearby area. Legal descriptions (e.g., county boundaries, townships and ranges) of these areas are found below in the supporting technical analysis for each area. As provided in CAA section 188(a), the EPA will initially classify all nonattainment areas as "Moderate" nonattainment areas.

Table 1. State's or Tribe's Recommended Nonattainment Areas and EPA's Nonattainment Areas for the 2012 annual $PM_{2.5}$ NAAQS

Area	State's/Tribe's Recommended Nonattainment Counties or Areas of Indian country	EPA's Nonattainment Counties or Areas of Indian country
Imperial County, CA	Imperial County (partial)	Imperial County (partial)
Los Angeles-South Coast Air Basin[a]	Los Angeles County (partial) Orange County Riverside County (partial) San Bernardino County (partial)	Los Angeles County (partial) Orange County Riverside County (partial) San Bernardino County (partial)
• Cahuilla Band of Mission Indians of the Cahuilla Reservation	• did not submit recommendation	• Cahuilla Band of Mission Indians of the Cahuilla Reservation
• Morongo Band of Mission Indians	• did not submit recommendation	• Morongo Band of Mission Indians
• Ramona Band of Cahuilla	• did not submit recommendation	• Ramona Band of Cahuilla
• San Manuel Band of Mission Indians	• did not submit recommendation	• San Manuel Band of Mission Indians
• Soboba Band of Luiseño Indians	• did not submit recommendation	• Soboba Band of Luiseño Indians
Plumas County, CA	Plumas County (partial)	Plumas County (partial)

[3] In accordance with 40 CFR 50 Appendix N, $PM_{2.5}$ measurements from the primary monitor and suitable collocated $PM_{2.5}$ FRM, FEM or ARMs may be used in a "combined site data record" to establish a $PM_{2.5}$ design value to determine whether the NAAQS is met or not met at a particular $PM_{2.5}$ monitoring site.

San Joaquin Valley, CA[b]	Fresno County Kern County (partial) Kings County Madera County Merced County San Joaquin County Stanislaus County Tulare County	Fresno County Kern County (partial) Kings County Madera County Merced County San Joaquin County Stanislaus County Tulare County
• Big Sandy Rancheria of Western Mono Indians	• did not submit recommendation	• Big Sandy Rancheria of Western Mono Indians
• Cold Springs Rancheria of Mono Indians of California	• did not submit recommendation	• Cold Springs Rancheria of Mono Indians of California
• Northfork Rancheria of Mono Indians of California	• did not submit recommendation	• Northfork Rancheria of Mono Indians of California
• Picayune Rancheria of Chuckchansi Indians of California	• did not submit recommendation	• Picayune Rancheria of Chuckchansi Indians of California
• Santa Rosa Indian Community of the Santa Rosa Rancheria	• did not submit recommendation	• Santa Rosa Indian Community of the Santa Rosa Rancheria
• Table Mountain Rancheria of California	• did not submit recommendation	• Table Mountain Rancheria of California
• Tule River Indian Tribe of the Tule River Reservation	• did not submit recommendation	• Tule River Indian Tribe of the Tule River Reservation

[a] Los Angeles-South Coast Air Basin is a multi-jurisdictional nonattainment area that includes areas of Indian country of Federally-recognized tribes. Table 1 identifies the tribal lands that the EPA is designating as part of the nonattainment area. The areas of Indian country of each tribe that the EPA also is designating as part of the nonattainment area are discussed further in Section 3, Technical Analysis.
[b] San Joaquin Valley Air Basin is a multi-jurisdictional nonattainment area that includes areas of Indian country of Federally-recognized tribes. Table 1 identifies the tribal lands that the EPA is designating as part of the nonattainment area. The areas of Indian country of each tribe that the EPA also is designating as part of the nonattainment area are discussed further in Section 3, Technical Analysis.

In December 2013, the Pechanga Band of Luiseño Mission Indians of the Pechanga Reservation (Pechanga) recommended that their portion of Indian country be designated "unclassifiable" for the 2012 annual $PM_{2.5}$ NAAQS. On August 19, 2014, the EPA sent Pechanga a letter conveying our preliminary designations and informing Pechanga of the opportunity to provide additional information for the EPA to consider in its final designations. In October 2014, Pechanga responded by providing a revised recommendation of "attainment/unclassifiable" based on complete, certified 2011-2013 monitoring data. After considering Pechanga's recommendations, the EPA is designating Pechanga unclassifiable/attainment.

In its 2013 recommendation letter and additional July 2, 2014 recommendation, California recommended that the EPA designate as "unclassifiable/attainment" all other counties and partial counties not identified in the State's/Tribe's Recommendation Column of Table 1. For state lands, the EPA agrees with the State's recommendation for nonattainment for the Los Angeles-South Coast Air Basin, San Joaquin Valley, Imperial County (partial), and Plumas County (partial). The EPA is designating the remainder of state lands in California as unclassifiable/attainment based on the State's recommendation, ambient monitoring data collected during the

2011-2013 period showing compliance with the 2012 annual $PM_{2.5}$ NAAQS, and the EPA's assessment that those unclassifiable/attainment areas within the State are not likely to be contributing to nearby violations.[4,5]

The EPA has included the areas of Indian country of federally recognized tribes in the Los Angeles-South Coast Air Basin and San Joaquin Valley listed in Table 1 in the nonattainment areas, based on the technical analysis described in Section 3.0. All tribes are being designated in accordance with two guidance documents finalized in 2011 by the EPA's Office of Air Quality, Planning, and Standards: *Guidance to Regions for Working with Tribes during the National Ambient Air Quality Standard (NAAQS) Designations Process*[6] and the *Policy for Establishing Separate Air Quality Designations for Areas of Indian Country*[7]. The EPA is designating all of the Indian country of five tribes in the Los Angeles-South Coast Air Basin and all of the Indian country of seven tribes in the San Joaquin Valley as part of these multi-jurisdictional nonattainment areas. The EPA offered consultation in accordance with *EPA's Policy on Coordination and Consultation with Indian Tribes*[8].

2.0 Nonattainment Area Analyses and Boundary Determination

The EPA evaluated and determined the boundaries for each nonattainment area on a case-by-case basis considering the specific facts and circumstances unique to the area. In accordance with the CAA section 107(d), the EPA is designating as nonattainment not only the area with the monitoring sites that violate the 2012 annual $PM_{2.5}$ NAAQS, but also those nearby areas with emissions sources that contribute to the violation in the violating area. As described in EPA guidance[9], after identifying each monitoring site indicating a violation of the standard in an area, the EPA analyzed those areas with emissions contributing to that violating area by considering those counties in the entire metropolitan area (e.g., Core Based Statistical Area (CBSA) or Combined Statistical Area (CSA)) in which the violating monitoring sites are located. The EPA also evaluated counties adjacent to the CBSA or CSA that have emissions sources with the potential to contribute to the violations. The EPA uses the CBSA or CSA as a starting point for the contribution analysis because those areas are nearby for purposes of the $PM_{2.5}$ NAAQS. Based upon relevant facts and circumstances in each area, the designated nonattainment area could be larger or smaller that the CBSA or CSA. The EPA's analytical approach for nonattainment areas is described in section 3 of this technical support document.

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[4] Unless a state or tribe has specifically identified jurisdictional boundaries in their area recommendations, when determining "remainder of the state," EPA will use Federal Information Processing Standard (FIPS) codes maintained by the National Institute of Standards and Technology (NIST), which are used to identify counties and county equivalents (e.g., parishes, boroughs) of the United States and its unincorporated territories (e.g., American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and the US Virgin Islands). Available on EPA's Envirofacts website at *http://www.epa.gov/envirofw/html/codes/state.html*.

[5] EPA uses a designation category of "unclassifiable/ attainment" for areas that are monitoring attainment and for areas that do not have monitoring sites but which the EPA believes are likely attainment and does not emissions sources that are contributing to nearby violations based on the five factor analysis and other available information.

[6] *http://www.epa.gov/ttn/caaa/t1/memoranda/20120117naaqsguidance.pdf*

[7] *http://www.epa.gov/ttn/caaa/t1/memoranda/20120117indiancountry.pdf*

[8] *http://www.epa.gov/tp/pdf/cons-and-coord-with-indian-tribes-policy.pdf*

[9] EPA issued guidance on April 16, 2013, that identified important factors that EPA intended to evaluate, in making a recommendation for area designations and nonattainment boundaries for the 2012 annual $PM_{2.5}$ NAAQS. Available at *http://www.epa.gov/pmdesignations/2012standards/docs/april2013guidance.pdf.*

3.0 Technical Analysis

In this technical analysis, the EPA used the latest data and information available to the EPA (and to the states and tribes through the $PM_{2.5}$ Designations Mapping Tool[10] and the EPA PM Designations Guidance and Data web page[11]) and/or data provided to the EPA by states or tribes. This technical analysis identifies the areas with monitoring sites that violate the 2012 annual $PM_{2.5}$ standard. The EPA evaluated these areas and other nearby areas with emissions sources or activities that potentially contribute to ambient fine particle concentrations at the violating monitors in the area based on the weight of evidence of the five factors recommended in EPA guidance and any other relevant information.

These five factors are:

Factor 1: Air Quality Data. The air quality data analysis involves examining available ambient $PM_{2.5}$ air quality monitoring data at, and in the proximity of, the violating monitoring locations. This includes reviewing the design values (DV) calculated for each monitoring location in the area based on air quality data for the most recent complete 3 consecutive calendar years of quality-assured, certified air quality data in the EPA's Air Quality System (AQS). In general, the EPA identifies violations using data from suitable Federal Reference Method (FRM), Federal Equivalent Method (FEM), and/or Approved Regional Method (ARM) monitors sited and operated in accordance with 40 CFR Part 58.[12] Procedures for using the air quality data to determine whether a violation has occurred are given in 40 CFR part 50 Appendix N, as revised by a final action published in the Federal Register on January 15, 2013 (78 FR 3086).[13] In addition to reviewing data from violating monitor sites, the EPA also assesses the air quality data from other monitoring locations to help ascertain the potential contribution of sources in areas nearby to the violating monitoring sites. Examples include using chemical speciation data to help characterize contributing emissions sources and the determination of nearby contributions through analyses that differentiate local and regional source contributions.

Factor 2: Emissions and emissions-related data. The emissions analysis examines identified sources of direct $PM_{2.5}$, the major components of direct $PM_{2.5}$ (primary organic carbon/organic mass, elemental carbon, crustal material (and/or individual trace metal compounds)), primary nitrate and primary sulfate, and precursor gaseous pollutants (e.g., SO_2, NO_X, total VOC, and NH_3). Emissions data are generally derived from the most recent National Emissions Inventory (NEI) (i.e., 2011 NEI version 1), and are given in tons per year. The emission estimates are based on the "2011ed" air quality modeling platform.[14] Although many emissions inventory components of the "2011ed" modeling platform derive from the 2011 NEIv1, there are some differences between

[10] EPA's $PM_{2.5}$ Designations Mapping Tool can be found at *http://geoplatform2.epa.gov/PM_MAP/index.html*.
[11] EPA's PM Designations Guidance and Data web page can be found at *http://www.epa.gov/pmdesignations/2012standards/techinfo.htm*.
[12] Suitable monitors include all FEM and/or ARMs except those specific continuous FEMs/ARMs used in the monitoring agency's network where the data are not of sufficient quality such that data are not to be compared to the NAAQS in accordance with 40 CFR part 58.10(b)(13) and approved by the EPA Regional Administrator per 40 CFR part 58.11(e).
[13] As indicated in Appendix N to 40 CFR part 50, Interpretation of the National Ambient Air Quality Standards for $PM_{2.5}$, section 3(a) indicates "Except as otherwise provided in this appendix, all valid FRM/FEM/ARM $PM_{2.5}$ mass concentration data produced by suitable monitors that are required to be submitted to AQS, or otherwise available to EPA, meeting the requirements of part 58 of this chapter including appendices A, C, and E shall be used in the DV (design value) calculations. Generally, EPA will only use such data if they have been certified by the reporting organization (as prescribed by § 58.15 of this chapter); however, data not certified by the reporting organization can nevertheless be used, if the deadline for certification has passed and EPA judges the data to be complete and accurate."
[14] *http://www.epa.gov/ttn/chief/emch/2011v6/outreach/2011v6_2018base_EmisMod_TSD_26feb2014.pdf*

the platform inventories and the 2011NEIv1 emissions. There are also some differences in PM emissions between the 2011 NEIv1 and "2011ed" due to the meteorological adjustments made for certain sectors. In some cases, the EPA may also evaluate emissions information from states, tribes, or other relevant sources that may not be reflected in the NEI. One example of "other information" could include an inventory or assessment of local/regional area sources that individually does not meet the current threshold for reporting to the NEI but collectively contributes to area $PM_{2.5}$ concentrations. Emissions data indicate the potential for a source to contribute to observed violations, making it useful in assessing boundaries of nonattainment areas.

Factor 3: Meteorology. Evaluating meteorological data helps to determine the effect on the fate and transport of emissions contributing to $PM_{2.5}$ concentrations and to identify areas potentially contributing to the violations at monitoring sites. The Factor 3 analysis includes assessing potential source-receptor relationships in the area identified for evaluation using summaries of air trajectories, wind speed, wind direction, and other meteorological data, as available.

Factor 4: Geography/topography. The geography/topography analysis includes examining the physical features of the land that might define the airshed and, therefore, affect the formation and distribution of $PM_{2.5}$ over an area. Mountains or other physical features may influence the fate and transport of emissions and $PM_{2.5}$ concentrations. Additional analyses may consider topographical features that cause local stagnation episodes via inversions, such as valley-type features that effectively "trap" air pollution, leading to periods of elevated $PM_{2.5}$ concentrations.

Factor 5: Jurisdictional boundaries. The analysis of jurisdictional boundaries identifies the governmental planning and organizational structure of an area that may be relevant for designations purposes. These jurisdictional boundaries provide insight into how the governing air agencies conduct or might conduct air quality planning and enforcement in a potential nonattainment area. Examples of jurisdictional boundaries include counties, air districts, areas of Indian country, CBSA or CSA, metropolitan planning organizations (MPOs), and existing nonattainment areas.

The EPA developed the area designations for all tribes in accordance with two guidance documents finalized in late 2011 by the EPA's Office of Air Quality, Planning, and Standards: *Guidance to Regions for Working with Tribes during the National Ambient Air Quality Standard (NAAQS) Designations Process*[15] and the *Policy for Establishing Separate Air Quality Designations for Areas of Indian Country*[16]; in addition to *EPA Policy on Consultation and Coordination with Indian Tribes.*[17] In accordance with these documents, the EPA notified tribes of the $PM_{2.5}$ designation process and their ability to consult with the EPA and provide designation recommendations in 2013 and again in May 2014. The EPA received recommendations from four tribes in 2013: the Gila River Indian Community, the Pechanga Band of Luiseño Mission Indians (Pechanga), the Pala Band of Mission Indians, and the Salt River Pima Maricopa Indian Community. The EPA received a revised recommendation from Pechanga in October 2014 and a request for consultation from the Soboba Band of Luiseño Indians (Soboba Band) in September 2014. The EPA consulted with the Soboba Band in September and described the designations process, the history of the $PM_{2.5}$ standard in the southern California area, and implications of the nonattainment designation for the Soboba Band. On October 2, 2014, the EPA sent a response letter to the tribe summarizing this discussion. The EPA has carefully evaluated and considered all tribal recommendations and feedback in the development of these designations.

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[15] *http://www.epa.gov/ttn/caaa/t1/memoranda/20120117naaqsguidance.pdf*.

[16] *http://www.epa.gov/ttn/caaa/t1/memoranda/20120117indiancountry.pdf*.

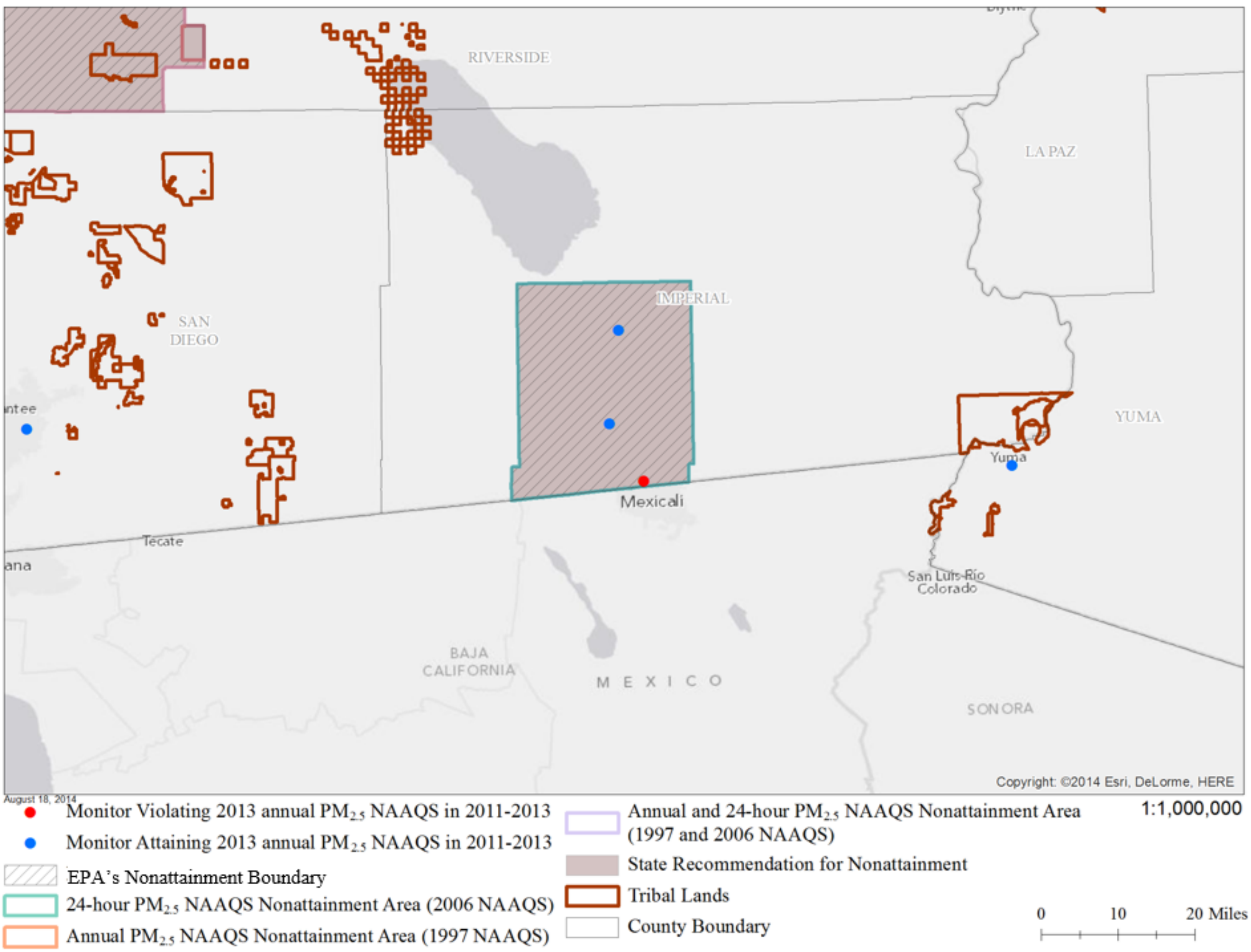
[17] *http://www.epa.gov/tp/pdf/cons-and-coord-with-indian-tribes-policy.pdf*

3.1 Area Background and Overview – Imperial County, CA

Figure 1 is a map of the EPA's nonattainment boundary for Imperial County. The map shows the location and design values of ambient air quality monitoring locations, county and other jurisdictional boundaries, the EPA's area of analysis, the State recommendation, and existing 2006 24-hour $PM_{2.5}$ NAAQS nonattainment boundaries.

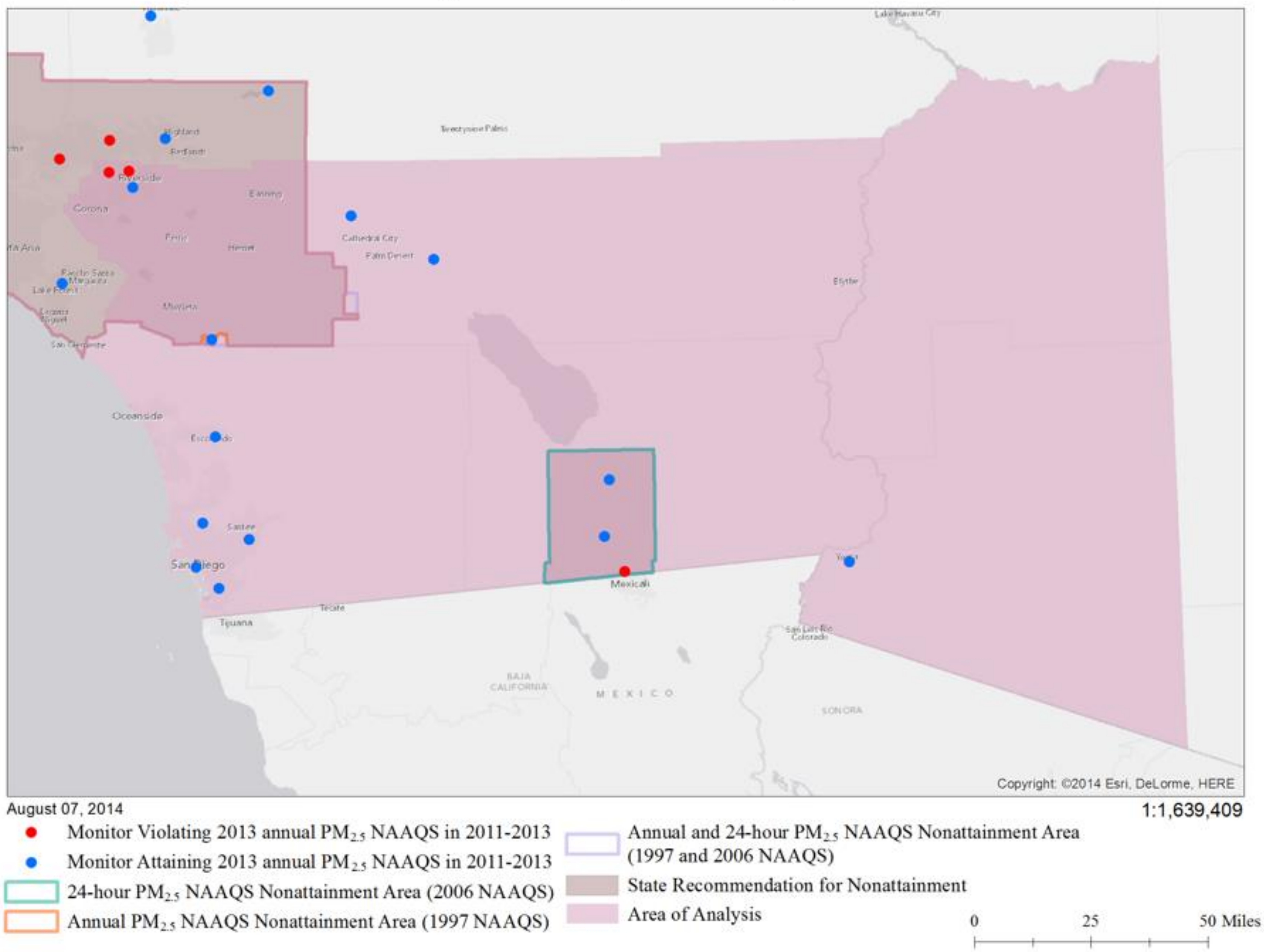
For purposes of the 2006 24-hour $PM_{2.5}$ NAAQS, this area was designated nonattainment. The boundary for the nonattainment area for the 2006 24-hour $PM_{2.5}$ NAAQS included a portion of Imperial County, CA. The boundary for the 2012 annual $PM_{2.5}$ NAAQS is a portion of Imperial County consistent with the existing 2006 24-hour $PM_{2.5}$ nonattainment area.

Figure 1. EPA's Nonattainment Boundaries for the Imperial County Area



The EPA must designate as nonattainment areas that violate the NAAQS and nearby areas that contribute to the violation in the violating area. Monitor data in Imperial County show a violation of the 2012 $PM_{2.5}$ NAAQS, thus the EPA needs to ascertain what areas contain sources of emissions that contribute to this violation. As shown in Figure 1a, the EPA evaluated each county located near the county with a violating monitoring site based on the five factors and other relevant information. In addition, because Imperial County itself includes a large geographic area, the EPA has also evaluated whether the nonattainment area should encompass all of Imperial County or only a smaller portion of such county in order to include the sources of emissions and emissions activities that are contributing to the violations of the NAAQS at the violating monitor. The following sections describe this five factor analysis process. While the factors are presented individually, they are not independent. The five factor analysis process carefully considers their interconnections and the dependence of each factor on one or more of the others.

Figure 1a. Area of Analysis for the Imperial County, CA Nonattainment Area



Factor 1: Air Quality Data

All data collected during the year are important when determining contributions to an annual standard such as the 2012 annual $PM_{2.5}$ NAAQS. Compliance with an annual NAAQS is dependent upon monitor readings throughout the year, including days with monitored ambient concentrations below the level of the NAAQS. This is somewhat different than the case for the 24-hour $PM_{2.5}$ NAAQS, where compliance is often dependent on a few days over the level of the NAAQS, which are typically associated with episodic conditions. For the 2012 annual $PM_{2.5}$ NAAQS, the annual mean is calculated as the mean of quarterly means. A high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV. Although all data are important, seasonal or episodic emissions can provide insight as to relative contributors to measured $PM_{2.5}$ concentrations. For these reasons, for the Factor 1 air quality analysis, the EPA assessed and characterized air quality at, and in the proximity of, the violating monitoring site locations first, by evaluating trends and the spatial extent of measured concentrations at monitors in the area of analysis, and then, by identifying the conditions most associated with high average concentration levels of $PM_{2.5}$ mass in the area of analysis.

In most cases, the EPA assessed air quality data on a seasonal, or quarterly, basis.[18] The EPA also identified the spatial extent of these high $PM_{2.5}$ concentrations. The mass and composition at the design value location represents contributions from various emission sources including local, area-wide (which may comprise nearby urban and rural areas) and regional sources. To determine the source mix (by mass) at the design value monitoring site, the EPA examined the chemical composition of the monitored $PM_{2.5}$ concentrations by pairing each violating FRM/FEM/ARM monitoring site with a collocated or nearby Chemical Speciation Network (CSN) monitoring site or sites. Then, the EPA contrasted the approximated mass composition at the design value monitoring site with data collected at IMPROVE[19] and other monitoring locations whose data are representative of regional background.[20,21] This comparison of local/area-wide chemical composition data to regional chemical composition data derives an "urban increment," which helps differentiate the influence of more distant emissions sources from

[18] Although compliance with the annual NAAQS depends on contributions from all days of the year, examining data on a quarterly or seasonal basis can inform the relationship between the temporal variability of emissions and meteorology and the resulting $PM_{2.5}$ mass and composition. In some areas of the country where there may be noticeable month-to-month variations in average $PM_{2.5}$, the quarterly averages may not adequately represent seasonal variability. In these areas, air quality data may be aggregated and presented by those months that best correspond to the local "seasons" in these areas.

[19] IMPROVE stands for Interagency Monitoring for Protected Visual Environments and is an aerosol monitoring network in mostly rural and remote areas.

[20] The "urban increment" analysis assesses and characterizes the increase in seasonal and annual average $PM_{2.5}$ mass and chemical constituents observed at violating monitoring site(s) relative to monitoring sites outside the area of analysis (which represent background concentrations). Developing the urban increment involves pairing a violating FRM/FEM/ARM monitor with a collocated monitor or nearby monitor with speciation data. EPA made every effort to pair these data to represent the same temporal and spatial scales. However, in some cases, the paired violating and CSN "urban" monitoring locations were separated by some distance such that the included urban CSN site(s) reflect(s) a different mixture of emissions sources, which could lead to misinterpretations. To generally account for differences in $PM_{2.5}$ mass between the violating site and the nearby CSN site(s), EPA determined material balance of the $PM_{2.5}$ composition at the violating site by assigning the extra measured $PM_{2.5}$ mass to the carbon components of $PM_{2.5}$. Where the general urban increment approach may be misleading, or in situations where non-carbonaceous emissions are believed to be responsible for a local $PM_{2.5}$ concentration gradient, EPA used alternative analyses to reflect the mix of urban and rural sources contributing to the measured concentrations at violating monitoring sites.

[21] The urban monitors were paired with any rural sites within a 150 mile radius of an urban site to calculate spatial means of the quarterly averages of each species. If there were no rural sites within 150 miles, then the nearest rural site was used alone. That rural mean was then subtracted from the quarterly mean of the urban site to get the increment. Negative values were simply replaced with zeros.

the influence of closer emissions sources, thus representing the portion of the measured violation that is associated with nearby emission contributions.[22,23,24]

<u>$PM_{2.5}$ Design Values and Total Mass Measurements</u> – The EPA examined ambient $PM_{2.5}$ air quality monitoring data represented by the DVs at the violating monitoring site and at other monitors in the area of analysis. The EPA calculated DVs based on air quality data for the most recent 3 consecutive calendar years of quality-assured, certified air quality data from suitable FEM/FRM/ARM monitoring sites in the EPA's Air Quality System (AQS). For this designations analysis, the EPA used data for the 2011-2013 period (i.e., the 2013 design value), which are the most recent years with fully-certified air quality data. A monitor's DV is the metric or statistic that indicates whether that monitor attains a specified air quality standard. The 2012 annual $PM_{2.5}$ NAAQS is met at a monitoring site when the 3-year average annual mean concentration is 12.0 micrograms per cubic meter ($\mu g/m^3$) or less (e.g., 12.1 $\mu g/m^3$ or greater is a violation). A DV is only valid if minimum data completeness criteria are met or when other regulatory data processing provisions are satisfied (See 40 CFR part 50 Appendix N). Table 2 identifies the current design value(s) (i.e., the 2013 DV) and the most recent two design values based on all monitoring sites in the area of analysis for the Imperial County nonattainment area.[25] Where a county has more than one monitoring location, the county design value is indicated in red type.

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[22] In most, but not all, cases, the violating design value monitoring site is located in an urban area. Where the violating monitor is not located in an urban area, the "urban increment" represents the difference between local and other nearby emission sources in the vicinity of the violating monitoring location and more regional sources.

[23] Hand, et. al. Spatial and Seasonal Patterns and Temporal Variability of Haze and its Constituents in the United States: Report V, June 2011. Chapter 7 – Urban Excess in $PM_{2.5}$ Speciated Aerosol Concentrations, *http://vista.cira.colostate.edu/improve/Publications/Reports/2011/PDF/Chapter7.pdf*

[24] US EPA, Office of Air Quality Planning and Standards, December 2004. (2004) Area Designations for 1997 Fine Particle ($PM_{2.5}$) Standards, Technical Support Document for State and Tribal Air Quality Fine Particle ($PM_{2.5}$) Designations, Chapter 3, Urban Excess Methodology. Available at *www.epa.gov/pmdesignations/1997standards/documents/final/TSD/Ch3.pdf*

[25] In certain circumstances, one or more monitoring locations within a monitoring network may not meet the network technical requirements set forth in 40 CFR 58.11(e), which states, "State and local governments must assess data from Class III $PM_{2.5}$ FEM and ARM monitors operated within their network using the performance criteria described in table C-4 to subpart C of part 53 of this chapter, for cases where the data are identified as not of sufficient comparability to a collocated FRM, and the monitoring agency requests that the FEM or ARM data should not be used in comparison to the NAAQS. These assessments are required in the monitoring agency's annual monitoring network plan described in §58.10(b) for cases where the FEM or ARM is identified as not of sufficient comparability to a collocated FRM…."

Table 2. Air Quality Data Collected at Regulatory Monitors (all DV levels in μg/m^3)[a]

County, State	Monitor Site ID	Site Name	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
Imperial, CA	060250005	Calexico-Ethel	Yes	13.9 [f]	14.1[f]	14.3[f]
Imperial, CA	060250007	Brawley	Yes	7.1	7.1	7.5
Imperial, CA	060251003	El Centro	Yes	7.4	7.2	7.4
La Paz, AZ	N/A		No	No monitor		
Riverside, CA	060651003	Riverside	Yes[e]	12	11.4	11.5
Riverside, CA	060652002	Indio	No	7.3	7.2	7.7
Riverside, CA	060655001	Palm Springs	No	6.2	6.2	6.4
Riverside, CA	060658001	Rubidoux	Yes[e]	14.2[c]	13.4 [c]	13.2 [c]
Riverside, CA	060658005	Mira Loma-Van Buren	Yes[e]	15.9 [c]	15.2 [c]	14.8 [c]
San Diego, CA	060730001	Chula Vista	No	10.3	9.8	9.9
San Diego, CA	060730003	El Cajon	No	11.8	10.6[c]	10.6[c]
San Diego, CA	060731002	Escondido	No	10.7	10.5[c]	10.7[c]
San Diego, CA	060731010	San Diego - Downtown	No	11.0	10.8[c]	10.8[c]
San Diego, CA	060731016	San Diego - Kearny Villa Road[d]	No	9.4	8.9	8.7
Yuma, AZ	040278011	Yuma Supersite	No	-	7.8	7.8[b]

[a] Where a county has more than one monitoring location, the county design value is indicated in red type.

[b] The listed design value is not valid due to completeness issues.

[c] This design value does not include data from Class III FEM monitors that EPA has approved as not eligible for comparison to the NAAQS per 40 CFR 58.11(e). Documents associated with this action available at www.regulations.gov, Docket ID No. EPA-HQ-OAR-2012-0918.

[d] In February 2012, the San Diego-Overland (Kearny Mesa) site (060730006) was relocated to the San Diego-Kearny Villa Road site (060731016). The data listed for the San-Diego-Kearny Villa Road site is a combination of data from San Diego-Overland from 2009 through February 17, 2012, and from San-Diego-Kearny Villa Road from February 21, 2012 through 2013.

[e] State recommended nonattainment as part of a separate nonattainment area. See the section of this document titled “Area Background and Overview – Los Angeles-South Coast Air Basin, CA” for more information.

[f] Design value based on all valid data, including data in 2011 and 2012 that were submitted to, but are not currently in, AQS. EPA considers these data valid for use per 40 CFR Part 50 and 58 (see Memorandum “Use of Data for Imperial County, CA $PM_{2.5}$ Design Value Calculations”).

In addition to the FEM/FRM/ARM monitoring sites identified in Table 2 whose collected data are used to calculate DVs, Imperial Irrigation District also operates the nonregulatory monitoring locations identified in Table 2a. These monitors are run to evaluate the evolution of the impact of the water diversion from the Salton Sea on air quality and are not required per 40 CFR 58.20 to be compared to the NAAQS. Although these nonregulatory monitors are not eligible for comparison to the NAAQS, the data collected may help define an appropriate boundary for areas with emissions sources or activities that potentially contribute to ambient fine particle concentrations at the violating monitor.

While the Salton Sea monitoring locations measure DVs below the 2012 annual $PM_{2.5}$ NAAQS, the daily and hourly data show episodic increases in $PM_{2.5}$ concentrations well above the NAAQS throughout the year that are likely associated with windblown dust and regional increases in $PM_{2.5}$ concentrations throughout Imperial County.

The episodic increases in $PM_{2.5}$ concentrations measured in this area suggests that the area surrounding the Salton Sea is likely a large contributing source of crustal material to $PM_{2.5}$ concentration in Imperial County. Generally, sources of crustal material in Imperial County contain a larger percentage of $PM_{2.5}$ than other areas, likely due to the unique soil characteristics in the area. Table 2a also shows an increase of 1.5 $\mu g/m^3$ from the 2010-2012 DV to the 2011-2013 DV for the Salton City monitoring location. Annual means for the Salton City monitoring location also increase from 2010 to 2013, suggesting that $PM_{2.5}$ concentrations may be increasing in the area surrounding the Salton Sea.

Table 2a. Air Quality Data Collected at Nonregulatory Monitors (all DV levels in $\mu g/m^3$)[26]

County, State	Monitor Site ID	Site Name	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
Imperial, CA	n/a	Salton City	No	-	7.1[a]	8.6[a]
Imperial, CA	n/a	Naval Test Base	No	-	5.0[a]	5.9[a]
Imperial, CA	n/a	Sonny Bono	No	-	6.5[a]	6.6[a]
Imperial, CA	n/a	Bombay Beach	No	-	6.0[a]	6.7[a]

[a] The listed design value is not valid due to completeness issues.

The Figure 1 map, shown previously, identifies the Imperial County nonattainment area and monitoring locations with 2011-2013 violating DVs. As indicated on the map, the one violating monitoring site within Imperial County is located in the City of Calexico near the United States/Mexico border and the City of Mexicali. This monitor is approximately 0.7 miles from the border with Mexico. The data at the Calexico-Ethel monitor show a slight increasing trend of 0.3 $\mu g/m^3$ from the 2009-2011 DV to the 2011-2013 DV. Further from the border with reduced potential impacts from border-related emissions sources are the Brawley and El Centro regulatory monitors. The monitors in the cities of El Centro and Brawley have a 7.4 $\mu g/m^3$ and 7.5 $\mu g/m^3$ 2011-2013 DV, respectively. These monitors are approximately 9and 22 miles from the border with Mexico, respectively. While these monitors do not currently record violations of the 2012 annual $PM_{2.5}$ NAAQS, they, like the Salton Sea monitors, indicate that elevated $PM_{2.5}$ concentrations exist in Imperial County beyond areas closer to the United States/Mexico border. These elevated ambient levels likely reflect that there are sources $PM_{2.5}$ and $PM_{2.5}$ precursors at locations in portions of Imperial County that are contributing to the violations of the 2012 annual $PM_{2.5}$ NAAQS at the Calexico-Ethel monitor, in addition to contributions that are likely coming from beyond the international border. Potential emission sources associated with these elevated concentrations will be discussed in Factor 2, and their potential contribution to measured violations at the Calexico-Ethel monitor in Factor 3.

Seasonal variation can highlight those conditions most associated with high average concentration levels of $PM_{2.5}$. Figure 2 shows quarterly mean $PM_{2.5}$ concentrations for the most recent 3-year period for the highest DV monitoring sites in each county within the area of analysis. Figure 2a shows quarterly mean $PM_{2.5}$ concentrations for the most recent 3-year period for all monitoring sites in Imperial County, allowing us to compare values over the past three years at monitors within the county. This type of graphical representation is particularly relevant when assessing air quality data for an annual standard, such as the 2012 annual $PM_{2.5}$ NAAQS, because, as previously stated, the annual mean is calculated as the mean of quarterly means and a high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV.

[26] Data from CARB's online Air Quality and Meteorological Information System (AQMIS2), available at http://www.arb.ca.gov/aqmis2/aqmis2.php . Data pulled June 2, 2014.

Figure 2. Imperial County Area of Analysis Monitors - $PM_{2.5}$ Quarterly Means for 2011-2013

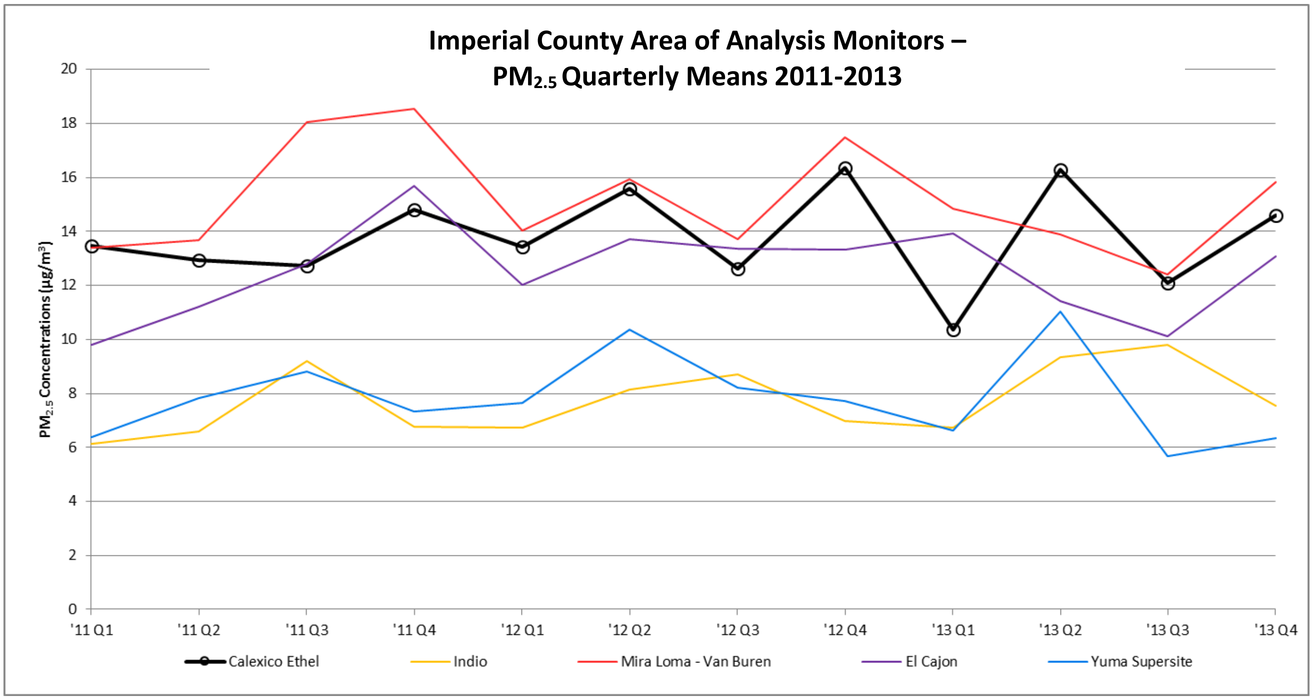
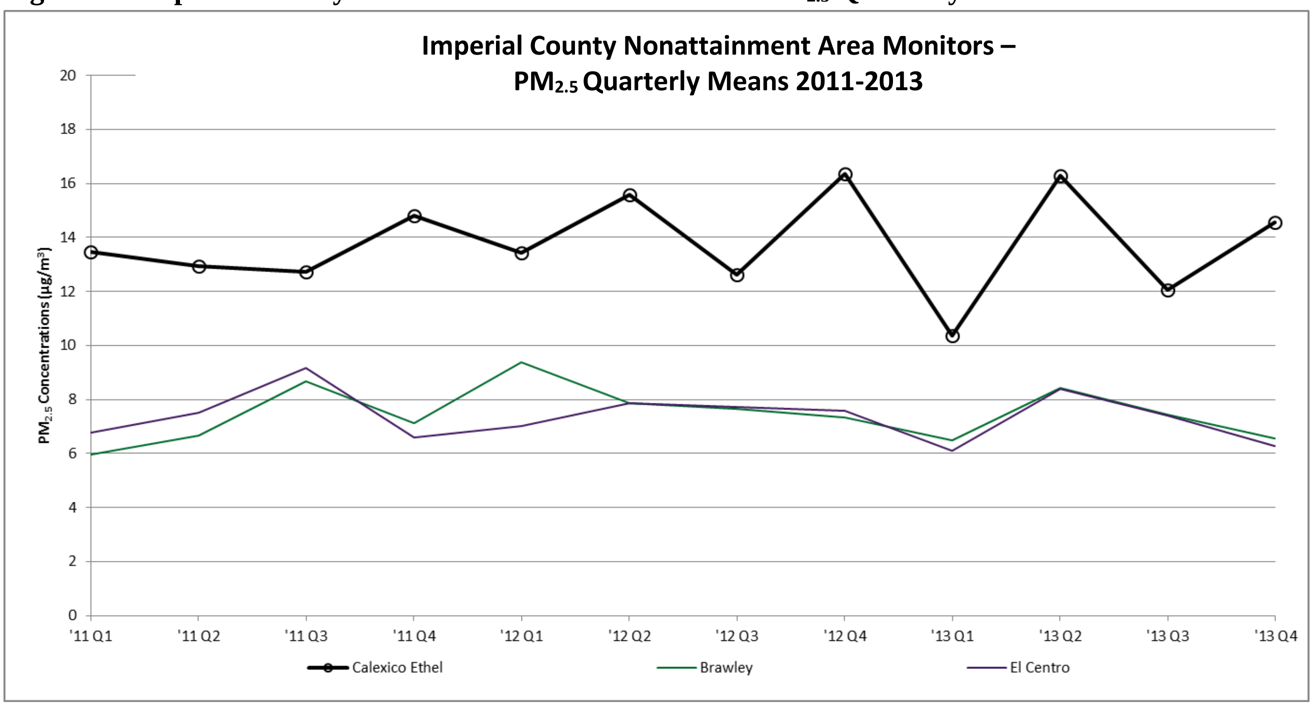


Figure 2a. Imperial County Nonattainment Area Monitors - $PM_{2.5}$ Quarterly Means for 2011-2013



As shown in Figure 2a, at the design value monitor (Calexico-Ethel) in Imperial County in 2012 and 2013, both quarters two (Q2) and four (Q4) measured higher $PM_{2.5}$ concentrations than other quarters of the year. Q2 is April through June and Q4 is October through December. As discussed further in Factor 3, increased concentrations and differences in meteorological patterns suggest that there are two different regimes of high $PM_{2.5}$ concentrations that contribute to violation of the NAAQS during these quarters. Also, all quarters from 2011 quarter one (Q1) through 2013 Q4 at Calexico Ethel measured quarterly averages above 12.0 µg/m^3, with the sole exception of Q1 in 2013, which measured a quarterly average of 10.4 µg/m^3. While the quarterly means and DVs for the Brawley and El Centro monitors are lower than the concentrations measured at Calexico Ethel, further evaluation of concentrations at these sites is warranted to determine whether sources in Imperial County impacting these monitors also contribute to violations at Calexico Ethel. As discussed further in Factors 2, 3, and 4, the areas surrounding these monitors contain numerous sources of $PM_{2.5}$ and $PM_{2.5}$ precursors along with meteorological conditions during portions of the year which are conducive to transport of $PM_{2.5}$ to the Calexico Ethel monitoring location.

$PM_{2.5}$ Composition Measurements - To assess potential emissions contributions for each violating monitoring location, the EPA determined the various chemical species comprising total $PM_{2.5}$ to identify the chemical constituents over the analysis area, which can provide insight into the types of emission sources impacting the monitored concentration. To best describe the $PM_{2.5}$ at the violating monitoring location, the EPA first adjusted the chemical speciation measurement data from a monitoring location at or near the violating FRM monitoring site using the SANDWICH approach to account for the amount of $PM_{2.5}$ mass constituents retained in the FRM measurement.[27,28,29,30] In particular, this approach accounts for losses in fine particle nitrate and increases in sulfate mass associated with particle bound water. Figure 3a illustrates the fraction of each $PM_{2.5}$ chemical constituent at the Calexico Ethel monitoring site based on annual averages for the years 2010-2012.

[27] SANDWICH stands for measured **S**ulfate, **A**djusted **N**itrate, **D**erived **W**ater, **I**nferred **C**arbonaceous mass **H**ybrid Material Balance Approach." The SANDWICH adjustment uses an FRM mass construction methodology that results in reduced nitrates (relative to the amount measured by routine speciation networks), higher mass associated with sulfates (reflecting water included in gravimetric FRM measurements) and a measure of organic carbonaceous mass derived from the difference between measured $PM_{2.5}$ and its non-carbon components. This characterization of $PM_{2.5}$ mass also reflects crustal material and other minor constituents. The resulting characterization provides a complete mass closure for the measured FRM $PM_{2.5}$ mass, which can be different than the data provided directly by the speciation measurements from the CSN network.

[28] Frank, N. H., SANDWICH Material Balance Approach for $PM_{2.5}$ Data Analysis, National Air Monitoring Conference, Las Vegas, Nevada, November 6-9, 2006. *http://www.epa.gov/ttn/amtic/files/2006conference/frank.pdf*.

[29] Frank, N. H., The Chemical Composition of $PM_{2.5}$ to support PM Implementation, EPA State /Local/Tribal Training Workshop: $PM_{2.5}$ Final Rule Implementation and 2006 $PM_{2.5}$ Designation Process, Chicago IL, June 20-21, 2007, *http://www.epa.gov/ttn/naaqs/pm/presents/pm2.5_chemical_composition.pdf.*

[30] Frank, N. H. *Retained Nitrate, Hydrated Sulfates, and Carbonaceous Mass in Federal Reference Method Fine Particulate Matter for Six Eastern U.S. Cities*. J. Air & Waste Manage. Assoc. 2006 56:500–511.

Figure 3a. Imperial County Annual Average $PM_{2.5}$ Chemical Constituents (2010-2012)

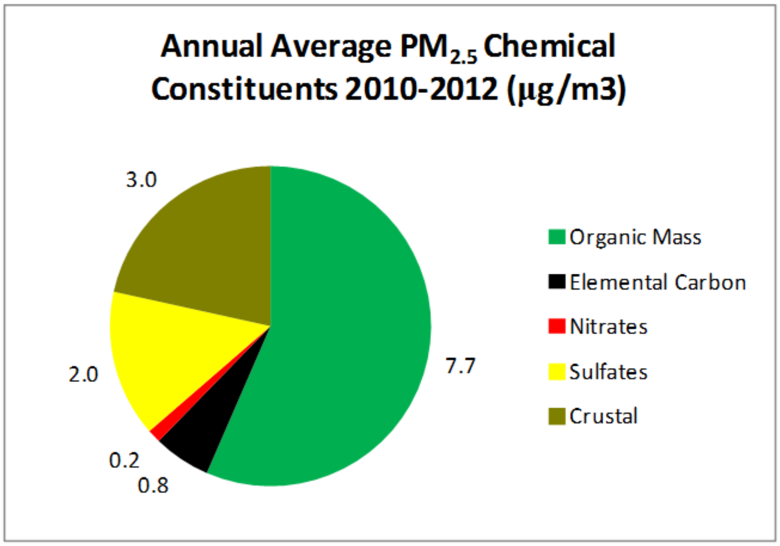
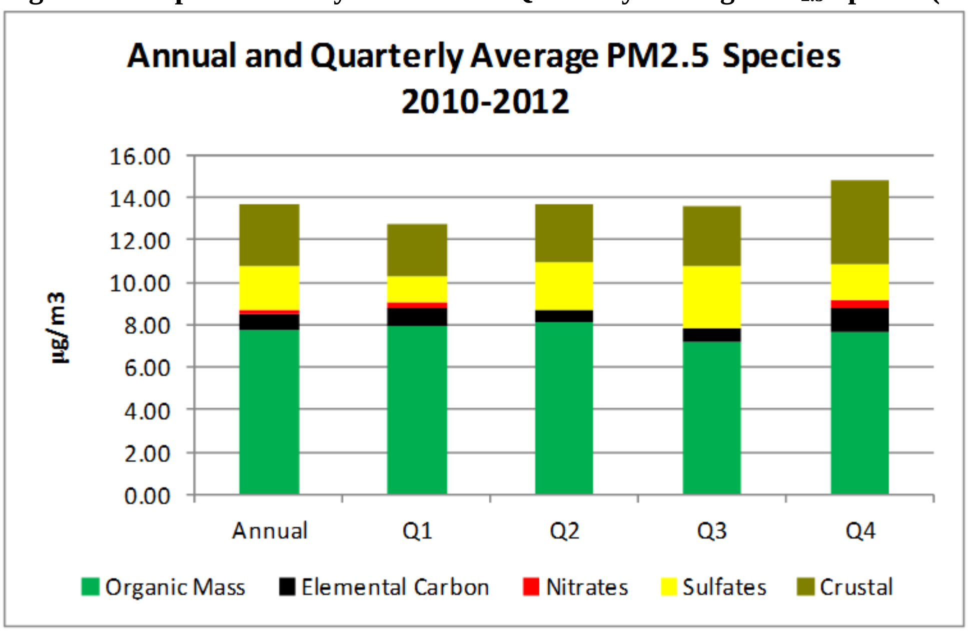


Figure 3b shows annual and quarterly chemical composition profiles and illustrates any seasonal or episodic contributors to $PM_{2.5}$ mass. This "increment analysis," combined with the other factor analyses, can provide additional insight as to which sources or factors may contribute at a greater level. Simply stated, this analysis can help identify nearby sources of emissions that contribute to the violation at the violating monitoring site.

Figure 3b. Imperial County Annual and Quarterly Average $PM_{2.5}$ Species (2010-2012)[a]

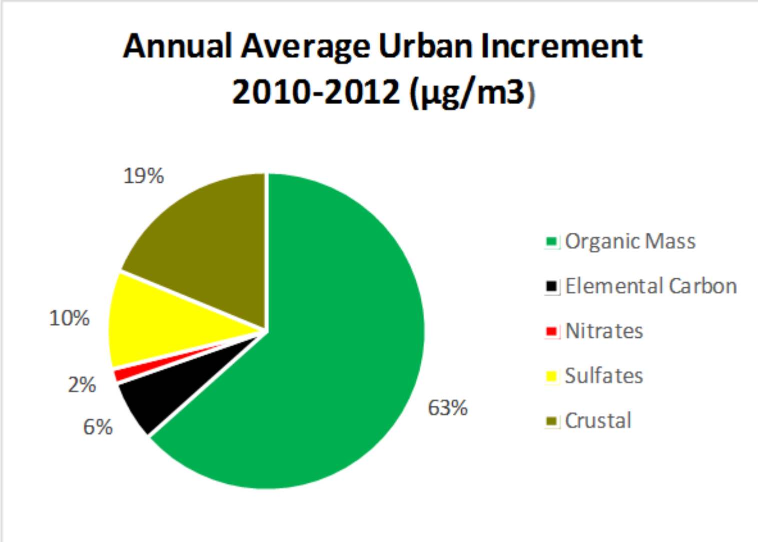


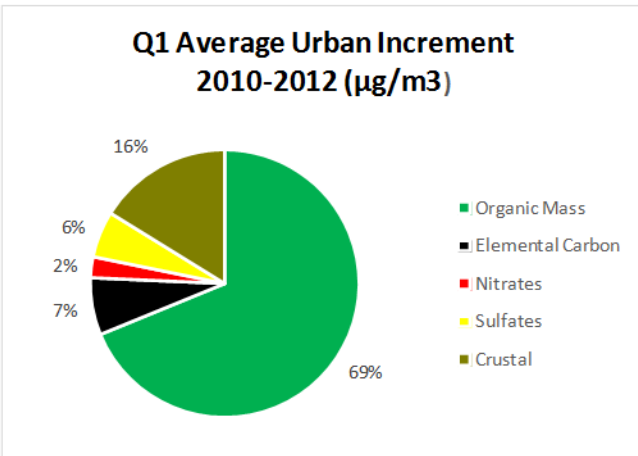
[a]*Adjusted to FRM Total $PM_{2.5}$* indicates that the speciation profile and total mass depicted in this figure are the result of the urban increment calculation for the particular FRM monitor.

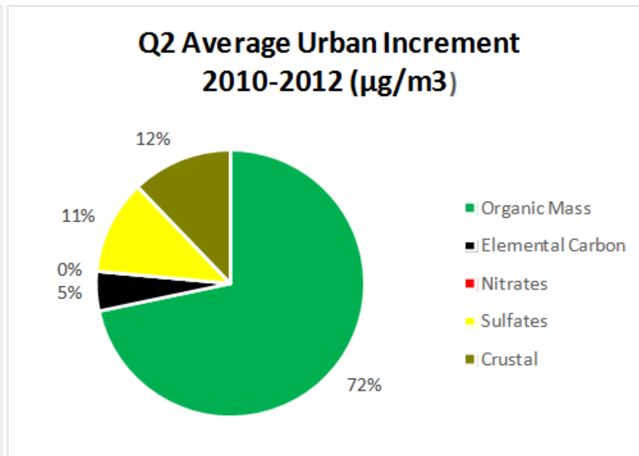
Figures 3a and 3b show that organic mass and crustal material are the predominant species on an annual mean basis, as well as for each quarter. Sulfates and elemental carbon also contribute to measured $PM_{2.5}$ mass at Calexico Ethel throughout the year. Nitrates do not contribute to measured $PM_{2.5}$ mass in quarter two and three, but they do increase in the winter months, affecting Q1 and Q4 concentrations. There is also an increase in elemental carbon during Q1 and Q4. This suggests that biomass burning, combustion sources, and fugitive dust sources such as agricultural sources, unpaved roads, and windblown dust are large contributors to high annual $PM_{2.5}$ concentrations within Imperial County. The speciation results for the days that exceed the 24-hour standard show more of a contribution from organic matter and ammonium nitrate, which is different than what the annual mean speciation data show.

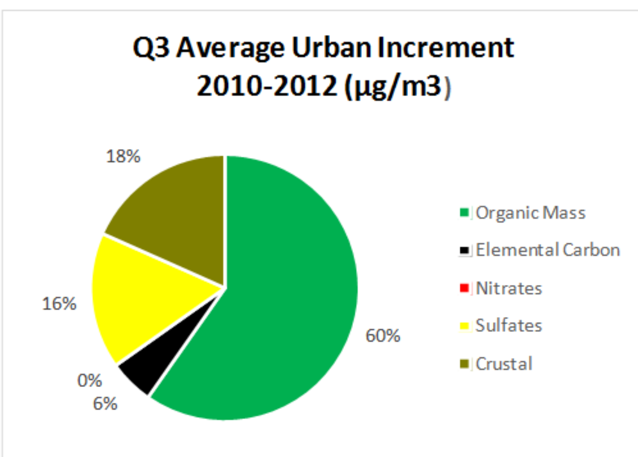
The EPA assessed seasonal and annual average $PM_{2.5}$ constituents at monitoring sites within the area relative to monitoring sites outside of the analysis area to account for the difference between regional background concentrations of $PM_{2.5}$, and the concentrations of $PM_{2.5}$ in the area of analysis, also known as the "urban increment." This analysis differentiates between the influences of emissions from sources in nearby areas and in more distant areas on the violating monitor. Estimating the urban increment in the area helps to illuminate the amount and type of particles at the violating monitor that are most likely to be the result of sources of emissions in nearby areas, as opposed to impacts of more distant or regional sources of emissions. Figure 4a includes pie charts showing the annual and quarterly chemical mass constituents of the urban increment. The quarterly pie charts correspond to the high-concentration quarters identified in Figure 2. Evaluating these high concentration quarters can help identify composition of $PM_{2.5}$ during these times. Note that in these charts, sulfates and nitrates have been adjusted to represent their mass in measured $PM_{2.5}$.

Figure 4a. Imperial County Urban Increment Analysis for 2010-2012.









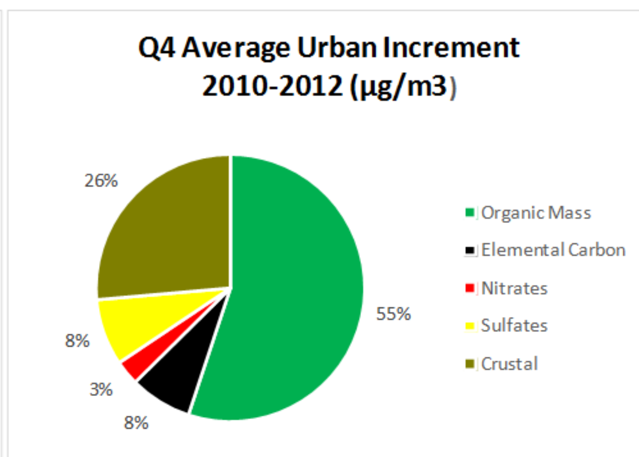
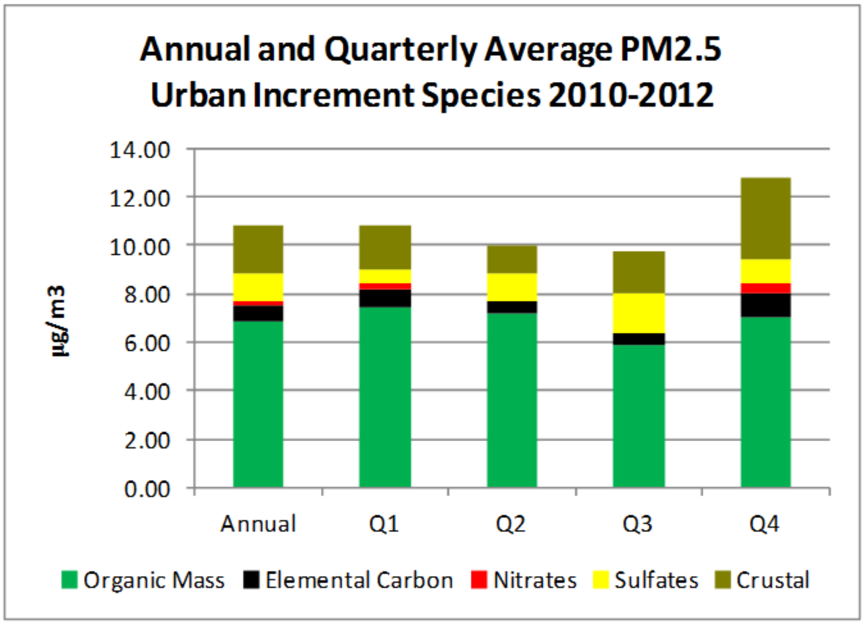


Figure 4b. Imperial County Average Urban Increment Analysis for 2010-2012.



Imperial County has one monitoring site violating the NAAQS. The Calexico-Ethel monitoring site measures increased $PM_{2.5}$ concentrations during Q2 and Q4, and considering meteorology (discussed further in Factor 3), this suggests that there are two different regimes of high $PM_{2.5}$ concentrations that contribute to exceedances of the NAAQS during these quarters.

The speciation analysis shows high percentages of both crustal material and organic mass suggesting that the main contributing sources to $PM_{2.5}$ concentrations at Calexico-Ethel are biomass burning, other combustion emissions, and fugitive dust emissions primarily associated with unpaved roads, agricultural sources, and windblown dust. In reviewing the urban increment analysis for the Imperial County DV monitor, the results are similar to the adjusted speciation measurements.

Factor 2: Emissions and Emissions-related Data

In this designations process, for each area with a violating monitoring site, the EPA evaluated the emissions data from nearby areas using emissions related data for the relevant counties to assess each county's potential contribution to $PM_{2.5}$ concentrations at the violating monitoring site or monitoring sites in the area under evaluation. Similar to the air quality analysis, these data were examined on a seasonal basis. The EPA examined emissions of identified sources or source categories of direct $PM_{2.5}$, the major components of direct $PM_{2.5}$ (organic mass, elemental carbon, crustal material (and/or individual trace metal compounds)), primary nitrate and primary sulfate, and precursor gaseous pollutants (i.e., SO_2, NO_X, total VOC, and NH_3). The EPA also considered the distance of those sources of emissions from the violating monitoring site. While direct $PM_{2.5}$ emissions and its major carbonaceous components are generally associated with sources near violating $PM_{2.5}$ monitoring sites, the gaseous precursors tend to have a more regional influence (although the EPA is mindful of the potential local NO_X and VOC emissions contributions to $PM_{2.5}$ from mobile and stationary sources) and transport from neighboring areas can contribute to higher $PM_{2.5}$ levels at the violating monitoring sites.

Emissions Data

For this factor, the EPA reviewed data from the 2011 National Emissions Inventory (NEI) version 1 (see *http://www.epa.gov/ttn/chief/net/2011inventory.html*). For each county in the area of analysis, the EPA examined the magnitude of county-level emissions reported in the NEI. These county-level emissions represent the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires. In some instances, non-anthropogenic sources of emissions such as wildfires account for large portions of the emissions inventory data presented below. The EPA also looked at the geographic distribution of major point sources of the relevant pollutants.[31] Substantial emissions levels from sources in a nearby area indicate the potential for the area to contribute to monitored violations.

To further analyze area emissions data, the EPA also developed a summary of direct $PM_{2.5}$, components of direct $PM_{2.5}$, and precursor pollutants, which is available at *http://www.epa.gov/pmdesignations/2012standards/docs/nei2011v1pointnei2008v3county.xlsx*.

When considered with the urban increment analysis in Factor 1, evaluating the components of direct $PM_{2.5}$ and precursor gases can help identify specific sources or source types contributing to elevated concentrations at violating monitoring sites and thus assist in identifying appropriate area boundaries. In general, directly emitted particulate organic carbon (POC) and VOCs[32] contribute to $PM_{2.5}$ organic mass (OM); directly emitted EC contributes to $PM_{2.5}$ EC; NO_X, NH_3 and directly emitted nitrate contribute to $PM_{2.5}$ nitrate mass; SO_2, NH_3 and directly emitted sulfate contribute to $PM_{2.5}$ sulfate mass; and directly emitted crustal material and metal oxides contribute to $PM_{2.5}$ crustal matter.[33,34] The EPA believes that the quantities of those nearby emissions as potential contributors to the $PM_{2.5}$ violating monitors are somewhat proportional to the $PM_{2.5}$ chemical constituents in the estimated urban increment. Thus, directly emitted POC is more important per ton than SO_2, partially because POC emissions are already $PM_{2.5}$ whereas SO_2 must convert to $PM_{2.5}$ and not all of the emitted SO_2 undergoes this conversion.

Table 3a provides a county-level emissions summary (i.e., the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires) of directly emitted $PM_{2.5}$ and precursor species for the county with the violating monitoring site and nearby counties considered for inclusion in the Imperial County, CA area. Table 3b summarizes the directly emitted components of $PM_{2.5}$ for the same counties in the area of analysis for the Imperial County, CA area. This information will be paired with the Urban Increment composition previously shown in Figures 4a and 4b.

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[31] For purposes of this designations effort, "major" point sources are those whose sum of PM precursor emissions ($PM_{2.5}$ + NOx + SO_2 + VOC + NH_3) are greater than 500 tons per year based on NEI 2011v1.

[32] As previously mentioned, nearby VOCs are presumed to be a less important contributor to $PM_{2.5}$ OM than POC.

[33] *See*, Seinfeld J. H. and Pandis S. N. (2006) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 2nd edition, J. Wiley, New York. See also, Seinfeld J. H. and Pandis S. N. (1998) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 1st edition, J. Wiley, New York.

[34] USEPA Report (2004), The Particle Pollution Report: Current Understanding of Air Quality and Emissions through 2003, found at: *http://www.epa.gov/airtrends/aqtrnd04/pm.html*.

Table 3a. County-Level Emissions of Directly Emitted $PM_{2.5}$ and Precursors (tons/year)

County, State	Total NH_3	Total NOx	Total Direct $PM_{2.5}$	Total SO_2	Total VOC	Total
San Diego, CA	6,754	42,667	10,559	1,286	60,083	121,348
Riverside, CA	9,421	35,935	5,453	378	26,789	77,975
Imperial, CA	16,396	10,052	4,472	146	6,978	38,043
Yuma, AZ	2,835	6,303	1,855	86	5,950	17,029
La Paz, AZ	357	3,745	1,102	43	2,446	7,693

Table 3b. County-Level Emissions for Components of Directly Emitted $PM_{2.5}$ (tons/year) [35]

County, State	POM	EC	PSO_4	PNO_3	PCrustal	Residual	Total Direct
San Diego, CA	5,979	1,357	186	27	1,078	1,931	10,559
Riverside, CA	2,140	1,087	109	14	929	1,174	5,453
Imperial, CA	1,200	346	103	11	1,323	1,488	4,472
Yuma, AZ	453	198	13	2	629	560	1,855
La Paz, AZ	235	118	8	1	420	318	1,102

Table 3b breaks down the direct $PM_{2.5}$ emissions value from Table 3a into its components. These data will also be compared with the previously presented Urban Increment composition.

Using the previously described relationship between directly emitted and precursor gases and the measured mass to evaluate data presented in Tables 3a and 3b, the EPA identified the following components warranting additional review: NH_3, $PM_{2.5}$, SO_2, VOC, POM, PSO_4, Crustal and Residual. The EPA then looked at the contribution of these constituents of interest from each of the counties included in the area of analysis as shown in Tables 4a-h.

Table 4a. County-Level NH_3 Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**NH_3**	**Pct.**	**Cumulative %**
Imperial, CA	16,396	46	46
Riverside, CA	9,421	26	72
San Diego, CA	6,754	19	91
Yuma, AZ	2,835	8	99
La Paz, AZ	357	1	100

[35] Data are based on the 2011 and 2018 Emissions Modeling Platform Data Files and Summaries (*ftp://ftp.epa.gov/EmisInventory/2011v6/v1platform*) available at: *http://www.epa.gov/ttn/chief/emch/index.html#2011* (accessed 02/26/14).

Table 4b. County-Level $PM_{2.5}$ Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**$PM_{2.5}$**	**Pct.**	**Cumulative %**
San Diego, CA	10,559	45	45
Riverside, CA	5,453	23	68
Imperial, CA	4,472	19	87
Yuma, AZ	1,855	8	95
La Paz, AZ	1,102	5	100

Table 4c. County-Level SO_2 Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**SO_2**	**Pct.**	**Cumulative %**
San Diego, CA	1,286	66	66
Riverside, CA	378	19	86
Imperial, CA	146	8	93
Yuma, AZ	86	4	98
La Paz, AZ	43	2	100

Table 4d. County-Level VOC Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**VOC**	**Pct.**	**Cumulative %**
San Diego, CA	60,083	59	59
Riverside, CA	26,789	26	85
Imperial, CA	6,978	7	92
Yuma, AZ	5,950	6	98
La Paz, AZ	2,446	2	100

Table 4e. County-Level POM Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**POM**	**Pct.**	**Cumulative %**
San Diego, CA	5,979	60	60
Riverside, CA	2,140	21	81
Imperial, CA	1,200	12	93
Yuma, AZ	453	5	98
La Paz, AZ	235	2	100

Table 4f. County-Level PSO_4 Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**PSO_4**	**Pct.**	**Cumulative %**
San Diego, CA	186	44	44
Riverside, CA	109	26	70
Imperial, CA	103	25	95
Yuma, AZ	13	3	98
La Paz, AZ	8	2	100

Table 4g. County-Level Crustal Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**Crustal**	**Pct.**	**Cumulative %**
Imperial, CA	1,323	30	30
San Diego, CA	1,078	25	55
Riverside, CA	929	21	76
Yuma, AZ	629	14	90
La Paz, AZ	420	10	100

Table 4h. County-Level Residual Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**Residual**	**Pct.**	**Cumulative %**
San Diego, CA	1,931	35	35
Imperial, CA	1,488	27	62
Riverside, CA	1,174	21	84
Yuma, AZ	560	10	94
La Paz, AZ	318	6	100

The EPA also reviewed seasonal emissions for Imperial County, which show that all components (NH_3, $PM_{2.5}$, SO_2, VOC, POM, PSO_4, Crustal and Residual) had higher emissions in Q2 and Q3 than in Q1 and Q4. For example, direct $PM_{2.5}$ emissions were lowest in Q4, slightly higher in Q1, higher again in Q2, and highest in Q3. Crustal material emissions were lowest in Q1 and Q4, and highest in Q2 and Q3, which is consistent with the pollution rose analysis in Factor 3, showing that meteorological conditions occurring in Q2 and Q3 are conducive to the transport of crustal material to the Calexico Ethel monitoring location from various sources of crustal material present throughout the county. Also, NH_3 emissions increase in Q2 compared to other quarters in the year.

In addition to reviewing county-wide emissions of $PM_{2.5}$ and $PM_{2.5}$ precursors in the area of analysis, the EPA also reviewed emissions from major point sources located in the area of analysis. The magnitude and location of these sources can help inform nonattainment boundaries. Table 5 provides facility-level emissions of direct $PM_{2.5}$, components of direct $PM_{2.5}$, and precursor pollutants (given in tons per year) from major point sources located in the area of analysis for the Imperial County, CA area. Table 5 also shows the distance from the facility to the DV monitor for the respective county.

Table 5. NEI 2011 v1 Major Point Source Emissions (tons/year)

		Distance	NEI 2011 v1 Emissions - Tons/Year					
County, State	**Facility Name (Facility ID)**	**monitor (miles)**	**NH_3**	**NOx**	**$PM_{2.5}$**	**SO_2**	**VOC**	**Total**
San Diego, CA	San Diego Intl-Lindberg	100	n/a	1,156	21	125	165	1,468
Riverside, CA	None	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Imperial, CA	None	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Yuma, AZ	None	n/a	n/a	n/a	n/a	n/a	n/a	n/a
La Paz, AZ	None	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Figure 5 shows the major point source emissions (from the 2011 NEI in tons per year) in the area of analysis for Imperial County, CA and the relative distances of these sources from the violating monitoring location(s), as depicted by red dots. The actual distance from the point sources to the DV monitoring location is presented in Table 5). The distance from the violating monitoring location is particularly important for directly emitted $PM_{2.5}$. The influence of directly emitted $PM_{2.5}$ on ambient $PM_{2.5}$ diminishes more than that of gaseous precursors as a function of distance.[36]

As indicated in Figure 5, there is one major point source located approximately 100 miles west of the monitor. The source is located on the other side of the coastal mountain range from the location of monitored violations in Imperial County, described further in Factor 4, below. Its largest emissions (nearly 80% by weight) are of NO_x, which is not observed at high concentrations in the speciation measurements, as discussed above in Factor 1. There are no major point sources in the remaining counties in the area of analysis. Thus, major point sources from all of the counties in the analysis area are unlikely to contribute to the violating monitor in Imperial County.

In addition to major point source emissions, the EPA further evaluated non-point source emissions within Imperial County. The EPA examined the spatial and temporal extent of agricultural burning within Imperial County, which typically occurs in the winter and summer months. Historical data from 2006 and 2007 suggest that over 35,000 acres of Bermuda grass and wheat fields are burned annually. The highest number of acres burned occur in Q1 (specifically in January and February) and Q2 (specifically in May and June).[37] Agricultural burning occurs throughout Imperial County. As discussed in Factor 3, meteorological conditions during Q1 and Q2 are substantially different, with Q1 having a higher percentage of hours associated with stagnant conditions

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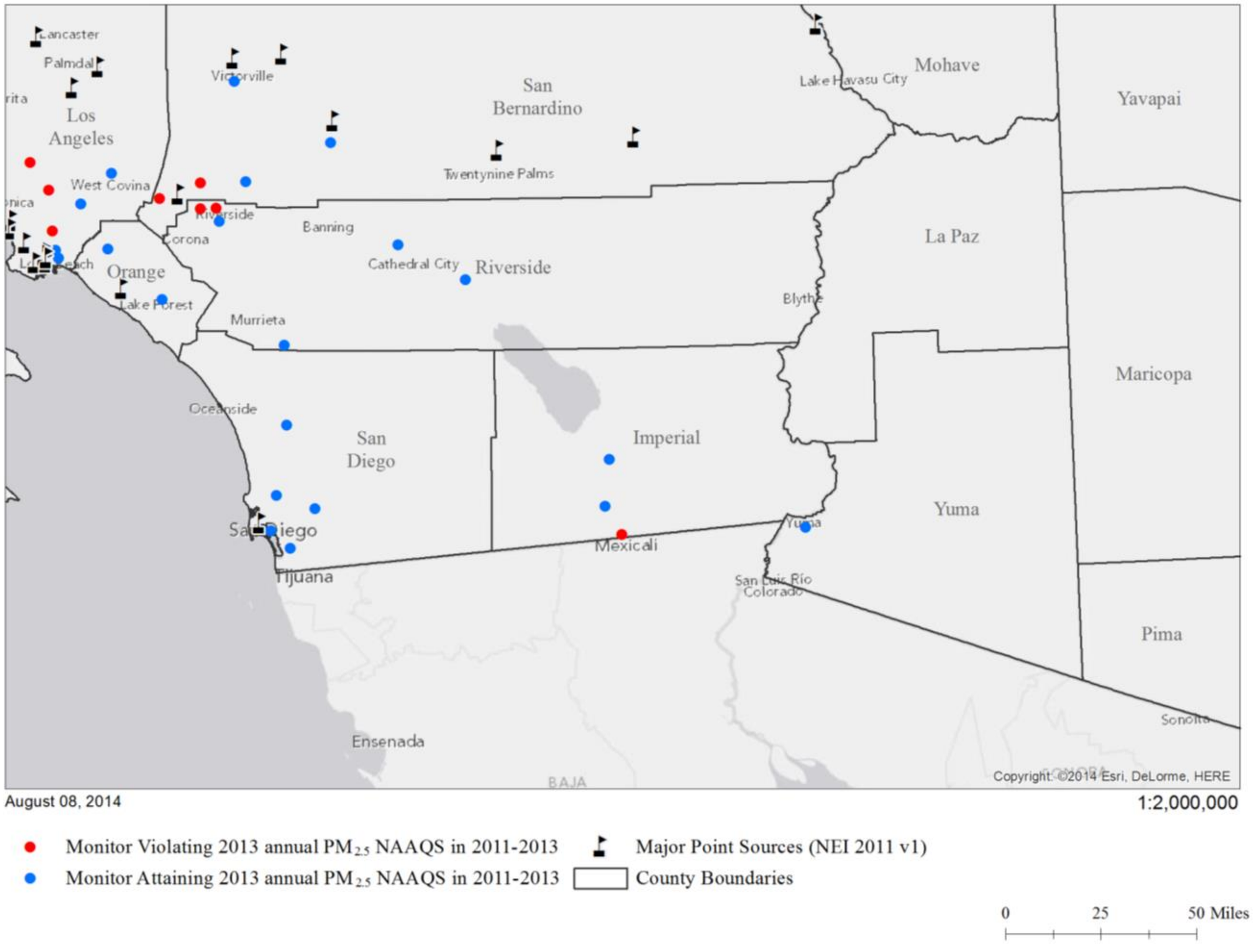
[36] Baker, K. R. and K. M. Foley. *A nonlinear regression model estimating single source concentrations of primary and secondarily formed $PM_{2.5}$.* Atmospheric Environment. 45 (2011) 3758-3767.

[37] Agricultural Burning: Air Monitoring and Exposure Reduction in Imperial County, California: Final Report to U.S./Mexico Border Environmental Cooperation Commission Funded under Technical Assistance Agreement Number TAA08-068. Environmental Health Investigations Branch, California Department of Public Health and School of Public Health, San Diego State University. May 22, 2011.

and Q2 experiencing a higher number of hours of non-stagnant conditions with winds coming from the north. Despite these differences, concentrations measured in both Q1 and Q2 are more likely to be influenced by emissions from agricultural burning than other times of the year when a lesser amount of acres are burned. The combination of non-stagnant meteorological conditions associated with winds generally from the north and the high number of acres burned in Q2 may be a cause for the increased monitored $PM_{2.5}$ concentrations in Q2, shown in Figures 2 and 2a.The data at the Calexico-Ethel monitor represent a combination of $PM_{2.5}$ concentrations from both non-point sources located throughout Imperial County and emissions sources from the City of Mexicali to the south. The two other monitoring locations in Imperial County (Brawley and El Centro) are located north of the City of Calexico. While these monitors do not currently record violations of the 2012 annual $PM_{2.5}$ NAAQS and are not as clearly influenced by emissions from Mexicali, they do represent contributions from non-point emissions sources located throughout Imperial County. While not violating, the Brawley and El Centro monitors show elevated concentrations during the second and third quarters (see Factor 1). For example, Figure 2a in Factor 1 shows that quarterly means at Brawley and El Centro in 2013 were highest in Q2. As discussed further in Factor 3, various meteorological conditions that occur throughout the year are conducive to transport from sources located near the Brawley and El Centro monitoring locations, suggesting that these sources likely contribute to elevated $PM_{2.5}$ concentrations at the violating Calexico-Ethel monitoring location.

Figure 5. Major Point Source Emissions in the Area of Analysis for the Imperial County, CA Area.



In addition to analyzing emissions from Imperial County and from other United States counties that are adjacent to Imperial County, CA, the EPA also looked at emissions from the City of Mexicali and the municipality ("municipio," analogous to U.S. counties, hereafter referred to as the municipio/county) of Mexicali, which are located on the south side of the U.S. – Mexico international border. While emissions from the Mexican side of the border are beyond the legal jurisdiction of the Clean Air Act, and thus are not in an area that the EPA could include within the designated nonattainment area for the 2012 annual $PM_{2.5}$ NAAQS, the EPA nevertheless believes that the impacts of these sources should be acknowledged as a part of the nonattainment problem in Imperial County. Figure 5a shows a map of the Mexicali-Calexico international area.

Figure 5a. Map of Border Region, City of Mexicali and Municipio/County of Mexicali

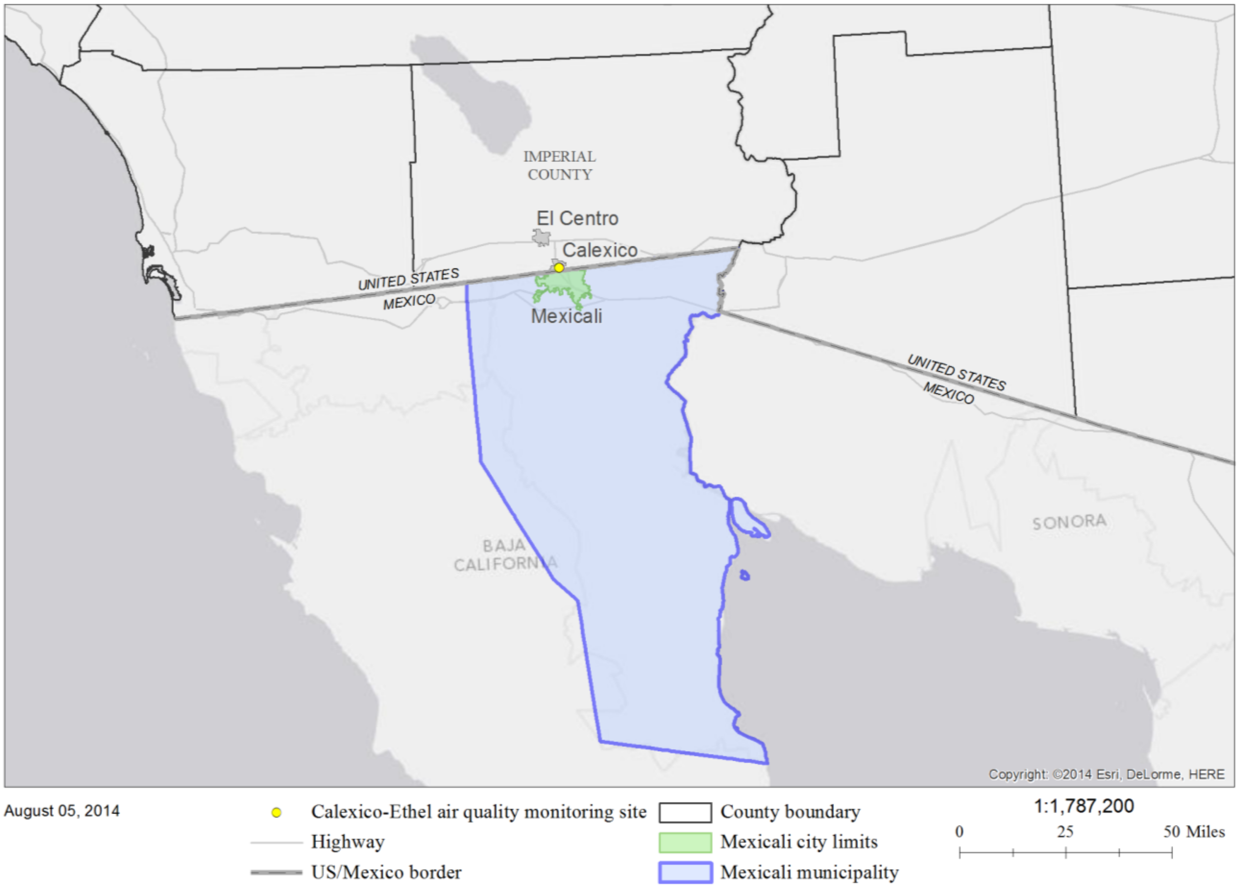
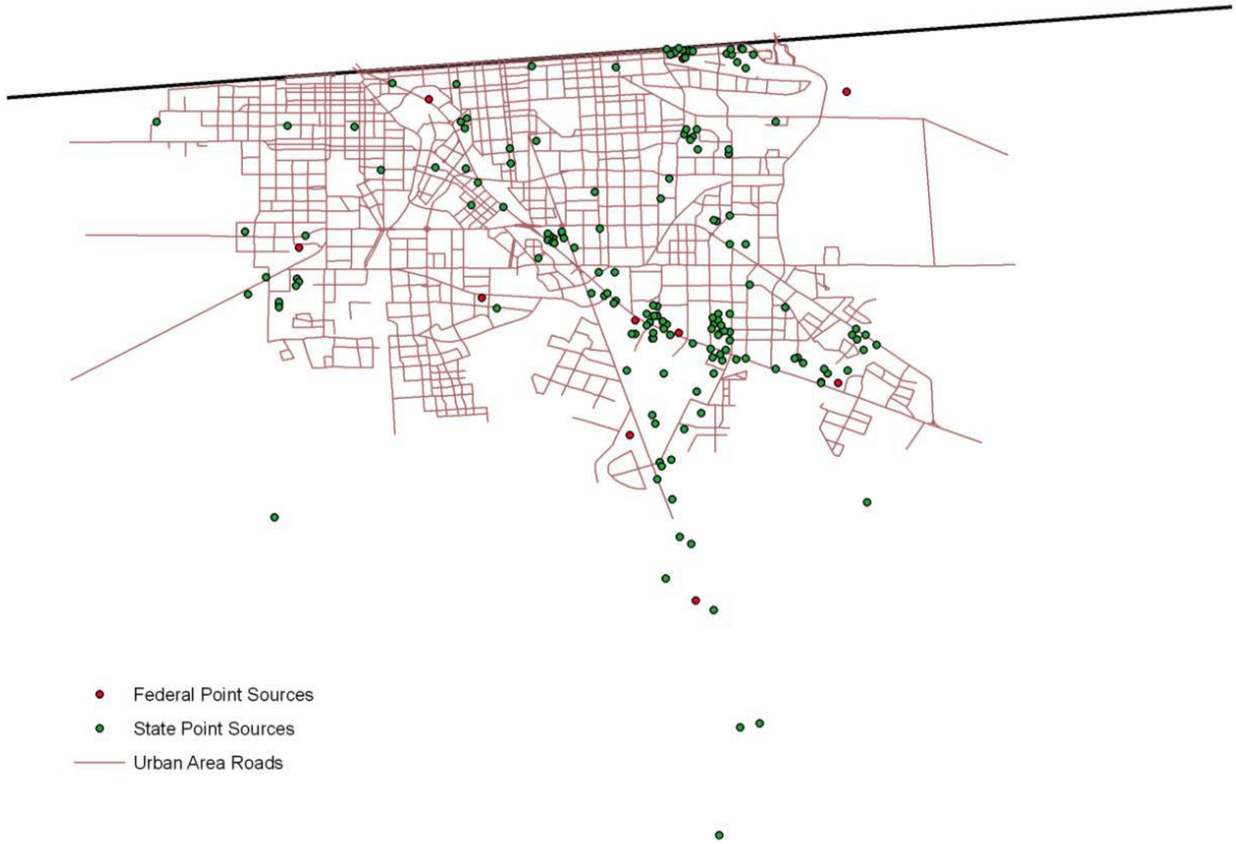


Figure 5b shows the locations of point source emissions in the metropolitan area of the City of Mexicali. Table 5a shows the emissions from these sources.

Figure 5b. Location of Point Sources in the Urban Portion of Mexicali



Source: "2005 Mexicali Emissions Inventory: Final Report," Figure 2-1, page 2-3

Table 5a. 2005 Mexicali Point Source Emissions (Tons per Year)

	NO_x	SO_2	VOC	$PM_{2.5}$
Point Source Emissions	14,376	4,624	733	128

Source: "2005 Mexicali Emissions Inventory: Final Report," Tables 2-2 and 2-3, page 2-9

Emissions information for non-point sources for the city of Mexicali was not available; information was available from the entire municipio/county of Mexicali and is presented in Table 5b. As shown in Figure 5a above, the municipio/county of Mexicali has an area of 5,300 square miles that includes the City of Mexicali and areas of Mexico that range from the U.S.- Mexico border to the Sea of Cortez, which is approximately 120 miles to the south.[38]

[38] See "2005 Mexicali Emissions Inventory: Final Report," prepared for Western Governors' Association, Denver, Colorado; U.S. EPA Region 9, San Francisco, CA; and the Secretaria de Proteccion al Ambiente de Baja California, Mexicali, Baja California, Mexico.

Table 5b. 2005 Municipio/County of Mexicali Emissions Inventory Summary (Tons per Year)

Source Type	NO_x	SO_2	VOC	CO	$PM_{2.5}$	NH_3	CH_4
Point	14,376	4,624	732	4,116	128		
Area	1,206	131	15,302	18,854	6,754	9,015	6,033
On-Road Mobile	8,570	169	8,977	60,603	666	252	144
Nonroad Mobile	4,485	61	543	3,207	533	0	1.5
Total	**28,637**	**4,985**	**25,554**	**86,780**	**8,081**	**9,268**	**6,179**

Blanks indicate that pollutant emissions were not applicable or were not estimated due to a lack of data.
Source: "2005 Mexicali Emissions Inventory: Final Report," Table ES-1, page ES-3

Table 5c shows a comparison of county-level emissions for Imperial County and emissions in the adjacent municipio/county of Mexicali. Except for NH_3, direct $PM_{2.5}$ emissions and precursors are 2 to 34 times as high in the municipio/county of Mexicali as in Imperial.

Table 5c. 2011 Imperial County and 2005 Municipio/County of Mexicali Emissions (Tons per Year)

	NO_x	SO_2	VOC	$PM_{2.5}$	NH_3
Imperial County, CA	10,052	146	6,978	4,472	16,396
Municipio/County of Mexicali, Baja California, Mexico	28,637	4,985	25,554	8,081	9,268

In summary, the EPA's analysis showed major point sources north of the U.S.-Mexico border are not contributing to violations of the 2012 annual $PM_{2.5}$ NAAQS in Imperial County, while non-point sources throughout the county account for a large percentage of the emissions and are therefore likely contributing to violations of the 2012 annual $PM_{2.5}$ NAAQS. Crustal material and organic mass are the highest identified components of directly-emitted $PM_{2.5}$ within Imperial County based on the speciated ambient $PM_{2.5}$ information presented in Factor 1, and are associated with emissions sources located throughout the county.

<u>Population density and degree of urbanization</u>

In this part of the factor analysis, the EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions. Rapid population growth in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that it may be appropriate to include the county associated with area source and mobile source emissions as part of the nonattainment area. Table 6 shows the 2000 and 2010 population, population growth since 2000, and population density for each county in the area.

Table 6. Population Growth and Population Density.

County, State	Population 2000	Population 2010	% Change from 2000	Land Area (Sq. Miles)	Population Density (per Sq. Mile)	%	Cumulative %
San Diego,	2,813,833	3,103,933	10%	4,200	739	54	54
Riverside, CA	1,545,387	2,202,361	43%	7,207	306	39	93
Imperial, CA	160,026	196,786	23%	5,514	36	3	97
Yuma, AZ	142,361	174,667	23%	4,175	42	3	100
La Paz, AZ	19,715	20,465	4%	4,500	5	0	100
Total	**4,681,322**	**5,698,212**					

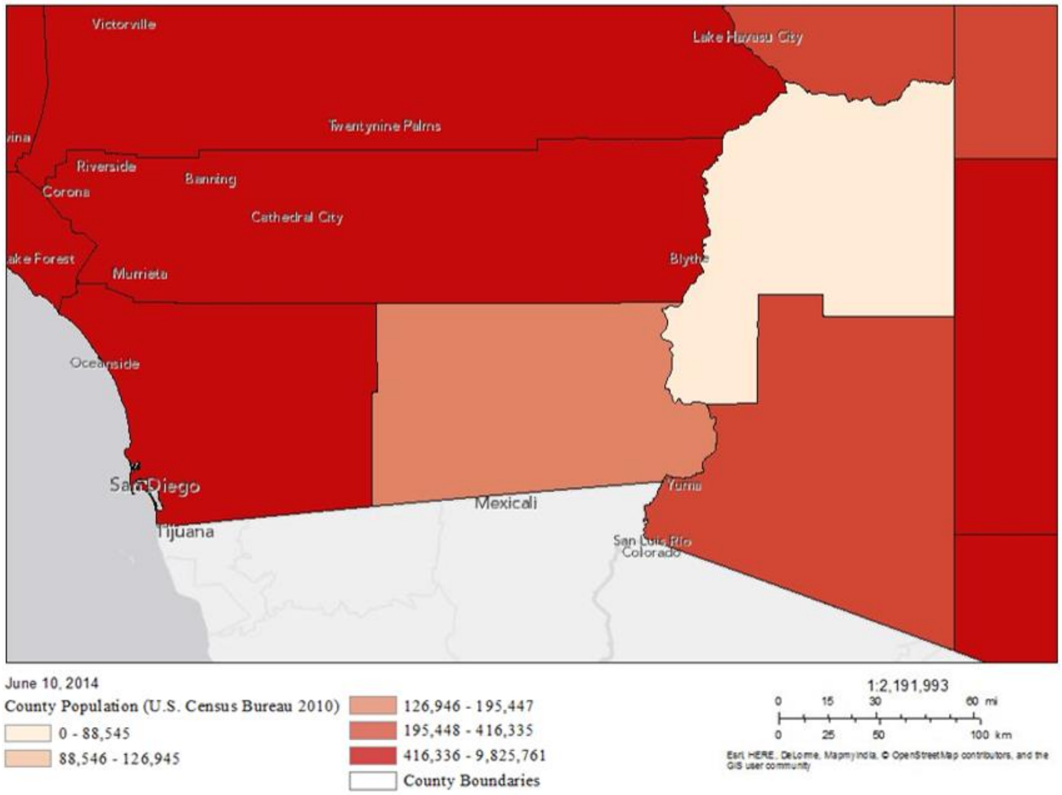
Source: U.S. Census Bureau population estimates for 2000 and 2010

Imperial County, CA is low in both population and population density, compared to other counties in the area of analysis, as shown in Table 6. The county accounts for only 3% of the total population in that area. The population in Imperial County is not economically integrated with neighboring counties. The large population to the north in Riverside County is concentrated in the South Coast Air Basin, in the western portion of the county and to a lesser extent in the central portion, known as Coachella Valley, which forms the northern portion of the Salton Sea Air Basin (SSAB), of which the Imperial Valley forms the southern portion. In between these two portions lies the Salton Sea, which effectively splits the population in the SSAB between people who live in the north and are more or less associated with the greater Los Angeles metropolitan area on the west side of Banning Pass – the high mountain pass that separates the SSAB from the SCAB. Although Riverside County is experiencing the highest growth in the area of analysis, and one of the highest growth rates nationally, that growth is happening in areas that are disparate from the populated area of south central Imperial County, where monitored violations of the 2012 $PM_{2.5}$ NAAQS are occurring.

The population in San Diego County, CA is concentrated along the Pacific Ocean Coast. San Diego County's population is experiencing rapid growth, but that growth is occurring in the western portion of that large (4,200 square miles) county, on the other side of a coastal range of mountains. Yuma and La Paz counties in Arizona, like San Diego County, are separate and distinct population centers that have little commuting to or from Imperial County. Both Arizona counties have low population and low population density. At a 4% increase from 2000 to 2010, La Paz is not experiencing rapid population growth. Although Yuma County is experiencing rapid growth, that growth is occurring in and around Yuma City and is more associated with economic activity in Mexico than in Imperial County. The absence of contribution of emissions from VMT and little economic integration between these areas and Imperial County indicate these four counties are not one large, urban area.

In addition to population data for counties within the area of analysis, the EPA also notes that the Calexico-Ethel monitoring location is 0.7 miles from the U.S. – Mexico border and the City of Mexicali, which had a population of 689,775 in 2010.

Figure 6. 2010 County-Level Population in the Area of Analysis for the Imperial County, CA Area.



Traffic and Vehicle Miles Travelled

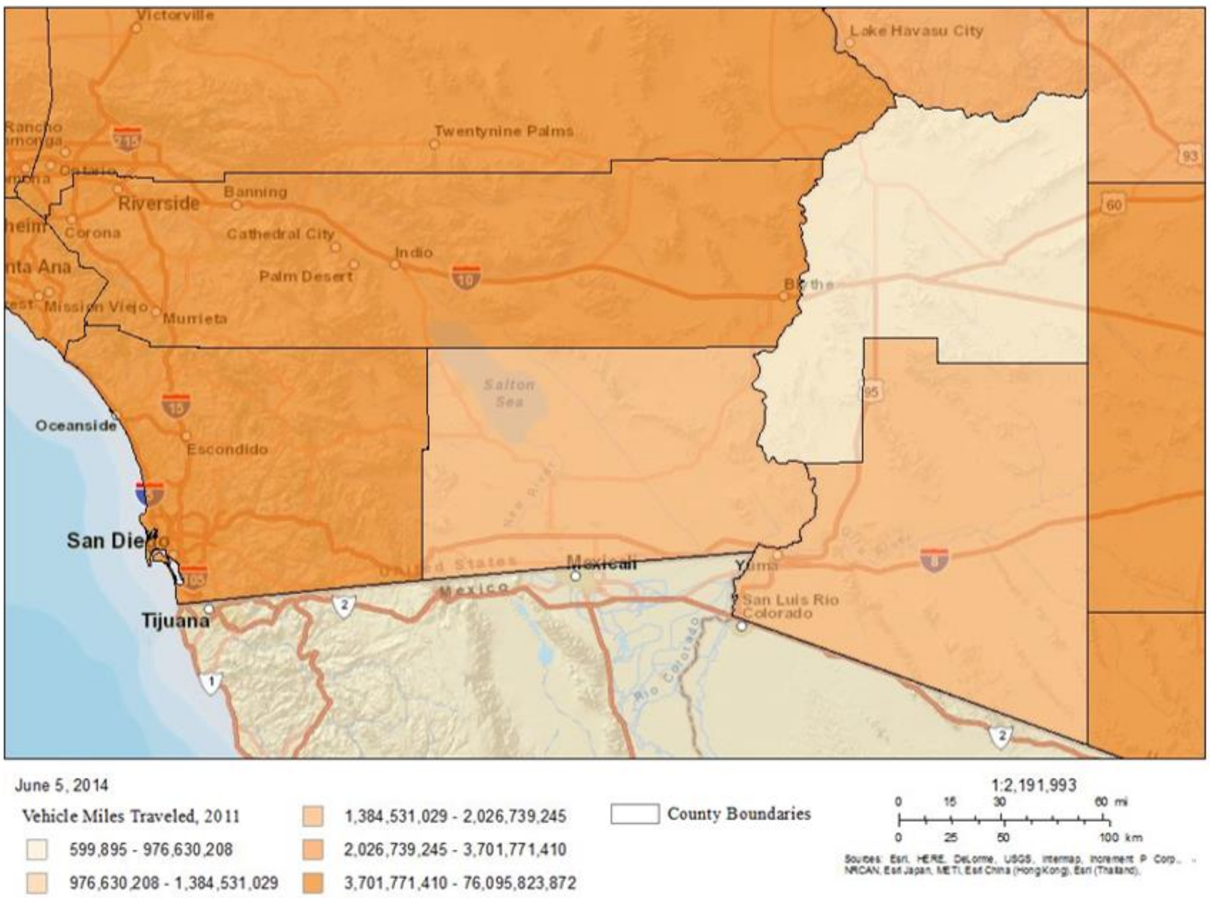
High vehicle miles travelled (VMT) and/or a high number of commuters associated with a county is generally an indicator that the county is an integral part of an urban area. Mobile source emissions of NO_x, VOC, and direct PM may contribute to ambient particulate matter that contributes to monitored violations of the NAAQS in the area. In combination with the population/population density data and the location of main transportation arteries, an assessment of VMT helps identify the probable location of nonpoint source emissions that contribute to violations in the area. Comparatively high VMT in a county outside of the CBSA or CSA signifies integration with the core urban area contained within the CSA or CBSA, and indicates that a county with the high VMT may be appropriate to include in the nonattainment area because emissions from mobile sources in that county contribute to violations in the area. Table 7 shows 2011 VMT while Figure 7 overlays 2011 county-level VMT with a map of the transportation arteries. VMT information reflects data from the Federal Highway Administration.

Table 7. 2011 VMT for the Imperial County, CA Area.

County, State	Total 2011 VMT	Percent	Cumulative %
San Diego, CA	27,302,301,628	54	54
Riverside, CA	19,110,634,300	38	92
Imperial, CA	1,771,872,720	4	96
Yuma, AZ	1,453,430,294	3	98
La Paz, AZ	776,932,996	2	100
Total	**50,415,171,938**		

http://www.census.gov/hhes/commuting/data/commuting.html

Figure 7. Overlay of 2011 County-level VMT with Transportation Arteries.



According to Table 7 and Figure 7, Imperial County is shown as having the same pattern of isolation in terms of its VMT as it had for its population. San Diego and Riverside counties in CA have larger VMT than any other counties in the area of analysis, and again as for population, this VMT is associated with the ocean-facing western portion of San Diego County and for Riverside County, with the western portion of the county in SCAB and to a lesser extent the northern Coachella portion of SSAB, whose VMT is associated with traffic within Coachella Valley as well as to and from SCAB.

According to Census Bureau statistics for commuter flow between counties for 2006-2010, Imperial County, CA has 55,565 commuters. See: http://www.census.gov/population/metro/data/other.html. Of those commuters residing in Imperial County, 51,171 or 92% travel to a workplace destination within the county, while 2% (1,231 commuters) travel to a workplace in Riverside County and less than 2% (961 commuters) travel to a San Diego workplace.

In the reverse direction, commuters residing in the surrounding area of analysis do not appreciably commute into Imperial County for work. From Yuma County, AZ, 1,066 commuters travel to Imperial for work, while from Riverside and San Diego counties only 665 and 792 commuters, respectively, travel to work in the county. There were no commuters who resided in La Paz County, AZ who travelled to work in Imperial County, CA.
Table 7a presents statistics for border crossings at the two land ports of entry, Calexico and Calexico East, on the Imperial County portion of the U.S.-Mexico border.

Table 7a. 2013 Border Crossing/Entry at Calexico and Calexico East, CA

Port Name	Trucks	Trains	Train Passengers	Buses	Bus Passengers	Personal Vehicles	Personal Vehicle Passengers	Pedestrians
Calexico, CA	0	0	0	0	0	4,112,348	7,132,134	4,398,916
Calexico East, CA	325,690	250	259	2571	103,690	3,198,849	5,915,717	717,009

Source: U.S. Department of Transportation, Research and Innovative Technology Administration, Bureau of Transportation Statistics, based on data from the Department of Homeland Security, U.S. Customs and Border Protection, Office of Field Operations. Report created: Fri Jul 11 16:06:27 EDT 2014

In summary for emissions-related information, Imperial County is isolated from the surrounding counties in the area of analysis. Crustal material and organic mass are the components that account for the largest percentage of directly-emitted $PM_{2.5}$ within Imperial County, and are associated with emissions sources located throughout the county. North of the U.S-Mexico border, there are no major point sources contributing to violations of the 2012 $PM_{2.5}$ NAAQS, and non-point sources, population and VMT are isolated to Imperial County. The EPA does note that the Calexico Ethel monitoring site is in close proximity to the U.S – Mexico border and the city of Mexicali, which has a large population compared to Imperial County and is a known source of $PM_{2.5}$ emissions, which, in addition to the Imperial County emissions, likely impact the Calexico Ethel monitor, especially during times of stagnant conditions as discussed further in Factor 3.

Factor 3: Meteorology

EPA evaluated available meteorological data to determine how meteorological conditions, including, but not limited to, weather, transport patterns, and stagnation conditions, could affect the fate and transport of directly emitted particulate matter and precursor emissions from sources in the area of analysis. The EPA used two primary tools for this assessment: wind roses and kernel density estimation (KDE). When considered in combination with area $PM_{2.5}$ composition and county-level and facility emissions source location information, wind roses and KDE can help to identify nearby areas contributing to violations at violating monitoring sites.

Wind roses are graphic illustrations of the frequency of wind direction and wind speed. Wind direction can indicate the direction from which contributing emissions are transported; wind speed can indicate the force of the wind and thus the distance from which those emissions are transported. The EPA constructed wind roses from hourly observations of wind direction and wind speed using 2009-2012 data from National Weather Service locations archived at the National Climate Data Center.[39] When developing these wind roses, the EPA also used wind observations collected at meteorological sampling stations collocated at air quality monitoring sites, where these data were available. Figure 8 shows wind roses that the EPA generated from data relevant in the Imperial County area.

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.

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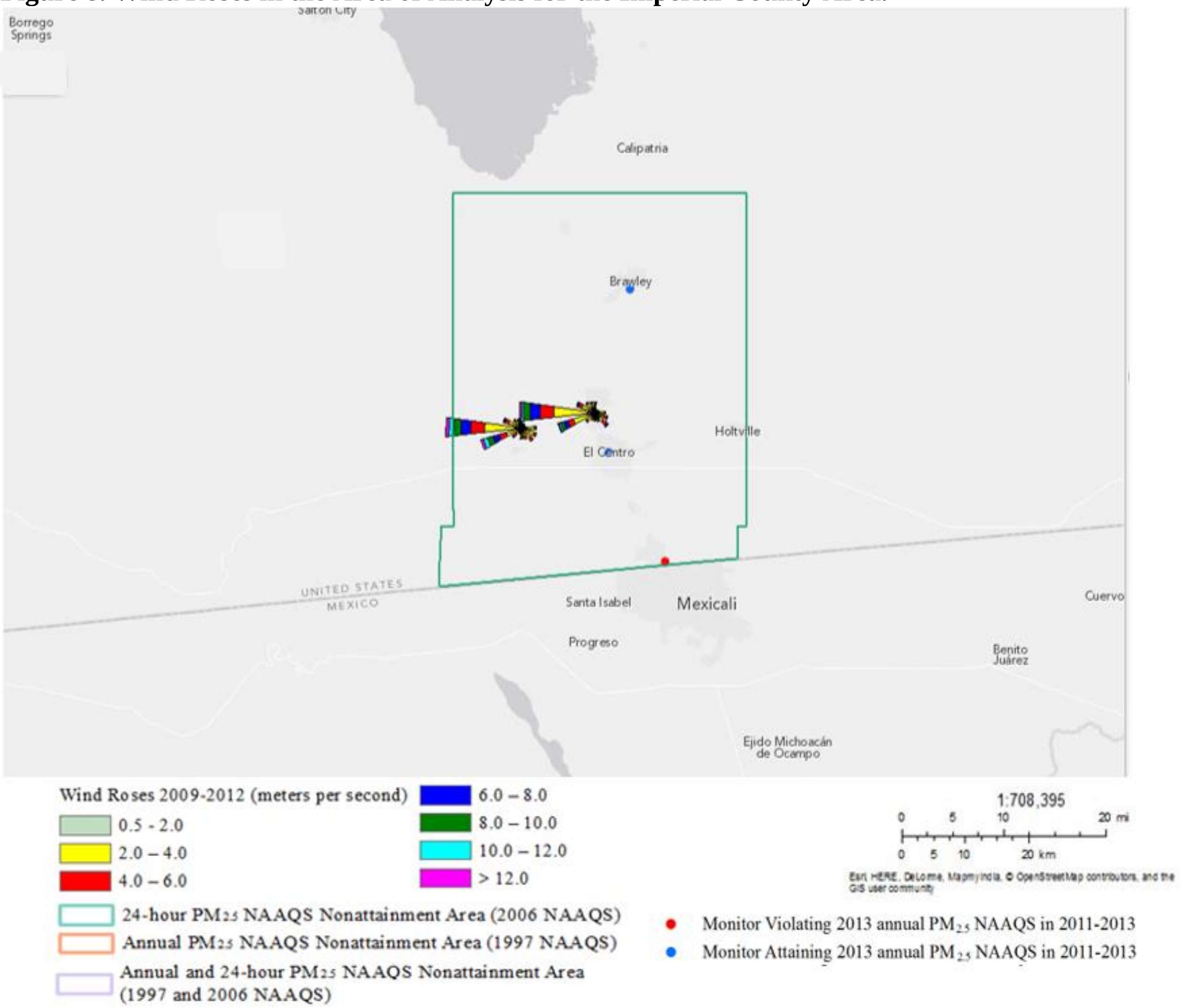
[39] *ftp.ncdc.noaa.gov/pub/data/noaa* or *http://gis.ncdc.noaa.gov/map/viewer/#app=cdo&cfg=cdo&theme=hourly&layers=1&node=gis* Quality assurance of the National Weather Service data is described here: *http://www1.ncdc.noaa.gov/pub/data/inventories/ish-qc.pdf*.

Figure 8. Wind Roses in the Area of Analysis for the Imperial County Area.



As shown in Figure 8, there is a pattern across the CBSA of predominantly southwest to west winds on an annual average basis, mostly at mid-level speeds of 2 to 8 meters per second.

In addition to wind roses, the EPA also generated kernel density estimation (KDE) plots to represent HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) backward trajectory frequency at violating monitoring sites.[40,41] These KDEs are graphical statistical estimations to determine the density of trajectory endpoints at a particular location represented by a grid cell. The EPA used KDEs to characterize and analyze the collection of individual HYSPLIT backward trajectories.[42] Higher density values, indicated by darker blue colors, indicate a greater frequency of observed trajectory endpoints within a particular grid cell. Figure 9 shows a HYSPLIT KDE plot for the Calexico-Ethel air monitoring site (AQS number 060651103) in Imperial County, summarized by calendar quarter for the 2010-2012 period.

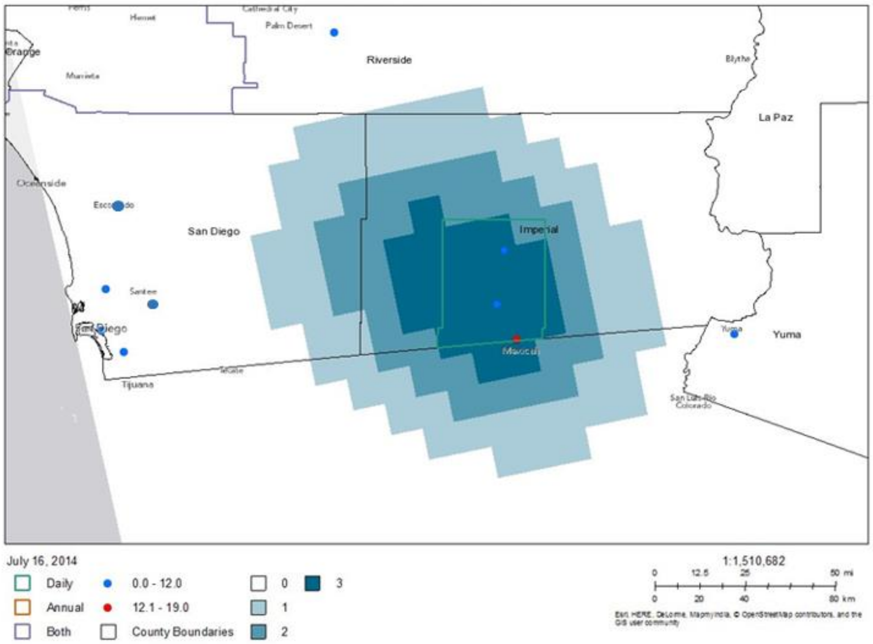
[40] In some past initial area designations efforts, EPA has used HYSPLIT backward trajectories to assist in determining nonattainment area boundaries. A HYSPLIT backward trajectory is usually depicted on a standard map as a single line, representing the centerline of an air parcel's motion, extending in two dimensional (x,y) space from a starting point and regressing backward in time to a point of origin. Backward trajectories may be an appropriate tool to assist in determining an air parcel's point of origin on a day in which a short-term standard, such as an 8-hour standard or a 24-hour standard, was exceeded. However, for an annual standard, such as the 2012 annual $PM_{2.5}$ NAAQS, every trajectory on every day is important. Plotting a mass of individual daily (e.g., 365 individual back trajectories), or more frequent, HYSPLIT trajectories may not be helpful as this process is likely to result in depicting air parcels originating in all directions from the violating monitoring site.

[41] HYSPLIT - Hybrid Single Particle Lagrangian Integrated Trajectory Model, *http://www.arl.noaa.gov/HYSPLIT_info.php*

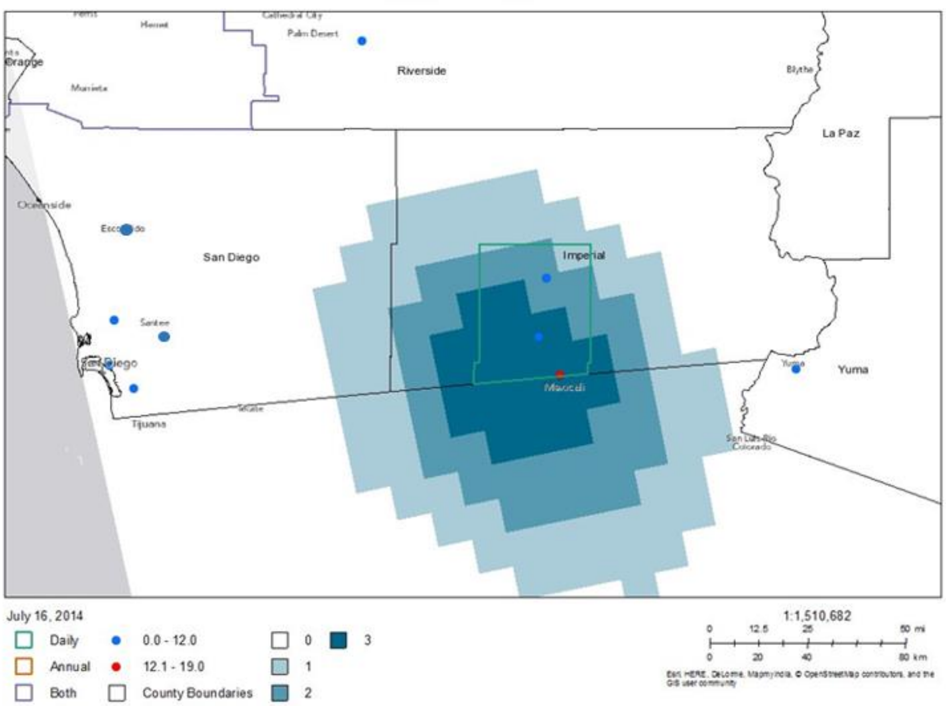
[42] The KDEs graphically represent the aggregate of HYSPLIT backward trajectories for the years 2010-2012, run every third day (beginning on the first day of monitoring), four times each day, and ending at four endpoint heights.

Figures 9. Quarter 1-Quarter 4: HYSPLIT Kernel Density Estimation Plots for the Calexico-Ethel Monitoring Station.

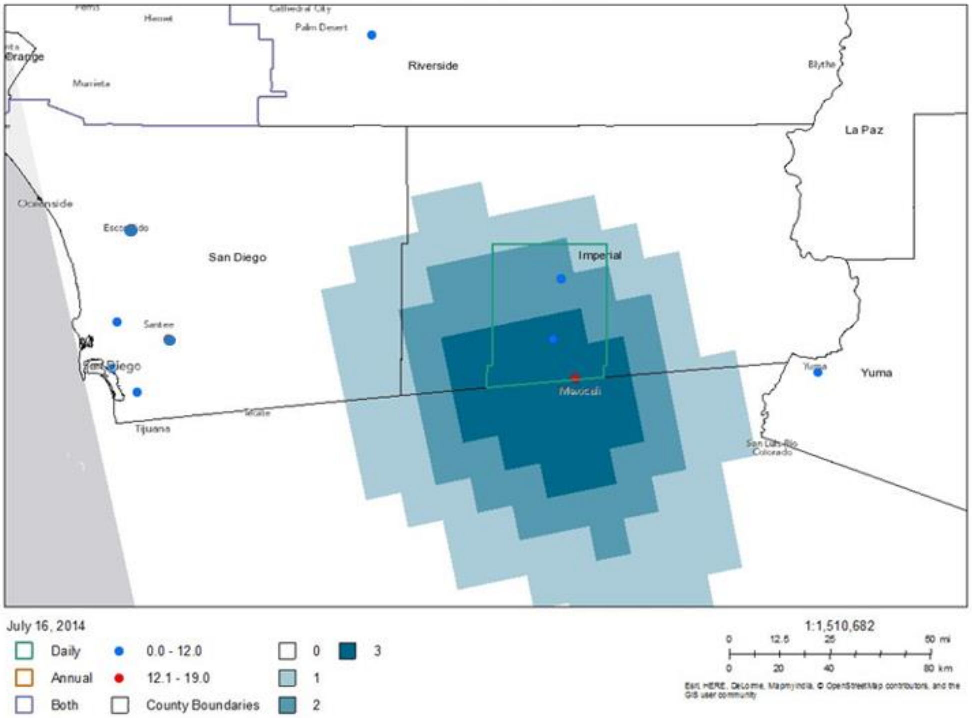
Calexico-Ethel Q1



Calexico-Ethel Q2



Calexico-Ethel Q3



Calexico-Ethel Q4

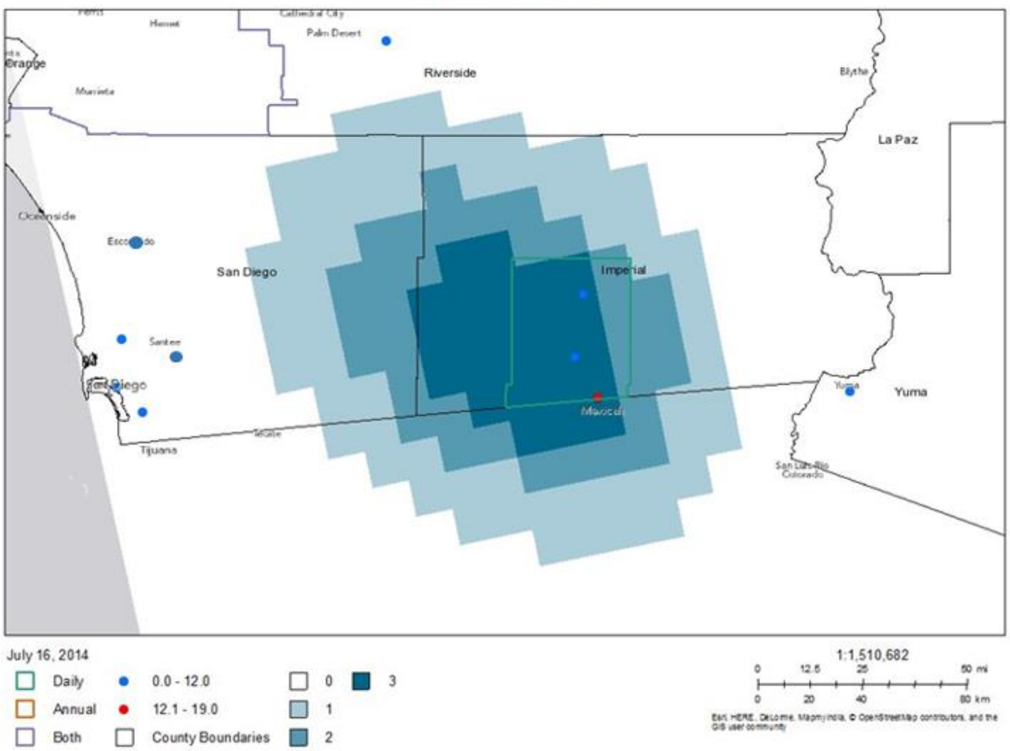


Figure 10. Pollution Roses for Calexico Ethel, 2011-2013. $PM_{2.5}$ > 12 µg/m^3 Binned by Wind Direction and Quarter.

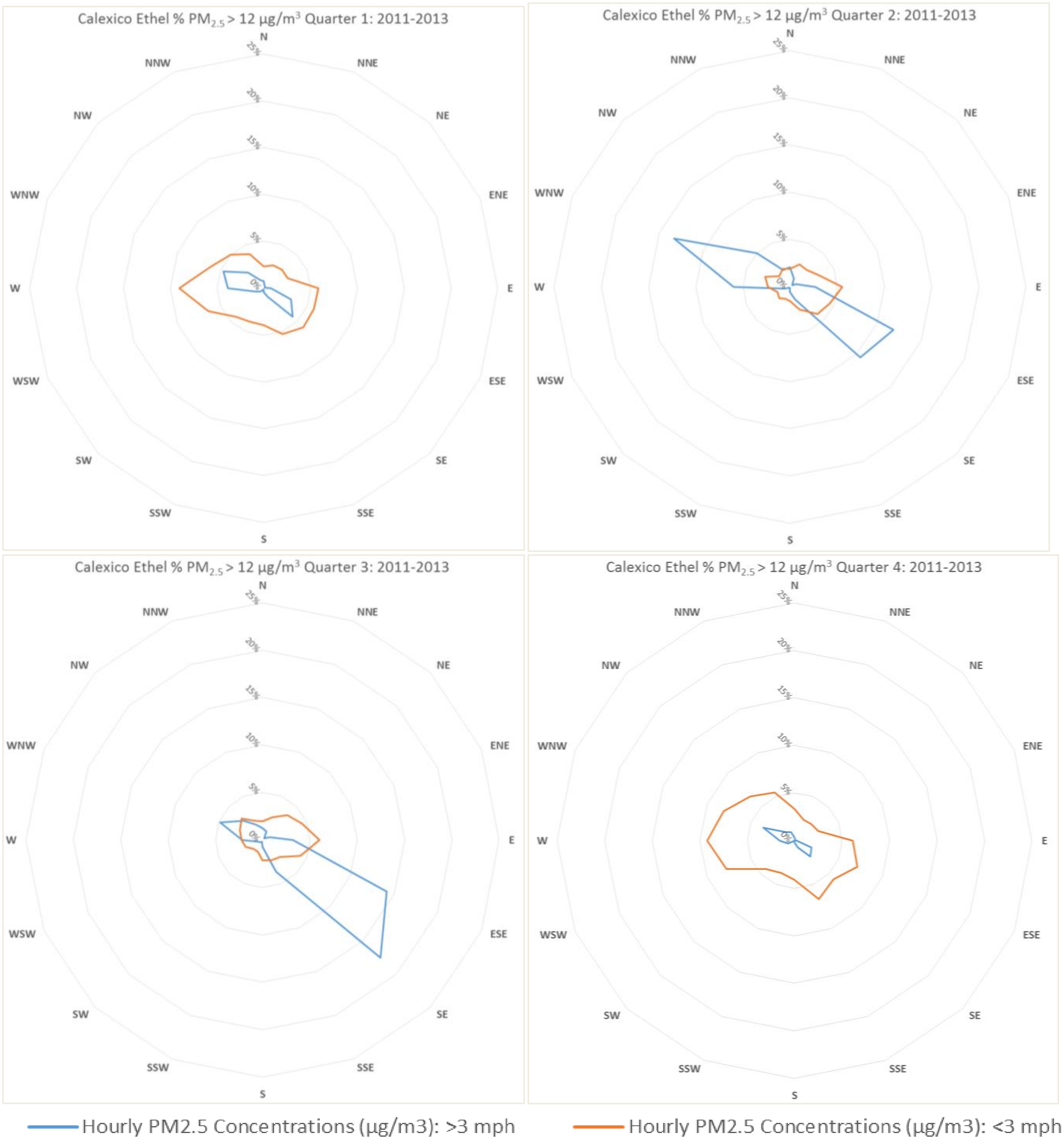


Figure 10 shows the distribution of hourly $PM_{2.5}$ concentrations greater than 12 µg/m^3 from the Calexico Ethel monitoring site binned by wind direction (e.g. direct N corresponds to hourly $PM_{2.5}$ concentrations from wind directions ranging from 349° to 11°, direct NNW corresponds to hourly $PM_{2.5}$ concentrations from wind directions ranging from 326° to 349°) for the years 2011-2013. These data are also separated by wind speed to highlight the effect of wind speeds over 3 miles per hour (mph) versus stagnant conditions, here characterized as instances when wind speeds are less than 3 mph, on $PM_{2.5}$ concentrations throughout the different quarters of the year.

These values represent the percentage of hourly $PM_{2.5}$ values greater than 12 µg/m^3 for a given wind direction. This analysis focuses on higher concentrations with respect to the annual NAAQS, which provides insight into the directionality of $PM_{2.5}$ concentrations on a subset of days throughout the year that may be contributing to violations of the annual NAAQS. For example, in Q2, 13% of all hourly values above 12 µg/m^3 are associated with wind speeds greater than 3 mph from the WNW wind direction. Generally, stagnant conditions are indicative of contributions from emission sources from locations closer to the monitor, while higher wind speeds indicate greater probability of contribution from emission sources from locations further away. For quarters two and four, shown to be the quarters with the highest average concentrations at the violating Calexico Ethel monitor (see Figure 2a in Factor 1), these data further support the conclusion that there are two different meteorological regimes resulting in different $PM_{2.5}$ sources contributing to violations of the NAAQS during these quarters. 58% of all hourly $PM_{2.5}$ concentrations greater than 12 µg/m^3 in quarter two are associated with wind speeds greater than 3 mph, while only 14% of the hourly $PM_{2.5}$ concentrations greater than 12 µg/m^3 are associated with these same conditions in quarter four. Conversely, it appears that higher hourly concentrations measured in quarter four are more associated with stagnant conditions - 86% of all hourly $PM_{2.5}$ concentrations greater than 12 µg/m^3 measured in quarter four occurred when wind speeds were less than 3 mph. Also, when considering $PM_{2.5}$ concentrations associated with wind speeds greater than 3 mph, 24% of all hourly $PM_{2.5}$ concentrations greater than 12 µg/m^3 measured at the Calexico Ethel monitoring site in quarter two are from northwesterly wind directions (i.e. >281° and <78.8°), compared to only 6% in quarter four. Figure 10 additionally shows in quarter 2 that the west-northwest direction contains the highest percentage of hourly $PM_{2.5}$ concentrations greater than 12 µg/m^3 at 13%. This indicates that there are greater contributions from sources in the west-northwest direction to violations of the annual NAAQS during quarter two compared to quarter four.

Factor 4: Geography/topography

To evaluate the geography/topography factor, the EPA assessed physical features of the area of analysis that might define the airshed and thus affect the formation and distribution of $PM_{2.5}$ concentrations over the area.

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 10a) 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 that limit air-pollution transport within its airshed. There are no topographical barriers to separate the EPA's nonattainment area from the rest of the Imperial Valley. Outside of Imperial County, the Peninsular Ranges to the west of Imperial County serve as a partial barrier to transport from San Diego County. The Chocolate, Orocopia, and Cargo Muchacho Mountains mountain ranges within and to the east of Imperial County serve as a partial barrier to transport from Yuma County and La Paz County in Arizona.

Figure 10a. Topographic Map in the Area of Analysis for Imperial County.

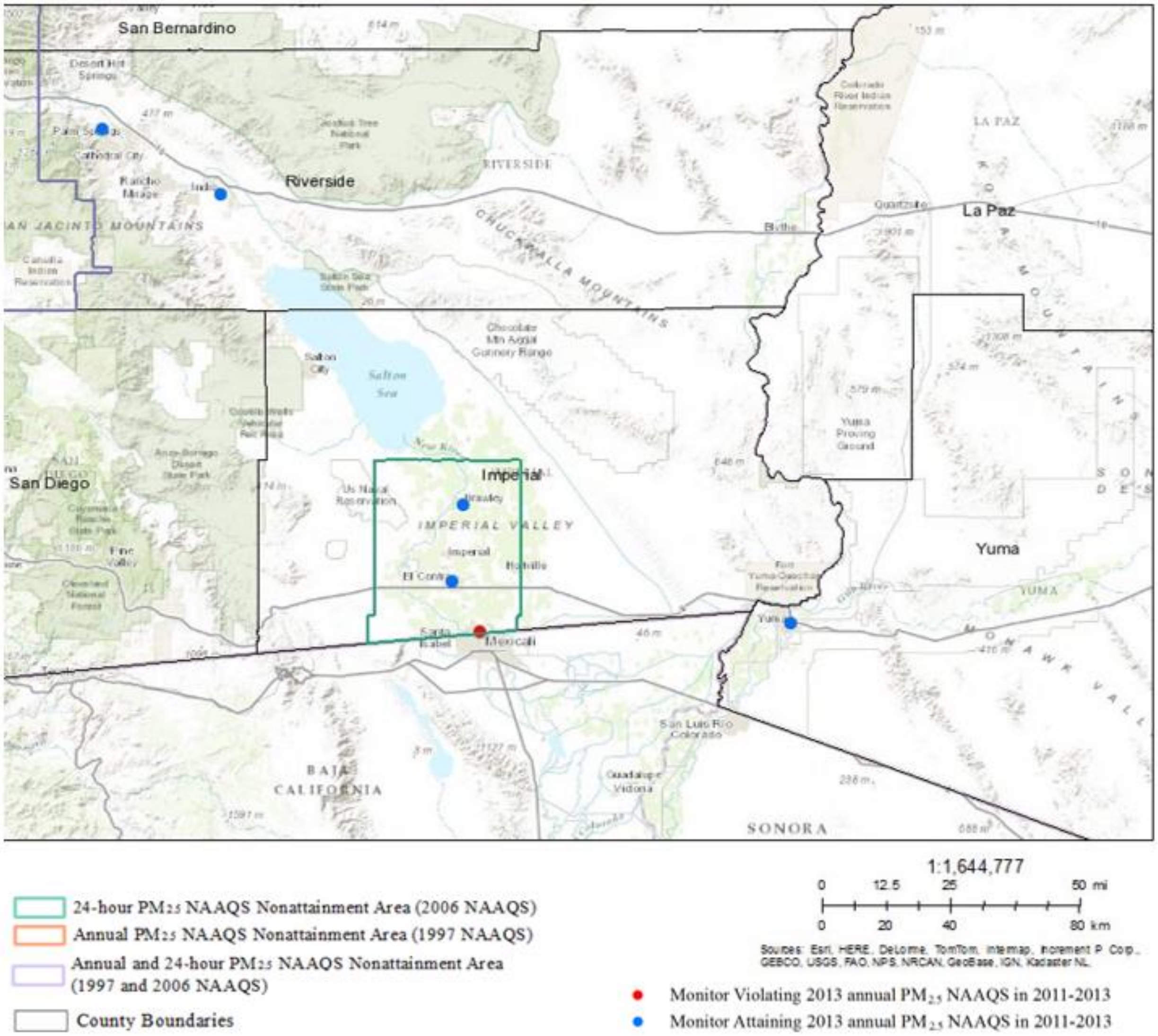
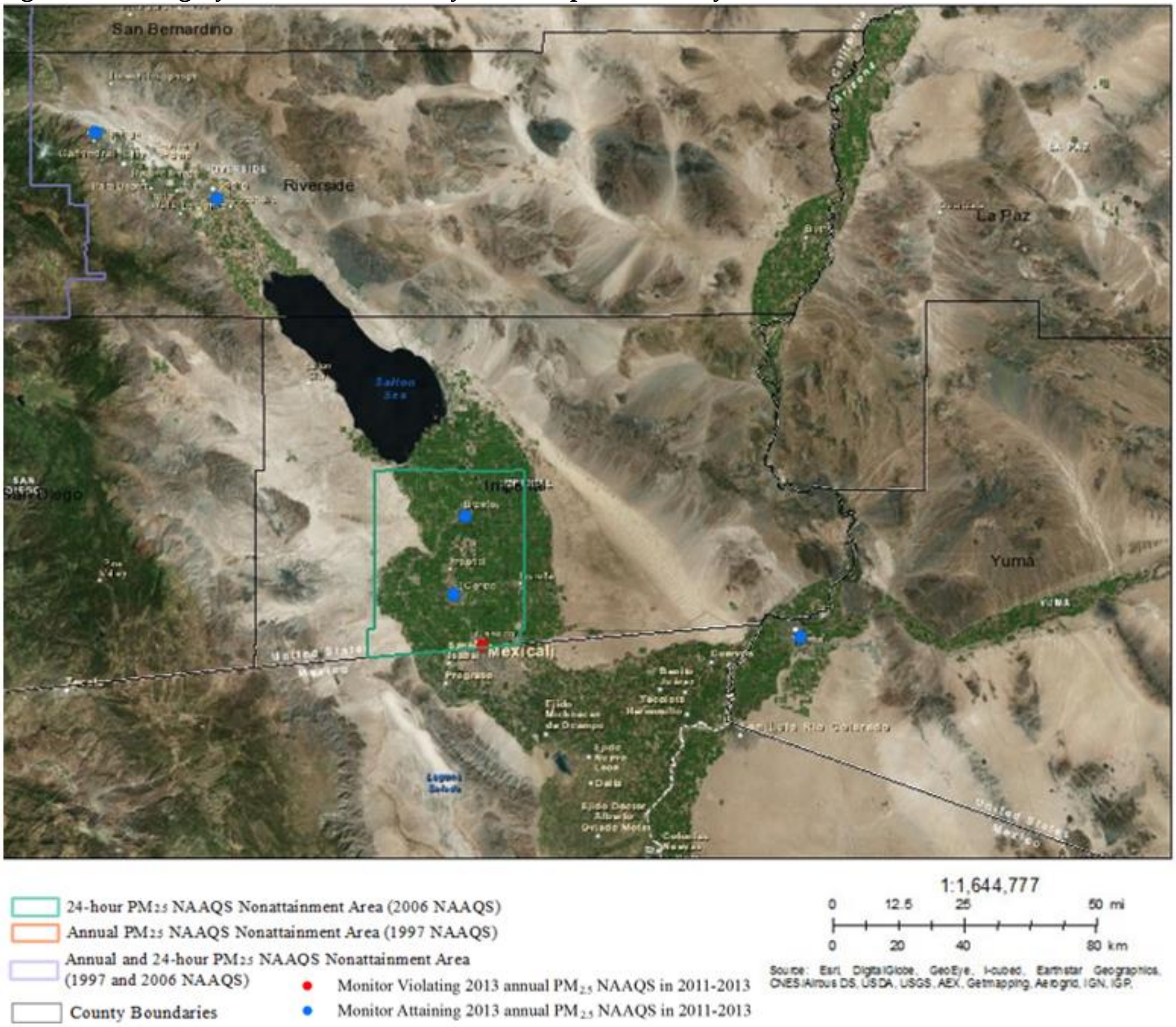


Figure 10b. Imagery in the Area of Analysis for Imperial County.



Factor 5: Jurisdictional boundaries

In defining the boundaries of the Imperial County, CA nonattainment area, the EPA considered existing jurisdictional boundaries, which can provide easily identifiable and recognized boundaries for purposes of implementing the NAAQS. Existing jurisdictional boundaries often signify the state or local governmental organization with the necessary legal authority for carrying out air quality planning and enforcement functions for the nonattainment area. Examples of such jurisdictional boundaries include existing/prior nonattainment area boundaries for particulate matter, county lines, air district boundaries, township boundaries, areas covered by a metropolitan planning organization, state lines, and Reservation boundaries, if applicable. Where existing jurisdictional boundaries were not adequate or appropriate to describe the nonattainment area, the EPA considered other clearly defined and permanent landmarks or geographic coordinates for purposes of identifying the boundaries of the designated areas.

The EPA has previously established nonattainment boundaries for the 2006 24-hour $PM_{2.5}$ NAAQS within Imperial County, and a larger partial-county nonattainment area encompassing all of Imperial County except the portion east of the Chocolate Mountains for the 1997 24-hour PM_{10} NAAQS. The state has recommended the same boundary for the 2012 annual $PM_{2.5}$ NAAQS as exists for the 2006 24-hr $PM_{2.5}$ NAAQS. The state did not provide a 5-factor analysis to support their partial-county recommended nonattainment area for Imperial County, CA, instead merely relying on the existing 2006 24-hr $PM_{2.5}$ NAAQS jurisdiction factor to recommend the same area as nonattainment for the 2012 annual $PM_{2.5}$ NAAQS. [The 2006 24-hr nonattainment boundary was chosen based on the assumption that emissions from the City of Mexicali from across the U.S. – Mexico border influence exceedances of the 24-hour NAAQS during stagnation conditions in the winter months of November through February.]

In Imperial County, CA, air quality is managed by the Imperial County Air Pollution Control District (ICAPCD or district). ICAPCD has jurisdiction over control of stationary and non-point sources in the county while the state retains authority over mobile sources and consumer products. In addition, the district is the lead agency in developing state implementation plans for any area within the county. SIPs are submitted by ICAPCD to the state for subsequent action and then the state submits them to the EPA for federal action.

Imperial County is a member of the Southern California Association of Governments (SCAG). According to its website, "SCAG is the nation's largest metropolitan planning organization, representing six counties, 191 cities and more than 18 million residents." SCAG covers most of southern California, with the exception of San Diego County, CA. The EPA deemed the area under SCAG jurisdiction to be inappropriately large with respect to developing a boundary for the Imperial County, CA nonattainment area. However, Imperial County is a member of SCAG and has the ability to perform certain transportation and transit related functions in the county, such as addressing the requirements under the CAA of transportation conformity.

The Office of Management and Budget's December 2009 delineations of core-based statistical areas (CBSAs) lists Imperial County, CA as the El Centro metropolitan statistical area (metro CBSA). In the listing, OMB did not include the metro CBSA in any larger adjacent combined statistical area (CSA). Directly to the north of the metro CBSA is one of the largest CSAs in the nation, the Los Angeles-Long Beach-Riverside CSA (LA CSA). In not delineating the metro CBSA as part of the neighboring LA CSA, it is clear that the metro CBSA is not economically linked to the neighboring CSA, nor even to the neighboring metro CBSAs. To the west is the San Diego-Carlsbad-San Marcos metro CBSA, and to the east is the Yuma, AZ metro CBSA. This characterization is in line with the agricultural nature of Imperial County, CA, and is borne out by other factors above. The EPA has no indication that there is any large-scale commuting pattern between Imperial County, CA and any other neighboring county, for example. The southern border of Imperial County, CA is also the international border between the United States and Mexico.

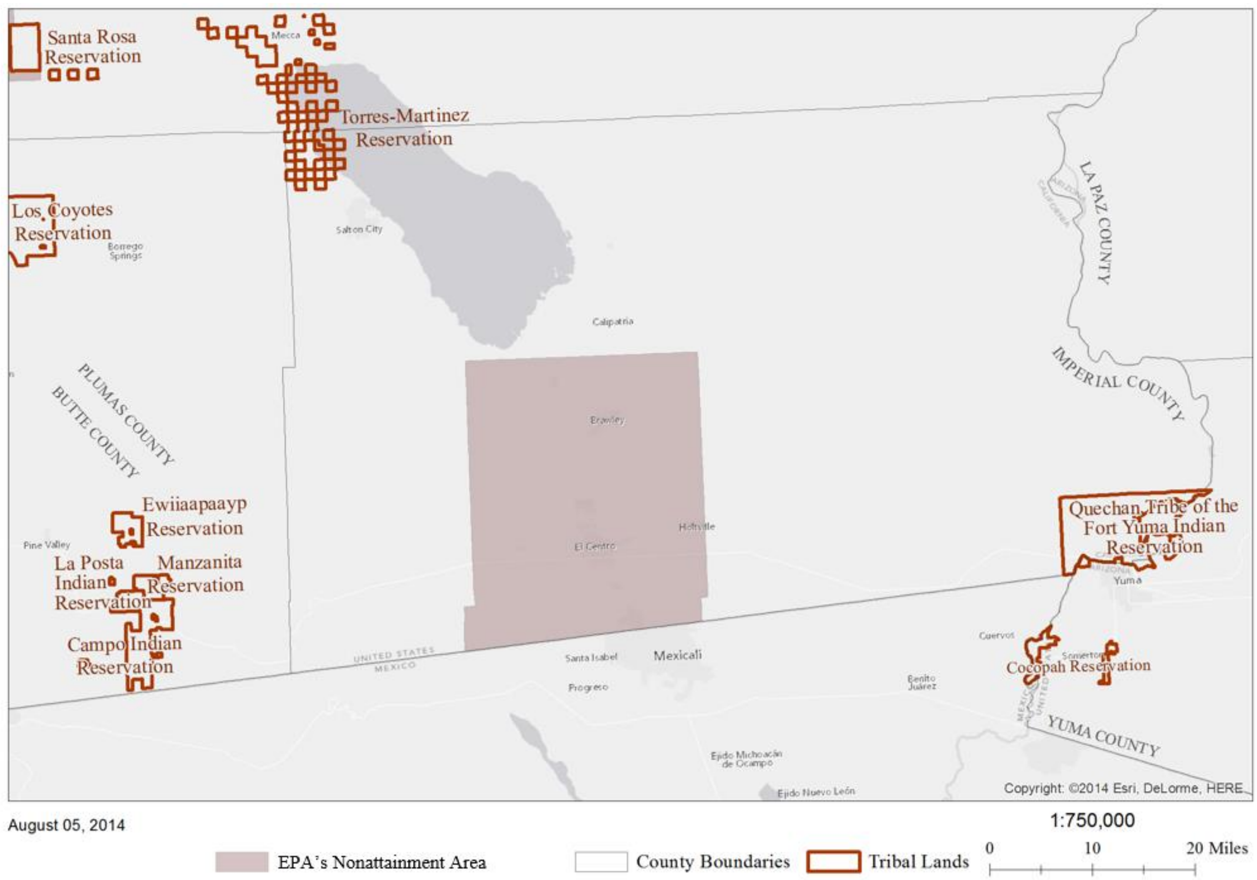
Imperial County also includes portions of Indian country of the following tribes: the Quechan Tribe of the Fort Yuma Indian Reservation (Quechan) and the Torres Martinez Desert Cahuilla Indians (Torres Martinez). As defined at 18 U.S.C. § 1151, "Indian country" refers to: "(a) all land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and, including rights-of-way running through the reservation, (b) all dependent Indian communities within the borders of the United States whether within the original or subsequently acquired territory thereof, and whether within or without the limits of a state, and (c) all Indian allotments, the Indian titles to which have not been extinguished, including rights-of-way running through the same." The EPA recognizes the sovereignty of tribal governments, and has attempted to take the desires of the tribes into account in establishing appropriate nonattainment area boundaries. We did not receive recommendations from either tribe.

Torres Martinez is a federally recognized tribe that has non-contiguous lands in both Imperial County and Riverside County. These portions of Indian country and the surrounding nonattainment areas are shown in Figure 1. We are designating the Torres Martinez reservation lands as "unclassifiable/attainment," consistent with the surrounding area.

Quechan is a federally recognized tribe that has contiguous lands spanning Imperial County, California and Yuma County, Arizona. These portions of Indian country and the surrounding nonattainment areas are shown in Figure 1. We are designating all areas of Quechan Indian country as "unclassifiable/attainment," consistent with the surrounding area.

The nonattainment area therefore does not include portions of Indian country.

Figure 11. EPA's Imperial County Nonattainment Area and Nearby Tribes



In summary for this factor, a nonattainment boundary consistent with the 2006 24-hour $PM_{2.5}$ nonattainment area covers both the area that violates the NAAQS and nearby areas that contribute to the violation.

Conclusion for Imperial County Area

Based on the assessment of factors described above, both individually and in combination, the EPA has concluded that the following partial county should be included as part of the Imperial County nonattainment area because portions of the county are either violating the 2012 annual $PM_{2.5}$ NAAQS or contributing to a violation at a nearby monitoring site: Imperial County (partial). The area the EPA is designating nonattainment for the annual standard is in the central-southern portion of Imperial County, CA, and includes the City of Calexico. The EPA concurs with the state's recommendation for this area, and is designating the same area as is included in the Imperial County nonattainment area for the 2006 24-hour $PM_{2.5}$ NAAQS.

An evaluation of Factor 1 shows that the air quality monitoring sites in Imperial County indicate violations of the 2012 annual $PM_{2.5}$ NAAQS based on the 2013 DVs; therefore portions of the county are included in the nonattainment area. Further evaluation of $PM_{2.5}$ chemical mass constituents at the Calexico Ethel monitoring station show that while organic mass comprises 58% of the annual average $PM_{2.5}$ concentrations in the area, crustal material comprises 21%, which suggests that fugitive dust sources, including unpaved roads, agricultural sources, and windblown dust are also contributing sources to violations of the 2012 annual $PM_{2.5}$ NAAQS. Factor 2 shows that the Imperial County nonattainment area includes sources of directly emitted $PM_{2.5}$ and/or $PM_{2.5}$ precursors in the area that contribute to the violating monitor, and all areas in the nonattainment area contribute to the particulate matter concentrations which result in violations of the 2012 annual $PM_{2.5}$ NAAQS through emissions from non-point sources (e.g. area sources) and mobile sources. As discussed in Factor 1, both organic mass and crustal material are contributing emissions sources to violations of the 2012 annual $PM_{2.5}$ NAAQS and therefore, the nonattainment area includes both sources of organic mass and crustal material.

Factor 3 suggests that during the spring months there are likely contributions of emissions from the regions to the west-northwest and to the southeast of the Calexico Ethel monitoring location. Stagnant conditions during the winter months have the potential to cause more localized exceedances of the NAAQS, including influences from Mexico to the south of the violating Calexico-Ethel monitoring site. Both of these time periods are associated with higher quarterly averages than other times of the year (see Factor 1), which further supports that there are two distinct meteorological regimes under which different source areas contribute to violations of the 2012 annual $PM_{2.5}$ NAAQS.

As discussed in Factor 4, Imperial County does not have any geographical or topographical barriers that limit air-pollution transport within the Imperial Valley portion of the county. Outside of Imperial Valley, the Peninsular Ranges to the west of Imperial County does serve as a partial barrier to transport from San Diego County, while the Chocolate, Orocopia, and Cargo Muchacho Mountains mountain ranges within and to the east of Imperial County serve as a partial barrier to transport from Yuma County and La Paz County in Arizona.

An assessment of Factor 5 supports the Imperial County nonattainment area due to the previous 2006 24-hour $PM_{2.5}$ nonattainment boundary designations and local air district jurisdiction, which encompasses a portion of Imperial County.

Furthermore, given the uncertainty in the emissions of crustal sources outside the nonattainment boundary, the EPA is designating Imperial County nonattainment for the 2012 annual $PM_{2.5}$ NAAQS pursuant to the same boundary as the 24-hour $PM_{2.5}$ standard, including only a portion of Imperial County in the nonattainment area, based primarily on the jurisdiction factor.

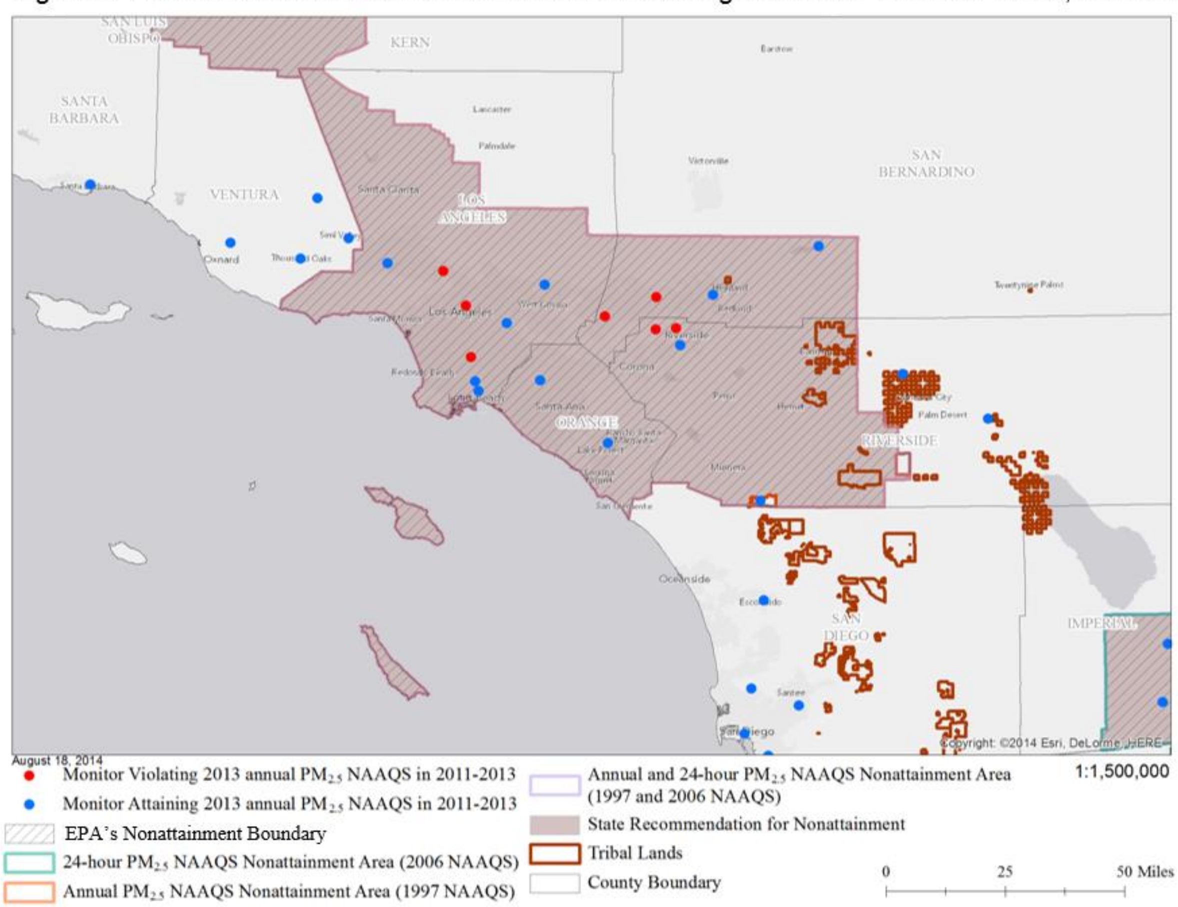
Based on proximity to the border, emissions data from Mexico, population statistics, and wind patterns, the EPA expects some contribution from sources in Mexicali to the violations at the Calexico Ethel site. In addition, based on speciated data, wind patterns, and land use, the EPA also expects a local contribution from within Imperial County. As described in the TSD, information available indicates that biomass burning, combustion sources, and fugitive dust sources such as agricultural sources, unpaved roads, and windblown dust are large contributors to high annual $PM_{2.5}$ concentrations within Imperial County. Specifically, wind patterns indicate that part of the year is strongly impacted by sources to the north and northwest of Calexico Ethel. The EPA is designating using the same boundary as the 24-hour $PM_{2.5}$ standard, based primarily on the jurisdiction factor.

3.2 Area Background and Overview – Los Angeles-South Coast Air Basin, CA

Figure 1 is a map of the EPA's nonattainment boundary for the Los Angeles-South Coast Air Basin. The map shows the location and design values of ambient air quality monitoring locations, county and other jurisdictional boundaries, the State recommendation, and existing 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS nonattainment boundaries. Figure 1a shows the EPA's area of analysis considered in this section, which includes the counties in the Los Angeles-Long Beach-Riverside combined statistical area (CSA) (Los Angeles, Orange, Riverside, and San Bernardino counties) as well as all adjacent counties (Imperial, Inyo, Kern, San Diego, and Ventura counties in California, Mojave and La Paz counties in Arizona, and Clark County, Nevada).

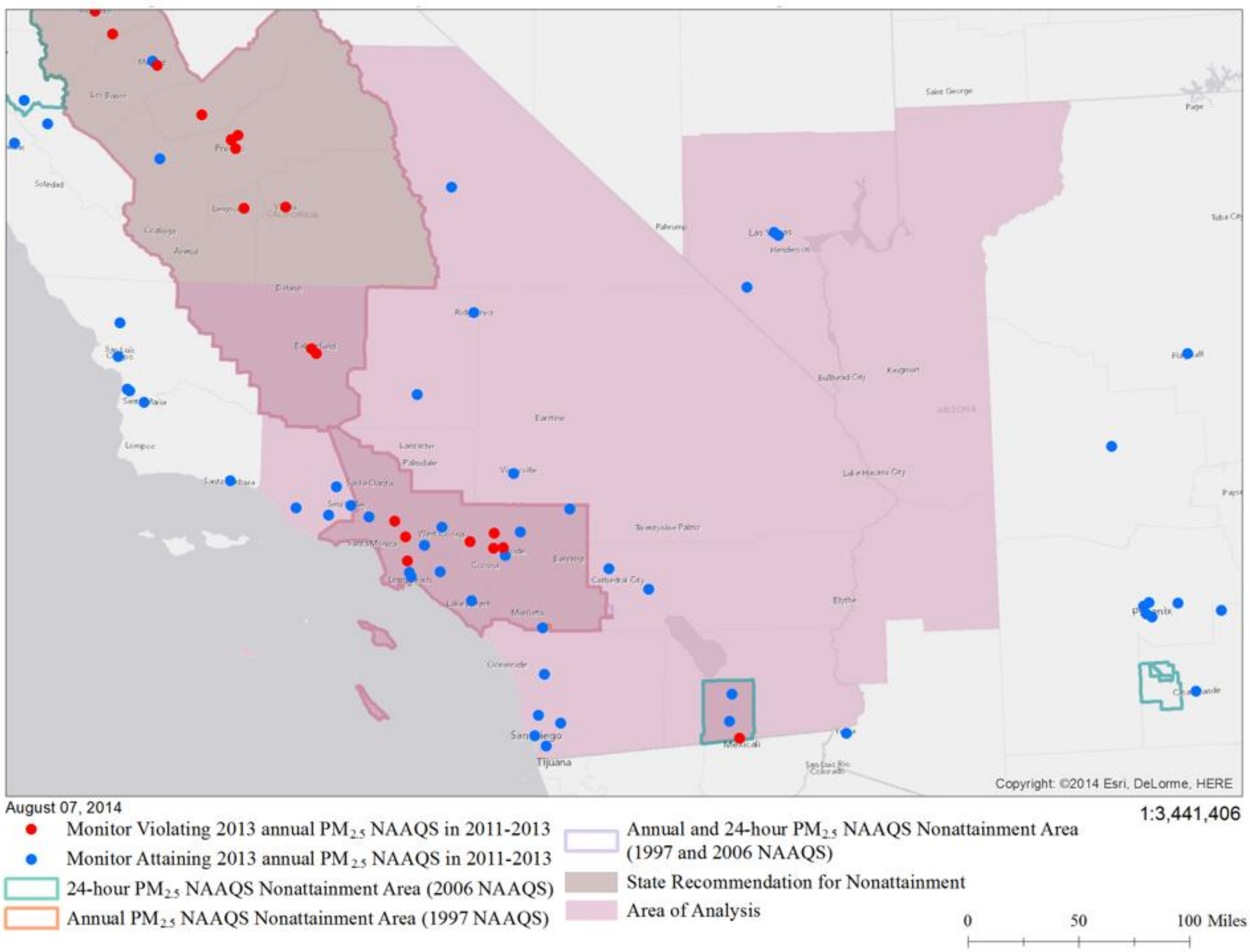
For purposes of the 1997 annual $PM_{2.5}$ NAAQS, this area was designated nonattainment. The boundary for the nonattainment area for the 1997 annual $PM_{2.5}$ NAAQS included the entirety of Orange County and parts of Los Angeles, San Bernardino and Riverside counties. For purposes of the 2006 24-hour $PM_{2.5}$ NAAQS, this area was designated nonattainment. The boundary for the nonattainment area for the 2006 24-hour $PM_{2.5}$ NAAQS included the entirety of Orange County and parts of Los Angeles, San Bernardino and Riverside counties. The boundary for the 2012 annual $PM_{2.5}$ NAAQS is the same as the existing designated boundaries for the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS. The Los Angeles-South Coast Air Basin nonattainment area includes areas of Indian country of the following federally recognized tribes: the Cahuilla Band of Mission Indians of the Cahuilla Reservation, the Morongo Band of Mission Indians, the Ramona Band of Cahuilla, the San Manuel Band of Mission Indians, and the Soboba Band of Luiseño Indians.

Figure 1. EPA's Nonattainment Boundaries for the Los Angeles-South Coast Air Basin, CA Area



The EPA must designate as nonattainment areas that violate the NAAQS and nearby areas that contribute to the violation in the violating area. Data from monitors located in Los Angeles, Riverside, and San Bernardino counties show violations of the 2012 $PM_{2.5}$ NAAQS, therefore it is appropriate for these three counties or some portion of these three counties to be designated nonattainment. As shown in Figure 1a, the EPA evaluated each county with a violating monitor as well as those located near a county with a violating monitoring site based on the five factors and other relevant information. The following sections describe this five factor analysis process. While the factors are presented individually, they are not independent. The five factor analysis process carefully considers their interconnections and the dependence of each factor on one or more of the others.

Figure 1a. Area of Analysis for the Los Angeles-South Coast Air Basin, CA Nonattainment Area



Factor 1: Air Quality Data

All data collected during the year are important when determining contributions to an annual standard such as the 2012 annual $PM_{2.5}$ NAAQS. Compliance with an annual NAAQS is dependent upon monitor readings throughout the year, including days with monitored ambient concentrations below the level of the NAAQS. For the 2012 annual $PM_{2.5}$ NAAQS, the annual mean is calculated as the mean of quarterly means. A high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV. Although all data are important, seasonal or episodic emissions can provide insight as to relative contributors to measured $PM_{2.5}$ concentrations. For these reasons, for the Factor 1 air quality analysis, the EPA assessed and characterized air quality at, and in the proximity of, the violating monitoring site locations first, by evaluating trends and the spatial extent of measured concentrations at monitors in the area of analysis, and then, by identifying the conditions most associated with high average concentration levels of $PM_{2.5}$ mass in the area of analysis.

In most cases, the EPA assessed air quality data on a seasonal, or quarterly, basis.[43] The EPA also identified the spatial extent of these high $PM_{2.5}$ concentrations. The mass and composition at the design value location represents contributions from various emission sources including local, area-wide (which may comprise nearby urban and rural areas) and regional sources. To determine the source mix (by mass) at the design value monitoring site, the EPA examined the chemical composition of the monitored $PM_{2.5}$ concentrations by pairing each violating FRM/FEM/ARM monitoring site with a collocated or nearby Chemical Speciation Network (CSN) monitoring site or sites. Then, the EPA contrasted the approximated mass composition at the design value monitoring site with data collected at IMPROVE[44] and other monitoring locations whose data are representative of regional background.[45,46] This comparison of local/area-wide chemical composition data to regional chemical composition data derives an "urban increment," which helps differentiate the influence of more distant emissions sources from

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[43] Although compliance with the annual NAAQS depends on contributions from all days of the year, examining data on a quarterly or seasonal basis can inform the relationship between the temporal variability of emissions and meteorology and the resulting $PM_{2.5}$ mass and composition. In some areas of the country where there may be noticeable month-to-month variations in average $PM_{2.5}$, the quarterly averages may not adequately represent seasonal variability. In these areas, air quality data may be aggregated and presented by those months that best correspond to the local "seasons" in these areas.

[44] IMPROVE stands for Interagency Monitoring for Protected Visual Environments and is an aerosol monitoring network in mostly rural and remote areas.

[45] The "urban increment" analysis assesses and characterizes the increase in seasonal and annual average $PM_{2.5}$ mass and chemical constituents observed at violating monitoring site(s) relative to monitoring sites outside the area of analysis (which represent background concentrations). Developing the urban increment involves pairing a violating FRM/FEM/ARM monitor with a collocated monitor or nearby monitor with speciation data. EPA made every effort to pair these data to represent the same temporal and spatial scales. However, in some cases, the paired violating and CSN "urban" monitoring locations were separated by some distance such that the included urban CSN site(s) reflect(s) a different mixture of emissions sources, which could lead to misinterpretations. To generally account for differences in $PM_{2.5}$ mass between the violating site and the nearby CSN site(s), EPA determined material balance of the $PM_{2.5}$ composition at the violating site by assigning the extra measured $PM_{2.5}$ mass to the carbon components of $PM_{2.5}$. Where the general urban increment approach may be misleading, or in situations where non-carbonaceous emissions are believed to be responsible for a local $PM_{2.5}$ concentration gradient, EPA used alternative analyses to reflect the mix of urban and rural sources contributing to the measured concentrations at violating monitoring sites.

[46] The urban monitors were paired with any rural sites within a 150 mile radius of an urban site to calculate spatial means of the quarterly averages of each species. If there were no rural sites within 150 miles, then the nearest rural site was used alone. That rural mean was then subtracted from the quarterly mean of the urban site to get the increment. Negative values were simply replaced with zeros.

the influence of closer emissions sources, thus representing the portion of the measured violation that is associated with nearby emission contributions.[47,48,49]

<u>$PM_{2.5}$ Design Values and Total Mass Measurements</u> – The EPA examined ambient $PM_{2.5}$ air quality monitoring data represented by the DVs at the violating monitoring site and at other monitors in the area of analysis. The EPA calculated DVs based on air quality data for the most recent 3 consecutive calendar years of quality-assured, certified air quality data from suitable FEM/FRM/ARM monitoring sites in the EPA's Air Quality System (AQS). For this designations analysis, the EPA used data for the 2011-2013 period (i.e., the 2013 design value), which are the most recent years with fully-certified air quality data. A monitor's DV is the metric or statistic that indicates whether that monitor attains a specified air quality standard. The 2012 annual $PM_{2.5}$ NAAQS is met at a monitoring site when the 3-year average annual mean concentration is 12.0 micrograms per cubic meter ($\mu g/m^3$) or less (e.g., 12.1 $\mu g/m^3$ or greater is a violation). A DV is only valid if minimum data completeness criteria are met or when other regulatory data processing provisions are satisfied (See 40 CFR part 50 Appendix N). Table 2 identifies the current design value(s) (i.e., the 2013 DV) and the most recent two design values based on all monitoring sites in the area of analysis.[50] Where a county has more than one monitoring location, the county design value is indicated in red type.

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[47] In most, but not all, cases, the violating design value monitoring site is located in an urban area. Where the violating monitor is not located in an urban area, the "urban increment" represents the difference between local and other nearby emission sources in the vicinity of the violating monitoring location and more regional sources.

[48] Hand, et. al. Spatial and Seasonal Patterns and Temporal Variability of Haze and its Constituents in the United States: Report V, June 2011. Chapter 7 – Urban Excess in $PM_{2.5}$ Speciated Aerosol Concentrations, http://vista.cira.colostate.edu/improve/Publications/Reports/2011/PDF/Chapter7.pdf

[49] US EPA, Office of Air Quality Planning and Standards, December 2004. (2004) Area Designations for 1997 Fine Particle ($PM_{2.5}$) Standards, Technical Support Document for State and Tribal Air Quality Fine Particle ($PM_{2.5}$) Designations, Chapter 3, Urban Excess Methodology. Available at www.epa.gov/pmdesignations/1997standards/documents/final/TSD/Ch3.pdf

[50] In certain circumstances, one or more monitoring locations within a monitoring network may not meet the network technical requirements set forth in 40 CFR 58.11(e), which states, "State and local governments must assess data from Class III $PM_{2.5}$ FEM and ARM monitors operated within their network using the performance criteria described in table C-4 to subpart C of part 53 of this chapter, for cases where the data are identified as not of sufficient comparability to a collocated FRM, and the monitoring agency requests that the FEM or ARM data should not be used in comparison to the NAAQS. These assessments are required in the monitoring agency's annual monitoring network plan described in §58.10(b) for cases where the FEM or ARM is identified as not of sufficient comparability to a collocated FRM…."

Table 2. Air Quality Data collected at Regulatory Monitors (all DV levels in μg/m^3)[a]

County, State	Monitor Site ID	Site Name	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
Los Angeles, CA	060370002	Azusa	Yes	12 [b]	11.3 [b]	11.2
Los Angeles, CA	060371002	Burbank	Yes	13.7[c]	12.6 [c]	12.5 [c]
Los Angeles, CA	060371103	Los Angeles - Main St.	Yes	13.1 [c]	12.5 [c]	12.5 [c]
Los Angeles, CA	060371201	Reseda	Yes	10.6	10.3	10.2
Los Angeles, CA	060371302	Compton	Yes	13.4	12.4	12.2
Los Angeles, CA	060371602	Pico Rivera #2	Yes	13.3	12.3	12.0
Los Angeles, CA	060372005	Pasadena	Yes	11.1 [b]	10.4 [b]	10.4 [b]
Los Angeles, CA	060374002	Long Beach (North)	Yes	11.5 [c]	10.6 [c]	10.9 [c]
Los Angeles, CA	060374004	South Long Beach	Yes	11.2	10.6 [c]	10.8 [c]
Los Angeles, CA	060379033	Lancaster	No	6.9 [b]	6.2 [b]	6.1 [b]
Orange, CA	060590007	Anaheim	Yes	11.1 [c]	10.6 [c]	10.6 [c]
Orange, CA	060592022	Mission Viejo	Yes	8.7	8.1	8.2
Riverside / San Diego, CA	060650009	Pechanga	No	8.5 [b]	7.8 [b]	7.7
Riverside, CA	060651003	Riverside	Yes	12	11.4	11.5
Riverside, CA	060652002	Indio	No	7.3	7.2	7.7
Riverside, CA	060655001	Palm Springs	No	6.2	6.2	6.4
Riverside, CA	060658001	Rubidoux	Yes	14.2 [c]	13.4 [c]	13.2 [c]
Riverside, CA	060658005	Mira Loma - Van Buren	Yes	15.9 [c]	15.2 [c]	14.8 [c]
San Bernardino, CA	060710025	Ontario Fire Station	Yes	13.7	12.9	12.6
San Bernardino, CA	060710306	Victorville - Park Avenue	No	7.7 [b]	6.9 [b]	6.8 [b]
San Bernardino, CA	060712002	Fontana	Yes	12.9	12.4	12.6
San Bernardino, CA	060718001	Big Bear	Yes	8.9	8.3	8.7
San Bernardino, CA	060719004	San Bernardino	Yes	12.1	11.7	11.8
Imperial, CA	060250005	Calexico Ethel	Yes[d]	13.9[g]	14.1[g]	14.3[g]
Imperial, CA	060250007	Brawley	Yes[d]	7.1	7.1	7.5
Imperial, CA	060251003	El Centro	Yes[d]	7.4	7.2	7.4
Inyo, CA	060271003	Keeler	No	7.3	7.3	7.5
Kern, CA	060290011	Mojave-Poole	No	5.3 [b]	5.7 [b]	7.0 [b]
Kern, CA	060290014	Bakersfield-California Avenue	Yes[e]	16.5	14.5	16.4
Kern, CA	060290015	Ridgecrest	No	5.5 [b]	5.3 [b]	5.4 [b]
Kern, CA	060290016	Bakersfield-Planz	Yes[e]	18.2	15.6	17.3
San Diego, CA	060730001	Chula Vista	No	10.3	9.8	9.9
San Diego, CA	060730003	El Cajon	No	11.8	10.6[c]	10.6 [c]
San Diego, CA	060731002	Escondido	No	10.7	10.5[c]	10.7 [c]
San Diego, CA	060731010	San Diego - Downtown	No	11.0	10.8 [c]	10.8 [c]
San Diego, CA	060731016	San Diego - Kearny Villa Road [f]	No	9.4	8.9	8.7
Ventura, CA	061110007	Thousand Oaks	No	9.3	8.9	9.1
Ventura, CA	061110009	Piru	No	8.5	8.6	8.1
Ventura, CA	061111004	Ojai	No	na	9.5 [b]	9.0 [b]
Ventura, CA	061112002	Simi Valley	No	9.3	8.9	9.1
Ventura, CA	061113001	El Rio	No	9.2	8.7	9.0
Clark, NV	320030298	Green Valley	No	0	0	6.8 [b]
Clark, NV	320030540	Jerome Mack	No	9	7.8	8.1

County, State	Monitor Site ID	Site Name	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
Clark, NV	320030561	Sunrise Acres	No	7.7	7.9	8.8
Clark, NV	320031019	Jean	No	3.7	4	4.6
Clark, NV	320032002	JD Smith	No	7.3 [b]	8.3 [b]	9.5 [b]
La Paz, AZ	N/A		No	No Monitor		
Mojave, AZ	N/A		No	No Monitor		

[a] Where a county has more than one monitoring location, the county design value is indicated in red type.
[b] The listed design value is not valid due to completeness issues.
[c] This design value does not include data from Class III FEM monitors that the EPA has approved as not eligible for comparison to the NAAQS per 40 CFR 58.11(e). Documents associated with this action available at www.regulations.gov, Docket ID No. EPA-HQ-OAR-2012-0918.
[d] State recommended nonattainment as part of a separate nonattainment area. See the section of this document titled "Area Background and Overview – Imperial County, CA" for more information.
[e] State recommended nonattainment as part of a separate nonattainment area. See the section of this document titled "Area Background and Overview – San Joaquin Valley, CA" for more information.
[f] In February 2012, the San Diego-Overland (Kearny Mesa) site (060730006) was relocated to the San Diego-Kearny Villa Road site (060731016). The data listed for the San-Diego-Kearny Villa Road site is a combination of data from San Diego-Overland from 2009 through February 17, 2012, and from San-Diego-Kearny Villa Road from February 21, 2012 through 2013.
[g] Design value based on all valid data, including data in 2011 and 2012 that were submitted to, but are not currently in, AQS. EPA considers these data valid for use per 40 CFR Part 50 and 58 (see Memorandum: "Use of Data for Imperial County, CA $PM_{2.5}$ Design Value Calculations").

In addition to the FEM/FRM/ARM monitoring sites identified in Table 2 whose collected data are used to calculate DVs, additional nonregulatory monitors exist in the area of analysis, identified in Table 2a. The Temecula and Lake Elsinore sites were established for informational purposes, and the Agua Tibia, Joshua Tree and Lebec sites listed are IMPROVE sites established to evaluate visibility impacts on Class I areas. None of these five monitors are required per 40 CFR 58.20 to be compared to the NAAQS. Although these nonregulatory monitors are not eligible for comparison to the NAAQS, the data collected may help define an appropriate boundary for areas with emissions sources or activities that potentially contribute to ambient fine particle concentrations at the violating monitors.

Table 2a. Air Quality Data Collected at Special Purpose Monitors (all DV levels in $\mu g/m^3$)

County, State	Monitor Site ID	Site Name	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
Riverside, CA	060650016	Temecula	Yes	-	-	8.5[a]
Riverside, CA	060659000	Agua Tibia	No	5.1	4.9	4.7[a]
Riverside, CA	060659000	Lake Elsinore	Yes	11.6	10.9	10.6
San Bernardino, CA	060719002	Joshua Tree National Monument – Black Rock Canyon	No	3.8	3.5	3.5[a]
Los Angeles, CA	060379034	Lebec-Peace Valley Rd	Yes	3.2[a]	2.7[a]	2.8[a]

[a] One or more years of data are not complete.

The Figure 1a map, shown previously, identifies the Los Angeles-South Coast Air Basin area of analysis and monitoring locations with 2011-2013 violating DVs. As indicated on the map, there are three violating monitoring sites located in Los Angeles County, two violating monitoring sites in Riverside County, and two violating monitoring sites in San Bernardino County, and no monitoring sites violating in Orange County.

Seasonal variation can highlight those conditions most associated with high average concentration levels of $PM_{2.5}$. Figure 2 shows quarterly mean $PM_{2.5}$ concentrations for the most recent 3-year period for the highest DV monitoring sites in each county within the area of analysis. Figure 2a shows quarterly mean $PM_{2.5}$ concentrations for the most recent 3-year period for the highest DV monitoring sites in each county within only the Los Angeles-South Coast Air Basin nonattainment area, excluding sites from surrounding counties outside the nonattainment area. This graphical representation is particularly relevant when assessing air quality data for an annual standard, such as the 2012 annual $PM_{2.5}$ NAAQS, because, as previously stated, the annual mean is calculated as the mean of quarterly means and a high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV.

Figure 2. Los Angeles-South Coast Air Basin Area of Analysis Monitors - $PM_{2.5}$ Quarterly Means for 2011-2013

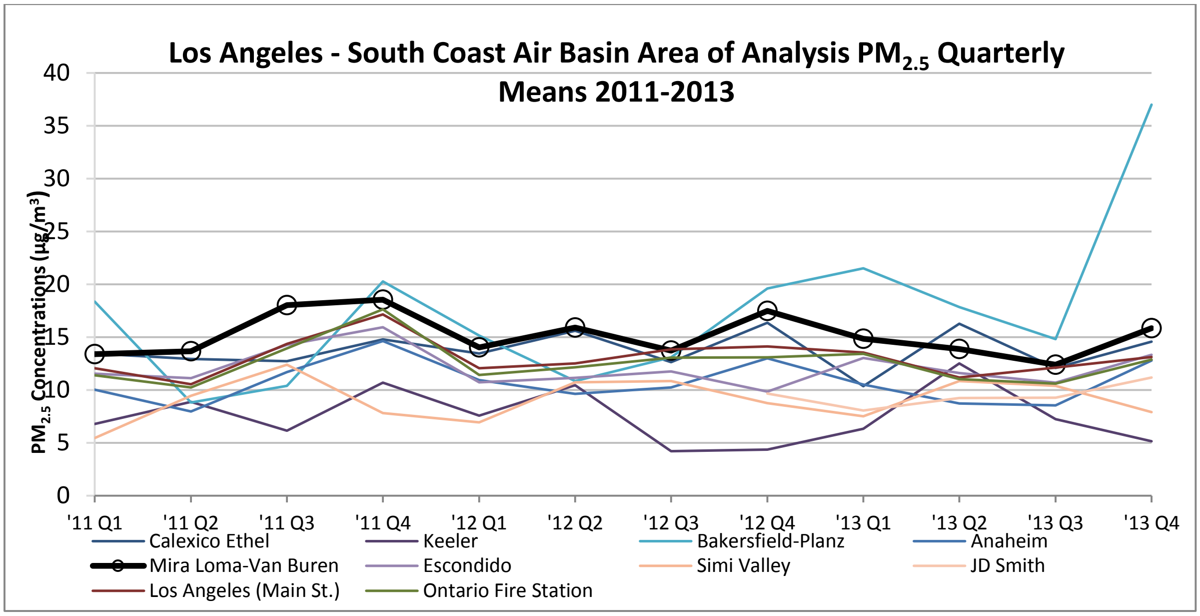
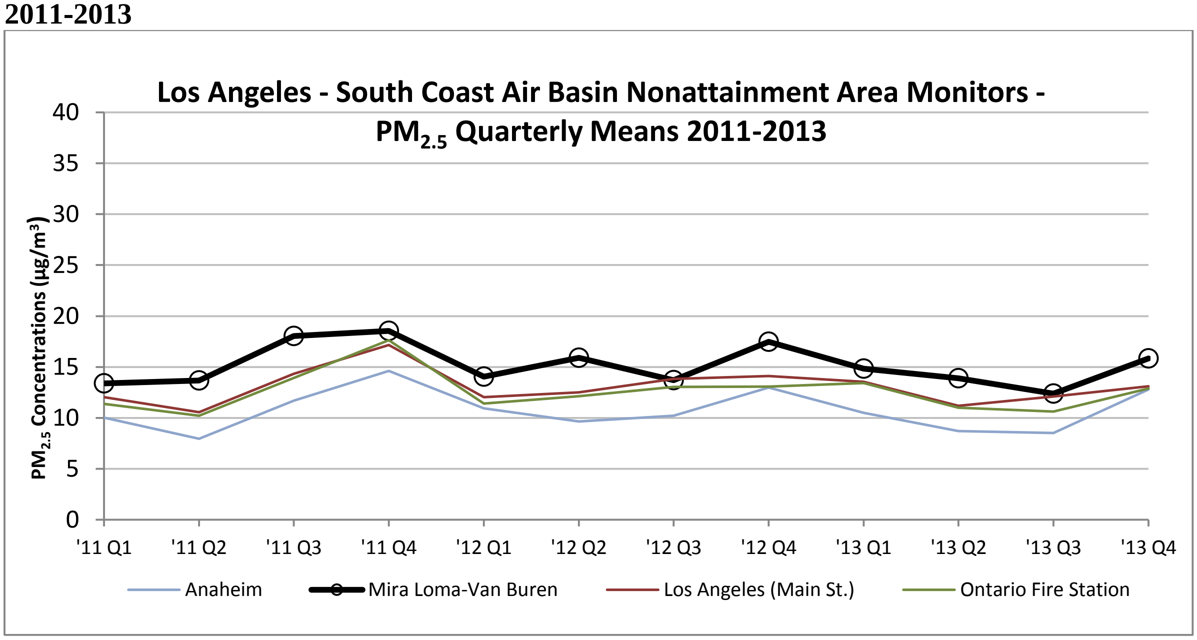


Figure 2a. Los Angeles-South Coast Air Basin Nonattainment Area Monitors - $PM_{2.5}$ Quarterly Means for 2011-2013



As shown in Figure 2a, in the Los Angeles – South Coast Air Basin, quarter four tends to measure higher $PM_{2.5}$ concentrations than other quarters of the year.

$PM_{2.5}$ Composition Measurements - To assess potential emissions contributions for each violating monitoring location, the EPA determined the various chemical species comprising total $PM_{2.5}$ to identify the chemical constituents over the analysis area, which can provide insight into the types of emission sources impacting the monitored concentration. To best describe the $PM_{2.5}$ at the violating monitoring location, the EPA first adjusted the chemical speciation measurement data from a monitoring location at or near the violating FRM monitoring site using the SANDWICH approach to account for the amount of $PM_{2.5}$ mass constituents retained in the FRM measurement.[51,52,53,54] In particular, this approach accounts for losses in fine particle nitrate and increases in sulfate mass associated with particle bound water. Figure 3a illustrates the fraction of each $PM_{2.5}$ chemical constituent estimated at the Los Angeles Main St. monitoring site based on annual averages for the years 2010-2012. Figures 3a and Figure 3b shows that organic carbonaceous mass (OM) is the predominant species contributing over fifty percent of the total mass throughout the year. Sulfates are the second largest component in the annual mean, contributing 25 percent, followed by crustal material (CM), contributing 9 percent. Nitrates contribute most during quarter one (Q1) and quarter four (Q4), while sulfates contribute about thirty percent of the total mass in quarter two (Q2) and quarter three (Q3). Crustal material (CM) contributes most during Q1 and Q2 and elemental carbon contribute most in Q1 and Q4. This suggests that OM sources contribute at a greater level than any other species on an annual basis, while nitrates and sulfates also contribute annually and have even higher impacts in the colder and warmer months, respectively. Sources emitting CM also seem to contribute most in Q1 and Q2.

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[51] SANDWICH stands for measured **S**ulfate, **A**djusted **N**itrate, **D**erived **W**ater, **I**nferred **C**arbonaceous mass **H**ybrid Material Balance Approach." The SANDWICH adjustment uses an FRM mass construction methodology that results in reduced nitrates (relative to the amount measured by routine speciation networks), higher mass associated with sulfates (reflecting water included in gravimetric FRM measurements) and a measure of organic carbonaceous mass derived from the difference between measured $PM_{2.5}$ and its non-carbon components. This characterization of $PM_{2.5}$ mass also reflects crustal material and other minor constituents. The resulting characterization provides a complete mass closure for the measured FRM $PM_{2.5}$ mass, which can be different than the data provided directly by the speciation measurements from the CSN network.
[52] Frank, N. H., SANDWICH Material Balance Approach for $PM_{2.5}$ Data Analysis, National Air Monitoring Conference, Las Vegas, Nevada, November 6-9, 2006. *http://www.epa.gov/ttn/amtic/files/2006conference/frank.pdf*.
[53] Frank, N. H., The Chemical Composition of $PM_{2.5}$ to support PM Implementation, EPA State /Local/Tribal Training Workshop: $PM_{2.5}$ Final Rule Implementation and 2006 $PM_{2.5}$ Designation Process, Chicago IL, June 20-21, 2007, *http://www.epa.gov/ttn/naaqs/pm/presents/pm2.5_chemical_composition.pdf.*
[54] Frank, N. H. *Retained Nitrate, Hydrated Sulfates, and Carbonaceous Mass in Federal Reference Method Fine Particulate Matter for Six Eastern U.S. Cities*. J. Air & Waste Manage. Assoc. 2006 56:500–511.

Figure 3a. Los Angeles-South Coast Air Basin Annual Average $PM_{2.5}$ Chemical Constituents (2010-2012)

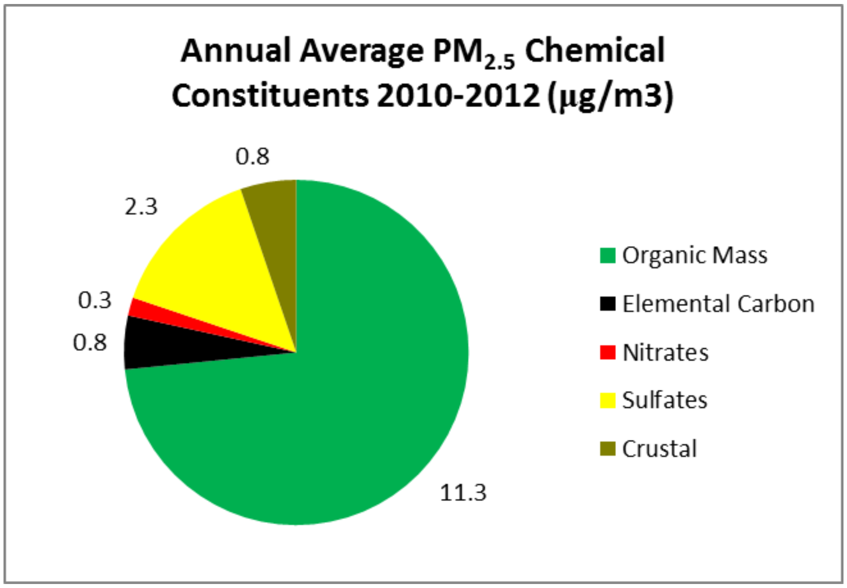
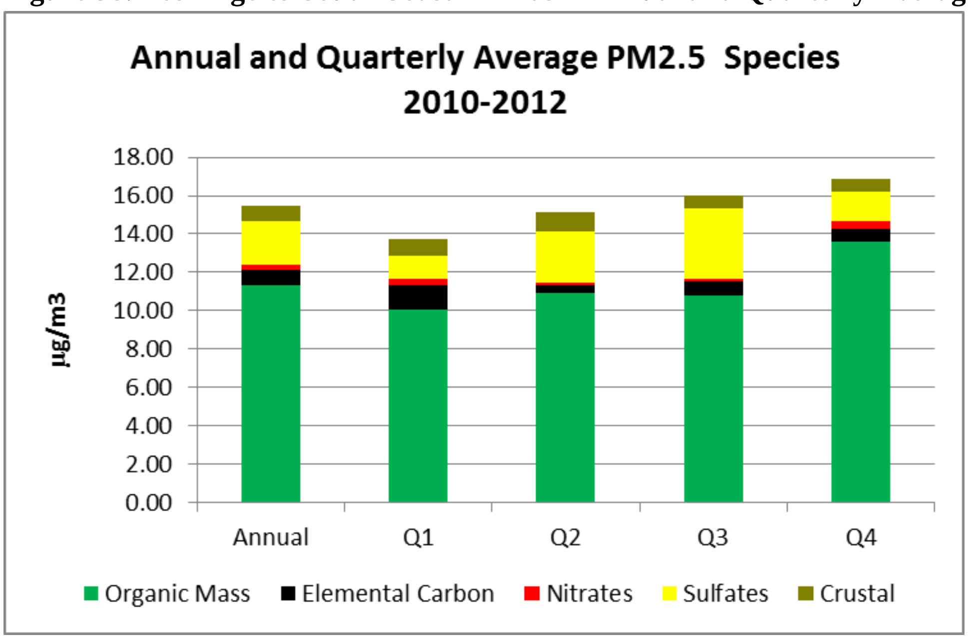


Figure 3b. Los Angeles-South Coast Air Basin Annual and Quarterly Average $PM_{2.5}$ Species (2010-2012)[a]



[a] *Adjusted to FRM Total $PM_{2.5}$* indicates that the speciation profile and total mass depicted in this figure are the result of the urban increment calculation for the particular FRM monitor.

The EPA assessed seasonal and annual average $PM_{2.5}$ constituents at monitoring sites within the nonattainment area relative to monitoring sites outside of the analysis area to account for the difference between regional background concentrations of $PM_{2.5}$, and the concentrations of $PM_{2.5}$ in the area of analysis, also known as the "urban increment." This analysis differentiates between the influences of emissions from sources in nearby areas and in more distant areas on the violating monitor. Estimating the urban increment in the area helps to illuminate the amount and type of particles at the violating monitor that are most likely to be the result of sources of emissions in nearby areas, as opposed to impacts of more distant or regional sources of emissions. Figure 4a includes pie charts showing the annual and quarterly chemical mass constituents of the urban increment. The quarterly pie charts correspond to the high-concentration quarters identified in Figure 2. Evaluating these high concentration quarters can help identify composition of $PM_{2.5}$ during these times. Note that in these charts, sulfates and nitrates have been adjusted to represent their mass in measured $PM_{2.5}$.

Figure 4a. Los Angeles-South Coast Air Basin Urban Increment Analysis for 2010-2012.

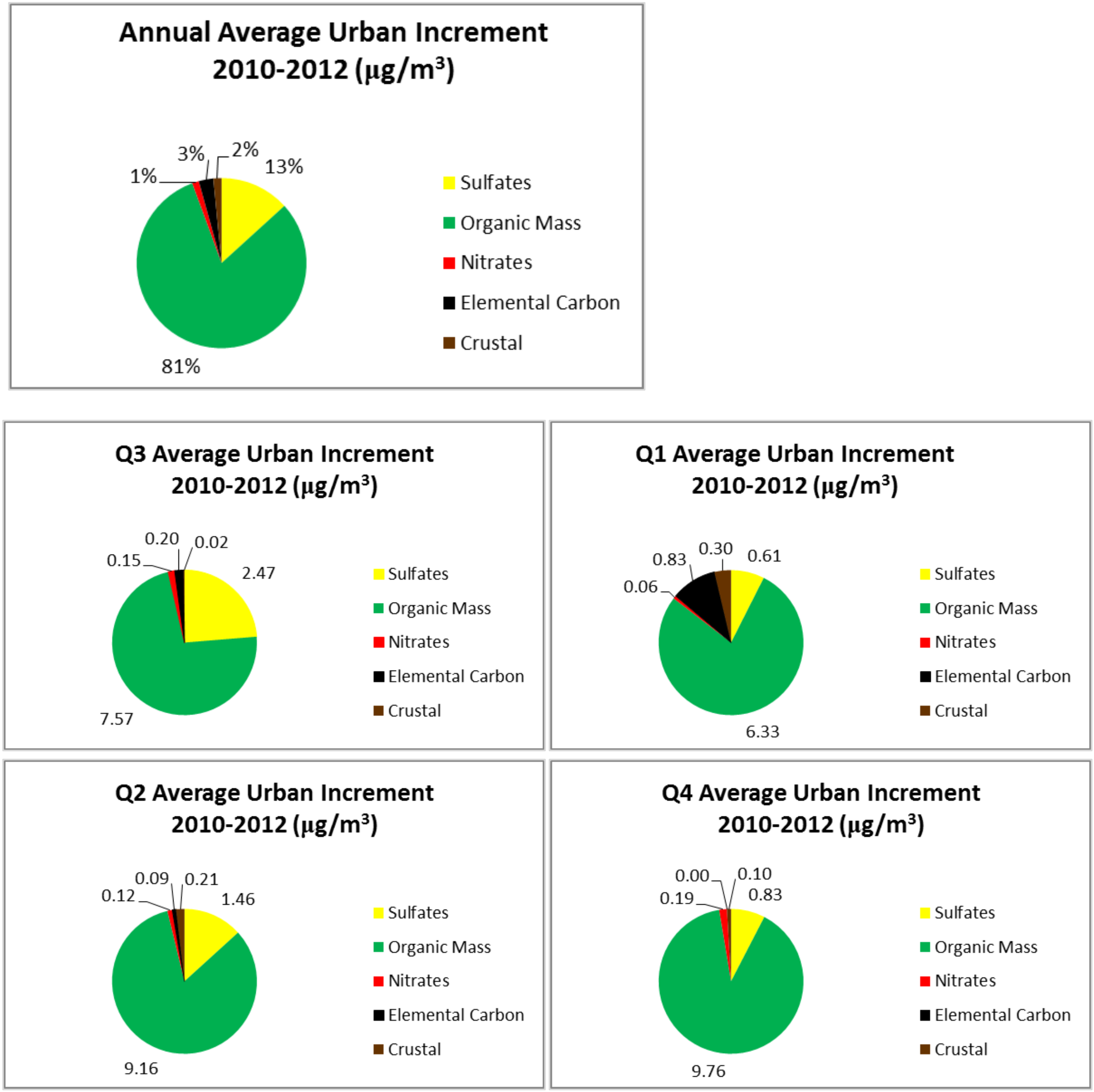
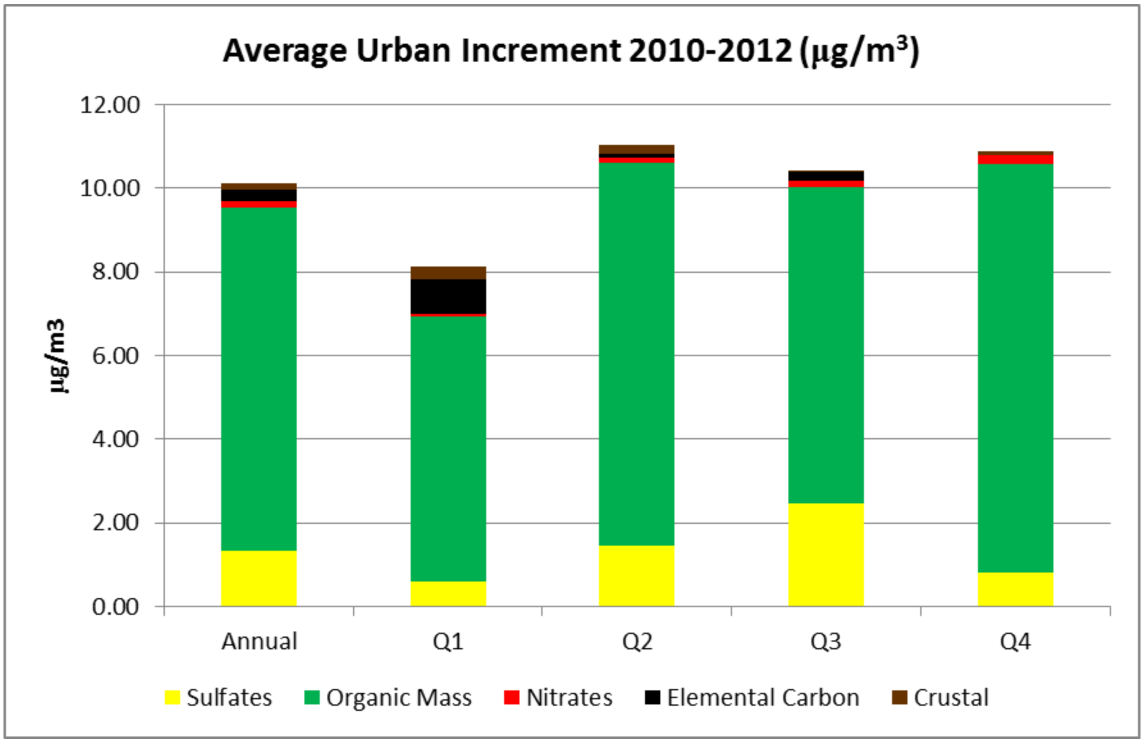


Figure 4b. Los Angeles-South Coast Air Basin Average Urban Increment Analysis for 2010-2012.



The Los Angeles – South Coast Air Basin has seven monitoring sites violating the NAAQS located in Los Angeles, Riverside, and San Bernardino counties. In addition, monitors within the nonattainment area measure increased $PM_{2.5}$ concentrations during quarter four, with more inter-annual variability in the other quarters of the year.

In reviewing the urban increment analysis for the Los Angeles Main St. monitor, the results are similar to the adjusted speciation measurements, indicating a somewhat consistent source mix throughout the area. There is an increase in the contribution of OM indicating that it may have an additional contribution from a source closer to the speciation monitoring site. This analysis points in general to contributions from direct $PM_{2.5}$ or $PM_{2.5}$ precursors from sources throughout the region, with an increased contribution of OM from sources closer to the speciation monitoring site.

Factor 2: Emissions and Emissions-related Data

In this designations process, for each area with a violating monitoring site, the EPA evaluated the emissions data from nearby areas using emissions related data for the relevant counties to assess each county's potential contribution to $PM_{2.5}$ concentrations at the violating monitoring site or monitoring sites in the area under evaluation. The EPA examined emissions of identified sources or source categories of direct $PM_{2.5}$, the major components of direct $PM_{2.5}$ (organic mass, elemental carbon, crustal material (and/or individual trace metal compounds)), primary nitrate and primary sulfate, and precursor gaseous pollutants (i.e., SO_2, NO_X, total VOC, and NH_3). The EPA also considered the distance of those sources of emissions from the violating monitoring site. While direct $PM_{2.5}$ emissions and its major carbonaceous components are generally associated with sources near violating $PM_{2.5}$ monitoring sites, the gaseous precursors tend to have a more regional influence (although the EPA is mindful of the potential local NO_X and VOC emissions contributions to $PM_{2.5}$ from mobile and stationary sources) and transport from neighboring areas can contribute to higher $PM_{2.5}$ levels at the violating monitoring sites.

Emissions Data

For this factor, the EPA reviewed data from the 2011 National Emissions Inventory (NEI) version 1 (see *http://www.epa.gov/ttn/chief/net/2011inventory.html*). For each county in the area of analysis, the EPA examined the magnitude of county-level emissions reported in the NEI. These county-level emissions represent the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires. In some instances, non-anthropogenic sources of emissions such as wildfires account for large portions of the emissions inventory data presented below. The EPA also looked at the geographic distribution of major point sources of the relevant pollutants.[55] Substantial emissions levels from sources in a nearby area indicate the potential for the area to contribute to monitored violations.

To further analyze area emissions data, the EPA also developed a summary of direct $PM_{2.5}$, components of direct $PM_{2.5}$, and precursor pollutants, which is available at *http://www.epa.gov/pmdesignations/2012standards/docs/nei2011v1pointnei2008v3county.xlsx*.

When considered with the urban increment analysis in Factor 1, evaluating the components of direct $PM_{2.5}$ and precursor gases can help identify specific sources or source types contributing to elevated concentrations at violating monitoring sites and thus assist in identifying appropriate area boundaries. In general, directly emitted particulate organic carbon (POC) and VOCs[56] contribute to $PM_{2.5}$ organic mass (OM); directly emitted EC contributes to $PM_{2.5}$ EC; NO_X, NH_3 and directly emitted nitrate contribute to $PM_{2.5}$ nitrate mass; SO_2, NH_3 and directly emitted sulfate contribute to $PM_{2.5}$ sulfate mass; and directly emitted crustal material and metal oxides contribute to $PM_{2.5}$ crustal matter.[57,58] The EPA believes that the quantities of those nearby emissions as potential contributors to the $PM_{2.5}$ violating monitors are somewhat proportional to the $PM_{2.5}$ chemical constituents in the estimated urban increment. Thus, directly emitted POC is more important per ton than SO_2, partially because POC emissions are already $PM_{2.5}$ whereas SO_2 must convert to $PM_{2.5}$ and not all of the emitted SO_2 undergoes this conversion.

Table 3a provides a county-level emissions summary (i.e., the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires) of directly emitted $PM_{2.5}$ and precursor species for the county with the violating monitoring site and nearby counties considered for inclusion in the Los Angeles-South Coast Air Basin, CA area. Table 3b summarizes the directly emitted components of $PM_{2.5}$ for the same counties in the area of analysis for the Los Angeles-South Coast Air Basin, CA area. This information will be paired with the Urban Increment composition previously shown in Figures 4a and 4b.

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[55] For purposes of this designations effort, "major" point sources are those whose sum of PM precursor emissions ($PM_{2.5}$ + NOx + SO_2 + VOC + NH_3) are greater than 500 tons per year based on NEI 2011v1.

[56] As previously mentioned, nearby VOCs are presumed to be a less important contributor to $PM_{2.5}$ OM than POC.

[57] *See*, Seinfeld J. H. and Pandis S. N. (2006) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 2nd edition, J. Wiley, New York. See also, Seinfeld J. H. and Pandis S. N. (1998) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 1st edition, J. Wiley, New York.

[58] USEPA Report (2004), The Particle Pollution Report: Current Understanding of Air Quality and Emissions through 2003, found at: *http://www.epa.gov/airtrends/aqtrnd04/pm.html*.

Table 3a. County-Level Emissions of Directly Emitted $PM_{2.5}$ and Precursors (tons/year)

County, State	Total NH_3	Total NO_x	Total Direct $PM_{2.5}$	Total SO_2	Total VOC	Total
Los Angeles, CA	19,205	143,295	16,929	7,888	117,854	305,172
Kern, CA	26,732	41,723	12,303	3,060	47,172	130,990
San Bernardino, CA	12,974	67,255	11,665	1,934	35,543	129,371
San Diego, CA	6,754	42,667	10,559	1,286	60,083	121,348
Clark, NV	1,329	52,422	11,931	7,160	38,011	110,852
Orange, CA	6,958	31,637	4,004	387	38,273	81,260
Riverside, CA	9,421	35,935	5,453	378	26,789	77,975
Imperial, CA	16,396	10,051	4,472	146	6,978	38,043
Ventura, CA	3,604	11,652	2,084	291	13,937	31,568
Mohave, AZ	446	12,747	2,850	132	10,995	27,170
La Paz, AZ	357	3,745	1,102	43	2,446	7,693
Inyo, CA	1,468	932	922	199	1,505	5,026

Bold = counties (whole or partial) within the Los Angeles-South Coast nonattainment area.

Table 3b. County-Level Emissions for Components of Directly Emitted $PM_{2.5}$ (tons/year) [59]

County, State	POM	EC	PSO_4	PNO_3	PCrustal	Residual	Total Direct
Los Angeles, CA	6,953	2,968	692	63	1,942	4,310	16,929
Kern, CA	6,863	1,862	324	65	1,204	1,987	12,303
Clark, NV	2,968	1,478	215	24	3,567	3,678	11,931
San Bernardino, CA	3,237	1,512	344	48	2,765	3,760	11,665
San Diego, CA	5,979	1,357	186	27	1,078	1,931	10,559
Riverside, CA	2,140	1,087	109	14	929	1,174	5,453
Imperial, CA	1,200	346	103	11	1,323	1,488	4,472
Orange, CA	1,891	718	96	15	418	867	4,004
Mohave, AZ	767	379	25	5	841	833	2,850
Ventura, CA	1,138	384	35	6	218	303	2,084
La Paz, AZ	235	118	8	1	420	318	1,102
Inyo, CA	201	69	21	3	303	325	922

Bold = counties (whole or partial) within the Los Angeles-South Coast nonattainment area.

Table 3b breaks down the direct $PM_{2.5}$ emissions value from Table 3a into its components. These data will also be compared with the previously presented Urban Increment composition.

Using the previously described relationship between directly emitted and precursor gases and the measured mass to evaluate data presented in Tables 3a and 3b, the EPA identified the following components warranting additional review: NH_3, NO_X, $PM_{2.5}$, SO_2, VOC, POM, EC, PSO_4, PNO_3, Crustal and Residual. The EPA then

[59] Data are based on the 2011 and 2018 Emissions Modeling Platform Data Files and Summaries (*ftp://ftp.epa.gov/EmisInventory/2011v6/v1platform*) available at: *http://www.epa.gov/ttn/chief/emch/index.html#2011* (accessed 02/26/14).

looked at the contribution of these constituents of interest from each of the counties included in the area of analysis as shown in Tables 4a-k.

Table 4a. County-Level NH_3 Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**NH_3**	**Pct.**	**Cumulative %**
Kern, CA	26,732	25	25
Los Angeles, CA	19,205	18	43
Imperial, CA	16,396	16	59
San Bernardino, CA	12,974	12	71
Riverside, CA	9,421	9	80
Orange, CA	6,958	7	87
San Diego, CA	6,754	6	93
Ventura, CA	3,604	3	97
Inyo, CA	1,468	1	98
Clark, NV	1,329	1	99
Mohave, AZ	446	0	100
La Paz, AZ	357	0	100

Bold = counties (whole or partial) within the Los Angeles-South Coast nonattainment area.

Table 4b. County-Level NO_X Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**NO_X**	**Pct.**	**Cumulative %**
Los Angeles, CA	143,295	32	32
San Bernardino, CA	67,255	15	46
Clark, NV	52,422	12	58
San Diego, CA	42,667	9	67
Kern, CA	41,723	9	77
Riverside, CA	35,935	8	84
Orange, CA	31,637	7	91
Mohave, AZ	12,747	3	94
Ventura, CA	11,652	3	97
Imperial, CA	10,051	2	99
La Paz, AZ	3,745	1	100
Inyo, CA	932	0	100

Bold = counties (whole or partial) within the Los Angeles-South Coast nonattainment area.

Table 4c. County-Level $PM_{2.5}$ Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**$PM_{2.5}$**	**Pct.**	**Cumulative %**
Los Angeles, CA	16,929	20	20
Kern, CA	12,303	15	35
Clark, NV	11,931	14	49
San Bernardino, CA	11,665	14	63
San Diego, CA	10,559	13	75
Riverside, CA	5,453	6	82
Imperial, CA	4,472	5	87
Orange, CA	4,004	5	92
Mohave, AZ	2,850	3	95
Ventura, CA	2,084	2	98
La Paz, AZ	1,102	1	99
Inyo, CA	922	1	100

Bold = counties (whole or partial) within the Los Angeles-South Coast nonattainment area.

Table 4d. County-Level SO_2 Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**SO_2**	**Pct.**	**Cumulative %**
Los Angeles, CA	7,888	34	34
Clark, NV	7,160	31	66
Kern, CA	3,060	13	79
San Bernardino, CA	1,934	8	88
San Diego, CA	1,286	6	93
Orange, CA	387	2	95
Riverside, CA	378	2	96
Ventura, CA	291	1	98
Inyo, CA	199	1	99
Imperial, CA	146	1	99
Mohave, AZ	132	1	100
La Paz, AZ	43	0	100

Bold = counties (whole or partial) within the Los Angeles-South Coast nonattainment area.

Table 4e. County-Level VOC Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**VOC**	**Pct.**	**Cumulative %**
Los Angeles, CA	117,854	29	29
San Diego, CA	60,083	15	45
Kern, CA	47,172	12	56
Orange, CA	38,273	10	66
Clark, NV	38,011	10	75
San Bernardino, CA	35,543	9	84
Riverside, CA	26,789	7	91
Ventura, CA	13,937	3	95
Mohave, AZ	10,995	3	97
Imperial, CA	6,978	2	99
La Paz, AZ	2,446	1	100
Inyo, CA	1,505	0	100

Bold = counties (whole or partial) within the Los Angeles-South Coast nonattainment area.

Table 4f. County-Level POM Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**POM**	**Pct.**	**Cumulative %**
Los Angeles, CA	6,953	21	21
Kern, CA	6,863	20	41
San Diego, CA	5,979	18	59
San Bernardino, CA	3,237	10	69
Clark, NV	2,968	9	77
Riverside, CA	2,140	6	84
Orange, CA	1,891	6	89
Imperial, CA	1,200	4	93
Ventura, CA	1,138	3	96
Mohave, AZ	767	2	99
La Paz, AZ	235	1	99
Inyo, CA	201	1	100

Bold = counties (whole or partial) within the Los Angeles-South Coast nonattainment area.

Table 4g. County-Level EC Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**EC**	**Pct.**	**Cumulative %**
Los Angeles, CA	2,968	24	24
Kern, CA	1,862	15	39
San Bernardino, CA	1,512	12	52
Clark, NV	1,478	12	64
San Diego, CA	1,357	11	75
Riverside, CA	1,087	9	84
Orange, CA	718	6	89
Ventura, CA	384	3	93
Mohave, AZ	379	3	96
Imperial, CA	346	3	98
La Paz, AZ	118	1	99
Inyo, CA	69	1	100

Bold = counties (whole or partial) within the Los Angeles-South Coast nonattainment area.

Table 4h. County-Level PSO_4 Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**PSO_4**	**Pct.**	**Cumulative %**
Los Angeles, CA	692	32	32
San Bernardino, CA	344	16	48
Kern, CA	324	15	63
Clark, NV	215	10	73
San Diego, CA	186	9	82
Riverside, CA	109	5	87
Imperial, CA	103	5	91
Orange, CA	96	4	96
Ventura, CA	35	2	97
Mohave, AZ	25	1	99
Inyo, CA	21	1	100
La Paz, AZ	8	0	100

Bold = counties (whole or partial) within the Los Angeles-South Coast nonattainment area.

Table 4i. County-Level PNO_3 Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**PNO_3**	**Pct.**	**Cumulative %**
Kern, CA	65	23	23
Los Angeles, CA	63	22	45
San Bernardino, CA	48	17	62
San Diego, CA	27	10	72
Clark, NV	24	9	80
Orange, CA	15	5	86
Riverside, CA	14	5	91
Imperial, CA	11	4	94
Ventura, CA	6	2	97
Mohave, AZ	5	2	98
Inyo, CA	3	1	99
La Paz, AZ	1	0	100

Bold = counties (whole or partial) within the Los Angeles-South Coast nonattainment area.

Table 4j. County-Level Crustal Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**Crustal**	**Pct.**	**Cumulative %**
Clark, NV	3,567	24	24
San Bernardino, CA	2,765	18	42
Los Angeles, CA	1,942	13	55
Imperial, CA	1,323	9	64
Kern, CA	1,204	8	72
San Diego, CA	1,078	7	79
Riverside, CA	929	6	85
Mohave, AZ	841	6	91
La Paz, AZ	420	3	94
Orange, CA	418	3	97
Inyo, CA	303	2	99
Ventura, CA	218	1	100

Bold = counties (whole or partial) within the Los Angeles-South Coast nonattainment area.

Table 4k. County-Level Residual Emissions (tons/year)

	Emissions in average tons/yr		
County, State	Residual	Pct.	Cumulative %
Los Angeles, CA	4,310	21	21
San Bernardino, CA	3,760	18	38
Clark, NV	3,678	18	56
Kern, CA	1,987	9	65
San Diego, CA	1,931	9	75
Imperial, CA	1,488	7	82
Riverside, CA	1,174	6	87
Orange, CA	867	4	92
Mohave, AZ	833	4	95
Inyo, CA	325	2	97
La Paz, AZ	318	2	99
Ventura, CA	303	1	100

Bold = counties (whole or partial) within the Los Angeles-South Coast nonattainment area.

In addition to reviewing county-wide emissions of $PM_{2.5}$ and $PM_{2.5}$ precursors in the area of analysis, the EPA also reviewed emissions from major point sources located in the area of analysis. The magnitude and location of these sources can help inform nonattainment boundaries. Table 5 provides facility-level emissions of direct $PM_{2.5}$, components of direct $PM_{2.5}$, and precursor pollutants (given in tons per year) from major point sources located in the area of analysis for the Los Angeles-South Coast Air Basin, CA area. Table 5 also shows the distance from the facility to the Los Angeles-South Coast Air Basin nonattainment area DV monitoring site (Mira Loma-Van Buren). These major sources may be closer to another violating monitor within the Los Angeles-South Coast nonattainment area.

Table 5. NEI 2011 v1 Major Point Source Emissions (tons/year)

		Distance	NEI 2011 v1 Emissions - Tons/Year					
County, State	Facility Name (Facility ID)	monitor (miles)	NH_3	NO_x	$PM_{2.5}$	SO_2	VOC	Total
Clark, NV	REID-GARDNER GENERATING STATION	245	18	3,034	543	1,423	37	5,056
Clark, NV	Mc Carran Intl	195		2,508	59	272	377	3,216
Clark, NV	Lhoist North America and Granite Const. (Apex)	219		1,200	62	229	6	1,497
Clark, NV	Nevada Power (Chuck Lenzie)	220	15	227	177	30	71	519
Kern, CA	CALIFORNIA PORTLAND CEMENT CO.	85		2,204	168	790	6	3,168
Kern, CA	NATIONAL CEMENT CO	92		817	224	13	14	1,067
Kern, CA	CHEVRON USA INC	146		78	274	633	26	1,011
Kern, CA	OCCIDENTAL OF ELK HILLS, INC.	144	8	372	1	9	261	651
Kern, CA	CHEVRON USA INC	155	16	195	138	134	89	571
Kern, CA	AERA ENERGY LLC	157		354	60	20	71	506
Los Angeles, CA	LOS ANGELES INT AIRPORT	53		5,485	95	539	852	6,971
Los Angeles, CA	EXXONMOBIL OIL CORPORATION	49	50	818	322	347	613	2,150

		Distance	NEI 2011 v1 Emissions - Tons/Year					
County, State	**Facility Name (Facility ID)**	**monitor (miles)**	**NH_3**	**NO_x**	**$PM_{2.5}$**	**SO_2**	**VOC**	**Total**
Los Angeles, CA	BP WEST COAST PROD.LLC BP CARSON REF.	45	164	584	312	524	483	2,067
Los Angeles, CA	CHEVRON PRODUCTS CO.	53	48	649	177	379	541	1,794
Los Angeles, CA	TESORO REFINING AND MARKETING CO	45	38	584	153	215	235	1,225
Los Angeles, CA	CONOCOPHILLIPS COMPANY	48	81	583	89	115	241	1,110
Los Angeles, CA	CONOCOPHILLIPS COMPANY	45	1	331	53	287	91	764
Los Angeles, CA	ULTRAMAR INC (NSR USE ONLY)	45	32	275	65	202	179	753
Los Angeles, CA	SCE-VINCENT SUBSTATION	49		604	0	0	0	604
Los Angeles, CA	SCE- ANTELOPE SUBSTATION	66		604	0	0	0	604
Los Angeles, CA	ROBERTSONS READY MIX / PALMDAL	49			508		14	522
Orange, CA	JOHN WAYNE AIRPORT	31		580	16	63	95	753
San Bernardino, CA	MITSUBISHI CEMENT	44		1,920	421	321	39	2,701
San Bernardino, CA	CEMEX - BLACK MOUNTAIN QUARRY	49	10	2,008	189	164	30	2,400
San Bernardino, CA	SEARLES VALLEY MINERAL	122	5	1,865	178	160	33	2,241
San Bernardino, CA	US ARMY NATIONAL TRAINING CTR.	99	0	1,272	213	30	128	1,643
San Bernardino, CA	PG&E TOPOCK COMPRESSOR STATION	178		1,204	14	0	125	1,344
San Bernardino, CA	ACE COGENERATION CO	122	12	620	37	479	4	1,152
San Bernardino, CA	TXI RIVERSIDE CEMENT COMPANY	43		870	221	14	15	1,120
San Bernardino, CA	MAGTFTC MCAGCC TWENTYNINE PALMS	84	1	719	45	68	222	1,055
San Bernardino, CA	TETRA TECHNOLOGIES, INC. - AMB	122	0	20	836	1	2	859
San Bernardino, CA	ONTARIO INT. AIRPORT	7		550	10	57	80	697
San Diego, CA	San Diego Intl-Lindberg	89		1,156	21	125	165	1,468

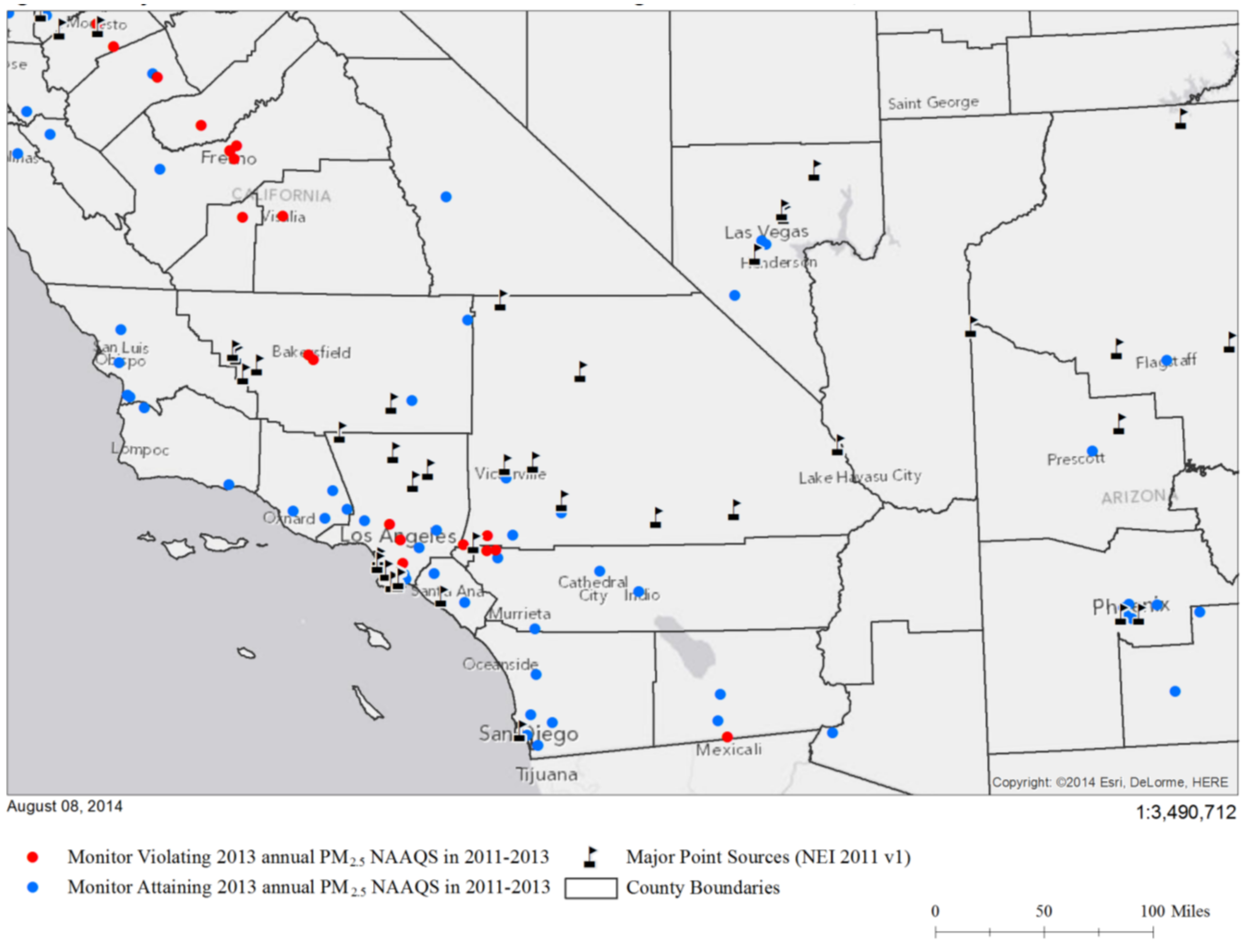
Bold = counties (whole or partial) within the Los Angeles-South Coast nonattainment area.

Figure 5 shows the major point source emissions (from the 2011 NEI in tons per year) in the area of analysis for Los Angeles-South Coast Air Basin, CA and the relative distances of these sources from the violating monitoring location(s), as depicted by red dots. The actual distance from the point sources to the Los Angeles-South Coast Air Basin nonattainment area DV monitoring site (Mira Loma-Van Buren) is presented in Table 5. The distance from the violating monitoring location is particularly important for directly emitted $PM_{2.5}$. The influence of directly emitted $PM_{2.5}$ on ambient $PM_{2.5}$ diminishes more than that of gaseous precursors as a function of distance.[60]

As indicated in Figure 5, there are 33 major point sources located in the area of analysis.

[60] Baker, K. R. and K. M. Foley. *A nonlinear regression model estimating single source concentrations of primary and secondarily formed $PM_{2.5}$.* Atmospheric Environment. 45 (2011) 3758-3767.

Figure 5. Major Point Source Emissions in the Area of Analysis for the Los Angeles-South Coast Air Basin, CA Area.



The EPA's analysis of relevant county-level emissions and the geographic locations of the relevant pollutants indicates that, of the twelve counties included in the area of analysis, Los Angeles, San Bernardino, Orange, Riverside, Kern, and San Diego counties in California, and Clark County in Nevada rank the highest for county-level emissions of directly emitted $PM_{2.5}$ and precursors. The Los Angeles-South Coast Air Basin nonattainment area includes all of Orange County and portions of Los Angeles, San Bernardino, and Riverside counties. The northern portions Los Angeles County and the eastern portions of San Bernardino and Riverside counties are not included in the nonattainment area primarily due to topography, the geographic extent of the South Coast Air Basin, and jurisdiction. These topographic and jurisdictional separations between the nonattainment area and sources to the north in northern Los Angeles County and Kern County, to the south in San Diego County, and to the east in San Bernardino and Riverside counties are described in further detail in Factor 4 and Factor 5. Clark County, Nevada and its emission sources are a substantial distance from the Los Angeles-South Coast Air Basin nonattainment area and associated monitors, and meteorological data indicates that the emissions in Clark County are less likely to be contributing to violations at monitoring locations in the Los Angeles-South Coast area.

Several counties in the area of analysis are also located substantial distances away from the Los Angeles-South Coast Air Basin nonattainment area and rank low in directly emitted $PM_{2.5}$ and precursors relative to emissions from other counties under evaluation, and meteorological data indicate that the emissions from these counties are less likely to be contributing to violations at the monitor locations in the Los Angeles-South Coast area. These counties are La Paz and Mohave counties in Arizona, and Inyo County in California. While Ventura and Imperial counties are closer geographically to the nonattainment area, emissions of directly emitted $PM_{2.5}$ and precursors from these two counties are 90% and 88% less, respectively, than emissions from Los Angeles County, and are even smaller when compared to emissions from the entire Los Angeles-South Coast Air Basin nonattainment area. Moreover, the EPA is separately designating a portion of Imperial County as a separate nonattainment area to address violations of the NAAQS that occur in that area.

Population density and degree of urbanization

In this part of the factor analysis, the EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions. Rapid population growth in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that it may be appropriate to include the county associated with area source and mobile source emissions as part of the nonattainment area. Table 6 shows the 2000 and 2010 population, population growth since 2000, and population density for each county in the area.

Table 6. Population Growth and Population Density.

County, State	Population 2000	Population 2010	% Change from 2000	Land Area (Sq. Miles)	Population Density (per Sq. Mile)	%	Cumulative %
Los Angeles, CA	9,519,338	9,825,761	3%	4,061	2,420	41	41
San Diego, CA	2,813,833	3,103,933	10%	4,200	739	13	53
Orange, CA	2,846,289	3,018,181	6%	789	3,823	12	66
Riverside, CA	1,545,387	2,202,361	43%	7,207	306	9	75
San Bernardino, CA	1,709,434	2,041,626	19%	20,052	102	8	83
Clark, NV	1,375,765	1,953,422	42%	7,910	247	8	91
Kern, CA	661,645	841,687	27%	8,141	103	3	95
Ventura, CA	753,197	825,378	10%	1,845	447	3	98
Mohave, AZ	155,032	200,380	29%	13,312	15	1	99
Imperial, CA	142,361	174,667	23%	4,175	42	1	100
La Paz, AZ	19,715	20,465	4%	4,500	5	0	100
Inyo, CA	17,945	18,531	3%	10,203	2	0	100
Total	**21,559,941**	**24,226,392**					

Source: U.S. Census Bureau population estimates for 2000 and 2010
Bold = counties (whole or partial) within the Los Angeles-South Coast nonattainment area.

Although most of southern California is experiencing rapid population growth, as seen in Table 6 and Figures 6 and 6a, the population growth in the Los Angeles-South Coast, CA area is constrained by terrain.

Reviewing the list of counties in Table 6, the county with the largest population is Los Angeles. The most populated portion of the county falls within the nonattainment area. San Diego County's population grew by 10.3% between 2000 and 2010, but given the smaller population actually added a similar total number of people as Los Angeles County added in the same time period.

The entirety of Orange County, CA is in the Los Angeles-South Coast Air Basin nonattainment area, proximate to violating monitors and although the smallest in terms of land area (789 square miles) among the counties in the area of analysis, Orange County is third in terms of population and is by a wide margin the first in terms of population density. The population of Orange County is integrated with the populations of the surrounding areas in Los Angeles, Riverside, and San Bernardino counties.

Riverside County, CA has an east-west geographic orientation and is hundreds of miles long in this direction. As such, the county has a widely diverse pattern of population distribution, with the western portion of the county, within the nonattainment area, reflecting population density that is fairly undifferentiated from that of the highly populated urban pattern of Orange County, which borders Riverside County to the west, while the central portion of the county is more rural in its population pattern, in the Coachella Valley, and the eastern portion has low population in terms of both population density and total population.

San Bernardino County, CA is like Riverside County in that the portion of the county that is within the Los Angeles-South Coast Air Basin nonattainment area is highly dense in terms of population while the rest of the county is sparse in comparison. San Bernardino County is the largest county in terms of square miles in the United States. The next-largest county is more than a thousand square miles smaller (Coconino County, AZ). Counties in the American Southwest are large for historic reasons having to do with how the nation was settled, and San Bernardino County is typical of that pattern. As such, the county covers a wide diversity of landscape, with the densely populated portion of the county in the southwest, within the nonattainment area, more closely integrated to the surrounding areas of Los Angeles, Orange, and Riverside counties, and the desert wilderness areas in much of the rest of the county more separate.

After San Bernardino, Clark County, NV is listed next in Table 6 in terms of 2010 population. However, Clark County's population is part of an adjacent combined statistical area (CSA) and is not economically integrated with the population in the Los Angeles CSA (for further discussion of statistical areas in the area of analysis, see factor 5 below).

Kern County, CA has a smaller but still appreciable population, over 800,000, and a high level of population growth (27%). Generally, due to commuting patterns, Kern County is not economically integrated with the population in the Los Angeles-South Coast Air Basin nonattainment area. See traffic discussion below.

Ventura County, CA also has a smaller but still appreciable population, with over 800,000 people. And like Kern County, has a high level of population growth (10%). Although it too is outside of the nonattainment area, the population of Ventura County is economically integrated with the population in the South Coast Air Basin. The population is fairly continuous and consistent with that of the portion of Los Angeles County that borders Ventura County to the southeast, the portion of Los Angeles County (the southwestern portion) within the South Coast Air Basin. Also see traffic discussion below.

Mohave and La Paz counties in Arizona and Imperial and Inyo counties in California have very small populations compared to the rest of the counties in the area of analysis. These populations are both remote and sparsely distributed within geographically very large counties.

In conclusion, the population that most impacts air quality at the violating monitors in the area of analysis are for the most part included in the nonattainment area, and populations outside the area are generally not as dense or not integrated with the population in the nonattainment area. Ventura County appears to also be economically integrated with the nonattainment area.

Figure 6. 2010 County-Level Population in the Area of Analysis for the Los Angeles-South Coast Air Basin, CA Area.

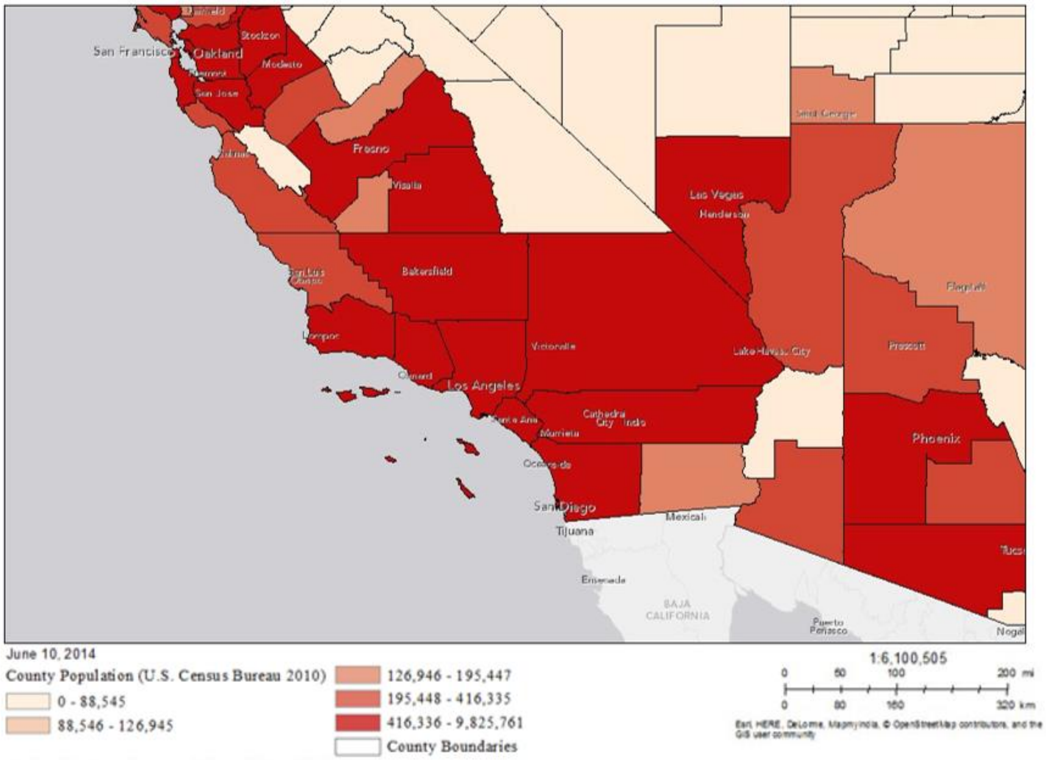
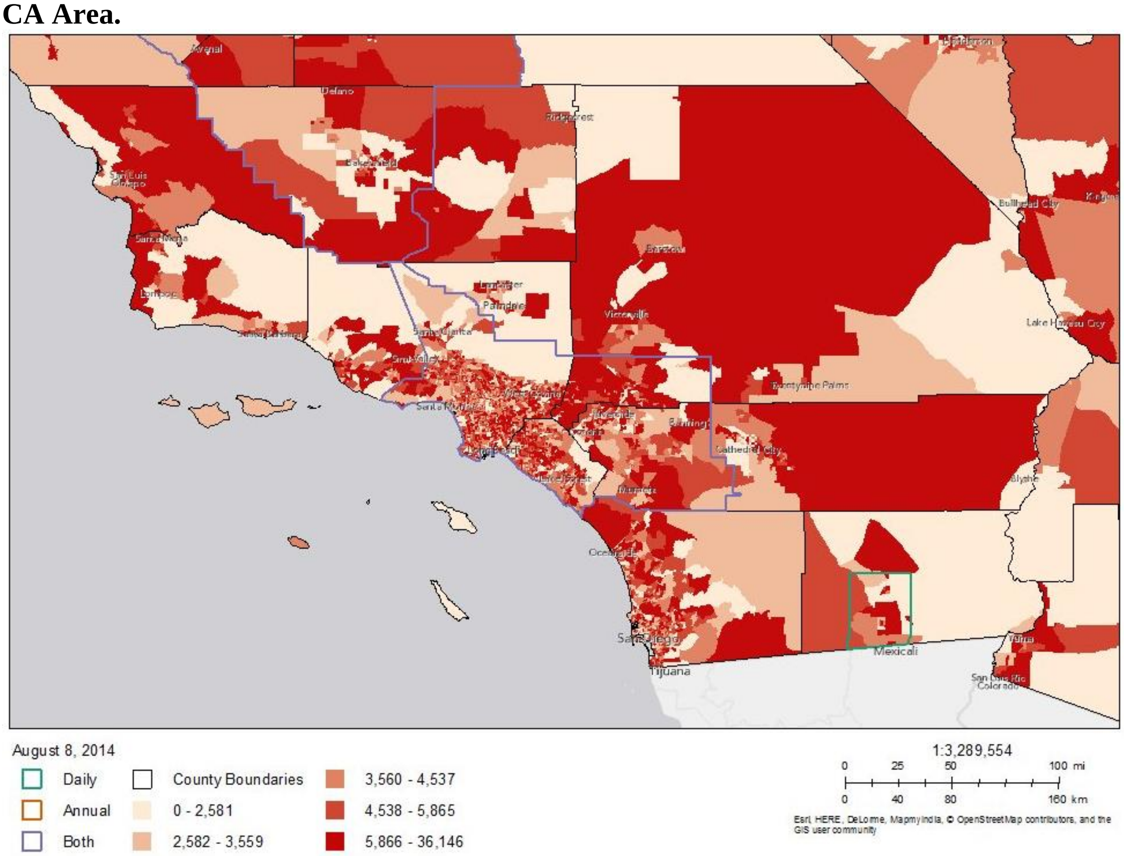


Figure 6a. 2010 Tract-Level Population in the Area of Analysis for the Los Angeles-South Coast Air Basin, CA Area.



Traffic and Vehicle Miles Travelled

High vehicle miles travelled (VMT) and/or a high number of commuters associated with a county is generally an indicator that the county is an integral part of an urban area. Mobile source emissions of NO_x, VOC, and direct PM may contribute to ambient particulate matter that contributes to monitored violations of the NAAQS in the area. In combination with the population/population density data and the location of main transportation arteries, an assessment of VMT helps identify the probable location of nonpoint source emissions that contribute to violations in the area. Comparatively high VMT in a county outside of the CBSA or CSA signifies integration with the core urban area contained within the CSA or CBSA, and indicates that a county with the high VMT may be appropriate to include in the nonattainment area because emissions from mobile sources in that county contribute to violations in the area. Table 7 shows 2011 VMT while Figure 7 overlays 2011 county-level VMT with a map of the transportation arteries. The VMT shown is from the Federal Highway Administration.

Table 7. 2011 VMT for the Los Angeles-South Coast Air Basin, CA Area.

County, State	Total 2011 VMT	Percent	Cumulative %
Los Angeles, CA	76,095,823,872	37	37
San Diego, CA	27,302,301,628	13	51
Orange, CA	26,418,285,864	13	63
San Bernardino, CA	20,423,645,232	10	73
Riverside, CA	19,110,634,300	9	83
Clark, NV	14,587,496,972	7	90
Kern, CA	8,288,439,996	4	94
Ventura, CA	6,744,473,079	3	97
Mohave, AZ	2,587,178,738	1	98
Imperial, CA	1,771,872,720	1	99
La Paz, AZ	776,932,996	0	100
Inyo, CA	604,078,683	0	100
Total	**204,711,164,080**		

http://www.census.gov/hhes/commuting/data/commuting.html

Bold = counties (whole or partial) within the Los Angeles-South Coast nonattainment area.

Reviewing the data in Table 7, Los Angeles County has by far the highest amount of VMT. This high level of traffic is a clear indication that Los Angeles County is contributing to violations of the 2012 PM2.5 NAAQS in the South Coast Air Basin. According to Census Bureau statistics for commuter flow between counties for 2006-2010, Los Angeles County has 4.4 million commuters. See: http://www.census.gov/population/metro/data/other.html. Of those, 4.0 million commuters, or approximately 92%, commute from their residence to a workplace within the county. Nearly half (approximately 45%) of the remaining 0.4 million commuters commute to a workplace in Orange County. The population patterns, described above, further indicate that the commuting patterns in the area of analysis are likely confined to an area within the Los Angeles-South Coast Air Basin nonattainment area. Likewise, the majority of the VMT in San Bernardino and Riverside counties, given their population densities, is expected to occur within the nonattainment area.

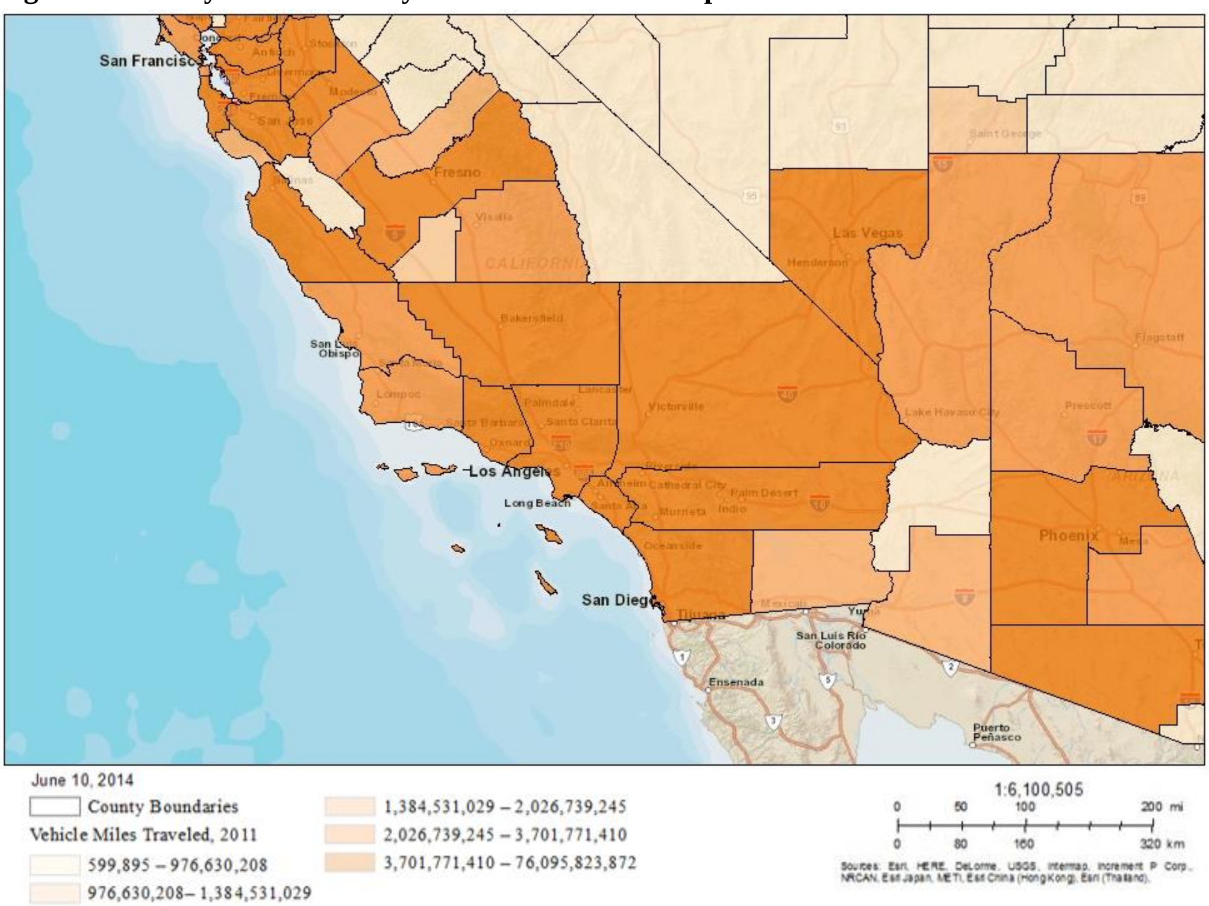
In contrast, other portions of these same counties and the rest of the counties in the area of analysis either have low overall VMT or are not integrated with the populated areas within the Los Angeles-South Coast Air Basin nonattainment area. Mohave and La Paz counties in Arizona and Imperial and Inyo counties in CA are both small in terms of overall VMT as compared to the rest of the area of analysis. Together their VMT amounts to roughly 3% of the total VMT in the area of analysis. Given the relatively small populations in these counties and the distances to any portion of the nonattainment area, and considering other factors such as topography and meteorology, it is unlikely that mobile source emissions from Mohave County, AZ, La Paz County, AZ, Imperial County, CA, or Inyo County, CA are contributing to violations of the NAAQS at monitoring locations within the nonattainment area.

San Diego County, CA, Kern County, CA, and Clark County, NV are not economically integrated with any portion of the nonattainment area. Of 1.4 million commuters in San Diego, only 2% travel to the counties within the South Coast Air Basin (i.e., Los Angeles, Orange, Riverside or San Bernardino counties). Of 894,892 commuters in Clark County, NV, only 0.5% (4,281 commuters) travel to work in any of the other counties in the area of analysis. Likewise, of 304,506 commuters in Kern County, less than 5% (14,146 commuters) travel to work in any other county in the area of analysis.

Arterial flow, as shown in Figure 7, that otherwise might suggest that expanding a nonattainment area boundary is appropriate, is characteristic of the area's ports (the international ports of Los Angeles and Long Beach) and the role the area plays as the point of origin for goods movement from oceangoing vessels to trucks for distribution in the rest of the nation.

According to the same Census Bureau statistics for commuter flow between counties for 2006-2010, 18% of Ventura County's commuters commuted from their residence to a workplace in Los Angeles or Orange counties. See: http://www.census.gov/population/metro/data/other.html. This could indicate inclusion in the EPA's Los Angeles-South Coast Air Basin nonattainment area, if it were the only factor the EPA considered.

Figure 7. Overlay of 2011 County-level VMT with Transportation Arteries.



In conclusion, emissions from directly emitted $PM_{2.5}$ and precursors are highest for the four counties included in the nonattainment area, as well as Kern and San Diego counties in California, and Clark County in Nevada. Clark County is geographically distant from the Los Angeles-South Coast Air Basin nonattainment area, while Kern and San Diego are topographically separated (see Factor 4). Emissions from Imperial and Ventura counties were small in comparison to the nonattainment area emissions. Major point sources in the nonattainment area contribute to the monitored violations, and due to topography and meteorology, it is unlikely that those outside of the Los Angeles-South Coast Air Basin nonattainment area contribute to the monitored violations.

Factor 3: Meteorology

The EPA evaluated available meteorological data to determine how meteorological conditions, including, but not limited to, weather, transport patterns, and stagnation conditions, could affect the fate and transport of directly emitted particulate matter and precursor emissions from sources in the area of analysis. The EPA used two primary tools for this assessment: wind roses and kernel density estimation (KDE). When considered in combination with area $PM_{2.5}$ composition and county-level and facility emissions source location information, wind roses and KDE can help to identify nearby areas contributing to violations at violating monitoring sites.

Wind roses are graphic illustrations of the frequency of wind direction and wind speed. Wind direction can indicate the direction from which contributing emissions are transported; wind speed can indicate the force of the wind and thus the distance from which those emissions are transported. The EPA constructed wind roses from hourly observations of wind direction and wind speed using 2009-2012 data from National Weather Service locations archived at the National Climate Data Center.[61] When developing these wind roses, the EPA also used wind observations collected at meteorological sampling stations collocated at air quality monitoring sites, where these data were available. Figure 8 shows wind roses that the EPA generated from data relevant in the Los Angeles-South Coast Air Basin nonattainment area.

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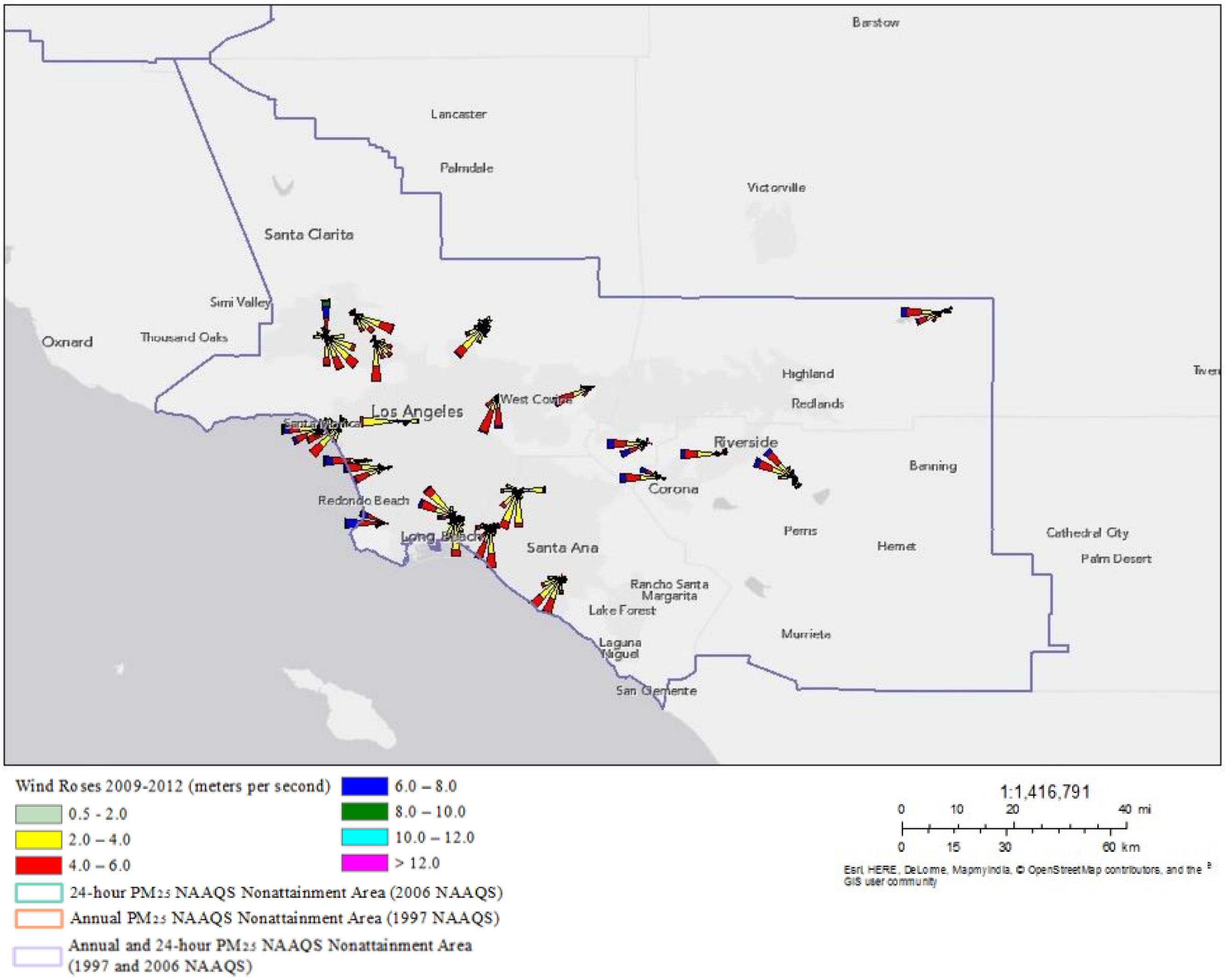
[61] *ftp.ncdc.noaa.gov/pub/data/noaa* or *http://gis.ncdc.noaa.gov/map/viewer/#app=cdo&cfg=cdo&theme=hourly&layers=1&node=gis* Quality assurance of the National Weather Service data is described here: *http://www1.ncdc.noaa.gov/pub/data/inventories/ish-qc.pdf*.

Figure 8. Wind Roses in the Area of Analysis for Los Angeles – South Coast Air Basin.



As shown in Figure 8, there is a pattern across the CBSA of predominantly westerly winds, mostly at mid-level speeds of 2 to 6 meters per second, suggesting that potential emission sources in the west upwind direction should be considered for analysis. The roses also suggest less contribution from the east, thus supporting the exclusion of counties to the east, including Clark County, NV and Imperial County, CA.

In addition to wind roses, the EPA also generated kernel density estimation (KDE) plots to represent HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) backward trajectory frequency at violating monitoring sites.[62,63] These KDEs are graphical statistical estimations to determine the density of trajectory endpoints at a particular location represented by a grid cell. The EPA used KDEs to characterize and analyze the collection of individual HYSPLIT backward trajectories.[64] Higher density values, indicated by darker blue colors, indicate a greater frequency of observed trajectory endpoints within a particular grid cell.

Figures 9 shows a HYSPLIT KDE plot for the Los Angeles – South Coast Air Basin summarized by calendar quarter for the 2010-2012 period. Figure 9a shows a HYSPLIT KDE plot for each calendar quarter for the Los Angeles Main St. air monitoring site (AQS number 060651103) in Los Angeles County. Figure 9b shows a HYSPLIT KDE plot for each calendar quarter for the Mira Loma-Van Buren air monitoring site (AQS number 060658005) in Riverside County. The HYSPLIT KDE is weighted in westerly direction, indicating a greater frequency of trajectories passing over grid cells to the west and supporting the Los Angeles-South Coast Air Basin nonattainment boundaries.

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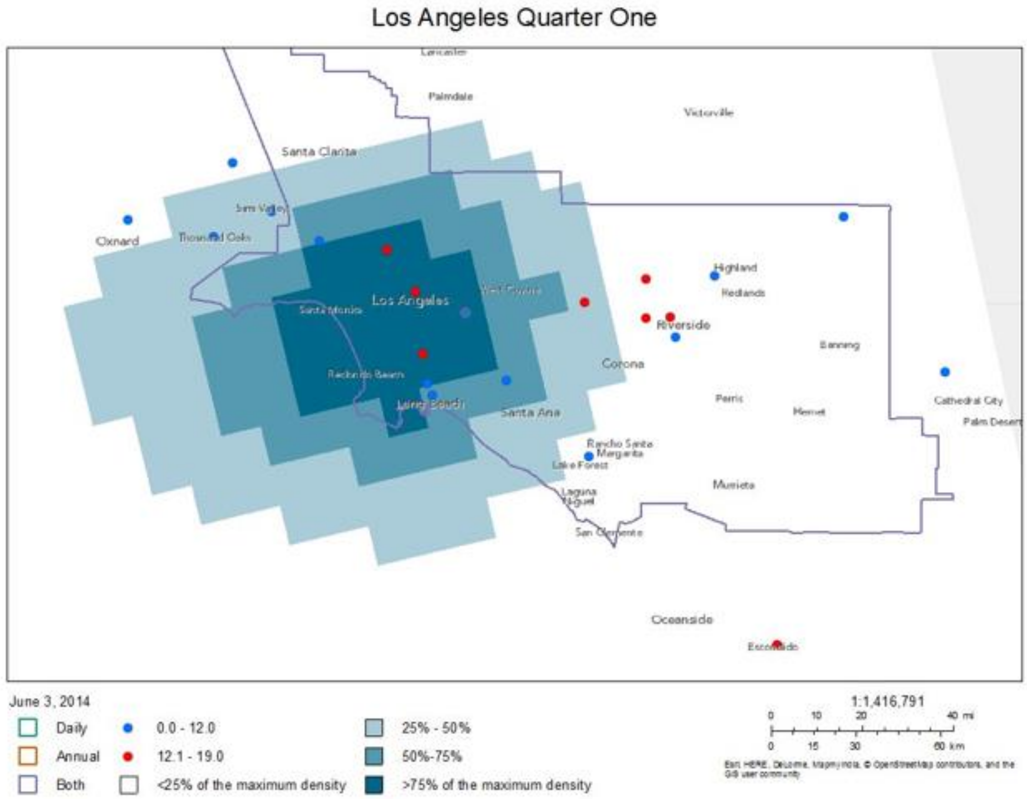
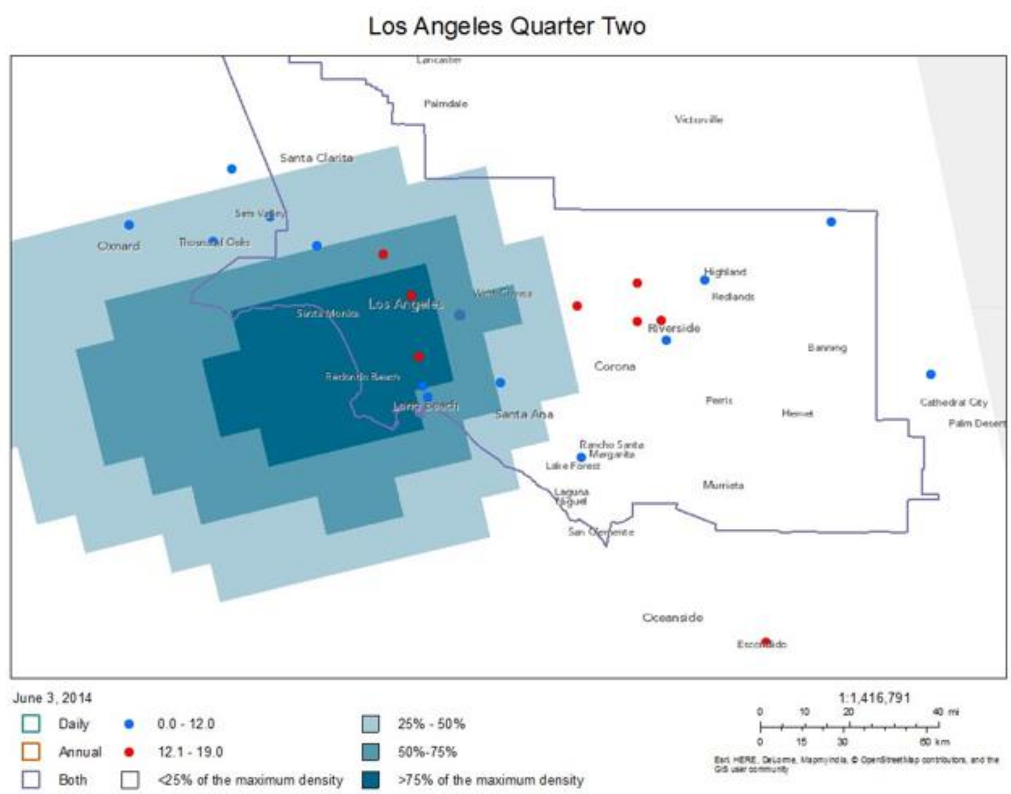
[62] In some past initial area designations efforts, EPA has used HYSPLIT backward trajectories to assist in determining nonattainment area boundaries. A HYSPLIT backward trajectory is usually depicted on a standard map as a single line, representing the centerline of an air parcel's motion, extending in two dimensional (x,y) space from a starting point and regressing backward in time to a point of origin. Backward trajectories may be an appropriate tool to assist in determining an air parcel's point of origin on a day in which a short-term standard, such as an 8-hour standard or a 24-hour standard, was exceeded. However, for an annual standard, such as the 2012 annual $PM_{2.5}$ NAAQS, every trajectory on every day is important. Plotting a mass of individual daily (e.g., 365 individual back trajectories), or more frequent, HYSPLIT trajectories may not be helpful as this process is likely to result in depicting air parcels originating in all directions from the violating monitoring site.

[63] HYSPLIT - Hybrid Single Particle Lagrangian Integrated Trajectory Model, *http://www.arl.noaa.gov/HYSPLIT_info.php*

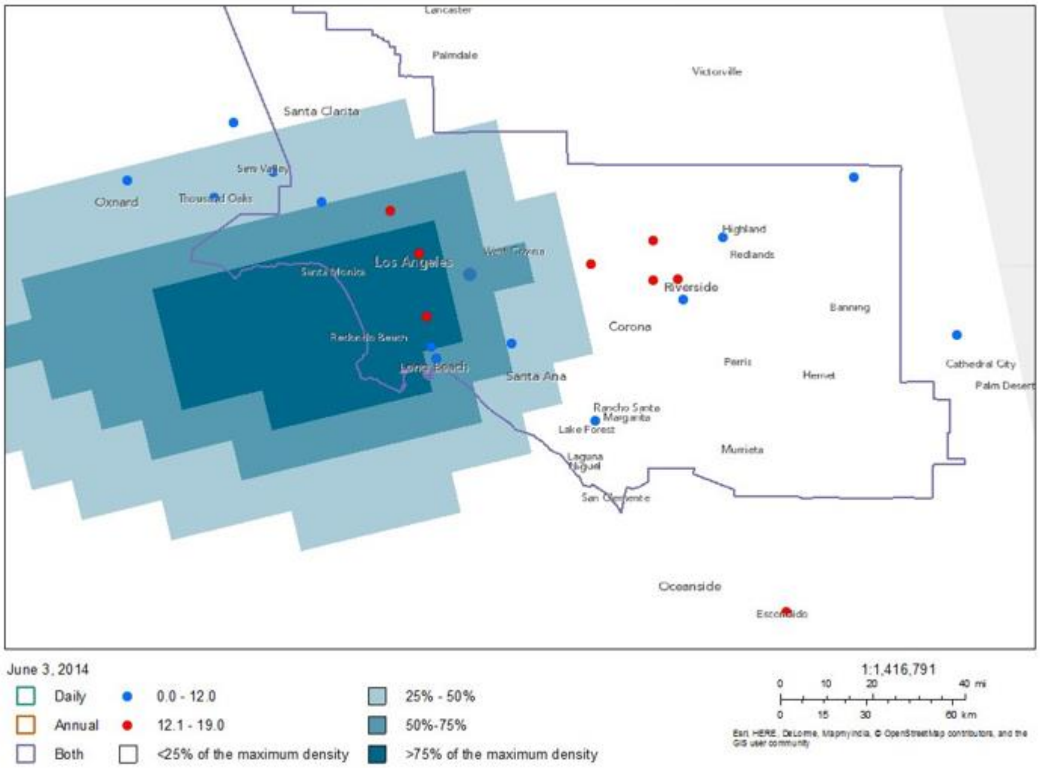
[64] The KDEs graphically represent the aggregate of HYSPLIT backward trajectories for the years 2010-2012, run every third day (beginning on the first day of monitoring), four times each day, and ending at four endpoint heights.

Figures 9a. Q1-Q4: HYSPLIT Kernel Density Estimation Plots for the Los Angeles Air Monitor.

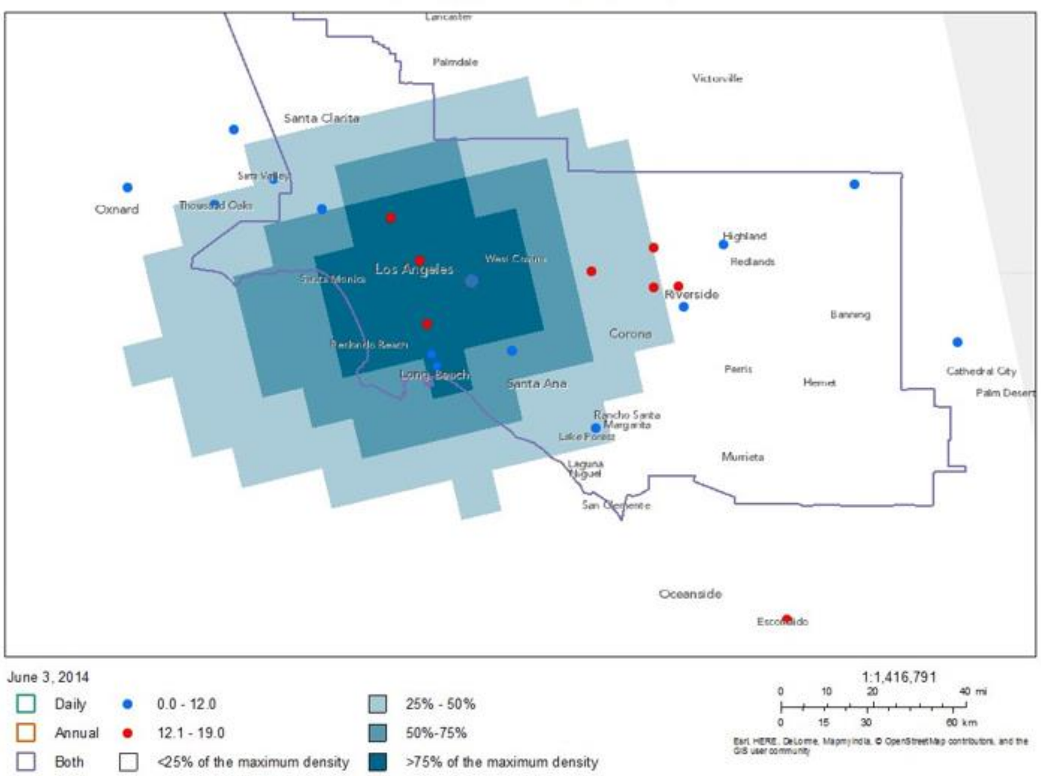




Los Angeles Quarter Three

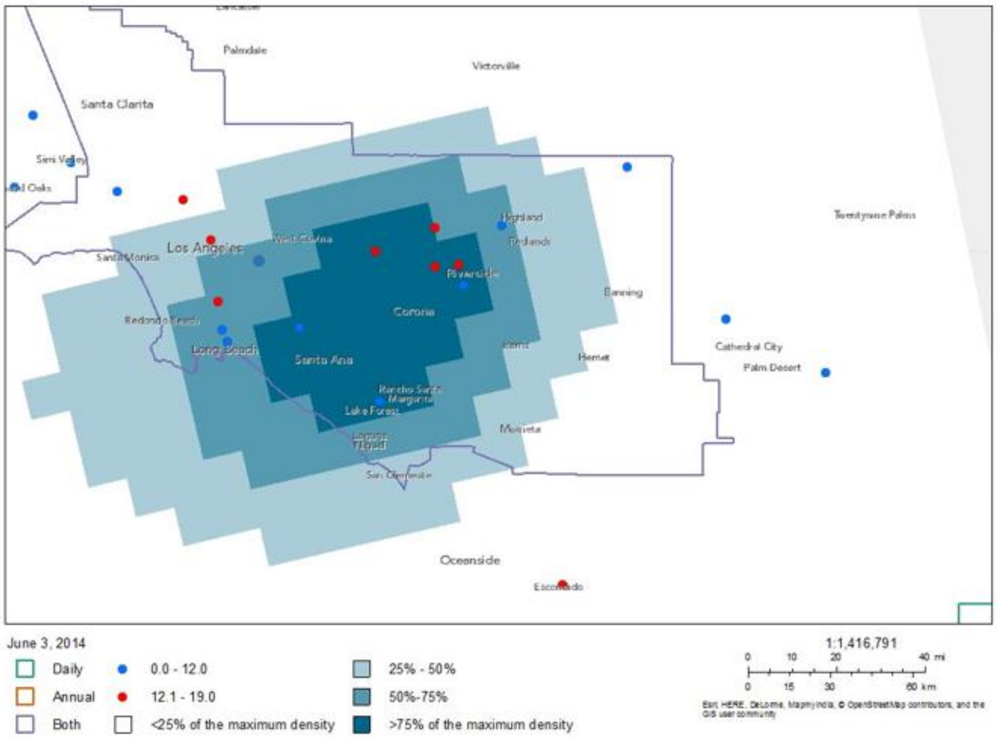


Los Angeles Quarter Four

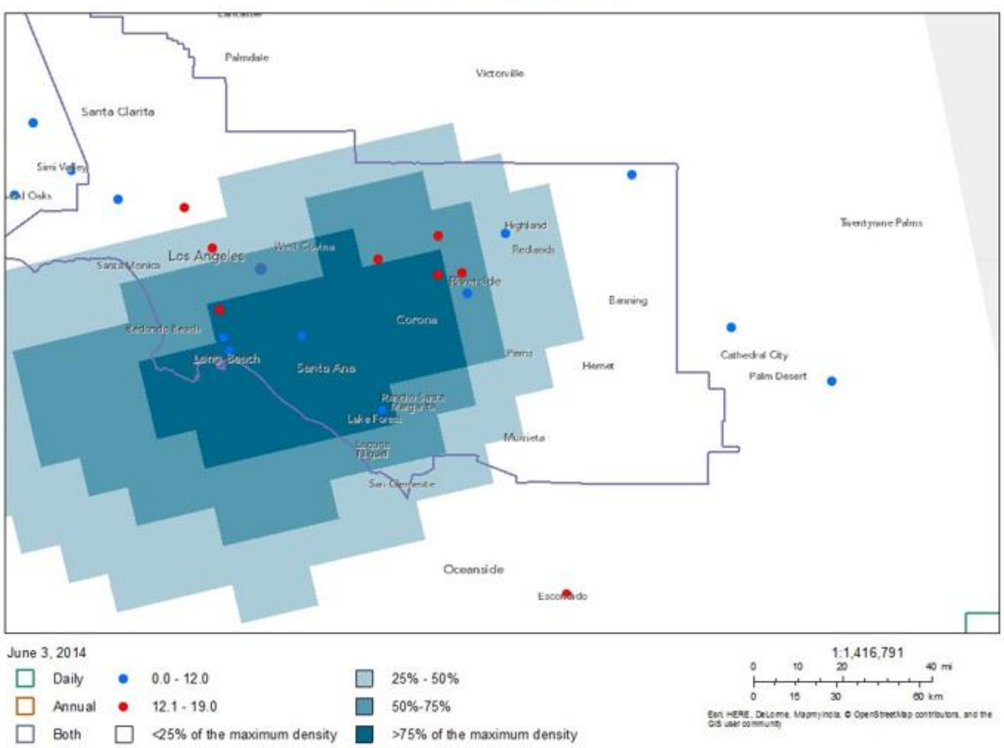


Figures 9b. Q1-Q4: HYSPLIT Kernel Density Estimation Plots – Mira Loma Air Monitor in Riverside County.

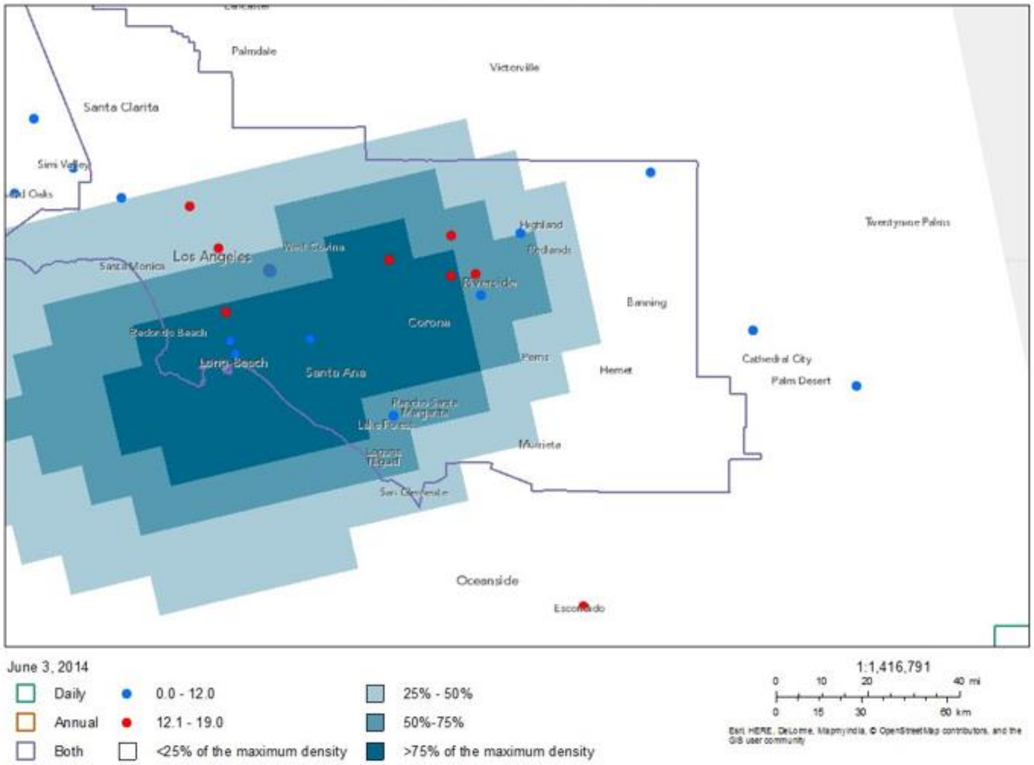
Riverside Quarter One



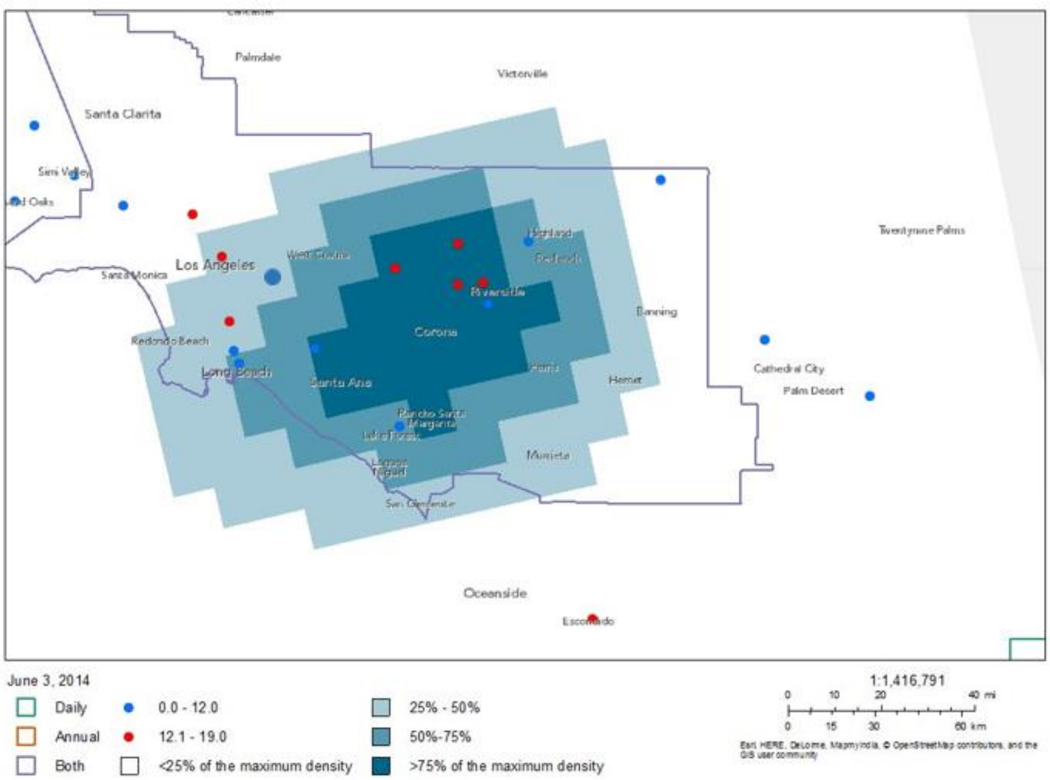
Riverside Quarter Two



Riverside Quarter Three



Riverside Quarter Four

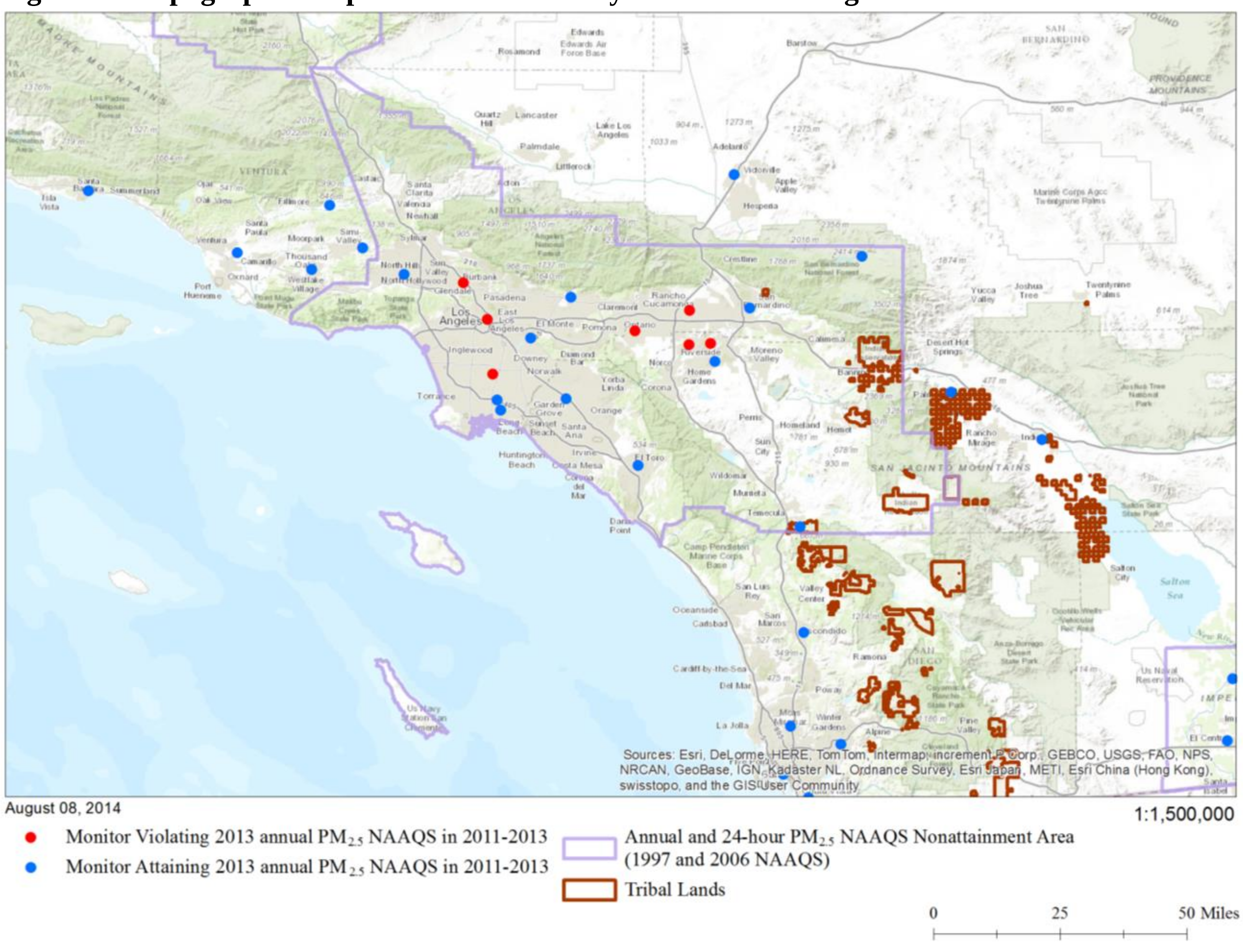


Factor 4: Geography/topography

To evaluate the geography/topography factor, the EPA assessed physical features of the area of analysis that might define the airshed and thus affect the formation and distribution of $PM_{2.5}$ concentrations over the area.

Unlike many areas of the Eastern U.S., topography can have a substantial impact on pollutant formation and transport in California, and thus can play a more important role in assessing what areas are contributing to monitored violations of the NAAQS. California has historically been divided into fifteen distinct air basins. The South Coast Air Basin consists of Orange County and parts of Los Angeles, Riverside, and San Bernardino counties, and contain the same state lands as the EPA's Los Angeles-South Coast Air Basin nonattainment area. 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. While these mountain ranges do not preclude transport from other areas, they are nevertheless high enough of limit contribution from other areas.

Figure 10. Topographic Map in the Area of Analysis for the Los Angeles – South Coast Air Basin.



Factor 5: Jurisdictional boundaries

In defining the boundaries of the Los Angeles-South Coast Air Basin nonattainment area, the EPA considered existing jurisdictional boundaries, which can provide easily identifiable and recognized boundaries for purposes of implementing the NAAQS. Existing jurisdictional boundaries often signify the state, local, or tribal governmental organization with the necessary legal authority for carrying out air quality planning and enforcement functions for the area. Examples of such jurisdictional boundaries include existing/prior nonattainment area boundaries for particulate matter, county lines, air district boundaries, township boundaries, areas covered by a metropolitan planning organization, state lines, and Reservation boundaries, if applicable. Where existing jurisdictional boundaries were not adequate or appropriate to describe the nonattainment area, the EPA considered other clearly defined and permanent landmarks or geographic coordinates for purposes of identifying the boundaries of the designated areas.

The Los Angeles-South Coast Air Basin nonattainment area has previously established nonattainment area boundaries associated with both the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS. The boundary for the nonattainment area for the 1997 annual $PM_{2.5}$ NAAQS and the 2006 24-hour $PM_{2.5}$ NAAQS was the same and included the entirety of Orange County and parts of Los Angeles, San Bernardino and Riverside counties, and is the same boundary as the South Coast Air Basin. The state has recommended the same boundary for the 2012 annual $PM_{2.5}$ NAAQS.

The Los Angeles-South Coast Air Basin nonattainment area comprises a large western portion of the larger Los Angeles-Long Beach-Riverside combined statistical area (CSA). The CSA includes the entirety of Los Angeles, Orange, San Bernardino and Riverside counties, while the nonattainment area includes only portions of some of these counties. Transportation planning is performed by the Southern California Association of Governments (SCAG), whose jurisdictional area includes Los Angeles, Orange, Riverside, San Bernardino, Imperial and Ventura counties. The EPA's analysis indicates that the excluded portions of Los Angeles, San Bernardino, and Riverside counties are less likely to be contributing to the violations in the area as a whole due to topography and meteorology. The nonattainment area for the 2012 $PM_{2.5}$ NAAQS is within the jurisdictional boundaries of the South Coast Air Quality Management District, and is also consistent with our analysis of the air quality data (Factor 1), meteorology (Factor 3), and topography (Factor 4).

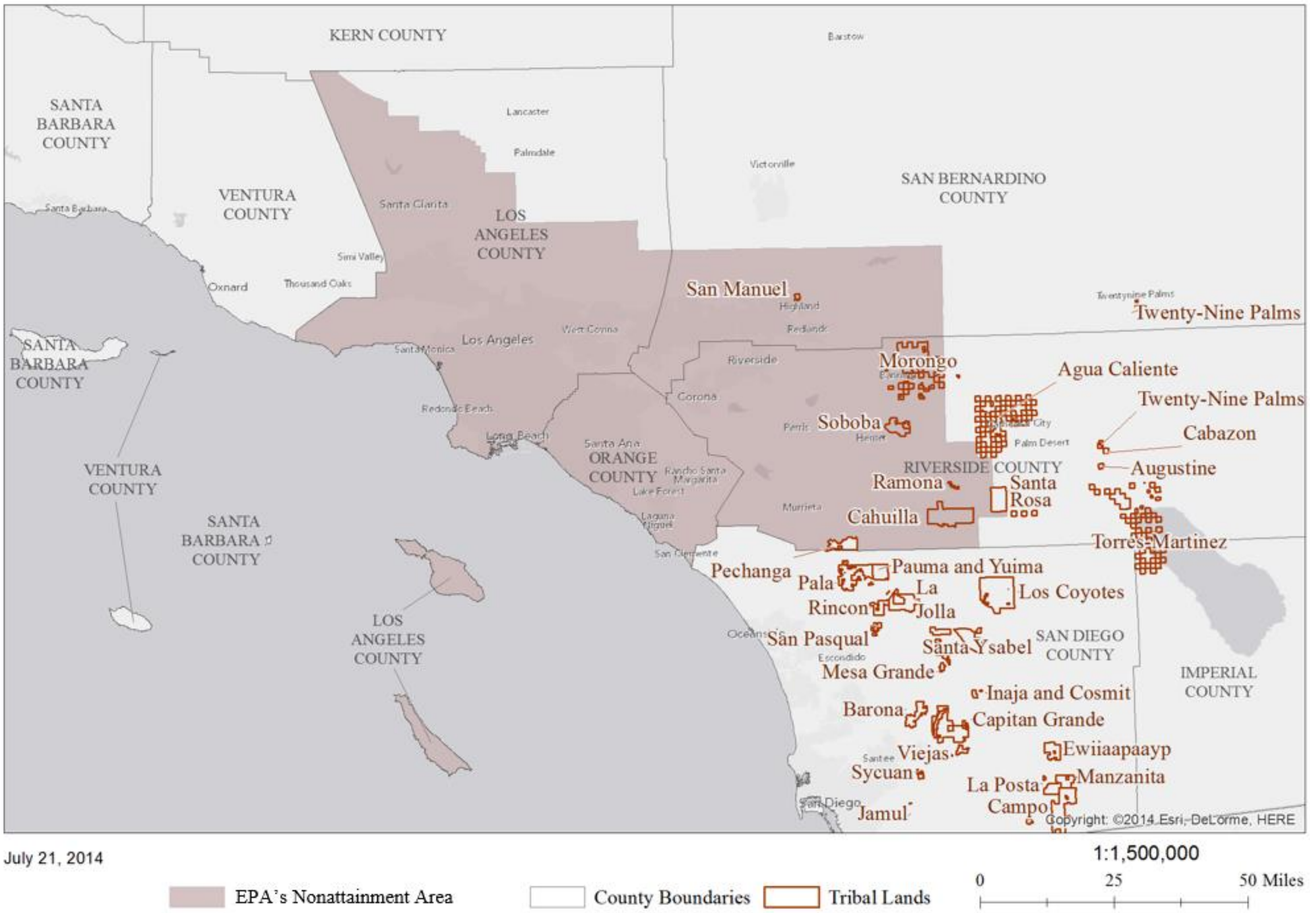
The Los Angeles-South Coast Air Basin nonattainment area also includes Indian country of the following tribes: the Cahuilla Band of Mission Indians of the Cahuilla Reservation, the Morongo Band of Mission Indians, the Ramona Band of Cahuilla, and the Soboba Band of Luiseño Indians (Soboba Band). As defined at 18 U.S.C. § 1151, "Indian country" refers to: "(a) all land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and, including rights-of-way running through the reservation, (b) all dependent Indian communities within the borders of the United States whether within the original or subsequently acquired territory thereof, and whether within or without the limits of a state, and (c) all Indian allotments, the Indian titles to which have not been extinguished, including rights-of-way running through the same." The EPA recognizes the sovereignty of tribal governments, and has attempted to take the desires of the tribes into account in establishing appropriate nonattainment area boundaries. The EPA received a request for consultation from the Soboba Band in September 2014. The EPA consulted with the Soboba Band in September and described the designations process, the history of the $PM_{2.5}$ standard in the southern California area, and implications of the nonattainment designation for the Soboba Band. On October 2, 2014, the EPA sent a response letter to the tribe summarizing this discussion. The EPA received designation recommendations from the Pechanga Band of Luiseño Mission Indians of the Pechanga Reservation (Pechanga).

We did not receive designation recommendations from any of the tribes within the Los Angeles-South Coast Air Basin nonattainment area.

The Santa Rosa Band of Cahuilla Indians (Santa Rosa Cahuilla) has contiguous areas of Indian country in both the Los Angeles-South Coast Air Basin nonattainment area and in Riverside County. We are designating all of Santa Rosa Cahuilla as “unclassifiable/attainment” consistent with surrounding Riverside County.

Pechanga has contiguous areas of Indian country in both the Los Angeles-South Coast Air Basin and San Diego County. In December 2013, Pechanga submitted a recommendation of “unclassifiable” based on a five-factor analysis which noted that the tribe did not yet have a complete design value from a monitor on tribal lands. In August 2014, the EPA shared its intended designations with states and tribes, and published a notice of availability and public comment period in the Federal Register. The EPA intended to designate Pechanga “unclassifiable” based on a technical analysis (available at www.regulations.gov, Docket ID No. EPA-HQ-OAR-2012-0918) indicating Pechanga was unlikely to be contributing to exceedances within the Los Angeles-South Coast Air Basin intended nonattainment area, the lack of complete data from a monitor on tribal lands, Pechanga’s recommendation and tribal jurisdiction, and overall consideration of the five factors of analysis. In October 2014, Pechanga submitted a revised recommendation of “attainment/unclassifiable” based on complete, certified 2011-2013 monitoring data. Considering there is now a monitor on tribal lands with a complete, attaining design value, in addition to the previous factors including the technical analysis indicating Pechanga is unlikely to contribute to exceedances elsewhere, tribal jurisdiction, and Pechanga’s revised recommendation, the EPA is designating all of Pechanga’s Indian country as “unclassifiable/attainment.”

Figure 11. EPA's Nonattainment Boundaries for the Los Angeles – South Coast Air Basin Area and Nearby Tribes.



Conclusion for Los Angeles – South Coast Air Basin Area

Based on the assessment of factors described above, both individually and in combination, the EPA has concluded that the following counties or portions of counties should be included as part of the Los Angeles – South Coast Air Basin nonattainment area because they are either violating the 2012 annual $PM_{2.5}$ NAAQS or contributing to a violation in a nearby area: Los Angeles (partial), Orange, Riverside (partial), and San Bernardino (partial) counties. The relevant portions of Los Angeles, Orange, Riverside, and San Bernardino will be the same as those previously designated nonattainment for the 2006 24-hour and 1997 annual $PM_{2.5}$ NAAQS and follow the area contained within the South Coast Air Basin: the southwest portion of Los Angeles County, all of Orange County, the westernmost portion of Riverside, and the southwestern portion of San Bernardino County. The EPA concurs with the State's recommendation for the designation and the boundaries for this area.

An evaluation of information relevant to Factor 1 shows that the air quality monitoring sites in Los Angeles, Riverside, and San Bernardino counties indicate violations of the 2012 annual $PM_{2.5}$ NAAQS based on the 2013 DVs; therefore these counties or portions of counties are included in the nonattainment area. Orange County is a nearby county that does not have violating monitoring sites, but the EPA has concluded that emissions from this county contribute to the particulate matter concentrations in violation of the 2012 annual $PM_{2.5}$ NAAQS through emissions from point sources, non-point sources (i.e., area sources), and from mobile source emissions.

Consideration of data relevant to Factor 2 indicates that Los Angeles and San Bernardino counties have among the highest emissions of directly emitted $PM_{2.5}$ and/or $PM_{2.5}$ precursors in the area, and all counties or portions of counties in the nonattainment area have relatively large of amounts of these emissions that can contribute to the violations of the 2012 annual $PM_{2.5}$ NAAQS through emissions from point sources, non-point sources (i.e., area sources), and mobile sources. While Ventura is economically integrated with the nonattainment area and shares commuters with Orange County and Los Angeles County, Ventura does not appear to have substantial emissions of $PM_{2.5}$ and/or $PM_{2.5}$ precursors. Thus, evaluation of Factor 2 suggests that inclusion of Ventura is not necessary for this area.

Factor 3 suggests that the greatest potential contribution of emissions is from the regions immediately to the west of the violating monitors, which provides further support for the nonattainment boundary for the Los Angeles-South Coast Air Basin.

As discussed with respect to Factor 4, the topography of this area is particularly relevant to evaluation of the appropriate boundaries for this nonattainment area. The Los Angeles-South Coast Air Basin is bordered on the west by the Pacific Ocean, and surrounded on the other sides by mountains which channel and confine the airflow. The location of the mountain ranges that border the airshed indicate that it is appropriate to include only portions of Los Angeles, San Bernardino, and Riverside counties and all of Orange County within the designated nonattainment area.

Finally, an assessment of information relevant to Factor 5 further supports the Los Angeles- South Coast Air Basin nonattainment area due to previous historical nonattainment boundary designations for both $PM_{2.5}$ and ozone and local air district jurisdiction.

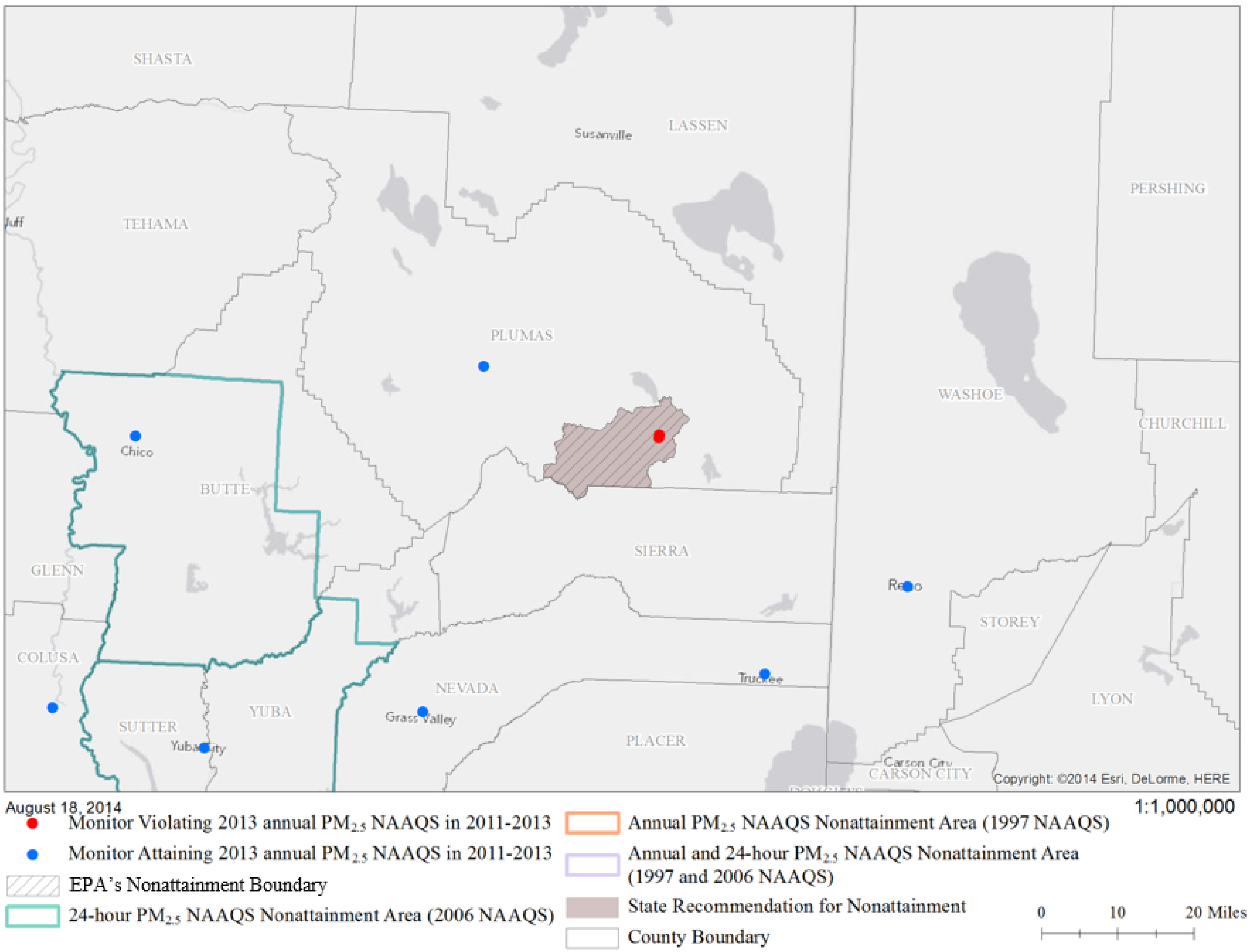
Only portions of Los Angeles, Riverside, and San Bernardino counties are included in the Los Angeles-South Coast Air Basin nonattainment area because of air quality data (Factor 1), meteorology (Factor 3), topography (Factor 4), and jurisdictional boundaries (Factor 5). The northeastern portion of the Los Angeles County, and the eastern portions of Riverside and San Bernardino do not have a violating monitoring site. Also, the portions of the counties excluded from the nonattainment are separated by topographical barriers. Considering topography and meteorology, it is unlikely these excluded portions of Los Angeles, Riverside, and San Bernardino counties are contributing to the NAAQS violations at monitoring locations within the nonattainment area. The factors that the EPA primarily relied upon when determining the appropriate boundary for the Los Angeles-South Coast Air Basin nonattainment area were air quality data (Factor 1), meteorology (Factor 3) geography/topography (Factor 4), and jurisdiction (Factor 5).

Also, the EPA is including the areas of Indian country of the following tribes as part of the Los Angeles- South Coast Air Basin nonattainment area for the 2012 annual $PM_{2.5}$ NAAQS: the Cahuilla Band of Mission Indians of the Cahuilla Reservation, the Morongo Band of Mission Indians, the Ramona Band of Cahuilla, and the Soboba Band of Luiseño Indians.

3.3 Area Background and Overview – Plumas County, CA

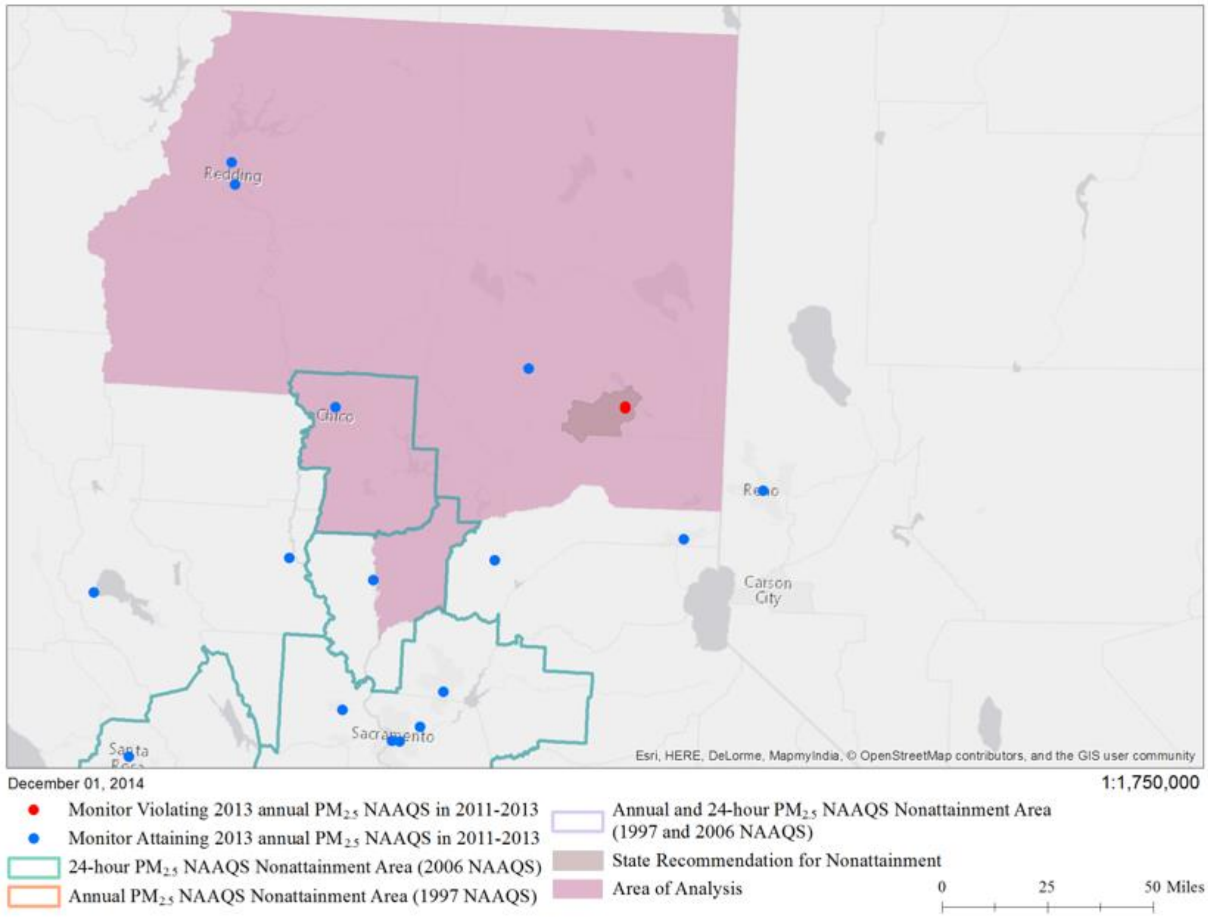
Figure 1 is a map of the EPA's nonattainment boundary for the nonattainment area located in Plumas County, CA. The map shows the location and design values of ambient air quality monitoring locations, county and other jurisdictional boundaries and other information, such as 2006 24-hour $PM_{2.5}$ NAAQS nonattainment boundaries. As shown in Figure 1a, the EPA's area of analysis considered in this section includes Plumas County (which does not include any core-based statistical areas (CBSAs)), as well as all adjacent counties (Butte, Shasta, Tehama, Lassen, Sierra, and Yuba counties).

Figure 1. EPA's Nonattainment Boundaries for the Plumas County, CA Area



The EPA must designate as nonattainment areas that violate the NAAQS and nearby areas that contribute to the violation in the violating area. Data from a monitor located in Plumas County shows a violation of the 2012 $PM_{2.5}$ NAAQS, therefore a portion of this county is included in the nonattainment area. As explained below, the EPA is designating only a portion of Plumas County as nonattainment, based upon an analysis of various factors such as the location of emission sources and topography. As shown in Figure 1a, the EPA evaluated each county located near the county with a violating monitoring site based on the five factors and other relevant information. The following sections describe this five factor analysis process. While the factors are presented individually, they are not independent. The five factor analysis process carefully considers their interconnections and the dependence of each factor on one or more of the others.

Figure 1a. Area of Analysis for the Plumas County, CA Nonattainment Area



Factor 1: Air Quality Data

All data collected during the year are important when determining contributions to an annual standard such as the 2012 annual $PM_{2.5}$ NAAQS. Compliance with an annual NAAQS is dependent upon monitor readings throughout the year, including days with monitored ambient concentrations below the level of the NAAQS. For the 2012 annual $PM_{2.5}$ NAAQS, the annual mean is calculated as the mean of quarterly means. A high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV. Although all data are important, seasonal or episodic emissions can provide insight as to relative contributors to measured $PM_{2.5}$ concentrations. For these reasons, for the Factor 1 air quality analysis, the EPA assessed and characterized air quality at, and in the proximity of, the violating monitoring site locations first, by evaluating trends and the spatial extent of measured concentrations at monitors in the area of analysis, and then, by identifying the conditions most associated with high average concentration levels of $PM_{2.5}$ mass in the area of analysis.

In most cases, the EPA assessed air quality data on a seasonal, or quarterly, basis.[65] The EPA also identified the spatial extent of these high $PM_{2.5}$ concentrations. The mass and composition at the design value location

[65] Although compliance with the annual NAAQS depends on contributions from all days of the year, examining data on a quarterly or seasonal basis can inform the relationship between the temporal variability of emissions and meteorology and the resulting $PM_{2.5}$ mass and composition. In some areas of the country where there may be noticeable month-to-month

represents contributions from various emission sources including local, area-wide (which may comprise nearby urban and rural areas) and regional sources. To determine the source mix (by mass) at the design value monitoring site, the EPA examined the chemical composition of the monitored $PM_{2.5}$ concentrations by pairing each violating FRM/FEM/ARM monitoring site with a collocated or nearby Chemical Speciation Network (CSN) monitoring site or sites. Then, the EPA contrasted the approximated mass composition at the design value monitoring site with data collected at IMPROVE[66] and other monitoring locations whose data are representative of regional background.[67,68] This comparison of local/area-wide chemical composition data to regional chemical composition data derives an "urban increment," which helps differentiate the influence of more distant emissions sources from the influence of closer emissions sources, thus representing the portion of the measured violation that is associated with nearby emission contributions.[69,70,71]

$PM_{2.5}$ Design Values and Total Mass Measurements – The EPA examined ambient $PM_{2.5}$ air quality monitoring data represented by the DVs at the violating monitoring site and at other monitors in the area of analysis. The EPA calculated DVs based on air quality data for the most recent 3 consecutive calendar years of quality-assured, certified air quality data from suitable FEM/FRM/ARM monitoring sites in the EPA's Air Quality System (AQS). For this designations analysis, the EPA used data for the 2011-2013 period (i.e., the 2013 design value), which are the most recent years with fully-certified air quality data. A monitor's DV is the metric or statistic that indicates

variations in average $PM_{2.5}$, the quarterly averages may not adequately represent seasonal variability. In these areas, air quality data may be aggregated and presented by those months that best correspond to the local "seasons" in these areas.

[66] IMPROVE stands for Interagency Monitoring for Protected Visual Environments and is an aerosol monitoring network in mostly rural and remote areas.

[67] The "urban increment" analysis assesses and characterizes the increase in seasonal and annual average $PM_{2.5}$ mass and chemical constituents observed at violating monitoring site(s) relative to monitoring sites outside the area of analysis (which represent background concentrations). Developing the urban increment involves pairing a violating FRM/FEM/ARM monitor with a collocated monitor or nearby monitor with speciation data. EPA made every effort to pair these data to represent the same temporal and spatial scales. However, in some cases, the paired violating and CSN "urban" monitoring locations were separated by some distance such that the included urban CSN site(s) reflect(s) a different mixture of emissions sources, which could lead to misinterpretations. To generally account for differences in $PM_{2.5}$ mass between the violating site and the nearby CSN site(s), EPA determined material balance of the $PM_{2.5}$ composition at the violating site by assigning the extra measured $PM_{2.5}$ mass to the carbon components of $PM_{2.5}$. Where the general urban increment approach may be misleading, or in situations where non-carbonaceous emissions are believed to be responsible for a local $PM_{2.5}$ concentration gradient, EPA used alternative analyses to reflect the mix of urban and rural sources contributing to the measured concentrations at violating monitoring sites.

[68] The urban monitors were paired with any rural sites within a 150 mile radius of an urban site to calculate spatial means of the quarterly averages of each species. If there were no rural sites within 150 miles, then the nearest rural site was used alone. That rural mean was then subtracted from the quarterly mean of the urban site to get the increment. Negative values were simply replaced with zeros.

[69] In most, but not all, cases, the violating design value monitoring site is located in an urban area. Where the violating monitor is not located in an urban area, the "urban increment" represents the difference between local and other nearby emission sources in the vicinity of the violating monitoring location and more regional sources.

[70] Hand, et. al. Spatial and Seasonal Patterns and Temporal Variability of Haze and its Constituents in the United States: Report V, June 2011. Chapter 7 – Urban Excess in $PM_{2.5}$ Speciated Aerosol Concentrations, *http://vista.cira.colostate.edu/improve/Publications/Reports/2011/PDF/Chapter7.pdf*.

[71] US EPA, Office of Air Quality Planning and Standards, December 2004. (2004) Area Designations for 1997 Fine Particle ($PM_{2.5}$) Standards, Technical Support Document for State and Tribal Air Quality Fine Particle ($PM_{2.5}$) Designations, Chapter 3, Urban Excess Methodology. Available at *www.epa.gov/pmdesignations/1997standards/documents/final/TSD/Ch3.pdf*.

whether that monitor attains a specified air quality standard. The 2012 annual $PM_{2.5}$ NAAQS is met at a monitoring site when the 3-year average annual mean concentration is 12.0 micrograms per cubic meter ($\mu g/m^3$) or less (e.g., 12.1 $\mu g/m^3$ or greater is a violation). A DV is only valid if minimum data completeness criteria are met or when other regulatory data processing provisions are satisfied (See 40 CFR part 50 Appendix N). Table 2 identifies the current design value(s) (i.e., the 2013 DV) and the most recent two design values based on all monitoring sites in the area of analysis for the Plumas County nonattainment area.[72] Where a county has more than one monitoring location, the county design value is indicated in red type.

Table 2. Air Quality Data Collected at Regulatory Monitors (all DV levels in $\mu g/m^3$)[a]

County, State	Monitor Site ID	Site Name	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
Plumas, CA	060631006	Quincy	No	9.4	9.1	10.2
Plumas, CA	060631010[c]	Portola North Substation[c]	Yes[e]	10.3	11.5	12.8
Butte, CA	060070008[d]	Chico-East[d]	No	10.1	9.5	10.1
Lassen, CA	N/A		No	No monitor		
Shasta, CA	060890004	Redding	No	5.3	5.3	5.7
Shasta, CA	060893004	Redding-Buckeye	No	6.5	6.3	6.2
Shasta, CA	060893005	Redding-Toyon	No	4.0	4.3	4.9[b]
Sierra, CA	N/A		No	No monitor		
Tehama, CA	N/A		No	No monitor		
Yuba, CA	N/A		No	No monitor		

[a] Where a county has more than one monitoring location, the county design value is indicated in red type.
[b] The listed design value is not valid due to completeness issues.
[c] In July 2013, the Portola-Nevada Street site (AQS ID 060631009) was relocated to the Portola North Substation site (AQS ID 060631010). The data listed for Plumas County is a combination of data from Portola-Nevada Street site from 2009 through June 2013, and from Portola North Substation from July 2013 through the remainder of 2013.
[d] In July 2012, the Chico-Manzanita site (AQS ID 060070002) was relocated to the Chico East site (AQS ID 060070008). The data listed for Butte County is a combination of data from Chico-Manzanita from 2009 through June 2012, and from Chico East from July 2012 through 2013.
[e] California amended its November 2013 recommendation for Plumas County on July 2, 2014, revising its recommendation to nonattainment for a portion of the county.

In addition to the FEM/FRM/ARM monitoring sites identified in Table 2 whose collected data are used to calculate DVs, the Northern Sierra Air Pollution Control District, the Tehama County Air Pollution Control District, and the National Park Service also operate the nonregulatory monitoring locations identified in Table 2a. The Paradise, Gridley, Chester, and Red Bluff sites were established for informational purposes, and the Lassen Volcanic National Park site is an IMPROVE site, established to evaluate visibility impacts on Class I areas. These

[72] In certain circumstances, one or more monitoring locations within a monitoring network may not meet the network technical requirements set forth in 40 CFR 58.11(e), which states, "State and local governments must assess data from Class III $PM_{2.5}$ FEM and ARM monitors operated within their network using the performance criteria described in table C-4 to subpart C of part 53 of this chapter, for cases where the data are identified as not of sufficient comparability to a collocated FRM, and the monitoring agency requests that the FEM or ARM data should not be used in comparison to the NAAQS. These assessments are required in the monitoring agency's annual monitoring network plan described in §58.10(b) for cases where the FEM or ARM is identified as not of sufficient comparability to a collocated FRM…."

monitors are not required per 40 CFR 58.20 to be compared to the NAAQS. Although these nonregulatory monitors are not eligible for comparison to the NAAQS, the data collected may help define an appropriate boundary for areas with emissions sources or activities that potentially contribute to ambient fine particle concentrations at the violating monitor.

Within Plumas County, the Portola monitor is in the south of the county within the Portola Valley. The Quincy monitor is further north near the center of the county. The nonregulatory Chester monitor is the northernmost $PM_{2.5}$ monitor in Plumas County. The California Air Resources Board (CARB) recommendation states that the coefficient of divergence and other statistical analyses indicate emissions that affect readings at the Quincy monitor do not likely directly impact the Portola monitor. While the Chester nonregulatory monitor indicates elevated $PM_{2.5}$ concentrations, the aforementioned CARB statement that emissions impacting a monitor north of Portola do not likely impact the Portola monitor likely applies in this area as well. The analysis of concentrations measured at the Portola monitor versus the Quincy monitor, coupled with topographic considerations (discussed further in Factor 4) and low mixing height suggests emissions outside of Portola Valley do not contribute to the violating monitor.

Table 2a. Air Quality Data Collected at Nonregulatory Monitors (all DV levels in μg/m^3)

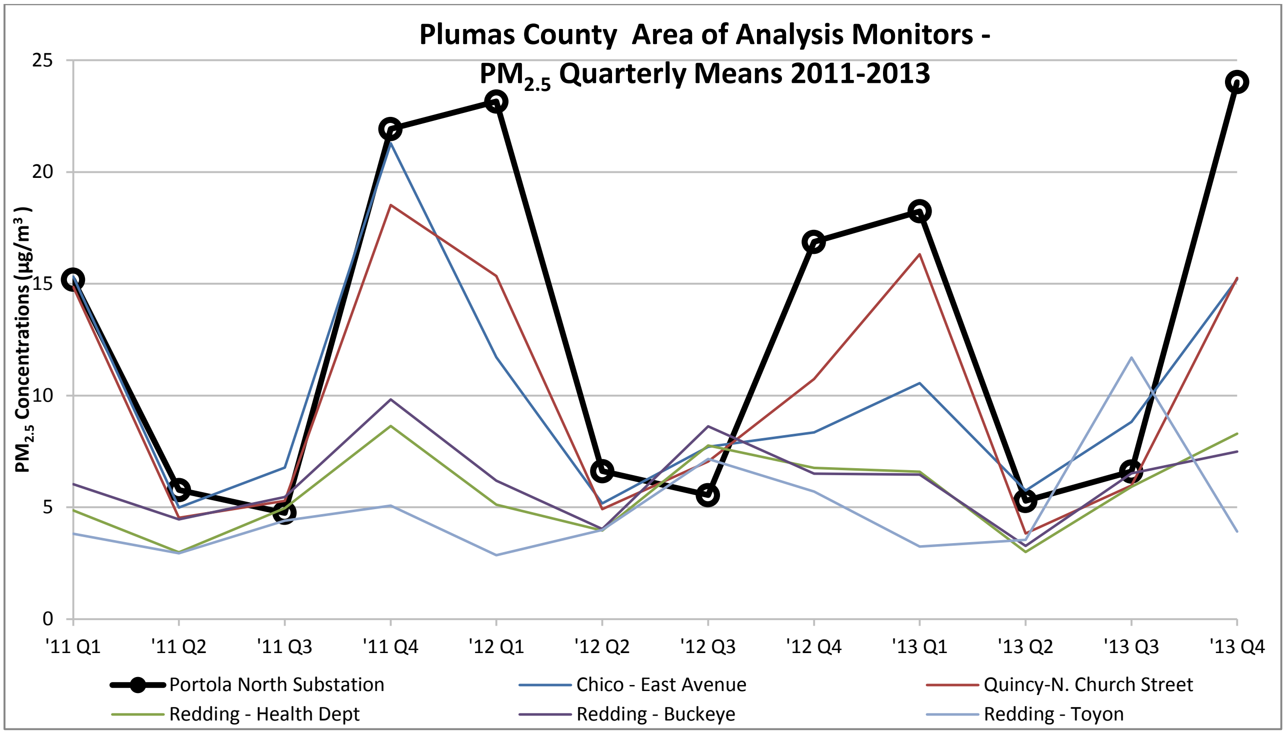
County, State	Monitor Site ID	Site Name	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
Butte, CA	060072002	Paradise	No	9.0	9.4	10.1
Butte, CA	060074001	Gridley	No	10.6	10.0	10.4
Plumas, CA	060631007	Chester	No	9.1[a]	11.6	13.1
Shasta, CA	060893003	Lassen Volcanic NP	No	2.7	2.6	2.4
Tehama, CA	061030006 [b]	Red Bluff	No	10.5 [a]	9.8 [a]	8.1

[a] One or more years of data are not complete.

[b] This monitor is currently incorrectly coded as a regulatory monitor in AQS. Recent information indicates this is a non-FEM instrument, and should be reported in AQS under the nonregulatory parameter code of 88502. EPA is working with the monitoring agency and CARB to resolve this issue.

The Figure 1 map, shown above, identifies the Plumas County nonattainment area and the monitoring location with a 2011-2013 violating DV. As indicated on the map, the area has one violating monitoring site located in the city of Portola in Plumas County. The 2013 DV at Portola is the first time the DV for Plumas County has been above 12 μg/m^3 since 2005. There is one other regulatory monitoring location in Plumas County, in Quincy, which is located north-east of the city of Portola, which does not currently record violations of the $PM_{2.5}$ standard. Seasonal variation can highlight those conditions most associated with high average concentration levels of $PM_{2.5}$. Figure 2 shows quarterly mean $PM_{2.5}$ concentrations for the most recent 3-year period for the highest DV monitoring sites and other, non-violating, monitoring sites in each county within the area of analysis. This graphical representation is particularly relevant when assessing air quality data for an annual standard, such as the 2012 annual $PM_{2.5}$ NAAQS, because, as previously stated, the annual mean is calculated as the mean of quarterly means and a high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV.

Figure 2. Plumas County Area of Analysis Monitor - $PM_{2.5}$ Quarterly Means for 2011-2013



As shown, there is consistent seasonal temporal variation across the 3-year period for the Portola Substation, Chico-East Ave, and Quincy-N. Church Street monitors. Quarterly values across the period are relatively higher in quarter one (Q1) and quarter four (Q4) (October-March) for these monitors. This signature is most pronounced at the Portola North Substation monitor where quarterly means in Q1 and Q4, 2011-2013, range from 15.2-24.0 $\mu g/m^3$ whereas in quarter two (Q2) and quarter three (Q3) the mean concentrations range from 4.8-6.6 $\mu g/m^3$. The Redding-Health Department, Redding-Toyon, and Redding-Buckeye monitors do not exhibit this seasonality as strongly, though both the Redding-Health Department and Redding-Buckeye monitors peak in Q4 of 2011 and trend similarly across the three-year period.

<u>$PM_{2.5}$ Composition Measurements</u> - To assess potential emissions contributions for each violating monitoring location, the EPA determined the various chemical species comprising total $PM_{2.5}$ to identify the chemical constituents over the analysis area, which can provide insight into the types of emission sources impacting the monitored concentration. To best describe the $PM_{2.5}$ at the violating monitoring location, the EPA first adjusted the chemical speciation measurement data from a monitoring location at or near the violating FRM monitoring site using the SANDWICH approach to account for the amount of $PM_{2.5}$ mass constituents retained in the FRM

measurement.[73,74,75,76] In particular, this approach accounts for losses in fine particle nitrate and increases in sulfate mass associated with particle bound water. Figure 3a illustrates the fraction of each $PM_{2.5}$ chemical constituent at the Portola North Substation monitoring site based on annual averages for the years 2010-2012.

Figure 3a. Plumas County Annual Average $PM_{2.5}$ Chemical Constituents (2010-2012)

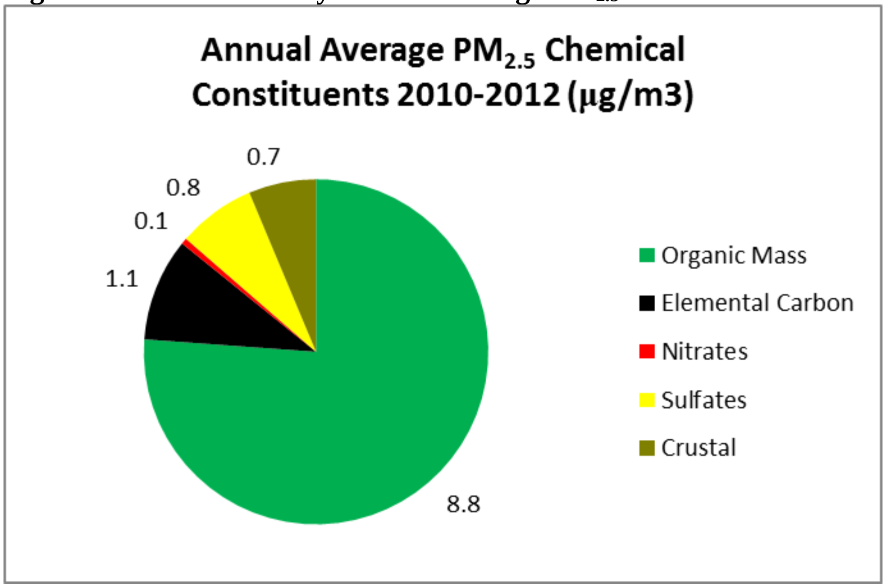


Figure 3b shows annual and quarterly chemical composition profiles and illustrates any seasonal or episodic contributors to $PM_{2.5}$ mass. This "increment analysis," combined with the other factor analyses, can provide additional insight as to which sources or factors may contribute at a greater level. Simply stated, this analysis can help identify nearby sources of emissions that contribute to the violation at the violating monitoring site.

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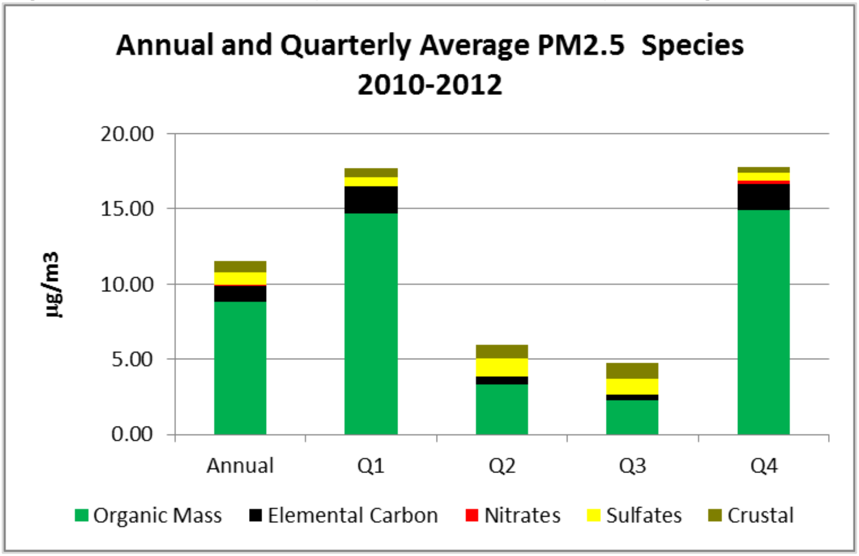
[73] SANDWICH stands for measured **S**ulfate, **A**djusted **N**itrate, **D**erived **W**ater, **I**nferred **C**arbonaceous mass **H**ybrid Material Balance Approach." The SANDWICH adjustment uses an FRM mass construction methodology that results in reduced nitrates (relative to the amount measured by routine speciation networks), higher mass associated with sulfates (reflecting water included in gravimetric FRM measurements) and a measure of organic carbonaceous mass derived from the difference between measured $PM_{2.5}$ and its non-carbon components. This characterization of $PM_{2.5}$ mass also reflects crustal material and other minor constituents. The resulting characterization provides a complete mass closure for the measured FRM $PM_{2.5}$ mass, which can be different than the data provided directly by the speciation measurements from the CSN network.

[74] Frank, N. H., SANDWICH Material Balance Approach for $PM_{2.5}$ Data Analysis, National Air Monitoring Conference, Las Vegas, Nevada, November 6-9, 2006. *http://www.epa.gov/ttn/amtic/files/2006conference/frank.pdf*.

[75] Frank, N. H., The Chemical Composition of $PM_{2.5}$ to support PM Implementation, EPA State /Local/Tribal Training Workshop: $PM_{2.5}$ Final Rule Implementation and 2006 $PM_{2.5}$ Designation Process, Chicago IL, June 20-21, 2007, *http://www.epa.gov/ttn/naaqs/pm/presents/pm2.5_chemical_composition.pdf.*

[76] Frank, N. H. *Retained Nitrate, Hydrated Sulfates, and Carbonaceous Mass in Federal Reference Method Fine Particulate Matter for Six Eastern U.S. Cities*. J. Air & Waste Manage. Assoc. 2006 56:500–511.

Figure 3b. Plumas County Annual and Quarterly Average $PM_{2.5}$ Species (2010-2012)[a]



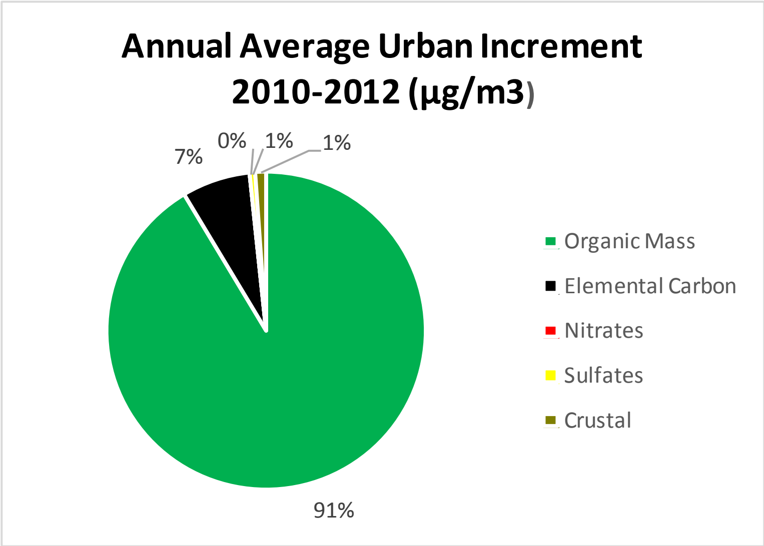
[a] *Adjusted to FRM Total $PM_{2.5}$* indicates that the speciation profile and total mass depicted in this figure are the result of the urban increment calculation for the particular FRM monitor.

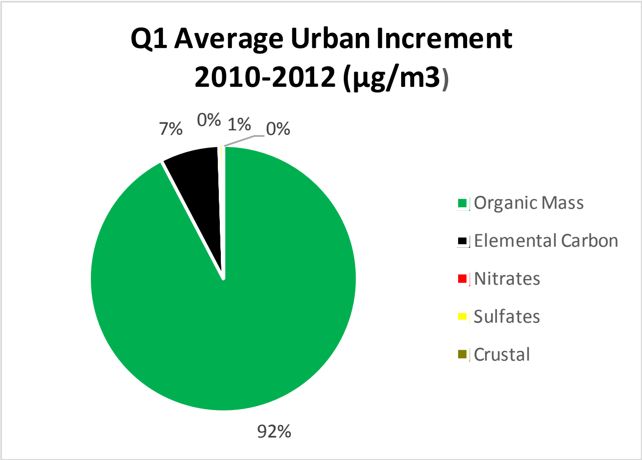
Figures 3a and 3b show that organic mass (OM) accounts for over seventy-five percent of the $PM_{2.5}$ mass on an annual basis, and elemental carbon (EC), sulfates and crustal mass (CM) are the next largest contributors at 9.8%, 7.5% and 6.5% respectively. The percent contribution of OM is even larger (over 80%) during Q1 and Q4 when the $PM_{2.5}$ concentrations are the highest. Sulfates and CM contribute about 15-25 percent during Q2 and Q3, but less than five percent during Q1 and Q4. The percent contributions of EC and nitrates to measured $PM_{2.5}$ mass are about ten percent under one percent, respectively, and are relatively constant throughout the year. This suggests that for the Q1 and Q4, which include the winter months, organic mass is the overwhelmingly predominant source of $PM_{2.5}$ and, as discussed in Factor 2, is likely related to emissions from residential wood burning. A letter from the Northern Sierra Air Quality Management District, dated June 18, 2014, supports this conclusion. It cites the diurnal pattern of the $PM_{2.5}$ concentrations that peak around the two times people use their wood stoves most: from 5:00pm to 12:00am, and from 5:00 am to 8:00 am.[77] The CARB recommendation indicates that levoglucosan and $PM_{2.5}$ concentrations are correlated, affirming the source of high concentrations as emissions from wood burning.

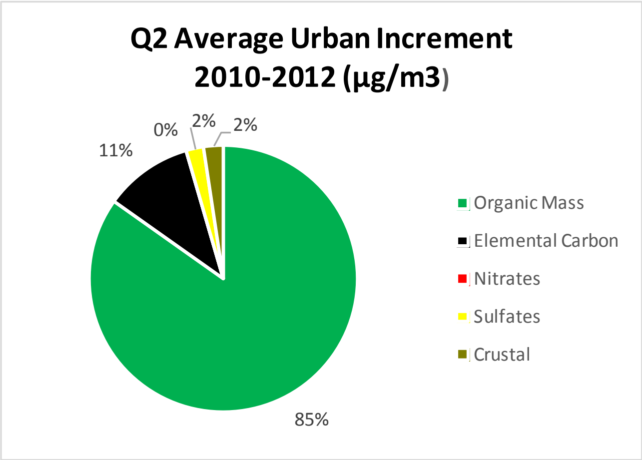
The EPA assessed seasonal and annual average $PM_{2.5}$ constituents at monitoring sites within the area relative to monitoring sites outside of the analysis area to account for the difference between regional background concentrations of $PM_{2.5}$, and the concentrations of $PM_{2.5}$ in the area of analysis, also known as the “urban increment.” This analysis differentiates between the influences of emissions from sources in nearby areas and in more distant areas on the violating monitor. Estimating the urban increment in the area helps to illuminate the amount and type of particles at the violating monitor that are most likely to be the result of sources of emissions in nearby areas, as opposed to impacts of more distant or regional sources of emissions. Figure 4a includes pie charts showing the annual and quarterly chemical mass constituents of the urban increment. The quarterly pie charts correspond to the high-concentration quarters identified in Figure 2. Evaluating these high concentration quarters can help identify composition of $PM_{2.5}$ during these times. Note that in these charts, sulfates and nitrates have been adjusted to represent their mass in measured $PM_{2.5}$.

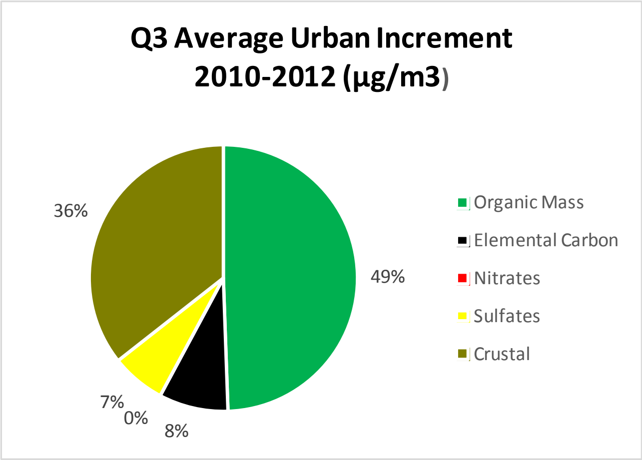
[77] Letter from Gretchen Bennitt, Executive Director, Northern Sierra Air Quality Management District’s Board of Directors, to Gwen Yoshimura, U.S. EPA Region IX. June 18, 2014, pp. 1-4 & attachment 2.

Figure 4a. Plumas County Urban Increment Analysis for 2010-2012.









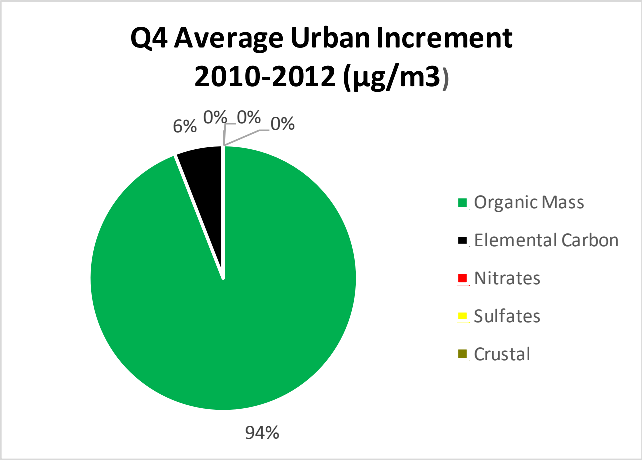
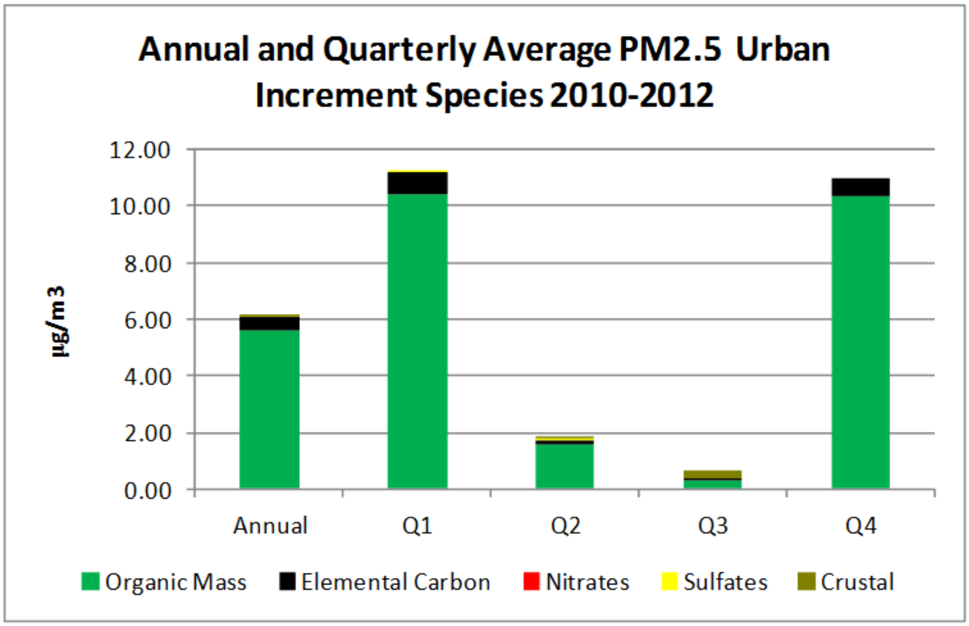


Figure 4b. Plumas County Average Urban Increment Analysis for 2010-2012.



Plumas County has one regulatory monitoring site with a DV exceeding the NAAQS. In addition, the DV monitoring site as well as surrounding sites have clear seasonal peaks in ambient $PM_{2.5}$ concentrations in Q1 and Q4.

In reviewing the speciation data derived for the Portola North Substation monitor, organic mass is the predominant species throughout the year, though the percent contribution is largest in Q1 and Q4. Sulfates, CM and EC are small components of the measured $PM_{2.5}$ mass and nitrate is a negligible component of the measured $PM_{2.5}$ mass throughout the year. This suggests that for the high concentration quarters, Q1 and Q4, which include the winter months, organic mass related to emissions from residential wood burning is the predominant contributor to $PM_{2.5}$ mass measured by the FRM monitor at Portola. The results of the urban increment analysis for the Portola monitor are similar to the adjusted speciation measurements, indicating a somewhat consistent source mix throughout the area. However, there is a substantial increase in the contribution of OM in the annual mean and quarters 1 and 4, indicating that there is likely an additional contribution from a source closer to the DV monitoring site. This supports the conclusions from the speciation data that residential wood burning is a dominant source of high $PM_{2.5}$ concentrations.

Factor 2: Emissions and Emissions-related Data

In this designations process, for each area with a violating monitoring site, the EPA evaluated the emissions data from nearby areas using emissions related data for the relevant counties to assess each county's potential contribution to $PM_{2.5}$ concentrations at the violating monitoring site or monitoring sites in the area under evaluation. The EPA examined emissions of identified sources or source categories of direct $PM_{2.5}$, the major components of direct $PM_{2.5}$ (organic mass, elemental carbon, crustal material (and/or individual trace metal compounds)), primary nitrate and primary sulfate, and precursor gaseous pollutants (i.e., SO_2, NO_X, total VOC, and NH_3). The EPA also considered the distance of those sources of emissions from the violating monitoring site. While direct $PM_{2.5}$ emissions and its major carbonaceous components are generally associated with sources near violating $PM_{2.5}$ monitoring sites, the gaseous precursors tend to have a more regional influence (although the EPA is mindful of the potential local NO_X and VOC emissions contributions to $PM_{2.5}$ from mobile and stationary sources) and transport from neighboring areas can contribute to higher $PM_{2.5}$ levels at the violating monitoring sites.

Emissions Data

For this factor, the EPA reviewed data from the 2011 National Emissions Inventory (NEI) version 1 (see *http://www.epa.gov/ttn/chief/net/2011inventory.html*). For each county in the area of analysis, the EPA examined the magnitude of county-level emissions reported in the NEI. These county-level emissions represent the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires. In some instances, non-anthropogenic sources of emissions such as wildfires account for large portions of the emissions inventory data presented below. The EPA also looked at the geographic distribution of major point sources of the relevant pollutants.[78] Substantial emissions levels from sources in a nearby area indicate the potential for the area to contribute to monitored violations.

To further analyze area emissions data, the EPA also developed a summary of direct $PM_{2.5}$, components of direct $PM_{2.5}$, and precursor pollutants, which is available at *http://www.epa.gov/pmdesignations/2012standards/docs/nei2011v1pointnei2008v3county.xlsx*.

When considered with the urban increment analysis in Factor 1, evaluating the components of direct $PM_{2.5}$ and precursor gases can help identify specific sources or source types contributing to elevated concentrations at violating monitoring sites and thus assist in identifying appropriate area boundaries. In general, directly emitted particulate organic carbon (POC) and VOCs[79] contribute to $PM_{2.5}$ organic mass (OM); directly emitted EC contributes to $PM_{2.5}$ EC; NO_X, NH_3 and directly emitted nitrate contribute to $PM_{2.5}$ nitrate mass; SO_2, NH_3 and directly emitted sulfate contribute to $PM_{2.5}$ sulfate mass; and directly emitted crustal material and metal oxides contribute to $PM_{2.5}$ crustal matter.[80,81] The EPA believes that the quantities of those nearby emissions as potential contributors to the $PM_{2.5}$ violating monitors are somewhat proportional to the $PM_{2.5}$ chemical constituents in the estimated urban increment. Thus, directly emitted POC is more important per ton than SO_2, partially because POC emissions are already $PM_{2.5}$ whereas SO_2 must convert to $PM_{2.5}$ and not all of the emitted SO_2 undergoes this conversion.

Table 3a provides a county-level emissions summary (i.e., the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires) of directly emitted $PM_{2.5}$ and precursor species for the county with the violating monitoring site and nearby counties considered for inclusion in the Plumas County, CA area. Table 3b summarizes the directly emitted components of $PM_{2.5}$ for the same counties in the area of analysis for the Plumas County, CA area. This information will be paired with the Urban Increment composition previously shown in Figures 4a and 4b.

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[78] For purposes of this designations effort, "major" point sources are those whose sum of PM precursor emissions ($PM_{2.5}$ + NOx + SO_2 + VOC + NH_3) are greater than 500 tons per year based on NEI 2011v1.

[79] As previously mentioned, nearby VOCs are presumed to be a less important contributor to $PM_{2.5}$ OM than POC.

[80] *See*, Seinfeld J. H. and Pandis S. N. (2006) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 2nd edition, J. Wiley, New York. See also, Seinfeld J. H. and Pandis S. N. (1998) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 1st edition, J. Wiley, New York.

[81] USEPA Report (2004), The Particle Pollution Report: Current Understanding of Air Quality and Emissions through 2003, found at: *http://www.epa.gov/airtrends/aqtrnd04/pm.html*.

Table 3a. County-Level Emissions of Directly Emitted $PM_{2.5}$ and Precursors (tons/year)

County, State	Total NH_3	Total NOx	Total Direct $PM_{2.5}$	Total SO_2	Total VOC	Total
Shasta, CA	2,578	8,847	2,723	206	9,301	23,653
Butte, CA	2,471	6,847	2,886	181	10,195	22,580
Lassen, CA	1,863	1,961	2,320	237	6,646	13,026
Tehama, CA	1,500	4,346	1,632	134	4,762	12,375
Plumas, CA	1,191	2,138	2,013	200	6,291	11,833
Yuba, CA	940	2,181	1,881	146	5,966	11,114
Sierra, CA	485	324	1,200	87	3,789	5,885

Table 3b. County-Level Emissions for Components of Directly Emitted $PM_{2.5}$ (tons/year) [82]

County, State	POM	EC	PSO_4	PNO_3	PCrustal	Residual	Total Direct
Butte, CA	1,880	287	27	15	243	435	2,886
Shasta, CA	1,872	333	44	19	148	308	2,723
Lassen, CA	1,714	226	30	15	94	241	2,320
Plumas, CA	1,588	216	16	16	53	124	2,013
Yuba, CA	1,414	196	12	14	84	160	1,881
Tehama, CA	1,126	204	16	11	102	174	1,632
Sierra, CA	931	118	12	5	24	109	1,200

Table 3b breaks down the direct $PM_{2.5}$ emissions value from Table 3a into its components. These data will also be compared with the previously presented Urban Increment composition.

Using the previously described relationship between directly emitted and precursor gases and the measured mass to evaluate data presented in Tables 3a and 3b, the EPA identified the following components warranting additional review: $PM_{2.5}$, VOC, POM and Crustal. The EPA then looked at the contribution of these constituents of interest from each of the counties included in the area of analysis as shown in Tables 4a-d.

Table 4a. County-Level $PM_{2.5}$ Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**$PM_{2.5}$**	**Pct.**	**Cumulative %**
Butte, CA	2,886	20	20
Shasta, CA	2,723	19	38
Lassen, CA	2,320	16	54
Plumas, CA	2,013	14	68
Yuba, CA	1,881	13	81
Tehama, CA	1,632	11	92
Sierra, CA	1,200	8	100

[82] Data are based on the 2011 and 2018 Emissions Modeling Platform Data Files and Summaries (*ftp://ftp.epa.gov/EmisInventory/2011v6/v1platform*) available at: *http://www.epa.gov/ttn/chief/emch/index.html#2011* (accessed 02/26/14).

Table 4b. County-Level VOC Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**VOC**	**Pct.**	**Cumulative %**
Butte, CA	10,195	22	22
Shasta, CA	9,301	20	42
Lassen, CA	6,646	14	56
Plumas, CA	6,291	13	69
Yuba, CA	5,966	13	82
Tehama, CA	4,762	10	92
Sierra, CA	3,789	8	100

Table 4c. County-Level POM Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**POM**	**Pct.**	**Cumulative %**
Butte, CA	1,880	18	18
Shasta, CA	1,872	18	36
Lassen, CA	1,714	16	52
Plumas, CA	1,588	15	67
Yuba, CA	1,414	13	80
Tehama, CA	1,126	11	91
Sierra, CA	931	9	100

Table 4d. County-Level Crustal Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**SO_2**	**Pct.**	**Cumulative %**
Butte, CA	243	33	33
Shasta, CA	148	20	52
Tehama, CA	102	14	66
Lassen, CA	94	13	79
Yuba, CA	84	11	90
Plumas, CA	53	7	97
Sierra, CA	24	3	100

Tables 4a-d above show a pattern in county-level emissions in the area of analysis, whereby the least emissions are from Sierra County and the most are in Butte and Shasta counties.

A letter from the Northern Sierra Air Quality Management District, dated June 18, 2014, cites wood burning for residential heating in wood stoves and fireplaces, open burn piles for yard waste disposal, and prescribed burning in nearby federal lands performed by the U.S. Forest Service and a railroad switching yard as the sources affecting $PM_{2.5}$ concentrations in Portola. The letter also states that natural gas is not available in Portola but is available in other communities in the area, such as Quincy.[83] Lack of alternate fuel sources such as natural gas likely results in

[83] Letter from Gretchen Bennitt, Executive Director, Northern Sierra Air Quality Management District's Board of Directors, to Gwen Yoshimura, U.S. EPA Region IX. June 18, 2014, p.1-4 and attachment 2.

more people using wood stoves for heating and cooking in Portola versus in communities that have access to other fuel sources.

In addition to reviewing county-wide emissions of $PM_{2.5}$ and $PM_{2.5}$ precursors in the area of analysis, the EPA also reviewed emissions from major point sources located in the area of analysis. The magnitude and location of these sources can help inform nonattainment boundaries.

There are no major point sources within the area of analysis (Plumas, Butte, Lassen, Shasta, Sierra, Tehama, and Yuba counties), however, there are several biomass facilities and other lumber-related sources of emissions in these counties. As there are no major point sources located in the area of analysis (as defined in a previous footnote, for purposes of this designations effort, "major" point sources are those whose sum of PM precursor emissions ($PM_{2.5}$ + NOx + SO_2 + VOC + NH_3) are greater than 500 tons per year based on NEI 2011v1), major point sources are unlikely to contribute to monitored violations of the 2012 $PM_{2.5}$ NAAQS at the Portola monitoring site.

In summary, the EPA's analysis of relevant county-level emissions and the geographic locations of the relevant pollutants showed that major point sources are not contributing to violations in Plumas County of the 2012 $PM_{2.5}$ NAAQS, and that the main type of source contributing to these violations is residential wood burning. While there are likely other areas where substantial amounts of wood burning occur, the impacts tend to be highly localized due to rough terrain and winter meteorology, and are not expected to contribute to the violations in Portola, as discussed further in Factors 3 and 4.

Population density and degree of urbanization

In this part of the factor analysis, the EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions. Rapid population growth in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that it may be appropriate to include the county associated with area source and mobile source emissions as part of the nonattainment area. Table 5 shows the 2000 and 2010 population, population growth since 2000, and population density for each county in the area.

Table 5. Population Growth and Population Density.

County, State	Population 2000	Population 2010	% Change from 2000	Land Area (Sq. Miles)	Population Density (per Sq. Mile)	%	Cumulative %
Butte, CA	203,171	219,968	8%	1,639	134	37	37
Shasta, CA	163,256	177,324	9%	3,785	47	30	67
Yuba, CA	60,219	72,366	20%	631	115	12	79
Tehama, CA	56,039	63,666	14%	2,951	22	11	90
Lassen, CA	33,828	34,820	3%	4,557	8	6	96
Plumas, CA	20,824	19,940	-4%	2,554	8	3	99
Sierra, CA	3,555	3,226	-9%	953	3	1	100
Total	**540,892**	**591,310**					

Source: U.S. Census Bureau population estimates for 2000 and 2010

As seen in Table 5, Plumas County has a small population and it is declining. Plumas County and the adjacent county to the south, Sierra County, are the only two counties in the area of analysis that have declining populations. However, Lassen County to the north has a similarly small population density, with only 34,820 people in a county that is 4,557 square miles. These three counties have some of the smallest population densities in the nation. Although the adjacent Yuba County has a higher degree of population growth (20%), compared to all other counties in the area of analysis, and Butte, Shasta and Tehama counties also are experiencing population growth, it is not in a pattern that is associated with the population in Plumas County, which is spread throughout this large (2,554 square miles) county. Yuba County's population, for example, is associated with Yuba City-Marysville in the central portion of the two-county Sutter County and Yuba County area. Butte and Shasta counties do have much higher population than Plumas County suggesting the potential for contribution from those counties, but those populations are much farther away and emission activity from those counties is less likely to contribute to the violations in Plumas County.

Figure 5. 2010 County-Level Population in the Area of Analysis for the Plumas County, CA Area.

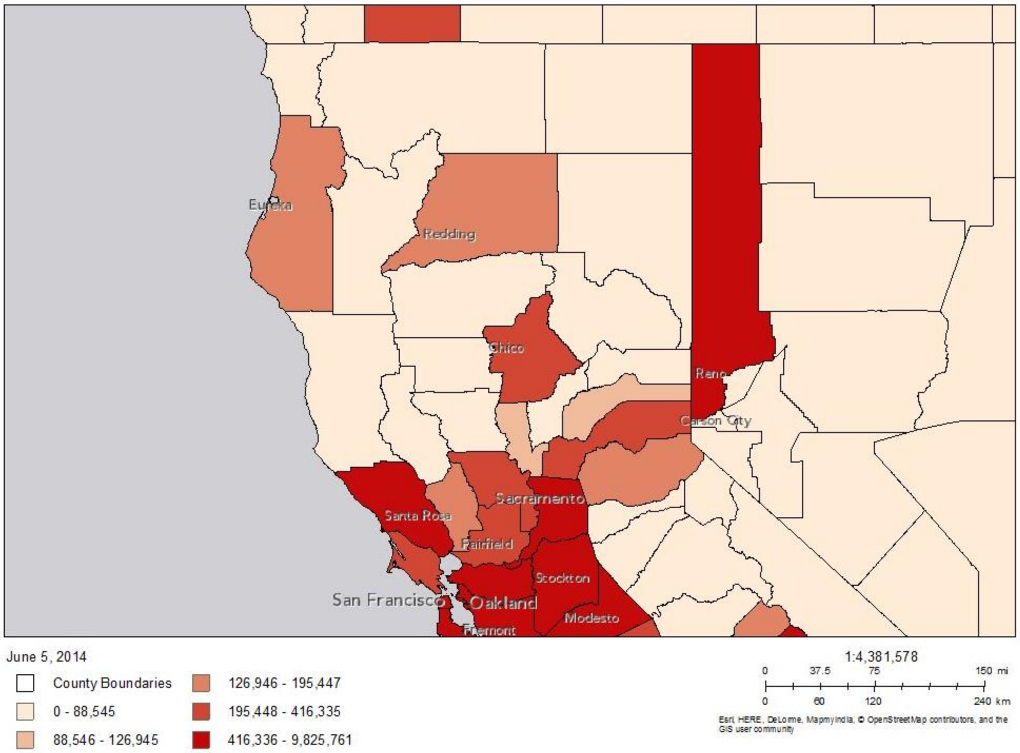
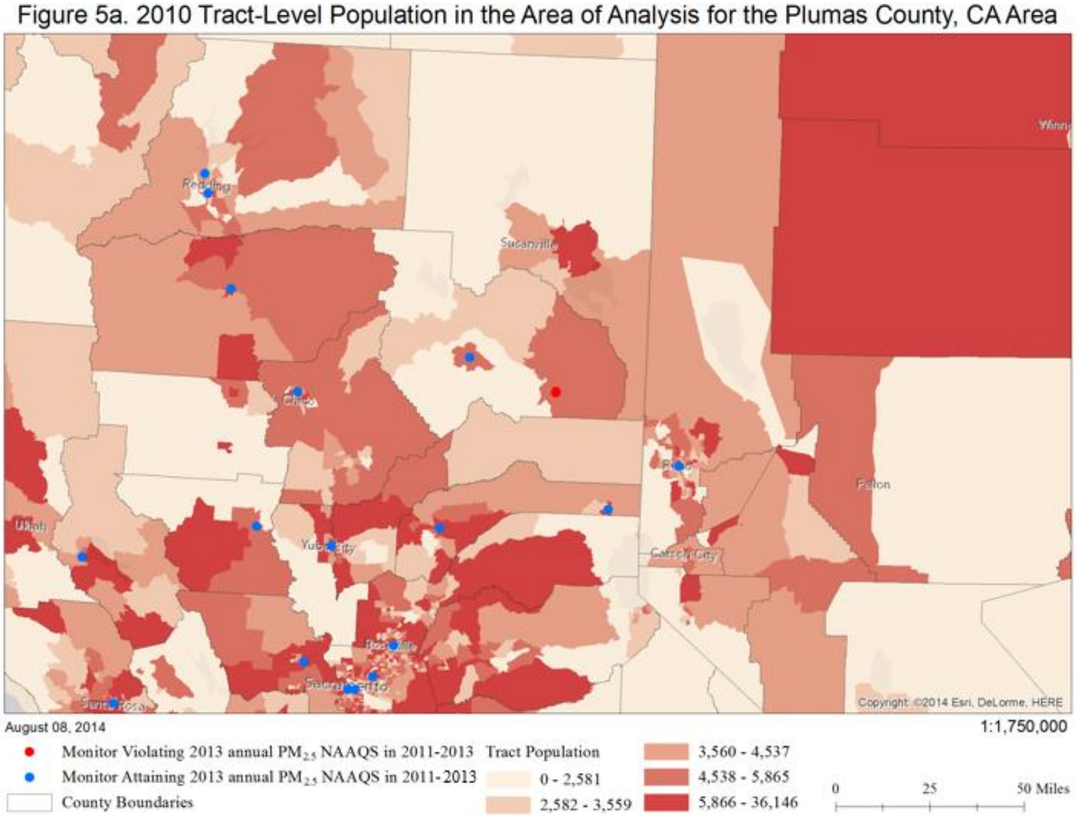


Figure 5a. 2010 Tract-Level Population in the Area of Analysis for the Plumas County, CA Area



As shown in Figure 5 and in more detail in Figure 5a, the population of Plumas County is small and sparse.

<u>Traffic and Vehicle Miles Travelled</u>

High vehicle miles travelled (VMT) and/or a high number of commuters associated with a county is generally an indicator that the county is an integral part of an urban area. Mobile source emissions of NO_x, VOC, and direct PM may contribute to ambient particulate matter that contributes to monitored violations of the NAAQS in the area. In combination with the population/population density data and the location of main transportation arteries, an assessment of VMT helps identify the probable location of nonpoint source emissions that contribute to violations in the area. Comparatively high VMT in a county outside of the CBSA or CSA signifies integration with the core urban area contained within the CSA or CBSA, and indicates that a county with the high VMT may be appropriate to include in the nonattainment area because emissions from mobile sources in that county contribute to violations in the area. Table 6 shows 2011 VMT while Figure 6 overlays 2011 county-level VMT with a map of the transportation arteries. VMT information shown below comes from the Federal Highway Administration.

Table 6. 2011 VMT for the Plumas County, CA Area.

County, State	Total 2011 VMT	Percent	Cumulative %
Shasta, CA	2,423,021,028	34	34
Butte, CA	1,803,224,860	25	59
Tehama, CA	1,096,503,798	15	74
Yuba, CA	779,782,024	11	85
Lassen, CA	775,933,492	11	96
Plumas, CA	216,739,350	3	99
Sierra, CA	74,257,303	1	100
Total	**7,169,461,855**		

http://www.census.gov/hhes/commuting/data/commuting.html

Figure 6. Overlay of 2011 County-level VMT with Transportation Arteries.

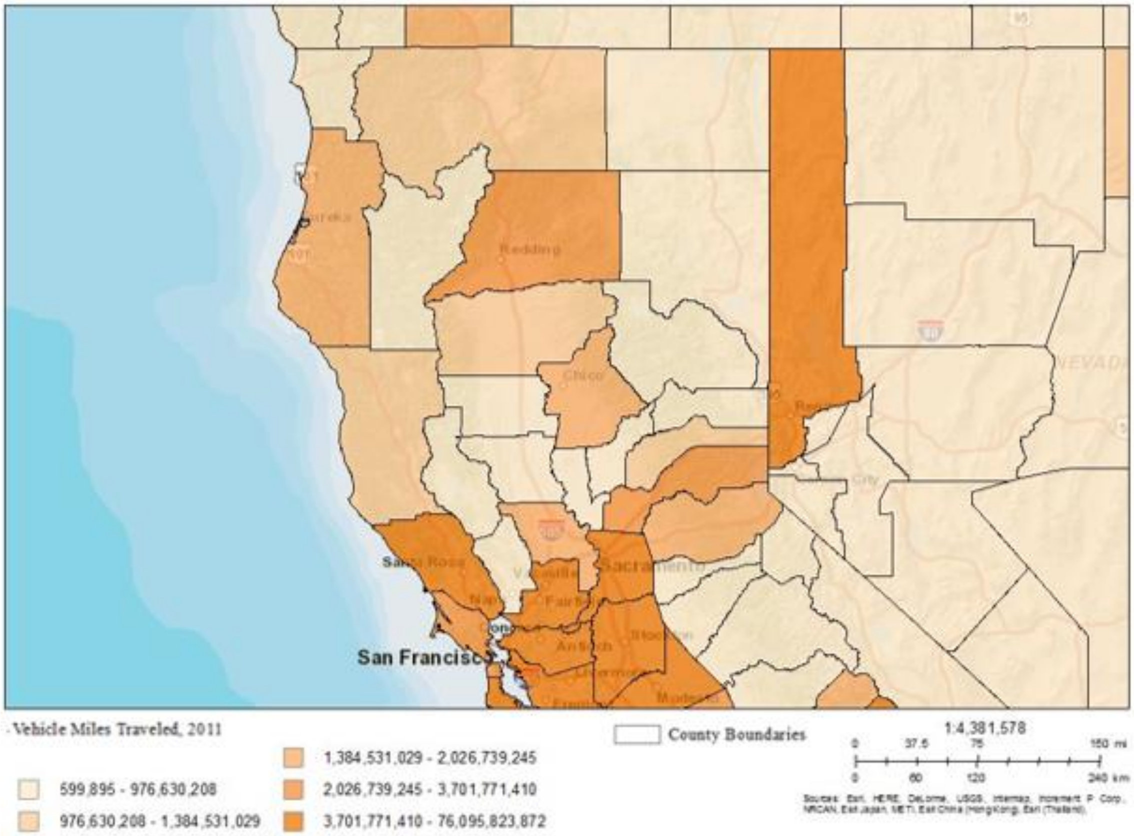


Figure 6 shows that there are no major transportation arteries within Plumas County. The county is isolated in terms of its population. According to Census Bureau statistics for commuter flow between counties for 2006-2010, Plumas County has 8,744 commuters. See: http://www.census.gov/population/metro/data/other.html. Of these, 7,260, or 83%, commute to work within the county. Only 30 commuters commute to Plumas County from Shasta County; 220 from Lassen County; 81 from Sierra County, the closest county in the area of analysis to the violating monitor in Plumas County; no commuters in Yuba County commute to Plumas County; 314 from Butte County, to the west; and again, no commuters in Glenn County commute to Plumas County.

In summary, with respect to emissions sources in the area of analysis for Plumas County, there are no major point sources. Emissions that impact monitored $PM_{2.5}$ concentrations are likely related to residential burning activities. The population in most of the area of analysis is sparse and widely distributed, typical of relatively uninhabited areas of the American West. In this area, the EPA believes that most of the emissions that are contributing to the violations in Plumas County occur within the portion of the county that the EPA is designating as nonattainment.

Factor 3: Meteorology

The EPA evaluated available meteorological data to determine how meteorological conditions, including, but not limited to, weather, transport patterns, and stagnation conditions, could affect the fate and transport of directly emitted particulate matter and precursor emissions from sources in the area of analysis. The EPA generally uses wind roses for this analysis; however, there is no National Weather Service or comparable meteorological data available within the narrow Portola Valley.

Prevailing winds in the Portola Valley are from the southwest during the day, with stagnant wind conditions at night. The average low temperature for the 6-month period of October through March is 21.8°F with frost conditions experienced an average of 218 days per year.[84] At night the ground cools, creating a shallow surface-based inversion, since air near the ground is cooler than that above. This, along with the valley's steep topography, inhibits mixing and confines pollutants to a relatively shallow layer near the ground. The low sun-angle and climatologically dominant high pressure over Northern California, allow for little heat or wind to break the inversion. As such, high $PM_{2.5}$ concentrations at the Portola monitor mostly occur in the wintertime during evening through morning hours and are confined to the Portola Valley, supporting the limited portion of Plumas County as the appropriate nonattainment boundary.

The EPA generated kernel density estimation (KDE) plots to represent HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) backward trajectory frequency at violating monitoring sites.[85,86] These KDEs are graphical statistical estimations to determine the density of trajectory endpoints at a particular location represented by a grid cell. The EPA used KDEs to characterize and analyze the collection of individual HYSPLIT backward trajectories.[87] Higher density values, indicated by darker blue colors, indicate a greater frequency of observed trajectory endpoints within a particular grid cell. Figure 7 shows a HYSPLIT KDE plot for the Portola-Nevada Street air monitoring site (AQS ID 060631009) in Plumas County summarized by calendar quarter for the 2010-2012 period. These trajectories are not conclusive due to the coarse grid resolution (40kmx40km) of the Eta Data Assimilation System (EDAS) data driving the HYSPLIT trajectories. The valley containing Portola is at most 20 km wide. The data are not resolved enough to portray the wintertime stagnation that is a key feature of local Portola meteorology.

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[84] Letter from Gretchen Bennitt, Executive Director, Northern Sierra Air Quality Management District's Board of Directors, to Gwen Yoshimura, U.S. EPA Region IX. June 18, 2014, pp. 2-5.

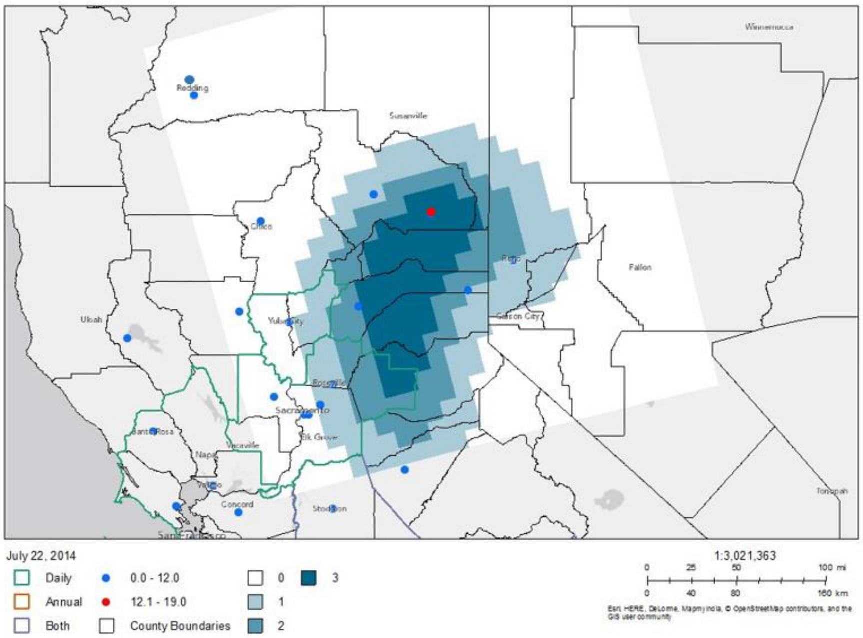
[85] In some past area designations efforts, EPA has used HYSPLIT backward trajectories to assist in determining nonattainment area boundaries. A HYSPLIT backward trajectory is usually depicted on a standard map as a single line, representing the centerline of an air parcel's motion, extending in two dimensional (x,y) space from a starting point and regressing backward in time to a point of origin. Backward trajectories may be an appropriate tool to assist in determining an air parcel's point of origin on a day in which a short-term standard, such as an 8-hour standard or a 24-hour standard, was exceeded. However, for an annual standard, such as the 2012 annual $PM_{2.5}$ NAAQS, every trajectory on every day is important. Plotting a mass of individual daily (e.g., 365 individual back trajectories), or more frequent, HYSPLIT trajectories may not be helpful as this process is likely to result in depicting air parcels originating in all directions from the violating monitoring site.

[86] HYSPLIT - Hybrid Single Particle Lagrangian Integrated Trajectory Model, *http://www.arl.noaa.gov/HYSPLIT_info.php*

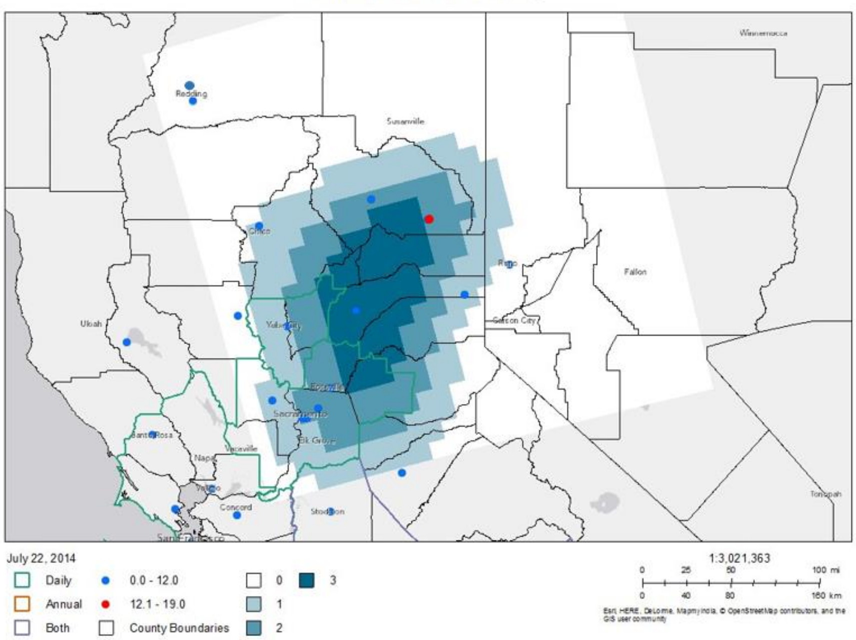
[87] The KDEs graphically represent the aggregate of HYSPLIT backward trajectories for the years 2010-2012, run every third day (beginning on the first day of monitoring), four times each day, and ending at four endpoint heights.

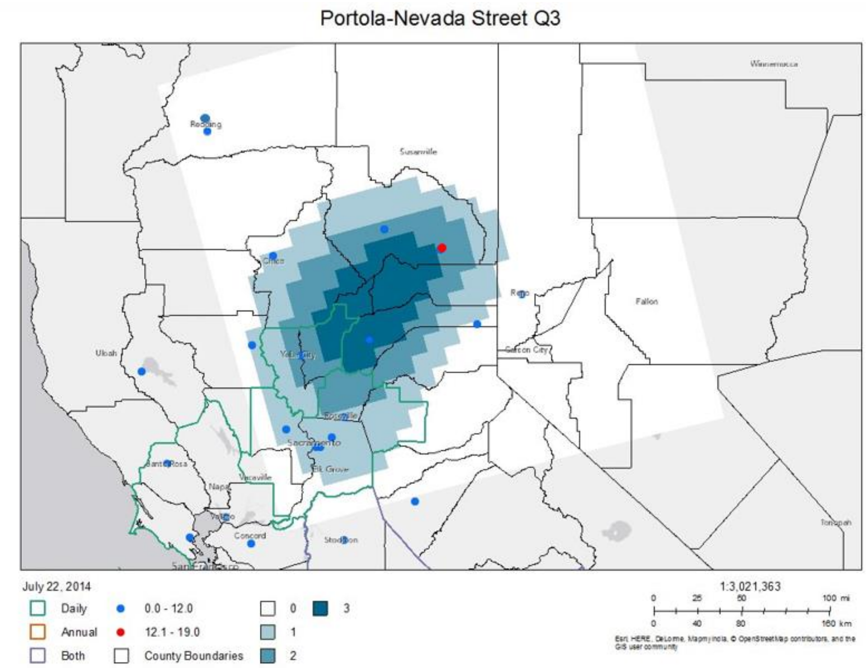
Figures 7. Quarter 1-Quarter 4: HYSPLIT Kernel Density Estimation Plots for the Portola –Nevada Street Monitoring Station.

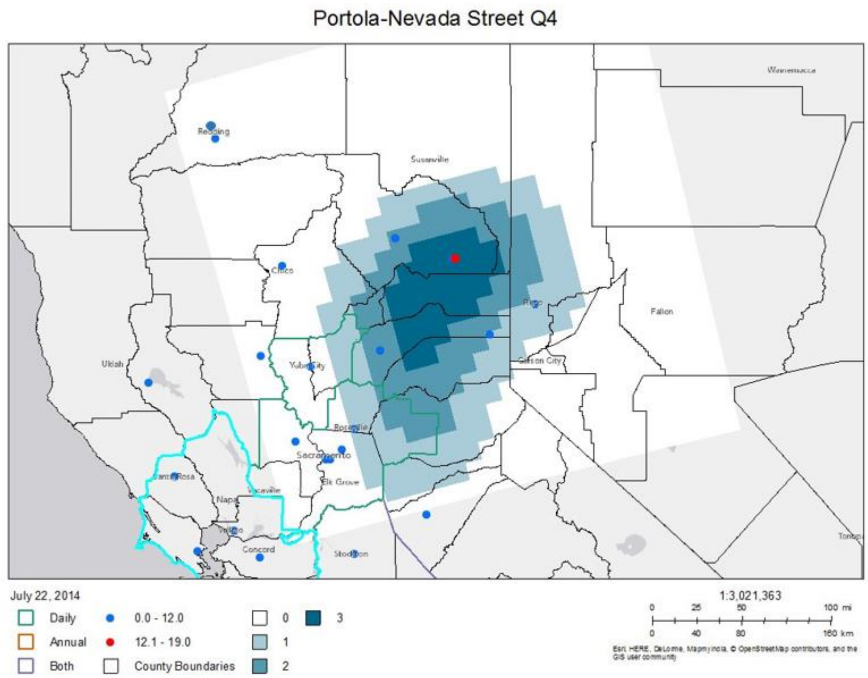
Portola-Nevada Street Q1



Portola-Nevada Street Q2







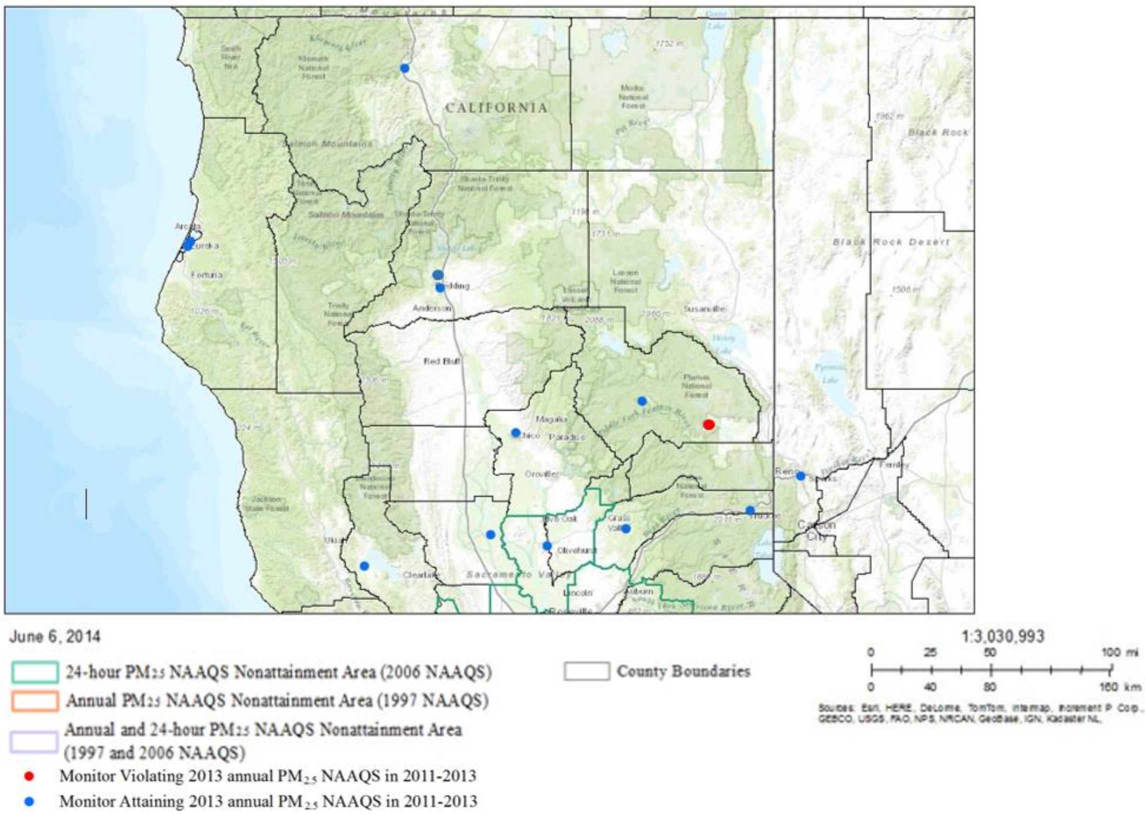
Factor 4: Geography/topography

To evaluate the geography/topography factor, the EPA assessed physical features of the area of analysis that might define the airshed and thus affect the formation and distribution of $PM_{2.5}$ concentrations over the area.

The town of Portola (elevation 4890 feet) lies in Plumas County in the northern Sierra Nevada Mountains near the southern border of the Cascade Range. The Middle Fork of the Feather River runs through the center of Portola (See Figure 8b). The topography of Plumas County is highly variable, including mountain peaks (>7,000 ft) and valleys with extreme slopes and differences in altitude. This topography affects and directs airflow, causing shallow vertical mixing, and creating areas of high pollutant concentrations by hindering dispersion. The Portola area is geographically isolated from other areas by rugged mountains, forming a bowl-shaped valley. There is a distinct range with 6000-7000 ft peaks separating Portola from Quincy, 32 miles to the west-northwest.[88] To the east the Feather River provides a narrow air corridor from the Portola Valley into the expansive Sierra Valley (See Figure 8b). While high $PM_{2.5}$ concentrations within the Portola Valley could enter the Sierra Valley, these concentrations would be quickly diluted limiting their effect on unmonitored concentrations in that area.

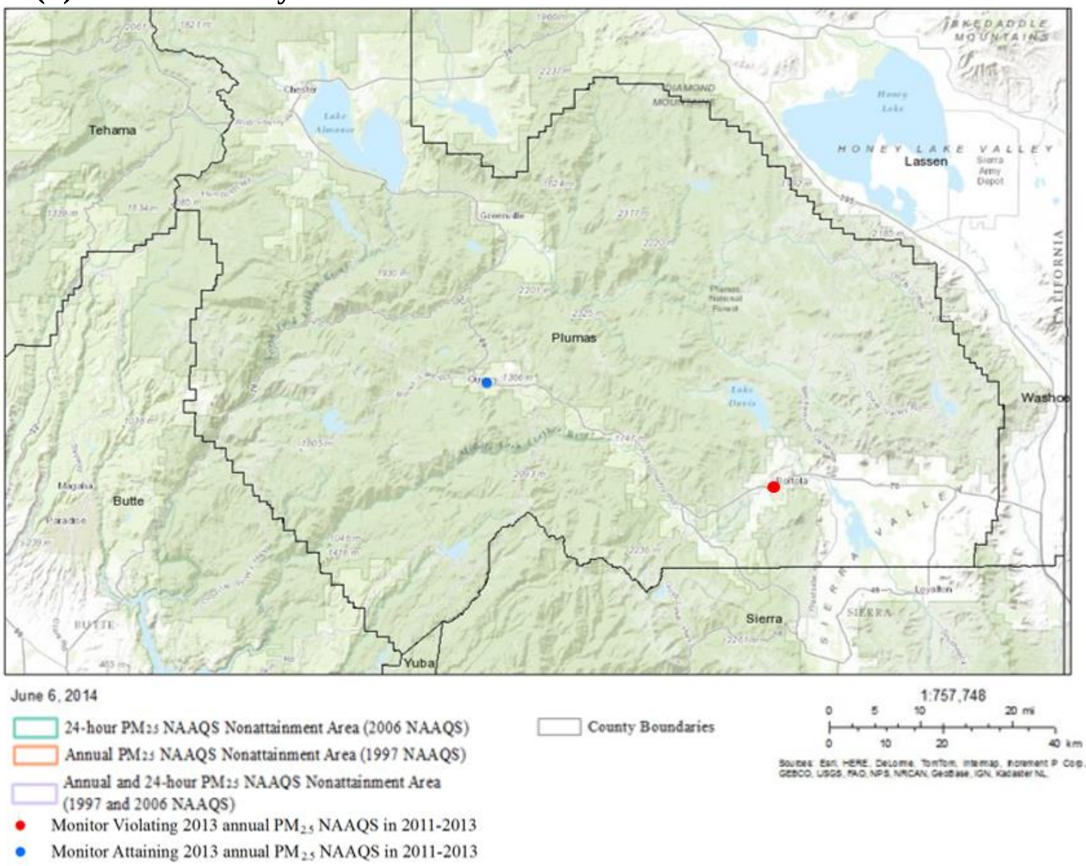
Figure 8. Topographical Map of Northern California (a) and of Plumas County. County boundaries and AQS stations are shown.

(a) Northern California



[88] *Id.*

(b) Plumas County



Factor 5: Jurisdictional boundaries

In defining the boundaries of the Plumas County nonattainment area, the EPA considered existing jurisdictional boundaries, which can provide easily identifiable and recognized boundaries for purposes of implementing the NAAQS, as well as recommendations from the state and local air district. On June 18, 2014, Northern Sierra Air Quality Management District (the District) provided its recommendation to the EPA, recommending that the EPA designate the Portola Valley, following the existing state standard nonattainment area, as the federal nonattainment area.[89] The District's recommendation was accompanied by a five-factor analysis.

On July 2, 2014, CARB provided an additional recommendation to its November 2013 State recommendation. The additional recommendation provided a recommendation for nonattainment for Plumas County, CA, based on complete air quality monitoring data for 2013 that was not available at the time of its initial recommendation. The State's letter recommended the same area as the District recommended, and also included a five-factor analysis in support of its recommended boundary.[90]

[89]Letter from Gretchen Bennitt, Executive Director, Northern Sierra Air Quality Management District to Gwen Yoshimura, U.S. EPA Region 9 Air Division Air Quality Analysis Office, dated June 18, 2014.
[90]Letter from Richard Corey, Executive Officer, Air Resources Board, to Jared Blumenfeld, Regional Administrator, U.S. EPA Region 9, dated July 2, 2014.

Existing jurisdictional boundaries often signify the state or local governmental organization with the necessary legal authority for carrying out air quality planning and enforcement functions for the area. Examples of such jurisdictional boundaries include existing/prior nonattainment area boundaries for particulate matter, county lines, air district boundaries, township boundaries, areas covered by a metropolitan planning organization, state lines, and Reservation boundaries, if applicable. Where existing jurisdictional boundaries were not adequate or appropriate to describe the nonattainment area, the EPA considered other clearly defined and permanent landmarks or geographic coordinates for purposes of identifying the boundaries of the designated areas.

The Plumas County nonattainment area is the same as the State's recommended partial-county area, which is currently designated by the State as a $PM_{2.5}$ nonattainment area for the State of California's $PM_{2.5}$ standard. The State of California's $PM_{2.5}$ standard is set at an annual arithmetic mean of 12 $\mu g/m^3$. This area is defined by the State's hydrological "super planning watershed" areas in Plumas County, CA, as described below, and the Sierra-Plumas county line to the south.

Plumas County's air quality is managed by the Northern Sierra Air Quality Management District, which also manages the air quality of Sierra and Nevada Counties. Plumas County is in the northeastern part of California and is part of the Mountain Counties Air Basin. The Mountain Counties Air Basin includes nine counties: Plumas, Sierra, Nevada, Placer, El Dorado, Amador, Calaveras, Tuolumne and Mariposa. There is no metropolitan planning organization (MPO) for Plumas County or for the state-recommended partial-county area.

The Office of Management and Budget's December 2009 delineations of core-based statistical areas (CBSAs) does not consider Plumas County a CBSA. Plumas County is surrounded by six counties with a wide range of CBSA/CSA delineations: Sierra County (not a CBSA), Lassen County (micro-CBSA), Tehama County (micro-CBSA), Butte County (metro-CBSA), Yuba County (part of Sacramento-CSA), and Shasta County (metro-CBSA). This diversity of delineations is in keeping with the EPA's assessment that Plumas County is not interconnected with any of the surrounding counties. Neither Plumas County itself, nor the county to the south, Sierra County, have populations that are large enough to be delineated as a micropolitan CBSA.

The State designated the nonattainment area as nonattainment for the State's $PM_{2.5}$ ambient air quality standard in 2003. Since that time, air quality in the area has been managed by cooperation between federal, state and local authorities and businesses, regarding programs ranging from limits on open burning to requirements for EPA certified wood-burning appliances for home change of ownership, to an agreement with the railway not to idle their diesel engines in Portola. See District recommendation, pages 3 and 4.

The State's nonattainment area consists of one whole watershed, as defined by the State, and several partial watersheds. To the northeast, the entirety of the State's "super planning watershed" # 55183301 (Humbug Valley) includes the city of Portola as well as all or part of the cities of Delleker, Iron Horse, Beckworth, Lake Davis, Mohawk Vista, C-Road, Clio and Valley Ranch. To the south, the Plumas County portion of watershed # 55183302 (Sulpher Creek) includes the city of Whitehawk and the remainder of Valley Ranch. To the southwest, the Plumas County portion of watershed # 55183303 (Frazier Creek) includes another portion of Mohawk Vista and the remainders of D-Road and Clio and a portion of Graeagle. To the west, the Plumas County portion of watershed # 55183304 (Eureka Lake) includes the remainders of Graeagle and Mohawk Vista, Plumas Eureka and most of Johnsville. The remainder of the nonattainment area is unincorporated. See District recommendation Attachment 1, map of the Portola Valley State $PM_{2.5}$ Nonattainment Area; see also the attachment to the State's recommendation, page 16.

The nonattainment area does not include portions of Indian country.

Conclusion for Plumas County Area

Based on the assessment of factors described above, both individually and in combination, the EPA has concluded that the following partial county should be included as part of the Plumas County nonattainment area because portions of the county are either violating the 2012 annual $PM_{2.5}$ NAAQS or contributing to a violation at a nearby monitoring site: Plumas County (partial), including Portola Valley and the city of Portola, and as defined by the existing state standard nonattainment area. The EPA concurs with the state's recommendation for this area.

An evaluation of design value and speciation information relevant to Factor 1 shows that the air quality monitoring sites in Plumas County indicate violations of the 2012 annual $PM_{2.5}$ NAAQS based on the 2013 DVs, likely primarily due to local sources of residential burning; therefore a portion of the county is included in the nonattainment area.

Information relevant to Factor 2 indicates that there are no large sources in the area of analysis. The likely source contributing the most to the particulate matter concentrations which result in violations of the 2012 annual $PM_{2.5}$ NAAQS in Portola are residential burning activities, which tend to affect a very localized area when they occur in a topographically- and meteorologically-contained area such as the Portola Valley.

Factor 3 suggests that the greatest potential contribution of emissions is from the area contained within the valley with the violating monitor due to the meteorological conditions of stagnant, wintertime inversions during the quarters with the highest $PM_{2.5}$ concentrations. Although there may be similar sources of emissions elsewhere in the area of analysis, geographic distance and topographical barriers in combination with this meteorology make it less likely that those emissions contribute to the violations in the Portola Valley in Plumas County.

As discussed with respect to Factor 4, the topography of the region is highly variable, including mountain peaks (>7,000 ft) and valleys with extreme slopes and differences in altitude. The Portola Valley area is geographically isolated from other areas by rugged mountains, forming a bowl-shaped valley. This topography affects and directs airflow, causes shallow vertical mixing, and creates areas of high pollutant concentrations by hindering dispersion, especially in the Portola area. Finally, an assessment of information relevant to Factor 5 further supports the boundary of the Plumas County nonattainment area due to local air district jurisdiction and the existing State nonattainment area.

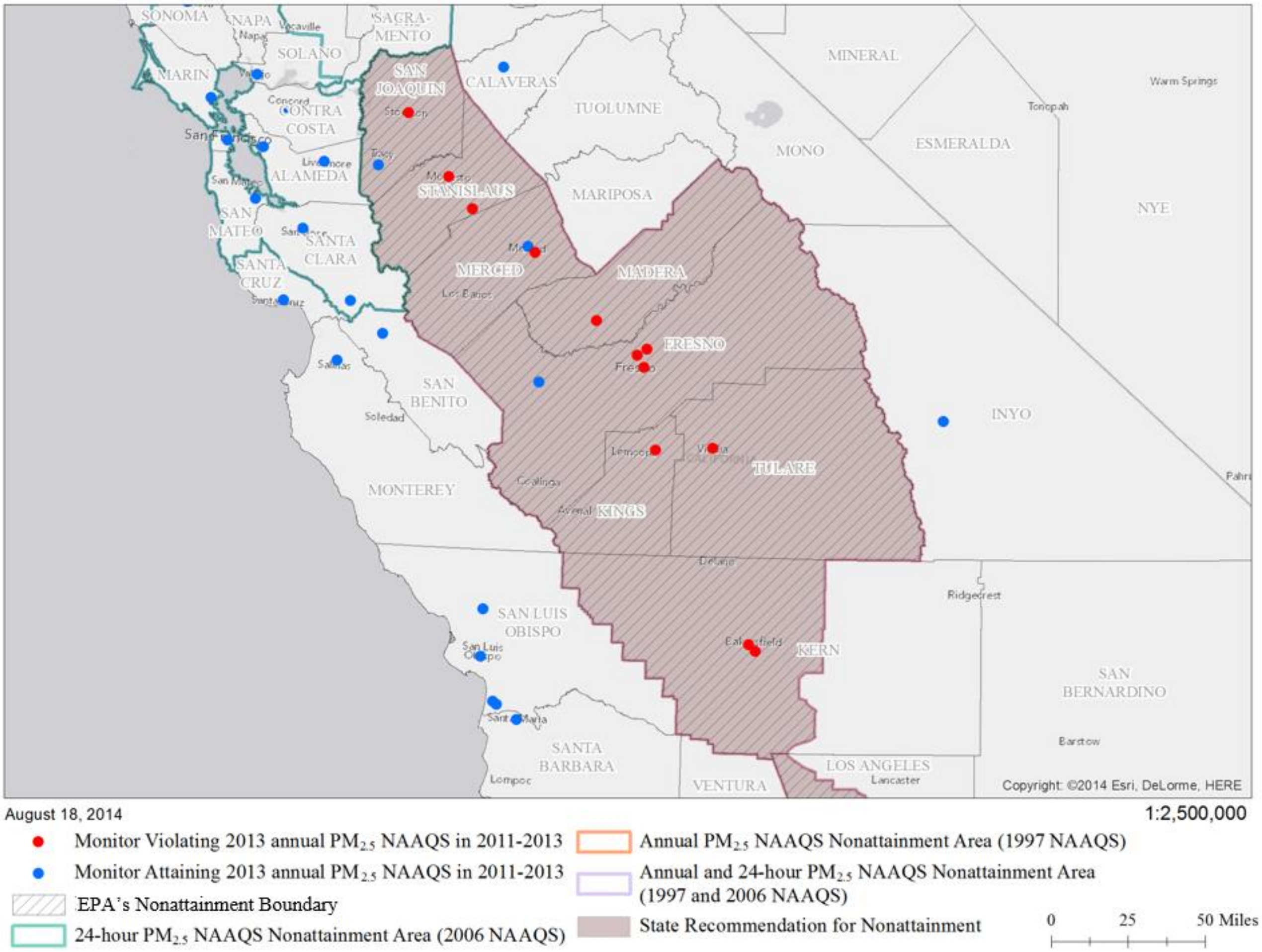
Only a portion of Plumas County is included in the Plumas County nonattainment area. The remainder of the county does not have sources of emissions or emissions activity that are likely to be contributing to the violating monitor in the Portola Valley. The factors that the EPA primarily relied upon when determining the appropriate boundary for the Plumas County nonattainment area were Air Quality Data (Factor 1), Meteorology (Factor 3), Geography/Topography (Factor 4), and Jurisdiction (Factor 5).

3.4 Area Background and Overview – San Joaquin Valley, CA

Figure 1 is a map of the EPA's nonattainment boundary for the San Joaquin Valley. The map shows the location and design values of ambient air quality monitoring locations, county and other jurisdictional boundaries and existing 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS nonattainment boundaries. As shown in Figure 1a, the EPA's area of analysis considered in this section includes the counties in the San Joaquin Valley Air Basin (consisting of San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, and Tulare counties, as well as the western portion of Kern County), and all counties adjacent to the San Joaquin Valley Air Basin (Alameda, Amador, Calaveras, Contra Costa, Inyo, Los Angeles, Mariposa, Mono, Monterey, Sacramento, San Benito, San Bernardino, San Luis Obispo, Santa Barbara, Santa Clara, Tuolumne, and Ventura counties) as part of the area of analysis. The San Joaquin Valley Air Basin includes the Fresno-Madera combined statistical area (CSA), and the entireties of the Stockton, Modesto, Merced, Hanford-Corcoran, and Visalia-Porterville metropolitan statistical areas (MSA). The entirety of Kern County forms the Bakersfield-Delano MSA.

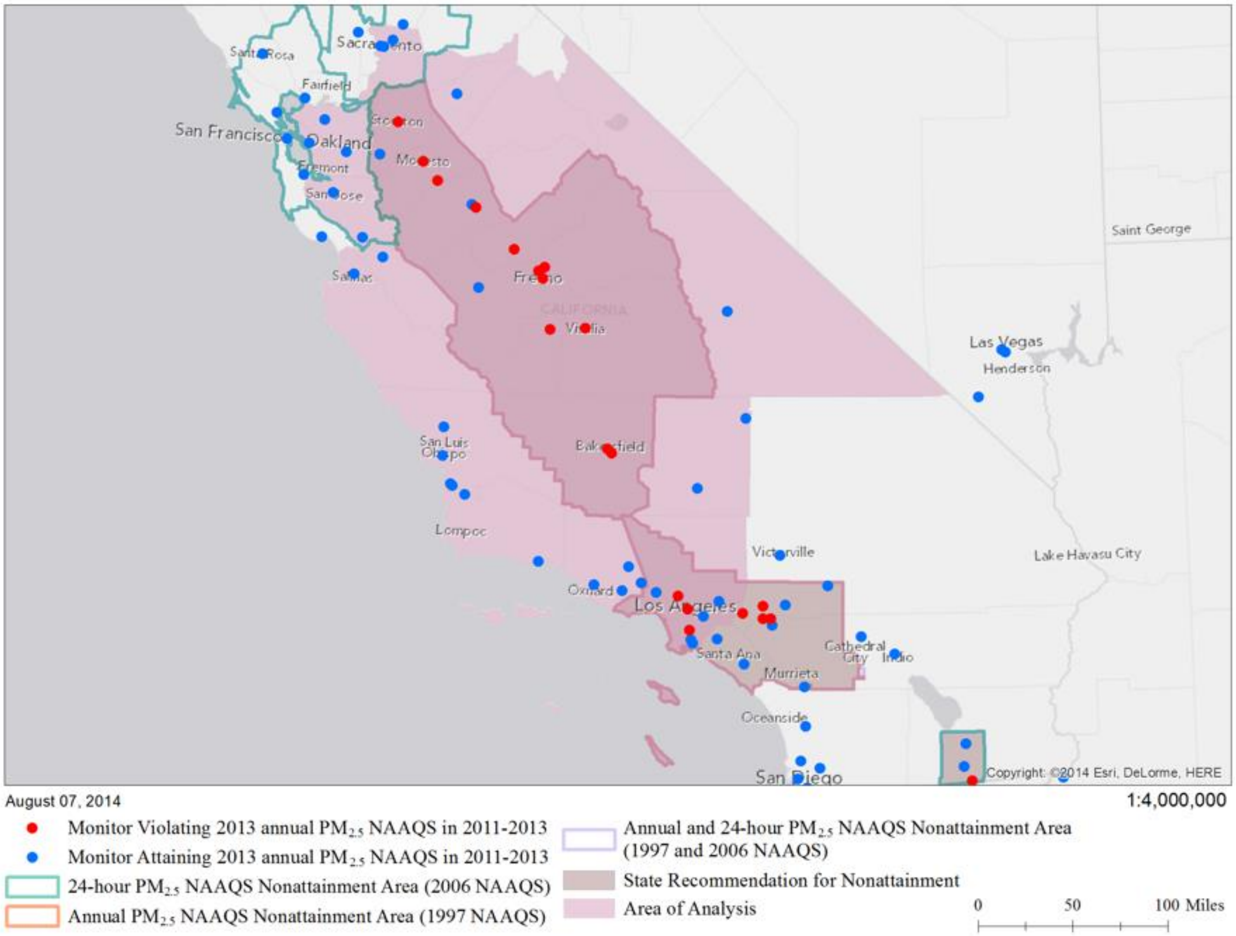
For purposes of the 1997 annual $PM_{2.5}$ NAAQS, this area was designated nonattainment. The boundary for the nonattainment area for the 1997 annual $PM_{2.5}$ NAAQS included the entire counties of Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus and Tulare and a portion of Kern County. For purposes of the 2006 24-hour $PM_{2.5}$ NAAQS, this area was designated nonattainment. The boundary for the nonattainment area for the 2006 24-hour $PM_{2.5}$ NAAQS also included the entire counties of Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus and Tulare and a portion of Kern County. The boundary for the 2012 annual $PM_{2.5}$ NAAQS is the same as the nonattainment area boundary for the 1997 annual $PM_{2.5}$ NAAQS and the 2006 24-hour $PM_{2.5}$ NAAQS. This nonattainment area includes areas of Indian country of the following federally recognized tribes: the Big Sandy Rancheria of Western Mono Indians, the Cold Springs Rancheria of Mono Indians of California, the Northfork Rancheria of Mono Indians of California, the Picayune Rancheria of Chuckchansi Indians of California, the Santa Rosa Indian Community of the Santa Rosa Rancheria, the Table Mountain Rancheria of California, and the Tule River Indian Tribe of the Tule River Reservation.

Figure 1. EPA's Nonattainment Boundaries for the San Joaquin Valley, CA Area



The EPA must designate as nonattainment areas that violate the NAAQS and nearby areas that contribute to the violation in the violating area. Eight counties - San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern counties, show a violation of the 2012 $PM_{2.5}$ NAAQS, therefore the first seven counties listed and a portion of Kern County are included in the nonattainment area. As shown in Figure 1a, the EPA evaluated each county as well as those counties located near the counties with a violating monitoring site based on the five factors and other relevant information. The following sections describe this five factor analysis process. While the factors are presented individually, they are not independent. The five factor analysis process carefully considers their interconnections and the dependence of each factor on one or more of the others.

Figure 1a. Area of Analysis for the San Joaquin Valley, CA Nonattainment Area



Factor 1: Air Quality Data

All data collected during the year are important when determining contributions to an annual standard such as the 2012 annual $PM_{2.5}$ NAAQS. Compliance with an annual NAAQS is dependent upon monitor readings throughout the year, including days with monitored ambient concentrations below the level of the NAAQS. For the 2012 annual $PM_{2.5}$ NAAQS, the annual mean is calculated as the mean of quarterly means. A high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV. Although all data are important, seasonal or episodic emissions can provide insight as to relative contributors to measured $PM_{2.5}$ concentrations. For these reasons, for the Factor 1 air quality analysis, the EPA assessed and characterized air quality at, and in the proximity of, the violating monitoring site locations first, by evaluating trends and the spatial extent of measured concentrations at monitors in the area of analysis, and then, by identifying the conditions most associated with high average concentration levels of $PM_{2.5}$ mass in the area of analysis.

In most cases, the EPA assessed air quality data on a seasonal, or quarterly, basis.[91] The EPA also identified the spatial extent of these high $PM_{2.5}$ concentrations. The mass and composition at the design value location

[91] Although compliance with the annual NAAQS depends on contributions from all days of the year, examining data on a quarterly or seasonal basis can inform the relationship between the temporal variability of emissions and meteorology and the resulting $PM_{2.5}$ mass and composition. In some areas of the country where there may be noticeable month-to-month

represents contributions from various emission sources including local, area-wide (which may comprise nearby urban and rural areas) and regional sources. To determine the source mix (by mass) at the design value monitoring site, the EPA examined the chemical composition of the monitored $PM_{2.5}$ concentrations by pairing each violating FRM/FEM/ARM monitoring site with a collocated or nearby Chemical Speciation Network (CSN) monitoring site or sites. Then, the EPA contrasted the approximated mass composition at the design value monitoring site with data collected at IMPROVE[92] and other monitoring locations whose data are representative of regional background.[93,94] This comparison of local/area-wide chemical composition data to regional chemical composition data derives an "urban increment," which helps differentiate the influence of more distant emissions sources from the influence of closer emissions sources, thus representing the portion of the measured violation that is associated with nearby emission contributions.[95,96,97]

$PM_{2.5}$ Design Values and Total Mass Measurements – The EPA examined ambient $PM_{2.5}$ air quality monitoring data represented by the DVs at the violating monitoring site and at other monitors in the area of analysis. The EPA calculated DVs based on air quality data for the most recent 3 consecutive calendar years of quality-assured, certified air quality data from suitable FEM/FRM/ARM monitoring sites in the EPA's Air Quality System (AQS). For this designations analysis, the EPA used data for the 2011-2013 period (i.e., the 2013 design value), which are the most recent years with fully-certified air quality data. A monitor's DV is the metric or statistic that indicates

variations in average $PM_{2.5}$, the quarterly averages may not adequately represent seasonal variability. In these areas, air quality data may be aggregated and presented by those months that best correspond to the local "seasons" in these areas.

92 IMPROVE stands for Interagency Monitoring for Protected Visual Environments and is an aerosol monitoring network in mostly rural and remote areas.

93 The "urban increment" analysis assesses and characterizes the increase in seasonal and annual average $PM_{2.5}$ mass and chemical constituents observed at violating monitoring site(s) relative to monitoring sites outside the area of analysis (which represent background concentrations). Developing the urban increment involves pairing a violating FRM/FEM/ARM monitor with a collocated monitor or nearby monitor with speciation data. EPA made every effort to pair these data to represent the same temporal and spatial scales. However, in some cases, the paired violating and CSN "urban" monitoring locations were separated by some distance such that the included urban CSN site(s) reflect(s) a different mixture of emissions sources, which could lead to misinterpretations. To generally account for differences in $PM_{2.5}$ mass between the violating site and the nearby CSN site(s), EPA determined material balance of the $PM_{2.5}$ composition at the violating site by assigning the extra measured $PM_{2.5}$ mass to the carbon components of $PM_{2.5}$. Where the general urban increment approach may be misleading, or in situations where non-carbonaceous emissions are believed to be responsible for a local $PM_{2.5}$ concentration gradient, EPA used alternative analyses to reflect the mix of urban and rural sources contributing to the measured concentrations at violating monitoring sites.

94 The urban monitors were paired with any rural sites within a 150 mile radius of an urban site to calculate spatial means of the quarterly averages of each species. If there were no rural sites within 150 miles, then the nearest rural site was used alone. That rural mean was then subtracted from the quarterly mean of the urban site to get the increment. Negative values were simply replaced with zeros.

95 In most, but not all, cases, the violating design value monitoring site is located in an urban area. Where the violating monitor is not located in an urban area, the "urban increment" represents the difference between local and other nearby emission sources in the vicinity of the violating monitoring location and more regional sources.

96 Hand, et. al. Spatial and Seasonal Patterns and Temporal Variability of Haze and its Constituents in the United States: Report V, June 2011. Chapter 7 – Urban Excess in $PM_{2.5}$ Speciated Aerosol Concentrations, *http://vista.cira.colostate.edu/improve/Publications/Reports/2011/PDF/Chapter7.pdf*.

97 US EPA, Office of Air Quality Planning and Standards, December 2004. (2004) Area Designations for 1997 Fine Particle ($PM_{2.5}$) Standards, Technical Support Document for State and Tribal Air Quality Fine Particle ($PM_{2.5}$) Designations, Chapter 3, Urban Excess Methodology. Available at *www.epa.gov/pmdesignations/1997standards/documents/final/TSD/Ch3.pdf*.

whether that monitor attains a specified air quality standard. The 2012 annual $PM_{2.5}$ NAAQS is met at a monitoring site when the 3-year average annual mean concentration is 12.0 micrograms per cubic meter (μg/m^3) or less (e.g., 12.1 μg/m^3 or greater is a violation). A DV is only valid if minimum data completeness criteria are met or when other regulatory data processing provisions are satisfied (See 40 CFR part 50 Appendix N). Table 2 identifies the current design value(s) (i.e., the 2013 DV) and the most recent two design values based on all monitoring sites in the area of analysis for the San Joaquin Valley nonattainment area.[98] Where a county has more than one monitoring location, the county design value is indicated in red type.

Table 2. Air Quality Data Collected at Regulatory Monitors (all DV levels in μg/m^3)[a]

County, State	Monitor Site ID	Site Name	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
Fresno, CA	060190011	Fresno – Garland[d]	Yes	14.5	14.3	15.4
Fresno, CA	060192009	Tranquillity	Yes	-	7.4	7.8
Fresno, CA	060195001	Clovis	Yes	17.0	16.0	16.4
Fresno, CA	060195025	Fresno-Pacific	Yes	14.5	13.8	14.7
Kern, CA	060290011	Mojave-Poole	No	5.3[b]	5.7[b]	7.0[b]
Kern, CA	060290014	Bakersfield-California Avenue	Yes	16.5	14.5	16.4
Kern, CA	060290015	Ridgecrest	No	5.5[b]	5.3[b]	5.4[b]
Kern, CA	060290016	Bakersfield-Planz	Yes	18.2	15.6	17.3
Kings, CA	060310004	Corcoran	Yes	16.2	15.8[b]	15.0[b]
Kings, CA	060311004	Hanford	Yes	16.3[b]	15.8	17.0
Madera, CA	060392010	Madera-City	Yes	20.5[b]	19.0	18.1
Merced, CA	060470003	Merced-Coffee	Yes	18.2	14.3	13.3
Merced, CA	060472510	Merced-M St	Yes	11.7	10.4	11.1
San Joaquin, CA	060771002	HAZELTON-HD, STOCKTON	Yes	11.1	11.4	13.8
San Joaquin, CA	060772010	Manteca	Yes	14.2[b]	12.1[b]	10.2
Stanislaus, CA	060990005	Modesto-14th Street	Yes	13.2[b]	12.9	13.6
Stanislaus, CA	060990006	Turlock	Yes	15.3	14.9	15.7
Tulare, CA	061072002	Visalia - N. Church	Yes	15.2	14.8	16.6
Amador, CA	N/A	N/A	No	No monitor		
Alameda, CA	060010007	Livermore - Rincon	No	8.2	7.3	7.6
Alameda, CA	060010009	Oakland East	No	9.0	9.1	10.0
Alameda, CA	060010011	Oakland West	No	na	7.0[b]	9.9[b]

[98] In certain circumstances, one or more monitoring locations within a monitoring network may not meet the network technical requirements set forth in 40 CFR 58.11(e), which states, “State and local governments must assess data from Class III $PM_{2.5}$ FEM and ARM monitors operated within their network using the performance criteria described in table C-4 to subpart C of part 53 of this chapter, for cases where the data are identified as not of sufficient comparability to a collocated FRM, and the monitoring agency requests that the FEM or ARM data should not be used in comparison to the NAAQS. These assessments are required in the monitoring agency's annual monitoring network plan described in §58.10(b) for cases where the FEM or ARM is identified as not of sufficient comparability to a collocated FRM….”

County, State	Monitor Site ID	Site Name	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
Calaveras, CA	060090001	SAN ANDREAS - GOLD STRIKE ROAD	No	7.3	7.6	8.4
Contra Costa, CA	060130002	Concord	No	7.8	7.2	7.4
Contra Costa, CA	060131004	San Pablo - Rumrill	No	n/a	7.3 [b]	9.6
Inyo, CA	060271003	Keeler	No	7.3	7.3	7.5
Los Angeles, CA	060370002	Azusa	Yes[c]	12.0 [b]	11.3 [b]	11.2
Los Angeles, CA	060371002	Burbank	Yes[c]	13.7[e]	12.6[e]	12.5[e]
Los Angeles, CA	060371103	Los Angeles (Main St.)	Yes[c]	13.1[e]	12.5[e]	12.5[e]
Los Angeles, CA	060371201	Reseda	Yes[c]	10.6	10.3	10.2
Los Angeles, CA	060371302	Compton	Yes[c]	13.4	12.4	12.2
Los Angeles, CA	060371602	Pico Rivera #2	Yes[c]	13.3	12.3	12.0
Los Angeles, CA	060372005	Pasadena	Yes[c]	11.1 [b]	10.4 [b]	10.4 [b]
Los Angeles, CA	060374002	Long Beach (North)	Yes[c]	11.5[e]	10.6[e]	10.9[e]
Los Angeles, CA	060374004	South Long Beach	Yes[c]	11.2	10.6[e]	10.8[e]
Los Angeles, CA	060379033	Lancaster	No	6.9 [b]	6.2 [b]	6.1 [b]
Mariposa, CA	N/A	N/A	No	No monitor		
Mono, CA	N/A	N/A	No	No monitor		
Monterey, CA	060531003	Salinas 3	No	6.1	6.1	6.1
Monterey, CA	060530002	Carmel Valley	No	n/a	n/a	5.9 [b]
Monterey, CA	060530008	King City 2	No	n/a	n/a	6.3 [b]
Sacramento, CA	060670006	Sacramento-Del Paso Manor	No	10.0	9.5	10.4
Sacramento, CA	060670010	Sacramento-1309 T Street	No	9.2	8.8	9.5
Sacramento, CA	060674001	Sacramento-Health Dept.	No	9.2	8.7	9.3
San Benito, CA	060690002	Hollister 2	No	5.6	5.4	5.5
San Bernardino, CA	060710025	Ontario Fire Station	Yes[c]	13.7	12.9	12.6
San Bernardino, CA	060710306	Victorville -Park Avenue	No	7.7 [b]	6.9 [b]	6.8 [b]
San Bernardino, CA	060712002	Fontana	Yes[c]	12.9	12.4	12.6
San Bernardino, CA	060718001	Big Bear	Yes[c]	8.9	8.3	8.7
San Bernardino, CA	060719004	San Bernardino	Yes[c]	12.1	11.7	11.8
San Luis Obispo, CA	060792004	Unocal - Nipomo	No	8.2 [b]	8.2	8.7
San Luis Obispo, CA	060792006	SAN LUIS OBISPO	No	6.1	6.1	6.6
San Luis Obispo, CA	060792007	MESA CAL FIRE STATION 22	No	11.0 [b]	10.5 [b]	11.3
San Luis Obispo, CA	060798001	ATASCADERO CITY FIRE DEPARTMENT	No	7.7	6.6	7.0

County, State	Monitor Site ID	Site Name	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
Santa Barbara, CA	060830011	Santa Barbara-National Guard Armory	No	9.9	9.5	9.5
Santa Barbara, CA	060831008	RELOCATED FROM ARB SITE AT 500 S. BROADWAY	No	6.9	7.2	7.6
Santa Clara, CA	060850002	Gilroy - 9th St	No	8.4	7.9	8.0
Santa Clara, CA	060850005	San Jose - Jackson St.	No	9.6	9.3	10.3
Tuolumne, CA	N/A	N/A	No	No monitor		
Ventura, CA	061110007	THOUSAND OAKS	No	9.3	8.9	9.1
Ventura, CA	061110009	PIRU	No	8.5	8.6	8.1
Ventura, CA	061111004	OJAI	No	na	9.5 [b]	9.0 [b]
Ventura, CA	061112002	SIMI VALLEY	No	9.3	8.9	9.1
Ventura, CA	061113001	EL RIO	No	9.2	8.7	9.0

[a] Where a county has more than one monitoring location, the county design value is indicated in red type.

[b] The listed design value is not valid.

[c] State recommended nonattainment as part of a separate nonattainment area. See the section of this document titled: "Area Background and Overview" for the Los Angeles-South Coast Air Basin.

[d] At the end of 2011, the Fresno-First Street site (AQS ID 060190008) was relocated to the Fresno-Garland site (AQS ID 060190011). The design values listed combine data from Fresno-First Street through 2011 and data from Fresno-Garland from 2012 and 2013.

[e] This design value does not include data from Class III FEM monitors that the EPA has approved as not eligible for comparison to the NAAQS per 40 CFR 58.11(e). Documents associated with this action available at www.regulations.gov, Docket ID No. EPA-HQ-OAR-2012-0918.

In addition to the FEM/FRM/ARM monitoring sites identified in Table 2 whose collected data are used to calculate DVs, San Joaquin Valley Air Pollution Control District, California Air Resources Board, and the National Parks Service also operate special purpose monitoring locations identified in Table 2a. The Huron, Lebec-Beartrap Road, Yosemite NP-Visitor Center, Sequoia and Kings Canyon NP-Ash Mountain, and Porterville sites were established for informational purposes, and the remaining sites in Table 2a are IMPROVE sites, established to evaluate visibility impacts on Class I areas. These monitors are not required per 40 CFR 58.20 to be compared to the NAAQS. Although these nonregulatory monitors are not eligible for comparison to the NAAQS, the data collected may help define an appropriate boundary for areas with emissions sources or activities that potentially contribute to ambient fine particle concentrations at the violating monitors.

Table 2a. Air Quality Data Collected at Nonregulatory Monitors (all DV levels in $\mu g/m^3$)

County, State	Monitor Site ID	Site Name	State Rec NA?	09-11 DV	10-12 DV	11-13 DV
Fresno, CA	060192008	Huron	Yes	14.4[a]	13.6[a]	13.6[a]
Fresno, CA	060199000	Kaiser	Yes	3.0	2.9	2.8[a]
Inyo, CA	060270101	DEATH VALLEY NM	No	3.4	3.4	3.1[a]
Kern, CA	060292009	Lebec-Beartrap Rd	Yes	6.9[a]	7.5[a]	7.8[a]
Kern, CA	060299001	Lebec-Peace Valley Rd Kern County	Yes	4.6	4.6	4.5[a]
Los Angeles, CA	060379034	Lebec-Peace Valley Rd LA County	Yes	3.2[a]	2.7[a]	2.8[a]
Mariposa, CA	060430003	Yosemite NP-Turtleback Dome	No	3.4	3.3	3.3[a]
Mariposa, CA	060431001	YOSEMITE NP-Visitor Center	No	10.3[a]	9.8[a]	10.2[a]
Mono, CA	060519000	Hoover	No	2.2	2.2	2.2[a]
San Benito, CA	060690003	Pinnacles NM	No	3.9	3.7	3.9[a]
San Bernardino, CA	060719002	Joshua Tree NM-Black Rock Canyon	No	3.8	3.5	3.5[a]
Tulare, CA	061070009	Sequoia and Kings Canyon NP- Ash Mountain	Yes	9.9[a]	9.0	8.3[a]
Tulare, CA	061071001	ASH MOUNTAIN, SEQUOIA NATIONAL PARK	Yes	6.4	6.4	6.2[a]
Tulare, CA	061072010	Porterville	Yes	-	15.4[a]	16.4

[a] One or more years of data are not complete.

The Figure 1 map, shown previously, identifies the San Joaquin Valley nonattainment area, the existing $PM_{2.5}$ nonattainment area boundaries, and monitoring locations with 2011-2013 violating DVs. As indicated on the map, there are 12 violating monitoring sites located within the San Joaquin Valley nonattainment area. Many sites within the nonattainment area have persistently shown violations for the 2009-2011, 2010-2012, and 2011-2013 DV periods. Within San Joaquin County, a monitor in the city of Stockton has violated for the 2011-2013 DV period while to the south of this monitor within the same county, the Manteca monitor did not violate for the same DV period. Within Merced County, a monitor near the center of the city of Merced on M Street has not shown a violation for the 2009-2011 or 2010-2012 DV periods, while a monitor to the southeast on Coffee Avenue has persistently shown a violation for the 2009-2011, 2010-2012, and 2011-2013 DV periods. Within Fresno County, all monitors persistently violate for the 2009-2011, 2010-2012, and 2011-2013 DV periods with the exception of a background monitor west of the city of Fresno near the city of Tranquillity which does not show a violation for the 2010-2012 and 2011-2013 DV periods. Within the western portion of Kern County that is included as part of the San Joaquin Valley nonattainment area, all monitors in the city of Bakersfield have persistently shown a violation for the 2009-2011, 2010-2012, and 2011-2013 DV periods. Two monitors, located in the cities of Mojave and Ridgecrest, with non-valid design values exist in the eastern portion of Kern County that is not included as part of the San Joaquin Valley nonattainment area. All other counties within the remainder of the San Joaquin Valley nonattainment area, including Stanislaus, Madera, Kings, and Tulare counties, only contain monitors that have shown a violation for the 2011-2013 DV period. Within the area of analysis several violating monitors exist in Los Angeles and San Bernardino counties. However, the EPA is designating these areas nonattainment as part of the Los Angeles-South Coast Air Basin nonattainment area. (See the "Area Background and Overview - Los Angeles-South Coast Air Basin, CA" section of this document.) No other monitors in the area of analysis have valid 2009-2011, 2010-2012, or 2011-2013 DVs that violate the 2012 annual $PM_{2.5}$ NAAQS.

Seasonal variation can highlight those conditions most associated with high average concentration levels of $PM_{2.5}$. Figure 2 shows quarterly mean $PM_{2.5}$ concentrations for the most recent 3-year period for the highest DV monitoring site in the nonattainment area (Madera-City), as well as from the highest DV monitoring site in each county outside of the nonattainment area, but within the area of analysis (i.e., those counties bordering the nonattainment area). For Kern County, which is being partially designated nonattainment as part of the San Joaquin Valley nonattainment area, one monitor (Mojave-Poole) is also included in Figure 2 from the unclassifiable/attainment portion of the county. Figure 2a shows quarterly mean $PM_{2.5}$ concentrations for the most recent 3-year period for all monitoring sites within the San Joaquin Valley nonattainment area, and excludes sites from surrounding counties outside the nonattainment area. In both figures the design value monitor (Madera-City) for the nonattainment area is shown as a black line. This graphical representation is particularly relevant when assessing air quality data for an annual standard, such as the 2012 annual $PM_{2.5}$ NAAQS, because, as previously stated, the annual mean is calculated as the mean of quarterly means and a high quarter can drive the mean for an entire year, which, in turn, can drive an elevated 3-year DV.

Figure 2. San Joaquin Valley Area of Analysis Monitors - $PM_{2.5}$ Quarterly Means for 2011-2013

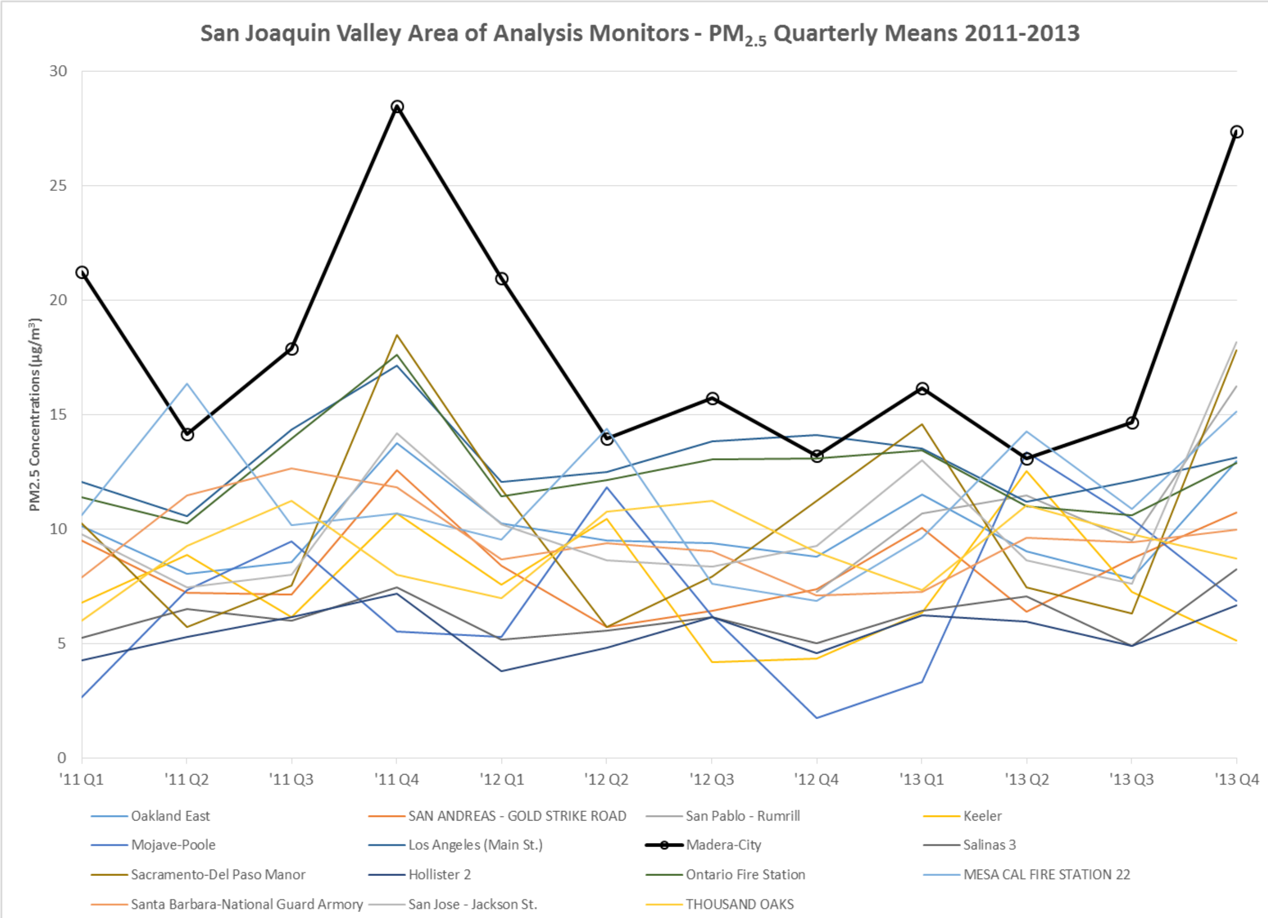
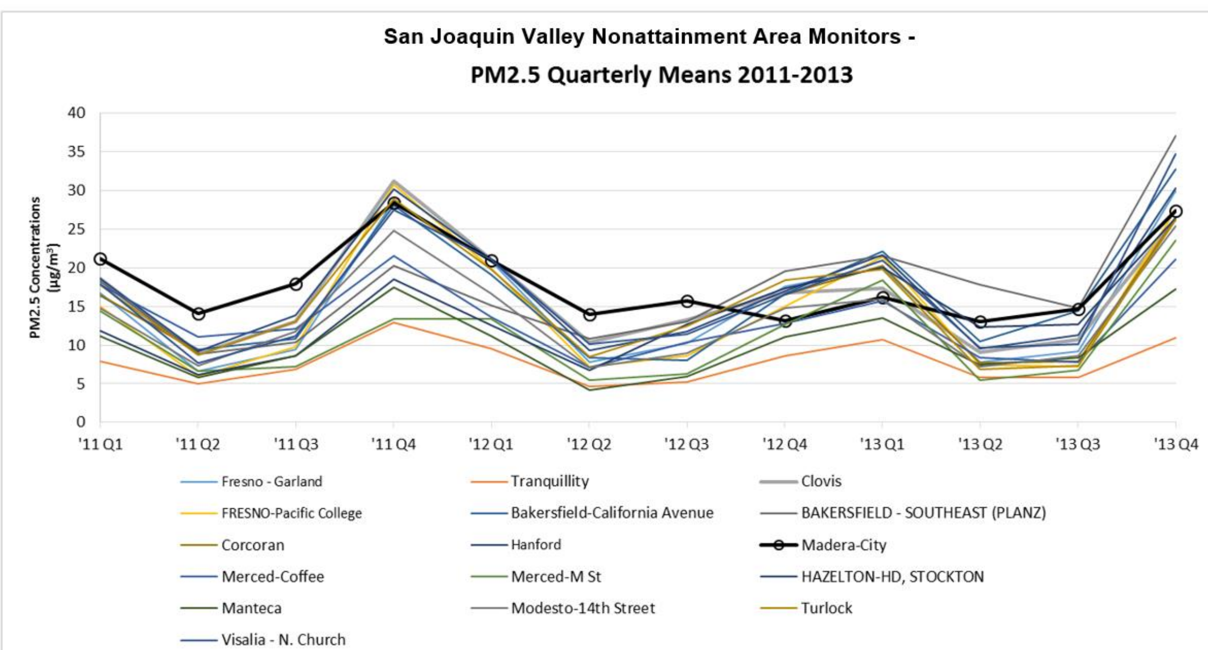


Figure 2a. San Joaquin Valley Nonattainment Area Monitors - $PM_{2.5}$ Quarterly Means for 2011-2013



As shown, quarter four (Q4) of 2013 recorded the highest concentration average within the San Joaquin Valley followed by Q4 2011. Peak concentrations within the San Joaquin Valley for the 3-year period occurred in Q4 or quarter one (Q1).

$PM_{2.5}$ Composition Measurements - To assess potential emissions contributions for each violating monitoring location, the EPA determined the various chemical species comprising total $PM_{2.5}$ to identify the chemical constituents over the analysis area, which can provide insight into the types of emission sources impacting the monitored concentration. To best describe the $PM_{2.5}$ at the violating monitoring location, the EPA first adjusted the chemical speciation measurement data from a monitoring location at or near the violating FRM monitoring site using the SANDWICH approach to account for the amount of $PM_{2.5}$ mass constituents retained in the FRM measurement.[99,100,101,102] In particular, this approach accounts for losses in fine particle nitrate and increases in sulfate mass associated with particle bound water. Figure 3a illustrates the fraction of each $PM_{2.5}$ chemical constituent estimated at the Madera design value monitoring site using the speciation sampler from the nearby Fresno-Garland monitoring site based on annual averages for the years 2010-2012.

[99] SANDWICH stands for measured **S**ulfate, **A**djusted **N**itrate, **D**erived **W**ater, **I**nferred **C**arbonaceous mass **H**ybrid Material Balance Approach." The SANDWICH adjustment uses an FRM mass construction methodology that results in reduced nitrates (relative to the amount measured by routine speciation networks), higher mass associated with sulfates (reflecting water included in gravimetric FRM measurements) and a measure of organic carbonaceous mass derived from the difference between measured $PM_{2.5}$ and its non-carbon components. This characterization of $PM_{2.5}$ mass also reflects crustal material and other minor constituents. The resulting characterization provides a complete mass closure for the measured FRM $PM_{2.5}$ mass, which can be different than the data provided directly by the speciation measurements from the CSN network.
[100] Frank, N. H., SANDWICH Material Balance Approach for $PM_{2.5}$ Data Analysis, National Air Monitoring Conference, Las Vegas, Nevada, November 6-9, 2006. *http://www.epa.gov/ttn/amtic/files/2006conference/frank.pdf*.
[101] Frank, N. H., The Chemical Composition of $PM_{2.5}$ to support PM Implementation, EPA State /Local/Tribal Training Workshop: $PM_{2.5}$ Final Rule Implementation and 2006 $PM_{2.5}$ Designation Process, Chicago IL, June 20-21, 2007, *http://www.epa.gov/ttn/naaqs/pm/presents/pm2.5_chemical_composition.pdf.*
[102] Frank, N. H. *Retained Nitrate, Hydrated Sulfates, and Carbonaceous Mass in Federal Reference Method Fine Particulate Matter for Six Eastern U.S. Cities*. J. Air & Waste Manage. Assoc. 2006 56:500–511.

Figure 3a. San Joaquin Valley Annual Average $PM_{2.5}$ Chemical Constituents (2010-2012)

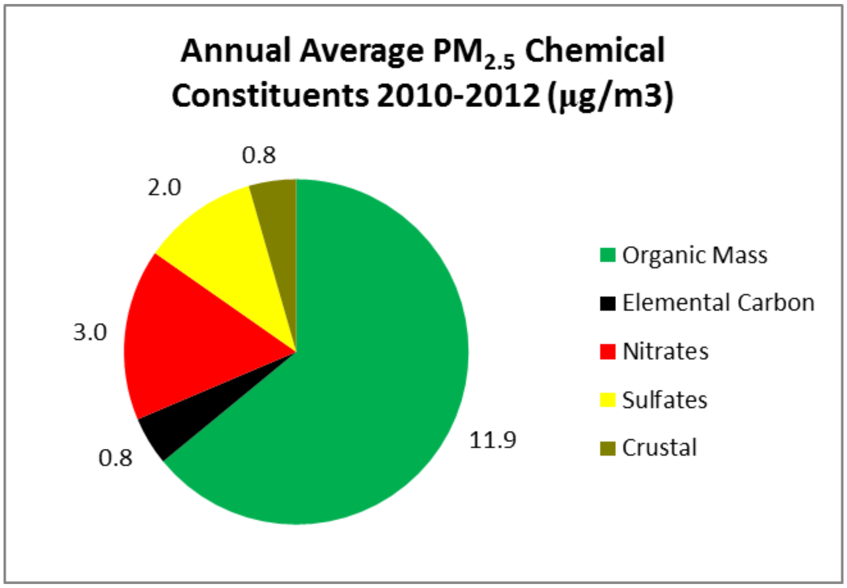
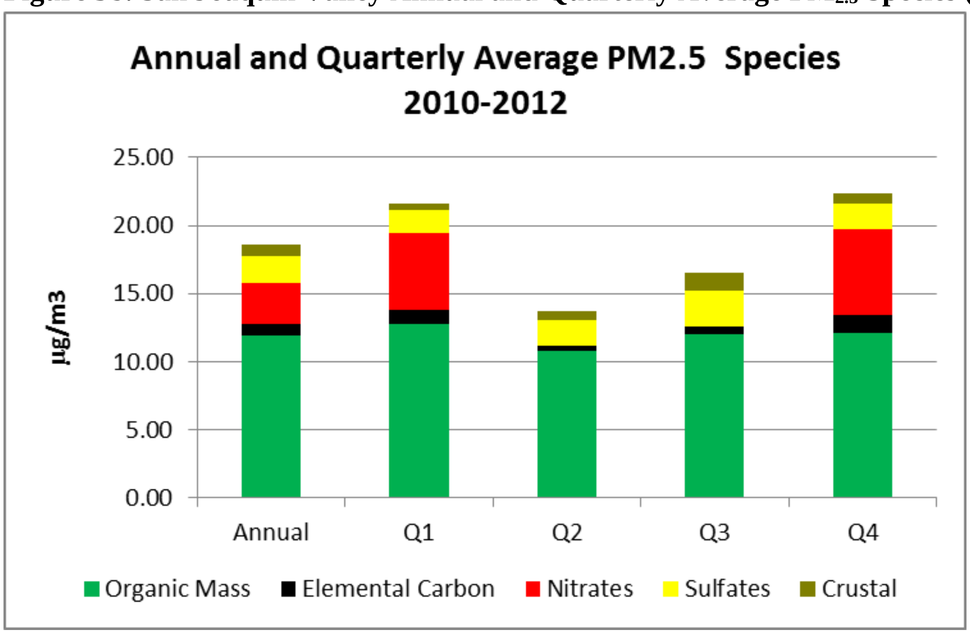


Figure 3b shows annual and quarterly chemical composition profiles and illustrates any seasonal or episodic contributors to $PM_{2.5}$ mass. This "increment analysis," combined with the other factor analyses, can provide additional insight as to which sources or factors may contribute at a greater level. Simply stated, this analysis can help identify nearby sources of emissions that contribute to the violation at the violating monitoring sites.

Figure 3b. San Joaquin Valley Annual and Quarterly Average $PM_{2.5}$ Species (2010-2012)[a]



[a]*Adjusted to FRM Total $PM_{2.5}$* indicates that the speciation profile and total mass depicted in this figure are the result of the urban increment calculation for the particular FRM monitor.

Figure 3b shows that organic carbonaceous mass (OM) is the predominant species contributing over fifty percent of the total mass throughout the year. Nitrates are the second largest component in the annual mean, contributing 21 percent followed by sulfates contributing 14 percent. Nitrates contribute most during quarter one (Q1) and quarter four (Q4), when the total $PM_{2.5}$ concentration is highest, but not as much to quarter two (Q2) and quarter three (Q3). Sulfates contribute about thirty percent of the total mass in Q2 and Q3. Crustal material (CM) and elemental carbon contribute only six percent each to the total mass on an annual average, although CM does contribute over ten percent of the total mass in Q2 and Q3. This suggests that OM sources contribute at a greater level than any other species on an annual basis, while nitrates and sulfates also contribute annually and have even higher impacts in the colder and warmer months, respectively. Sources emitting CM also seem to contribute most in Q2 and Q3. Based on speciation measurements at the Modesto, Visalia and Bakersfield-California Avenue sites, the magnitude of the contribution of each species varies somewhat throughout the San Joaquin Valley, however, OM is consistently the largest contributor, followed by nitrates and sulfates.

The EPA assessed seasonal and annual average $PM_{2.5}$ constituents at monitoring sites within the area relative to monitoring sites outside of the analysis area to account for the difference between regional background concentrations of $PM_{2.5}$, and the concentrations of $PM_{2.5}$ in the area of analysis, also known as the "urban increment." This analysis differentiates between the influences of emissions from sources in nearby areas and in more distant areas on the violating monitor. Estimating the urban increment in the area helps to illuminate the amount and type of particles at the violating monitor that are most likely to be the result of sources of emissions in nearby areas, as opposed to impacts of more distant or regional sources of emissions. Figure 4a includes pie charts showing the annual and quarterly chemical mass constituents of the urban increment estimated for the Madera design value monitoring site. Evaluating the average urban increment in each quarter can help identify composition of $PM_{2.5}$ at the design value site. Note that in these charts, the individual components have been adjusted to represent their retained mass in FRM-measured $PM_{2.5}$ as described for Figures 3a and 3b above.

Figure 4a. San Joaquin Valley Urban Increment Analysis for 2010-2012.

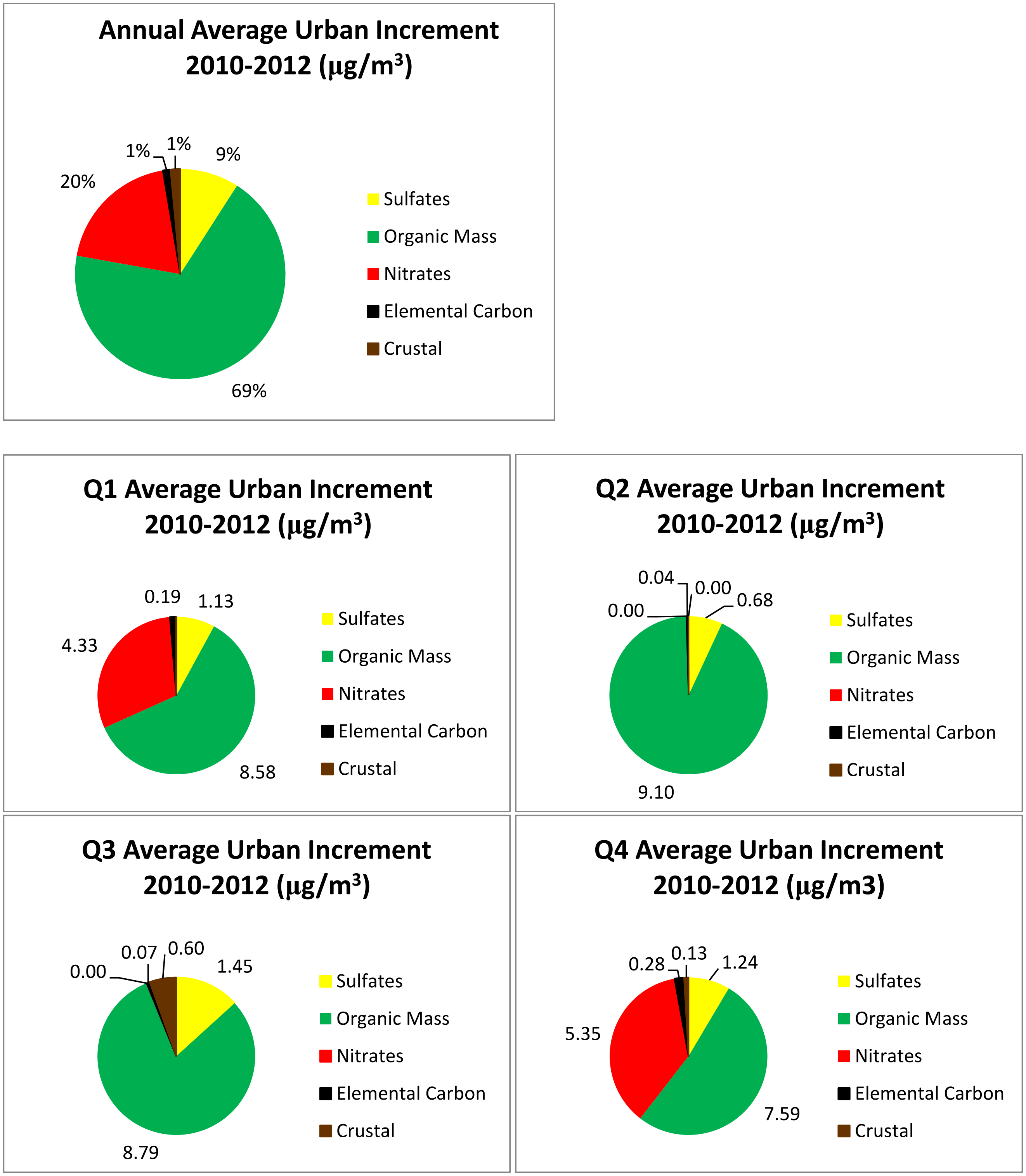
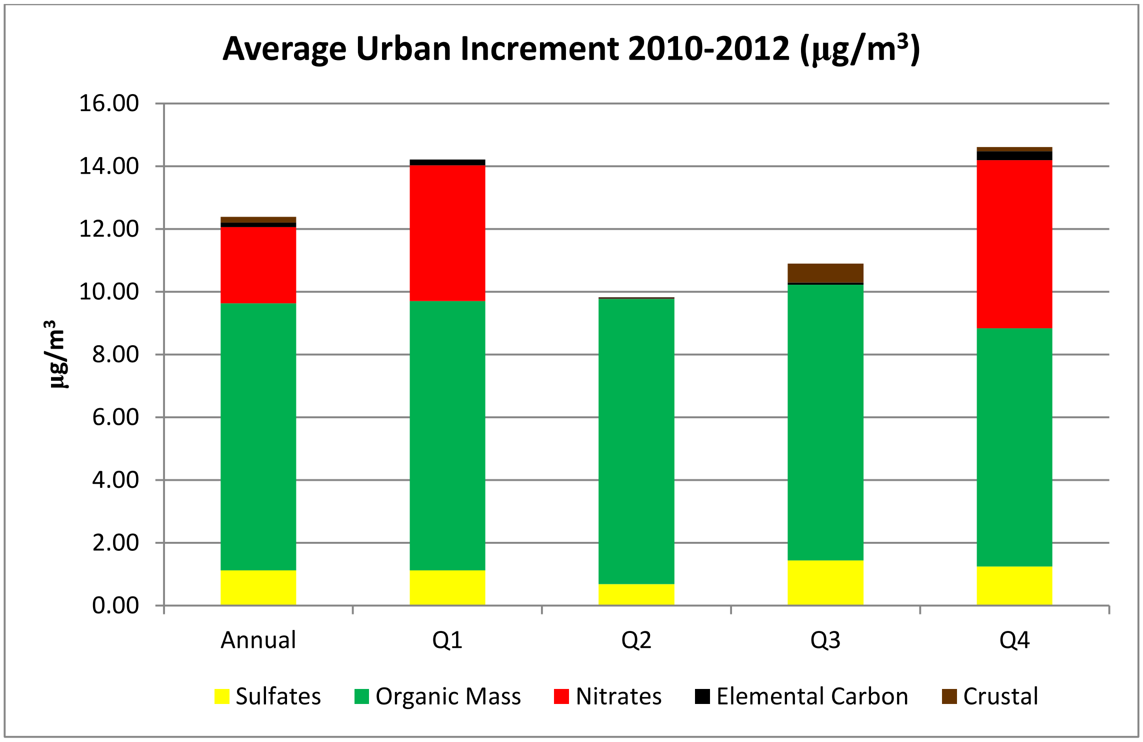


Figure 4b. San Joaquin Valley Average Urban Increment Analysis for 2010-2012.



Each county in the San Joaquin Valley nonattainment area has one or more monitoring site with a 2011-2013 DV exceeding the NAAQS. Seasonal peaks in ambient $PM_{2.5}$ concentrations for monitoring sites within the San Joaquin Valley tend to occur in quarters four and one.

In reviewing the urban increment analysis for the San Joaquin Valley DV monitor, the results are similar to the adjusted speciation measurements, indicating a somewhat consistent source mix throughout the area. There is an increase in the contribution of OM indicating that it may have an additional contribution from a source closer to the DV monitoring site. This analysis points in general to contributions from direct $PM_{2.5}$ or $PM_{2.5}$ precursors from sources throughout the region, with an increased contribution of OM from sources closer to the DV monitoring site.

Factor 2: Emissions and Emissions-related Data

In this designations process, for each area with a violating monitoring site, the EPA evaluated the emissions data from nearby areas using emissions related data for the relevant counties to assess each county's potential contribution to $PM_{2.5}$ concentrations at the violating monitoring site or monitoring sites in the area under evaluation. Similar to the air quality analysis, these data were examined on a seasonal basis. The EPA examined emissions of identified sources or source categories of direct $PM_{2.5}$, the major components of direct $PM_{2.5}$ (organic mass, elemental carbon, crustal material (and/or individual trace metal compounds)), primary nitrate and primary sulfate, and precursor gaseous pollutants (i.e., SO_2, NO_X, total VOC, and NH_3). The EPA also considered the distance of those sources of emissions from the violating monitoring site. While direct $PM_{2.5}$ emissions and its major carbonaceous components are generally associated with sources near violating $PM_{2.5}$ monitoring sites, the gaseous precursors tend to have a more regional influence (although the EPA is mindful of the potential local NO_X and VOC emissions contributions to $PM_{2.5}$ from mobile and stationary sources) and transport from neighboring areas can contribute to higher $PM_{2.5}$ levels at the violating monitoring sites.

Emissions Data

For this factor, the EPA reviewed data from the 2011 National Emissions Inventory (NEI) version 1 (see *http://www.epa.gov/ttn/chief/net/2011inventory.html*). For each county in the area of analysis, the EPA examined the magnitude of county-level emissions reported in the NEI. These county-level emissions represent the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires. In some instances, non-anthropogenic sources of emissions such as wildfires account for large portions of the emissions inventory data presented below. The EPA also looked at the geographic distribution of major point sources of the relevant pollutants.[103] Substantial emissions levels from sources in a nearby area indicate the potential for the area to contribute to monitored violations.

To further analyze area emissions data, the EPA also developed a summary of direct $PM_{2.5}$, components of direct $PM_{2.5}$, and precursor pollutants, which is available at *http://www.epa.gov/pmdesignations/2012standards/docs/nei2011v1pointnei2008v3county.xlsx*.

When considered with the urban increment analysis in Factor 1, evaluating the components of direct $PM_{2.5}$ and precursor gases can help identify specific sources or source types contributing to elevated concentrations at violating monitoring sites and thus assist in identifying appropriate area boundaries. In general, directly emitted particulate organic carbon (POC) and VOCs[104] contribute to $PM_{2.5}$ organic mass (OM); directly emitted EC contributes to $PM_{2.5}$ EC; NO_X, NH_3 and directly emitted nitrate contribute to $PM_{2.5}$ nitrate mass; SO_2, NH_3 and directly emitted sulfate contribute to $PM_{2.5}$ sulfate mass; and directly emitted crustal material and metal oxides contribute to $PM_{2.5}$ crustal matter. [105,106] The EPA believes that the quantities of those nearby emissions as potential contributors to the $PM_{2.5}$ violating monitors are somewhat proportional to the $PM_{2.5}$ chemical constituents in the estimated urban increment. Thus, directly emitted POC is more important per ton than SO_2, partially because POC emissions are already $PM_{2.5}$ whereas SO_2 must convert to $PM_{2.5}$ and not all of the emitted SO_2 undergoes this conversion.

Table 3a provides a county-level emissions summary (i.e., the sum of emissions from the following general source categories: point sources, non-point (i.e., area) sources, nonroad mobile, on-road mobile, and fires) of directly emitted $PM_{2.5}$ and precursor species for the county with the violating monitoring site and nearby counties considered for inclusion in the San Joaquin Valley, CA area. Table 3b summarizes the directly emitted components of $PM_{2.5}$ for the same counties in the area of analysis for the San Joaquin Valley, CA area. This information will be paired with the Urban Increment composition previously shown in Figures 4a and 4b.

[103] For purposes of this designations effort, "major" point sources are those whose sum of PM precursor emissions ($PM_{2.5}$ + NOx + SO_2 + VOC + NH_3) are greater than 500 tons per year based on NEI 2011v1.
[104] As previously mentioned, nearby VOCs are presumed to be a less important contributor to $PM_{2.5}$ OM than POC.
[105] *See*, Seinfeld J. H. and Pandis S. N. (2006) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 2nd edition, J. Wiley, New York. See also, Seinfeld J. H. and Pandis S. N. (1998) *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*, 1st edition, J. Wiley, New York.
[106] USEPA Report (2004), The Particle Pollution Report: Current Understanding of Air Quality and Emissions through 2003, found at: *http://www.epa.gov/airtrends/aqtrnd04/pm.html*.

Table 3a. County-Level Emissions of Directly Emitted $PM_{2.5}$ and Precursors (tons/year)

County, State	Total NH_3	Total NOx	Total Direct $PM_{2.5}$	Total SO_2	Total VOC	Total
Los Angeles, CA	19,205	143,295	16,929	7,888	117,854	305,172
Tulare, CA	**34,722**	**13,621**	**22,462**	**1,624**	**67,387**	**139,817**
Kern, CA	**26,732**	**41,723**	**12,303**	**3,060**	**47,172**	**130,990**
San Bernardino, CA	12,974	67,255	11,665	1,934	35,543	129,371
Fresno, CA	**20,412**	**24,503**	**4,465**	**657**	**20,780**	**70,817**
San Joaquin, CA	**26,692**	**21,199**	**2,551**	**1,256**	**13,696**	**65,394**
Santa Clara, CA	2,969	24,824	4,996	747	26,637	60,172
Alameda, CA	2,002	29,385	4,755	1,057	21,260	58,460
Contra Costa, CA	2,411	20,752	5,928	5,516	17,536	52,143
Sacramento, CA	4,446	19,759	3,779	353	21,444	49,782
Stanislaus, CA	**16,609**	**11,670**	**2,164**	**478**	**13,147**	**44,067**
Merced, CA	**17,829**	**10,967**	**1,666**	**138**	**7,039**	**37,639**
Monterey, CA	4,222	12,236	2,800	472	12,784	32,514
Ventura, CA	3,604	11,652	2,084	291	13,937	31,568
Kings, CA	**14,315**	**5,717**	**865**	**98**	**3,418**	**24,414**
Santa Barbara, CA	1,517	9,943	1,487	544	10,808	24,299
Madera, CA	**5,610**	**6,857**	**1,899**	**217**	**5,979**	**20,561**
San Luis Obispo, CA	1,910	6,285	1,855	273	7,699	18,022
Tuolumne, CA	1,186	2,512	3,380	373	10,301	17,752
Mariposa, CA	1,153	939	3,430	263	10,340	16,126
Calaveras, CA	650	1,453	1,242	85	4,520	7,951
Amador, CA	392	1,650	1,258	72	2,868	6,240
San Benito, CA	941	2,752	464	24	1,596	5,777
Mono, CA	784	634	888	78	2,691	5,074
Inyo, CA	1,468	932	922	199	1,505	5,026

Bold = counties (whole or partial) within the San Joaquin Valley nonattainment area.

Table 3b. County-Level Emissions for Components of Directly Emitted $PM_{2.5}$ (tons/year) [107]

County, State	POM	EC	PSO_4	PNO_3	PCrustal	Residual	Total Direct
Tulare, CA	**16,794**	**2,179**	**295**	**39**	**668**	**2,488**	**22,462**
Los Angeles, CA	6,953	2,968	692	63	1,942	4,310	16,929
Kern, CA	**6,863**	**1,862**	**324**	**65**	**1,204**	**1,987**	**12,303**
San Bernardino, CA	3,237	1,512	344	48	2,765	3,760	11,665
Contra Costa, CA	2,406	794	354	53	941	1,381	5,928
Santa Clara, CA	1,851	585	115	16	1,031	1,398	4,996
Alameda, CA	1,403	632	135	12	971	1,603	4,755
Fresno, CA	**1,986**	**621**	**95**	**14**	**764**	**985**	**4,465**
Sacramento, CA	2,344	441	57	16	357	565	3,779
Mariposa, CA	2,667	331	39	8	52	335	3,430
Tuolumne, CA	2,514	315	47	15	139	349	3,380
Monterey, CA	1,621	356	51	13	318	441	2,800
San Joaquin, CA	**1,039**	**381**	**87**	**9**	**456**	**579**	**2,551**
Stanislaus, CA	**976**	**280**	**62**	**7**	**348**	**491**	**2,164**
Ventura, CA	1,138	384	35	6	218	303	2,084
Madera, CA	**1,034**	**228**	**47**	**6**	**186**	**398**	**1,899**
San Luis Obispo, CA	1,118	195	26	5	192	320	1,855
Merced, CA	**714**	**279**	**18**	**5**	**321**	**328**	**1,666**
Santa Barbara, CA	721	248	29	5	222	262	1,487
Amador, CA	852	116	30	10	59	191	1,258
Calaveras, CA	941	127	9	6	34	126	1,242
Inyo, CA	201	69	21	3	303	325	922
Mono, CA	647	85	12	2	36	106	888
Kings, CA	**206**	**141**	**11**	**2**	**262**	**244**	**865**
San Benito, CA	179	67	14	1	76	127	464

Bold = counties (whole or partial) within the San Joaquin Valley nonattainment area.

Table 3b breaks down the direct $PM_{2.5}$ emissions value from Table 3a into its components. These data will also be compared with the previously presented Urban Increment composition.

Using the previously described relationship between directly emitted and precursor gases and the measured mass to evaluate data presented in Tables 3a and 3b, the EPA identified the following components warranting additional review: NH_3, NOx, $PM_{2.5}$, SO_2, VOC, POM, PSO_4, PNO_3, Crustal and Residual. The EPA then looked at the contribution of these constituents of interest from each of the counties included in the area of analysis as shown in Tables 4a-j.

[107] Data are based on the 2011 and 2018 Emissions Modeling Platform Data Files and Summaries (*ftp://ftp.epa.gov/EmisInventory/2011v6/v1platform*) available at: *http://www.epa.gov/ttn/chief/emch/index.html#2011* (accessed 02/26/14).

Table 4a. County-Level NH_3 Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**NH_3**	**Pct.**	**Cumulative %**
Tulare, CA	**34,722**	**15**	**15**
Kern, CA	**26,732**	**12**	**27**
San Joaquin, CA	**26,692**	**12**	**39**
Fresno, CA	**20,412**	**9**	**48**
Los Angeles, CA	19,205	9	57
Merced, CA	**17,829**	**8**	**65**
Stanislaus, CA	**16,609**	**7**	**72**
Kings, CA	**14,315**	**6**	**79**
San Bernardino, CA	12,974	6	84
Madera, CA	**5,610**	**2**	**87**
Sacramento, CA	4,446	2	89
Monterey, CA	4,222	2	91
Ventura, CA	3,604	2	92
Santa Clara, CA	2,969	1	94
Contra Costa, CA	2,411	1	95
Alameda, CA	2,002	1	96
San Luis Obispo, CA	1,910	1	96
Santa Barbara, CA	1,517	1	97
Inyo, CA	1,468	1	98
Tuolumne, CA	1,186	1	98
Mariposa, CA	1,153	1	99
San Benito, CA	941	0	99
Mono, CA	784	0	100
Calaveras, CA	650	0	100
Amador, CA	392	0	100

Bold = counties (whole or partial) within the San Joaquin Valley nonattainment area.

Table 4b. County-Level NOx Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**NO_X**	**Pct.**	**Cumulative %**
Los Angeles, CA	143,295	29	29
San Bernardino, CA	67,255	14	43
Kern, CA	**41,723**	**8**	**51**
Alameda, CA	29,385	6	57
Santa Clara, CA	24,824	5	62
Fresno, CA	**24,503**	**5**	**67**
San Joaquin, CA	**21,199**	**4**	**72**
Contra Costa, CA	20,752	4	76
Sacramento, CA	19,759	4	80
Tulare, CA	**13,621**	**3**	**82**
Monterey, CA	12,236	2	85
Stanislaus, CA	**11,670**	**2**	**87**
Ventura, CA	11,652	2	90
Merced, CA	**10,967**	**2**	**92**
Santa Barbara, CA	9,943	2	94
Madera, CA	**6,857**	**1**	**95**
San Luis Obispo, CA	6,285	1	97
Kings, CA	**5,717**	**1**	**98**
San Benito, CA	2,752	1	98
Tuolumne, CA	2,512	1	99
Amador, CA	1,650	0	99
Calaveras, CA	1,453	0	99
Mariposa, CA	939	0	100
Inyo, CA	932	0	100
Mono, CA	634	0	100

Bold = counties (whole or partial) within the San Joaquin Valley nonattainment area.

Table 4c. County-Level $PM_{2.5}$ Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**$PM_{2.5}$**	**Pct.**	**Cumulative %**
Tulare, CA	**22,462**	**19**	**19**
Los Angeles, CA	16,929	15	34
Kern, CA	**12,303**	**11**	**44**
San Bernardino, CA	11,665	10	55
Contra Costa, CA	5,928	5	60
Santa Clara, CA	4,996	4	64
Alameda, CA	4,755	4	68
Fresno, CA	**4,465**	**4**	**72**
Sacramento, CA	3,779	3	75
Mariposa, CA	3,430	3	78
Tuolumne, CA	3,380	3	81
Monterey, CA	2,800	2	83
San Joaquin, CA	**2,551**	**2**	**86**
Stanislaus, CA	**2,164**	**2**	**87**
Ventura, CA	2,084	2	89
Madera, CA	**1,899**	**2**	**91**
San Luis Obispo, CA	1,855	2	92
Merced, CA	**1,666**	**1**	**94**
Santa Barbara, CA	1,487	1	95
Amador, CA	1,258	1	96
Calaveras, CA	1,242	1	97
Inyo, CA	922	1	98
Mono, CA	888	1	99
Kings, CA	**865**	**1**	**100**
San Benito, CA	464	0	100

Bold = counties (whole or partial) within the San Joaquin Valley nonattainment area.

Table 4d. County-Level SO_2 Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**SO_2**	**Pct.**	**Cumulative %**
Los Angeles, CA	7,888	28	28
Contra Costa, CA	5,516	20	48
Kern, CA	**3,060**	**11**	**59**
San Bernardino, CA	1,934	7	66
Tulare, CA	**1,624**	**6**	**72**
San Joaquin, CA	**1,256**	**5**	**77**
Alameda, CA	1,057	4	81
Santa Clara, CA	747	3	83
Fresno, CA	**657**	**2**	**86**
Santa Barbara, CA	544	2	88
Stanislaus, CA	**478**	**2**	**89**
Monterey, CA	472	2	91
Tuolumne, CA	373	1	92
Sacramento, CA	353	1	94
Ventura, CA	291	1	95
San Luis Obispo, CA	273	1	96
Mariposa, CA	263	1	97
Madera, CA	**217**	**1**	**97**
Inyo, CA	199	1	98
Merced, CA	**138**	**0**	**99**
Kings, CA	**98**	**0**	**99**
Calaveras, CA	85	0	99
Mono, CA	78	0	100
Amador, CA	72	0	100
San Benito, CA	24	0	100

Bold = counties (whole or partial) within the San Joaquin Valley nonattainment area.

Table 4e. County-Level VOC Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**VOC**	**Pct.**	**Cumulative %**
Los Angeles, CA	117,854	24	24
Tulare, CA	**67,387**	**14**	**37**
Kern, CA	**47,172**	**9**	**47**
San Bernardino, CA	35,543	7	54
Santa Clara, CA	26,637	5	59
Sacramento, CA	21,444	4	63
Alameda, CA	21,260	4	68
Fresno, CA	**20,780**	**4**	**72**
Contra Costa, CA	17,536	4	75
Ventura, CA	13,937	3	78
San Joaquin, CA	**13,696**	**3**	**81**
Stanislaus, CA	**13,147**	**3**	**84**
Monterey, CA	12,784	3	86
Santa Barbara, CA	10,808	2	88
Mariposa, CA	10,340	2	90
Tuolumne, CA	10,301	2	93
San Luis Obispo, CA	7,699	2	94
Merced, CA	**7,039**	**1**	**95**
Madera, CA	**5,979**	**1**	**97**
Calaveras, CA	4,520	1	98
Kings, CA	**3,418**	**1**	**98**
Amador, CA	2,868	1	99
Mono, CA	2,691	1	99
San Benito, CA	1,596	0	100
Inyo, CA	1,505	0	100

Bold = counties (whole or partial) within the San Joaquin Valley nonattainment area.

Table 4f. County-Level POM Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**POM**	**Pct.**	**Cumulative %**
Tulare, CA	**16,794**	**28**	**28**
Los Angeles, CA	6,953	12	39
Kern, CA	**6,863**	**11**	**51**
San Bernardino, CA	3,237	5	56
Mariposa, CA	2,667	4	60
Tuolumne, CA	2,514	4	65
Contra Costa, CA	2,406	4	69
Sacramento, CA	2,344	4	72
Fresno, CA	**1,986**	**3**	**76**
Santa Clara, CA	1,851	3	79
Monterey, CA	1,621	3	82
Alameda, CA	1,403	2	84
Ventura, CA	1,138	2	86
San Luis Obispo, CA	1,118	2	88
San Joaquin, CA	**1,039**	**2**	**89**
Madera, CA	**1,034**	**2**	**91**
Stanislaus, CA	**976**	**2**	**93**
Calaveras, CA	941	2	94
Amador, CA	852	1	96
Santa Barbara, CA	721	1	97
Merced, CA	**714**	**1**	**98**
Mono, CA	647	1	99
Kings, CA	**206**	**0**	**99**
Inyo, CA	201	0	100
San Benito, CA	179	0	100

Bold = counties (whole or partial) within the San Joaquin Valley nonattainment area.

Table 4g. County-Level PSO_4 Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**PSO_4**	**Pct.**	**Cumulative %**
Los Angeles, CA	692	24	24
Contra Costa, CA	354	12	36
San Bernardino, CA	344	12	47
Kern, CA	**324**	**11**	**58**
Tulare, CA	**295**	**10**	**68**
Alameda, CA	135	5	73
Santa Clara, CA	115	4	77
Fresno, CA	**95**	**3**	**80**
San Joaquin, CA	**87**	**3**	**83**
Stanislaus, CA	**62**	**2**	**85**
Sacramento, CA	57	2	87
Monterey, CA	51	2	89
Madera, CA	**47**	**2**	**90**
Tuolumne, CA	47	2	92
Mariposa, CA	39	1	93
Ventura, CA	35	1	94
Amador, CA	30	1	95
Santa Barbara, CA	29	1	96
San Luis Obispo, CA	26	1	97
Inyo, CA	21	1	98
Merced, CA	**18**	**1**	**98**
San Benito, CA	14	0	99
Mono, CA	12	0	99
Kings, CA	**11**	**0**	**100**
Calaveras, CA	9	0	100

Bold = counties (whole or partial) within the San Joaquin Valley nonattainment area.

Table 4h. County-Level PNO_3 Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**PNO_3**	**Pct.**	**Cumulative %**
Kern, CA	**65**	**15**	**15**
Los Angeles, CA	63	15	30
Contra Costa, CA	53	12	42
San Bernardino, CA	48	11	53
Tulare, CA	**39**	**9**	**62**
Sacramento, CA	16	4	66
Santa Clara, CA	16	4	70
Tuolumne, CA	15	4	73
Fresno, CA	**14**	**3**	**76**
Monterey, CA	13	3	79
Alameda, CA	12	3	82
Amador, CA	10	2	85
San Joaquin, CA	**9**	**2**	**87**
Mariposa, CA	8	2	89
Stanislaus, CA	**7**	**2**	**90**
Ventura, CA	6	1	92
Madera, CA	**6**	**1**	**93**
Calaveras, CA	6	1	95
Merced, CA	**5**	**1**	**96**
Santa Barbara, CA	5	1	97
San Luis Obispo, CA	5	1	98
Inyo, CA	3	1	99
Mono, CA	2	0	99
Kings, CA	**2**	**0**	**100**
San Benito, CA	1	0	100

Bold = counties (whole or partial) within the San Joaquin Valley nonattainment area.

Table 4i. County-Level Crustal Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**Crustal**	**Pct.**	**Cumulative %**
San Bernardino, CA	2,765	20	20
Los Angeles, CA	1,942	14	34
Kern, CA	**1,204**	**9**	**43**
Santa Clara, CA	1,031	7	50
Alameda, CA	971	7	57
Contra Costa, CA	941	7	64
Fresno, CA	**764**	**6**	**69**
Tulare, CA	**668**	**5**	**74**
San Joaquin, CA	**456**	**3**	**77**
Sacramento, CA	357	3	80
Stanislaus, CA	**348**	**3**	**83**
Merced, CA	**321**	**2**	**85**
Monterey, CA	318	2	87
Inyo, CA	303	2	89
Kings, CA	**262**	**2**	**91**
Santa Barbara, CA	222	2	93
Ventura, CA	218	2	94
San Luis Obispo, CA	192	1	96
Madera, CA	**186**	**1**	**97**
Tuolumne, CA	139	1	98
San Benito, CA	76	1	99
Amador, CA	59	0	99
Mariposa, CA	52	0	99
Mono, CA	36	0	100
Calaveras, CA	34	0	100

Bold = counties (whole or partial) within the San Joaquin Valley nonattainment area.

Table 4j. County-Level Residual Emissions (tons/year)

	Emissions in average tons/yr		
County, State	**Residual**	**Pct.**	**Cumulative %**
Los Angeles, CA	4,310	18	18
San Bernardino, CA	3,760	16	34
Tulare, CA	**2,488**	**11**	**45**
Kern, CA	**1,987**	**8**	**54**
Alameda, CA	1,603	7	60
Santa Clara, CA	1,398	6	66
Contra Costa, CA	1,381	6	72
Fresno, CA	**985**	**4**	**77**
San Joaquin, CA	**579**	**2**	**79**
Sacramento, CA	565	2	81
Stanislaus, CA	**491**	**2**	**84**
Monterey, CA	441	2	85
Madera, CA	**398**	**2**	**87**
Tuolumne, CA	349	1	89
Mariposa, CA	335	1	90
Merced, CA	**328**	**1**	**91**
Inyo, CA	325	1	93
San Luis Obispo, CA	320	1	94
Ventura, CA	303	1	95
Santa Barbara, CA	262	1	97
Kings, CA	**244**	**1**	**98**
Amador, CA	191	1	98
San Benito, CA	127	1	99
Calaveras, CA	126	1	100
Mono, CA	106	0	100

Bold = counties (whole or partial) within the San Joaquin Valley nonattainment area.

Table 3a shows county-level emissions of directly-emitted $PM_{2.5}$ and $PM_{2.5}$ precursors. Counties within the San Joaquin Valley nonattainment area are shown in bold, while bordering counties are shown in plain text. Of the twenty-five counties within and bordering the nonattainment area, the five with the highest emissions of directly-emitted $PM_{2.5}$ and $PM_{2.5}$ precursors are Los Angeles and San Bernardino counties to the south of the nonattainment area, Tulare and Kern counties which fall within the nonattainment area, and Alameda County to the west of San Joaquin Valley. As discussed in Factor 4, San Joaquin Valley is topographically separated from bordering counties by mountain ranges to the west, south and east. Emissions from these bordering counties are therefore less likely to contribute to monitored violations within the San Joaquin Valley.

In addition to reviewing county-wide emissions of $PM_{2.5}$ and $PM_{2.5}$ precursors in the area of analysis, the EPA also reviewed emissions from major point sources located in the area of analysis. The magnitude and location of these sources can help inform nonattainment boundaries. Table 5 provides facility-level emissions of direct $PM_{2.5}$, components of direct $PM_{2.5}$, and precursor pollutants (given in tons per year) from major point sources located in the area of analysis for the San Joaquin Valley, CA area. Table 5 also shows the distance from the facility to the

San Joaquin Valley nonattainment area DV monitoring site (Madera-City). These major sources may be closer to another violating monitor within the San Joaquin Valley nonattainment area.

Table 5. NEI 2011 v1 Major Point Source Emissions (tons/year)

		Distance	NEI 2011 v1 Emissions - Tons/Year					
County, State	**Facility Name (Facility ID)**	**monitor (miles)**	**NH_3**	**NOx**	**$PM_{2.5}$**	**SO_2**	**VOC**	**Total**
Alameda, CA	Metropolitan Oakland In	131		941	20	97	156	1,215
Amador, CA	SIERRAPINE LTD AMPINE DIVISION	107		83	414	0	263	760
Contra Costa, CA	SHELL MARTINEZ REFINERY	136	0	1,036	832	1,160	1,228	4,256
Contra Costa, CA	CHEVRON PRODUCTS COMPANY	146	128	835	590	367	1,008	2,929
Contra Costa, CA	TESORO REFINING AND MARKETING	134	0	1,023	137	470	587	2,217
Contra Costa, CA	PHILLIPS 66 CARBON PLANT	141		507	13	1,151	0	1,671
Contra Costa, CA	PHILLIPS 66 COMPANY - SAN FRAN	143	55	309	112	411	156	1,044
Kern, CA	CALIFORNIA PORTLAND CEMENT CO.	164		2,204	168	790	6	3,168
Kern, CA	NATIONAL CEMENT CO	164		817	224	13	14	1,067
Kern, CA	CHEVRON USA INC	123		78	274	633	26	1,011
Kern, CA	OCCIDENTAL OF ELK HILLS, INC.	120	8	372	1	9	261	651
Kern, CA	CHEVRON USA INC	112	16	195	138	134	89	571
Kern, CA	AERA ENERGY LLC	111		354	60	20	71	506
Los Angeles, CA	LOS ANGELES INT AIRPORT	227		5,485	95	539	852	6,971
Los Angeles, CA	EXXONMOBIL OIL CORPORATION	234	50	818	322	347	613	2,150
Los Angeles, CA	BP WEST COAST PROD.LLC BP CARSON REF.	239	164	584	312	524	483	2,067
Los Angeles, CA	CHEVRON PRODUCTS CO.	229	48	649	177	379	541	1,794
Los Angeles, CA	TESORO REFINING AND MARKETING CO	241	38	584	153	215	235	1,225
Los Angeles, CA	CONOCOPHILLIPS COMPANY	241	81	583	89	115	241	1,110
Los Angeles, CA	CONOCOPHILLIPS COMPANY	240	1	331	53	287	91	764
Los Angeles, CA	ULTRAMAR INC (NSR USE ONLY)	242	32	275	65	202	179	753
Los Angeles, CA	SCE-VINCENT SUBSTATION	202		604	0	0	0	604
Los Angeles, CA	SCE- ANTELOPE SUBSTATION	185		604	0	0	0	604
Los Angeles, CA	ROBERTSONS READY MIX / PALMDAL	201			508		14	522
Sacramento, CA	Sacramento International	147		586	11	66	90	752
Sacramento, CA	KIEFER LANDFILL	125	376	69	14	16	136	610
San Bernardino, CA	MITSUBISHI CEMENT	253		1,920	421	321	39	2,701
San Bernardino, CA	CEMEX - BLACK MOUNTAIN QUARRY	230	10	2,008	189	164	30	2,400
San Bernardino, CA	SEARLES VALLEY MINERAL	169	5	1,865	178	160	33	2,241
San Bernardino, CA	US ARMY NATIONAL TRAINING CTR.	220	0	1,272	213	30	128	1,643
San Bernardino, CA	PG&E TOPOCK COMPRESSOR STATION	347		1,204	14	0	125	1,344
San Bernardino, CA	ACE COGENERATION CO	169	12	620	37	479	4	1,152
San Bernardino, CA	TXI RIVERSIDE CEMENT COMPANY	222		870	221	14	15	1,120
San Bernardino, CA	MAGTFTC MCAGCC TWENTYNINE PALMS	292	1	719	45	68	222	1,055

		Distance	NEI 2011 v1 Emissions - Tons/Year					
County, State	**Facility Name (Facility ID)**	**monitor (miles)**	**NH_3**	**NOx**	**$PM_{2.5}$**	**SO_2**	**VOC**	**Total**
San Bernardino, CA	TETRA TECHNOLOGIES, INC. – AMB	320	0	20	836	1	2	859
San Bernardino, CA	ONTARIO INT. AIRPORT	242		550	10	57	80	697
San Joaquin, CA	PILKINGTON NORTH AMERICA, INC	91		632	82	69	1	783
San Joaquin, CA	OWENS-BROCKWAY GLASS CONTAINER	96		404	21	226	0	652
Santa Clara, CA	LEHIGH SOUTHWEST CEMENT COMPANY	116		1,755	17	492	71	2,335
Santa Clara, CA	Norman Y. Mineta San Jose	109		575	12	65	96	748
Stanislaus, CA	GROVER LANDSCAPE SERVICES	83	10	1	1	0	624	636
Stanislaus, CA	GALLO GLASS COMPANY	70		195	49	284	3	532

Bold = counties (whole or partial) within the San Joaquin Valley nonattainment area.

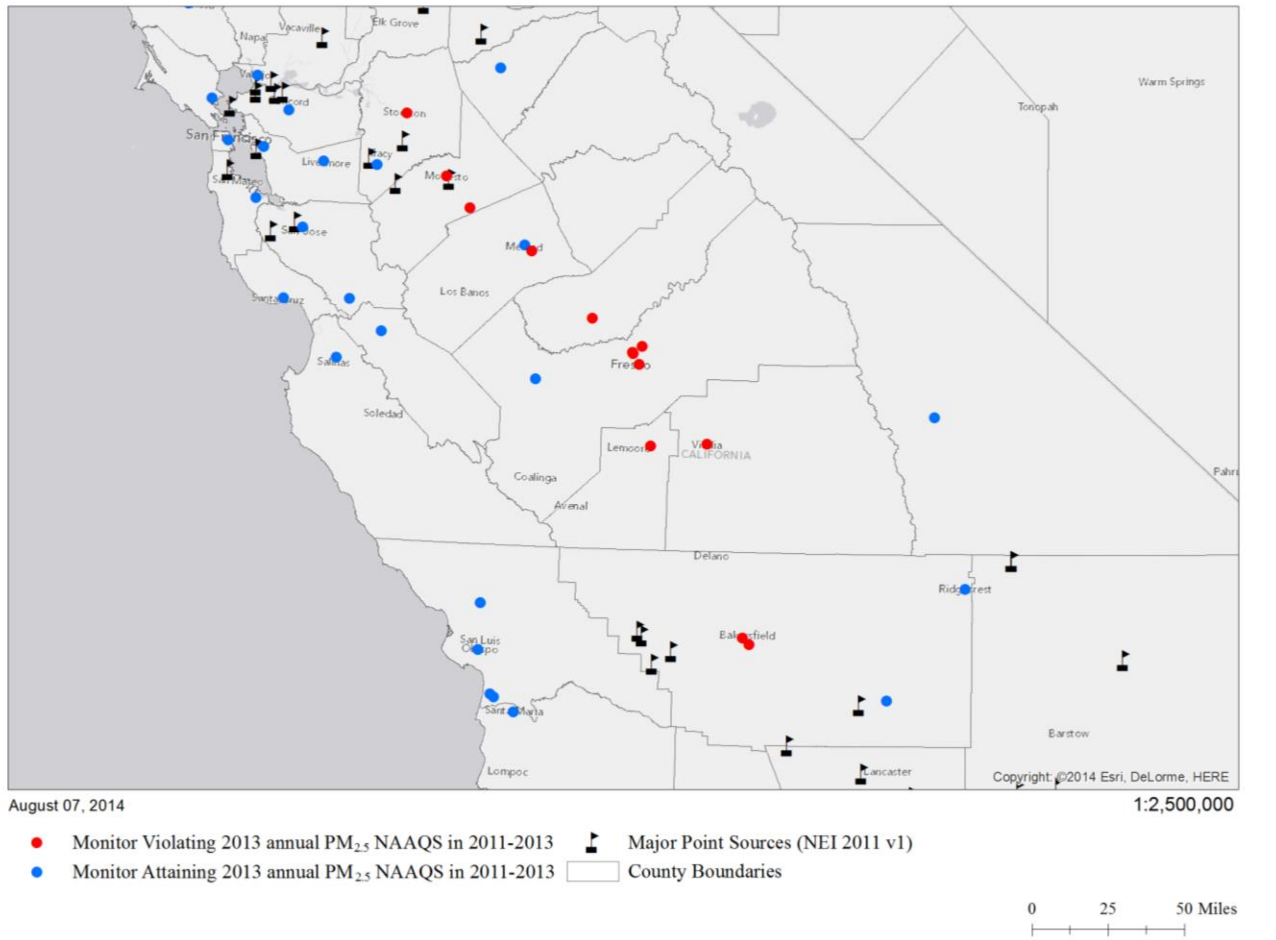
Figure 5 shows the major point source emissions (from the 2011 NEI in tons per year) in the area of analysis for San Joaquin Valley, CA and the relative distances of these sources from the violating monitoring location(s), as depicted by red dots. The actual distance from the major point sources to the DV monitoring location is presented in Table 5). The distance from the violating monitoring location is particularly important for directly emitted $PM_{2.5}$. The influence of directly emitted $PM_{2.5}$ on ambient $PM_{2.5}$ diminishes more than that of gaseous precursors as a function of distance.[108]

As listed in Table 5 and shown in Figure 5, there are 42 major point sources located in the area of analysis. Major point sources located in air basins outside the San Joaquin Valley Air Basin (consisting of San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, and Tulare counties, as well as the western portion of Kern County) are not expected to impact air quality within the San Joaquin Valley because of the topography of the air basin (see Factors 3 and 4). This includes sources located in the eastern portion of Kern County, and in San Bernardino, Los Angeles, Santa Clara, Alameda, Contra Costa, Sacramento and Amador counties.

Of the counties bordering the nonattainment area, Ventura, Santa Barbara, San Luis Obispo, Monterey, San Benito, Calaveras, Tuolumne, Mariposa, Mono and Inyo counties have no major point sources.

[108] Baker, K. R. and K. M. Foley. *A nonlinear regression model estimating single source concentrations of primary and secondarily formed $PM_{2.5}$.* Atmospheric Environment. 45 (2011) 3758-3767.

Figure 5. Major Point Source Emissions in the Area of Analysis for the San Joaquin Valley, CA Area.



In summary, the EPA's analysis of the geographic locations of the relevant pollutants showed that point sources located outside of the San Joaquin Valley are typically over 100 miles from the nonattainment area's DV monitor and are located outside of the airshed for this area. Accordingly, these areas are less likely to contribute to the violations in the San Joaquin Valley.

<u>Population density and degree of urbanization</u>

In this part of the factor analysis, the EPA evaluated the population and vehicle use characteristics and trends of the area as indicators of the probable location and magnitude of non-point source emissions. Rapid population growth in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that it may be appropriate to include the county associated with area source and mobile source emissions as part of the nonattainment area. Table 6 shows the 2000 and 2010 population, population growth since 2000, and population density for each county in the area.

Table 6. Population Growth and Population Density.

County, State	Population 2000	Population 2010	% Change from 2000	Land Area (Sq. Miles)	Population Density (per Sq. Mile)	%	Cumulative %
Los Angeles, CA	9,519,338	9,825,761	3%	4,061	2,420	41	41
San Bernardino, CA	1,709,434	2,041,626	19%	20,052	102	9	50
Santa Clara, CA	1,682,585	1,786,540	6%	1,291	1,384	8	57
Alameda, CA	1,443,741	1,513,586	5%	738	2,052	6	64
Sacramento, CA	1,223,499	1,422,316	16%	966	1,473	6	70
Contra Costa, CA	948,816	1,052,887	11%	720	1,462	4	74
Fresno, CA	**799,407**	**932,696**	**17%**	**5,963**	**156**	**4**	**78**
Kern, CA	**661,645**	**841,687**	**27%**	**8,141**	**103**	**4**	**82**
Ventura, CA	753,197	825,378	10%	1,845	447	3	85
San Joaquin, CA	**563,598**	**687,516**	**22%**	**1,399**	**491**	**3**	**88**
Stanislaus, CA	**446,997**	**515,326**	**15%**	**1,494**	**345**	**2**	**90**
Tulare, CA	**368,021**	**443,218**	**20%**	**4,824**	**92**	**2**	**92**
Santa Barbara, CA	399,347	424,403	6%	2,737	155	2	94
Monterey, CA	401,762	416,335	4%	3,322	125	2	95
San Luis Obispo, CA	246,681	269,954	9%	3,304	82	1	97
Merced, CA	**210,554**	**256,877**	**22%**	**1,929**	**133**	**1**	**98**
Kings, CA	**129,461**	**152,301**	**18%**	**1,391**	**109**	**1**	**98**
Madera, CA	**123,109**	**151,177**	**23%**	**2,136**	**71**	**1**	**99**
San Benito, CA	53,234	55,583	4%	1,389	40	0	99
Tuolumne, CA	54,501	55,162	1%	2,235	25	0	99
Calaveras, CA	40,554	45,488	12%	1,020	45	0	100
Amador, CA	35,100	37,829	8%	593	64	0	100
Inyo, CA	17,945	18,531	3%	10,203	2	0	100
Mariposa, CA	17,130	18,254	7%	1,451	13	0	100
Mono, CA	12,853	14,268	11%	3,044	5	0	100
Total	**21,862,509**	**23,804,699**					

Source: U.S. Census Bureau population estimates for 2000 and 2010

Bold = counties (whole or partial) within the San Joaquin Valley nonattainment area.

As with point sources discussed above, population in adjacent air basins is not expected to impact air quality in the San Joaquin Valley due to the topography and meteorology of the air basin (see Factors 3 and 4). As Table 6 and Figure 6 show, there is a high degree of urbanization in the San Joaquin Valley Air Basin, as there is in a number of counties adjacent to the air basin. Population growth within the eight counties included in the San Joaquin Valley nonattainment area has been around twenty percent from 2000 to 2010. While Figure 6 gives the appearance that there are populations immediately adjacent to the air basin, given the topography of the air basin, populations within and outside the air basin are separated by large distances and mountain ranges and thus are unlikely to reflect as much contribution to violations in the San Joaquin Valley.

Figure 6. 2010 County-Level Population in the Area of Analysis for the San Joaquin Valley, CA Area.

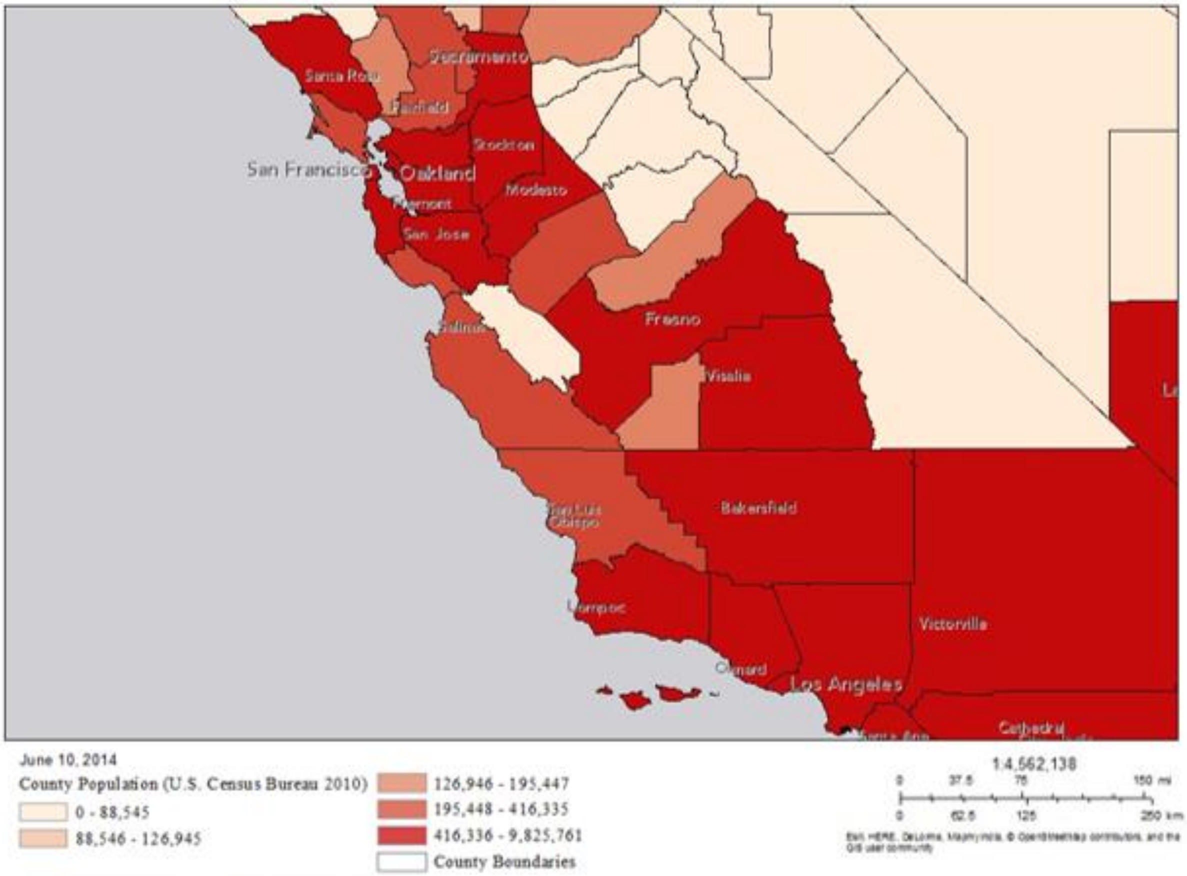


Figure 6a shows a closer view of the northern portion of the area of analysis. Tract-level population data (tracts as defined by the U.S. Census Bureau) show that the population in the EPA's nonattainment area is fairly contained within the nonattainment area. Amador and Calaveras counties are shown to the northeast of San Joaquin County, shown in the center of the figure. Amador and Calaveras counties would at first appear to be an exception, as if they both had large, contiguous populations with San Joaquin County, however, their populations are small (around 80,000 total for the two counties) and are not as likely to be contributing to violations of the 2012 $PM_{2.5}$ NAAQS in the San Joaquin Valley nonattainment area. See traffic discussion below. Otherwise, tract-level population data shown in Figure 6a show a clear pattern of denser population in the central portion of the San Joaquin Valley, along the Highway 99 corridor.

Figure 6a. 2010 Tract-Level Population in the Northern Portion of the Area of Analysis for the San Joaquin Valley, CA Area.

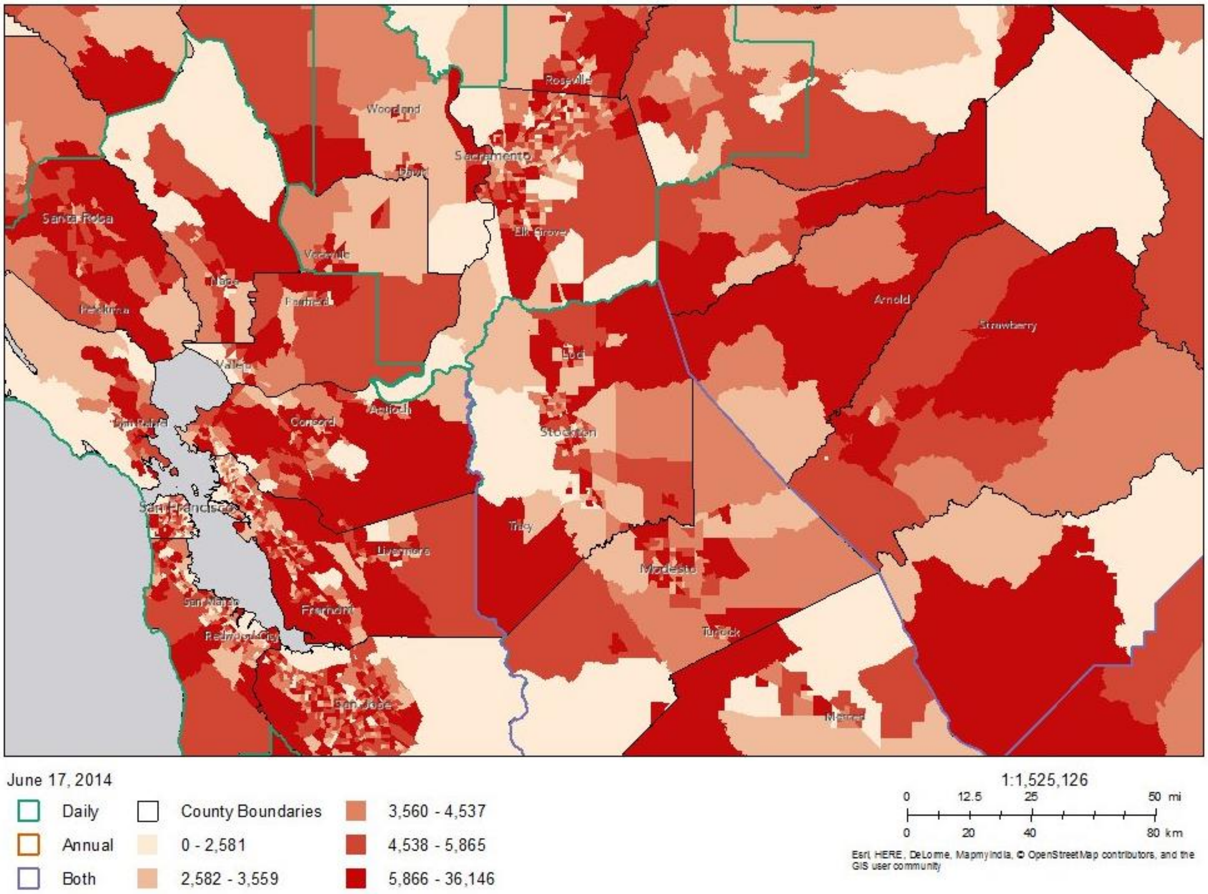


Figure 6b shows similar tract level population data for the central portion of the area of analysis. As in Figure 6a, the trend of population clustered along the Highway 99 corridor continues in this central portion of the San Joaquin Valley.

Figure 6b. 2010 Tract-Level Population in the Central Portion of the Area of Analysis for the San Joaquin Valley, CA Area.

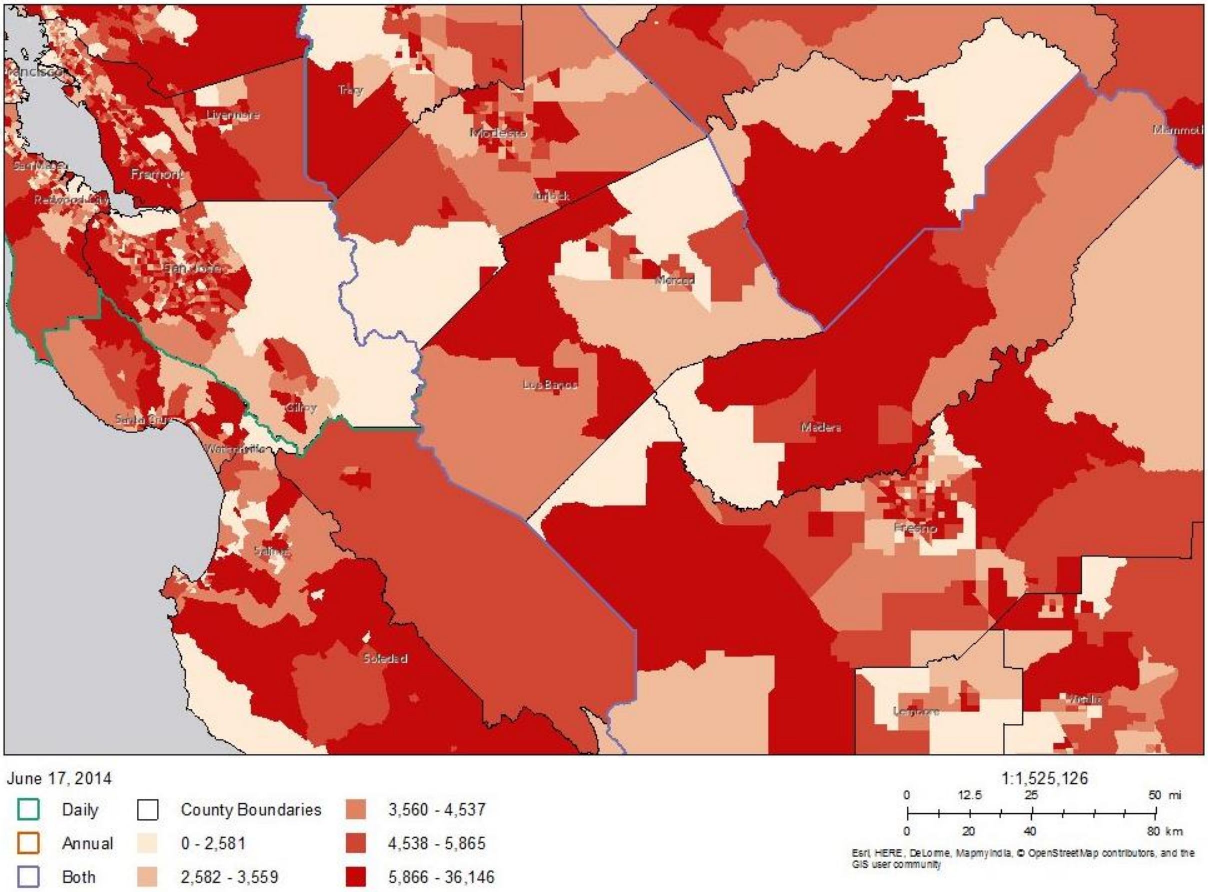
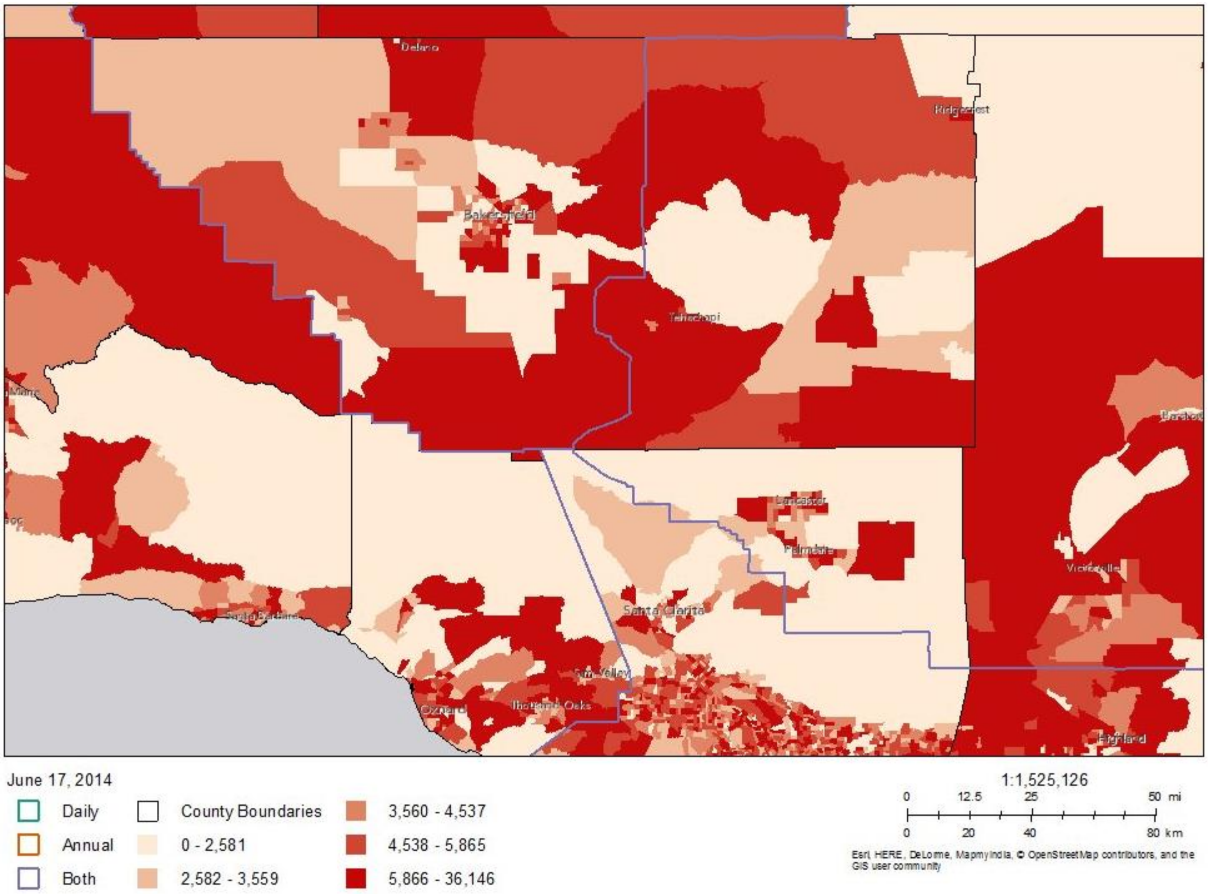


Figure 6c shows similar tract level data as above for the north and central portions of the area of analysis. In the southern portion of San Joaquin Valley, census tracts follow the curvature of the southern portion of the valley. There is a clear lack of population contiguity between population in the valley, centered in the city of Bakersfield in the western (San Joaquin Valley) portion of Kern County and the more sparsely populated areas to the east, west and south. There is also a clear separation between the high density populations of Los Angeles County and the city of Bakersfield. See Factor 4 for topographical reasons for this separation.

Figure 6c. 2010 Tract-Level Population in the Southern Portion of the Area of Analysis for the San Joaquin Valley, CA Area.



Traffic and Vehicle Miles Travelled

High vehicle miles travelled (VMT) and/or a high number of commuters associated with a county is generally an indicator that the county is an integral part of an urban area. Mobile source emissions of NO_x, VOC, and direct PM may contribute to ambient particulate matter that contributes to monitored violations of the NAAQS in the area. In combination with the population/population density data and the location of main transportation arteries, an assessment of VMT helps identify the probable location of nonpoint source emissions that contribute to violations in the area. Comparatively high VMT in a county outside of the CBSA or CSA signifies integration with the core urban area contained within the CSA or CBSA, and indicates that a county with the high VMT may be appropriate to include in the nonattainment area because emissions from mobile sources in that county contribute to violations in the area. Table 7 shows 2011 VMT while Figure 7 overlays 2011 county-level VMT with a map of the transportation arteries. VMT information presented is from the Federal Highway Administration.

Table 7. 2011 VMT for the San Joaquin Valley, CA Area.

County, State	Total 2011 VMT	Percent	Cumulative %
Los Angeles, CA	76,095,823,872	38	38
San Bernardino, CA	20,423,645,232	10	48
Santa Clara, CA	14,809,943,116	7	56
Alameda, CA	12,771,269,214	6	62
Sacramento, CA	10,784,648,568	5	68
Contra Costa, CA	8,414,684,420	4	72
Kern, CA	**8,288,439,996**	**4**	**76**
Fresno, CA	**7,576,060,237**	**4**	**80**
Ventura, CA	6,744,473,079	3	83
San Joaquin, CA	**6,435,426,334**	**3**	**87**
Monterey, CA	3,981,084,587	2	89
Stanislaus, CA	**3,718,885,802**	**2**	**90**
Tulare, CA	**3,478,307,796**	**2**	**92**
Santa Barbara, CA	3,441,832,537	2	94
San Luis Obispo, CA	2,656,494,099	1	95
Merced, CA	**2,612,728,520**	**1**	**97**
Madera, CA	**1,821,119,189**	**1**	**97**
Kings, CA	**1,318,583,674**	**1**	**98**
Inyo, CA	604,078,683	0	98
Tuolumne, CA	602,697,848	0	99
Amador, CA	593,212,816	0	99
San Benito, CA	569,721,719	0	99
Mono, CA	502,386,471	0	100
Calaveras, CA	501,779,972	0	100
Mariposa, CA	382,208,742	0	100
Total	**199,129,536,523**		

http://www.census.gov/hhes/commuting/data/commuting.html

Bold = counties (whole or partial) within the San Joaquin Valley nonattainment area.

Table 7 lists all the counties in the area of analysis, ranked by the level of VMT in each county. The data shown in the table can be characterized as having three regimes or groups of VMT levels, each separated from the next by a factor of 10. With under one million VMT each, the counties listed at the bottom of the table (starting with Inyo County down to Mariposa County) can be discounted for discussion of this table. Together their VMT accounts for less than 2% of the VMT for the entire area of analysis.

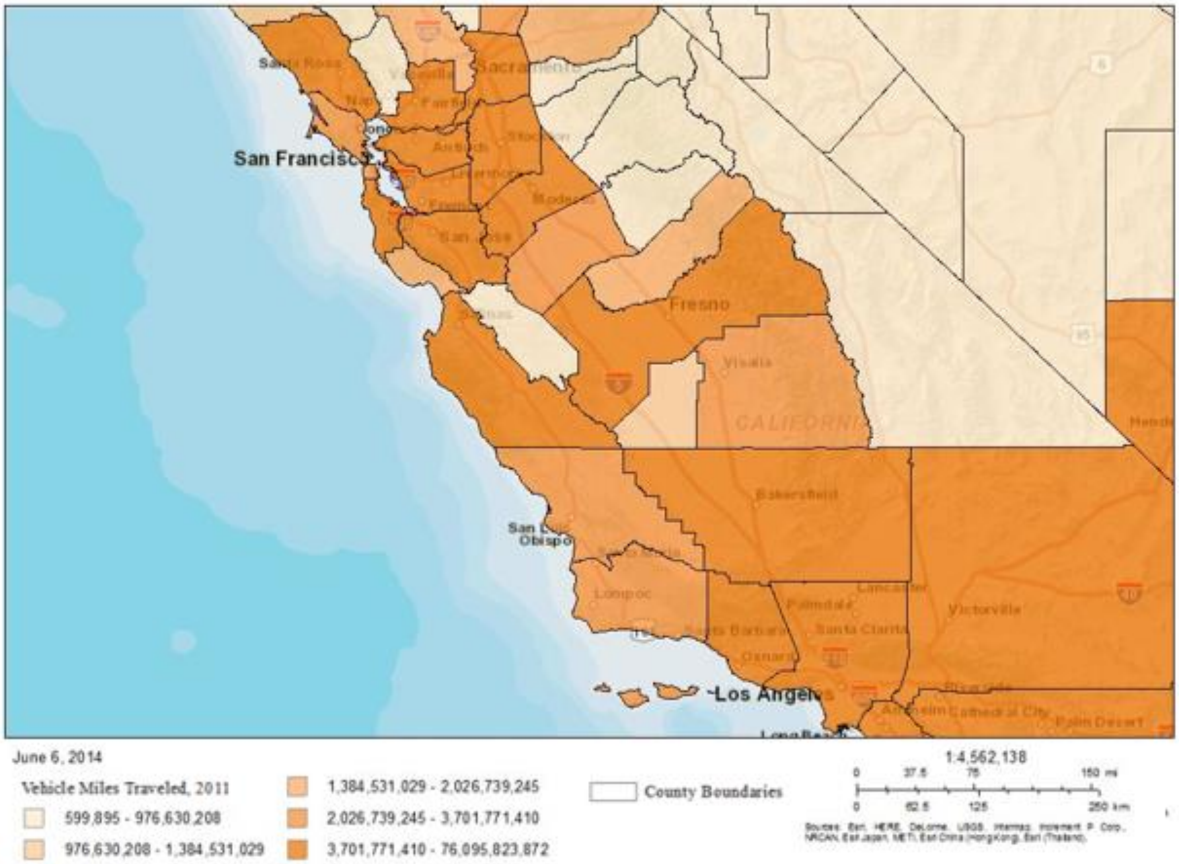
The group of counties with a mid-range of VMT (Contra Costa County to Kings County, as listed in Table 7) each have between one and ten million VMT. Kings County has 1.3 million VMT and Contra Costa County has 8.4 million VMT. Of these thirteen counties, seven (Fresno, San Joaquin, Stanislaus, Tulare, Merced, Madera and Kings) are entirely within the nonattainment area. Kern County has 8.2 million VMT, the second highest of this middle group of counties. The western portion of Kern County has the bulk of the VMT for the county and is the portion that is included in the nonattainment area.

The remaining counties in this mid-range (Contra Costa, Ventura, Monterey, Santa Barbara and San Luis Obispo), as well as the counties listed with the highest VMT (Los Angeles, San Bernardino, Santa Clara, Alameda and Sacramento), are all in separate air basins and are not as likely to contribute to violations of the 2012 PM2.5 NAAQS in the San Joaquin Valley Air Basin. Los Angeles County is the highest ranked county in Table 7 and is adjacent, to the south, of Kern County, the western portion of which includes the city of Bakersfield. According to Census Bureau statistics for commuter flow between counties for 2006-2010, Los Angeles County has 4.4 million commuters. See: http://www.census.gov/population/metro/data/other.html. Of those, a mere 728 commute to a workplace anywhere in Kern County. These 728 commuters are also a small group when compared to the total number of commuters in Kern County (304,506 commuters).

To the north of the EPA's San Joaquin Valley nonattainment area, Sacramento County has 9,767 commuters, or about 1.6% of Sacramento's commuters, who commute to workplaces in counties in the area. Other adjacent counties in the area of analysis have far fewer commuters traveling to counties in the nonattainment area, for example: Alameda County (990 commuters), Contra Costa (567 commuters). Regarding the counties with the lowest VMT in Table 7, only a handful of commuters commute to workplace destinations within the San Joaquin Valley. Inyo County, for example has a total of seven commuters working in the air basin. Of Amador County's 13,776 commuters, 588 travel to work in the air basin. Taken together, all commuters from outside the nonattainment area are a small fraction of the nearly 1.5 million commuters whose commute originate within counties in the nonattainment area.

While individuals commuting into the San Joaquin Valley air basin might not result in contribution to violations of the 2012 $PM_{2.5}$ NAAQS inside the air basin, there is a great deal of commerce in the form of goods movement from the ports of Los Angeles and Long Beach that is trucked through the San Joaquin Valley Air Basin and no doubt contributes to such violations. However, these emissions occur both in the upstream (in terms of the flow of goods movement) greater Los Angeles area, that is, the South Coast Air Basin, which the EPA is designating nonattainment as the Los Angeles-South Coast Air Basin nonattainment area, as well as in the San Joaquin Valley Air Basin. These two air basins are separated by a mountain range and a high-elevation mountain pass. To the extent these emissions are occurring as a result of transportation routes that go through the San Joaquin Valley, those routes will be within the boundaries of the designated nonattainment area and the question of what controls may or may not be appropriate for such emissions will be evaluated in the context of the subsequent development of the attainment plan for the area.

Figure 7. Overlay of 2011 County-level VMT with Transportation Arteries.



In summary for "Factor 2: Emissions and Emissions-related Data," the EPA's nonattainment area for the 2012 $PM_{2.5}$ NAAQS includes the counties and the Kern-County partial-county area that violate and contribute to nearby violations in those counties. The EPA's nonattainment area comprises the entirety of the San Joaquin Valley Air Basin. This air basin contains point and non-point sources of $PM_{2.5}$ and precursor emissions, and the related population and VMT associated with other emissions activity that all contribute to the monitored violations in the nonattainment area. Population growth within the air basin was around twenty percent from 2000 to 2010. The EPA analyzed the data relevant to counties in the area of analysis that are adjacent to the nonattainment area and has determined that there is less likely to be contribution from emissions in those adjacent areas for a number of reasons, but most particularly because they are occurring in separate airsheds and thus are less likely to contribute to violations in the San Joaquin Valley airshed. In addition, the EPA is designating several of the adjacent counties as a separate nonattainment area due to their violations or contribution to other nearby violating areas in a separate airshed. Populations in adjacent areas are not extensions of urban areas within the nonattainment area. Although Los Angeles to the south and Sacramento to the north of the nonattainment area represent large urbanized areas near the San Joaquin Valley, neither area contributes relatively meaningful commuter traffic to counties within the San Joaquin Valley. The EPA is designating the Los Angeles-South Coast Air Basin (consisting of Orange County and portions Los Angeles, Riverside, and San Bernardino counties) as a separate nonattainment area based on violations in that airshed. The unique meteorology and topography discussed in Factors 3 and 4 below describes why it is less likely that the emissions from the Sacramento area are contributing to the violations throughout the San Joaquin Valley Air Basin.

Factor 3: Meteorology

The EPA evaluated available meteorological data to determine how meteorological conditions, including, but not limited to, weather, transport patterns, and stagnation conditions, could affect the fate and transport of directly emitted particulate matter and precursor emissions from sources in the area of analysis. The EPA used two primary tools for this assessment: wind roses and kernel density estimation (KDE). When considered in combination with area $PM_{2.5}$ composition and county-level and facility emissions source location information, wind roses and KDE can help to identify nearby areas contributing to violations at violating monitoring sites.

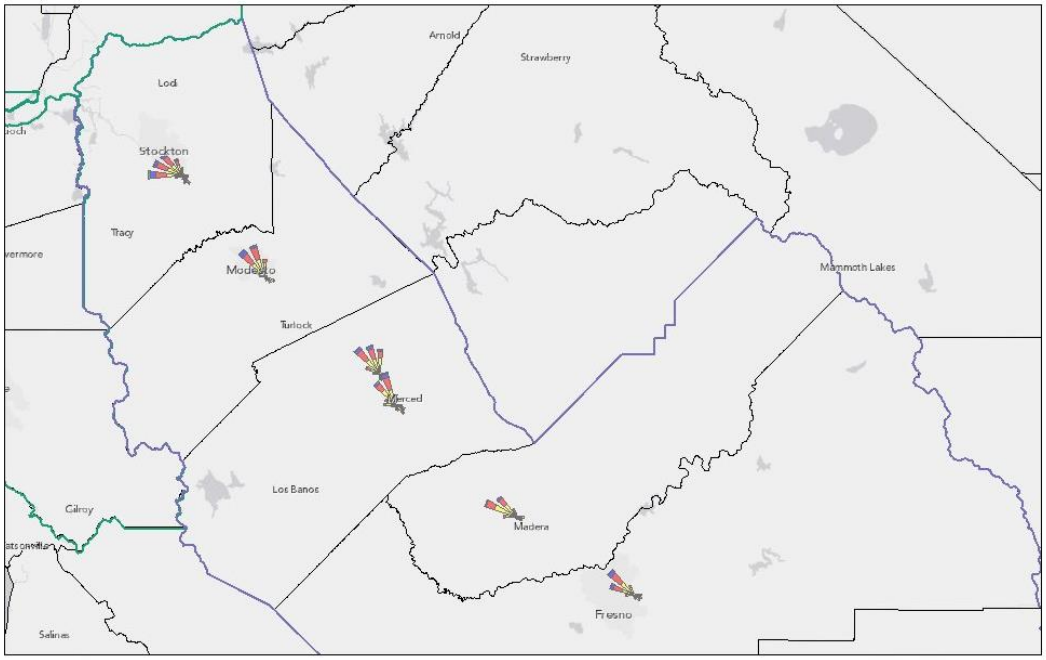
Wind roses are graphic illustrations of the frequency of wind direction and wind speed. Wind direction can indicate the direction from which contributing emissions are transported; wind speed can indicate the force of the wind and thus the distance from which those emissions are transported. The EPA constructed wind roses from hourly observations of wind direction and wind speed using 2009-2012 data from National Weather Service locations archived at the National Climate Data Center.[109] When developing these wind roses, the EPA also used wind observations collected at meteorological sampling stations collocated at air quality monitoring sites, where these data were available. Figure 8 shows wind roses that the EPA generated from data relevant in the northern (top) and southern (bottom) San Joaquin Valley area.

As shown in Figure 8, wind flow in the San Joaquin Valley most frequently comes from the northwest, at low wind speeds between 2-6 meters per second. This is consistent with the geographic orientation of the San Joaquin Valley and its relationship to the Golden Gate (at the mouth of San Francisco Bay), the key route for air flow between the Pacific Ocean and the Central Valley of California. These data suggest that potential emission sources in the northwest upwind direction should be considered for analysis.

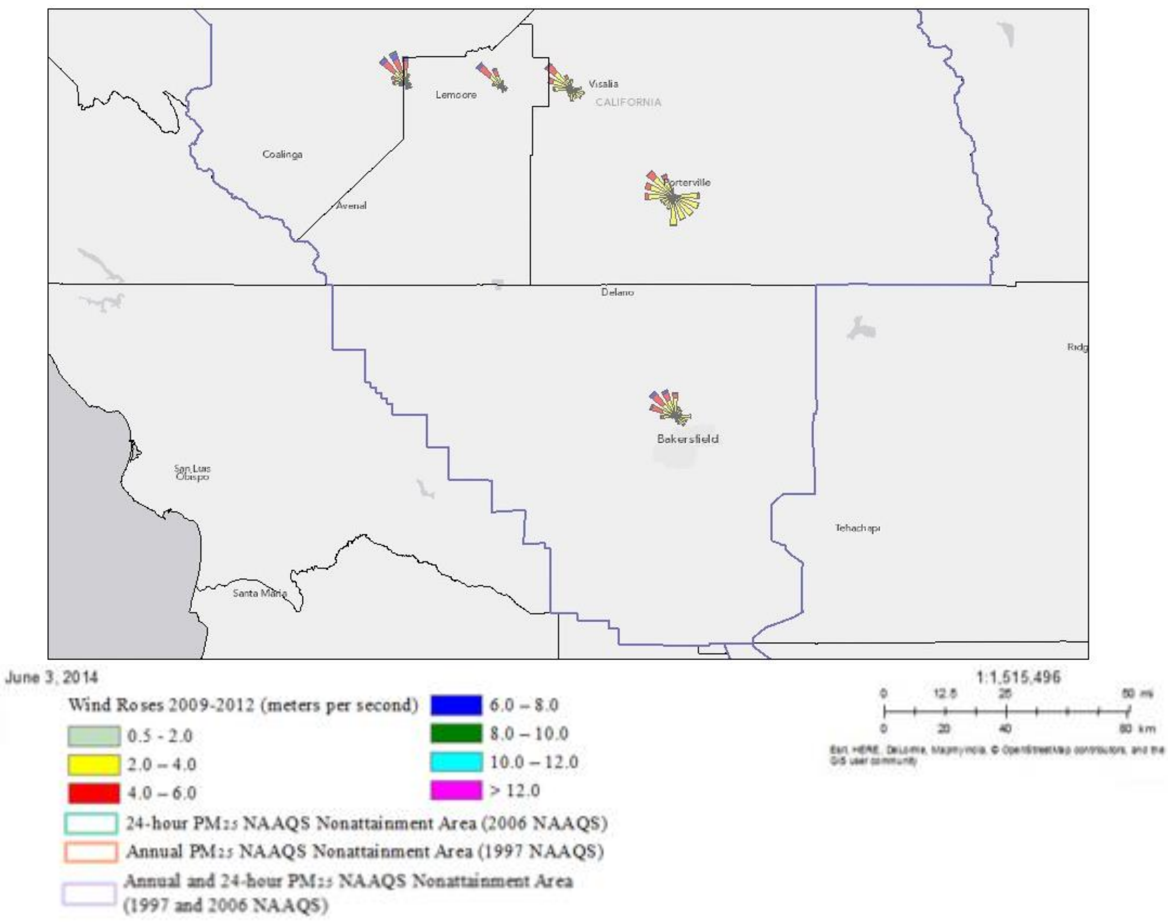
[109] *ftp.ncdc.noaa.gov/pub/data/noaa* or *http://gis.ncdc.noaa.gov/map/viewer/#app=cdo&cfg=cdo&theme=hourly&layers=1&node=gis* Quality assurance of the National Weather Service data is described here: *http://www1.ncdc.noaa.gov/pub/data/inventories/ish-qc.pdf*.

Figure 8. Wind Roses in the Area of Analysis for the (a) Northern and (b) Southern San Joaquin Valley.

(a) Northern San Joaquin Valley



(b) Southern San Joaquin Valley



In addition to wind roses, the EPA also generated kernel density estimation (KDE) plots to represent HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) backward trajectory frequency at violating monitoring sites.[110,111] These KDEs are graphical statistical estimations to determine the density of trajectory endpoints at a particular location represented by a grid cell. The EPA used KDEs to characterize and analyze the collection of individual HYSPLIT backward trajectories.[112] Higher density values, indicated by darker blue colors, indicate a greater frequency of observed trajectory endpoints within a particular grid cell. Figure 9 shows a HYSPLIT KDE plot for the San Joaquin Valley area summarized by calendar quarter for the 2010-2012 period. The HYSPLIT KDE is weighted in the west-northwesterly direction, indicating a greater frequency of trajectories passing over grid cells to the west and northwest. Here we show three representative stations in the North (Modesto-14th Street Station), Central (Fresno-Garland Station) and Southern (Bakersfield-Planz Station) San Joaquin Valley.

For the Modesto-14th Street station, representing the northern San Joaquin Valley, the HYPSPLIT KDE plot suggest greatest potential contribution of emissions from Modesto and the regions immediately to the northwest, Tracey and Stockton in all quarters, with additional contributions from Concord and Livermore in the Bay Area in quarters 2 and 3 (Figure 9a). For the Fresno-Garland station, representing the central San Joaquin Valley, the HYPSPLIT KDE plots suggest greatest potential contribution of emissions from Fresno and Madera in all quarters, with additional contributions from regions to the northwest extending to Merced and Modesto in quarters 2 and 3 (Figure 9b). For the Bakersfield-Planz station, representing the southern San Joaquin Valley, the HYPSPLIT KDE plot suggest greatest potential contribution of emissions from Bakersfield and regions just to the northwest for all quarters (Figure 9c).

In summary, for the violating San Joaquin Valley monitors, the HYPSPLIT KDE plots and wind roses suggest greatest potential contribution of emissions is from the regions immediately to the west-northwest of the monitors. While there is interchange of air between San Joaquin Valley and the Sacramento Valley to the north and the San Francisco Bay Area to the northwest, San Joaquin Valley's unique flow patterns make it meteorologically distinct from those areas. While there is no topographic barrier between the San Joaquin Valley and the Sacramento Valley to the north, and at times there can be transport between them, generally the air flow from the Pacific Ocean through the Golden Gate toward the east tends to bifurcate where the two valleys meet, providing some degree of separation much of the time.

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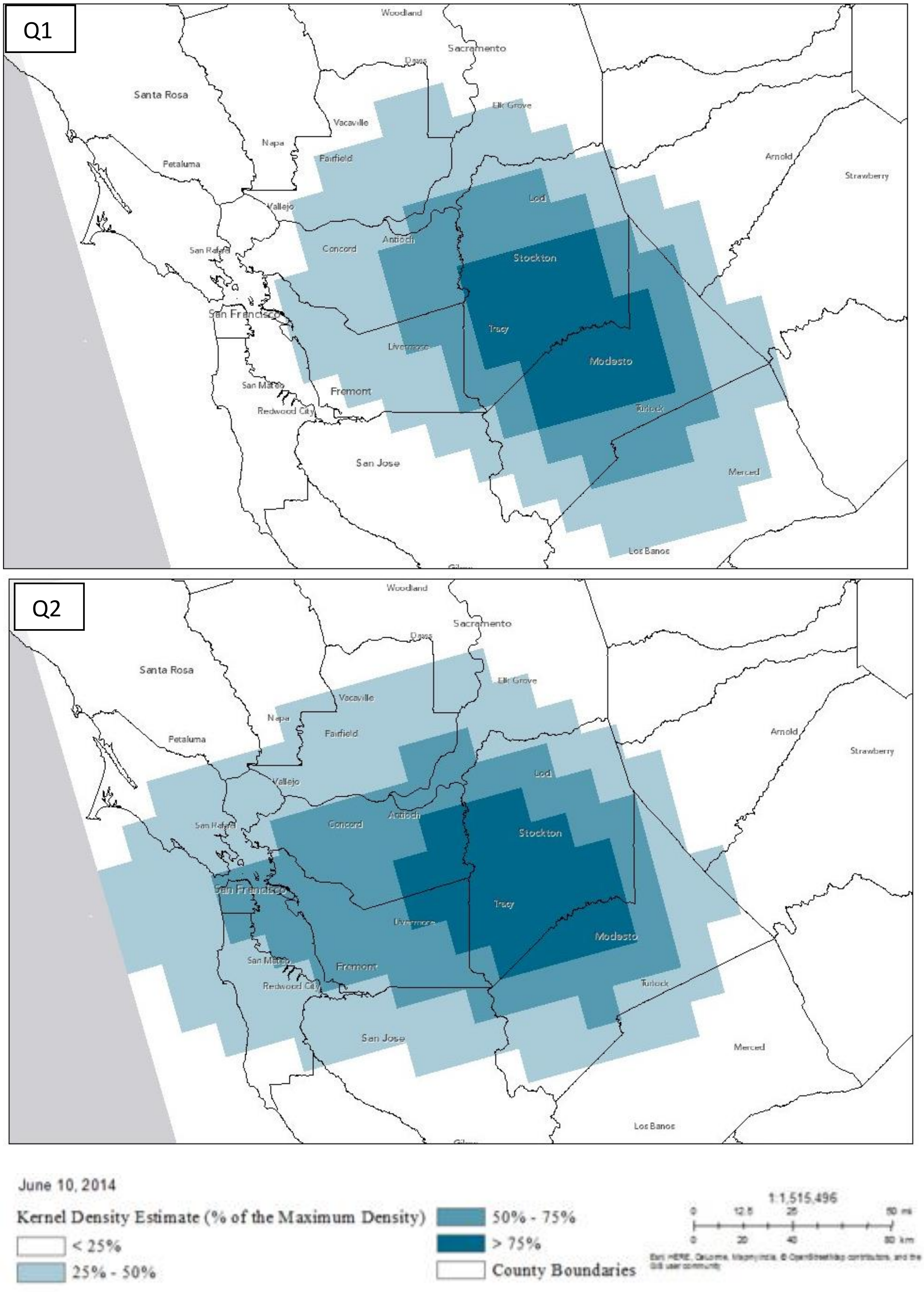
[110] In some past area designations efforts, EPA has used HYSPLIT backward trajectories to assist in determining nonattainment area boundaries. A HYSPLIT backward trajectory is usually depicted on a standard map as a single line, representing the centerline of an air parcel's motion, extending in two dimensional (x,y) space from a starting point and regressing backward in time to a point of origin. Backward trajectories may be an appropriate tool to assist in determining an air parcel's point of origin on a day in which a short-term standard, such as an 8-hour standard or a 24-hour standard, was exceeded. However, for an annual standard, such as the 2012 annual $PM_{2.5}$ NAAQS, every trajectory on every day is important. Plotting a mass of individual daily (e.g., 365 individual back trajectories), or more frequent, HYSPLIT trajectories may not be helpful as this process is likely to result in depicting air parcels originating in all directions from the violating monitoring site.

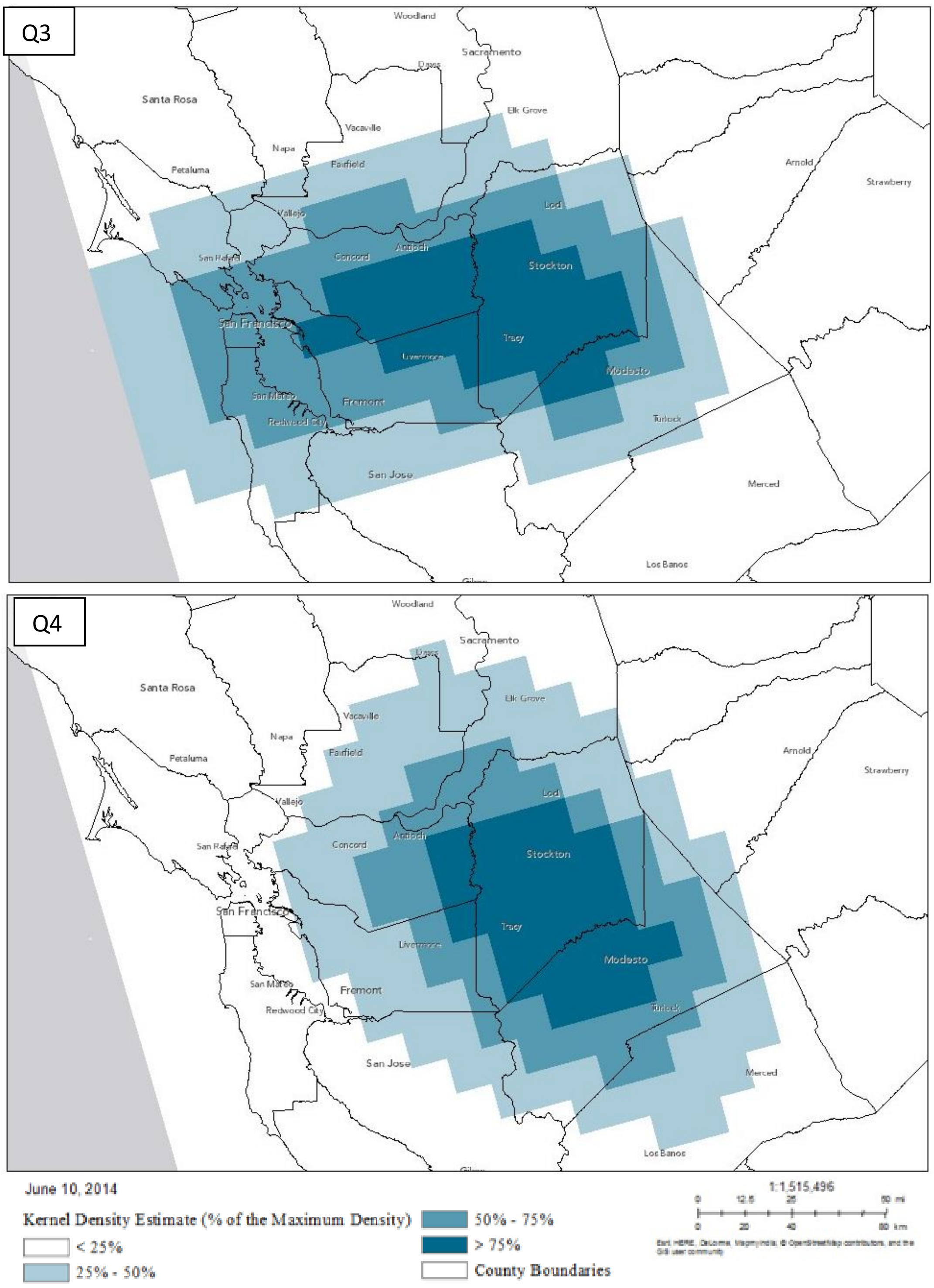
[111] HYSPLIT - Hybrid Single Particle Lagrangian Integrated Trajectory Model, *http://www.arl.noaa.gov/HYSPLIT_info.php*

[112] The KDEs graphically represent the aggregate of HYSPLIT backward trajectories for the years 2010-2012, run every third day (beginning on the first day of monitoring), four times each day, and ending at four endpoint heights.

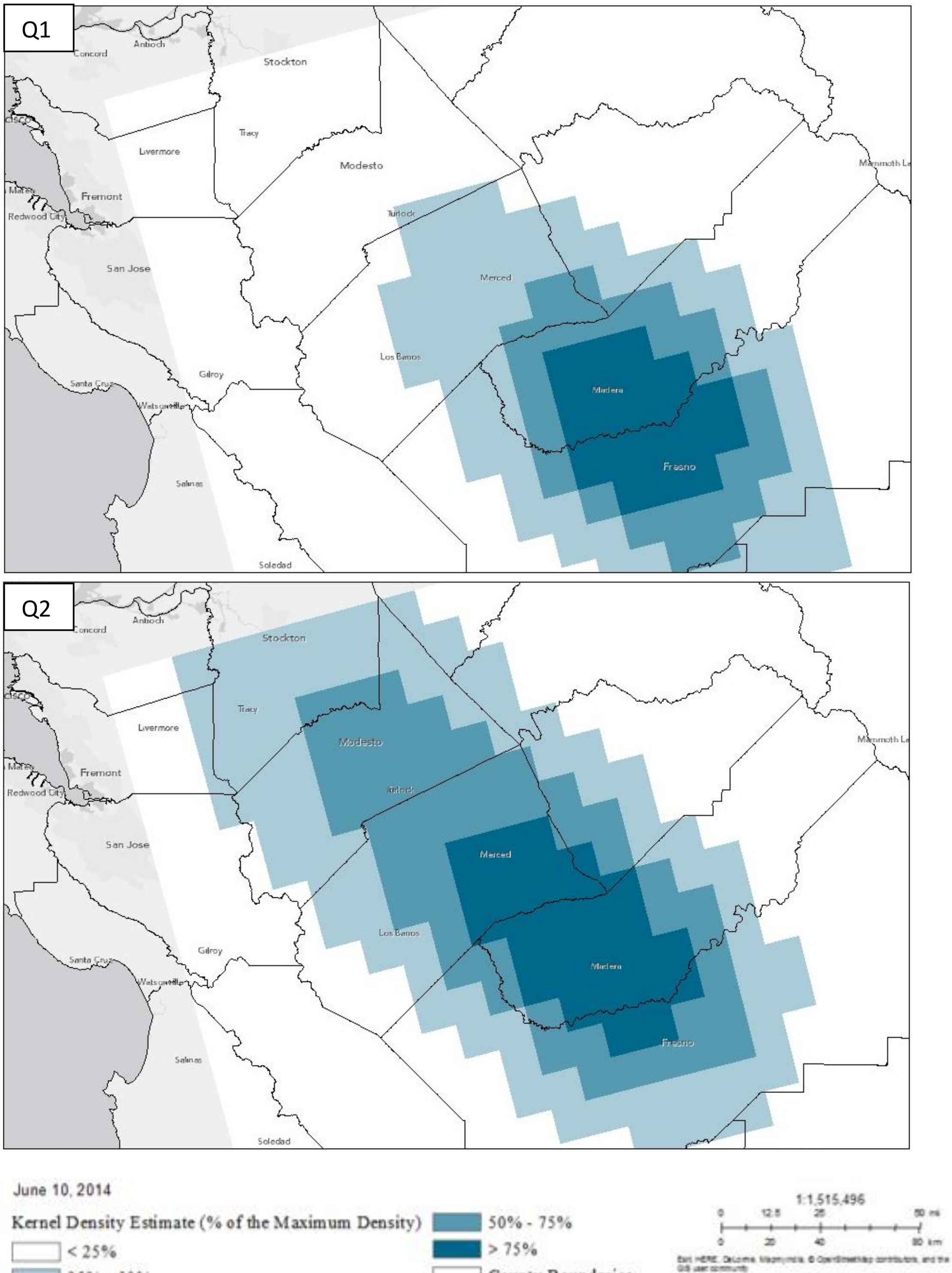
Figures 9a) HYSPLIT Kernel Density Estimation Plots for the northern San Joaquin Valley, Modesto-14th Street Station (AQS # 060990005)



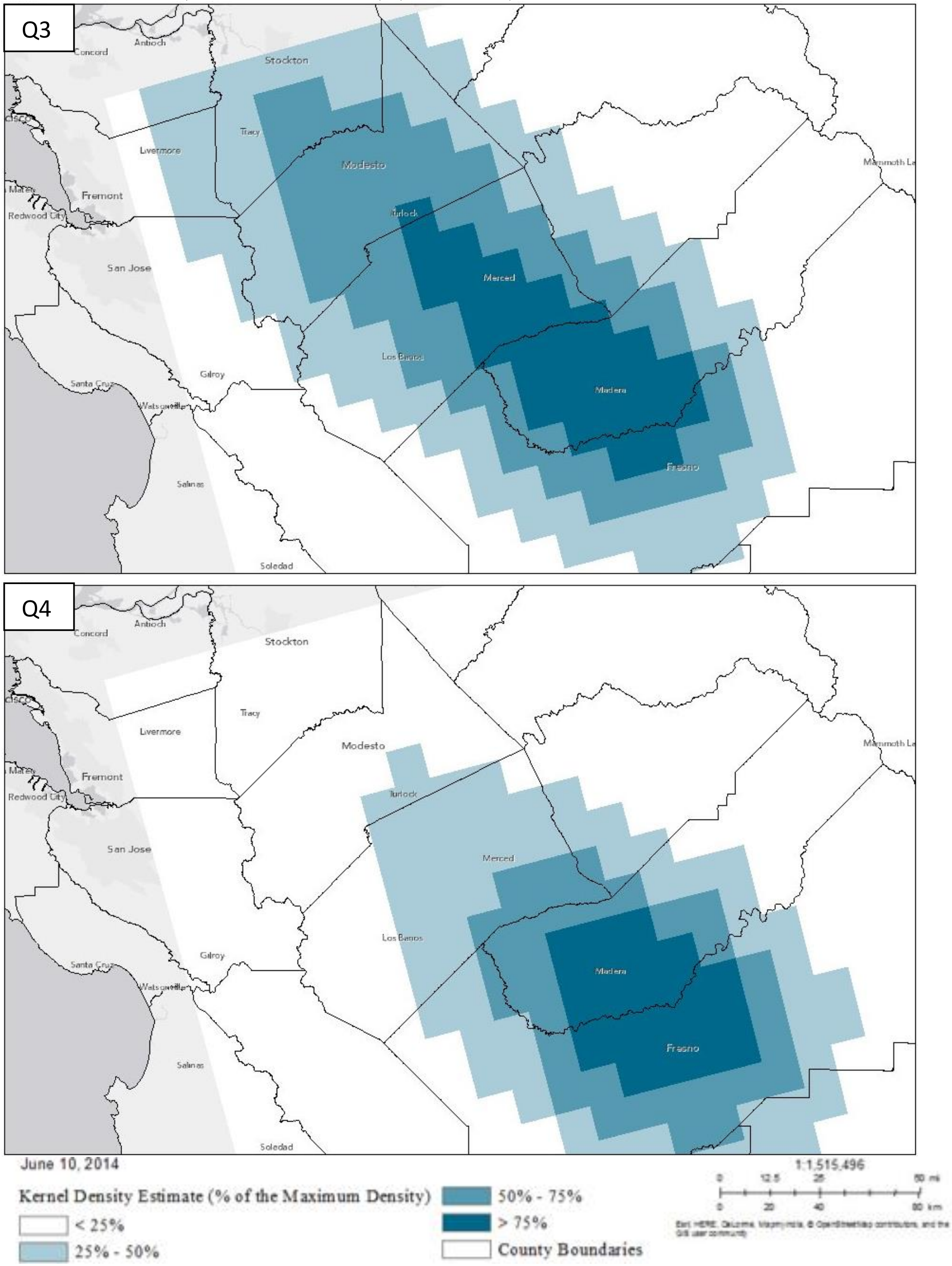
Figures 9a) HYSPLIT Kernel Density Estimation Plots for the northern San Joaquin Valley, Modesto-14th Street Station (AQS # 060990005) (continued)



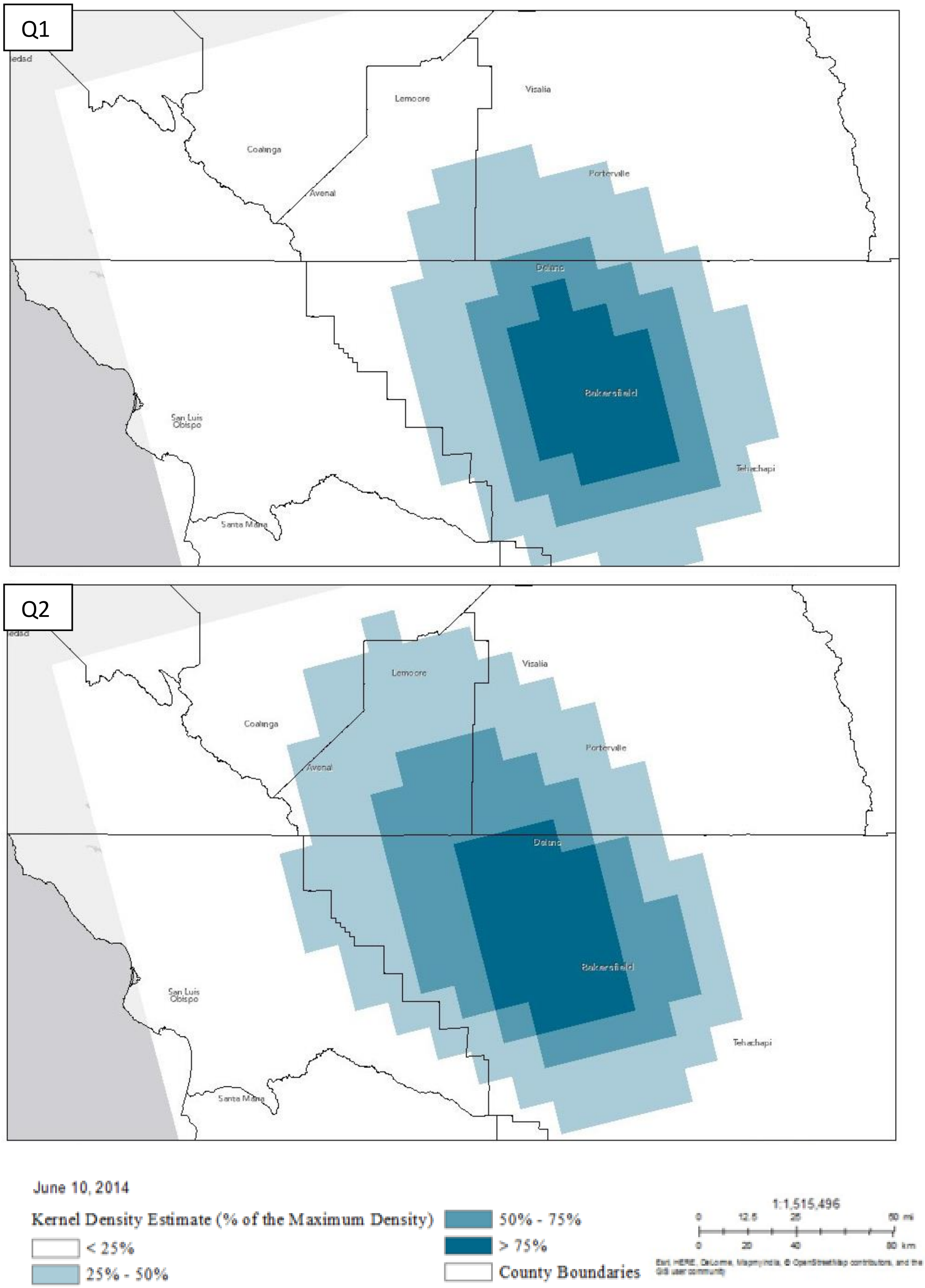
Figures 9b) HYSPLIT Kernel Density Estimation Plots for the Central San Joaquin Valley, Fresno-Garland Station (AQS # 060190011)



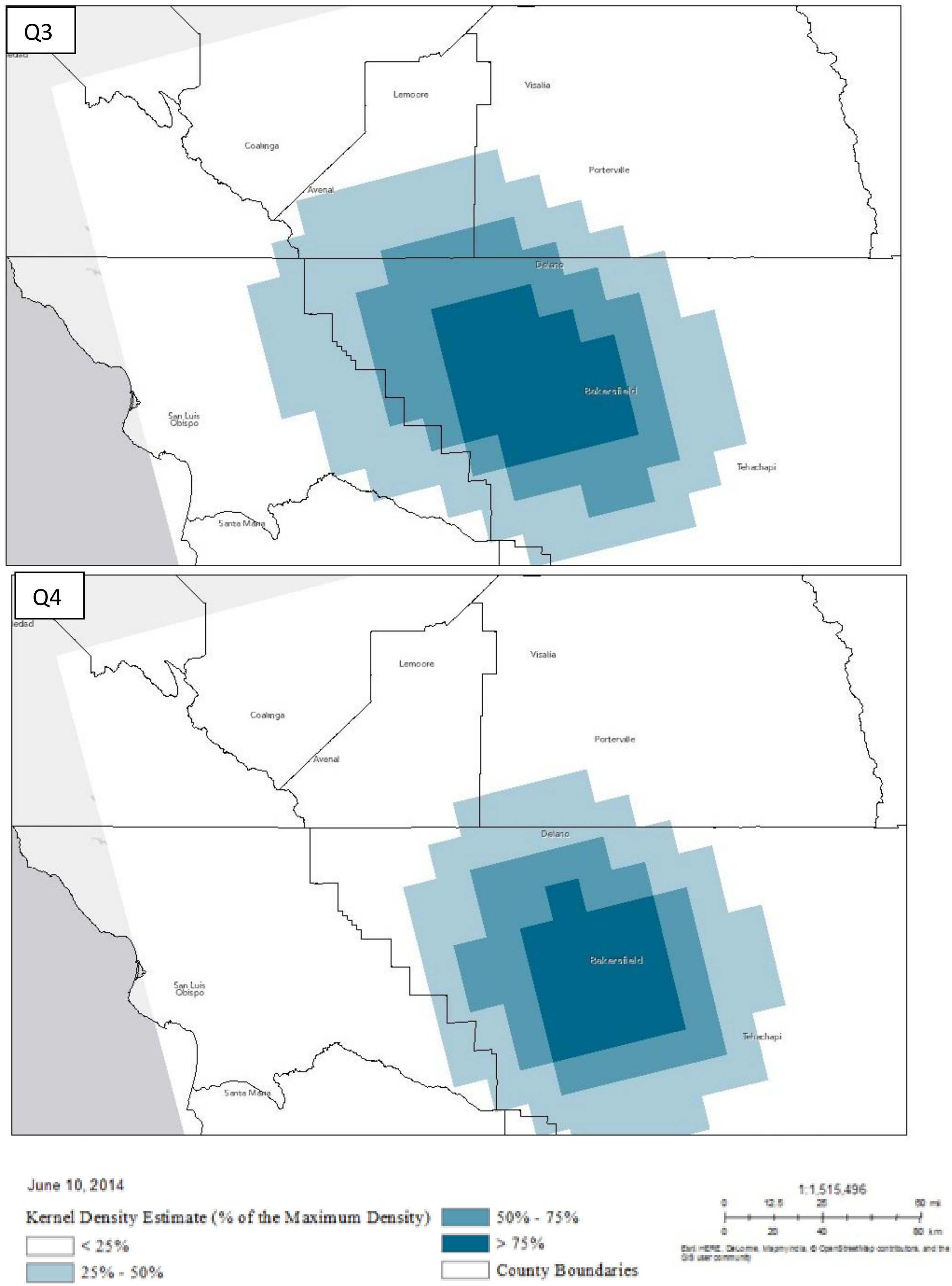
Figures 9b) HYSPLIT Kernel Density Estimation Plots for the Central San Joaquin Valley, Fresno-Garland Station (AQS # 060190011) (continued)



Figures 9c) HYSPLIT Kernel Density Estimation Plots for the southern San Joaquin Valley, Bakersfield-Planz Station (AQS # 060290016)



Figures 9c) HYSPLIT Kernel Density Estimation Plots for the southern San Joaquin Valley, Bakersfield-Planz Station (AQS # 060290016) (continued)



Factor 4: Geography/topography

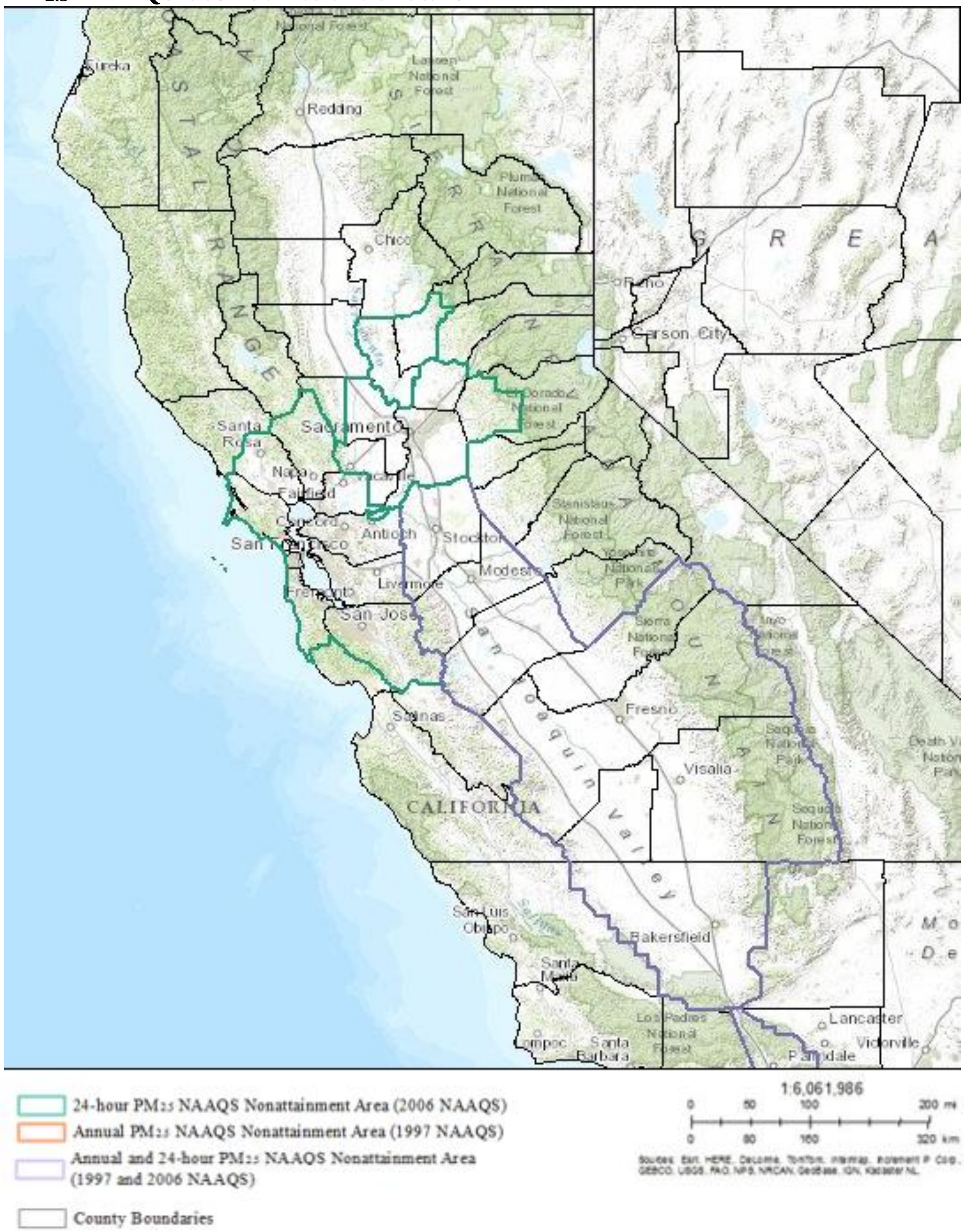
To evaluate the geography/topography factor, the EPA assessed physical features of the area of analysis that might define the airshed and thus affect the formation and distribution of $PM_{2.5}$ concentrations over the area.

The San Joaquin Valley is the southern half of the large, flat Central Valley of California, extending 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 10).

Except to the north, the San Joaquin Valley is surrounded on all sides by tall mountains. These ranges tend to restrict air flow and ventilation. Mountains also run through Kern County, separating it into an eastern and western portion. As shown in Figure 10, this topography makes it unlikely that the small emissions in the eastern portion of the county contribute to the western part that has violating monitors and is included in the nonattainment area. While there is no topographic barrier between the San Joaquin Valley and the Sacramento Valley to the north, air masses tend to bifurcate where the two valleys meet, providing a degree of separation much of the time. Additionally, periods of high $PM_{2.5}$ concentrations in the San Joaquin Valley are often associated with stagnation and low wind speeds, limiting the influence of air masses outside of the nonattainment area boundary.

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, residential wood burning, and agricultural operations such as dairies and field-tilling that occur widely throughout the counties in the nonattainment area. Consideration of this factor supports the boundary for the San Joaquin Valley nonattainment area.

Figure 10. Topographical Map of San Joaquin Valley. County and nonattainment area for the $PM_{2.5}$ NAAQS boundaries are shown.



Factor 5: Jurisdictional boundaries

In defining the boundaries of the San Joaquin Valley nonattainment area, the EPA considered existing jurisdictional boundaries, which can provide easily identifiable and recognized boundaries for purposes of implementing the NAAQS. Existing jurisdictional boundaries often signify the state, local, or tribal governmental organization with the necessary legal authority for carrying out air quality planning and enforcement functions for the nonattainment area. Examples of such jurisdictional boundaries include existing/prior nonattainment area boundaries for particulate matter, county lines, air district boundaries, township boundaries, areas covered by a metropolitan planning organization, state lines, and Reservation boundaries, if applicable. Where existing jurisdictional boundaries were not adequate or appropriate to describe the nonattainment area, the EPA considered other clearly defined and permanent landmarks or geographic coordinates for purposes of identifying the boundaries of the designated areas.

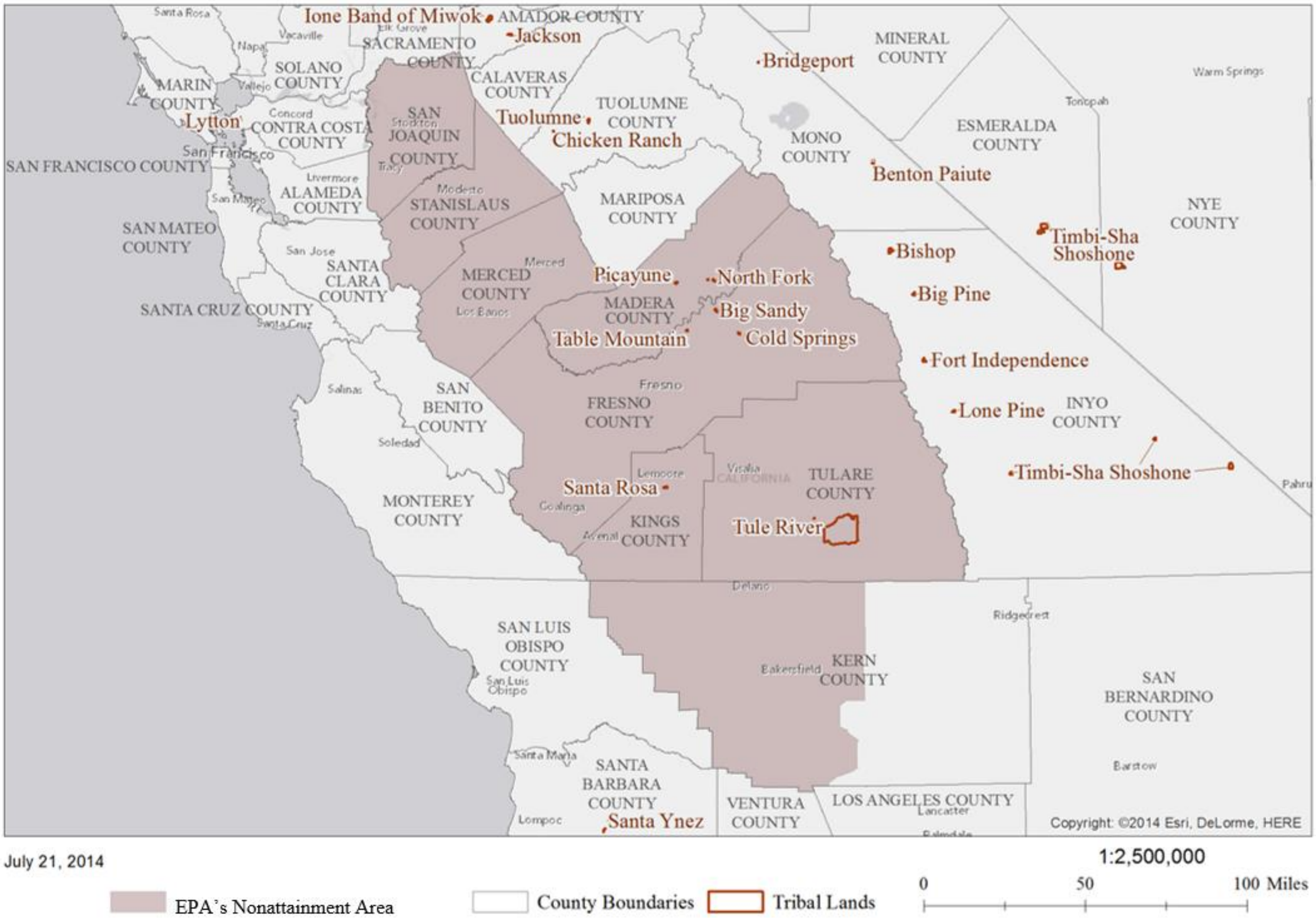
The San Joaquin Valley area has previously established nonattainment boundaries associated with both the 1997 annual and 2006 24-hour $PM_{2.5}$ NAAQS. The boundary for the nonattainment area for the 1997 annual $PM_{2.5}$ NAAQS and the 2006 24-hour $PM_{2.5}$ NAAQS was the same and included the entire counties of Fresno, Kings, Madera, Merced, San Joaquin, Stanislaus and Tulare and a portion of Kern County. The state has recommended the same boundary for the 2012 annual $PM_{2.5}$ NAAQS.

The San Joaquin Valley nonattainment area includes the Fresno-Madera combined statistical area (CSA), and the entireties of the Stockton, Modesto, Merced, Hanford-Corcoran, and Visalia-Porterville metropolitan statistical areas (MSA). The entirety of Kern County forms the Bakersfield-Delano MSA; however, only the western portion is being included as part of the San Joaquin Valley nonattainment area. The boundary for the San Joaquin Valley nonattainment area is the same as the jurisdictional boundary for the San Joaquin Valley Air Pollution Control District and the San Joaquin Valley Air Basin.

The boundary between western and eastern Kern County is a generally north-south line bisecting the county along the Sierra Nevada mountain range. The eastern portion of Kern County is under the jurisdiction of the Kern County Air Pollution Control District. It contains part of the Sierra Nevada mountain range and lands east of the Sierras, within the Mojave Desert Air Basin. The eastern portion of Kern County is less likely to be contributing to violating monitors in the San Joaquin Valley Air Basin due to the lower population and VMT discussed in Factor 2, combined with the separation between the airsheds due to the mountain range discussed in Factor 4.

San Joaquin Valley also includes Indian country of the following tribes: the Big Sandy Rancheria of Western Mono Indians, the Cold Springs Rancheria of Mono Indians of California, the Northfork Rancheria of Mono Indians of California, the Picayune Rancheria of Chuckchansi Indians of California, the Santa Rosa Indian Community of the Santa Rosa Rancheria, the Table Mountain Rancheria of California, and the Tule River Indian Tribe of the Tule River Reservation. Indian country within the nonattainment areas are shown in Figure 1. As defined at 18 U.S.C. 1151, "Indian country" refers to: "(a) all land within the limits of any Indian reservation under the jurisdiction of the United States Government, notwithstanding the issuance of any patent, and, including rights-of-way running through the reservation, (b) all dependent Indian communities within the borders of the United States whether within the original or subsequently acquired territory thereof, and whether within or without the limits of a state, and (c) all Indian allotments, the Indian titles to which have not been extinguished, including rights-of-way running through the same." The EPA recognizes the sovereignty of tribal governments, and has attempted to take the desires of the tribes into account in establishing appropriate nonattainment area boundaries. The EPA did not receive recommendations from these tribes.

Figure 11. EPA's Nonattainment Boundaries for the San Joaquin Valley Area and Nearby Tribes.



Conclusion for San Joaquin Valley Area

Based on the assessment of factors described above, both individually and in combination, the EPA has concluded that the following counties or portions of counties should be included as part of the San Joaquin Valley nonattainment area because they are either violating the 2012 annual $PM_{2.5}$ NAAQS or contributing to a violation in a nearby area: San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern (partial) counties. The EPA concurs with the state's recommendation for this area and notes that this is the same area that is included in the San Joaquin Valley nonattainment area for both the 2006 24-hour and 1997 annual $PM_{2.5}$ NAAQS.

An evaluation of Factor 1 shows that the air quality monitoring sites in San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern counties indicate violations of the 2012 annual $PM_{2.5}$ NAAQS based on the 2013 DVs; therefore these counties or portions of counties are included in the nonattainment area. Factor 2 shows that Tulare and Kern counties have among the highest emissions of directly emitted $PM_{2.5}$ and/or $PM_{2.5}$ precursors in the area, population growth from 2000 to 2010 was around twenty percent for all counties in the nonattainment area, and there is not relatively meaningful commuting between Sacramento and San Joaquin Valley. Factor 2 also shows that all counties in the nonattainment area contribute to the particulate matter concentrations which result in violations of the 2012 annual $PM_{2.5}$ NAAQS through emissions from point sources, non-point sources (e.g. area sources), and mobile sources. Factor 3 suggests that the greatest potential contribution of emissions is from the regions immediately to the west-northwest of the monitors. As discussed in Factors 3 and 4, the San Joaquin Valley is surrounded on all sides by tall mountains, except to the north where generally the air flow from the Pacific Ocean through the Golden Gate toward the east tends to bifurcate where the two valleys meet, providing some degree of separation between the San Joaquin Valley and the Sacramento Valley much of the time. Finally, an assessment of Factor 5 further supports the San Joaquin Valley nonattainment area due to previous nonattainment boundary designations and local air district jurisdiction.

Only a portion of Kern County is included in the San Joaquin Valley nonattainment area because of jurisdictional boundaries (Factor 5), and because the sources in the eastern portion of Kern are less likely to be contributing because they are relatively small and there is topographic separation between the air basins (Factors 2 and 4). The factors that the EPA primarily relied upon when determining the appropriate boundary for the San Joaquin Valley nonattainment area were Air Quality Data (Factor 1), Meteorology (Factor 3), Geography/Topography (Factor 4), and Jurisdiction (Factor 5).

Also, the EPA is including the areas of Indian country of the following tribes as part of the San Joaquin Valley nonattainment area for the 2012 annual $PM_{2.5}$ NAAQS: the Big Sandy Rancheria of Western Mono Indians, the Cold Springs Rancheria of Mono Indians of California, the Northfork Rancheria of Mono Indians of California, the Picayune Rancheria of Chuckchansi Indians of California, the Santa Rosa Indian Community of the Santa Rosa Rancheria, the Table Mountain Rancheria of California, and the Tule River Indian Tribe of the Tule River Reservation.

Appendix 1:

Air Quality Monitoring Data Table

Appendix 1: Air Quality Monitoring Data Table

State	Nonattainment Area (if applicable)	County	AQS ID	Site Name	2011-2013 DV
California	**Imperial Co, CA**	**Imperial**	**060250005**	**Calexico-Ethel**	**14.3[e]**
California	Imperial Co, CA	Imperial	060250007	Brawley	7.5
California	Imperial Co, CA	Imperial	060251003	El Centro	7.4
California	Los Angeles-South Coast Air Basin	Los Angeles	060370002	Azusa	11.2
California	**Los Angeles-South Coast Air Basin**	**Los Angeles**	**060371002**	**Burbank**	**12.5[f]**
California	**Los Angeles-South Coast Air Basin**	**Los Angeles**	**060371103**	**Los Angeles-Main St.**	**12.5[f]**
California	Los Angeles-South Coast Air Basin	Los Angeles	060371201	Reseda	10.2
California	Los Angeles-South Coast Air Basin	Los Angeles	060371302	Compton	12.2
California	Los Angeles-South Coast Air Basin	Los Angeles	060371602	Pico Rivera #2	12.0
California	Los Angeles-South Coast Air Basin	Los Angeles	060372005	Pasadena	10.4*
California	Los Angeles-South Coast Air Basin	Los Angeles	060374002	Long Beach (North)	10.9[f]
California	Los Angeles-South Coast Air Basin	Los Angeles	060374004	South Long Beach	10.8[f]
California	**Los Angeles-South Coast Air Basin**	**Orange**	**060590007**	**Anaheim**	**10.6[f]**
California	Los Angeles-South Coast Air Basin	Orange	060592022	Mission Viejo	8.2
California	Los Angeles-South Coast Air Basin	Riverside	060651003	Riverside	11.5
California	Los Angeles-South Coast Air Basin	Riverside	060658001	Rubidoux	13.2[f]
California	**Los Angeles-South Coast Air Basin**	**Riverside**	**060658005**	**Mira Loma-Van Buren**	**14.8[f]**
California	**Los Angeles-South Coast Air Basin**	**San Bernardino**	**060710025**	**Ontario Fire Station**	**12.6**
California	**Los Angeles-South Coast Air Basin**	**San Bernardino**	**060712002**	**Fontana**	**12.6**
California	Los Angeles-South Coast Air Basin	San Bernardino	060718001	Big Bear	8.7
California	Los Angeles-South Coast Air Basin	San Bernardino	060719004	San Bernardino	11.8
California	Plumas County, CA	Plumas	060631006	Quincy	10.2
California	**Plumas County, CA**	**Plumas**	**060631010[a]**	**Portola North Substation**	**12.8**
California	San Joaquin Valley, CA	Fresno	060192009	Tranquillity	7.8

State	Nonattainment Area (if applicable)	County	AQS ID	Site Name	2011-2013 DV
California	**San Joaquin Valley, CA**	**Fresno**	**060195001**	**Clovis**	**16.4**
California	San Joaquin Valley, CA	Fresno	060195025	Fresno-Pacific	14.7
California	San Joaquin Valley, CA	Fresno	060190011[b]	Fresno - Garland	15.4
California	San Joaquin Valley, CA	Kern	060290014	Bakersfield-California Avenue	16.4
California	**San Joaquin Valley, CA**	**Kern**	**060290016**	**Bakersfield-Planz**	**17.3**
California	San Joaquin Valley, CA	Kings	060310004	Corcoran	15.0*
California	**San Joaquin Valley, CA**	**Kings**	**060311004**	**Hanford**	**17.0**
California	**San Joaquin Valley, CA**	**Madera**	**060392010**	**Madera-City**	**18.1**
California	**San Joaquin Valley, CA**	**Merced**	**060470003**	**Merced-Coffee Ave**	**13.3**
California	San Joaquin Valley, CA	Merced	060472510	Merced-M Street	11.1
California	**San Joaquin Valley, CA**	**San Joaquin**	**060771002**	**Stockton-Hazelton**	**13.8**
California	San Joaquin Valley, CA	San Joaquin	060772010	Manteca	10.2
California	San Joaquin Valley, CA	Stanislaus	060990005	Modesto-14th Street	13.6
California	**San Joaquin Valley, CA**	**Stanislaus**	**060990006**	**Turlock**	**15.7**
California	**San Joaquin Valley, CA**	**Tulare**	**061072002**	**Visalia - N. Church**	**16.6**
California		Alameda	060010007	Livermore - Rincon	7.6
California		**Alameda**	**060010009**	**Oakland East**	**10.0**
California		Alameda	060010011	Oakland West	9.9*
California		**Butte**	**060070008[c]**	**Chico - East Avenue**	**10.1**
California		**Calaveras**	**060090001**	**San Andreas-Gold Strike Road**	**8.4**
California		**Colusa**	**060111002**	**Colusa-Sunrise Blvd**	**7.1**
California		**Contra Costa**	**060130002**	**Concord**	**7.4**
California		Contra Costa	060131004	San Pablo - Rumrill	9.6*
California		**Humboldt**	**060231002**	**Eureka-I Street**	**6.2**
California		Humboldt	060231004	Eureka-Jacobs	7.7*

State	Nonattainment Area (if applicable)	County	AQS ID	Site Name	2011-2013 DV
California		Humboldt	060231005	Eureka-Humboldt Hill	7.4*
California		**Inyo**	**060271003**	**Keeler**	**7.5**
California		Kern	060290011	Mojave-Poole	7.0*
California		Kern	060290015	Ridgecrest	5.4*
California		**Lake**	**060333001**	**Lakeport**	**3.8**
California		Los Angeles	060379033	Lancaster	6.1*
California		**Marin**	**060410001**	**San Rafael**	**9.5**
California		Mendocino	060450006	Ukiah-Library	6.7*
California		Mendocino	060452002	Willits Justice Center	8.8*
California		Monterey	060530002	Carmel Valley	5.9*
California		Monterey	060530008	King City 2	6.3*
California		**Monterey**	**060531003**	**Salinas 3**	**6.1**
California		Napa	060550003	Napa	12.7*[g]
California		Nevada	060570005	Grass Valley - Litton Bldg	4.6
California		**Nevada**	**060571001**	**Truckee-Fire Station**	**7.0**
California		Placer	060610003	Auburn-11645 Atwood	5.8*
California		**Placer**	**060610006**	**Roseville-N Sunrise Blvd**	**7.5**
California		**Riverside**	**060652002**	**Indio**	**7.7**
California		Riverside	060655001	Palm Springs	6.4
California		Riverside / San Diego	060650009	Pechanga	7.7
California		**Sacramento**	**060670006**	**Sacramento-Del Paso Manor**	**10.4**
California		Sacramento	060670010	Sacramento-1309 T Street	9.5
California		Sacramento	060674001	Sacramento-Health Dept.	9.3
California		**San Benito**	**060690002**	**Hollister 2**	**5.5**
California		San Bernardino	060710306	Victorville	6.8*

State	Nonattainment Area (if applicable)	County	AQS ID	Site Name	2011-2013 DV
California		San Diego	060730001	Chula Vista	9.9
California		San Diego	060730003	El Cajon	10.6[f]
California		San Diego	060731002	Escondido	10.7[f]
California		San Diego	060731006	Alpine	7.8*
California		San Diego	060731008	Camp Pendleton	10.4*
California		**San Diego**	**060731010**	**San Diego - Downtown**	**10.8[f]**
California		San Diego	060731016[d]	San Diego-Kearny Villa Road	8.7
California		**San Francisco**	**060750005**	**San Francisco - Arkansas St.**	**9.2**
California		San Luis Obispo	060792004	Unocal - Nipomo	8.7
California		San Luis Obispo	060792006	San Luis Obispo	6.6
California		**San Luis Obispo**	**060792007**	**Mesa Cal Fire Station 22**	**11.3**
California		San Luis Obispo	060798001	Atascadero	7.0
California		**San Mateo**	**060811001**	**Redwood City**	**9.3**
California		**Santa Barbara**	**060830011**	**Santa Barbara**	**9.5**
California		Santa Barbara	060831008	Santa Maria	7.6
California		Santa Clara	060850002	Gilroy	8.0
California		**Santa Clara**	**060850005**	**San Jose**	**10.3**
California		**Santa Cruz**	**060870007**	**Santa Cruz 4**	**6.3**
California		Shasta	060890004	Redding – Health Dept	5.7
California		**Shasta**	**060893004**	**Redding - Buckeye**	**6.2**
California		Shasta	060893005	Redding - Toyon	4.9*
California		**Siskiyou**	**060932001**	**Yreka**	**6.3**
California		**Solano**	**060950004**	**Vallejo**	**9.6**
California		**Sonoma**	**060970003**	**Santa Rosa**	**8.4**
California		**Sutter**	**061010003**	**Yuba City**	**7.7**

State	Nonattainment Area (if applicable)	County	AQS ID	Site Name	2011-2013 DV
California		Trinity	061050002	Weaverville	6.5*
California		**Ventura**	**061110007**	**Thousand Oaks**	**9.1**
California		Ventura	061110009	Piru	8.1
California		Ventura	061111004	Ojai	9.0*
California		**Ventura**	**061112002**	**Simi Valley**	**9.1**
California		Ventura	061113001	El Rio	9.0
California		**Yolo**	**061131003**	**Woodland-Gibson Road**	**7.2**

[a] In July 2013, the Portola-Nevada Street site (AQS ID 060631009) was relocated to the Portola North Substation site (AQS ID 060631010). The data listed for Plumas County is a combination of data from Portola-Nevada Street site from 2009 through June 2013, and from Portola North Substation from July 2013 through the remainder of 2013.

[b] In December 2011, the Fresno-First Street site (AQS ID 060190008) was relocated to the Fresno-Garland site (AQS ID 060190011). The design values listed combine data from Fresno-First Street through 2011 and data from Fresno-Garland from 2012 and 2013.

[c] In July 2012, the Chico-Manzanita site (AQS ID 060070002) was relocated to the Chico East site (AQS ID 060070008). The data listed for Butte County is a combination of data from Chico-Manzanita from 2009 through June 2012, and from Chico East from July 2012 through 2013.

[d] In February 2012, the San Diego-Overland (Kearny Mesa) site (060730006) was relocated to the San Diego-Kearny Villa Road site (060731016). The data listed for the San-Diego-Kearny Villa Road site is a combination of data from San Diego-Overland from 2009 through February 17, 2012, and from San-Diego-Kearny Villa Road from February 21, 2012 through 2013.

[e] Design value based on all valid data, including data in 2011 and 2012 that were submitted to, but are not currently in, AQS. EPA considers these data valid for use per 40 CFR Part 50 and 58 (see Memorandum "Use of Data for Imperial County, CA PM2.5 Design Value Calculations").

[f] This design value does not include data from Class III FEM monitors that EPA has approved as not eligible for comparison to the NAAQS per 40 CFR 58.11(e).

Documents associated with this action available at www.regulations.gov, Docket ID No. EPA-HQ-OAR-2012-0918.

[g] This design value is from a monitor that began operating on December 13, 2012.

* = Design Value (DV) does not meet data completeness requirements.

BOLD = DV monitor for the County

BOLD AND RED = DV monitor for the Nonattainment Area and the County

Grouped by Nonattainment Area (and within the area, alphabetically by County), then Unclassifiable/Attainment Counties or partial counties.