

Technical Support Document for 2008 Ozone NAAQS Designations

California Area Designations for the 2008 Ozone National Ambient Air Quality Standards

Technical Analysis for San Francisco Bay Area

Figure 1 is a map of the San Francisco Bay Area, CA nonattainment area. The map provides other relevant information including the locations and design values of air quality monitors, county names and boundaries, and indicates EPA's 2008 ozone NAAQS nonattainment designation. Also shown is the boundary of the existing area that is designated nonattainment for the 1997 ozone NAAQS.

San Francisco Bay Area, CA

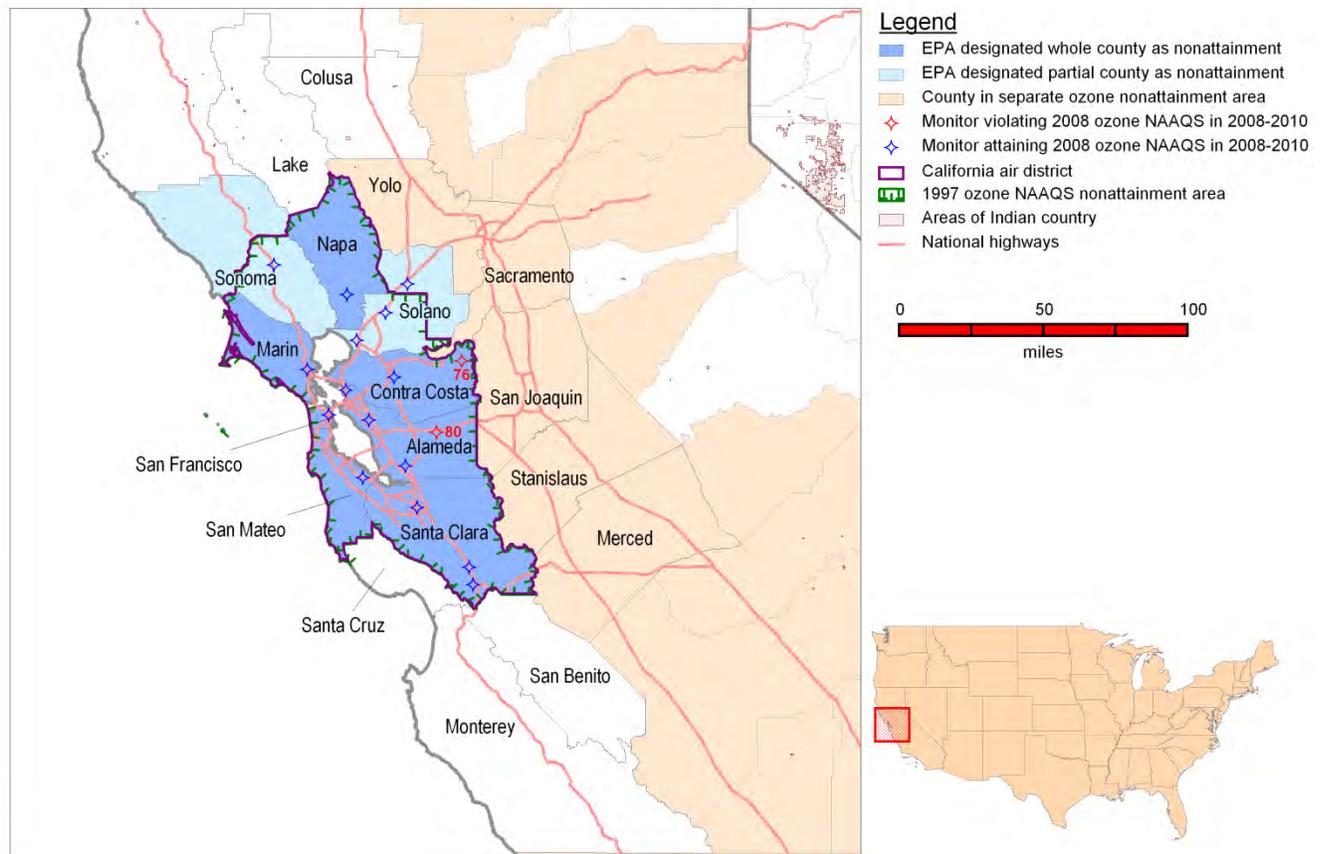


Figure 1

Note: The map shown in Figure 1 provides 8-hour ozone design values in parts per billion (ppb) based on data from 2008-2010 (i.e., the 2010 design value, or DV), which are the most recent years with fully-certified air quality data. Factor 1 and Appendix 3 describe the air quality data relevant for our nonattainment decisions.

For purposes of the 1997 8-hour ozone NAAQS, this area was designated nonattainment. The boundary for the nonattainment area for the 1997 ozone NAAQS included the entire counties of San Francisco, Marin, Napa, Contra Costa, Alameda, Santa Clara and San Mateo and part of Sonoma (southern part) and Solano (southwest part not included in Sacramento Metro Area) counties. Several areas of Indian country were included in the nonattainment area. These are the same tribes that are listed in Table 1, below.

In March 2009, California recommended that the same counties or parts of counties be designated as “nonattainment” for the 2008 ozone NAAQS based on air quality data from 2006-2008 (letter from James Goldstene, Executive Officer, California Air Resources Board, to Laura Yoshii, Acting Regional Administrator, U.S. EPA Region IX, dated March 11, 2009). California provided an update to the original recommendation in October 2011 based on air quality data from 2008-2010 and preliminary 2009-2011 data, but did not revise its recommendation for the San Francisco Bay Area. These 2009 and 2011 recommendations are based on data from Federal Equivalent Method (FEM) monitors sited and operated in accordance with 40 CFR Part 58 (letter from Lynn Terry, Deputy Executive Officer, California Air Resources Board, to Deborah Jordan, Director, U.S. EPA Region IX Air Division, dated October 12, 2011).

After considering these recommendations and based on EPA's technical analysis described below, EPA is designating seven counties, two partial counties, and areas of Indian country of two federally recognized tribes (identified in Table 1 below) as “nonattainment” for the 2008 ozone NAAQS as part of the San Francisco Bay Area multi-jurisdictional nonattainment area.

Table 1. State or Tribe’s Recommended and EPA’s 2008 ozone NAAQS Nonattainment Counties or Areas of Indian country for San Francisco Bay Area.

San Francisco Bay Area, CA	State or Tribe-Recommended Nonattainment Counties or Areas of Indian country	EPA’s Nonattainment Counties or Areas of Indian country
San Francisco County	San Francisco County	San Francisco County
Marin County	Marin County	Marin County
Sonoma County	Sonoma County (p)	Sonoma County (p)
Napa County	Napa County	Napa County
Solano County	Solano County	Solano County
Contra Costa County	Contra Costa County	Contra Costa County
Alameda County	Alameda County	Alameda County
Santa Clara County	Santa Clara County	Santa Clara County
San Mateo County	San Mateo County	San Mateo County
Federated Indians of Graton Rancheria	N/A	Federated Indians of Graton Rancheria
Lytton Rancheria of California	N/A	Lytton Rancheria of California

p = partial

N/A = Tribe did not submit a recommendation

Factor Assessment

Factor 1: Air Quality Data

For this factor, we considered 8-hour ozone design values for air quality monitors in counties in the existing San Francisco Bay Area nonattainment area, based on data from the 2008-2010 period (i.e., the 2010 design value, or DV) 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 2008 ozone NAAQS are met at a monitor when the annual fourth-highest daily maximum 8-hour average concentration, averaged over 3 years is 0.075 parts per million (ppm) (75 parts per billion (ppb)) or less. A DV is only valid if minimum data completeness criteria are met. See 40 CFR part 50 Appendix P. Where several monitors are located in a county (or a designated nonattainment area or maintenance area), the DV for the county or area is determined by the monitor with the highest level.

[Note: Monitors that are eligible for providing design value data generally include State and Local Air Monitoring Stations (SLAMS) that are sited in accordance with 40 CFR Part 58, Appendix D (Section 4.1) and operating with a federal reference method (FRM) or federal equivalent method (FEM) monitor that meets the requirements of 40 CFR part 58, Appendix A. All data from a special purpose monitor (SPM) using an FRM or FEM which has operated for more than 24 months is eligible for comparison to the NAAQS unless the monitoring agency demonstrates that the data came from a particular period during which the requirements of Appendix A (quality assurance requirements) or Appendix E (probe and monitoring path siting criteria) were not met.]

The existing San Francisco Bay Area nonattainment area comprises Alameda County, Contra Costa County, Marin County, Napa County, San Francisco County, San Mateo County, Santa Clara County, Solano County (partial), and Sonoma County (partial) (see Map 12a in Appendix 2). The 2010 DVs for the ozone NAAQS for counties in the existing San Francisco Bay Area nonattainment area are shown in Table 2.

Table 2. Air Quality Data.

County	State Recommended Nonattainment?	2008-2010 Design Value (ppb)
Alameda, CA	Yes	80
Contra Costa, CA	Yes	76
Marin, CA	Yes	54
Napa, CA	Yes	66
San Francisco, CA	Yes	47
San Mateo, CA	Yes	57
Santa Clara, CA	Yes	75
Solano, CA	Yes	71
Sonoma, CA	Yes (partial)	54

Ozone monitors relevant for comparison to the NAAQS and information from additional data sources within the San Francisco Bay Area nonattainment area are shown in Appendix 1, Map 12 (inserted below). The state has recommended that Solano County be designated nonattainment, with the northeastern part in the Sacramento Metro nonattainment area, and the southwestern part in the San Francisco Bay Area nonattainment area. The design value shown in Table 2 is from a monitor located within this northeastern portion of Solano County. As shown in Appendix 1, Map 12, the southwestern part of Solano County, within the existing San Francisco Bay Area nonattainment area, has a 2010 DV

of 69 ppb. All other values shown in Table 2 are from monitors within the existing San Francisco Bay Area nonattainment area.

California's ozone season encompasses the entire year, but some ozone monitors in the San Francisco Bay Area have been approved to operate on a seasonal schedule per 40 CFR part 58, Appendix D, section 4.1(i). Certified, quality assured data are available in EPA's Air Quality System (AQS) for all areas through calendar year 2010. Map 12 in Appendix 1 includes preliminary 2011 DVs for the existing San Francisco Bay Area nonattainment area for informational purposes only. For each monitor, Appendix 1 lists the monitor, the 2008-2010 DV (certified and quality assured in AQS) and the 2009-2011 DV (data that are not yet certified and quality assured in AQS are denoted with an underline). Absence of a DV is symbolized with an "x".

Appendix 3 lists the DVs for monitors in the existing San Francisco Bay Area nonattainment area. Monitors shown in bold are the DV monitors (i.e., the monitor with the highest DV) for each individual county. Monitors shown in red font are the DV monitor for the nonattainment area. Values with an asterisk do not meet data completeness, and therefore those DVs are not relevant for comparison to the NAAQS and are solely provided for informational purposes.

Monitors in Alameda County and Contra Costa County show a violation of the 2008 8-hour ozone standard based on 2008-2010 data. Therefore, these areas are included in the San Francisco Bay Area 2008 ozone NAAQS nonattainment area. A county (or partial county) must also be designated nonattainment if it contributes to a violation in a nearby area. Each county without a violating monitor that is located near a county with a violating monitor has been evaluated based on the weight of evidence of the five factors to determine whether it contributes to the nearby violation.



From Appendix 1, Map 12: For map legend describing monitors, emissions, traffic, population, and boundaries, see Appendix 1. Monitor dot colors (green or red) are based on preliminary 2011 DV data. EPA is basing its intended designation for the San Francisco Bay Area on 2008-2010 data.

Factor 2: Emissions and Emissions-Related Data

EPA evaluated emissions of ozone precursors, nitrogen oxides (NO_x) and volatile organic compounds (VOC), and other emissions-related data that provide information on areas contributing to violating monitors.

Emissions data

EPA evaluated county-level emission data for NO_x and VOC derived from the 2008 National Emissions Inventory (NEI), version 1.5. This is the most recently available NEI. (See <http://www.epa.gov/ttn/chief/net/2008inventory.html>) Emissions in a nearby area indicate the potential for the area to contribute to observed violations. Table 3 shows emissions of NO_x and VOC (given in tons per year) for violating and nearby counties that we considered for inclusion in the San Francisco Bay Area 2008 ozone NAAQS nonattainment area.

Table 3. Total 2008 NO_x and VOC Emissions.

County	State Recommended Nonattainment?	NO _x (tpy)	VOC (tpy)
Alameda, CA	Yes	40,415	27,192
Contra Costa, CA	Yes	34,200	21,751
Marin, CA	Yes	5,518	5,959
Napa, CA	Yes	3,761	4,626
San Francisco, CA	Yes	15,391	10,779
San Mateo, CA	Yes	14,002	11,959
Santa Clara, CA	Yes	32,952	33,035
Solano, CA	Yes	15,361	11,339
Sonoma, CA	Yes (partial)	10,517	13,906
	Areawide:	172,116	140,546

Emissions of ozone precursors from the nine-county San Francisco Bay Area nonattainment area are higher than emissions from the Sacramento Metro area (70,578 and 56,819 tons per year of NO_x and VOC, respectively), but not as high as emissions from the San Joaquin Valley and Los Angeles-South Coast Air Basin nonattainment areas. Stationary source emissions are clustered along the San Francisco Bay (rather than along the Pacific Ocean side of San Francisco and Marin counties), and along the major roadways running north through southern Sonoma and Napa counties, northeast through Solano County, east through Contra Costa County and Alameda County, and south through Santa Clara County (see Map 12 in Appendix 1). Stationary sources of ozone precursor emissions are distributed throughout the San Francisco Bay Area, on both a north-south axis, as well as running east into the Sacramento Metro and San Joaquin Valley nonattainment areas. The northern portion of Sonoma County is distinct from the southern portion in that it contains very few stationary sources of ozone precursor emissions. The northeastern portion of Solano County, included in the Sacramento Metro nonattainment area, contains numerous stationary sources of emissions.

Population density and degree of urbanization

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. These include ozone-creating emissions from on-road and off-road vehicles and engines, consumer products, residential fuel combustion, and consumer services. Areas of dense population or commercial development are an indicator of area source and mobile source NO_x and VOC emissions, which contribute to ozone formation. Rapid population growth or growth in vehicle miles traveled (VMT) (see below) 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 area associated with area source and mobile source emissions as part of the nonattainment area. Table 4 shows the population, population density, and population growth information for each county in the area.

Table 4. Population and Growth.

County	State Recommended Nonattainment?	2010 Population	2010 Population Density (1000 pop/sq mi)	Absolute change in population (2000-2010)	Population % change (2000-2010)
Alameda, CA	Yes	1,510,271	2.01	59,875	+4%
Contra Costa, CA	Yes	1,049,025	1.38	95,721	+10%
Marin, CA	Yes	252,409	0.47	4,812	+2%
Napa, CA	Yes	136,484	0.17	11,946	+10%
San Francisco, CA	Yes	805,235	17.06	27,703	+4%
San Mateo, CA	Yes	718,451	1.57	10,009	+1%
Santa Clara, CA	Yes	1,781,642	1.37	95,488	+6%
Solano, CA	Yes	413,344	0.47	16,373	+4%
Sonoma, CA	Yes (partial)	483,878	0.30	23,453	+5%
	Areawide:	7,150,739	1.00	345,380	+5%

Sources: U.S. Census Bureau population estimates for 2010 as of August 4, 2011

(http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_PL_GCTPL2.STO5&prodType=table)

Maps 12 and 12a in Appendices 1 and 2, respectively, show population for this area. Over the 2000 - 2010 period, the nine counties in the San Francisco Bay Area exhibited growth rates of 10% or less, which are lower than growth rates observed in the counties comprising the San Joaquin Valley and Sacramento Metro nonattainment areas. However, the absolute change in population in the San Francisco Bay was similar to the population increase in the Sacramento Metro area. Population growth is associated with even greater growth in traffic and commuting patterns, which are also associated with emissions of ozone precursors (see next section). Population centers are located throughout the San Francisco Bay Area counties, and are generally co-located with the stationary sources of NO_x and VOC emissions (see Maps 12 and 12a of Appendices 1 and 2). The violating monitors in the San Francisco Bay Area are located farther inland in parts of Alameda and Contra Costa counties that are less densely populated than the population centers adjacent to the San Francisco Bay. The northern portion of Sonoma County is distinct from the southern portion in that it is sparsely populated. The northeastern portion of Solano County is also not heavily populated.

Traffic (VMT) data

EPA evaluated the commuting patterns of residents in the area, as well as the total VMT for each county. In combination with the population/population density data and the location of main transportation arteries (see above), this information helps identify the probable location of non-point

source emissions. A county with high VMT indicates the presence of motor vehicle emissions that may contribute to ozone formation and nonattainment in the area. Rapid population or VMT growth in a county on the urban perimeter signifies increasing integration with the core urban area, and indicates that the associated area source and mobile source emissions may be appropriate to include in the nonattainment area. Table 5 shows total 2008 VMT for each county in the area.

Table 5. Traffic (VMT) data.

County	State Recommended Nonattainment?	2008 VMT* (million miles)
Alameda, CA	Yes	11,201
Contra Costa, CA	Yes	8,405
Marin, CA	Yes	2,364
Napa, CA	Yes	1,488
San Francisco, CA	Yes	4,258
San Mateo, CA	Yes	7,543
Santa Clara, CA	Yes	14,993
Solano, CA	Yes	3,280
Sonoma, CA	Yes (partial)	4,118
Areawide:		57,651

*MOBILE model VMTs are those inputs into the NEI version 1.5.

In the San Francisco Bay Area, VMT is high compared to VMT in the Sacramento Metro and San Joaquin Valley nonattainment areas. The northern portion of Sonoma County is distinct from the southern portion in that it has lower traffic volume (see Map 12 of Appendix 1). The northeastern portion of Solano County, included in the Sacramento Metro 2008 ozone NAAQS nonattainment area, contains high traffic volume. EPA is designating Sacramento Metro and the San Joaquin Valley as separate nonattainment areas.

Factor 3: Meteorology (weather/transport patterns)

EPA evaluated available meteorological data to help determine how meteorological conditions, such as weather, transport patterns and stagnation conditions, would affect the fate and transport of precursor emissions contributing to ozone formation.

The eastern portions of the San Francisco Bay Area have hot, dry, summers, with conditions conducive to ozone formation. The summers are less intense than in the Central Valley toward the east, on the other side of the Coast Ranges. The summer heat is mitigated by periods of fog caused by condensation in air cooled by the cold upwelling Pacific waters.

The San Francisco Bay Area flow is most frequently from the north-northwest according to 30-year average of National Weather Service summer wind direction frequencies computed by EPA, as shown in the “radar”-style wind rose diagram below (Figure 2).

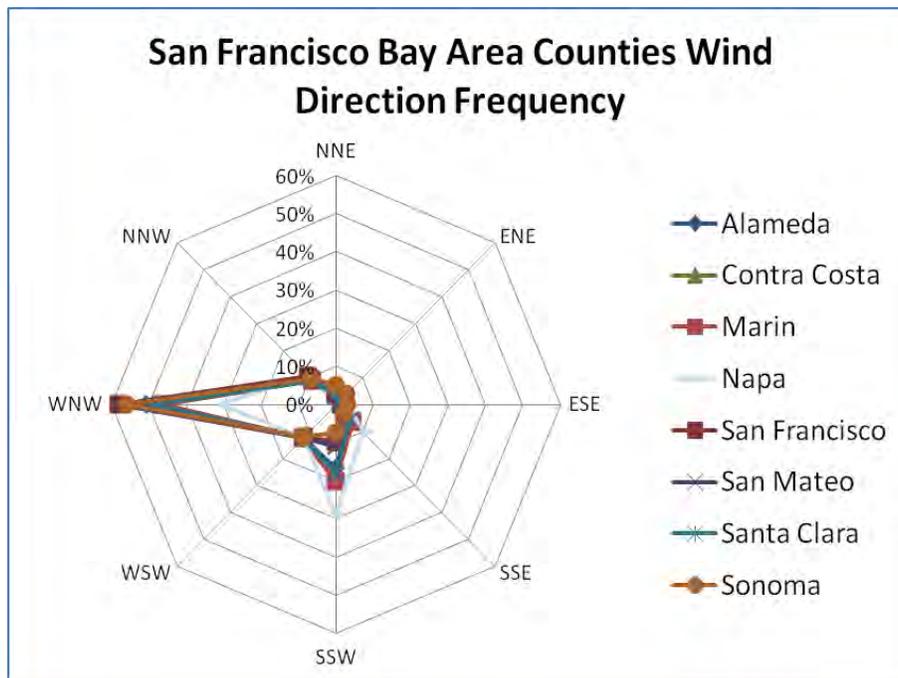


Figure 2

The California Coast Range topographically separates the Sacramento Metro area from the San Francisco Bay area, despite the important gap leading to the Golden Gate. The two areas have different meteorology, with the Sacramento Metro area being part of the hot and dry Central Valley, with substantial marine influence at times, while the San Francisco Bay area is dominated by interaction with air masses over the Pacific Ocean.

Factor 4: Geography/topography (mountain ranges or other air basin boundaries)

The geography/topography analysis evaluates the physical features of the land that might affect the airshed and, therefore, the distribution of ozone over the area.

The San Francisco Air Basin encompasses approximately 5,430 square miles and consists of all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo and Santa Clara counties, the southern half of Sonoma County and the southwestern portion of Solano County. The Air Basin is equivalent to the state’s recommended San Francisco Bay Area nonattainment area. The region is characterized by complex terrain, consisting of coastal mountain ranges, rugged hillsides, and inland valleys and bays. Elevations range from sea level to 1,500 feet. The area is generally surrounded by hilly or mountainous terrain that separates it from neighboring areas. The main exception is the Golden Gate (at the mouth of San Francisco Bay), which is an important gap toward the northwest, and the Sacramento Metro area.

The California Coast Range topographically separates the Sacramento Metro area from the San Francisco Bay area, despite the important gap leading to the Golden Gate. The two areas have different topography, with the Sacramento Metro area being mainly flat, and a part of the Central Valley, and the San Francisco Bay area being more hilly, and a part of the Pacific coast.

Factor 5: Jurisdictional boundaries

For each potential nonattainment area, we considered existing jurisdictional boundaries to provide a clearly defined legal boundary and to help identify the areas appropriate for carrying out the air quality planning and enforcement functions for nonattainment areas. Examples of jurisdictional boundaries include existing/prior nonattainment area boundaries for ozone or other urban-scale pollutants, county lines, air district boundaries, township boundaries, areas covered by a metropolitan planning organization, state lines, areas of Indian country, and urban growth boundaries. Where existing jurisdictional boundaries were not adequate or appropriate to describe the nonattainment area, other clearly defined and permanent landmarks or geographic coordinates were considered.

The San Francisco Bay Area has previously-established nonattainment boundaries associated with both the 1-hour and the 1997 8-hour ozone NAAQS. The state has recommended the same boundary for the 2008 ozone NAAQS.

The state's recommendation includes the entire counties of San Francisco, Marin, Napa, Contra Costa, Alameda, Santa Clara and San Mateo and part of Sonoma (southern part) and Solano (southwest part not included in Sacramento Metro Area) counties. The state's recommendation includes the entirety of the jurisdictional area of the Bay Area Air Quality Management District (Bay Area AQMD). The partial county boundary for Sonoma County reflects the fact that the northern portion of the county is relatively less populated. The county forms the boundary for the Santa Rosa-Petaluma Metropolitan Statistical Area (MSA). The Office of Management and Budget defines such areas in decreasing ranking of populated areas within the MSA. Both Santa Rosa and Petaluma are completely within the partial county boundary that is included as part of the Bay Area AQMD. The partial county boundary for Sonoma County is consistent with the boundary between the Bay Area Air Basin and the North Coast Air Basin.

Regarding the partial county boundary in Solano County, this boundary is shared among various jurisdictions. The boundary demarcates the portion of the county that falls under the air quality management jurisdictions of the Bay Area AQMD and the Yolo-Solano Air Quality Management District (YSAQMD). The northern part of the YSAQMD is included in the Sacramento Metro nonattainment area for the 1997 ozone NAAQS and EPA is including it with the Sacramento Metro nonattainment area for the 2008 ozone NAAQS as well. The partial county boundary for Solano County is consistent with the boundary between the Bay Area Air Basin and the Sacramento Valley Air Basin¹. Regarding transportation planning, the partial county boundary in Solano County is also the boundary between the jurisdictions of the Metropolitan Transportation Commission (MTC), which performs transportation planning in the Bay Area, and the Sacramento Council of Governments (SACOG), which performs the same function in the wider Sacramento Metro area.

The San Francisco Bay Area 2008 ozone NAAQS nonattainment area includes most of the San Jose-San Francisco-Oakland combined statistical area (CSA). The CSA comprises six metropolitan statistical areas (MSAs): the Santa Rosa-Petaluma, Napa, Vallejo-Fairfield, San Francisco-Oakland-Fremont, San Jose-Sunnyvale-Santa Clara, and Santa Cruz-Watsonville MSAs. The CSA reflects the intended nonattainment area boundaries except the partial counties for Sonoma and Solano counties, as previously discussed, and the exclusion of San Benito County, to the south. San Benito County² is not

¹ <http://www.arb.ca.gov/ei/maps/statemap/abmap.htm>

² San Benito County is in attainment of the 2008 ozone NAAQS based on 2009-2011 data. See Appendix 3.

under the jurisdiction of the Bay Area Air Quality Management District, but rather it is under the jurisdiction of the Monterey Bay Unified Air Pollution Control District.

The San Francisco Bay Area also includes areas of Indian country. 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.” 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 tribes whose areas of Indian country are included in the San Francisco Bay Area nonattainment area are the Federated Indians of Graton Rancheria and Lytton Rancheria of California.

Conclusion

Based on the assessment of factors described above, EPA is designating the following counties as part of the San Francisco Bay Area, CA nonattainment area because they are either violating the 2008 ozone NAAQS or contributing to a violation in a nearby area: San Francisco County, Marin County, Sonoma County (partial), Napa County, Solano County (partial), Contra Costa County, Alameda County, Santa Clara County, and San Mateo County. This area also includes the reservation lands of two tribes: the Federated Indians of Graton Rancheria and the Lytton Rancheria of California.

The Clean Air Act requires EPA to designate any area as nonattainment if it violates a NAAQS or if it contributes to a violation in a nearby area. Air quality data (Factor 1) show that monitors in Alameda County and Contra Costa County show a violation of the 2008 8-hour ozone standard based on 2008-2010 data. Therefore, based on Factor 1, Alameda County and Contra Costa County are included in the San Francisco Bay Area nonattainment area.

Evaluation of emissions and emissions-related data (Factor 2) show that emission sources of ozone precursors (including stationary sources, population centers, and mobile sources) from all seven counties or partial counties are clustered along the San Francisco Bay. The state’s recommended nonattainment area includes two partial counties in the San Francisco Bay nonattainment area. The northern portion of Sonoma County is distinct from the southern portion in that it is sparsely populated, has lower traffic volume and contains very few stationary sources of ozone precursor emissions. The northeastern portion of Solano County is also not heavily populated but does contain numerous stationary sources of emissions and high traffic volume, both of which contribute to ozone formation. EPA is designating the northeastern portion of Solano County with the Sacramento Metro nonattainment area. Consideration of emissions data (Factor 2) supports the state’s recommended nonattainment area, which appropriately encompasses source and receptor populations in the San Francisco Bay Area.

EPA’s review of meteorology and weather or transport patterns (Factor 3) and geography and topography (Factor 4) support the state’s recommendation for the San Francisco Bay Area nonattainment area.

In considering jurisdictional boundaries (Factor 5), the San Francisco Bay Area has previously-established nonattainment boundaries associated with both the 1-hour and the 1997 8-hour ozone NAAQS. The state has recommended the same boundary for the 2008 ozone NAAQS. The existing

boundary includes two partial counties: Sonoma County to the north along the Pacific coast, and Solano County to the northeast. The Sonoma partial county boundary shares the same boundary as the boundary between the Bay Area Air Basin and the North Coast Air Basin. The boundary that creates the partial Solano County demarcates the portion of the county that falls under the jurisdictions of the Bay Area AQMD and the Yolo-Solano AQMD. The Yolo-Solano AQMD is part of the Sacramento Metro nonattainment area for the 1997 ozone NAAQS and EPA is including it with the Sacramento Metro nonattainment area for the 2008 ozone NAAQS as well. The state's recommended nonattainment area has identical borders to the San Francisco Bay Air Basin.

EPA concurs with the state's recommendation that the existing nonattainment area boundary appropriately encompasses stationary and mobile sources of emissions and accounts for meteorological, geographical, and existing jurisdictional boundaries in the San Francisco Bay Area. EPA is designating seven counties, two partial counties, and areas of Indian country (identified in Table 1 above) as "nonattainment" for the 2008 ozone NAAQS as part of the San Francisco Bay Area, CA multi-jurisdictional nonattainment area.