


Sacramento Regional 2008 NAAQS 8-Hour Ozone Attainment And Reasonable Further Progress Plan

July 24, 2017


El Dorado County Air Quality Management District
Dave Johnston, Air Pollution Control Officer
330 Fair Ln, Placerville, CA 95667
(530) 621-7501
http://edcgov.us/AirQualityManagement/

Feather River Air Quality Management District
Christopher Brown, AICP, Air Pollution Control Officer
541 Washington Ave, Yuba City, CA 95991
(530) 634-7659
http://www.fraqmd.org

Placer County Air Pollution Control District
Erik White, Air Pollution Control Officer
110 Maple Street
Auburn, CA 95603
(530) 745-2330
http://www.placerair.org

Sacramento Metropolitan Air Quality Management District
Dr. Alberto Ayala, Air Pollution Control Officer
777 12th Street, Third Floor
Sacramento, CA 95814-1908
(916) 874-4800
http://www.airquality.org

Yolo-Solano Air Quality Management District
Mat Ehrhardt P.E., Air Pollution Control Officer
1947 Galileo Court, Suite 103
Davis, CA 95618
(530) 757-3650
http://www.ysaqmd.org

SACRAMENTO REGIONAL

2008 NAAQS

8-HOUR OZONE ATTAINMENT AND

REASONABLE FURTHER PROGRESS PLAN

July 24, 2017

ACKNOWLEDGEMENTS

This report was prepared by Sacramento Metropolitan Air Quality Management District staff from the Program Coordination Division as a joint project with the El Dorado County Air Quality Management District, Feather River Air Quality Management District, Placer County Air Pollution Control District, Yolo-Solano Air Quality Management District, and Sacramento Area Council of Governments.

Project Oversight
Mark Loutzenhiser, Charles Anderson

Lead Authors
Steven Lau, Rich Muzzy, Karen Taylor, Hao Quinn

Subject (Authors or Contributors)
Emissions Inventory: Hao Quinn, Karen Taylor
Mobile Source and Land Use Control Measures: Tim Taylor
Transportation Control Measures: Renée DeVere-Oki, SACOG

Stationary Source Control Measure Authors
Oversight and Sacramento AQMD: Aleta Kennard, Kevin J. Williams
Yolo-Solano AQMD: Matt Jones
Placer County APCD: Yu-Shuo Chang
El Dorado County AQMD: Adam Baughman
Feather River AQMD: Sondra Spaethe

We would like to thank staff from the California Air Resources Board for their major contributions in the development of the updated motor vehicle emissions budgets, photochemical modeling, and reasonable further progress evaluation. Various consultants and California Air Resources Board staff also provided information on local, state, and federal control measures in conjunction with the attainment demonstration modeling assessment.

We would also like to thank staff from the United States Environmental Protection Agency Region IX for their assistance and consultation in the development of this plan.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

List of Abbreviations and Acronyms

AB -	Assembly Bill
ACC -	Advanced Clean Cars
APCD -	Air Pollution Control District
AQIP -	Air Quality Improvement Plan
AQMD -	Air Quality Management District
ARW -	Advanced Research WRF
ASM -	Acceleration Simulation Mode
AVG -	Average
BAR -	Bureau of Automotive Repair
BVOC -	Biogenic Volatile Organic Compound
BY -	Baseline Year
CAA -	Clean Air Act
CARB -	California Air Resources Board
CEPAM -	California Emissions Projection Analysis Model
CFR -	Code of Federal Regulations
CMAQ -	Community Multiscale Air Quality Model (Chapter 6)
CMAQ -	Congestion Mitigation and Air Quality Improvement (Chapter 7)
CO -	Carbon Monoxide
CO_2 -	Carbon Dioxide
CTG -	Control Techniques Guidelines
CVRP -	Clean Vehicle Rebate Project
DTIM -	Direct Travel Impact Model
DV -	Design Value
EDCAQMD -	El Dorado County Air Quality Management District
EPMP -	Enhanced Fleet Modernization Program
EIS -	Emissions Inspection System
EMFAC -	Emissions Factor California's on-road motor vehicle emission factor model
EMS -	Emissions Modeling System
ERC -	Emission Reduction Credit

FHWA - Federal Highway Administration
FR - Federal Register
FRAQMD - Feather River Air Quality Management District
FY - Future Year
g/bhp-hr grams per brake horsepower-hour
GVWR - Gross Vehicle Weight Rating
HC - Hydrocarbon
HVIP - Hybrid and Zero Emission Truck and Bus Voucher Incentive Project
HWRF - Hurricane WRF
IC - Internal Combustion
I/M - Vehicle Inspection And Maintenance
LEV - Low Emission Vehicle
LSI - Large Spark Ignition
MCAB - Mountain County Air Basin
MEGAN - Model of Emissions of Gases and Aerosols from Nature
MMM - Mesoscale and Microscale Meteorology
MOZART - Model for OZone And Related chemical Tracers
MPO - Metropolitan Planning Organization
MTC - Metropolitan Transportation Commission (Bay Area)
MTIP - Metropolitan Transportation Improvement Program
MTP - Metropolitan Transportation Plan
MVEB - Motor Vehicle Emissions Budget
NAAQS - National Ambient Air Quality Standard
NCAR - National Center for Atmospheric Research
NMM - Nonhydrostatic Mesoscale Model
NSR - New Source Review
NO_X - Nitrogen Oxides
OAQPS - Office of Air Quality Planning and Standards
OBD - On Board Diagnostics
OGV - Ocean Going Vehicle

PCAPCD - Placer County Air Pollution Control District
PM - Particulate Matter
ppb - parts per billion
ppm - parts per million
RACM - Reasonably Available Control Measure
RACT - Reasonably Available Control Technology
RFG - Reformulated Gasoline
RFP - Reasonable Further Progress
ROG - Reactive Organic Gases
ROP - rate-of-progress
RPP - Regional Planning Partnership
RRF - Relative Response Factor
RS - Redesignation Substitute
SACOG - Sacramento Area Council of Governments
SAPRC - Statewide Air Pollution Research Center
SCS - Sustainable Communities Strategy
SECAT - Sacramento Emergency Clean Air and Transportation
SFNA - Sacramento Federal Nonattainment Area
SIP - State Implementation Plan
SMAQMD - Sacramento Metropolitan Air Quality Management District
SMOKE – Sparse Matrix Operator Kernel Emissions modeling system
SORE - Small Off-Road Engine
SVAB - Sacramento Valley air Basin
TCM - Transportation Control Measure
TSI - Two Speed Idle
tpd - tons per day
USEPA - United States Environmental Protection Agency
VMT - Vehicle Miles Traveled
VOC - Volatile Organic Compounds
WRF - Weather and Research Forecasting

YSAQMD - Yolo-Solano Air Quality Management District

ZEV - Zero-Emission Vehicle

1 EXECUTIVE SUMMARY

1.1 Background Information on Ozone

Ground-level ozone or “smog” is one of the air pollutants regulated by both federal and state laws. It is a colorless gas formed in the presence of sunlight when precursor pollutants (nitrogen oxides and volatile organic compounds) mix. The high ozone season is during May through October for the Sacramento region.

Ground-level ozone is a strong irritant that adversely affects human health. Breathing ozone can reduce lung function and worsen respiratory problems. Ozone exposure has been associated with increased susceptibility to respiratory infections, cardiac-related effects, medical visits, school absenteeism, and can contribute to premature death, especially in people with heart and lung disease. Ozone can also cause damage to crops and natural vegetation by acting as a chemical oxidizing agent.

Ground level ozone is formed as a result of photochemical reactions involving two types of precursor pollutants: volatile organic compounds (VOCs) and nitrogen oxides (NO_X). VOCs and NO_X are emitted by many types of sources, including on-road and off-road combustion engine vehicles, power plants, industrial facilities, gasoline stations, organic solvents, and consumer products.

1.2 Overview of the 2008 Federal 8-Hour Ozone Standard

The 2008 federal 8-hour ozone National Ambient Air Quality Standard (NAAQS) lowered the health-based limit for ambient ozone from a concentration of 84 parts per billion (ppb) to 75 ppb averaged over eight hours[1]. An area’s nonattainment designation is based on whether the 8-hour ozone design value for any of the monitoring sites in the area exceeds the NAAQS. The Sacramento region is designated a nonattainment area, and includes all of Sacramento and Yolo counties and portions of Placer, El Dorado, Solano, and Sutter counties. This area is referred to as the Sacramento Federal Nonattainment Area (SFNA).

Nonattainment areas are classified as marginal, moderate, serious, severe, or extreme depending on the magnitude of the highest 8-hour ozone design value for the monitoring sites in the nonattainment area. The time period allowed to reach attainment increases with the severity of the classification. Under the United States Environmental Protection Agency’s (USEPA) classification rule for the 2008 8-hour ozone NAAQS -- as well as the prior 1997 standard – the SFNA would have been classified as serious based on its design value of 102 ppb (69 FR 23886) at the Folsom Monitoring Site. But the region previously requested reclassification to severe-15 under the 1997 ozone

[1] Under the 2008 eight-hour ozone standard, an area is designated non-attainment if the annual 4th-highest daily maximum 8-hour ozone concentration averaged over 3 years (i.e., ozone design value) exceeds 75 ppb at a monitoring site.

standard, because it could not attain by the deadline for a serious-15 area. USEPA proposed to extend the voluntary reclassification determination for the 1997 ozone NAAQS to the more stringent 2008 ozone NAAQS. It was unknown at the time whether the SFNA would need the additional years afforded to a severe-15 classification area to meet the 2008 standard; therefore none of the air districts within the SFNA opposed the reclassification. Accordingly, California Air Resources Board (CARB) confirmed that it wanted USEPA to interpret previous voluntary reclassification requests as requests for reclassification under the 2008 ozone NAAQS (Goldstene, 2012). As a result, the SFNA was classified as a severe-15 area (77 FR 30088) with a demonstrated attainment deadline of July 20, 2027. To demonstrate compliance, EPA reviews the last three complete years of ambient data preceding the attainment date. Therefore, the SFNA actually needs to attain the standard by the end of 2026. When referencing statutory attainment deadlines throughout this document the year 2026 will be used rather than the July 20, 2027 date. As discussed later in this plan, achieving the standard at an even earlier date will follow the same year convention referenced for the Severe-15 deadline.

1.3 Purpose of the Plan

This Plan demonstrates how the SFNA will meet Clean Air Act (CAA) reasonable further progress requirements and demonstrate attainment of the 2008 ozone NAAQS. This Plan also includes an updated emissions inventory, sets motor vehicle emissions budgets, demonstrates how it complies with vehicle miles traveled (VMT) emissions offset and reasonably available control measure (RACM) requirements, and documents the photochemical modeling used to support the attainment demonstration.

1.4 8-Hour Ozone Trends in the SFNA

Air quality trends from 1990 – 2016 at monitoring stations in the SFNA were compared to the 75 ppb 2008 ozone NAAQS to determine progress in reaching attainment. Within the SFNA[2] there are currently 17 active ozone monitoring stations that are operated by either local air districts or CARB. Identifying the number of days exceeding the 2008 NAAQS helps determine control strategy effectiveness.

The annual number of 8-hour ozone exceedance days recorded at the peak monitoring sites fluctuates from year to year due to meteorological variability and changes in precursor emission patterns. Most exceedances of the 2008 NAAQS occurred at the region's eastern monitoring sites: Cool, Folsom, Placerville, and Auburn.

[2] More information about the monitoring sites in Sacramento County can be found at http://www.airquality.org/Air-Quality-Health/Air-Monitoring, and the monitoring sites in the other districts at http://www.arb.ca.gov/aqd/amnr/amnr.htm.

Figure 1-1 illustrates the trend in the number of exceedance days at the SFNA's monitoring sites with the highest number of exceedance days for each year. The graph bars show the monitoring station with the highest number of exceedances in any given year. For 2016, Placerville recorded the most exceedance days. The overall trend line shows a decline in the number of exceedance days per year over the past 27 years, from 70 days in 1990 down to 28 days in 2016, representing a declining rate of about 1.5 days per year.

Figure 1-1 8-Hour Ozone Exceedance Days Trend SFNA – Peak Monitoring Site

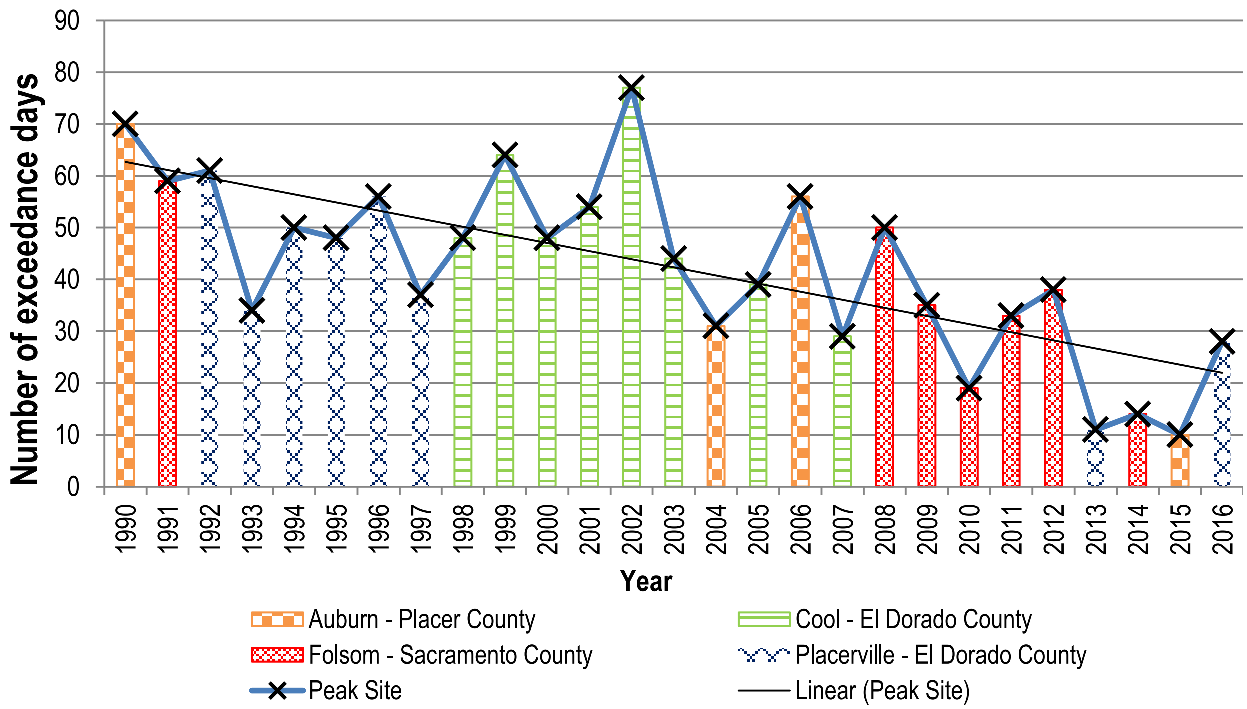
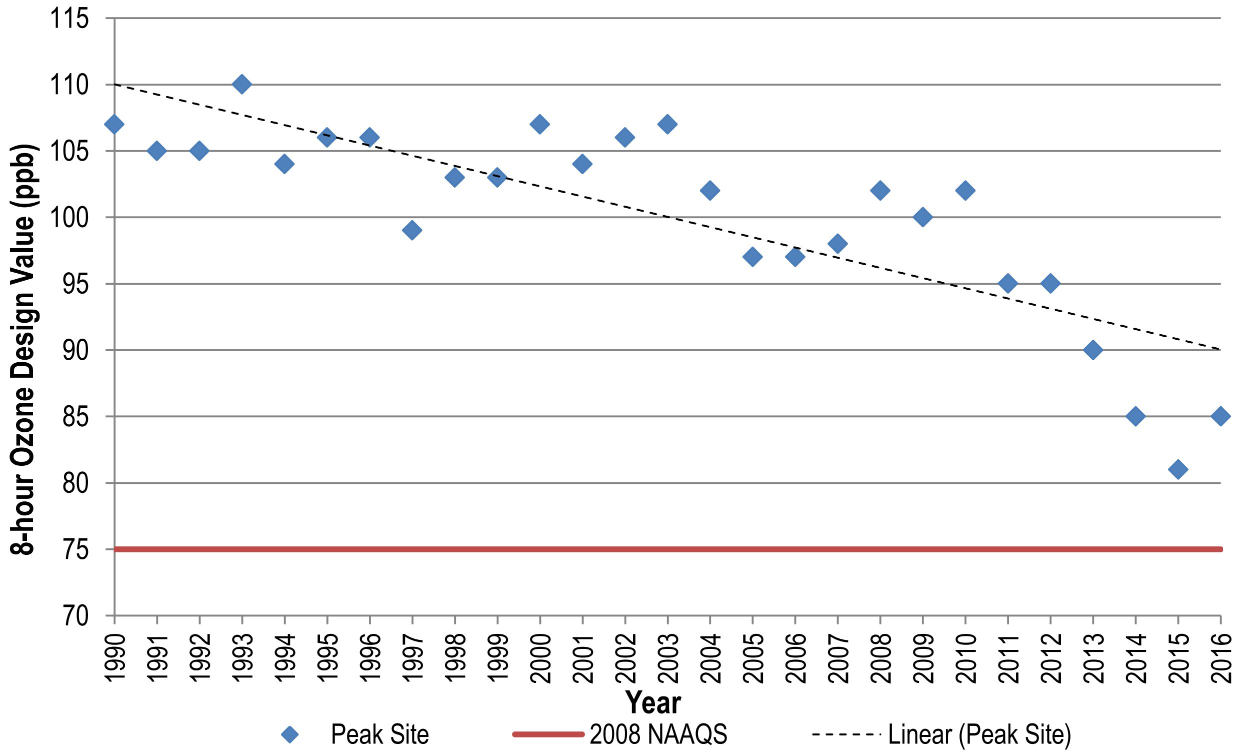


Figure 1-2 shows the ozone design value for the peak monitoring site in each year and a trend line from 1990 to 2016. The overall 27-year trend line indicates a steady decline, from the highest peak of 110 ppb in 1993 down to 85 ppb in 2016. The ozone design value has improved from being 35 ppb (or 46%) over the standard down to about 10 ppb (or 13%) over the standard. The linear trend line in Figure 1-2 shows a declining trend rate of about 0.7 ppb per year.

Figure 1-2 8-Hour Regional Ozone Design Values Trend SFNA



Note: This trend line is the highest 8-hour ozone design values in the region. The current federal 8-hour ozone standard is 75 ppb.

1.5 VOC and NO_X Emissions Inventory

Ozone is not directly emitted into the atmosphere; therefore, planning efforts to evaluate and reduce ozone air pollution include identifying and quantifying the various man-made (anthropogenic) processes and sources of precursor emissions (such as solvents, surface coatings, and motor vehicles, combustion equipment).

The emissions inventory is divided into four broad source categories: stationary sources, area-wide sources, on-road motor vehicles, and other mobile sources. Each of these major categories is further defined into more descriptive equipment types and specific emission processes. The biogenic VOC emissions from vegetation for natural areas, crops, and urban landscapes are estimated separately from the anthropogenic inventory.

The emissions inventory years documented in this plan are 2012 (baseline), 2018 (milestone), 2021 (milestone), and 2024 (attainment year). USEPA emission inventory guidance (USEPA, 2016, p.20) also requires that the State Implementation Plan (SIP) planning emissions inventory be based on estimates of actual emissions for an average summer weekday, typical of the ozone season (May – October). The 2012 base year anthropogenic planning inventory is estimated to be 110 tons per day of VOC emissions and 101 tons per day of NO_X emissions for the SFNA. The base year emissions were used to forecast future year inventories by using socio-economic growth indicators and applying the emission reduction benefits from previously adopted federal, State and local control strategies.

Tables 1-1 and 1-2 show the VOC and NO_X emission inventory forecasts for stationary sources, area-wide sources, on-road motor vehicles, and other mobile sources for the SFNA. The VOC and NO_X emission forecasts show significant declines in mobile source emissions, despite increasing population, vehicle activity, and economic development.

Table 1-1 Emissions Inventory of VOC - SFNA

Emission Category	2012	2018	2021	2024
Stationary Sources	22	22	23	23
Area-Wide Sources	29	29	30	31
On-Road Motor Vehicles	34	20	16	14
Other Mobile Sources	26	20	18	17
Total (tpd)	**110**	**91**	**87**	**84**

Notes: Source (CARB, 2016), does not include 5 tpd of VOC ERCs identified in Appendix A5, Tables A5-1 and A5-2.
Totals may not add exactly due to rounding.

Table 1-2 Emissions Inventory of NO_X - SFNA

Emission Category	2012	2018	2021	2024
Stationary Sources	8	7	7	7
Area-Wide Sources	3	2	2	2
On-Road Motor Vehicles	61	35	26	19
Other Mobile Sources	30	26	23	21
Total (tpd)	**101**	**69**	**58**	**49**

Notes: Source (CARB, 2016), does not include 4 tpd of NO_X ERCs identified in Appendix A5, Tables A5-1 and A5-2.
Totals may not add exactly due to rounding.

1.6 Air Quality Modeling Analysis

To evaluate the attainment of the 2008 8-hour NAAQS, future ozone concentrations were forecasted under changing emission scenarios. Extensive air monitoring and emissions data were collected or estimated for high ozone episodes to provide information for developing base case model simulations.

The photochemical modeling simulations cover May 1, 2012 through Oct 5, 2012 in the SFNA. The simulations were based on 2012 base case year emissions and future year emissions. The future emissions were used to determine if the ozone standard would be attained with existing control strategies. Two future years, 2026 and 2022 were evaluated in determining attainment. Photochemical modeling was done for 2026 since it is the attainment deadline for the SFNA. Based on the air quality data and emissions inventory trends, CARB and the SFNA air districts decided to investigate 2022 as another future modeling year for attainment demonstration.

The modeling results at the Folsom station indicate that both VOC and NO_X reductions provide ozone benefits in the SFNA, but NO_X reductions provide greater ozone benefits than VOC reductions. To lower 1 ppb of ozone, the SFNA can reduce 35 tpd of VOC emissions or 1.7 tpd of NO_X emissions. The modeling results project that the SFNA would attain the 2008 NAAQS between 2022 and 2026.

1.6.1 2024 Attainment Demonstration

Although the CAA sets deadlines for attainment, CAA Sections 172(a)(2)(A) and 181(a) also require nonattainment areas to meet the clean air standards “as expeditiously as practicable.” The modeling results predicted that the future design value at the Folsom monitor[3] for 2022 would be 75.2 ppb and for 2026 would be 70.7 ppb. The SFNA would attain the 2008 NAAQS by 2022 based on EPA guidance[4] without additional future regional and **local** VOC or NO_X control strategies. The Districts are proposing in this plan an attainment year of 2024, which is between the two modeled years of 2022 and 2026. This is two years earlier than the December 31, 2026 attainment demonstration date for a severe-15 classification[5]. An attainment year of 2024 provides a safeguard against inherent uncertainties in predicting ambient ozone concentrations, particularly in light of the uncertainties in emission reductions, meteorology, or natural events (see discussion of modeling uncertainties in Section 6.11). Base year and future emission forecasts were used to estimate the percent reduction in NO_X and VOC emissions needed from the 2012 base year to the 2024 attainment year. Based on the NO_X emissions projection provided by CARB, the design value at the Folsom monitor is estimated to be 72.1 ppb in 2024.

3 Folsom monitoring station was identified as the peak ozone monitoring site for the modeling. The 2012 weighted design value was 90 ppb.

4 USEPA draft modeling guidance truncates the future design value after decimal point (USEPA, 2014, p.106).

5 The regulatory attainment date of July 20, 2027 means that the region must demonstrate attainment by the end of 2026.

1.7 Control Measure Evaluation

The photochemical modeling results demonstrate that the SFNA does not need additional future regional and local control measures, but this SIP still relies on the reductions from existing local and regional control measures and adopted rules and reductions from existing state and federal regulations.

The SFNA air districts are implementing existing regional and local control measures (including stationary source measures), and are assisting the Sacramento Area Council of Governments (SACOG) in implementing existing transportation control measures. The agencies track the implementation of the control measures and monitor the success of the measures and TCMs committed to in the 1994 SIP (SMAQMD et al, 1994) and 2013 SIP (SMAQMD et al, 2013). CARB also tracks the implementation and success of mobile sources emissions control programs.

The Implementation of the 2008 NAAQS for Ozone: State Implementation Plan Requirements Rule (40 CFR 51.1112) requires that the state adopt all reasonably availably control measures necessary to demonstrate attainment as expeditiously as practicable (which the USEPA has defined as measures that, cumulatively, will advance attainment by at least one year) and to meet any reasonable further progress (RFP) requirements. The RACM analysis (Appendix E) considered all measures that are potentially reasonably available, and concluded that the measures would not advance attainment by an additional year (from 2024 to 2023), and as shown on Table 12-1, the measures were not necessary to meet the 3% per year RFP requirements. Therefore, no new local or regional control measures were needed in this SIP to meet CAA requirements.

1.8 Transport Analysis

The air quality in the SFNA can be impacted by pollutant transport from the San Francisco Bay Area and the San Joaquin Valley. Delta breezes carry air pollutants from coastal Bay Area and San Joaquin Valley emission sources downwind to the inland areas of the Sacramento region, and these pollutants may contribute to ozone formation during the same day or the following days. The CARB has determined that the relative impact on air quality in the Sacramento region, from the Bay Area and San Joaquin Valley pollutant transport can be considered overwhelming, significant, or inconsequential depending on meteorological conditions (CARB, 2001, p.25 and p.37). Various studies (Appendix B-2, p.27 and p.28) over the past two decades also reaffirmed that a strong sea breeze with a deep marine boundary layer from the San Francisco Bay Area enhanced pollutant transport into the Sacramento Delta Region. The air flow pattern in the Sacramento Valley (Schultz eddy) also causes pollutants to recirculate and become trapped in the Sacramento region.

1.9 Transportation Conformity and Motor Vehicle Emission Budgets (MVEB)

Under the CAA, federal agencies may not approve or fund transportation plans and projects unless they are consistent with the SIP. Transportation conformity with the SIP requires that transportation activities not cause new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS. Conformity regulations state that emissions from transportation plans and projects must be less than or equal to the MVEB established by reasonable further progress, attainment or maintenance plans (SIPs)(40 CFR 93.118).

Table 1-3 shows the transportation conformity MVEB for VOC and NO_X in the SFNA for the milestone (RFP) years of 2018 and 2021 as well as the attainment year of 2024. The budgets are consistent with the emissions inventory used to demonstrate reasonable further progress and attainment.

The MVEB uses EMFAC2014 with SACOG modeled VMT and speed distributions.The CARB staff released a revised emission rate program, EMFAC2014, which updates the emission rates and planning assumptions used in calculating conformity budgets. The proposed MVEBs will become effective after USEPA finds them adequate or approves the plan, whichever occurs first.

Table 1-3 MVEB for the 2008 8-hour Ozone NAAQS in the SFNA

SFNA	2018		2021		2024	
Unit: tons per day	VOC	NO_X	VOC	NO_X	VOC	NO_X
Baseline Emissions	19.85	35.38	16.24	26.96	14.03	19.55
Margin of Safety				0.5		
Total	19.85	35.38	16.24	27.46	14.03	19.55
Conformity (Emissions) Budget	20	36	17	28	15	20

Note: The budgets are calculated with EMFAC2014 using SACOG 2016 MTP activity and Bay Area Metropolitan Transportation Commission (MTC) data for Eastern Solano County. They reflect the latest regional and state strategies described in Chapter 7. Budgets are rounded up to the nearest ton.

The MVEB incorporated a “safety margin” (40 CFR 93.101; 40 CFR 93.124) of 0.5 tpd of NO_X in 2021. Table 1-3 shows the budgets decline significantly from 2018 through 2024, for both NO_X and VOCs, which will ensure continued progress towards attainment of the 8-hour ozone standard.

1.9.1 Vehicle Miles Traveled Offset (VMT Offset)

Section 182(d)(1)(A) in the CAA requires severe and extreme nonattainment areas to submit VMT offset demonstrations showing that has adopted sufficient transportation measures to offset the any growth in vehicle emissions over the attainment plan period (USEPA, 2012). EPA Guidance states that these demonstrations must show that VMT emissions in the attainment year (assuming predicted VMT growth and imposition of new transportation control measures) are equal to or less than the modeled emissions in the attainment year (assuming no growth in VMT and no new transportation measures added. The VMT offset demonstration in Appendix C meets this requirement by showing that the full motor vehicle control program emissions in the attainment year are lower than the emissions from the motor vehicle control program frozen at 2012 levels. Consequently, the identified transportation control strategies and TCMs are sufficient to offset the growth in emissions due to growth in VMT and satisfy the VMT Offset requirements. The VMT offset demonstration prepared by CARB is available in Appendix C.

1.10 General Conformity

General conformity is the federal regulatory process for preventing major federal actions or projects from interfering with air quality planning goals. Conformity provisions ensure that federal funding and approval are given only to those activities and projects that are consistent with SIPs. Conformity with the SIP means that major federal actions will not cause new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS. A federal agency may demonstrate conformity by showing that the total of direct and indirect emissions from the action is accounted for in the applicable SIP's attainment or maintenance demonstration.

There were no changes to the general conformity regulations made as part of the 2008 NAAQS implementation guidance (80 FR 12284). The existing de minimis emissions levels contained in 40 CFR 93.153(b)(1) will continue to apply to the 2008 ozone NAAQS. There are no additional set aside emissions included in the general conformity analysis as part of this SIP.

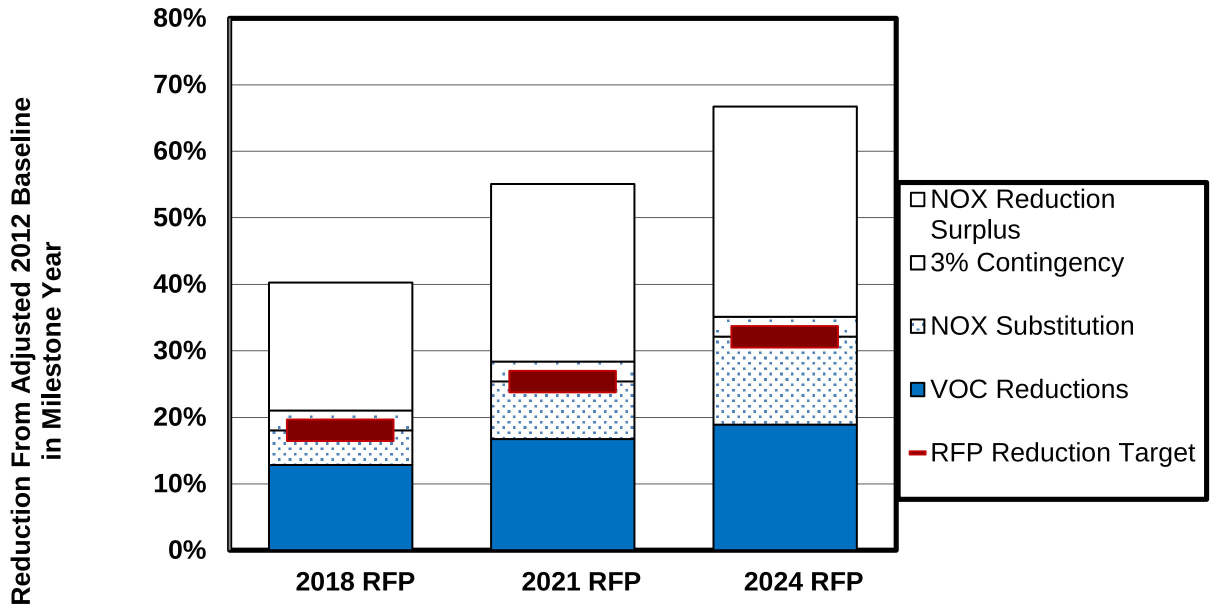
1.11 Reasonable Further Progress Demonstration

The federal 2008 8-hour ozone regulations (70 FR 71634) require that areas classified as "serious or above" submit a RFP demonstration plan that provides for at least 3% average annual reductions of VOC (and/or NO_X) emissions every 3-year period after 2008 out to the attainment year. The RFP demonstration fully accounts for emissions growth when calculating the net emission reductions.

The RFP evaluation shown on Figure 1-3 is based on the emission inventory forecasts, which assume expected growth rates and existing control measures. The 3 year RFP demonstrations are achieved through VOC and NO_X emission reductions for 2018 and 2021 (milestone years), and 2024 (attainment year). Figure 1-3 also shows the percentages of VOC and NO_X emission reductions used to meet the RFP reduction goals.

The RFP demonstrations are determined by forecasted emission reductions from existing control regulations and already adopted control measures. Additional emission reductions from new measures are not required to achieve the RFP and contingency demonstrations. Both VOC and NO_X emission reductions are needed to meet the RFP reduction targets. The NO_X substitution is used on a percentage basis to cover any VOC percentage shortfalls. The amount of NO_X emission reductions (13%) required to offset the VOC shortfalls in the attainment year is less than the total predicted NO_X reductions (48%) in 2024.

Figure 1-3 Summary of Reasonable Further Progress Demonstrations - SFNA



1.12 Conclusions

1. Since 1990, the SFNA shows a declining trend in exceedances of the 2008 8-hour ozone NAAQS and ozone design value concentrations, with the most frequent and highest violations occurring at SFNA's eastern monitoring sites: Cool, Folsom, Placerville, and Auburn.
2. The VOC and NO_X emissions inventory forecasts through 2024 show significant declines in mobile source emissions, despite increasing population, vehicle activity, and economic development in the Sacramento region.
3. Photochemical modeling results indicate that the combined reductions from existing local strategies, regional, state, and federal control measures are sufficient to demonstrate attainment by 2024.
4. No new regulatory VOC or NO_X control measures at the regional and local level are proposed for adoption in this plan.
5. New transportation conformity emission budgets are being proposed for the SFNA. The budgets incorporate the recent EMFAC2014 motor vehicle emission

factors, updated travel activity data, and latest transportation control strategies and TCMs.

6. Reasonable further progress demonstrations will be achieved through a combination of VOC and NO_X reductions for the milestone years of 2018, 2021, and the 2024 attainment analysis year.

7. Future ozone planning efforts will include the preparation of progress (milestone) reports to assess reasonable further progress.

1.13 References

CARB. *Ozone Transport: 2001 Review.* Sacramento, CA: California Air Resources Board, April [2001.]

CARB. *CEPAM: 2016 SIP Baseline Emission Projections, Section 1.a. – CEFS2 External Adjustment Tool.* Web. 19 April 2017 < https://www.arb.ca.gov/app/emsinv/2016ozsip/2016ozsip/ >

Goldstene, James. *Letter from CARB to Air and Radiation Docket and Information Center*, 13 March 2012. Print.

SAOCG. *2017-20 Metropolitan Transportation Improvement Program, Amendment #1 to the 2016 Metropolitan Transportation Plan/Sustainable Communities Strategy, and Air Quality Conformity Analysis*. Sacramento, CA: Sacramento Area Council of Governments, 15 September [2016.] Print.

SMAQMD et al. *Sacramento Area Regional Ozone Attainment Plan.* Sacramento, CA: Sacramento Metropolitan Air Quality Management District, 15 November 1994. Print.

SMAQMD, et al. *Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan (2013 SIP Revision).* Sacramento, CA: Sacramento Metropolitan Air Quality Management District, 26 September [2013.]

USEPA. *Definitions*. 40 CFR §93.101

USEPA. *Criteria and procedures: Motor vehicle emissions budget.* 40 CFR §93.118

USEPA. *Using the motor vehicle emissions budget in the applicable implementation plan (or implementation plan submission).* 40 CFR §93.124

USEPA. *Applicability*. 40 CFR §93.153

USEPA (69 FR 23858 - 23951) Air Quality Designations and Classifications for the 8-Hour Ozone National Ambient Air Quality Standards, Federal Register, Volume 69, 30 April 2004, p 23858 -23951.

USEPA (70 FR 71612 - 71705) *Final Rule To Implement the 8-Hour Ozone National Ambient Air Quality Standard; Final Rule.* Federal Register, Volume 70, 29 November 2005, p. 71612-71705.

USEPA. (77 FR 30088-30160) *Air Quality Designations for the 2008 Ozone National Ambient Air Quality Standards; Implementation of the 2008 National Ambient Air Quality Standards: Final Rule*. Federal Register, Volume 77, 21 May 2012, p. 30088-30160.

USEPA. *Implementing Clean Air Act Section 182(d)(1)(A): Transportation Control Measures and Transportation Control Strategies to Offset Growth in Emissions Due to Growth in Vehicle Miles Travelled*. United States Environmental Protection Agency, August [2012.]

USEPA. *Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze- December 2014 DRAFT.* United States Environmental Protection Agency, 3 December [2014.]

USEPA. (80 FR 12264-12319) *Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements: Final Rule.* Federal Register, Volume 80, 6 March 2015, p. 12264-12319.

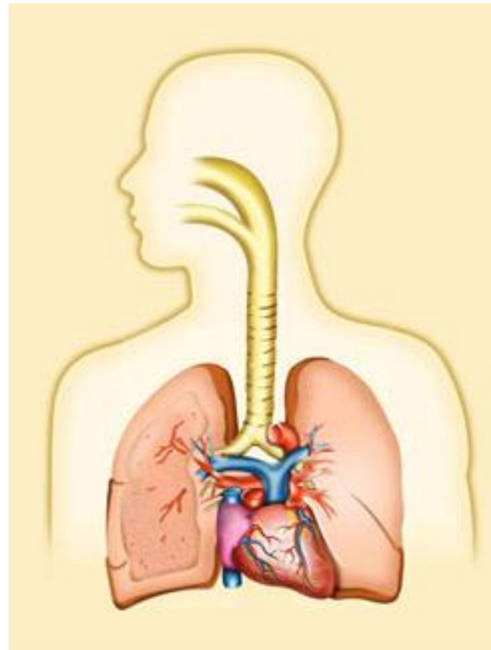
USEPA. *Draft Emission Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations*. United States Environmental Protection Agency. 16 December [2016.] Web. 19 April 2017 .< https://www.epa.gov/sites/production/files/2016-12/documents/2016_ei_guidance_for_naaqs.pdf >

2 BACKGROUND INFORMATION AND PLAN DEVELOPMENT OVERVIEW

2.1 Background Information

2.1.1 Ozone Health Effects

Ground-level ozone is one of the air pollutants regulated by both federal and state laws. It is a colorless gas formed in the presence of sunlight when precursor pollutants (nitrogen oxides and volatile organic compounds) mix together.



Effects on the Airways. Ozone is a powerful oxidant that can irritate the air ways causing coughing, a burning sensation, wheezing and shortness of breath and it can aggravate asthma and other lung diseases.

Ozone is a strong irritant that adversely affects human health. Ozone exposure can cause health issues, especially in sensitive groups: children, the elderly, people suffering from chronic diseases, and outdoor workers. Children are at a greater risk from exposure to ozone, especially at higher concentrations because their respiratory system is still developing and they are likely to be outdoors and more active.

Breathing ozone can trigger a variety of health problems which may:

- Create difficulty breathing deeply and vigorously
- Create a shortness of breath and pain when taking a deep breath
- Cause coughing and create a sore or scratchy throat
- Inflame and damage the airways and lung tissue
- Exacerbate lung diseases such as asthma, emphysema, and chronic bronchitis
- Increase risk of cardiovascular problems, such as heart attacks and strokes
- Make the lungs more susceptible to infection
- Continue to damage the lungs even when the symptoms have disappeared

These effects may lead to an increase in: school absences, medication use, visits to doctors, emergency rooms, and number of hospital admissions. Recent research also indicates that ozone exposure may increase the risk of premature death from heart or lung diseases (USEPA, 2014).

Reducing ground level ozone to concentrations below federal and state standards is one of the primary goals of the air districts in the Sacramento Federal Nonattainment Area (SFNA).

2.1.2 Ecosystem Effects

Ground level ozone is absorbed by the leaves of plants, where it can reduce photosynthesis, damage leaves and slow growth. It can also make sensitive plants more susceptible to certain diseases, insects, harsh weather and other pollutants.

In addition to health effects, ozone also affects vegetation and ecosystems, e.g. forests, parks, wildlife refuges, and wilderness areas. Ozone harms sensitive vegetation and can reduce tree and plant growth during the growing season.

Plant species that are sensitive to ozone are potentially at an increased risk from exposure, disease, damage from insects, and harm from severe weather. This includes trees such as black cherry, quaking aspen, ponderosa pine, and cottonwood which are found in many areas of the country, including the SFNA.

When sufficient ozone enters the leaves of a plant, it can:

- Interfere with the ability to produce and store food
- Visibly damage the leaves of trees and other plants, harming the appearance of vegetation in urban areas, national parks, and recreation areas.

These effects can also have adverse impacts on ecosystems, including loss of species diversity and changes to habitat quality, water, and nutrient cycles (USEPA, 2012).

2.1.3 Ozone Formation and Precursor Pollutants

Ozone is a gas composed of three oxygen atoms. It is not emitted directly into the air from pollution sources. At ground level, it is generated through chemical reactions between volatile organic compounds (VOCs) and nitrogen oxides (NO_X) in the presence of sunlight. VOCs and NO_X are known as ozone "precursors."

These precursors are emitted by many types of anthropogenic and biogenic sources. Anthropogenic (man-made) sources include on-road and off-road combustion engine vehicles, power plants, industrial facilities, gasoline stations, organic solvents, and consumer products; and biogenic sources include natural areas, crops, and urban vegetation. VOC pollutants are also known as reactive organic gases (ROG).

2.2 National Ambient Air Quality Standards (NAAQS) for Ozone

2.2.1 1979 1-Hour Ozone Standard (124 ppb)

The first comprehensive national air pollution legislation was the federal Clean Air Act (CAA) of 1970. The CAA was amended in 1977 and required states to prepare air quality plans to meet national ambient air quality standards (NAAQS). To further protect the public from unhealthy ozone levels, the United States Environmental Protection Agency (USEPA) revised[6] the NAAQS for ozone in 1979 to a concentration of 124 parts per billion (ppb) averaged over one hour[7].

Congress amended the CAA in 1990, revising the original attainment deadlines and establishing new planning requirements. In 1991, the Sacramento region was designated as a "serious" nonattainment area for the 1-hour ozone standard. The region was required to submit an attainment demonstration plan for the 1-hour ozone standard to USEPA by November 15, 1994 and was required to meet the new standard by 1999. CARB submitted the Sacramento Area Regional Ozone Attainment Plan to USEPA on November 15, 1994 (SMAQMD et al, 1994) and USEPA approved the plan on January 8, 1997 (62 FR 1150).

Attainment and Reasonable Further Progress Plan

Air quality modeling was conducted to simulate future ozone formation and evaluate the effectiveness of emission control scenarios. This modeling projected that the region would not attain the standard by 1999.

Because the emissions reductions from the proposed control strategies would not be adequate to meet the standard, the five air district's that comprise the SFNA proposed to the California Air Resource Board (CARB) that the region be reclassified from "serious" to "severe-15." USEPA approved the voluntary reclassification request (bump up) from a "serious" classification to a "severe-15" classification. The reclassification extended the deadline to November 2005. The change became effective June 1, 1995 (60 FR 20237).

Air quality data collected between 2007 and 2009 established that the Sacramento region met the 1-hour standard. Several high ozone days (June 23, June 27, and July 10, 2008) at the Folsom monitoring station were excluded from the attainment demonstration analysis calculations because they were attributable to wildfires.[8] USEPA

---

6 A one hour ozone standard was developed and approved in April 30, 1971 for total photochemical oxidants (36 FR 8186).

7 A one-hour ozone standard violation is defined as no more than 3 daily exceedances (>124 ppb) over 3 years at a monitoring site.

8 The analysis demonstrating why this data was excluded is contained in the "Exceptional Events Demonstration for High Ozone in the Sacramento Regional Nonattainment Area Due to Wildfires" (SMAQMD, 2009).

issued a determination (77 FR 64036) on October 18, 2012 finding that the Sacramento Region attained the federal 1-hour ozone standard.

2.2.2 1997 8-Hour Ozone Standard (84 ppb)

In July 1997, USEPA promulgated a new ozone standard, which considered prolonged exposure (62 FR 38856). This change lowered the health-based standard and increased the exposure time for ambient ozone from 124 ppb averaged over one hour to 84 ppb averaged over eight hours. The 8-hour standard considers the effect of greater exposure and is more protective of public health and more stringent than the previous 1-hour standard. An area is designated nonattainment if the annual 4th highest daily maximum 8-hour ozone concentration averaged over 3 years (i.e., ozone design value) is over the NAAQS of 84 ppb.

Classification and Voluntary Reclassification

In 2004, the Sacramento region was classified as a serious nonattainment area for the 1997 8-hour standard (69 FR 23858) with an attainment deadline of June 15, 2013. The region determined that it could not meet the 2013 attainment date because it needed to rely on longer term emission reduction strategies from state and federal mobile source control programs. Consequently, on February 14, 2008, CARB, on behalf of the air districts in the Sacramento region, requested that USEPA reclassify (bump-up) the SFNA from “serious” to “severe-15.” USEPA granted the voluntary reclassification request on May 5, 2010 (75 FR 24409), pushing the attainment deadline to June 15, 2019[9] (Goldstene, 2008).

Attainment and Reasonable Further Progress Plan

Air Districts within the SFNA and CARB prepared an attainment demonstration and reasonable further progress plan that included the updated emissions inventory, commitments to adopt and implement new reasonably available control measures, and new emission budgets for transportation and general conformity. On January 29, 2015, USEPA approved (80 FR 4795) the Sacramento Regional 8-hour Ozone Attainment and Reasonable Further Progress Plan (SMAQMD et al., 2013).

2.2.3 2008 8-hour Ozone Standard (75 ppb)

On March 27, 2008, USEPA promulgated a more stringent 8-hour ozone NAAQS of 75 ppb, based on findings from new health studies (73 FR 16436). The new standard provides additional protection for children and other at risk populations against ozone related adverse health effects. USEPA retained the region’s severe-15 classification for the 2008 NAAQS (40 CFR 51.1103(d)).

9 In order to attain by June 15, the prior year’s ozone season would need to be in attainment, making 2018 the attainment demonstration analysis year.

As a result, the SFNA was classified as a severe-15 area (77 FR 30088) with an attainment deadline of July 20, 2027 (42 U.S. Code § 7511). As a practical matter, this translates to an attainment demonstration deadline of December 31, 2026, because the attainment demonstration must be based on the full calendar years of monitoring data. Consequently, this SIP will refer to 2026 for the attainment demonstration date rather than the 2027 statutory deadline.

2.2.4 2015 Ozone Standard (70 ppb)

On October 26, 2015 USEPA issued a revised, more stringent 8-hour standard of 70 ppb (80 FR 65292).The revised NAAQS strengthens the nation's air quality standards for ground-level ozone to improve public health and environmental protection, especially for at-risk groups including children and older adults. Future planning efforts will address this standard. At this time, the 2008 NAAQS standard has not been revoked.

2.3 Revoked National Ambient Air Quality Standards

The NAAQS for ozone has become more health protective since the CAA was first adopted. USEPA revoked both the 1979 1-hour standard and 1997 8-hour standard. CAA Sections 108 and 109 require periodic review of the standards themselves, and the science upon which these and all standards are based.

2.3.1 1979 1-Hour Standard

On April 30, 2004, USEPA published the Final Phase 1 Rule (69 FR 23951) to implement the 1997 8-hour ozone NAAQS, which revoked the 1-hour ozone NAAQS. This revised the standard from a 1-hour value of 124 ppb to an 8-hour value of 84 ppb.[10] The 1-hour standard was revoked in California effective June 1, 2005 (70 FR 44470), but the region remains subject to anti-backsliding requirements intended to insure the area is able to maintain compliance with the standard (40 CFR 51.1105). These measures are summarized in section 2.3.4

2.3.2 1997 8-Hour Standard

On March 6, 2015, USEPA published the Final Rule (80 FR 12264) to implement the 2008 8-hour ozone NAAQS, which revoked the 1997 8-hour standard. The 8-hour standard was lowered to 75 ppb for both the primary and secondary standards to further protect public health and welfare. (80 FR 65292). The anti-backsliding requirements discussed under 2.3.4 also remain in place for the revoked 1997 8-Hour standard.

10 USEPA implemented the Phase 2 Final Rule (70 FR 7612) for the 2008 8-hour NAAQS in 2005, which established control and planning obligations: reasonably available control technology and measures (RACT and RACM), reasonable further progress (RFP), modeling, and attainment demonstrations, and new source review (NSR).

2.3.3 Redesignation Substitution Request

The anti-backsliding requirements must remain in place for the 1979 and 1997 standards until USEPA redesignates the areas as attainment. The Air Districts are developing a Redesignation Substitution (RS) Request for the former 1979 1-hour standard. The RS Request demonstrates that the SFNA has attained, and will continue to attain this standard.

Upon approval by the USEPA of the RS Request, the state may request that New Source Review (NSR) requirements be removed from the State Implementation Plan (SIP) and that other anti-backsliding measures be shifted to contingency measures (40 CFR 51.1105(b)(2)). Anti-backsliding control requirements include the possible collection of CAA Section 185 major stationary source penalty fees. Future fees could also be required for the 2008 NAAQS if the region does not attain the standard by the attainment date.

2.3.4 Anti-Backsliding Requirements

The CAA allows for nonattainment NSR to be removed from the SIP, and allows anti-backsliding measures to be shifted to contingency measures in the SIP provided that the action is consistent with CAA Sections 110(l) and 193 (40 CFR 51.1105(b)(2)). Since the SFNA was severe under both the 1979 and 1997 standards, it must adopt all the measures required for marginal, moderate and serious nonattainment areas, in addition to measures required for severe areas.

The region is also classified as a severe-15 nonattainment area for the 2008 NAAQS. Because the classification is the same, all of the requirements that were applicable under the prior NAAQS are applicable under the 2008 NAAQS. Consequently, these anti-backsliding measures are still requirements to be included in the 2008 SIP.

The anti-backsliding requirements that are applicable for the SFNA under a severe standard are:

1. Vehicle Miles Traveled (VMT) - Transportation Control Measures (TCMs) analysis of measures to offset any growth. [CAA section182(d)(1)]
2. Nonattainment New Source Review (NSR) – permitting program under CAA section 172(c)(5) with major source thresholds under CAA section 182(d) and offset ratios under CAA section 182(d)(2). The area will remain subject to the obligation to adopt and implement the major source threshold and offset requirements for NSR that apply to severe nonattainment areas. [CAA section 182(d) and 182(d)(2)].
3. CAA section 185 Fee Requirements - Major stationary sources within the SFNA could be subject to the collection of CAA section 185 fees if the region fails to attain the standard by the attainment date. Fees could be assessed for each year

after the attainment date, until the area is re-designated to attainment. [CAA section 182(d)(3)].

4. Reasonably available control technology (RACT) under CAA sections 172(c)(1) and 182(b)(2).
5. Vehicle Inspection and maintenance programs (I/M) under CAA sections 182(b)(4) and 182(c)(3).
6. Reductions to achieve Reasonable Further Progress (RFP) under CAA sections 172(c)(2), 181(b)(1)(A), 182(c)(2)(B).
7. Clean fuels fleet program under CAA section183(c)(4).
8. Enhanced (ambient) monitoring under CAA section182(c)(1).
9. Transportation controls under CAA section182(c)(5).
10. NO_X requirements under CAA section 182(f).
11. Attainment demonstration requirements under CAA sections 172(c)(4), 181(b)(1)(A), 182(c)(2).
12. Nonattainment contingency measures required under CAA sections 172 (c)(9) and 182(c)(9) for failure to attain by the applicable deadline or to meet RFP milestones.
13. Contingency Measures - CAA section172(c)(9) and 182(c)(9) – An area is required to meet this requirement in their SIPs. (77 FR 28424)
14. Reasonably available control measures (RACM) requirements under CAA Section 172 (c)(1).

2.4 Development of the Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan

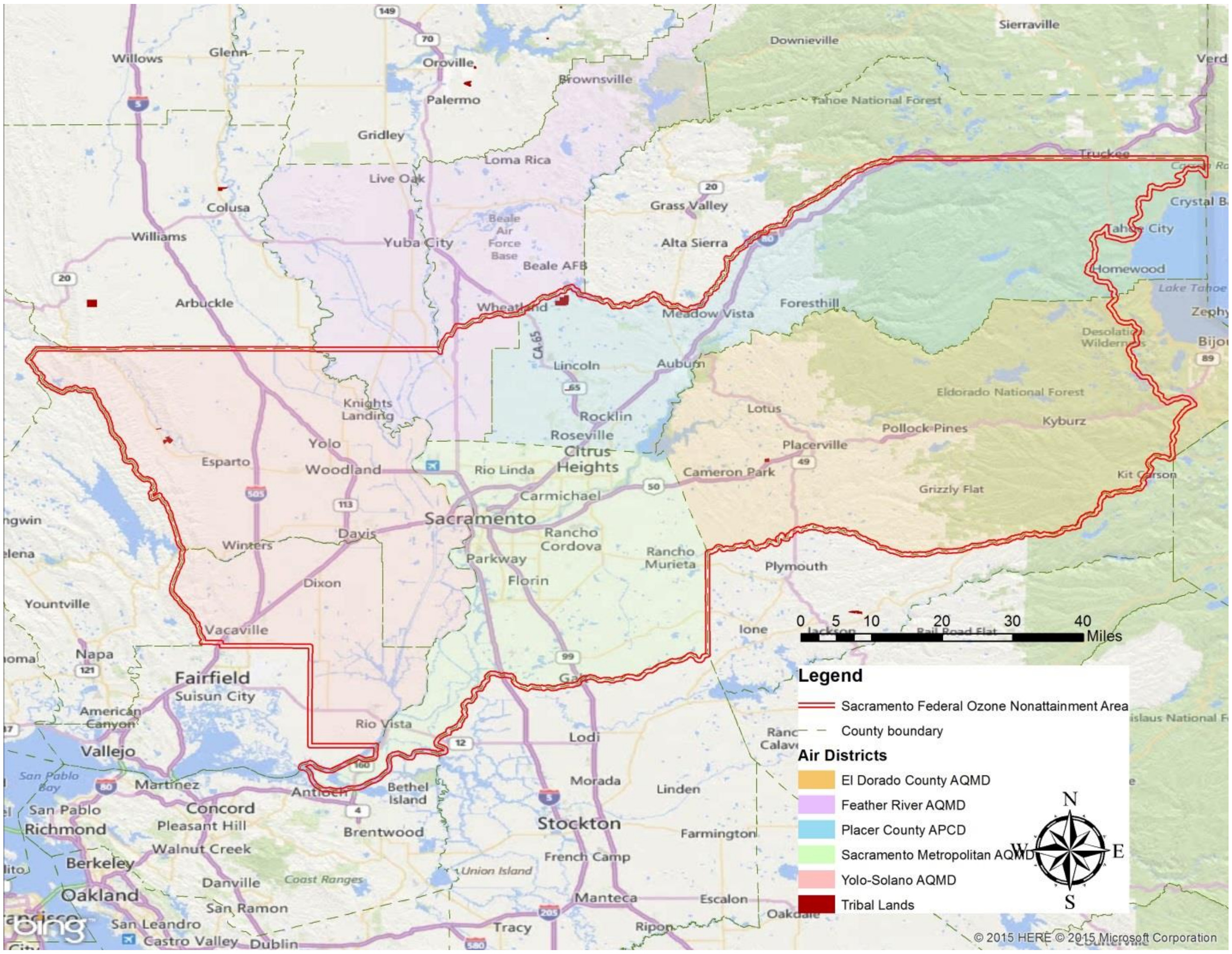
This ozone Attainment Demonstration and Reasonable Further Progress Plan was developed for the Sacramento region by the five air districts in the nonattainment area with participation from the CARB, the Sacramento Area Council of Governments (SACOG), and the Bay Area Metropolitan Transportation Commission (MTC)[11]. The five local air districts include: El Dorado County Air Quality Management District (EDCAQMD), Feather River Air Quality Management District (FRAQMD), Placer County Air Pollution Control District (PCAPCD), SMAQMD, and Yolo-Solano Air Quality Management District (YSAQMD). SACOG and MTC are the metropolitan planning organizations (MPO) for transportation planning in the SFNA.

Figure 2-1 shows the boundaries of the Sacramento Federal Ozone Nonattainment Area (SFNA) which includes all of Sacramento and Yolo counties and portions of Placer, El Dorado, Solano, and Sutter counties. The non-attainment area boundaries

[11] MTC is the MPO for the east Solano County portion of the Sacramento nonattainment area.

are the same boundaries for the 1997 8-hour ozone standard (69 FR 23858) and 2008 8-hour (77 FR 30088) ozone standard.

Figure 2-1 Sacramento Federal Ozone Nonattainment Area



This air quality plan utilizes the latest planning assumptions from the 2016 Metropolitan Transportation Plan/Sustainable Communities Strategy (2016 MTP/SCS). The 2016 MTP/SCS is a long-range transportation plan that is built on the Blueprint[12] concept. The SACOG Board adopted this plan on February 18, 2016. SACOG is the transportation planning agency responsible for conformity determinations[13] in the SFNA and was a key contributor in the development of the motor vehicle emissions inventory and review of transportation control measures. Updated activity data based on the

---

12 This program was initiated by SACOG with the goal of reducing traffic congestion in the future metropolitan transportation plans. Blueprint is discussed further in Chapter 10.

13 Conformity determination ensures that transportation plans and projects are consistent with the applicable SIP. A conformity determination is discussed further in Chapter 10.

2017/2020 Metropolitan Transportation Improvement Program (MTIP)[14] was used in setting the baseline projections for the motor vehicle inventory. The 2017/2020 MTIP/SCS will be included as Amendment #1 to the 2016 MTP/SCS.

2.4.1 Purpose of Plan

This plan demonstrates how the region will reduce emissions to meet CAA reasonable further progress requirements and demonstrate attainment of the 2008 ozone NAAQS of 75 ppb. The Federal CAA General Nonattainment Plan Requirements for a severe area are discussed in Appendix F. This plan includes an updated emissions inventory, sets motor vehicle and general conformity emissions budgets, describes the photochemical modeling used to support the attainment demonstration, and demonstrates how it complies with vehicle miles traveled (VMT), emissions offset and reasonably available control measure (RACM) requirements. It will be part of California's State Implementation Plan (SIP). The California SIP includes plans for each of the state's nonattainment areas, along with rules, regulations, and other control strategies adopted by air districts and the California Air Resource Board (CARB). After this Plan is reviewed and approved by CARB, it will be submitted to USEPA for federal review and approval.

2.4.2 Photochemical Modeling

CARB conducted photochemical modeling for 2022 and 2026 to determine when the region would attain the 2008 NAAQS. This modeling is used to simulate the formation of ozone through mathematical descriptions of atmospheric processes and photochemical reactions of pollutants over large regional air basins. A detailed discussion of the photochemical modeling and results is presented in Chapter 6 and Appendix B.

2.4.3 Interagency Collaboration

Several committees and working groups provided input on technical and policy issues during the development of this Plan.

- The Regional Planning Partnership (RPP) consisted of participants from the various agencies mentioned above and from the California Department of Transportation, USEPA, and Federal Highways Administration. The RPP is assembled to coordinate the efforts of the local, state, and federal governmental agencies directly involved in the preparation or review of the MTP and is responsible for inter-agency consultation on motor vehicle emissions budgets, conformity determinations and transportation control measures.

[14] Conformity analysis adopted by the SACOG Board for the 2016 MTP/SCS Amendment #1 and 2017/2020 MTIP.

- The Regional Air Pollution Control Officers Committee for the Sacramento region helped to discuss and coordinate SIP topics and concerns.
- The State Implementation Plan Inventory Working Group (SIPIWG) provided a platform for sharing information and updating status regarding the emissions inventory development among air districts, USEPA, and CARB.

2.4.4 Public Input and Review Process

This Plan meets the requirements of CAA Section 110(a)(2) which requires reasonable notice and public hearing for plan adoptions. The Board of Directors for each of the air districts in the SFNA provided notice and held a public hearing prior to adopting the plan.

Stakeholder groups helped to disseminate information and seek input during the development of the plan. These included the Sacramento Cleaner Air Partnership, SACOG's Climate and Air Quality Committee and Regional Planning Partnership, and the Chamber of Commerce's Air Quality and Transportation Committee. These stakeholders represent business interests, environmental groups, transportation agencies, local government, and other community organizations. In addition, representatives for the various Native American tribes in the Sacramento region were contacted and invited to participate in the process.

2.5 Contents of 8-Hour Ozone Plan

This document includes information and analyses that fulfills the 2008 8-hour ozone NAAQS attainment demonstration and reasonable further progress planning requirements for the SFNA.

Table 2-1 SIP Plan Chapter Description

Chapter	Title	Descriptions
1	Executive Summary	Executive summary of the 8-hour ozone plan
2	Background Information and Plan Development Overview	An introduction that contains background information on ozone health effects, ozone formation, the federal ozone standards, and an overview of the plan's development process
3	Federal Clean Air Act Requirements	Explains the purpose of the attainment plan and defines federal Clean Air Act 8-hour ozone requirements for the region
4	Air Quality Trends	Analyzes and illustrates 8-hour ozone air quality trends in the Sacramento region
5	Emissions Inventory	Presents the 2012 base year emissions inventory and the emission forecasts that are based on existing control strategies and growth assumptions
6	Air Quality Modeling Analysis	Characterizes the air quality modeling simulations and predictions, and analysis of results for determining attainment emission targets
7	Control Measures	Describes the Reasonable Available Control Measure (RACM) analysis that was conducted and provides an overview of the control measures that were evaluated as part of the process
8	Attainment Demonstration	Shows the 8-hour ozone attainment demonstration for the SFNA using the emission forecasts, photochemical modeling results, and the proposed control strategy scenario
9	Transport Analysis	Discusses inter-basin pollutant transport issues and addresses transport assumptions included in the photochemical modeling
10	Transportation Conformity and Emissions Budget	Documents the motor vehicle emissions budgets for transportation conformity purposes. This chapter also provides an analysis demonstrating that the SFNA meets the vehicle miles traveled (VMT) Offset requirements under CAA section 182(d)(1)(A)
11	General Conformity	Explains general conformity requirements and provides estimates for forecasted airport emissions
12	Reasonable Further Progress Demonstrations	Demonstrates how the Reasonable Further Progress emission reduction requirements will be achieved
13	Summary and Conclusions	Summarizes the key points and major conclusions of this report, and mentions expected future air quality planning efforts by the air districts

Additional documentation for the more technical sections of the 8-hour ozone attainment plan is contained in the following Appendices:

A – Emissions Inventory
B – Photochemical Modeling
C – Motor Vehicle Emissions Budgets and VMT Offset Analysis
D – Reasonable Further Progress Demonstrations
E – Reasonably Available Control Measures (RACM) Analysis

F – Federal Clean Air Act Requirements

2.6 References

Goldstene James N. (CARB) *Letter to Wayne Nastri (USEPA Region IX Regional Administrator).* 14 February 2008.

SMAQMD, et al. *Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan (2013 SIP Revisions).* Sacramento, CA: Sacramento Metropolitan Air Quality Management District, 26 September 2013.

SMAQMD, et al. *Sacramento Area Regional Ozone Attainment Plan.* Sacramento, CA: Sacramento Metropolitan Air Quality Management District, 15 November 1994.

SMAQMD, et al. *Exceptional Events Demonstration for High Ozone in the Sacramento Regional Nonattainment Area Due to Wildfires.* Sacramento, CA: Sacramento Metropolitan Air Quality Management District, 2009.

USEPA. *Transition from the 1997 ozone NAAQS to the 2008 ozone NAAQS and anti-backsliding*. 40 CFR §51.1105.

USEPA. *Ecosystem Effects of Ground-level Ozone.* 1 November 2012. Web 15 June, 2015.

USEPA. *Heath Effects of Ground-level Ozone,*26 November 2014. Web 30 April, 2015.

USEPA. (36 FR 8186 - 8201) *National and Primary Secondary Air Quality standards,* Federal Register, Volume 36, 30 April, 1971, p. 8186.

USEPA. (60 FR 20237 - 20238) *California, Sacramento Ozone Nonattainment Area, Reclassification to Severe; Final Rule*. Federal Register, Volume 60, 25 April, 1995, p. 20237 - 20238.

USEPA. (62 FR 1150 - 1187) *Approval and Promulgation of Implementation Plans; California—Ozone; Final Rule*. Federal Register, Volume 62, 8 January, 1997, p. 1150 - 1187.

USEPA. (62 FR 38856 - 38896) *National Ambient Air Quality Standards for Ozone: Final Rule*. Federal Register, Volume 62, 18 July, 1997, p. 38856 - 38896.

USEPA (69 FR 23858 - 23951) *Air Quality Designations and Classifications for the 8-Hour Ozone National Ambient Air Quality Standards*, Federal Register, Volume 69, 30 April 2004, p 23858 -23951.

USEPA. (69 FR 23951-24000) *Final Rule to Implement the 8-Hour Ozone National Ambient Air Quality Standard – Phase 1.* Federal Register 69, 30 April 2004, p. 23951 – 24000.

USEPA. (70 FR 44470 - 44478) *Identification of Ozone Areas for Which the 1-Hour Standard Has Been Revoked and Technical Correction to Phase 1 Rule*. Federal Register, Volume 70, 3 August, 2005, p. 44470 – 44478.

USEPA. (73 FR 16436-16514) *National Ambient Air Quality Standards for Ozone; Final Rule.* Federal Register, Volume 73, 17 March, 2008, p. 16436 – 16514.

USEPA. (75 FR 24409 - 24421) *Designation of Areas for Air Quality Planning Purposes; California; San Joaquin Valley, South Coast Air Basin, Coachella Valley, and Sacramento Metro 8-Hour Ozone Nonattainment Areas; Reclassification*. Federal Register, Volume 75, 5 May, 2010, p. 24409 - 24421.

USEPA. (77 FR 28424 -28446) *Final Rule To Implement the 1997 8-Hour Ozone National Ambient Air Quality Standard: Classification of Areas That Were Initially Classified Under Subpart 1; Revision of the Anti-Backsliding Provisions To Address 1-Hour Contingency Measure Requirements; Deletion of Obsolete 1-Hour Ozone Standard Provision; Final Rule*. Federal Register, Volume 77, 14 May 2012, p. 28424-28446.

USEPA. (77 FR 30088-30160) *Air Quality Designations for the 2008 Ozone National Ambient Air Quality Standards; Implementation of the 2008 National Ambient Air Quality Standards: Final Rule*. Federal Register, Volume 77, 21 May, 2012, p. 30088-30160.

USEPA. (77 FR 64036 - 64039) *Determination of Attainment of the 1-Hour Ozone National Ambient Air Quality Standards in the Sacramento Metro Nonattainment Area in California*. Federal Register, Volume 77, 18 October, 2012, p. 64036 - 64039.

USEPA (80 FR 4795 - 4799) *Approval and Promulgation of Implementation Plans; State of California; Sacramento Metro Area; Attainment Plan for 1997 8-Hour Ozone Standard: Final Rule*. Federal Register, Volume 80, 28 January, 2015, p. 4795 - 4799.

USEPA. (80 FR 12264-12319) *Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements: Final Rule.* Federal Register, Volume 80, 6 March 2015, p. 12264-12319.

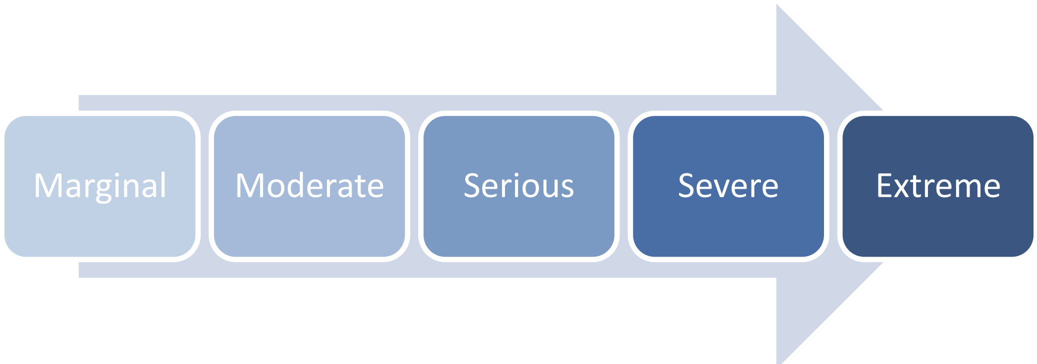
USEPA (80 FR 65292-65467) *National Ambient Air Quality Standards for Ozone*; Final Rule. Federal Register, Volume 80, 26 October, 2015, p. 65292 – 65467.

3 FEDERAL CLEAN AIR ACT REQUIREMENTS

3.1 Introduction

The Clean Air Act (CAA) requires that the United States Environmental Protection Agency (USEPA) designate areas as attainment or nonattainment based on how measured pollutant levels compare to standards. Nonattainment areas are classified as marginal, moderate, serious, severe, or extreme (Figure 3-1) based on “such factors as the severity of nonattainment in such area and the availability and feasibility of the pollution control measures that the Administrator believes may be necessary to provide for attainment of such standard in such area (CAA Section 172).”

Figure 3-1 Air Quality Classifications



3.2 Nonattainment Classification and Sacramento Federal Ozone Nonattainment Area

Under USEPA’s classification approach for the 2008 8-hour ozone National Ambient Air Quality Standard (NAAQS) the Sacramento Federal Nonattainment Area (SFNA) would have been classified as serious based on its design value of 102 ppb (69 FR 23886) at the Folsom Monitoring Site. USEPA proposed to extend the voluntary reclassification determination for the 1997 ozone NAAQS to the more stringent 2008 ozone NAAQS unless a state explicitly requested otherwise. It was unknown at the time whether the SFNA would need the additional attainment time afforded under the severe-15 classification, so no air district within the SFNA opposed the reclassification. Accordingly, CARB confirmed that it wanted USEPA to interpret previous voluntary reclassification requests as requests for reclassification under the 2008 ozone NAAQS (Goldstene, 2012). As a result, the SFNA was classified as a severe-15 area (77 FR 30088).

3.3 Attainment Deadline and Attainment Date Extension

The statutory attainment date for a severe-15 nonattainment area is 15 years after the effective date of designation and for a serious area it is 9 years (80 FR 12264)[15]. Notwithstanding this requirement, CAA Sections 172(a)(2)(A) and 181(a) require nonattainment areas to meet the clean air standards "as expeditiously as practicable." To comply with this requirement, and based on the results of the photochemical modeling conducted by CARB for 2022 and 2026, the reasonably available control measure (RACM) analysis, and other factors discussed in Chapter 8, an attainment year of 2024 was selected for this plan which would correspond to an attainment deadline of July 20, 2025 based on the initial nonattainment designation of July 20, 2012. An attainment year of 2024 does not change the severe-15 classification for the SFNA.

USEPA established rule 40 CFR 50.1107 to determine eligibility for attainment date extensions for the 2008 Ozone NAAQS under CAA Section 181(a)(5). If an area fails to attain the standard by its attainment date, it would be eligible for a 1-year extension providing that the attainment year's fourth highest daily maximum 8-hour average is at or below the 75 ppb standard. The area would be eligible for a second 1-year extension if the fourth highest daily maximum 8-hour value, averaged over both the original attainment year and the first extension year, is at or below the standard (80 FR 12292).

3.4 Transportation Conformity Requirements

Transportation conformity requires the linking and coordinating of transportation and air quality plans and projects. Under the CAA, federal agencies may not approve or fund transportation plans and projects unless they are consistent with state air quality implementation plans (SIPs). Transportation conformity refers to the process used to determine whether transportation projects that require federal approvals or use federal funds are consistent with SIPs.

USEPA restructured the transportation conformity regulations (USEPA, 2012) so that existing conformity requirements will apply for any new or revised NAAQS (77 FR 30160). This was done to provide consistency and avoid the need to revise the rule if the NAAQS changes in the future. Transportation conformity and emissions budgets are discussed in Chapter 10.

[15] The attainment deadline for the SFNA for a severe-15 area is July 20, 2027 and for a serious area is July 20, 2021.

3.5 Major New Source Review Requirements

New Source Review (NSR) requirements apply to new construction of major sources[16] of air pollution, or major modifications of existing sources for all ozone classification categories (marginal through extreme). The major source thresholds change based on the attainment classification, and under CAA Sections 182(d) and 182(f) the severe area emissions threshold is 25 tons per year of Volatile Organic Compound (VOC) or Nitrogen Oxides (NO_X) emissions. In addition, CAA Section 182(d)(2) requires that major sources in severe areas offset any increases in VOC and NO_X emissions by a ratio of 1.3 to 1.

3.6 Reasonably Available Control Technology (RACT) Requirements

RACT (44 FR 53762) is "the lowest emission limitation that a particular source is capable of meeting by the application of control technology that is reasonably available considering technological and economic feasibility." CAA Sections 182(b)(2) and 182(f) require the District to implement RACT for:

- Each category of VOC sources covered by a Control Techniques Guidelines (CTG) document issued by USEPA[17]; and
- All major stationary sources of VOC or NO_X.

The 2008 NAAQS implementation rule (80 FR 12264) requires each District to submit a SIP revision that meets the RACT requirements for VOC and NO_X in CAA Sections 182(b)(2) and 182(f). RACT SIP demonstrations are not included in this document and are prepared separately by each air district for submittal.

3.7 Reasonably Available Control Measures (RACM) Requirements

CAA Section 172(c)(1) states that SIP plan provisions "shall provide for the implementation of all reasonably available control measures as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonably available control technology) and shall provide for attainment of the national primary ambient air quality standards." The 2008 NAAQS Implementation Rule (80 FR 12264) requires that the "SIP revision demonstrate that it has adopted all RACM necessary to demonstrate attainment as expeditiously as practicable and to meet any Reasonable Further Progress (RFP) requirements."

16 For severe ozone nonattainment areas, a major source is defined by CAA §182(d) as a source that has the potential to emit 25 tons or more per year of NO_X or VOC.

17 CTG provide USEPA's recommendations on how to control emissions of VOCs from a specific type of product or process (source category) in an ozone nonattainment area. Each CTG includes emissions limitations based on RACT to address ozone nonattainment. This list can be found at https://www3.epa.gov/ttn/atw/ctg_act.html

USEPA continues to apply the existing guidance to implement RACM provisions under the CAA. USEPA's RACM guidance (Seitz, 1999) indicates that areas should consider all potentially reasonably available measures. Sources of potentially reasonable measures include measures adopted in other nonattainment areas, measures that the USEPA has identified in guidelines or other documents. In addition, any measure that a commenter indicates during a public comment period is reasonably available for a given area should be closely reviewed by the planning agency to determine if it is in fact reasonably available for implementation in the light of local circumstances.

Areas should consider all reasonably available measures for implementation in light of local circumstances. However, areas need only adopt measures if: (i) they are both economically and technologically feasible and cumulatively will advance the attainment date by one year, or (ii) are necessary to meet RFP requirements (80 FR 12278). The RACM analysis is discussed in more detail in Chapter 7 and Appendix E (RACM Analysis).

3.8 Vehicle Miles Travelled (VMT) Offset Requirement

CAA Section 182(d)(1)(A) applies to nonattainment areas classified as severe or extreme. A VMT offset demonstration was prepared in accordance with USEPA's guidance (USEPA, 2012) and is included in Appendix C.

3.9 Reasonable Further Progress Plan Requirements

CAA Sections 172(c)(2), 182(b)(1), and 182(c)(2)(B) include reasonable further progress (RFP) requirements for reducing emissions in ozone nonattainment areas. These requirements are further described in the 2008 NAAQS Implementation Rule (80 FR 12264). The baseline year for this plan is 2012, the two milestone years are 2018 and 2021, and the proposed attainment year is 2024. For moderate and above areas, a 15 percent ozone precursor emissions reduction is required in the 6 year period following the baseline year[18] (2012). After that, an additional 3 percent per year reduction in NO_X or VOC emissions is required, averaged over the 3-year period from 2019 to 2021) (40 CFR 51.1110(a)(2)(ii)).

The implementation rule modified three elements of the RFP calculations:

1. Emissions reductions from SIP-approved or federally promulgated measures that occur after the baseline emissions inventory may be used to meet rate RFP goals (40 CFR 51.1110(a)(5))

[18] USEPA proposed 2011 as the baseline year for nonattainment areas. The implementation rule allows the state to select an alternate year as baseline year between 2008 and 2012 (80 FR 12272; 40 CFR 51.1110(b)). The CARB and air districts selected 2012 as the baseline year, which is the most recent year that best captured current economic conditions, and reflects recovery from the recession.

2. Emission reductions must be obtained within the nonattainment area (40 CFR 51.1110(a)(6))
3. Elimination of the obligation to perform emissions reduction calculations for pre-1990 measures related to motor vehicle exhaust or evaporative emissions, correction of previous RACT requirements, and correction of previous inspection/maintenance programs (40 CFR 51.1110(a)(7)).

The RFP demonstration was prepared for each milestone year in accordance with USEPA's rules and is included as part of this plan in Chapter 12 and Appendix D.

3.10 Milestone Reports

CAA Section 182(g) requires that progress (milestone) reports be prepared to evaluate whether actual emission reductions meet the minimum reasonable further progress targets. This is required to be done every three years out to the attainment year. CARB determines whether each nonattainment area has achieved a reduction in the necessary emissions during the applicable milestone.

3.11 References

Goldstene, James. *Letter from CARB to Air and Radiation Docket and Information Center*, 13 March 2012.

Seitz, John. *Guidance on the Reasonable Available Control Measures (RACM) Requirement and Attainment Demonstration Submissions for Ozone Nonattainment Areas.* Research Triangle, NC: United States Environmental Protection Agency - Office of Air Quality Planning and Standards, [1999.]

USEPA. *Requirements for Reasonable Further Progress*. 40 CFR §51.1110

USEPA. (44 FR 53761 - 53763) *State Implementation Plans; General Preamble for Proposed Rulemaking on Approval of Plan Revisions for Nonattainment Areas- Supplement (on Control Techniques Guidelines).* Federal Register, Volume 44, 16 September, 1979, p. 53761-53763.

USEPA (69 FR 23858 - 23951) *Air Quality Designations and Classifications for the 8-Hour Ozone National Ambient Air Quality Standards*. Federal Register, Volume 69, 30 April 2004, p 23858 -23951.

USEPA. (77 FR 30088-30160) *Air Quality Designations for the 2008 Ozone National Ambient Air Quality Standards; Implementation of the 2008 National Ambient Air Quality Standards: Final Rule*. Federal Register, Volume 77, 21 May, 2012, p. 30088-30160.

USEPA. (77 FR 30160-30171) *Implementation of the 2008 National Ambient Air Quality Standards for Ozone: Nonattainment Area Classifications Approach, Attainment Deadlines and Revocation of the 1997 Ozone Standards for Transportation*

Conformity Purposes, Final Rule. Federal Register, Volume 77, 21 May, 2012, p. 30160 – 30171.

USEPA. (80 FR 12264-12319) *Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements; Final Rule*. Federal Register, Volume 80, 6 March, 2015, p. 12264-12319.

USEPA. *Implementing Clean Air Act Section 182(d)(1)(A): Transportation Control Measures and Transportation Control Strategies to Offset Growth in Emissions Due to Growth in Vehicle Miles Travelled.* Research Triangle, NC: United States Environmental Protection Agency - Office of Air Quality Planning and Standards. [2012.]

4 8-HOUR OZONE AIR QUALITY TRENDS

4.1 Introduction

This chapter shows air quality trends from 1990 – 2016, and compares the trends to the 2008 ozone National Ambient Air Quality Standard (NAAQS) of 0.075 parts per million (ppm). Identifying the number of days exceeding the federal standard helps determine control strategy effectiveness. A violation is determined by averaging the fourth highest 8-hour average concentration for each of the three most recent years at a monitoring site. The result is referred to as the *design value*[19] for the site. The overall design value is the highest design value of all the sites in the Sacramento Federal Nonattainment Area (SFNA).

4.2 Ozone Monitoring Sites

There are currently 16[20] active ozone monitoring stations located throughout the SFNA[21]. They are operated by either local air districts or CARB. Figure 4-1 shows the map of ozone monitoring stations operating in the SFNA during the summer of 2015. Most ozone monitoring sites also have meteorological instruments, and some sites also sample for ambient concentrations of ozone precursor pollutants. The map shows the 2015 design value contour lines[22]. It also overlays the United States Environmental Protection Agency's (USEPA's) EJSCREEN disadvantaged communities that are impacted by ozone. The area with highest measured ozone concentrations is located in the eastern portion of the nonattainment area. The peak 2015 ozone design value of 0.081 parts per million (ppm) or 81 parts per billion (ppb) was measured at the Placerville monitor.

Clean Air Act (CAA) Section 182(c)(1) requires areas classified as serious, severe, or extreme to establish Photochemical Assessment Monitoring Stations (PAMS) sites, which provide enhanced monitoring of ozone, nitrogen oxides (NO_X), volatile organic compounds (VOCs), and meteorological parameters. New PAMS requirements were promulgated with the 2015 revision of the NAAQS for Ozone (80 FR 65292).The Sacramento Metropolitan Air Quality Management District (SMAQMD) 2016 Monitoring Plan (SMAQMD, 2016) addresses future year changes and requirements under these

19 For example, the 2015 ozone design value concentration for a monitoring site would be calculated by taking the average of fourth highest daily 8-hour average ozone concentrations of 2013, 2014, and 2015.

20 The Sacramento Goldenland Court monitoring site was terminated on May 31, 2017. As a result, the number of monitors is reduced from 17 to 16.

21 More information about the monitoring sites in Sacramento County can be found at http://www.airquality.org/Air-Quality-Health/Air-Monitoring, and the monitoring sites in the other districts at http://www.arb.ca.gov/aqd/amnr/amnr.htm.

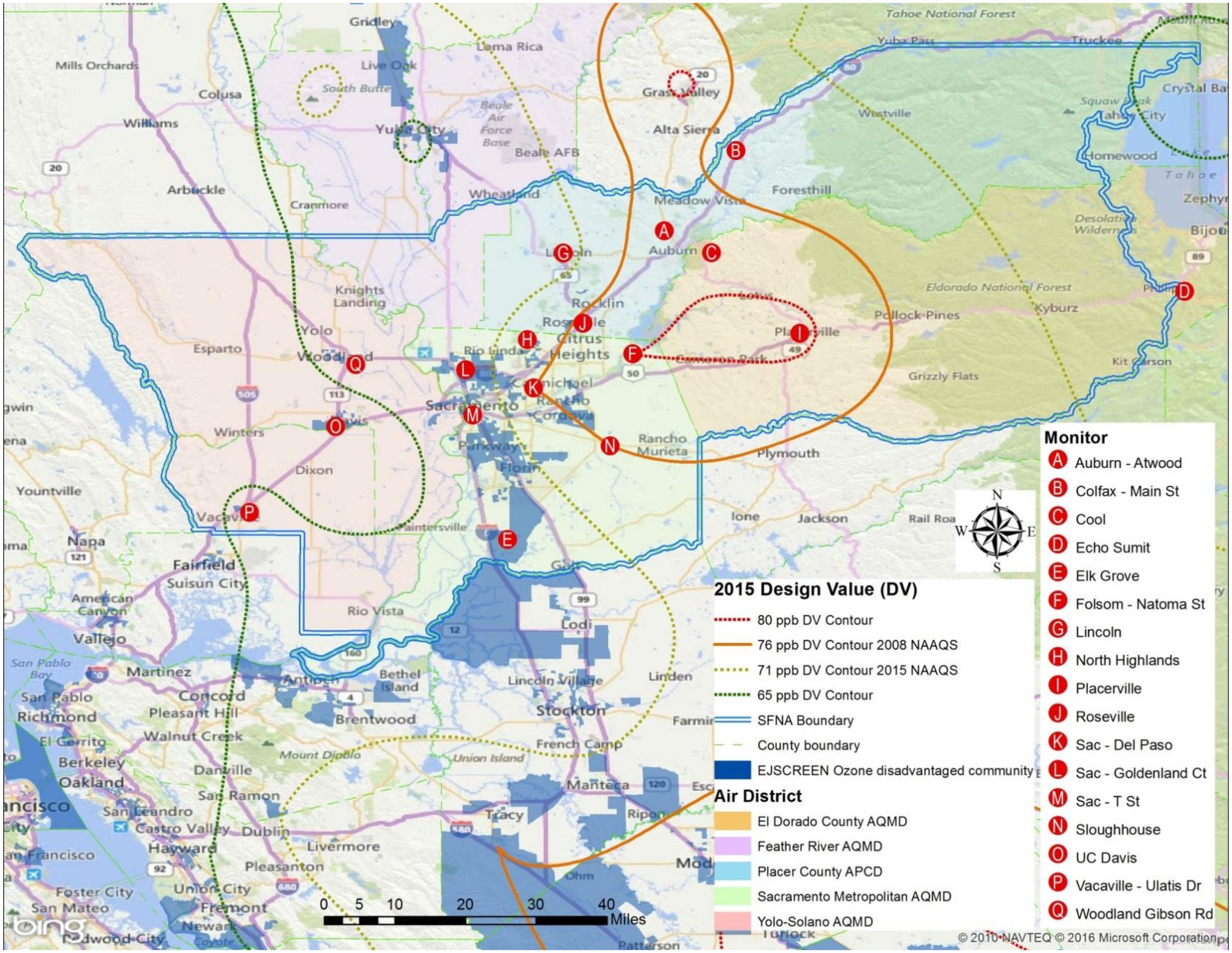
22 Contour lines were created by Golden Software Surfer 9.0 using Kriging gridding method with resolution of 0.01 degree.

new regulations. CARB also prepared a 2016 monitoring network plan (CARB, 2017) for other SFNA air districts to address future year changes and requirements. USEPA approved the SMAQMD 2016 Monitoring Network Plan on January 20, 2017 (USEPA, 2017a) and CARB's air monitoring network plan on February 24, 2017 (USEPA, 2017b).

4.3 Annual Number of Exceedance Days and Trend

Table 4-1 shows the annual number of days exceeding the 8-hour ozone standard for each of the ozone monitoring sites in the SFNA since 1990. Most exceedances of the 2008 federal 8-hour ozone standard occur at the region's eastern monitoring sites Cool, Folsom, Placerville, and Auburn. Cool recorded the highest number of exceedance days between 1996 and 2007. In the most recent years, 2008 – 2016, the Folsom monitor has recorded the highest number of exceedance days.

Figure 4-1 SFNA Ozone Monitoring Stations and 2015 Design Value Contours



Note: The area inside a contour line is estimated to be higher than the specified design value.

Table 4-1 8-Hour Ozone Exceedance Days above the 2008 NAAQS of 0.075 ppm for the SFNA Monitoring Sites

The site with the highest number of exceedance days for the year is highlighted in yellow.

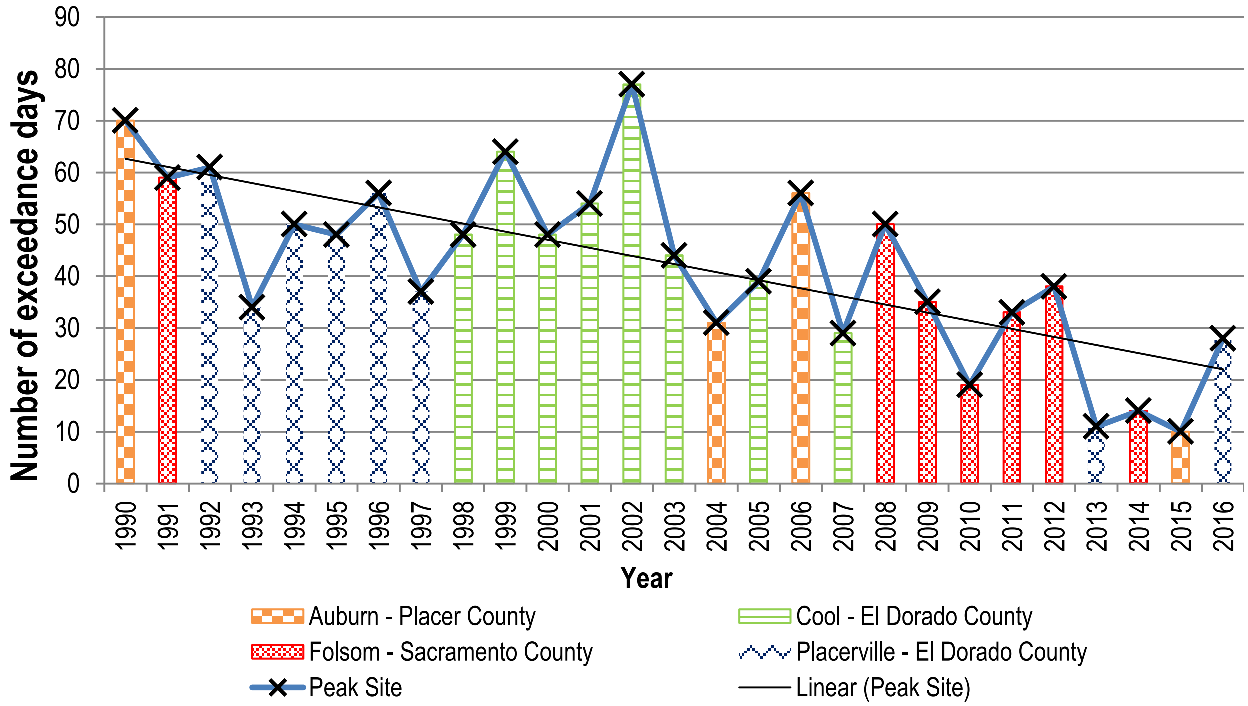
County	Monitoring Site	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
El Dorado	Cool							53	27	48	64	48	54	77	44	27	39	55	29	29	21	6	24	8	4	10	6	15
El Dorado	Echo Summit											2	4	8	3	1		3	3	5	0	0	0	1	0	0		0
El Dorado	Placerville			61	34	50	48	56	37	34	50	38	46	41	40	24	31	45	9	36	20	8	5	20	11	12	7	28
Placer	Auburn[1]	70	48	56	32	50	34	50	9	35	43	39	36	36	27	31	29	56	9	21	14	10	18	13	1	6	10	15
Placer	Colfax[2]	36		36	17	32	23	15	5	23	31	0	3	37	32	26	31	39	10	16	3	3	2	7	1	2	3	9
Placer	Rocklin[3]	23	26	48	18	34	28	40	17	22	25	22	25	29	Site Closed.													
Placer	Roseville				17	23	20	29	8	27	19	15	17	25	16	8	18	25	8	22	19	15	15	13	2	10	3	8
Placer	Lincoln																							5	0	1	2	8
Sacramento	Citrus Heights	18	20	17	Ozone monitoring ended in 1993 and site closed in 1996.																							
Sacramento	Elk Grove[4]	30	18	6	3	10	18	30	5	13	16	2	16	2	14	6	12	17	5	7	5	2	1	5	0	0	1	0
Sacramento	Folsom[5]	3	59	43	32	38	34	45	29	38	34	27	44	40	42	23	30	42	21	50	35	19	33	38	6	14	5	13
Sacramento	North Highlands	11	17	12	6	19	24	33	10	23	18	22	15	24	11	5	6	24	2	2	7	3	9	11	0	3	3	7
Sacramento	Sacramento-Del Paso	25	25	28	17	23	32	36	11	25	17	15	12	46	31	14	19	24	10	18	15	5	3	12	3	1	5	4
Sacramento	Sacramento-Goldenland Ct[6]	12	24	19	4	2	20	21	5	17	10	9	6	6	3	0	3	5	4	9	5	1	1	4	0	1	1	3
Sacramento	Sacramento-T Street	5	7	10	4	5	7	11	1	10	9	3	4	7	5	0	4	6	2	9	4	0	1	4	0	0	1	0
Sacramento	Sloughhouse								7	36	39	30	27	30	34	21	19	32	10	19	24	8	19	18	2	5	6	6
Sutter	Pleasant Grove	2	11	18	6	2	11	16	2	15	20	12	9	12	Site Closed.													
Solano	Vacaville[7]	2					4	12	3	14	14	3	1	2	2	1	2	6	2	4	2	1	0	1	0	0	0	0
Yolo	UC Davis	11	1	13	4	4	6	12	1	17	14	7	3	4	5	0	3	4	3	5	1	0	1	1	0	0	0	0
Yolo	Woodland[8]	7	6	15	1	5	9	15	2	12	18	7	5	13	10	0	6	14	2	4	3	0	0	2	0	0	0	0
	Peak Site	**70**	**59**	**61**	**34**	**50**	**48**	**56**	**37**	**48**	**64**	**48**	**54**	**77**	**44**	**31**	**39**	**56**	**29**	**50**	**35**	**19**	**33**	**38**	**11**	**14**	**10**	**28**

Data source: USEPA AQS database (https://aqs.epa.gov/aqs/) Downloaded on 07/19/2017.

1. Auburn monitor was moved from 108 C Ave, Auburn to 11645 Atwood St, Auburn in 2011.
2. Colfax monitor was moved from 10 West Church St. to 33 South Main St in 1992.
3. Rocklin monitor was moved from Sierra College to 5000 Rocklin Road in 1992. The Rocklin Road monitor ceased operations in 2003.
4. Elk Grove monitor was moved from 2800 Meadowview Road to Bruceville Blvd in 1992.
5. Folsom monitor was moved from City Corp Yard to 50 Natoma Street in 1996.
6. Sacramento-Goldenland Ct monitor was moved from Airport Road in 2009 and subsequently moved to 7926 Earhart Drive in 1998..
7. Vacaville monitor was moved from 1001 Allison Drive to 2012 Ulatis Drive in 2003.
8. Woodland monitor was moved from 177 West Main Street to 40 Sutter Street in 1992 and subsequently moved to 41929 East Gibson Road in 1998.

Figure 4-2 illustrates the trend in number of exceedance days at the region's monitoring sites with the highest number of exceedance days for each year. Year to year differences are caused by meteorological variability and changes in precursor emissions. The trend line in the figure indicates a decline in the number of exceedance days per year over the past 27 years, from 70 days in 1990 down to 28 days in 2016 representing a declining rate of about 1.5 days per year.

Figure 4-2 8-Hour Ozone Exceedance Days Trend SFNA – Peak Monitoring Site



4.4 Ozone Design Values and Trend

Table 4-2 lists the 8-hour ozone design value concentrations for each of the ozone monitoring sites in the SFNA from 1990 to 2016. To demonstrate attainment, the ozone design value must be at or below the 8-hour ozone standard (75 ppb).

Table 4-2 8-Hour Ozone Design Values (ppb) Sacramento Nonattainment Area – Ozone Monitoring Sites

The peak site for the year is highlight in yellow.

County	Monitoring Site	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
El Dorado	Cool							na	na	103	103	107	104	106	107	102	97	95	96	98	93	89	84	83	81	80	79	82
El Dorado	Echo Summit											na	na	75	76	75	na	na	na	76	na	71	67	69	69	69	na	na
El Dorado	Placerville			na	na	97	99	103	99	98	98	99	96	94	95	94	94	94	93	96	92	90	80	81	82	84	81	85
Placer	Auburn[1]	107	105	105	101	102	105	103	95	95	97	102	101	101	99	95	92	93	89	90	86	87	80	na	79	78	79	83
Placer	Colfax[2]	na	76	na	na	92	92	91	86	86	86	79	na	77	88	92	91	97	94	89	79	78	74	75	73	73	73	76
Placer	Rocklin[3]	na	76	na	101	103	100	100	95	94	92	93	91	92	Site Closed.													
Placer	Roseville				na	na	97	96	93	93	89	93	90	92	90	87	86	89	89	90	89	90	86	85	81	81	77	80
Placer	Lincoln																							na	na	na	69	74
Sacramento	Citrus Heights	98	94	97	80	na	na	Ozone monitoring ended in 1993 and site closed in 1996.																				
Sacramento	Elk Grove[4]	95	97	91	83	na	81	87	87	87	88	85	84	75	80	77	82	82	83	82	79	77	74	na	71	70	66	68
Sacramento	Folsom[5]	101	100	101	110	104	106	106	na	91	101	104	99	100	100	97	97	97	98	102	100	102	95	95	90	85	80	83
Sacramento	North Highlands	87	82	88	87	87	88	91	88	89	87	89	89	92	91	85	80	82	80	76	na	na	77	77	76	75	73	77
Sacramento	Sacramento-Del Paso	96	94	100	99	92	96	100	97	95	91	95	92	95	97	95	92	90	90	87	86	85	81	78	77	77	76	77
Sacramento	Sacramento-Goldenland Ct[6]	na	87	88	84	79	80	83	84	na	na	82	79	78	77	na	na	na	76	78	na	na	69	69	70	71	69	71
Sacramento	Sacramento-T Street	na	76	79	79	78	78	80	77	79	80	82	80	79	79	75	73	76	78	79	77	75	71	71	69	69	67	69
Sacramento	Sloughhouse								na	na	100	105	98	95	95	94	94	96	93	95	91	92	87	88	84	80	76	79
Sutter	Pleasant Grove	82	76	79	82	81	82	83	82	81	81	84	83	82	na	na	Site Closed.											
Solano	Vacaville[7]						na	na	76	82	85	85	77	72	na	na	na	73	74	75	72	71	68	69	67	66	66	67
Yolo	UC Davis	na	na	80	78	79	78	82	79	80	81	85	81	77	76	74	73	74	75	76	74	72	70	70	66	64	62	64
Yolo	Woodland[8]	80	77	na	na	79	78	81	79	na	na	84	82	83	83	79	77	79	80	79	74	72	69	69	69	68	67	69
	Peak Site	**107**	**105**	**105**	**110**	**104**	**106**	**106**	**99**	**103**	**103**	**107**	**104**	**106**	**107**	**102**	**97**	**97**	**98**	**102**	**100**	**102**	**95**	**95**	**90**	**85**	**81**	**85**

Data source: USEPA AQS database (https://aqs.epa.gov/aqs/) Downloaded on 07/19/2017.

1 Auburn monitor was moved from 108 C Ave, Auburn to 11645 Atwood St, Auburn in 2011.

2 Colfax monitor was moved from 10 West Church St. to 33 South Main St in 1992.

3 Rocklin monitor was moved from Sierra College to 5000 Rocklin Road in 1992. The Rocklin Road monitor ceased operations in 2003.

4 Elk Grove monitor was moved from 2800 Meadowview Road to Bruceville Blvd in 1992.

5 Folsom monitor was moved from City Corp Yard to 50 Natoma Street in 1996.

6 Sacramento-Goldenland Ct monitor was moved from Airport Road in 2009 and subsequently moved to 7926 Earhart Drive in 1998.

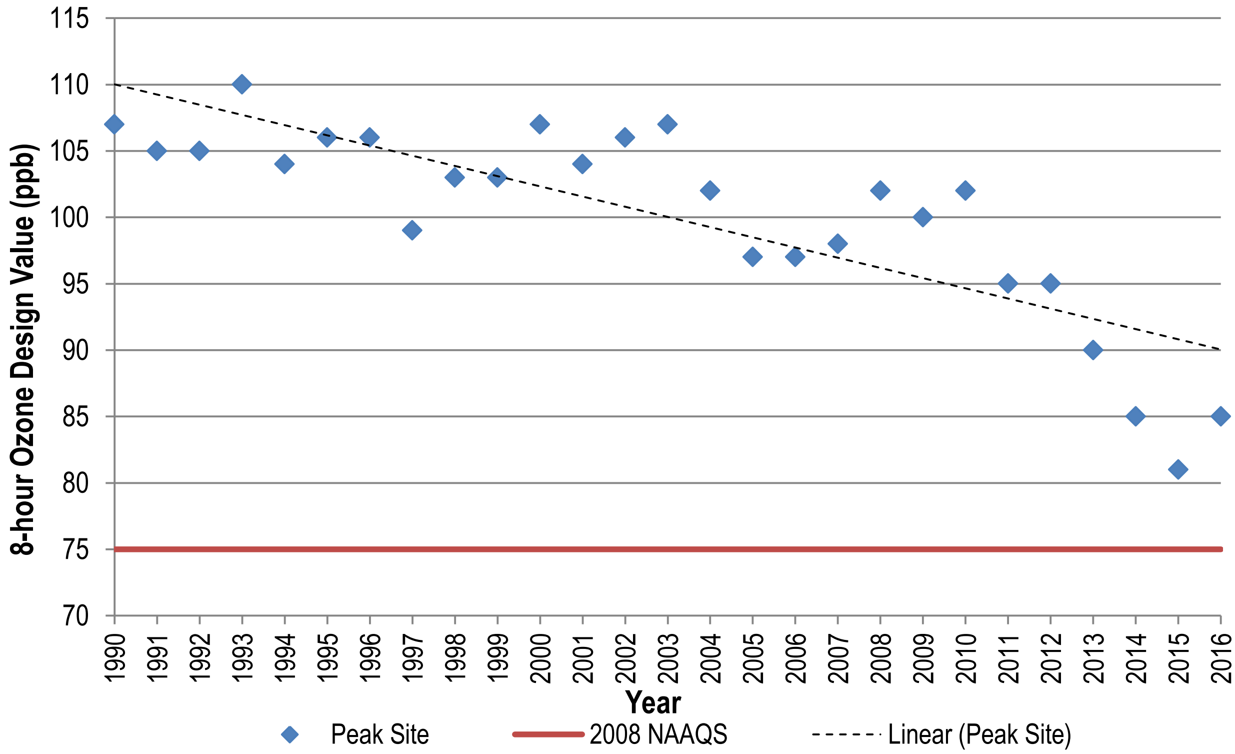
7 Vacaville monitor was moved from 1001 Allison Drive to 2012 Ulatis Drive in 2003.

8 Woodland monitor was moved from 177 West Main Street to 40 Sutter Street in 1992 and subsequently moved to 41929 East Gibson Road in 1998.

na Insufficient data to determine the design value.

Figure 4-3 shows the ozone design value for the peak monitoring site in each year and a trend line from 1990 to 2016. The overall 27-year trend line indicates a decline, from the peak 110 ppb in 1993 down to 85 ppb in 2016. The ozone design value has improved from being 35 ppb (or 46%) over the standard down to about 10 ppb (or 13%) over the standard. The linear trend line in Figure 4-3 shows a declining trend rate of about 0.7 ppb per year.

Figure 4-3 8-Hour Regional Ozone Design Values Trend SFNA



Note: This trend line is the highest 8-hour ozone design values in the region. The current federal 8-hour ozone standard is 75 ppb.

Figures 4-4 through 4-8 show the ozone design value declining trends of five peak monitors (Folsom, Cool, Sloughhouse, Auburn, and Placerville) in the SFNA. The historical trend lines indicate that the design values for the region are declining.

Figure 4-4 Design Values at the Folsom monitor

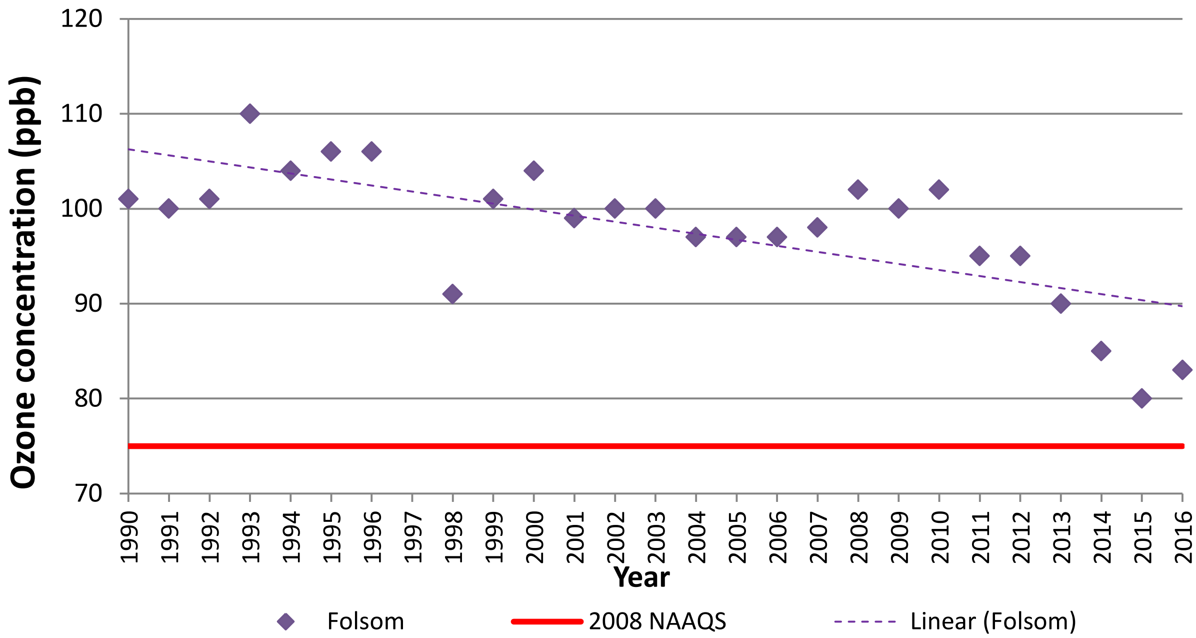


Figure 4-5 Design Values at the Cool monitor

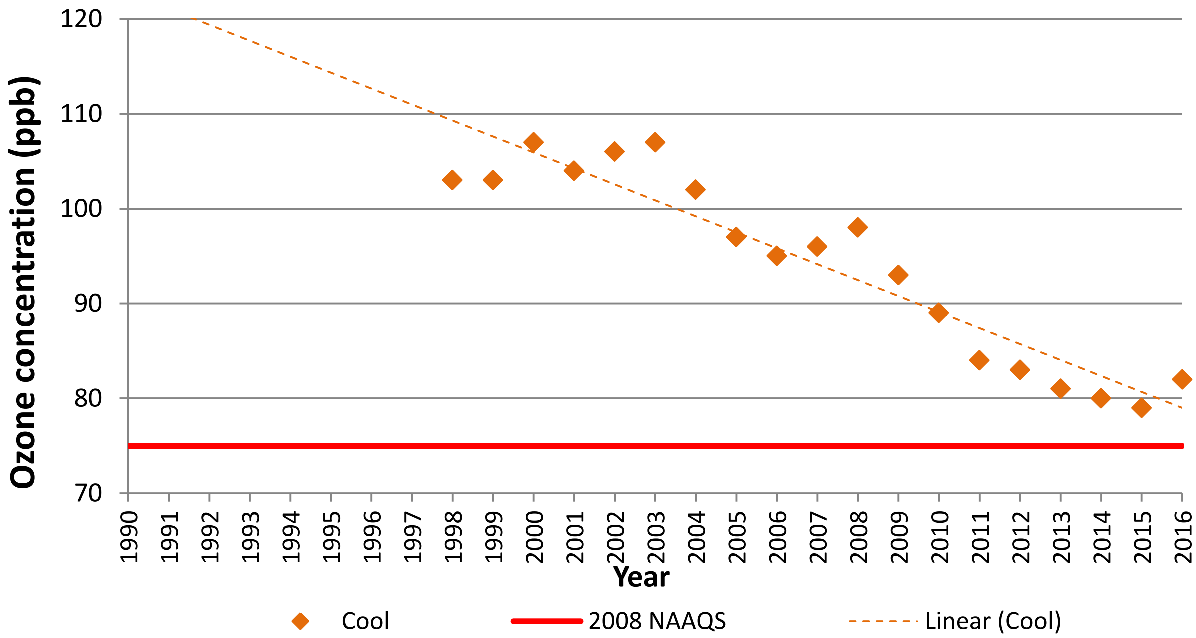


Figure 4-6 Design Values at the Sloughhouse monitor

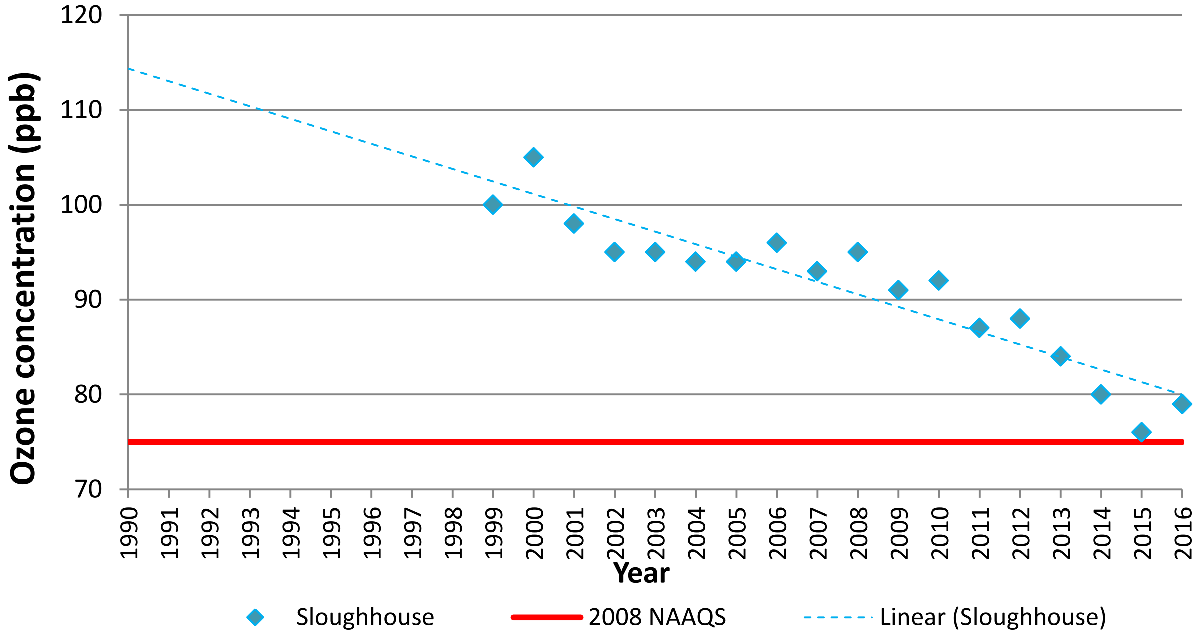


Figure 4-7 Design Values at the Auburn monitor

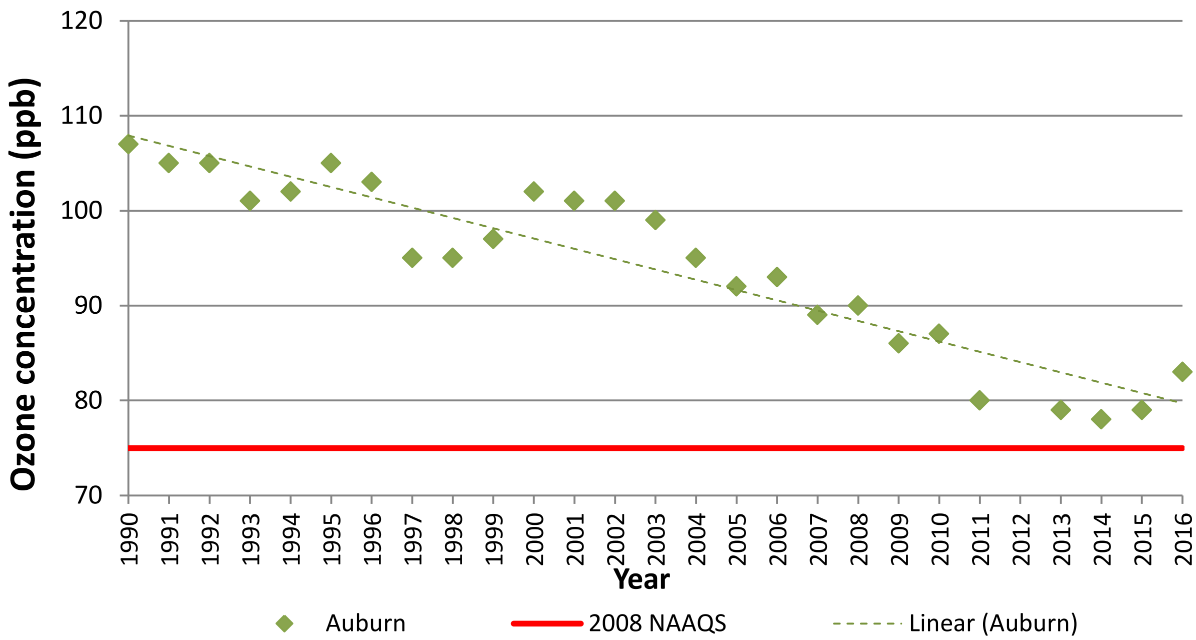
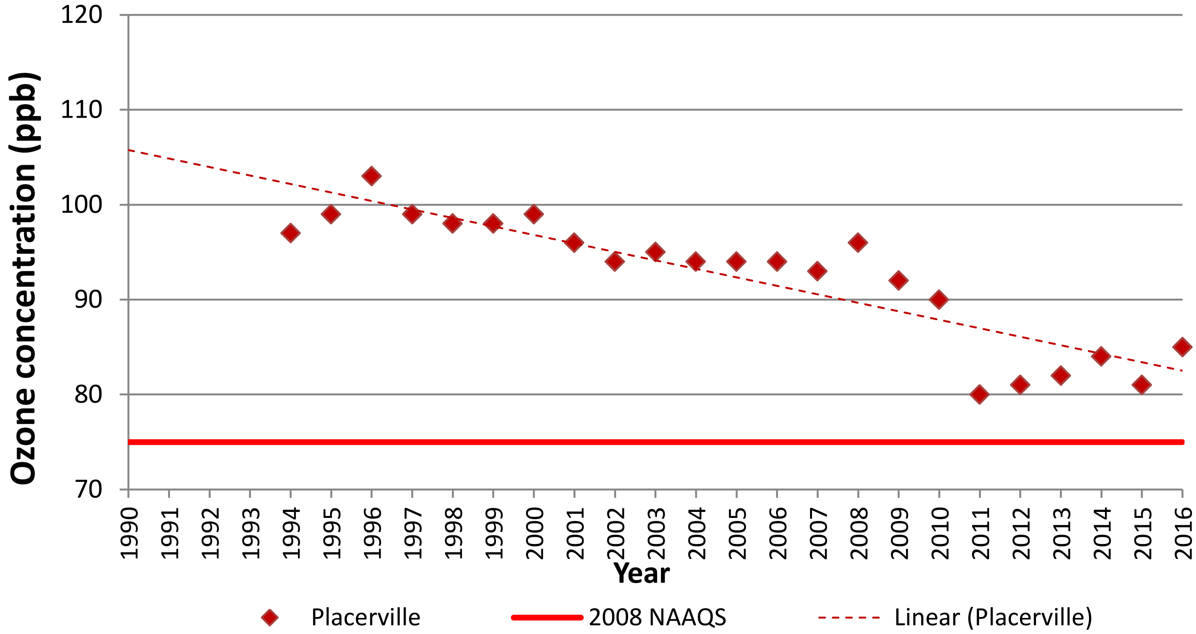


Figure 4-8 Design Values at the Placerville monitor



4.5 References

CARB. *Annual Network Plan Covering Monitoring Operations in 25 California Air Districts.* Sacramento, CA: California Air Resources Board. June [2016.]

SMAQMD. *Sacramento Air Quality Management District 2016 Monitoring Plan*. Sacramento, CA: Sacramento Metropolitan Air Quality Management district. 23 September [2016.] Print.

USEPA (69 FR 23951). *Final Rule: Final Rule to Implement the 8-Hour Ozone National Ambient Air Quality Standard—Phase I.* Federal Register, Volume 69, 30 April 2004, p23951-24000. Print.

USEPA (72 FR 13560). *Final Rule: Treatment of Data Influenced by Exceptional Events.* Federal Register, Volume 72, 22 March 2007, p13560-13581. Print.

USEPA (73 FR 16436). *Final Rule: National Ambient Air Quality Standards for Ozone.* Federal Register, Volume 73. 27 March 2008, p16436-16514. Print.

USEPA (80 FR 65292). *Final Rule: National Ambient Air Quality Standards for Ozone.* Federal Register, Volume 80. 26 October 2015, p65292-65468. Print.

USEPA. *Message from Gwen Yoshimura (USEPA, Region IX) to Larry Greene (SMAQMD)* 20 January [2017a]. Letter.

USEPA. *Message from Gwen Yoshimura (USEPA, Region IX) to Ravi Ramalingam (CARB)* 24 February [2017b.] Letter.

5 EMISSIONS INVENTORY

5.1 Introduction to Emissions Inventory

Planning efforts to evaluate and reduce ozone air pollution include identifying and quantifying the various processes and sources of Volatile Organic Compound (VOC) emissions (such as solvents, surface coatings, and motor vehicles) and Nitrogen Oxide (NO_X) emissions (such as motor vehicles and other fuel combustion equipment). VOC pollutants are also known as reactive organic gases (ROG), and the two are considered to be synonymous for this report.

A summary of VOC and NO_X emissions estimates by different air pollutant source categories are provided for the State Implementation Plan (SIP) planning years in tabular and graphical formats. The 2012 base year, 2018, 2021, and 2024 emission inventories use the latest planning assumptions and emissions data in California Air Resources Board's (CARB's) California Emission Projection Analysis Model (CEPAM). These inventories, presented in tons per day for an average summer day, are forecasted using the latest socio-economic growth indicators and applying the emission reduction benefits from adopted control strategies. Emission reduction credits are then added to the emissions inventory forecasts. More detailed information and emissions inventory tables are provided in Appendix A – Emissions Inventory.

5.2 Emission Inventory Requirements

Emissions are updated as part of the overall requirement that plan revisions include "a comprehensive, accurate, current inventory of actual emissions from all sources of the relevant pollutant or pollutants" under Clean Air Act sections 172(c)(3) and 182(a)(1). The baseline year for the SIP planning emissions inventory is identified as 2012.

The United States Environmental Protection Agency (USEPA) draft emission inventory guidance (USEPA, 2016) and federal 8-hour ozone implementation rules (70 FR 71612-71705) set specific planning requirements pertaining to future milestone years for reporting reasonable further progress (RFP) and to attainment demonstration years. Key RFP analysis years in this report include 2018 and every subsequent 3 years out to and including the attainment date.

Attainment demonstration for a severe-15 nonattainment area classification is 2026. However, the regional air districts, in consultation with CARB and USEPA Region IX, are proposing 2024[23] be established as the region's attainment demonstration year for the 2008 ozone National Ambient Air Quality Standard (NAAQS) for the Sacramento Federal Nonattainment Area (SFNA). An attainment year of 2024 is appropriate

[23] The attainment demonstration would be based on ambient air quality data from the 2022-2024 ozone seasons.

because it is bounded by two modeled attainment demonstrations, supports early attainment (it is before the statutory deadline for a severe-15 area), and provides a safeguard against inherent uncertainties in predicting future ambient ozone concentrations beyond 2022 (e.g. emission reductions, meteorology, natural events.). CARB is preparing a weight-of-evidence analysis, which will be submitted to EPA in conjunction with this SIP.

The emissions inventory years included in this plan are 2012 (baseline), 2018, 2021, and 2024. USEPA draft emission inventory guidance (USEPA, 2016, p.20) also requires the SIP planning emissions inventory to be based on estimates of actual emissions for an average summer weekday, typical of the ozone season (May – October).

5.3 Emission Inventory Source Categories

Due to the large number and wide variety of emission processes and sources, a hierarchical system of emission inventory categories was developed for more efficient use of the data. The anthropogenic (man-made) emissions inventory is divided into four broad categories: stationary, area-wide, on-road motor vehicles, and other mobile sources. Each of these major categories is subdivided into more descriptive subcategory sources, which are further defined into more specific emission processes.

5.3.1 Stationary Sources

The stationary sources category of the emissions inventory includes non-mobile, fixed sources of air pollution. They are mainly comprised of individual industrial, manufacturing, and commercial facilities called “point sources.” The more descriptive subcategories include fuel combustion (e.g., electric utilities and agricultural irrigation engines), waste disposal (e.g., landfills and composting), cleaning and surface coatings (e.g., printing and dry cleaning), petroleum production and marketing, and industrial processes (e.g., breweries and asphaltic concrete production). The facility operators report the process and emissions data to their local air district, which uses the information to calculate emissions from point sources.

5.3.2 Area-Wide Sources

The area-wide sources category includes aggregated emissions data from processes that are individually small and widespread or not well-defined point sources. The area-wide subcategories include solvent evaporation (e.g., consumer products and architectural coatings) and miscellaneous processes (e.g., residential fuel combustion and farming operations). Emissions from these sources are calculated from product sales, population, employment data, and other parameters for a wide range of activities that generate air pollution across the Sacramento nonattainment region. More detailed information on the area-wide source category emissions can be found on the CARB website: http://www.arb.ca.gov/ei/areasrc/areameth.htm

5.3.3 On-Road Motor Vehicles

The on-road motor vehicles inventory category consists of trucks, automobiles, buses, and motorcycles. On-road motor vehicle emission estimates were developed using the latest available transportation data and California's EMFAC2014 model. EMFAC (EMission FACtor) is California's model for estimating emissions from on-road motor vehicles operating in California. Pollutant emissions for hydrocarbons (HC), carbon monoxide (CO), nitrous oxides (NO_X), course particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), lead, carbon dioxide (CO_2), and sulfur oxides (SO_x) are output from the model. Emissions are calculated for fifty-one different vehicle classes composed of passenger cars, various types of trucks and buses, motorcycles, and motor homes. EMFAC has undergone many revisions over the years and the current on-road motor vehicles emission model, EMFAC2014, is used in this Plan.

5.3.3.1 Motor Vehicle Emissions Model, EMFAC2014

The CARB has continued to update and improve its EMFAC on-road motor vehicle emissions model. Effective December 14, 2015, the USEPA has approved the EMFAC2014 emissions model for SIP and conformity purposes (80 FR 77337). EMFAC2014 replaces EMFAC2011 and the model's major improvements include:

- Re-design of EMFAC with new programming architecture
- Fuel-based default vs. user-specified custom activities
- Incorporation of fuel-based statewide activity with new vehicle miles traveled (VMT) spatial allocations
- Socio-econometric modeling of population and VMT
- Revision of heavy-duty diesel (HD Diesel) truck emission rates
- Incorporation of natural gas vehicles for select vehicle classes
- Accounting for Federal and California regulations and standards adopted post-2010.

EMFAC2014 software and detailed information on the vehicle emission model can be found on the CARB website: https://www.arb.ca.gov/msei/categories.htm.

5.3.3.2 Vehicle Activity Data

The on-road motor vehicle emissions are from CARB's CEPAM 2016 v1.04 and are generated using EMFAC2014 with vehicle activity data from the 2016 Metropolitan Transportation Plan (2016 MTP) from SACOG and the 2015 Federal Statewide Transportation Improvement Program FSTIP from MTC (CARB, 2017). Although there are small differences between the on-road inventory and the motor vehicle emissions budgets due to the 2017 MTC FSTIP for eastern Solano, these differences do not impact the RFP or attainment demonstration.

5.3.4 Other Mobile Sources

The emission inventory category for other mobile sources includes aircraft, trains, ships, and off-road vehicles and equipment used for construction, farming, commercial, industrial, and recreational activities. Like EMFAC, the off-road emissions model underwent a significant update. The OFFROAD2007 model is being replaced by category-specific methods and inventory models that are being developed for specific regulatory support projects. The diesel equipment categories using the category-specific method include: In-Use Off-Road Equipment (Construction, Industrial, Ground Support and Oil Drilling); Cargo Handling Equipment; In-Use Mobile Agricultural Equipment; Locomotives; Transport Refrigeration Units; Commercial Harbor Craft; Ocean Going Vessels; and Stationary Commercial Engines. The Gasoline-Fueled equipment categories using the category-specific method include: Pleasure Craft, Recreational Vehicles, Outboard Marine Tanks, Portable Fuel Tanks, and Lawn and Garden. If a category is not listed above (e.g., farm equipment), OFFROAD2007 remains the current tool for estimating emissions. In general, emissions are calculated by using estimated equipment population, engine size and load, usage activity, and emissions factors.

More detailed information on the latest off-road motor vehicle emissions inventory, including can be found on the CARB website:
https://www.arb.ca.gov/msei/categories.htm.

5.3.5 Biogenic Sources

Biogenic emissions are emissions from natural sources, such as plants and trees. Using the MEGAN (Model of Emissions of Gases and Aerosols from Nature) model, CARB estimates emission of biogenic volatile organic compounds (BVOC) from vegetation for natural areas, agricultural crops, and urban landscapes. BVOC emissions vary with temperature. CARB does not estimate biogenic nitric oxide emissions from soils, therefore the biogenic emissions estimate is strictly BVOC. The average summer day biogenic emissions for the SFNA, in base year 2012, is 693.4 tons (CARB, 2016a).

5.4 Base Year Emissions Inventory

Anthropogenic Emissions Table by Source Category

The following tables (Tables 5-1 and 5-2) show the anthropogenic emissions inventory of VOC and NO_X by source categories for the SFNA. The SFNA includes emissions from Sacramento and Yolo Counties, the eastern portion of Solano County, Placer and El Dorado Counties excluding the Lake Tahoe Basin, and the southern portion of Sutter County[24]. The emissions inventory for ozone planning purposes represents emissions

[24] Southern Sutter County emissions include:
1) all point sources located in the area,

for a summer seasonal average day in units of tons per day. Inventories were generated using CEPAM: 2016 SIP Baseline Emission Projections (CARB, 2016) and do not include Emission Reduction Credits (ERCs). The VOC and NO_X emissions totals are 110 tons and 101 tons per day in 2012, respectively.

2) 4% of the county total of area and aggregated point sources that are projected by population where, which is the percent of Sutter County population in the Sutter portion of the SFNA based on the 2010 Census,
3) 41% of the county total for emissions from agriculture, where, 41% is the ag land ratio in the Sutter portion of the SFNA,
4) 34% of the county total for emissions from off-road equipment, where, 34% is the percent of Sutter County land area in the Sutter portion of the SFNA,
5) 56% of the total railroad emissions, where 56% of the train tracks are located in the South Sutter Split,
6) 0% of the county total for emissions from oil and gas operations categories.

Table 5-1 Emissions of VOC (tons per day) SFNA

	2012	2018	2021	2024
TOTAL EMISSIONS[a]	110	91	87	84
STATIONARY	22	22	23	23
AREA-WIDE	29	29	30	31
ON-ROAD MOTOR VEHICLES	34	20	16	14
OTHER MOBILE SOURCES	26	20	18	17
STATIONARY				
Solvent/Coatings	7.2	8.2	8.6	9.0
Petroleum Production/Marketing	5.9	5.3	4.9	4.6
Industrial Process	2.4	2.9	3.1	3.3
Waste Composting	6.1	5.3	5.5	5.7
Other	0.8	0.6	0.6	0.6
AREA-WIDE				
Consumer Products	12.4	12.3	12.6	13.0
Architectural Coatings	8.0	8.3	8.6	8.8
Pesticides/Fertilizers	1.2	1.2	1.2	1.2
Livestock Waste	2.9	2.9	2.9	2.9
Ag Burn/Other Managed Burn	0.9	0.8	0.8	0.8
Other	3.2	3.6	3.8	3.9
ON-ROAD				
Automobiles	12.1	6.0	4.7	4.0
Lt/Med Duty Trucks	13.3	8.5	7.0	6.0
Heavy Duty Gas Trucks	2.5	1.3	1.1	0.9
Heavy Duty Diesel Trucks	2.5	1.0	0.7	0.5
Motorcycles	2.8	2.5	2.5	2.4
Buses/Motor Homes	0.4	0.2	0.1	0.1
OTHER MOBILE				
Recreational Boats	11.7	8.6	7.3	6.2
Equipment (Construction/Industrial/Farm)	4.0	2.8	2.4	2.2
Lawn & Garden Equipment	5.6	4.8	4.7	4.8
Gas Can	1.7	1.4	1.3	1.2
Off-Road Recreational Vehicles	1.7	1.5	1.5	1.4
Trains	0.4	0.3	0.3	0.3
Aircraft	0.5	0.5	0.5	0.5
Ocean Vessels & Harbor Craft	0.1	0.1	0.1	0.1

Source: (CARB, 2016), does not include 5 tpd of VOC ERCs identified in Appendix A, Tables A3-1 and A3-2.
[a] TOTAL EMISSIONS are the rounded sum of reported emissions, as shown in Appendix A1.

Table 5-2 Emissions of NO_X (tons per day) SFNA

	2012	2018	2021	2024
TOTAL EMISSIONS[a]	101	69	58	49
STATIONARY	8	7	7	7
AREA-WIDE	3	2	2	2
ON-ROAD MOTOR VEHICLES	61	35	26	19
OTHER MOBILE SOURCES	30	26	23	21
STATIONARY				
Fuel Combustion	5.3	5.0	5.0	5.1
Ag Irrigation Pumps	2.2	1.0	0.8	0.8
Industrial Process	0.6	0.7	0.7	0.8
Other	0.1	0.1	0.1	0.0
AREA-WIDE				
Residential Fuel Combustion	2.4	2.0	1.9	1.8
Ag Burn/Other Managed Burn	0.3	0.3	0.3	0.3
ON-ROAD				
Heavy Duty Diesel Trucks	36.6	21.8	16.9	12.0
Lt/Med Duty Trucks	10.5	5.5	3.9	2.8
Automobiles	6.5	3.3	2.4	1.9
Heavy Duty Gas Trucks	2.8	1.7	1.3	1.0
Buses/Motor Homes	3.5	2.0	1.5	1.1
Motorcycles	0.5	0.5	0.5	0.5
OTHER MOBILE				
Construction & Mining Equip	5.5	4.6	3.9	3.1
Trains	6.2	6.7	6.3	5.9
Farm Equipment	8.3	6.6	5.6	4.7
Boats (Rec/Ships/Harbor Craft)	3.8	3.0	2.8	2.7
Commercial/Industrial Equipment	0.5	0.3	0.2	0.2
Aircraft	1.4	1.4	1.5	1.6
Oil Drilling/Workover	0.0	0.0	0.0	0.0
Other	2.8	2.1	1.8	1.7
Trans Refrig Units	1.3	0.9	0.9	0.9

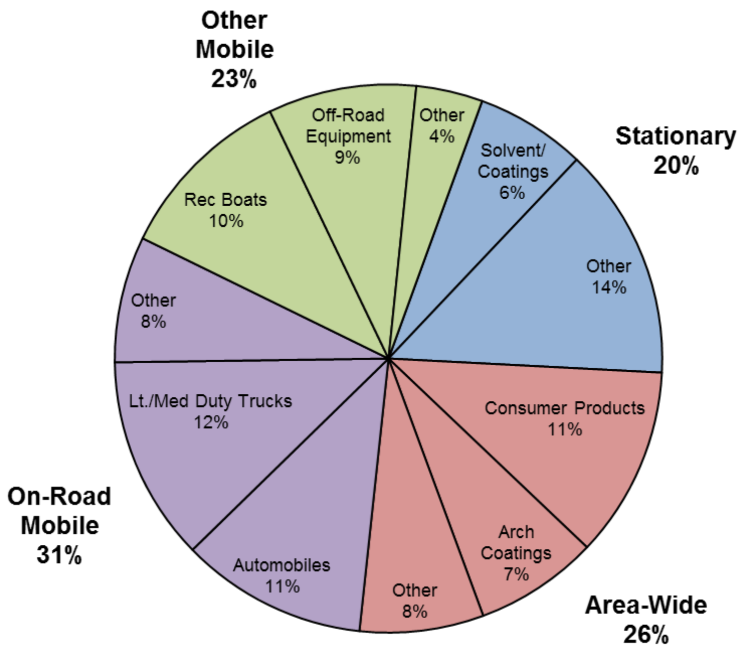
Source: (CARB, 2016), does not include 4 tpd of NO_X ERCs identified in Appendix A, Tables A3-1 and A3-2.
[a] TOTAL EMISSIONS are the rounded sum of reported emissions, as shown in Appendix A1.

2012 Emissions Pie Charts

The following pie charts (Figures 5-1 to 5-2) show the 2012 VOC and NO_X emission inventory categories as a percentage of the total inventory for the SFNA. In 2012, the VOC inventory includes 31% on-road mobile sources, 23% other mobile sources 26% area-wide sources, and 20% stationary sources.

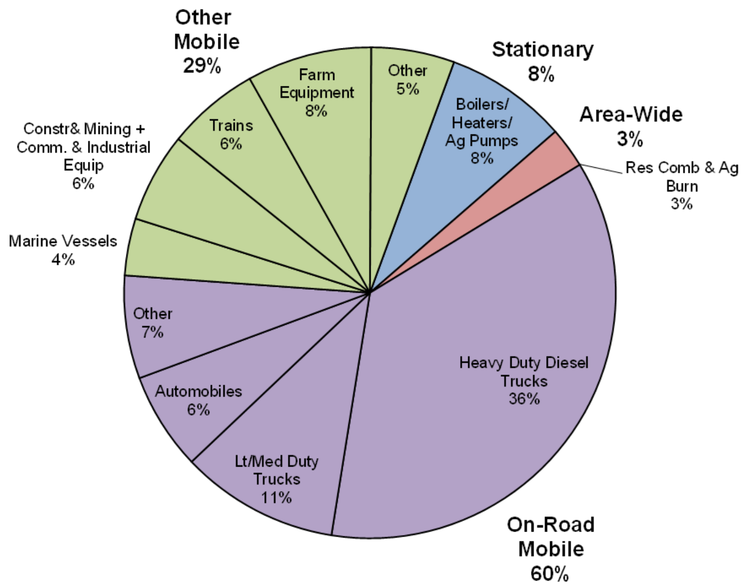
The NO_X inventory is predominately mobile source combustion emissions. In 2012, the NO_X inventory includes 60% on-road mobile sources, 29% other mobile sources, 8% stationary sources, and 3% area-wide sources.

Figure 5-1 2012 VOC Inventory SFNA 110 tpd



Source: (CARB, 2016) does not include 5 tpd of VOC ERCs identified in Appendix A, Tables A3-1and A3-2.

Figure 5-2 2012 NO_X Inventory SFNA 101 tpd



Source: (CARB, 2016) does not include 4 tpd of NO_X ERCs identified in Appendix A, Tables A3-1 and A3-2.

2012 Top 10 Emission Categories

Figures 5-3 and 5-4 contain bar charts that display the 2012 top 10 emission inventory categories for VOC and NO_X, respectively. The largest source categories for VOC are consumer products, automobiles, recreational boats, light-duty trucks, and architectural coatings. The largest source categories for NO_X are heavy-duty diesel trucks, off-road equipment, farm equipment, automobiles, trains, and light-duty trucks.

State and federal laws limit local air district authority to regulate certain emissions sources, notably motor vehicles, off-road engines, and consumer products. USEPA retains almost exclusive regulatory authority for emissions from trains, aircraft, and ships. The largest source categories that air districts have regulatory authority over include architectural coatings, solvents and coatings, waste composting, petroleum marketing, stationary fuel combustion, and agricultural irrigation pumps.

Figure 5-3 Top 10 Categories for VOC Planning Emissions – SFNA 2012

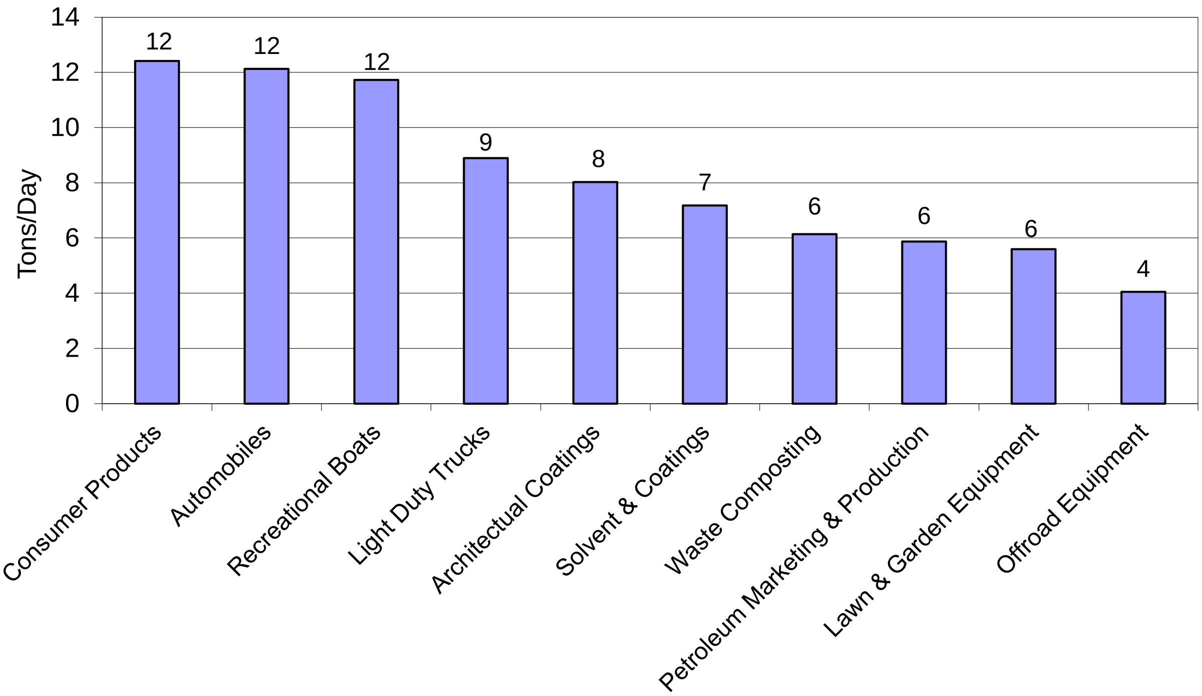
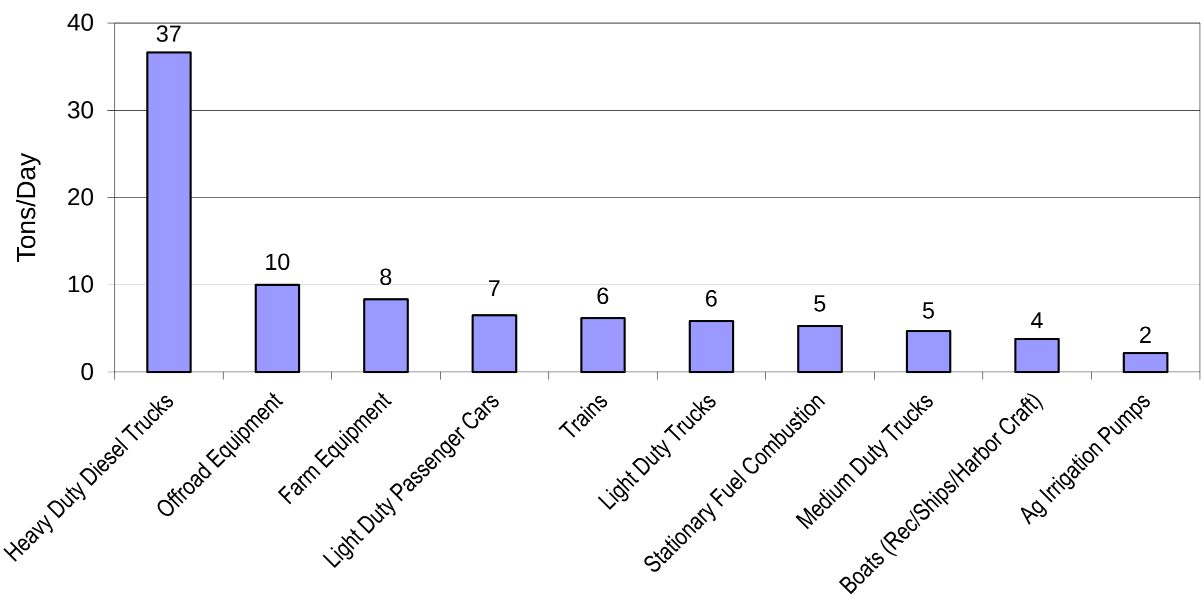


Figure 5-4 Top 10 Categories for NO_X Planning Emissions – SFNA 2012



Emissions Contribution by Agency Responsibility

Figures 5-5 and 5-6 show pie charts that identify the VOC and NO_X emissions contributions by primary agency responsibility (District, CARB, or USEPA). In terms of emissions, local air districts have direct regulatory authority for only 34% of VOC emissions and 11% of NO_X emissions in the SFNA. CARB has the most regulatory responsibility over emissions, 65% of VOC and 82% of NO_X, due to their authority over mobile source emissions.

Figure 5-5 VOC Emissions Contribution by Primary Agency Responsibility - SFNA

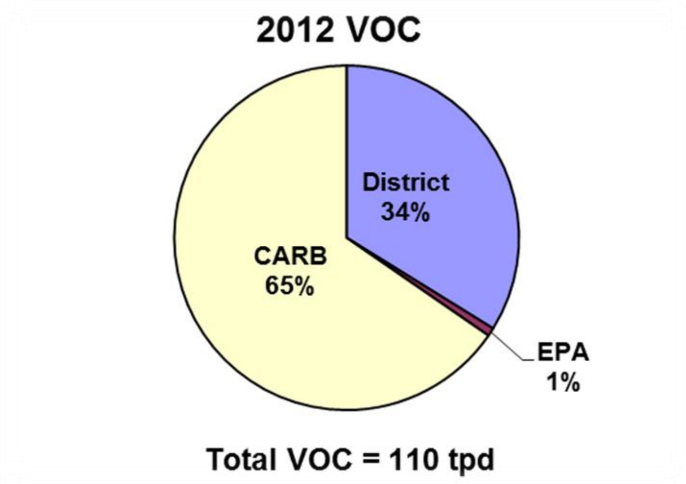
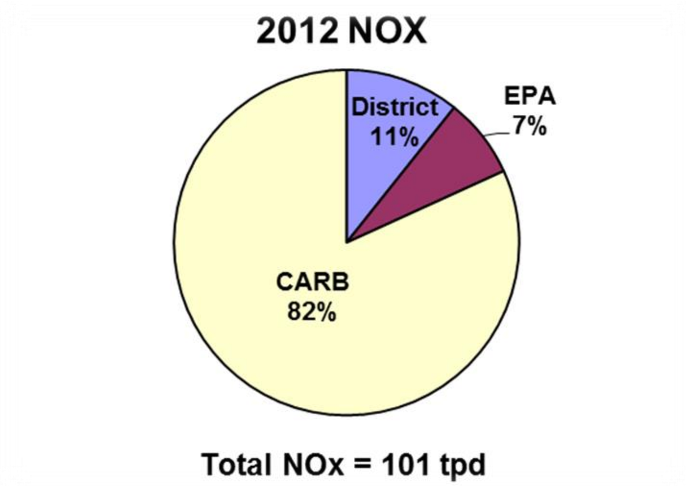


Figure 5-6 NO_X Emissions Contribution by Primary Agency Responsibility - SFNA



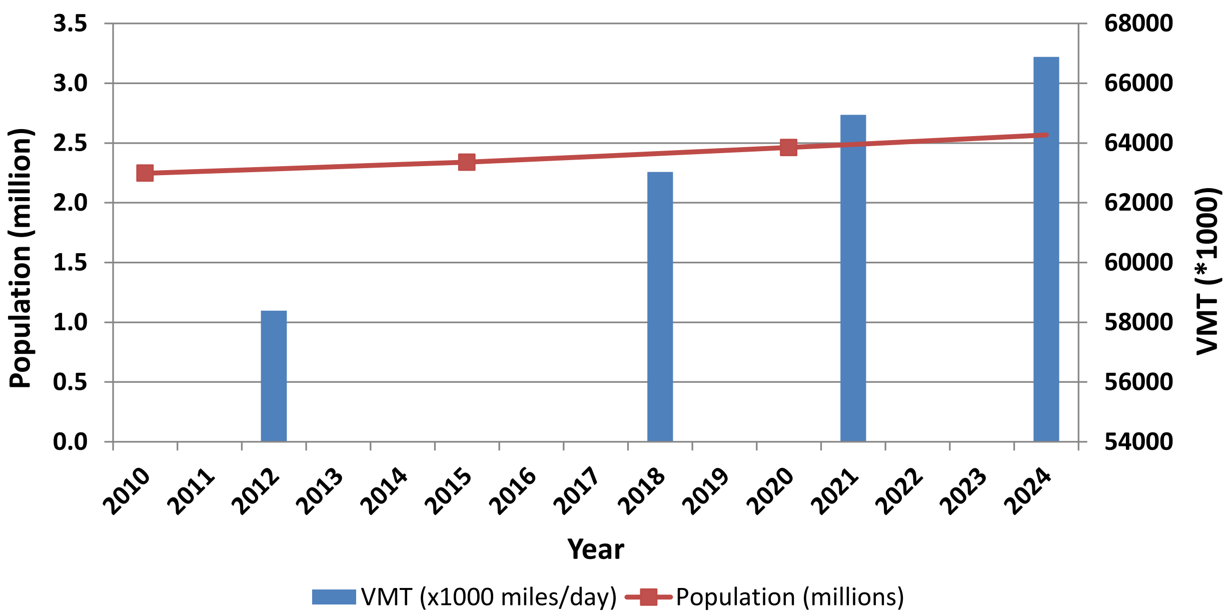
5.5 Emission Inventory Forecasts

The emission inventory forecasts take into account anticipated population and economic growth along with emission benefits from the federal, state, and local control measures. In order to forecast emissions for various future milestone and attainment analysis years, growth parameters and the post-2012 emission reduction effects of control measures[25] received by CARB as of late 2015 are applied to the 2012 emissions inventory at the emission process level for stationary and area-wide sources. The

25 The growth and control data used for emission forecasting stationary and area-wide sources in CARB's SIP planning projection model, CEPAM, are found in Appendix A2.

various growth parameters include forecasts for population, housing, employment, energy demand, motor vehicle travel, and other industrial and commercial outputs. Off-road motor vehicle emissions are forecasted separately by off-road category specific models using growth rates that were based on category-specific economic indicators such as employment, expenditures and fuel use. Future on-road emissions are determined by using VMT forecasts in SACOG's 2016 MTP (SACOG, 2016) and MTC's 2015 FSTIP (MTC, 2016). Figure 5-7 contains a graph showing population and VMT growth[26] for the Sacramento region. Existing control strategies continue to reduce future VOC and NO_X emissions from stationary and area sources, on-road motor vehicles, and some other mobile source categories (such as off-road equipment).

Figure 5-7 Population Growth and VMT Forecast – SFNA



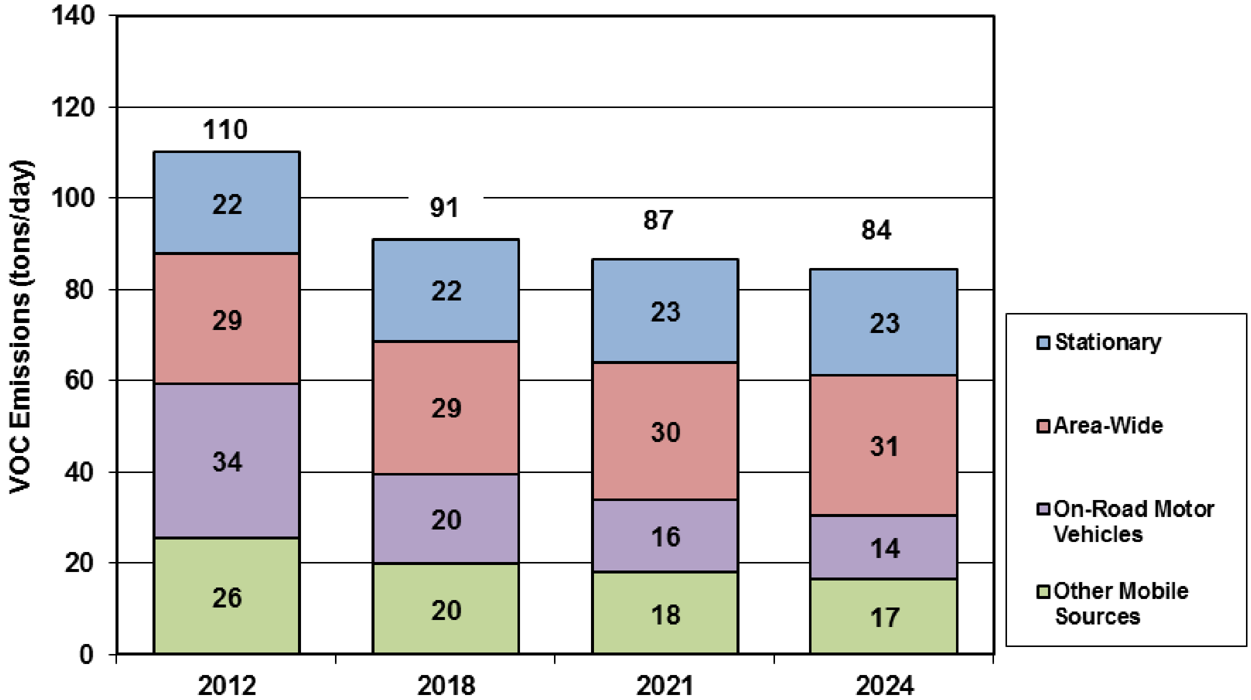
The following bar charts (Figures 5-8 and 5-9) show the VOC and NO_X emission inventory forecasts for stationary sources, area-wide sources, on-road motor vehicles, and other mobile sources for the Sacramento nonattainment region. Bar charts are given for the 2012 base year and compared to the milestone RFP years of 2018, and 2021, and to the attainment demonstration analysis year of 2024. The VOC and NO_X

[26] Population:
1. Data source: CARB Almanac.
2. El Dorado County and Placer County population data exclude the Tahoe Basin.
3. Sacramento Nonattainment Area fraction for South Sutter is estimated at 4% of Sutter County.

VMT:
1. 2012 VMT activities are from EMFAC2014.
2. 2018, 2021, and 2024 VMT activities are from SACOG's 2016 MTP and MTC's Plan Bay Area Preferred Land Use Scenario/Transportation Investment Strategy (MTC, 2016) for Solano County portion of SFNA.

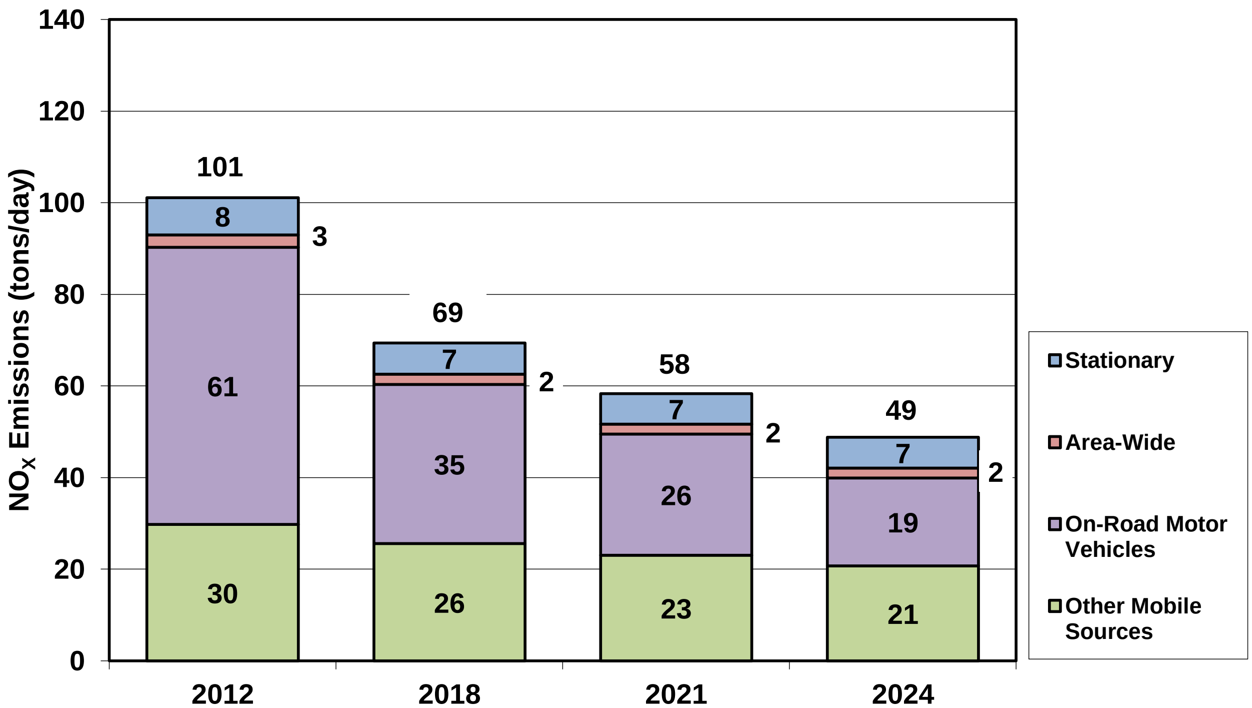
emission forecasts show significant declines in mobile source emissions, despite increasing population, vehicle activity, and economic development.

Figure 5-8 VOC Planning Inventory Forecasts – SFNA



Source: (CARB, 2016), does not include 5 tpd of VOC ERCs identified in Appendix A, Tables A3-1 and A3-2.

Figure 5-9 NO_X Planning Inventory Forecasts – SFNA



Source: (CARB, 2016), does not include 5 tpd of VOC ERCs identified in Appendix A, Tables A3-1 and A3-2.

5.6 Emission Reduction Credits Added to Emission Inventory Forecasts

Certain pollutant emission reductions due to equipment shutdown or voluntary control may be converted to ERCs and registered with the air districts. These ERCs may then be used as "offsets" to compensate for an increase in emissions from a new or modified major emission source regulated by the air districts. ERCs may also be used as an alternative to strict compliance with specified rules. Thus, if a permitted source cannot meet the applicable emission standard requirements, usually because it is technically infeasible or not cost effective, the source may lease or purchase ERCs to achieve the required reductions.

Since ERCs represent potential emissions, they need to be taken into account in the emission inventories. One method is to assume that the use of ERCs will already be included within the projected rate of stationary source growth in the emissions inventory. However, if the use of available ERCs exceeds anticipated emissions growth, future emissions could be underestimated. Therefore, to ensure that the use of ERCs will not be inconsistent with the future reasonable further progress and attainment goals, the amount of ERCs issued for reductions that occurred prior to the 2012 base year are added to the forecasts for VOC and NO_X planning emissions inventories that are used in attainment demonstration modeling and the RFP demonstration.

5.6.1 Emission Reduction Credits

For this attainment plan, the amounts of unused banked ERCs of emissions reductions that occurred prior to the 2012 baseline year for the Sacramento nonattainment area are 4.2 tons per day of VOC and 3.1 tons per day of NO_X. The quantity of these ERCs is listed for each air district in Appendix A. The ERCs consist of emissions reduced from stationary sources. Including these ERCs here simply maintains the validity of previously banked ERCs and other reductions.

5.6.2 Future Bankable Rice Burning Emission Reduction Credits

California legislation[27] in 1991 (known as the Connelly bill) required rice farmers to phase down rice field burning on an annual basis, beginning in 1992. A burn cap of 125,000 acres in the Sacramento Valley Air Basin was established, and growers with 400 acres or less were granted the option to burn their entire acreage once every four years. Since the rice burning reductions were mandated by state law, they would ordinarily not be "surplus" and eligible for banking. However, the Connelly bill included a special provision declaring that the reductions qualified for banking if they met the State and local banking rules.

[27] Connelly-Areias-Chandler Rice Straw Burning Reduction Act of 1991 (California Health and Safety Code Section 41865).

Some rice burning reductions have been banked as ERCs. Other pre-2012 reductions in rice burning may be banked in the future under an ERC rule[28] currently in development. The total amounts of potential bankable rice burning ERCs for the SFNA are estimated at 0.12 ton per day of VOC and 0.13 ton per day of NO_X. The only district with unbanked rice ERCs is SMAQMD. Other districts have already banked their rice emissions so that no more rice ERC will be banked in the future.

5.6.3 Summary of Emission Reduction Credits

ERCs issued for reductions that occurred prior to the 2012 base year and potential future bankable rice burning ERCs are summarized for the Sacramento nonattainment area, rounded up to 5 tpd VOC and 4 tpd NO_X ERCs, and added to the VOC and NO_X emission inventory forecasts for VOC and NO_X planning inventories used in attainment demonstration modeling and RFP demonstration. The summary of the VOC and NO_X planning inventories are shown in Tables 5-3 and 5-4, respectively.

Table 5-3 VOC Emission Reduction Credits - SFNA

Emissions in tons/day	2012	2018	2021	2024
Emission Reduction Credits	---	4.2	4.2	4.2
Future Bankable Rice Burning Emission Reduction Credits	---	0.1	0.1	0.1
Total ERCs (rounded up)	**---**	**5**	**5**	**5**
Emission Forecasts	**110**	**91**	**87**	**84**
Total Planning Inventory	**110**	**96**	**92**	**89**

Table 5-4 NO_X Emission Reduction Credits - SFNA

Emissions in tons/day	2012	2018	2021	2024
Emission Reduction Credits	---	3.1	3.1	3.1
Future Bankable Rice Burning Emission Reduction Credits	---	0.1	0.1	0.1
Total ERCs (rounded up)	**---**	**4**	**4**	**4**
Emission Forecasts	**101**	**69**	**58**	**49**
Total Planning Inventory	**101**	**73**	**62**	**53**

[28] This rice burning ERC rule must be approved by USEPA into the SIP for the rice ERCs to be used for compliance with federal air quality requirements.

5.7 Emissions Inventory Documentation

More detailed documentation of the VOC and NO_X emissions inventory is provided in Appendix A. This appendix contains the estimated 2012, 2018, 2021, and 2024 emission inventories for each county and air basin combination in the SFNA. A listing of the VOC and NO_X emission reduction credits by individual air district is also included.

Emission inventories are constantly being updated to incorporate new and better information and methodologies. Many improvements, especially in the mobile source categories, and the addition of previously un-inventoried emission sources, have been made to the inventory. Detailed information on emission methodologies, changes, and forecasts can be found on CARB websites: http://www.arb.ca.gov/ei/ei.htm and http:/www.arb.ca.gov/msei/msei.htm.

5.8 References

CARB. *CEPAM: 2016 SIP Baseline Emission Projections, Section 1.a. – CEFS2 External Adjustment Tool.* Web 19 April 2017a < https://www.arb.ca.gov/app/emsinv/2016ozsip/2016ozsip/ >

CARB. "*Re: Biogenic inventory*" Message to Karen Taylor (SMAQMD), 28 October 2016. E-mail.

CARB. "*Re: Request for EMFAC2014 Output Data*" Message to Hao Quinn (SMAQMD). 10 May 2017b. E-mail.

USEPA. (70 FR 71612 - 71705) Final Rule To Implement the 8-Hour Ozone National Ambient Air Quality Standard-Phase 2; Final Rule To Implement Certain Aspects of the 1990 Amendments Relating to New Source Review and Prevention of Significant Deterioration as They Apply in Carbon Monoxide, Particulate Matter and Ozone NAAQS; Final Rule for Reformulated Gasoline. Federal Register, Volume 70, 29 November, 2005, p. 71612 - 71705.

USEPA (80 FR 77337 - 77340). *Official Release of EMFAC2014 Motor Vehicle Emission Factor Model for Use in the State of California.* Federal Register, Volume 80, 14 December 2016, p. 77337-77340.

USEPA. *Draft Emission Inventory Guidance for Implementation of Ozone and Particulate Matter National Ambient Air Quality Standards (NAAQS) and Regional Haze Regulations*. United States Environmental Protection Agency, 16 December [2016.] Web. 19 April 2017

<https://www.epa.gov/sites/production/files/2016-12/documents/2016_ei_guidance_for_naaqs.pdf >

6 AIR QUALITY MODELING ANALYSIS

6.1 Introduction to Air Quality Modeling

Ozone is a secondary pollutant produced by complex chemical reactions in the air involving ozone precursor pollutants of volatile organic compounds (VOC) and nitrogen oxides (NO_X) in the presence of sunlight. Ozone formation is also affected by meteorological characteristics (e.g. temperature, wind, vertical mixing, pressure, cloud cover, and humidity) and land surface features (e.g., land use, surface roughness, albedo[29], and terrain).

Due to the large number of atmospheric interactions, varying physical factors, and vast spatial boundaries pertaining to ozone formation, the evaluation of air quality problems to develop adequate emission reduction strategies is inherently difficult and resource intensive. Therefore, state-of-the-science computer modeling is used to simulate the formation of ozone through mathematical descriptions of atmospheric processes and photochemical reactions of pollutants over large regional air basins.

This chapter describes the air quality modeling and analysis performed by the California Air Resources Board (CARB). The modeling results determine how soon the Sacramento Federal Nonattainment Area (SFNA) will attain the 2008 Ozone National Ambient Air Quality Standard (NAAQS). CARB prepared separate technical documents to address the conceptual modeling, modeling protocol, attainment demonstration, and modeling emissions inventory. These technical documents are included in Appendix B – Photochemical Modeling.

[29] Albedo is a measure of how much light that hits a surface is reflected without being absorbed.

Appendix	Technical Document Title	Key elements in the supporting document
B-1	*Modeling 8-Hour Ozone for the Sacramento Federal Nonattainment Area's 2016 State Implementation Plan for the 75ppb 8-Hour Ozone Standard*	Summary of the photochemical modeling results.
B-2	*Sacramento Federal Non-attainment Area (SFNA) 75 ppb 8-hour Ozone*	Conceptual modeling
B-3	*Photochemical Modeling Protocol – Photochemical Modeling for the 8-Hour Ozone and Annual/24-hour $PM_{2.5}$ State Implementation Plans*	Modeling Protocol
B-4	*Modeling Attainment Demonstration – Photochemical Modeling for the 8-Hour Ozone State Implementation Plan in the Sacramento Federal Non-attainment Area (SFNA)*	Attainment Demonstration Model Performance Evaluation Unmonitored Area Analysis
B-5	*Modeling Emission Inventory for the 8-Hour Ozone State Implementation Plan in the Sacramento Non-Attainment Area*	Photochemical modeling emissions inventory

6.2 Air Quality Modeling Methodology and Applications

To evaluate when the SFNA will attain the 2008 8-hour ozone NAAQS, it is necessary to understand what causes concentrations to be higher during the ozone season and then predict future ozone concentrations under changing emission scenarios. Extensive air monitoring and emissions data were first collected for the ozone season of 2012 (May 1 to October 5) to provide information for developing base case model simulations. Air quality modeling simulations were run for different future year emissions scenarios to study how reducing VOC and NO_X emissions would decrease ambient ozone concentrations. Emission reduction levels for meeting the ambient ozone standard were then quantified for a specified attainment year.

Ozone air quality modeling has other uses besides estimating attainment of the ambient standard. For example, it can also be used to determine potential unmonitored high ozone areas where future monitoring sites may be installed.

6.3 Air Quality Modeling Analysis Requirements

Clean Air Act §182(c)(2)(A) requires the attainment demonstration for a nonattainment area classified as "serious or higher" be based on photochemical grid modeling or any other United States Environmental Protection Agency (USEPA)-approved method. This analysis uses the grid modeling approach. In addition, USEPA published a draft modeling guidance (USEPA, 2014) on how to apply air quality models to generate results for preparing 8-hour ozone attainment demonstrations. The draft guidance document lists the following elements that USEPA expects when building a model platform:

1) A conceptual model which describes the air quality problems of the modeling region;
2) A modeling protocol which describes the proposed model setup procedures;
3) An attainment demonstration documentation package (listed deviation from the modeling protocol, actual modeling procedures; and the attainment demonstration results);
4) Episode selection which discusses the rationale for choosing the base year;
5) Future year selection which discusses the rationale for choosing the future year;
6) Modeling domain selection which considers the size of modeling domain buffer and resolution;
7) Discussion of the photochemical model selection;
8) Discussion of the meteorological model selection, input parameters, and modeling domain;
9) Discussion of the steps taken to develop the gridded emissions inventory; and
10) Discussion of boundary and initial conditions setup.

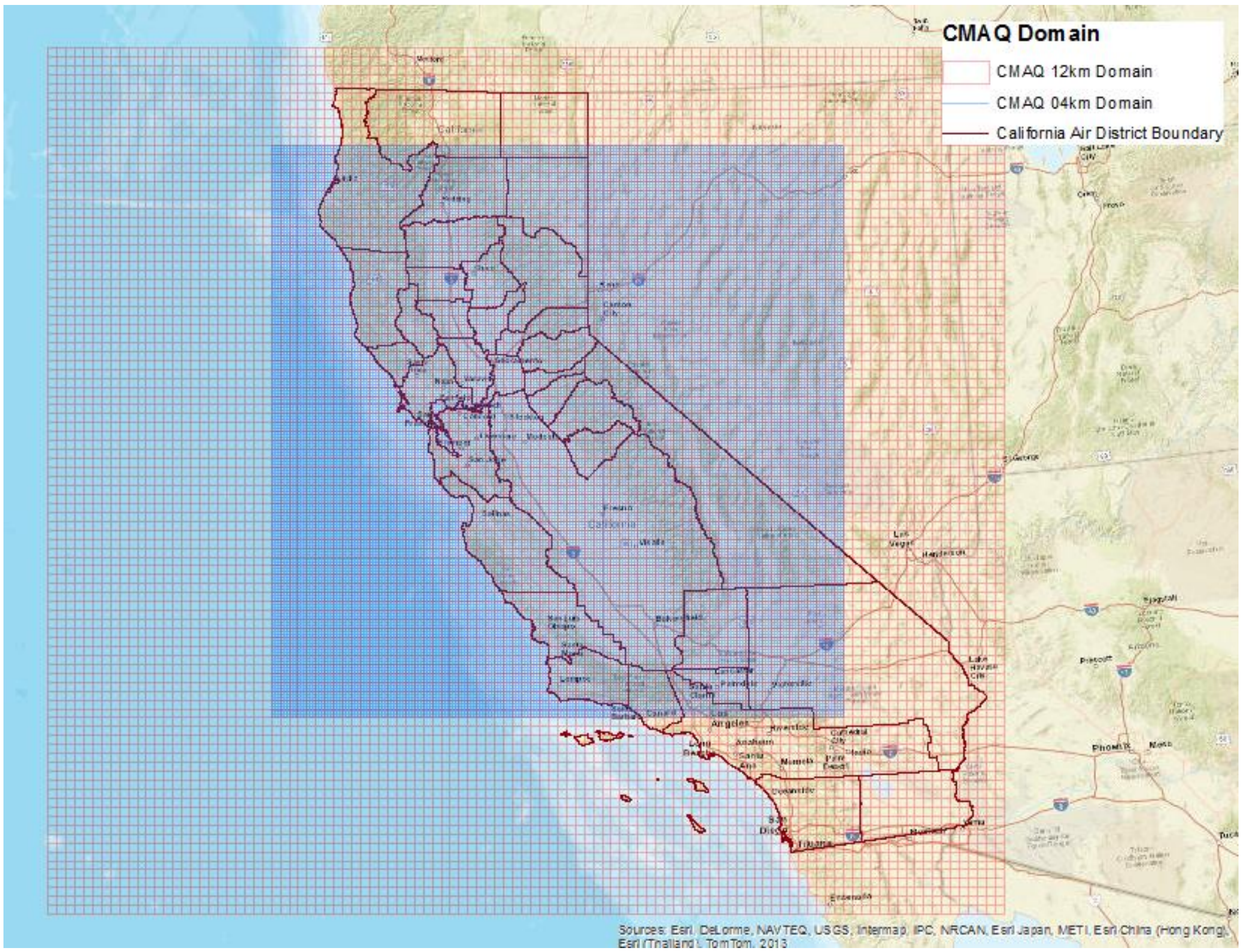
USEPA's draft modeling guidance document (USEPA, 2014, p.95) describes a modeled attainment test as a technical procedure in which an air quality model is used to simulate base year and future air pollutant concentrations for the purpose of demonstrating attainment of the relevant NAAQS. The test uses model estimates in a *relative* rather than *absolute* sense to estimate future design values. The fractional changes in air pollutant concentrations between the model future year and model base year are calculated for all valid monitors. These ratios are called relative response factors (RRF). Future ozone design values are estimated by multiplying the modeled RRF for each monitor by the monitor-specific base year design value. If the calculated future ozone design values are ≤ 75 ppb, then the attainment test is satisfied for the monitors.

The CARB is responsible for analyzing downwind and upwind influences from or on areas outside the nonattainment area. These influences are considered in the recommended modeled attainment test, which predicts whether all estimated future design values will achieve the ozone NAAQS under modeled meteorological conditions.

6.4 Description of Air Quality Model and Modeling Inputs

The photochemical grid modeling used for the 8-hour ozone attainment analysis is developed with the Community Multiscale Air Quality Model (CMAQ). (Version 5.0.2) The CMAQ model, a state-of-the-science "one-atmosphere" modeling system developed by the USEPA, was designed for applications ranging from regulatory and policy analysis to investigating the atmospheric chemistry and physics that contribute to air pollution. The CMAQ model simulates a three-dimensional atmosphere over the course of an ozone season (May 1 – October 5[30]), and is used to investigate air pollution at the spatial resolution of 4 km grid squares for the Central California Domain (see modeling domain in Figure 6-1). The CMAQ model uses the Statewide Air Pollution Research Center (SAPRC) chemical mechanism[31] 2007 version. The model calculates air quality concentrations averaged for each hour at each 4 km grid square location at the surface and for each vertical layer above.

Figure 6-1 CMAQ Modeling Domain



192x192 Grid Cells at 4x4-km Horizontal Resolution

30 The ozone season for the Sacramento Region is usually May through September. However, the region experienced high ozone on October 2 for the base model year. As a result, the model simulation was extended to October 5.

31 Chemical mechanism originally developed by the Statewide Air Pollution Research Center (SAPRC) of the University of California at Riverside.

Air quality models require time-varying meteorological fields including winds, temperature, and water vapor content to calculate the transport and transformations of air pollutants. For this State Implementation Plan (SIP) attainment demonstration, the Weather and Research Forecasting (WRF) model was used to develop the meteorological fields that drive the photochemical modeling. The USEPA draft modeling guidance (USEPA, 2014, p.25) recommends the use of a well-supported grid-based mesoscale meteorological model for generating meteorological inputs. The WRF model is a community-based mesoscale prediction model, which represents the state-of-the-science and has a large community of model users and developers who frequently update the model as new science becomes available (Appendix B-3, p15). The WRF model features two dynamical cores[32], a data assimilation system, and a software architecture facilitating parallel computation and system extensibility. The model serves a wide range of meteorological applications across scales from tens of meters to thousands of kilometers.

In this SIP model, WRF was run using multiple sub-domains with resolutions of 36 km, 12km, and 4 km grid squares. Figure 6-2 shows the WRF Modeling domain. In addition, the vertical structure of the meteorological modeling incorporated a 30 layer configuration and match to the CMAQ vertical modeling layers. Table 6-1 shows the vertical layer structures and the CMAQ layers matching.

[32] The two cores are referred to as the ARW (Advanced Research WRF) core and the NMM (Nonhydrostatic Mesoscale Model) core. The ARW has been largely developed and maintained by the NCAR (National Center for Atmospheric Research) MMM (Mesoscale and Microscale Meteorology) Laboratory. Details of ARW core can be found in the WRF manual < http://www2.mmm.ucar.edu/wrf/users/docs/user_guide_V3.8/users_guide_chap1.htm>. The NMM core was developed by the National Centers for Environmental Prediction. It is currently used in the HWRF (Hurricane WRF) system, for which user support is provided by the Developmental Testbed Center

Figure 6-2 WRF Modeling Domain

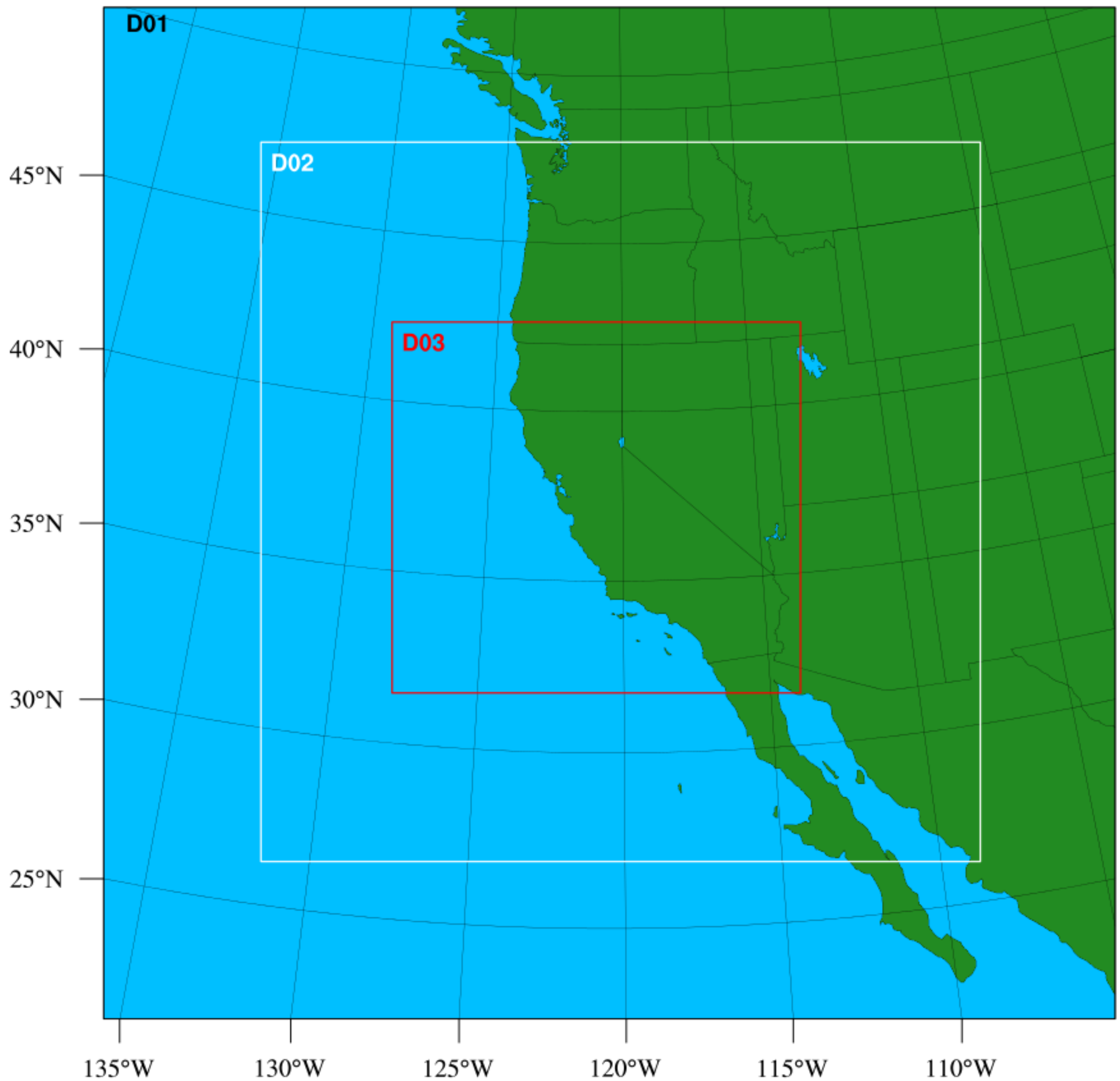


Table 6-1 WRF vertical layer structure and CMAQ layer matching

Layer Number	Height (m)	Layer Thickness (m)	Layer Number	Height (m)	Layer Thickness (m)
30	16082	1192	14	1859	334
29	14890	1134	13	1525	279
28	13756	1081	12	1246	233
27	12675	1032	11	1013	194
26	11643	996	10	819	162
25	10647	970	9	657	135
24	9677	959	8	522	113
23	8719	961	7	409	94
22	7757	978	6	315	79
21	6779	993	5	236	66
20	5786	967	4	170	55
19	4819	815	3	115	46
18	4004	685	2	69	38
17	3319	575	1	31	31
16	2744	482	0	0	0
15	2262	403			

Note: Shaded layers denote the subset of vertical layers to be used in the CMAQ photochemical model simulations.

Air quality models also require inputs for time-varying and spatially gridded emissions estimates. The modeling emissions files consist of hourly speciated emissions for point, area, motor vehicle, wildfires, ocean going vessels, and biogenic sources for each grid cell, which are provided by various methods. Point, area, and off-road mobile source emissions are processed into modeling inputs using SMOKE[33]. On-road motor vehicle emissions are prepared by EMFAC[34] and gridded using Caltrans' DTIM[35]. Ocean Going Vessels emissions (OGV) are prepared by CARB's OGV model. Emissions from biogenic sources are generated by MEGAN[36].

Other air quality model inputs include estimates of speciated concentrations for initial and boundary conditions. Initial pollutant concentrations represent ambient air quality

33 SMOKE is Sparse Matrix Operator Kernel Emissions modeling system (https://www.cmascenter.org/smoke). It is a processor converting point and area sources into gridded emissions inventory for photochemical modeling.

34 EMFAC is EMission FACtor model which is designed to generate county-level, average-day emissions estimates. The version for the SFNA SIP simulation is 2014. The EMFAC model is developed by the California Air Resources Board.

35 DTIM is Direct Travel Impact Model (DTIM). The version for the SFNA SIP simulation is 4. The DTIM model is maintained by California Department of Transportation (Caltrans) Division of Transportation Planning Office of Travel Forecasting and Analysis.

36 MEGAN is Model of Emissions of Gases and Aerosols from Nature. The model utilizes gridded emission factor and plant functional type data to estimate hourly biogenic emissions within each grid cell of the modeling domain. The model is maintained by Washington State University. (http://lar.wsu.edu/megan/)

inside the modeling domain at the time the modeling episode begins. In this SIP modeling, the default initial conditions included with the CMAQ model were used. Boundary conditions represent pollutant concentrations entering the modeling domain from the vertical top and horizontal side borders. MOZART[37] was used to define the boundary conditions for the outmost modeling domain.

6.5 Base Case Model Performance Evaluation

After preparing the air quality modeling input files (e.g., meteorological fields, gridded emissions inventories, initial and boundary conditions), the CMAQ air quality modeling was conducted and results evaluated for the SFNA which covered the period of May 1, 2012 to October 5, 2012. Since a continuous simulation is time consuming and takes months to complete, the modeling period has been split up into five monthly simulations and each simulation has a seven day spin-up[38] period. Since there are modeling uncertainties and limitations in running air quality models, the model performance was evaluated for each base case scenario.

For model performance, USEPA recommends at a minimum evaluating the following statistical parameters: mean observed value, mean model value, mean bias, mean error, root mean square error, normalized mean bias, normalized mean error, and correlation coefficient. The summary statistics were calculated for individual days averaged over all sites and for individual sites averaged over all days, and then aggregated into meaningful subregions or subperiods. In addition, statistical plots were included in evaluating the modeling: time-series comparing predictions and observations, scatter plots for comparing the magnitude of simulated and observed mixing ratios, box plots to summarize the time series data across different regions and averaging times, as well as frequency distributions. These plots are available in Appendix B-4.

USEPA draft modeling guidance (USEPA, 2014, p63) states it is not appropriate to assign any acceptance criteria levels that distinguish between adequate and inadequate model performance. Instead, USEPA recommends that a qualitative weight-of-evidence approach consisting of a variety of performance tests be used to determine whether a particular modeling application is valid for assessing the future attainment status of an area.

Based on the statistical comparisons between observed and predicted ozone data, the base case modeling scenarios were determined to be performing adequately overall in

[37] MOZART is Model for OZone And Related chemical Tracers. It is one of the global chemical transport model (CTM). It was developed by National Center for Atmospheric Research (NCAR) (https://www2.acom.ucar.edu/gcm/mozart).

[38] Spin up time is the time taken for a computer model to approach its own climatology after being started from the initial conditions.

the SFNA. Model performance statistics are consistent with previous studies in the SFNA, San Joaquin Valley, and other Central California ozone studies. Base case model performance statistics tables, base case model performance evaluations, and modeling documentation are available in Appendix B-4.

6.6 Baseline and Future Year Model Runs

After the photochemical modeling base case episodes were shown to perform adequately, the modeling was run with the summer planning inventory for a 2012 baseline year and 2022 and 2026 future years with existing control strategies for assessing attainment of the ozone NAAQS and excluded wildfires and 2012 Chevron refinery fire emissions. The USEPA's 2008 Ozone NAAQS implementation rule (40 CFR 51.1108(d)) states that the nonattainment area "must provide for implementation of all control measures needed for attainment no later than the beginning of the attainment year ozone season." As previously discussed, 2026 was the modeling year selected to demonstrate compliance with the "severe-15" nonattainment classification. The preliminary modeling results of 2026 show the SFNA could attain the standard by a margin of 5 ppb lower than the standard at the peak monitoring site. Based on the air quality data and emissions inventory trends, CARB and the SFNA air districts decided to investigate 2022 as another future attainment year. The 2022 modeling results shows that the SFNA future design value at the Folsom monitor is 75.2 ppb which is just 0.3 ppb below the standard when EPA's rounding conventions are applied.

6.7 Emission Reduction Credits Added to Future Year Model Runs

Emission reduction credits (ERCs) for the Sacramento region are discussed and quantified in Section 5.6. Since ERCs are potential future emissions, it is not currently known what emission sources they will be applied to and where the emission sources will be located. Existing inventories for stationary emissions are gridded for modeling by using the point source facility locations. Estimated area-wide emissions are gridded for modeling using related spatial surrogate parameters, such as population and land use types.

Due to the uncertainty of the type and location of future sources using ERCs, the baseline VOC and NO_X ERCs for the Sacramento nonattainment area were added to the future year gridded modeling inventory as stationary and area-wide emissions. The ERCs from each district were distributed to its stationary and area-wide emission categories using the across the board percentage increase from adding ERCs to total stationary and area-wide emissions.

6.8 Forecasted Ozone Design Values

The results from baseline and future year modeling runs are evaluated at each ozone nonattainment monitor to determine the predicted future ozone design value with the estimated future emissions scenario. The method for calculating the predicted future ozone design values is described by the following equation (USEPA, 2014, p69):

DV_{future} = RRF x (DV_{base}) where,

DV_{future} = the estimated future design value concentration at the monitor used to predict attainment of the 8-hour ozone NAAQS. [Truncated to whole ppb]

RRF = the relative response factor which is the ratio of the future year (FY) modeled average 8-hour daily maximum ozone (rounded to tenths of a ppb) to the baseline year (BY) modeled average 8-hour daily maximum ozone (rounded to tenths of a ppb) for the monitor. Only the top 10 days with baseline year modeled maximum daily average 8-hr ozone greater than or equal to 60 ppb are selected to calculate the RRF. [Rounded to three significant figures to right of decimal]

$$RRF = \frac{FY_{AVG}}{BY_{AVG}}$$

DV_{base} = the three-year average of the actual observed average base year design values (2012, 2013, and 2014) at the monitor for 8-hour ozone. [Rounded to tenths of a ppb]

The results for the forecasted ozone design values for the future year 2022 and 2026 are shown in Table 6-1. The future year 2026 corresponds to the attainment demonstration analysis year for a severe nonattainment classification and the future year 2022 corresponds to the earliest year that the Sacramento region could attain.

Based on the photochemical modeling results, attainment was predicted at all ozone monitors in 2022 in the SFNA. The SFNA air districts, in consultation with CARB and USEPA Region IX, are proposing 2024 be established as the SFNA attainment demonstration analysis year for the 2008 ozone NAAQS. Selection of 2024 is appropriate because it is bounded by two modeled attainment demonstrations, still supports early attainment (it is before the regulatory attainment deadline for a severe-15 area of July 20, 2027), and provides a safeguard against inherent uncertainties in predicting future ambient ozone concentrations beyond 2022 (e.g. emission reductions, meteorology, natural events and other uncertainties discussed in section 6.11, below.).

Table 6-2 Forecasted 8-Hour Ozone Design Values

Site	Base year 2012	Future Year 2022	Future Year 2026
Placerville-Gold Nugget Way (El Dorado, MCAB)	82.3	68.0	64.0
Cool-Hwy193 (El Dorado, MCAB)	81.3	67.8	64.1
Auburn - Atwood Rd (Placer, SVAB)	79.0	64.6	60.6
Colfax-City Hall (Placer, MCAB)	73.7	60.9	57.5
Echo Summit (El Dorado, MCAB)	69.0	64.9	63.9
Folsom-Natoma Street (Sacramento, SVAB)	90.0	75.2	70.7
Sloughhouse (Sacramento, SVAB)	84.0	71.1	67.2
Roseville-N Sunrise Ave (Placer, SVAB)	82.3	69.8	66.3
Sacramento-Del Paso Manor (Sacramento, SVAB)	77.3	66.4	63.1
North Highlands-Blackfoot Way (Sacramento, SVAB)	76.0	65.2	61.9
Sacramento - 1309 T Street (Sacramento, SVAB)	70.0	60.5	57.7
Sacramento-Goldenland Court (Sacramento, SVAB)	70.0	61.7	58.9
Elk Grove - Bruceville Road (Sacramento, SVAB)	71.7	61.4	58.3
Woodland-Gibson Road (Yolo, SVAB)	68.7	58.1	54.9
Vacaville-Ulatis Drive (Solano, SVAB)	67.3	56.9	53.9
Davis-UCD Campus (Yolo, SVAB)	66.7	56.7	53.7

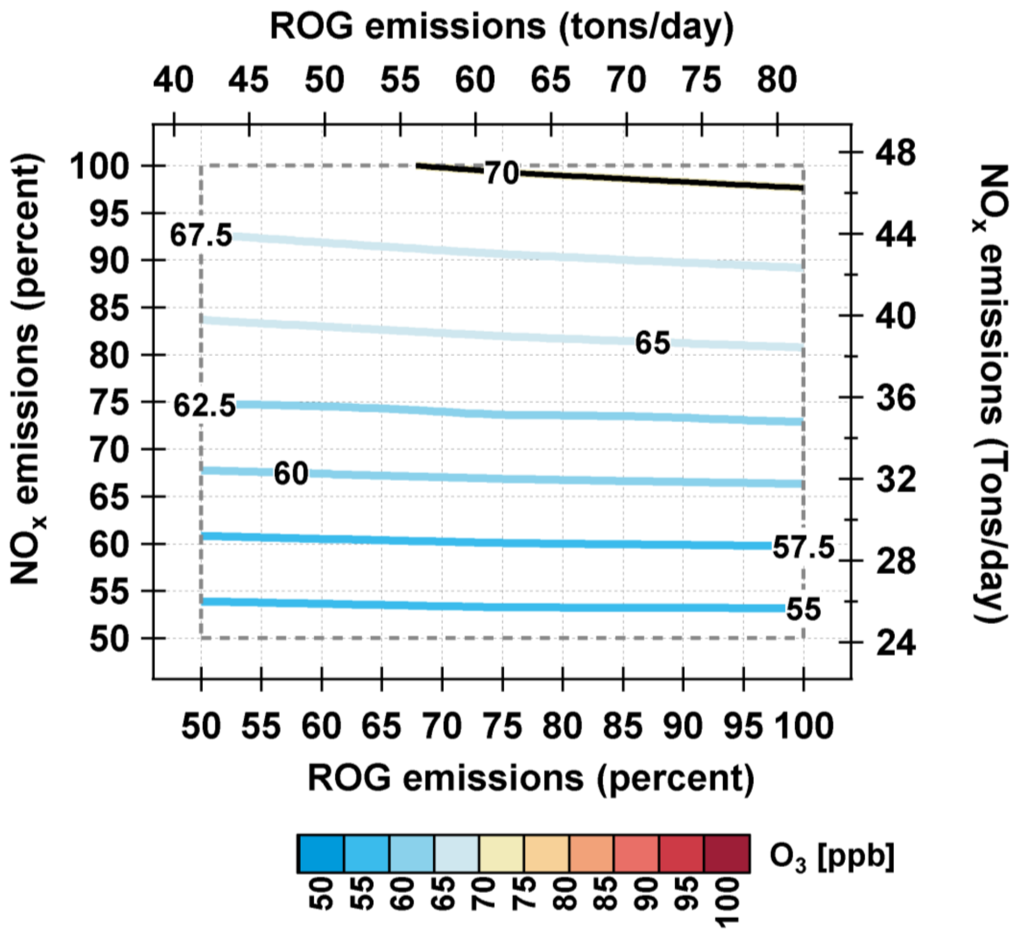
The forecasted 8-hour ozone design values indicate that all of the monitoring sites in the Sacramento nonattainment area are predicted to attain the federal 8-hour ozone standard (75ppb) by 2022.

6.9 Sensitivity to Ozone Precursors

To understand the future ozone sensitivity within the SFNA for different levels of NO_X and VOC emissions in the region, modeling sensitivity simulations were conducted to generate 8-hr ozone isopleths. These sensitivity simulations are identical to the future year 2026 simulation discussed in Section 6.6, except that domain-wide fractional reductions were applied to future year 2026 anthropogenic NO_X and VOC emission levels. Each sensitivity simulation was run for the entire ozone season. The RRF methodology described in Section 6.8 was then applied to the output of each fractional VOC and NO_X sensitivity simulation to calculate the future year DV at each monitoring site in the SFNA.

Figure 6-3 shows the 2026 ozone isopleth emissions at the Folsom Monitor. The bottom and top axes represent the domain-wide fractional ROG emissions and the corresponding SFNA emission totals (tons per day) in 2026, respectively. The left and right axes represent the domain-wide fractional NO_X emissions and emission total in 2026. The ozone isopleth plot shows that the SFNA requires 35 tpd of VOC emissions reductions or 1.7 tpd of NO_X emissions reduction to lower 1ppb of ozone if the other pollutant level remains constant. The future ozone mixing ratios throughout the SFNA are predicted to be in the NO_X-limited regime and the sensitivity to VOC emissions controls will be much lower when compared to NO_X controls.

Figure 6-3 The 2026 8-hr ozone isopleth at the Folsom monitor.



6.10 Unmonitored Area Analysis

The unmonitored area analysis is used to ensure that there are no regions outside of the existing monitoring network that would exceed the NAAQS if a monitor was present (USEPA, 2014, p144). USEPA recommends combining spatially interpolated design value fields with modeled ozone gradients and grid-specific RRFs in order to generate gridded future year gradient adjusted design values. The results and discussion of the unmonitored area analysis are available in Appendix B-4, Section 5.4. No exceedances were identified.

6.11 Air Quality Modeling Uncertainties

USEPA's draft modeling guidance document (USEPA, 2014, p179) states that, "models are simplistic approximations of complex phenomena. The modeling analyses used to assess whether emission reduction measures will bring an individual area into attainment for the NAAQS contain many elements that are uncertain. These uncertain aspects of the analyses can sometimes prevent definitive assessments of future attainment status." Uncertainty arises for a variety of reasons; for example, incomplete representation in the atmospheric physical and chemical processes may cause limitations in the model's scientific formulation. Modeling uncertainties can also result from meteorological, emissions projections, and other input data base limitations, such as land use, microclimate, background ozone concentrations, etc.

Other factors adding to air quality modeling uncertainties include:

1) How well the meteorological simulation represents the severity of future meteorological conditions conducive to high ozone formation,
2) How well the methodology for forecasting ozone design values corresponds to actual future monitored ozone design values, and
3) How well domain-wide emission reductions in the SFNA attainment analysis are achieved, especially during the time when pollutant transport is significant.

The impact of future climate change is not included in the photochemical modeling assumptions. Any effects from climate changes during the timeframe of this SIP (12 years, from 2012 to 2024) will unlikely be significant enough to have an impact on the model results. USEPA draft modeling guidance (USEPA, 2014, p28) states that "there are significant uncertainties regarding the precise location and timing of climate change impacts on air quality. Climate projections are more robust for periods at least several decades in the future because the forcing mechanisms that drive near-term natural variability in climate patterns. (e.g., El Nino, North American Oscillation) have substantially larger signals over short time spans than the driving forces related to long-term climate change. In contrast, attainment demonstration projections are generally for time spans of less than 20 years." USEPA does not recommend that air agencies explicitly account for long-term climate change in attainment demonstrations.

In order to mitigate potential air quality modeling uncertainties, the modeling guidance suggests using corroborative methods and analyses to support the air quality modeling results and attainment demonstration. A separate weight-of-evidence report will be submitted by CARB along with this Plan.

6.12 Air Quality Modeling Analysis Conclusions

The modeling results show that attainment of the 2008 NAAQS can be achieved as early as 2022 with a future design value of 75.2 ppb at the peak monitoring site. The modeling results also indicate that both VOC and NO_X reductions provide ozone benefits in SFNA, but the SFNA exhibits a NO_X-limited regime and therefore NO_X reductions are much more effective than VOC reductions on a tonnage basis. A detailed discussion of attainment demonstration is available in Chapter 8.

6.13 References

USEPA. *Draft Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze.* Washington, D.C.: United States Environmental Protection Agency, [2014.]

USEPA. *Guidance on the Use of Models and Other Analyses for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze.* Washington, D.C. United States Environmental Protection Agency, April [2007.]

USEPA (80 FR 65291-65468). *Final Rule: National Ambient Air Quality Standards for Ozone.* Federal Register, Volume 80, 26 October 2015, p. 65291-65468. Print.

7 CONTROL MEASURES

7.1 Introduction to Control Measures

Results of the photochemical modeling analysis performed by the California Air Resources Board (CARB) indicate that the Sacramento Federal Nonattainment Area (SFNA) will attain the 2008 Ozone National Ambient Air Quality Standard (NAAQS) by the end of 2024. To get there, the region will rely on the many existing federal, state, and local control programs to achieve reductions of ozone precursors, and CARB, SFNA air districts, and Sacramento Area Council of Governments (SACOG) will continue to enforce existing strategies and implement transportation control measures (TCMs). This chapter summarizes the reductions from CARB's existing mobile source measures, SACOG TCMs, contingency control measure strategies, local control measures contained in the 2013 8-Hour Ozone Attainment and Reasonable Further Progress Plan (2013 Plan) (SMAQMD, 2013), and results of the reasonably available control measure (RACM) analysis (also contained in Appendix E). This SIP document shows how the region will reach attainment through emissions reductions from existing control measures and adopted rules.

7.2 State and Federal Control Measures

Given the severity of California's air quality challenges and the need for ongoing emission reductions, the CARB has implemented the most stringent mobile source emissions control program in the nation. CARB's comprehensive program relies on four fundamental approaches:

- stringent emissions standards that minimize emissions from new vehicles and equipment;
- in-use programs that target the existing fleet and require the use of the cleanest vehicles and emissions control technologies;
- cleaner fuels that minimize emissions during combustion; and,
- incentive programs that remove older, dirtier vehicles and equipment, and pay for early adoption of the cleanest available technologies.

This multi-faceted approach has spurred the development of increasingly cleaner technologies and fuels and achieved significant emission reductions across all mobile source sectors that go far beyond national programs or programs in other states. These efforts extend back to the first mobile source regulations adopted in the 1960s, and pre-date the federal Clean Air Act (CAA) Amendments of 1970, which established the basic national framework for controlling air pollution. In recognition of the pioneering nature of CARB's efforts, the Act provides California unique authority to regulate mobile sources more stringently than the federal government by providing a waiver of preemption for its new vehicle emission standards under CAA Section 209(b)[39]. These authorization and waiver provisions preserve a pivotal role for California in the control of emissions from new motor vehicles, recognizing that California serves as a laboratory for setting motor vehicle emission standards. Since then, the CARB has consistently sought and obtained authorizations and waivers for its new motor vehicle regulations. CARB's history of progressively strengthening standards as technology advances, coupled with the authorization and waiver process requirements, ensures that California's regulations remain the most stringent in the nation. A list of regulatory actions CARB has taken since 1985 is provided at the end of this analysis to highlight the scope of CARB's actions to reduce mobile source emissions.

Recently, CARB adopted numerous regulations aimed at reducing exposure to diesel particulate matter and oxides of nitrogen, from freight transport sources like heavy duty diesel trucks, transportation sources like passenger cars and buses, and off-road sources like large construction equipment. Phased implementation of these regulations will produce increasing emission reduction benefits from now until 2024 and beyond, as the regulated fleets are retrofitted, and as older and dirtier portions of the fleets are replaced with newer and cleaner models at an accelerated pace.

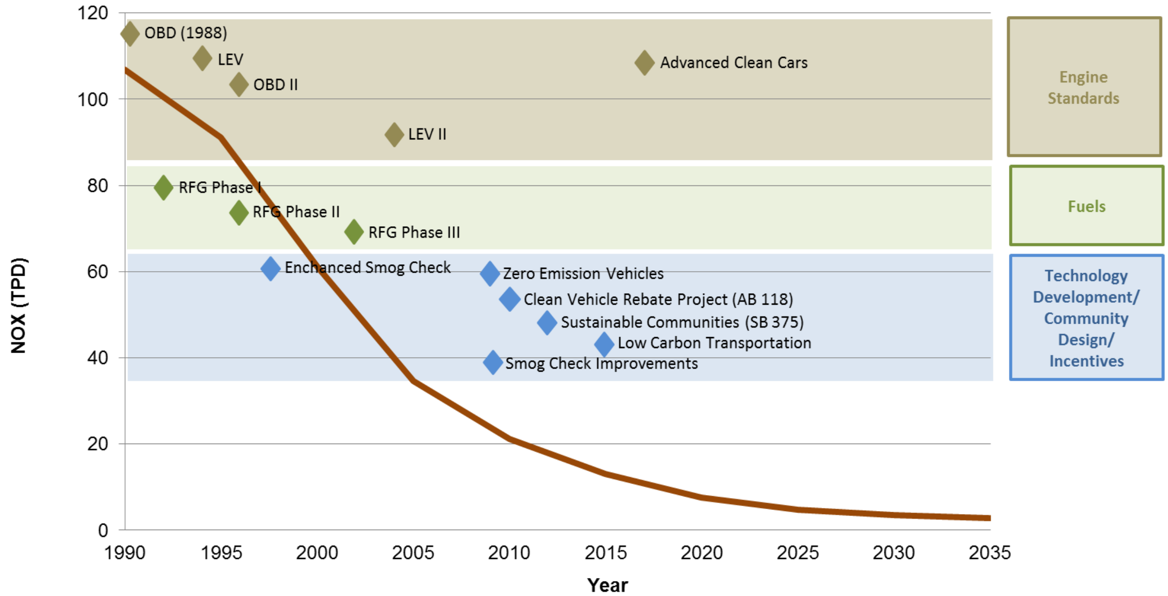
Further, CARB and the SFNA air district staff work closely on identifying and distributing incentive funds to accelerate cleanup of engines. Key incentive programs include: the Carl Moyer Program; the Goods Movement Program; the Lower-Emission School Bus Program; and the Air Quality Improvement Program (AQIP). These incentive-based programs work in tandem with regulations to accelerate deployment of cleaner technology.

7.2.1 Light-Duty Vehicles

Figure 7-1 illustrates the trend in Nitrogen Oxides (NO_X) emissions from light-duty vehicles and key programs contributing to those reductions in the SFNA. As a result of these efforts, light-duty vehicle emissions in the SFNA have been reduced significantly since 1990 and will continue to go down through 2024 due to the benefits of CARB's longstanding light-duty mobile source program. CARB estimates that light-duty vehicle NO_X emissions will be reduced by about 60 percent in 2024 when compared to the current year. Key light-duty programs include Advanced Clean Cars, On-Board Diagnostics, Reformulated Gasoline, Incentive Programs, and the Enhanced Smog Check Program.

[39] CAA Section 209(b) is limited to any state that had a program in 1966 but only California had such a program prior to 1966.

Figure 7-1: Key Programs to Reduce Light-Duty NO_X Emissions (SFNA)



Since setting the nation's first motor vehicle exhaust emission standards in 1966, which led to the first pollution controls, California has dramatically tightened emission standards for light-duty vehicles. Through CARB regulations, today's new cars pollute 99 percent less than their predecessors did thirty years ago. In 1970, CARB required auto manufacturers to meet the first standards to control NO_X emissions along with hydrocarbon emissions. The simultaneous control of emissions from motor vehicles and fuels led to the use of cleaner-burning reformulated gasoline (RFG), which has removed the emissions equivalent of 3.5 million vehicles from California's roads. Since CARB first adopted it in 1990, the Low Emission Vehicle (LEV and LEV II) Program and Zero-Emission Vehicle (ZEV) Program have resulted in the production and sales of hundreds of thousands of ZEVs in California.

7.2.1.1 Advanced Clean Cars

CARB's groundbreaking Advanced Clean Cars (ACC) program is now providing the next generation of emission reductions in California, and ushering in a new zero emission passenger transportation system. The success of these programs is evident: California is the world's largest market for ZEVs, with over 21 models available today, and a wide variety are now available at lower price points, attracting new consumers. As of January 2015, Californians drive 40 percent of all ZEVs on the road in the United States, while the U.S. makes up about half of the world market. This movement towards commercialization of advanced clean cars has occurred due to CARB's ZEV regulation, part of ACC, which affects passenger cars and light-duty trucks.

CARB's ACC Program, approved in January 2012, is a pioneering approach creating a 'package' of regulations that are separate in construction but related in terms of the synergy developed to address both ambient air quality needs and climate change. The

ACC program combines the control of smog, soot and greenhouse gas emissions into a single coordinated package of requirements for model years 2015 through 2025. The program assures the development of environmentally superior cars that will continue to deliver the performance, utility, and safety vehicle owners have come to expect.

The ACC program also included amendments affecting the current ZEV regulation through the 2017 model year to enable manufacturers to successfully meet 2018 and subsequent model year requirements. These ZEV amendments are intended to achieve commercialization through simplifying the regulation and pushing technology to higher volume production to achieve cost reductions. The ACC Program benefits will increase over time as new cleaner cars enter the fleet and displace older and dirtier vehicles.

7.2.1.2 On Board Diagnostics (OBD)

California's first OBD regulation required manufacturers to monitor some of the emission control components on vehicles starting with the 1988 model year. In 1989, CARB adopted OBD II, which required 1996 and subsequent model year passenger cars, light-duty trucks, and medium-duty vehicles and engines to be equipped with second-generation OBD systems. OBD systems are designed to identify when a vehicle’s emission control systems or other emission-related computer-controlled components are malfunctioning, causing emissions to be elevated above the vehicle manufacturer’s specifications. CARB subsequently strengthened OBD II requirements and added OBD II specific enforcement requirements for 2004 and subsequent model year passenger cars, light-duty trucks, and medium-duty vehicles and engines.

7.2.1.3 Reformulated Gasoline

Since 1996, CARB has been regulating the formulation of gasoline resulting in California gasoline being the cleanest in the world. California’s cleaner-burning gasoline regulation is one of the cornerstones of the State’s efforts to reduce air pollution and cancer risk. Reformulated gasoline is fuel that meets specifications and requirements established by CARB. The specifications reduced motor vehicle toxics by about 40 percent and reactive organic gases by about 15 percent. The results from cleaning up fuel can have an immediate impact as soon as it is sold in the State. Vehicle manufacturers design low-emission emission vehicles to take full advantage of cleaner-burning gasoline properties.

7.2.1.4 Incentive Programs

There are a number of different incentive programs focusing on light-duty vehicles that produce extra emission reductions beyond traditional regulations. The incentive programs work in two ways, encouraging the retirement of dirty older cars and encouraging the purchase of cleaner vehicles.

Voluntary accelerated vehicle retirement or “car scrap” programs provide monetary incentives to vehicle owners to retire older, more polluting vehicles. The purpose of these programs is to reduce fleet emissions by accelerating the turnover of the existing fleet and replacement with newer, cleaner vehicles. Both State and local vehicle retirement programs are available.

California’s voluntary vehicle retirement program is administered by the Bureau of Automotive Repair (BAR) and provides $1,000 per vehicle and $1,500 for low-income consumers for unwanted vehicles t that meet certain eligibility guidelines. This program is referred to as the Consumer Assistance Program.

The Enhanced Fleet Modernization Program (EFMP) was approved by the AB 118 legislation to augment the State’s existing vehicle retirement program. AB118 and its associated programs has been extended through 2023. CARB developed the program in consultation with BAR. The program is jointly administered by both BAR for vehicle retirement, and local air districts for vehicle replacement.

Other programs, in addition to vehicle retirement programs, help to clean up the light-duty fleet. The AQIP, established by AB 118, is a CARB voluntary incentive program to fund clean vehicle and equipment projects. The Clean Vehicle Rebate Project (CVRP) is one of the current projects under AQIP. CVRP, started in 2009, is designed to accelerate widespread commercialization of zero-emission vehicles and plug-in hybrid electric vehicles by providing consumer rebates up to $2,500 to partially offset the higher cost of these advanced technologies. The CVRP is administered statewide by the California Center for Sustainable Energy. In Fiscal Years 2009-2012, $26.1 million, including $2 million provided by the California Energy Commission, funded approximately 8,000 rebates. In June 2012, the CARB allocated $15-21 million to the CVRP as outlined in the AQIP FY2012-2013 Funding Plan.

7.2.1.5 California Enhanced Smog Check Program

BAR is the state agency charged with administration and implementation of the Smog Check Program. The Smog Check Program is designed to reduce air pollution from California registered vehicles by requiring periodic inspections for emission-control system problems, and by requiring repairs for any problems found. In 1998, the Enhanced Smog Check program began in which Smog Check stations relied on the BAR-97 Emissions Inspection System (EIS) to test tailpipe emissions with either a Two-Speed Idle (TSI) or Acceleration Simulation Mode (ASM) test depending on where the vehicle was registered. For instance, vehicles registered in urbanized areas received an ASM test, while vehicles in rural areas received a TSI test.

In 2009, the following requirements were added in to improve and enhance the Smog Check Program, making it more inclusive of motor vehicles and effective on smog reductions:

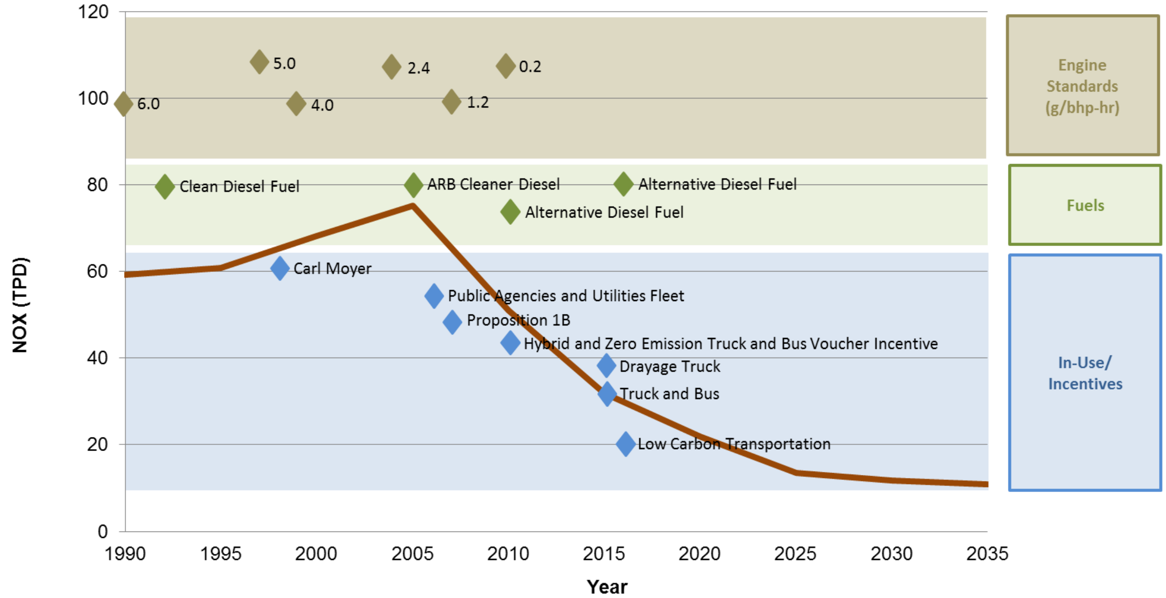
- Low pressure evaporative test;
- More stringent pass/fail cutpoints;
- Visible smoke test; and
- Inspection of light- and medium-duty diesel vehicles.

The next major change was due to AB 2289, which was adopted in October 2010. This new law restructured California's Smog Check Program, streamlined and strengthened inspections, increased penalties for misconduct, and reduced costs to motorists. The law was sponsored by CARB and BAR, and promised faster and less expensive Smog Check inspections by taking advantage of OBD software installed on all vehicles since 2000. The new law also directs vehicles without this equipment to high-performing stations, helping to ensure that these cars comply with current emission standards. This program will reduce consumer costs by having stations take advantage of diagnostic software that monitors pollution-reduction components and tailpipe emissions. Beginning mid-2013, testing of passenger vehicles using OBD was required on all vehicles model years 2000 or newer.

7.2.2 Heavy-Duty Trucks

Figure 7-2 illustrates the trend in NO_X emissions from heavy-duty vehicles and key programs contributing to those reductions in the SFNA. As a result of these efforts, heavy-duty vehicle emissions in the SFNA have been reduced significantly since 1990 and will continue to go down through 2024 due to the benefits of CARB's longstanding heavy-duty mobile source program. Heavy-duty NO_X emissions will be reduced by about 50 percent in 2024 when compared to this year. Key programs include Heavy-Duty Engine Standards, Clean Diesel Fuel, Truck and Bus Regulation and Incentive Programs.

Figure 7-2 : Key Programs to Reduce Heavy-Duty Emissions (SFNA)



7.2.2.1 Heavy-Duty Engine Standards

Since 1990, heavy-duty engine NO_X emission standards have become dramatically more stringent, dropping from 6 grams per brake horsepower-hour (g/bhp-hr) in 1990 down to the current 0.2 g/bhp-hr standard, which took effect in 2010. In addition to mandatory NO_X standards, there have been several generations of optional lower NO_X standards put in place over the past 15 years. Most recently in 2015, engine manufacturers can certify to three optional NO_X emission standards of 0.1 g/bhp-hr, 0.05 g/bhp-hr, and 0.02 g/bhp-hr (i.e., 50 percent, 75 percent, and 90 percent lower than the current mandatory standard of 0.2 g/bhp-hr). The optional standards allow local air districts and CARB to preferentially provide incentive funding to buyers of cleaner trucks to encourage the development of cleaner engines.

7.2.2.2 Clean Diesel Fuel

Since 1993 and amended since then, CARB has required that diesel fuel have a limit on the fuel's aromatic hydrocarbon and sulfur content to lower diesel combustion emissions. The diesel fuel regulation allows alternative diesel formulations as long as emission reductions are equivalent to the CARB formulation.

7.2.2.3 Cleaner In-Use Heavy-Duty Trucks (Truck and Bus Regulation)

The Truck and Bus Regulation was first adopted in December 2008. This rule represents a multi-year effort to turn over the legacy fleet of engines and replace them with the cleanest technology available. In December 2010, CARB revised specific provisions of the in-use heavy-duty truck rule, in recognition of the deep economic effects of the recession on businesses and the corresponding decline in emissions.

Starting in 2012, the Truck and Bus Regulation phases in requirements applicable to an increasing percentage of the truck and bus fleet over time, so that by 2023 nearly all older vehicles would need to be upgraded to have exhaust emissions meeting 2010 model year engine emissions levels. The regulation applies to nearly all diesel-fueled trucks and buses with a gross vehicle weight rating (GVWR) greater than 14,000 pounds, including on-road and off-road agricultural yard goats, and privately and publicly owned school buses. Moreover, the regulation applies to any person (person includes local and state agencies), business, school district, or federal government agency that owns, operates, leases, or rents affected vehicles. The regulation also establishes requirements for any in-state or out-of-state motor carrier, California-based broker, or any California resident who directs or dispatches vehicles subject to the regulation. Finally, California vehicle sellers subject to the regulation would have to disclose the regulation's potential applicability to buyers of the vehicles. The rule affects approximately 170,000 businesses in nearly all industry sectors in California, and almost a million vehicles that operate on California roads each year. Some common industry sectors that operate vehicles subject to the regulation include: for-hire transportation, construction, manufacturing, retail and wholesale trade, vehicle leasing and rental, bus lines, and agriculture.

CARB compliance assistance and outreach activities that are keys in support of the Truck and Bus Regulation include:

- The Truck Regulations Upload and Compliance Reporting System, an online reporting tool developed and maintained by CARB staff;
- The Truck and Bus regulation's fleet calculator, a tool designed to assist fleet owners in evaluating various compliance strategies;
- Targeted training sessions all over the State; and
- Out-of-state training sessions conducted by a contractor.

CARB staff also develops regulatory assistance tools, conducts and coordinates compliance assistance and outreach activities, administers incentive programs, and actively enforces the entire suite of regulations. Accordingly, CARB's approach to ensuring compliance is based on a comprehensive effort.

7.2.2.4 Incentive Programs

There are a number of different incentive programs focusing on heavy-duty vehicles that produce extra emission reductions beyond traditional regulations. The incentive programs encourage the purchase of a cleaner truck.

Several State and local incentive funding pools have been used historically -- and remain available -- to fund the accelerated turnover of on-road heavy-duty vehicles. Since 1998, the Carl Moyer Program (Moyer Program) has provided funding for replacement, new purchase, repower, and retrofit of trucks. Beginning in 2008, the

Goods Movement Emission Reduction Program funded by Proposition 1B has funded cleaner trucks for the region's transportation corridors; the final increment of funds will implement projects through 2018.

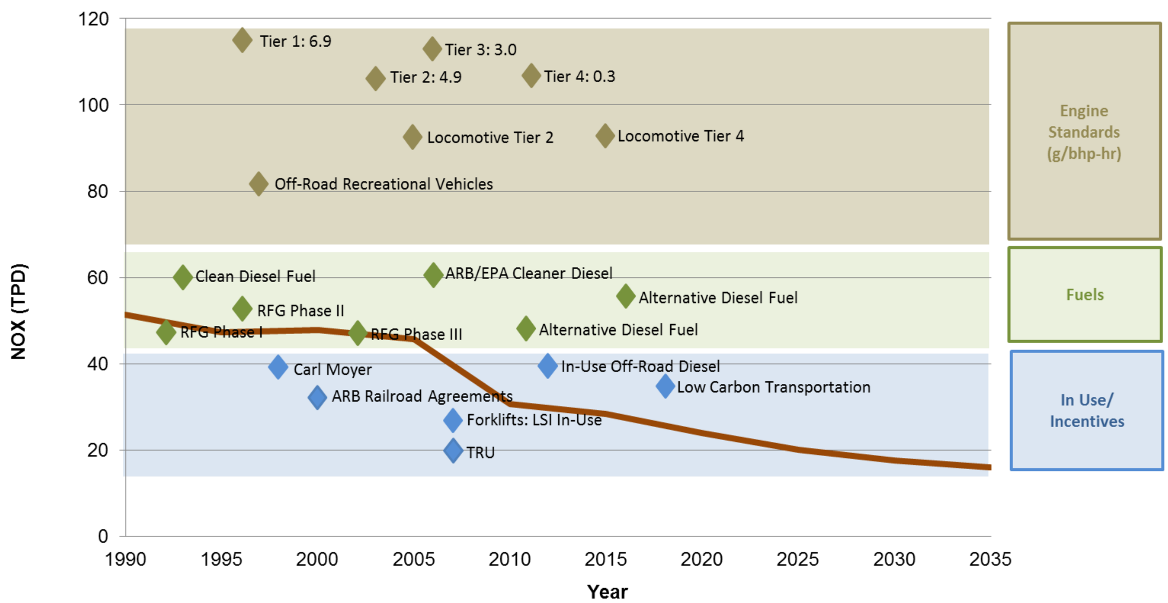
The Air Quality Improvement Program has funded the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP) since 2010, and continued Sacramento Valley participation is expected. CARB has also administered a Truck Loan Assistance Program since 2009.

7.2.3 Off-Road Vehicle and Equipment Sources

"Off-road" sources refers to equipment powered by an engine that does not operate on the road. Sources vary from ships to lawn and garden equipment and include sources like locomotives, aircraft, tractors, harbor craft, off-road recreational vehicles, construction equipment, forklifts, and cargo handling equipment.

Figure 7-3 illustrates the trend in NO_X emissions from off-road sources and key programs contributing to those reductions in the SFNA. As a result of these efforts, off-road emissions in the SFNA have been reduced significantly since 1990 and will continue to go down through 2024 due to CARB's and United States Environmental Protection Agency (USEPA) longstanding programs. Off-road NO_X emissions will be reduced by about 25 percent by 2024 when compared to this year. Key programs include Off-Road Engine Standards, Locomotive Engine Standards, Clean Diesel Fuel, Cleaner In-Use Off-Road Regulation, and In-Use Large Spark Ignition (LSI) Fleet Regulation.

Figure 7-3: Key Programs to Reduce Off-Road Emissions (SFNA)



7.2.3.1 Off-Road Engine Standards

The CAA preempts states, including California, from adopting requirements for new off-road engines less than 175 hp used in farm or construction equipment. California may adopt emission standards for in-use off-road engines pursuant to CAA Section 209(e)(2), but must receive authorization from USEPA before it may enforce the adopted standards.

The Board first approved regulations to control exhaust emissions from small off-road engines (SORE) such as lawn and garden equipment in December 1990 with amendments in 1998 and 2003. These regulations were implemented through three tiers of progressively more stringent exhaust emission standards that were phased in between 1995 and 2008.

Manufacturers of forklift engines are subject to new engine standards for both diesel and LSI engines. Off-road diesel engines were first subject to engine standards and durability requirements in 1996 while the most recent Tier 4 final emission standards were phased in starting in 2013. Tier 4 emission standards are based on the use of advanced after-treatment technologies such as diesel particulate filters and selective catalytic reduction. LSI engines have been subject to new engine standards that include both criteria pollutant and durability requirements since 2001 with the cleanest requirements phased-in starting in 2010.

7.2.3.2 Locomotive Engine Standards

The CAA and USEPA national locomotive regulations expressly preempt states and local governments from adopting or enforcing “any standard or other requirement relating to the control of emissions from new locomotives and new engines used in locomotives” (USEPA interpreted new engines in locomotives to mean remanufactured engines, as well). USEPA has approved two sets of national locomotive emission regulations (1998 and 2008). In 1998, USEPA approved the initial set of national locomotive emission regulations. These regulations primarily emphasized NO_X reductions through Tier 0, 1, and 2 emission standards. Tier 2 NO_X emission standards reduced older uncontrolled locomotive NO_X emissions by up to 60 percent, from 13.2 to 5.5 g/bhphr.

In 2008, USEPA approved a second set of national locomotive regulations. Older locomotives upon remanufacture are required to meet more stringent particulate matter (PM) emission standards, which are about 50 percent cleaner than Tier 0-2 PM emission standards. USEPA refers to the PM locomotive remanufacture emission standards as Tier 0+, Tier 1+, and Tier 2+. The new Tier 3 PM emission standard (0.1 g/bhphr), for model years 2012-2014, is the same as the Tier 2+ remanufacture PM emission standard. The 2008 regulations also included new Tier 4 (2015 and later model years) locomotive NO_X and PM emission standards. The USEPA Tier 4 NO_X and

PM emission standards further reduced emissions by approximately 95 percent from uncontrolled levels.

7.2.3.3 Clean Diesel Fuel

Since 1993, CARB has required that diesel fuel used to operate on-road vehicles have a limit on the aromatic hydrocarbon and sulfur content. Diesel powered vehicles account for a disproportionate amount of the diesel particulate matter, which is classified as a toxic air contaminant. In 2006, CARB also adopted a low-sulfur diesel fuel requirement for off-road engines. The diesel fuel regulation allows alternative diesel formulations as long as emission reductions are equivalent to the CARB formulation.

7.2.3.4 Cleaner In-Use Off-Road Equipment (Off-Road Regulation)

The Off-Road Regulation was first approved in 2007 and subsequently amended in 2010 in light of the impacts of the economic recession. The regulation covered off-road vehicles used in construction, manufacturing, rental industry, road maintenance, airport ground support, and landscaping. In December 2011, the Off-Road Regulation was modified to include on-road trucks with two diesel engines.

The Off-Road Regulation will significantly reduce emissions of diesel PM and NO_X from the over 150,000 in-use off-road diesel vehicles that operate in California. The regulation affects dozens of vehicle types used in thousands of fleets by requiring owners to modernize their fleets by replacing older engines or vehicles with newer, cleaner models, retiring older vehicles or using them less often, or applying retrofit exhaust controls.

The Off-Road Regulation imposes idling limits on off-road diesel vehicles, requires a written idling policy, and requires a disclosure when selling vehicles. The regulation also requires that all vehicles be reported to CARB and labeled, restricts the addition of older vehicles into fleets, and requires fleets to reduce their emissions by retiring, replacing, or repowering older engines, or installing verified exhaust retrofits. The requirements and compliance dates of the Off-Road Regulation vary by fleet size.

Fleets will be subject to increasingly stringent restrictions on adding older vehicles. The regulation also sets performance requirements. While the regulation has many specific provisions, in general by each compliance deadline, a fleet must demonstrate that it has either met the fleet average target for that year, or has completed the Best Available Control Technology requirements. The performance requirements of the Off-Road Regulation are phased in from January 1, 2014 through January 1, 2019.

Compliance assistance and outreach activities in support of the Off-Road Regulation include:

- The Diesel Off-road On-line Reporting System, an online reporting tool developed and maintained by CARB staff.

- The Diesel Hotline (866-6DIESEL), which provides the regulated public with answers to questions about the regulations and access to CARB staff. Staff is able to respond to questions in English, Spanish, and Punjabi.
- The Off-road Listserv, providing equipment owners and dealerships with timely announcement of regulatory changes, regulatory assistance documents, and deadline reminders.

7.2.3.5 LSI In-Use Fleet Regulation

Forklift fleets can be subject to either the LSI fleet regulation, if fueled by gasoline or propane, or the off-road diesel fleet regulation. Both regulations require fleets to retire, repower, or replace higher-emitting equipment to maintain fleet average standards. The LSI fleet regulation was originally adopted in 2007 with requirements beginning in 2009. While the LSI fleet regulation applies to forklifts, tow tractors, sweeper/scrubbers, and airport ground support equipment, it maintains a separate fleet average requirement specifically for forklifts. The LSI fleet regulation requires fleets with four or more LSI forklifts to meet fleet average emission standards.

7.3 Stationary and Area-wide Source Control Measures

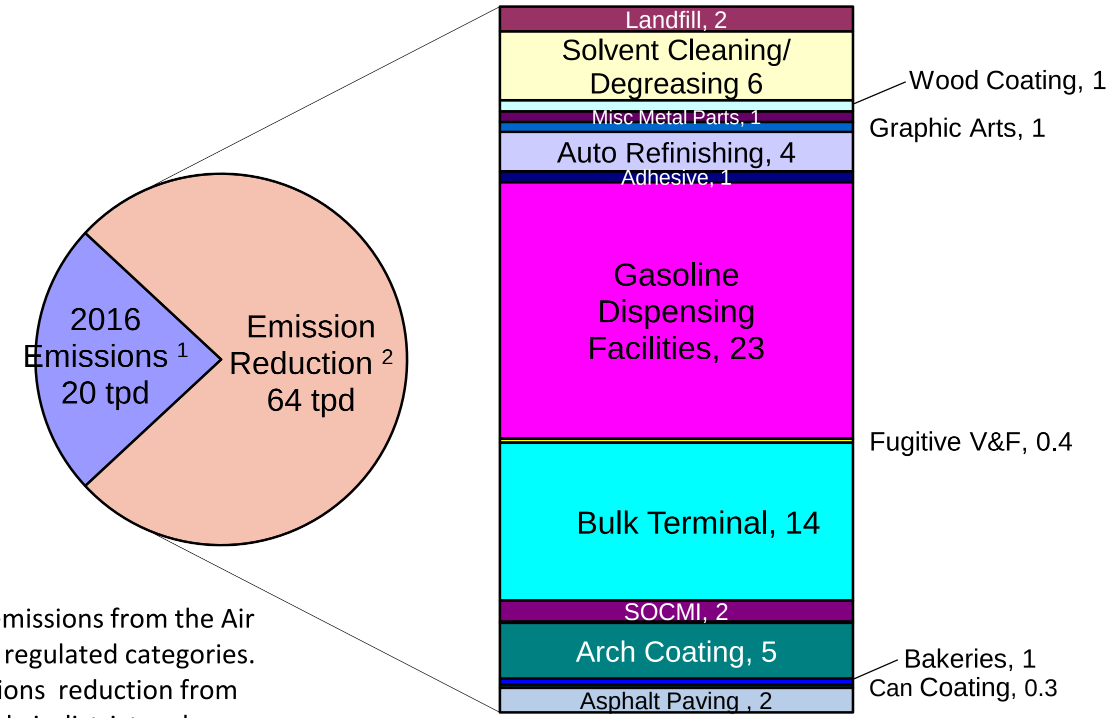
The California Health and Safety Code §40000 delegates authority to local air districts for control of air pollution from all sources except motor vehicle emissions. This means that local air districts are given regulatory authority to adopt and implement rules for controlling stationary and area-wide emissions sources. Stationary sources include sources such as power plants, cement plants, and manufacturing facilities. Area-wide sources are those where the emissions are spread over a wide area, such as gas stations, residential fuel combustion, and house paints.

7.4 Reductions from Existing Local Stationary and Area-wide Controls

The SFNA air districts have been regulating air pollution sources since the 1970's. Existing rules and their emission benefits are helping to make progress toward achieving clean air goals. The benefits from existing rules are reflected in the 2024 emissions inventory forecast (Chapter 5) and will continue to contribute toward cleaner air.

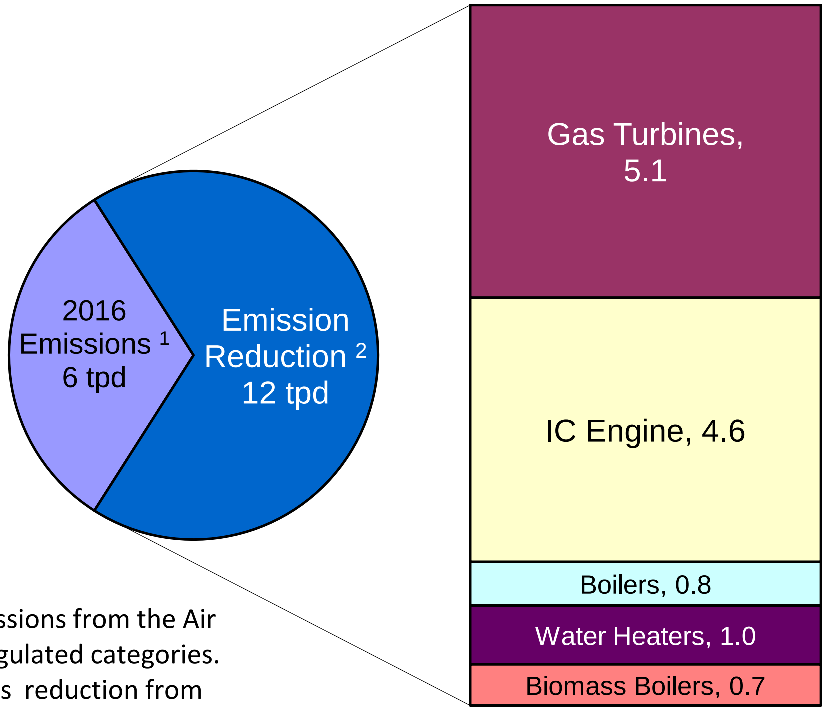
An analysis was prepared to illustrate benefits from existing SFNA air district rules. Figures 7-4 and 7-5 illustrate the emission reduction benefits in 2016 that were attributable to district stationary and area source Volatile Organic compounds (VOC) and NO_X rules implemented since 1975. Without the air districts' control measures, the emissions from regulated stationary source categories could have emitted 84 tons per day (tpd) of VOC and 18 tpd of NO_X. With the air district rules, the emissions from these sources were reduced to 20 tpd of VOC and 6 tpd of NO_X. The most beneficial VOC rules are those affecting: 1) gasoline dispensing facilities and bulk terminals, and 2) solvent cleaning, degreasing, and painting operations. The majority of NO_X emission reductions are due to controls on stationary and area-wide sources including: 1) gas turbines, 2) internal combustion (IC) engines, 3) boilers, and 4) water heaters.

Figure 7-4 2016 VOC Reduction Benefits (tpd) from SFNA District rules implemented since 1975



[1] VOC emissions from the Air District regulated categories.
[2] Emissions reduction from adopted air districts rules

Figure 7-5 2016 NO_X Reduction Benefits (tpd) from SFNA District rules since 1975



[1] NO_X emissions from the Air District regulated categories.
[2] Emissions reduction from adopted air districts rules

7.5 Consideration and Selection of New Regional and Local Control Measures

Photochemical modeling results (Chapter 6) demonstrate that the SFNA will attain the 2008 ozone NAAQS by the end of 2024, which is two years earlier than the attainment demonstration analysis year of 2026 for a severe-15 nonattainment area. Therefore, no new local, regional, or transportation control measure commitments are being proposed in this plan. The SFNA air districts will continue to implement existing local control measures.

USEPA's final 2008 NAAQS ozone implementation rule (40 CFR 51.1112(c)) requires that the attainment demonstration include a demonstration that it has adopted all reasonably available control measures (RACM) necessary to demonstrate attainment "as expeditiously as practicable" and to meet any RFP requirements. In the preamble to the final implementation rule, EPA interprets "as expeditiously as practicable" to mean measures that, considered cumulatively, could advance attainment by a year (80 FR 12264-12319). The RACM Analysis in Appendix E shows no additional measures were identified that, when considered cumulatively, would advance attainment by one year and no additional measures are needed for demonstrating reasonable further progress requirements (Chapter 12).

7.6 Transportation Control Measures (TCMs)

7.6.1 Background

TCMs are strategies used to reduce motor vehicle emissions. TCMs may reduce vehicle trips, vehicle use, vehicle miles traveled, vehicle idling, or traffic congestion. SACOG is the Metropolitan Planning Organization (MPO) for the greater Sacramento region (includes Sacramento, Yolo, Placer, El Dorado, Sutter, and Yuba counties). SACOG provides transportation planning and funding for the region and has worked with local governments and the SFNA air districts to develop and implement TCMs. For example, one of the TCMs developed for the previous Attainment Plan for the SFNA is the Spare The Air program, a program that has achieved a high level of public awareness.

Implemented TCMs are included in the measured baseline activity in the SACOG transportation model. This baseline activity data was used to forecast future projections for the motor vehicle inventory.

There are transportation planning implications associated with including TCMs in a SIP. Each time the MPO makes a conformity determination to accompany a new Metropolitan Transportation Plan (MTP), a new Metropolitan Transportation Improvement Program (MTIP), or an amendment to either document, it must demonstrate that all TCMs are still on track to be implemented in a timely fashion.

If a TCM does not stay on schedule, the MPO must show that all State and local agencies with influence over approvals or funding for TCMs are giving maximum priority to approve or fund TCMs over other projects within their control. The MPO and other responsible agencies would have to either ensure that the TCM is able to get back on schedule, or substitute another TCM. The MPO may not be able to demonstrate conformity on a new or amended MTP or MTIP if a TCM is failing.

In addition, the Transportation Conformity Rule (40 CFR 93.103) states that “When assisting or approving any action with air quality-related consequences, Federal Highway Authority (FHWA) and Federal Transit Administration shall give priority to the implementation of those transportation portions of an applicable implementation plan prepared to attain and maintain the NAAQS.”

7.6.2 Roles and Responsibilities in TCM Coordination

Based on suggestions received from interagency consultation and discussions with transportation and air quality stakeholders via the Regional Planning Partnership (RPP), SACOG formally refines the types of projects to be included as TCMs during the SIP and/or MTIP and MTIP Guidelines development process. During the regular update cycle for the MTP and MTIP, SACOG, in coordination with the RPP, will refine and revise TCM descriptions and definitions to clarify the general TCM process as well as resolve specific implementation issues. SACOG works with the project implementing agencies, air quality stakeholders, and any other interested parties, primarily through the RPP, to facilitate the TCM process and implement TCMs appropriately.

It is SACOG's responsibility to ensure that TCM strategies are funded in a manner consistent with the implementation schedule established in the MTIP at the time a project is identified as a TCM commitment. The transportation conformity process is designed to ensure timely implementation of TCM strategies. If the implementation of a TCM strategy is delayed, or if a TCM strategy is only partially implemented, the emission reduction shortfall must be made up by either substituting a new TCM strategy or by enhancing other control measures. The criteria for this process is discussed in the Guidance for implementing the CAA Section 176 (c)(8) Transportation Control Measure Substitution and Addition Provision (USEPA, 2009).

7.6.3 TCM RACM Evaluation

An evaluation (Sierra Research, 2015) of TCMs was conducted as part of the RACM Analysis (Appendix E) to identify any TCMs that met the selection criteria. The initial TCM RACM list consisted of: 1) strategies identified through a comprehensive review of implemented TCMs in California, as well as other states; 2) measures and strategies commitments in the Region's 2009 Ozone SIP (SMAQMD et al, 2009); and 3) statewide and mobile source emission reduction strategies.

Out of the almost 100 measures identified in the review, only those that were not already implemented in Sacramento (about 20) were selected for further analysis. The criteria for identifying TCM projects and requirements for timely implementation are defined in USEPA's transportation conformity rule, 40 CFR Part 93. None of the other strategies were included as commitments either because they were economically infeasible, no agency had authority to implement the measures (Seitz, 1999), or failed to advance attainment by a year when considered cumulatively.

7.7 Completed and Continuing TCM Projects

The CAA Section 108(f)(1)(A) lists sixteen potential TCM categories. TCM projects focus on reducing vehicle use or traffic congestion. There were 24 TCM projects and funding programs contained in the 2013 SIP[40] (SMAQMD et al, 2013). Appendix D (Transportation Control Measures) of the 2013 SIP describes the emissions reduction, timeframe, cost, and needed resources and authority for each TCM. All 24 of these TCMs were chosen to provide air quality benefits, while leaving as much flexibility as possible for implementation. They have the following characteristics: early completion dates (all but one will be completed by 2019), reasonable costs, fully committed funding, and projects of small or moderate-sized scope. These 24 TCM projects, measures and funding programs were grouped into seven categories, which include:

[40] 2013 SIP is the latest update for the 2009 SIP.

1. Intelligent Transportation Systems – 3 projects
2. Park and Ride Lots/Transit Centers - 3 projects
3. Transit Service Funding Programs – 2 programs
4. Other Specific Funding Programs- 3 programs
5. MTP Regional Funding Programs – 4 programs
6. Miscellaneous Projects – 2 projects
7. Research and Policy Development Further Study Measures – 7 measures

SAOCG reported the status of the TCMs in the latest conformity analysis (SACOG, 2016). Most of the projects (19 out of 24) were completed before 2014. The remaining five projects are programs, which SMAQMD, SACOG, Sacramento Transportation Authority (STA) and other air districts in the region have commitments to implement. Four of these projects will be implemented through 2018.

1. Freeway Service Patrol (AQ-1)
2. Sacramento Emergency Clean Air and Transportation (SECAT)(AQ-2)
3. Air Quality Funding Program (FP-1)
4. SACOG Regional Rideshare Program (FP-3)

The remaining project, Spare the Air Program (AQ-3), which is described more in Section 7.8 will continue through 2024. None of these five measures were relied on to demonstrate attainment in this SIP.

7.8 TCM Commitments

For severe nonattainment areas, CAA section 182(d)(1) requires that the state “consider measures specified in section 108(f) [see discussion in Section 7.7], and choose from among them and implement such measures as necessary to demonstrate attainment with the NAAQs.” None of the continuing TCM measures were relied on to demonstrate attainment. Therefore, with the exception of the Spare the Air program, they are not included in the SIP. “Spare The Air” was included in the SIP as a TCM because funding was extended from the prior 2019 expiration date to 2024.

Spare the Air is a year-round public education program with an episodic ozone reduction element during the summer ozone season, plus general awareness throughout the rest of the year. This program was created in 1995 to engage the general public in voluntarily helping to solve the problem of ozone air pollution. The program is designed to protect public health by informing people when air quality is unhealthy and achieving voluntary emission reductions. This is done by encouraging residents to reduce vehicle trips, reduce their commute time, take public transportation, and spend less time in their cars.

This program is implemented by the SMAQMD staff and benefits all the air districts within the SFNA, which cover Sacramento County, Yolo County, and parts of Placer, Solano, El Dorado, and Sutter Counties. Information conveyed through Spare The Air, such as alerts, further encourages people to use alternative modes by promoting public transportation and alternative modes of transportation. The Spare the Air program is included in the 2016 Metropolitan Transportation Plan/Sustainable Communities Strategy (MTP/SCS) as an air quality improvement program to reduce vehicle miles traveled on bad air quality days and as a strategy contained under Policy 8[41] (SACOG, 2016a). This 2016 MTP/SCS was adopted by the SACOG Board on February 18, 2016.

The Spare The Air program is a non-regulatory transportation control measure. The air districts receive approximately $600,000 per year from a Congestion Mitigation & Air Quality Improvement (CMAQ) grant. The funding is provided by the FHWA, but appropriated through SACOG. SACOG secured funding for Spare The Air through 2019, and on December 15, 2016, the SACOG Board approved continuing funding for Spare The Air as a TCM from 2019 – 2024.

7.9 Contingency Measures

Contingency measures are control measures that go into effect if a nonattainment area fails to reach desired goals or targets. Contingency provisions are required under CAA §172(c)(9) and 182(c)(9) in the event the nonattainment area fails to meet a reasonable further progress milestone or attainment date. Contingency measures are specific additional controls to be implemented automatically without further significant rulemaking activities, such as public hearings or legislative review, and without further action by the State or the USEPA Administrator.

To meet the contingency measure requirement, federal guidance (57 FR 13511; 80 FR 12285) requires that the plan provide 3% in emission reductions beyond the level needed to meet the reasonable further progress and attainment demonstration requirements. The existing local and state measures meet this requirement because they exceed emission reductions needed for reasonable further progress targets and for attainment requirements by more than 3%. The calculations that demonstrate the anticipated contingency reductions are documented in conjunction with the attainment demonstration in Chapter 8 and the reasonable further progress demonstration in Chapter 12.

7.10 References

USEPA. (57 FR 13511) *General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990*. Federal Register, Volume 57, April 16, 1992, p. 13511.

[41] This policy state that it is necessary to support and invest in strategies to reduce vehicle emissions that can be shown as cost effective to help achieve and maintain clean air and better public health.

USEPA, Guidance for implementing the Clean Air Act Section 176 (c)(8) Transportation Control Measure Substitution and Addition Provision, EPA-420-B-09-002, January [2009.] Web. 13 April 2017.
< http://www.scag.ca.gov/Documents/Section176-Guide-Jan08.pdf >

USEPA. (80 FR 4795 - 4799) *Approval and Promulgation of Implementation Plans; State of California; Sacramento Metro Area; Attainment Plan for 1997 8-Hour Ozone Standard, Final Rule.* Federal Register, Volume 80, No. 19, January 29, 2015, p. 4795-4799.

USEPA. (80 FR 12264 - 12319) *Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements; Final Rule*. Federal Register, Volume 80, March 6, 2015, p. 12264-12319.

USEPA. *Requirements for reasonably available control technology (RACT) and reasonably available control measures (RACM)*, 40 CFR §51.1112

USEPA. *Priority*, 40 CFR §93.103

SACOG. *Conformity Analysis - Developed as part of the Sacramento Area Council of Governments': 2016 Metropolitan Transportation Plan and Sustainable Communities Strategy Amendment #1 and Adoption of the 2017/20 Metropolitan Transportation Improvement Program.* Sacramento, CA: Sacramento Area Council of Governments, 15 September [2016.] Web. 3 March 2017. < http://www.sacog.org/sites/main/files/file-attachments/conformity_analysis_2017_20_mtip_ts.pdf >

SAOCG. *2016 Metropolitan Transportation Plan/Sustainable Communities Strategy, Final Plan.* Sacramento, CA: Sacramento Area Council of Governments, February [2016a.] Web. 17 August 2016. < http://www.sacog.org/general-information/2016-mtpscs >

Seitz, John. *Guidance on the Reasonably Available Control Measures (RACM) Requirement and Attainment Demonstration Submissions for Ozone Nonattainment Area.* U.S. EPA, Office of Air Quality Planning and Standards. 30 November [1999.] Web. 13 April 2017.
< https://www3.epa.gov/ttn/naaqs/aqmguide/collection/cp2/19991130_seitz_racm_guide_ozone.pdf >

SMAQMD. et al. *Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan.* Sacramento, CA: Sacramento Metropolitan Air Quality Management District, [2009.]

SMAQMD. et al. *2013 Revisions to the Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan.* Sacramento, CA: Sacramento Metropolitan Air Quality Management District, [2013.]

8 ATTAINMENT DEMONSTRATION

8.1 Attainment Demonstration Requirements

Clean Air Act Section 182(c)(2)(A) requires that attainment demonstrations for "serious and higher" nonattainment areas be based on photochemical grid modeling or any other analytical method determined by the United States Environmental Protection Agency (USEPA) to be at least as effective. The USEPA provides guidance (USEPA, 2014) on how to apply air quality models to generate results for preparing 8-hour ozone attainment demonstrations. The California Air Resource Board (CARB) conducted photochemical modeling to demonstrate attainment of the 2008 ozone National Ambient Air Quality Standard (NAAQS) for the Sacramento Federal Nonattainment Area (SFNA), using the single relative response factor (RRF) method from the guidelines.

8.2 Attainment Demonstration Evaluation using Photochemical Modeling

The photochemical modeling results discussed in Chapter 6 and Appendix B were used to predict the regional peak ozone design value for 2026, which is the attainment demonstration analysis year for a severe-15 nonattainment area. The analysis calculates the weighted design value[42] and projects forward to test for future attainment at each site. Design values were calculated for 2012, 2013, and 2014 and then averaged to determine the weighted design value used for modeling. The highest calculated 8-hour weighted design value was 90 parts per billion (ppb) and was measured at the Folsom-Natoma monitoring site.

The modeled Volatile Organic Compound (VOC) and Nitrogen Oxides (NO_X) emission forecasts incorporate growth assumptions and estimated reductions associated with existing control measures (the combined reductions from existing local, regional, state, and federal control measures). The measures include those adopted as part of the Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan (2013 Plan)(SMAQMD et al, 2013) for the 1997 8-hour standard. The current and forecasted emissions inventory reflects emission reductions from the implementation of federal regulations, ongoing benefits from the CARB programs, and the existing air district control programs. These existing regulations and control programs have demonstrated attainment - no new control measures are necessary to attain the 2008 National Ambient Air Quality Standard (NAAQS) by the 2024 attainment demonstration year.

[42] The discussion here and in the following section uses three related terms: design value, peak design value, and weighted design value. The design value is the average of the 4th highest emission concentration measured at a monitoring station for each year in any consecutive 3-year period. The peak design value is the highest design value in a given year at all stations in the region. The weighted design value is calculated by averaging the design value each year for a three year period. The weighted design value is only used in photo grid modeling and is intended to account for year-to-year meteorological variability (Appendix B, p. B-3).

Modeling results indicated that all monitors located within the SFNA will be below the 2008 8-hour NAAQS of 75 ppb by 2026. The modeling showed that the highest future year (2026) design value for the region was 70.7 ppb at the Folsom-Natoma monitoring site (Table 8-1). It also found that the region could possibly attain the 2008 standard as early as 2022 with a design value of 75.2 ppb at the Folsom-Natoma monitoring site (Table 8-1). This would result in a design value of 75 ppb at the Folsom-Natoma monitoring site because the 3-year average design values are rounded.[43]

8.3 Attainment Year Analysis based on Ambient Air Quality Data

The regional air districts, in consultation with CARB and USEPA Region IX, are proposing 2024 be established as the SFNA attainment deadline for the 2008 ozone NAAQS. Selection of 2024 is two years before the 2008 NAAQS 8-hour ozone attainment demonstration year for a severe-15 area of 2026, and provides a safeguard against inherent uncertainties in predicting future ambient ozone concentrations beyond 2022 (e.g. emission reductions, meteorology, or natural events).

One key additional factor is the steep rate of emission reductions that will be required at the Placerville site. Based on regional ambient air quality data for 2016, the Placerville monitoring site had the highest peak[44] design value of 85 ppb. To demonstrate attainment at this site by the earliest attainment date of 2022, ambient ozone concentrations in the region would need to decrease at a rate of about 1.7 ppb/year from 2016. That would be an extremely ambitious rate of reduction – during the previous 6 years the ambient concentration reduction rate at that site was much slower, decreasing only 0.8 ppb/year from 2010 to 2016. In contrast, a 2024 attainment year would require a 1.3 ppb/year reduction at the Placerville monitoring site over eight years (from 2016 to 2024) which – although still ambitious – is closer to the historic rate of reduction.

Further, the regional air districts and the Sacramento Area Council of Governments (SACOG), the region's metropolitan planning organization (MPO), conducted an exhaustive evaluation of reasonably available control measures (RACM) analysis. It was determined that the measures considered individually or collectively would not advance the attainment by one year from 2024 to 2023 and were not necessary to meet the reasonable further progress (RFP) requirements for the SFNA. The emissions reductions that any control strategies may potentially generate were found to be

[43] The measured 3-year average design values use the rounding/truncation rules established in 40 CRF Part 50 Appendix P (8-hour ozone). Hourly average concentrations are reported in parts per million (ppm) to the third decimal place, with additional digits to the right of the third decimal place truncated.The 2008 NAAQS standard is met when the 3-year average of the annual fourth-highest daily maximum ozone concentration is less than or equal to 0.075 ppm (75 ppb).

[44] See footnote 40 in section 8.2.

insignificant or non-quantifiable. A detailed analysis of the measures considered and evaluated is in Appendix E – Reasonably Available Control Measure (RACM) Analysis.

Finally, CARB is preparing a weight-of-evidence analysis, which will be submitted to EPA in conjunction with this SIP. Based on the air district's analysis above, we anticipate that the weight-of-evidence test will support the 2024 attainment deadline designation.

8.4 Methodology for Estimating 2024 Design Values

An estimated design value for 2024 was calculated based on photochemical modeling for 2022 and 2026. This was done by assuming that the ozone response to NO_X emissions is linear between those two years, and that small changes in VOC emissions have a negligible effect on ozone. Both assumptions are reasonable based on the results of the photochemical modeling (Appendix B), which shows that small changes in VOC emissions (<5 tons/day) have very little impact on ozone design values at the Folsom-Natoma monitor, and that the response to NO_X emission reductions is approximately linear over reductions less than ~10 tons/day.

Figure 8-1 shows future design values for 2022 and 2026 as a function of NO_X emissions. Emissions of NO_X and VOC for 2022, 2024, and 2026 are shown in Table 8-1, along with the corresponding design value. Assuming a linear relationship between the ozone design value and NO_X emissions from 2022 to 2026, a 2024 ozone design value can be estimated based on the 2024 NO_X emissions. The 2024 NO_X emissions were based on emissions inventories provided by CARB and plotted on the line to determine the 2024 design value. These emission inventories are presented in Chapter 5 and Appendix A. Utilizing this approach, the ozone design value at Folsom-Natoma in 2024 is estimated to be 72.1 ppb.

Figure 8-1 Ozone design value as a function of NO_X emissions at the Folsom-Natoma monitor

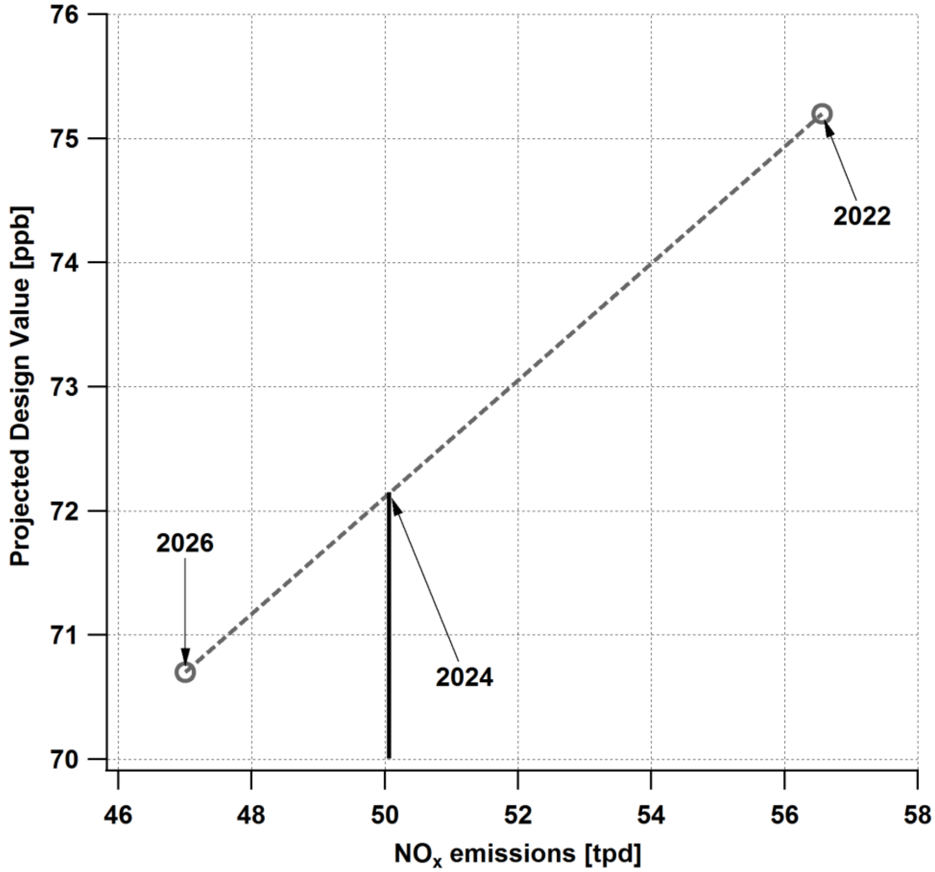


Table 8-1 Emissions of NO_X and VOC in 2022, 2024, 2026, and the corresponding ozone design value.

Year	NO_X Emissions (tpd)	VOC Emissions (tpd)	Linear fit DV
2022	56.6	84.5	75.2
2024	50.1	82.7	**72.1**
2026	47.0	81.5	70.7

Note:

- The 2024 design value is estimated from Figure 8-1
- CEPAM: 2016 SIP Baseline Emission Projections, Version 1.03. Sacramento Regional Nonattainment Area, Summer, Growth and Controlled with External Adjustments, used to calculate 2022 and 2026 emissions. The modeling emissions inventory discussed in Chapter 5 and Appendix B varies slightly.

8.5 VOC and NO_X Reduction Goals

Appendix B - Photochemical Modeling contains the ozone and pollutant emission reduction graphs, based on modeling results, for the peak ozone design value site at

Folsom in the SFNA. Figure 16 in Appendix B shows the pattern of ozone responses to varying combinations in domain-wide VOC and NO_X emission reductions. Since the ozone design values are truncated to the nearest whole ppb, values below 75 ppb represent attainment of the federal 8-hour ozone standard. Additional modeling details and assumptions for assessing the VOC and NO_X reduction attainment goals are also provided in Appendix B – Photochemical Modeling.

8.6 Attainment Demonstration Contingency Measure Requirement

Clean Air Act, sections 172 (c)(9) and 182 (c)(9) require the implementation of contingency measures if the SFNA fails to meet the reasonable further progress requirements (Chapter 12), or attain the standard by the applicable attainment date. Federal guidance requires that there should be sufficient contingency measures in the plan to provide a 3% emission reduction beyond what is needed for the attainment demonstration. Table 8-2 shows that the expected additional emission reduction benefits achieved from existing control programs will meet the 3% attainment demonstration contingency requirement. Projected emissions from after the 2024 attainment (2025 NO_X emissions plus NO_X emissions reduction credits), minus the attainment emissions, show that there will be sufficient emissions reductions to meet the contingency measure requirement, 3% of the 2012 baseline emissions inventory (80 FR 12285), shown in Line B. Line C reflects that, based on the photochemical modeling (Appendix B, Table B-1), a 45% reduction in NO_X from the 2012 baseline is needed for attainment.

The SFNA will be able to meet the 3% contingency requirement based entirely on NO_X emissions reductions. These reductions will be from the continued implementation of the mobile source program beyond what is needed for attainment. Reductions of NO_X have been demonstrated to be the most effective in bringing the area into attainment (Appendix B).

Table 8-2 Attainment Contingency Measure Reduction

Line		NO_X
A	2012 Baseline Emissions Inventory	101.1
B	3% of 2012 baseline	3.03
C	% NO_X Reduction Required for Attainment	45%
D = A * (100% - C)	Attainment Inventory	55.61
E	2025 Inventory	47.03
F	Emissions Reduction Credits (ERC)	4
G = E + F	2025 Inventory + ERC	51.03

H = D - G	Available Reduction for Attainment Demonstration Contingency	4.58
	Is 3% contingency met (Is H greater than B)	Yes

NOTES:
Line A - NO_X emissions for 2012 Baseline Emissions Inventory (Table 12-1).
Line C – the % NO_X reduction is based on Photochemical modeling (Table B-1).
Line E - emissions in 2025, the year after the attainment date (2024).
Line F - ERCs are discussed in Appendix A-3.

8.7 Attainment Demonstration Conclusions

Attainment of the 2008 8-hour ozone NAAQS is demonstrated by 2024, two years before the severe-15 classification attainment demonstration year of 2026.. The total emission reductions from existing measures are sufficient to provide for attainment by 2024.

8.8 References

SMAQMD et al. *Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan (2013 SIP Revisions).* Sacramento, CA: Sacramento Metropolitan Air Quality Management District, 26 September [2013.]

USEPA. *Draft Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$ and Regional Haze*. December 2014. Web < https://www.epa.gov/ttn/scram/guidance/guide/Draft_O3-PM-RH_Modeling_Guidance-2014.pdf >

9 TRANSPORT ANALYSIS

9.1 Introduction to Pollutant Transport

The air quality in the Sacramento Federal Nonattainment area (SFNA) can be impacted by pollutant transport from the San Francisco Bay Area and the San Joaquin Valley. Delta breezes carry air pollutants from coastal Bay Area and San Joaquin Valley emission sources downwind to the inland areas of the Sacramento region, and these pollutants may contribute to ozone formation during the same day or the following days. The California Air Resources Board (CARB) has determined that the relative impact on air quality in the SFNA, from the Bay Area and San Joaquin Valley pollutant transport can be considered overwhelming, significant or inconsequential on various days (CARB, 2001, p.25, 37) depending on meteorological conditions. Various studies in the past two decades also reaffirmed that a strong sea breeze within the deep marine boundary layer from the San Francisco Bay Area enhanced pollutant transport into the Sacramento Delta Region (Appendix B-2, p.27) and that the air flow pattern in the Sacramento Valley (Schultz eddy) causes pollutants to recirculate and become trapped within the Sacramento region (Appendix B-2, p.28).

This chapter discusses various interbasin transport issues and modeling assumptions regarding transported air pollutants.

9.2 Interbasin Transport Issues

To better manage air pollution, California is divided into 15 air basins based on their geography and meteorological features. County boundaries are also considered in determining an air basin. The SFNA is located at the southern part of the Sacramento Valley Air Basin and the middle of Mountain County Air Basin. Interbasin transport is the transport of air pollutants (ozone precursors) from upwind air basins to downwind air basins.

There are many different issues involving interbasin transport of air pollutants. First, air pollutant transport is evaluated to get a more complete picture of how ozone is formed in the SFNA. Depending on meteorological conditions, the amount of transport from outside the nonattainment area can vary from day to day. Understanding the impacts of transport can be an important factor in predicting future attainment of the ozone standard in the SFNA. For example, if an area’s ozone problem is significantly impacted by outside pollutant transport, then a local emission control strategy may not be effective.

In addition, the influence of air pollutant transport on ozone concentrations is difficult to assess and can involve many different, complex methodologies with varying limitations and uncertainties. For example, surface wind flow data from ambient monitors and wind flow patterns can reveal where pollutants are coming from, but the amount of ozone formation will depend on other factors, like temperature and vertical convection. Thus, impacts cannot be quantified on just the transport data alone. Photochemical grid modeling can quantify a more precise transport contribution to downwind ozone areas and account for pre-existing conditions, but they may only be representative of a specific ozone season and subject to various modeling performance uncertainties.

In addition, other issues pertaining to transport assessment include:

1) uncertainties in transport occurring from aloft layers[45],
2) differences in future emission reduction strategies in upwind air basins,
3) transport from the Sacramento region to other downwind areas, and
4) emissions transport due to motor vehicles traveling between air basins.

9.3 USEPA Rules and Regulations on Intrastate Transport

The 2008 National Ambient Air Quality Standards (NAAQS) ozone implementation rule (80 FR 12270) states that intrastate transport should be considered by the United States Environmental Protection Agency (USEPA) and the CARB in determining the attainment date. In determining the attainment date that is as expeditious as practicable, the CARB considered impacts on the nonattainment area of intrastate transport of pollution from sources within its jurisdiction, and potential reasonable measures to reduce emissions from those sources.

9.4 Attainment Assumptions of Domain-wide Reductions

Transported pollutants from upwind areas can contribute to the ozone problem further downwind across geographic air basins. Consequently, emission reductions from statewide and upwind regions' control measures reduce ozone precursors from transport and help reduce ambient ozone concentrations in the SFNA. The CARB's photochemical modeling simulations include the northern and central regions of California in the modeling domain (see Chapter 6 – Air Quality Modeling Analysis). This air quality modeling was used to address and account for air pollutant transport impacts among the San Francisco Bay Area, San Joaquin Valley, Sacramento Valley, and Mountain Counties air basins.

CARB, as a statewide agency, is responsible for submitting State Implementation Plans (SIPs) for California in which it must address intrastate transport for California's nonattainment areas. CARB modeling for the attainment demonstration for the SFNA used domain-wide emission reductions to characterize future ozone reductions at peak ozone monitoring stations.

[45] Aloft layers are the layers above the surface inversion layer.

9.5 Conclusions

The CARB continues to adopt, enforce, and implement the state control measures as described in Chapter 7. These statewide control measures will continue to bring emission reduction benefits to the SFNA. Other upwind air districts will also continue their efforts to enforce and implement control measures. The total emission reductions from existing federal, state, regional, and local measures will contribute to attainment and ensure the region meets the 2024 attainment deadline.

9.6 References

CARB. *Ozone Transport: 2001 Review.* Sacramento, CA: California Air Resources Board, April [2001.]

CARB. Air Resources Board's Proposed State Strategy for California's 2007 State Implementation Plan. Sacramento, CA: California Air Resources Board, [2007.] Web 18 April 2013,
< http://www.arb.ca.gov/planning/sip/2007sip/2007sip.htm#April26 >

CARB. *Proposed 2016 State Strategy for the State Implementation Plan.* Sacramento, CA: California Air Resources Board, May [2016.]

USEPA (70 FR 71623) *Final Rule to Implement the 8-Hour Ozone National Ambient Air Quality Standard – Phase 2.* Federal Register, Volume 70, 29 November 2005, p. 71623-71624. Print.

USEPA (80 FR 12270) *Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements.* Federal Register, Volume 80, 6 March 2015, p. 12264-12319. Print.

10 TRANSPORTATION CONFORMITY AND EMISSION BUDGETS

10.1 Introduction to Transportation Conformity

Transportation conformity analysis and findings are required under federal Clean Air Act (CAA) Section 176 to ensure that transportation activities do not impede an area's ability to attain air quality standards. The CAA requires that transportation plans, programs, and projects that obtain federal funds or require approval be consistent with, or conform to, applicable state implementation plans (SIPs) before they can be approved by a Metropolitan Planning Organization (MPO). Conformity to the SIP means that proposed transportation activities must not:

(1) cause or contribute to any new violation of any standard,
(2) increase the frequency or severity of any existing violation of any standard in any area, or
(3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area.

This SIP analyzes the region's total emissions inventory from all sources necessary to demonstrate reasonable further progress (RFP) and attainment of the 2008 National Ambient Air Quality Standards (NAAQS) for 8-hour ozone. The on-road highway and transit vehicle portion of the total emissions inventory used to demonstrate RFP and attainment of the NAAQS, is the "motor vehicle emissions budget" (MVEB)[46]. The MVEBs are used to ensure that transportation planning activities conform to the SIP and are set for each RFP milestone year and the attainment year. Transportation projects cannot be approved if they will cause emissions in the transportation plan to exceed the MVEB.

10.2 Transportation Conformity Requirements

To implement the CAA Section 176 requirement, United States Environmental Protection Agency (USEPA) established the Transportation Conformity Rule (40 CFR, Subpart A, 93.100 – 93.129). This rule:

- Establishes criteria and procedures for determining whether the long range metropolitan transportation plan (MTP) and a short range funding program, or metropolitan transportation improvement program (MTIP) conform to the SIP[47].
- Ensures that transportation plans and projects are consistent with the applicable SIP. This means that transportation emissions are less than or equal to the MVEB.

[46] Federal transportation conformity regulations are found in 40 CFR Part 51, subpart T – Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved under Title 23 U.S.C. of the Federal Transit Laws. Part 93, subpart A of this chapter was revised by the USEPA in the August 15, 1997 Federal Register.

[47] The MTP is updated every 4 years and the MTIP is 2 years after MTP.

- Ensures that transportation plans, programs, and other individual projects do not cause new air quality violations, exacerbate existing ones, or delay attainment of air quality standards.

USEPA restructured the transportation conformity rule (USEPA, 2012), so that existing conformity requirements will apply for any new or revised NAAQS. This was done to provide consistency and avoid the need to revise the rule in the future when NAAQS are added or revised..

Before adopting the MTP/MTIP, the Sacramento Area Council of Governments (SACOG), the MPO for the greater Sacramento area must prepare a regional emission analysis based on the projects in the proposed MTP/MTIP and programs as specified in the federal conformity regulation.[48] Those emissions are compared to the emission budgets in the SIP. The MPO may determine that the MTP/MTIP conforms if the emissions from the proposed actions are less than the emissions budgets in the SIP. The conformity determination also signifies that the MPO has met other transportation conformity requirements such as interagency consultation and financial constraint.

10.3 Purpose of the Motor Vehicle Emissions Budget

In this SIP, a motor vehicle emission budget is established for both Volatile Organic Compounds (VOC) and Nitrogen Oxide (NO_X) for two reasons:

1. Both VOC and NO_X are ozone precursors, and reductions of both pollutants are needed to demonstrate attainment of the ozone standards, and
2. The RFP demonstration relies on NO_X substitutions to meet the required goals.

Once ozone SIP budgets in this Plan are approved, areas must use those budgets to determine ozone conformity (40 CFR 93.109(c)(1)). SACOG must demonstrate that projected regional motor vehicle emissions from transportation projects contained in the MTP and MTIP will conform to the levels established in the SIP.

10.4 Latest Planning Assumptions

The latest planning and land use assumptions used to develop the MVEBs are included in Amendment #1 to the 2016 Metropolitan Transportation Plan/Sustainable Communities Strategy (2016 MTP/SCS),[49] which was approved by the SACOG Board of Directors in February 2016 (SACOG, 2016a). This included population, housing, households, and employment projections for 2012, 2020, and 2036 for the SACOG planning region (El Dorado, Placer, Sacramento, Sutter, Yolo, and Yuba Counties). These initial projections were updated in the 2017/2020 MTIP, which was adopted by

[48] For purposes of conformity, SACOG is also responsible for the analysis of transportation activities in eastern Solano County.
[49] Projections are updated every 4 years.

the SACOG Board in September 2016 (SACOG, 2016b). The updated activity data based on the 2017/2020 MTIP was used in setting the baseline projections for the motor vehicle inventory.

SACOG's Transportation Model

The transportation analysis for the 2017/2020 MTIP relied on the latest planning assumptions and SACOG's regional travel demand forecasting model, Sacramento Regional Activity-Based Simulation Model (SACSIM). The SACSIM model was used to estimate future traffic volumes and public transit ridership for the SACOG planning region. These boundaries are different than the boundaries of the Sacramento Federal Ozone Nonattainment Area (SFNA). SACSIM includes an "activity-based" travel module that allocates households to parcels and simulates each schedule, mode, and purpose for each person on a typical weekday.

The traffic assignment module loads the vehicle trips onto the road network, resulting in vehicle miles traveled at four time intervals (morning peak, midday, afternoon peak, and evening/early morning) and speed within each time period. To develop the travel forecasting model, information on the characteristics, constraints of the transportation system and residents' travel survey data were collected. The SACSIM travel outputs were compared to actual base year data to demonstrate adequate model performance results.

SACOG used the SACSIM travel demand model to forecast average weekday travel patterns for several future years based on given assumptions about expected future population and employment projections, land use allocations, and transportation system improvements. For the 2016 MTP/SCS[50], SACOG made minor refinements in the growth projections used in the 2012 MTP/SCS (SACOG, 2012). The refinements were based on an assessment of long term economic trends in the region (SACOG, 2016a, Chapter 9).

10.5 Proposed New Motor Vehicle Emissions Budgets

Table 10-1 shows the transportation conformity emissions budgets for VOC and NO_X in the SFNA for the RFP years of 2018 and 2021 as well as the attainment year of 2024. The federal conformity rule allows a SIP to create a safety margin in an emissions budget (40 CFR 93.101, 93.118(e)(4)(vi), and 93.124(a)), so long as the SIP explicitly quantifies the amount by which the MVEB could be higher while still allowing a demonstration of compliance with the milestone and attainment requirements, and explicitly states an intent that some or all of that amount should be available to the MPO and Department of Transportation (DOT) in the emission budget for conformity purposes. A safety margin is defined as the difference between projected emissions and

[50] SACOG typically updates their growth forecast on the four year MTP/SCS cycle.

the emissions necessary to demonstrate RFP and attainment. This plan establishes a safety margin of 0.5 tons/day of NO_X in 2021 only. The budgets, including the safety margin in 2021 for NO_X, are consistent with the emissions inventory used to demonstrate RFP and attainment. Consequently, the emissions budgets may be used by SACOG to establish conformity with their transportation projects and plans.

The emissions budgets presented below use EMFAC2014 with SACOG modeled VMT and speed distributions. For 2018 and 2021 (milestone years) and 2024 (demonstration year), VMT and speed distribution data was generated by SACOG using SACSIM15. Emissions for Eastern Solano County were estimated in EMFAC2014 separately based on data provided by the Metropolitan Transportation Commission (MTC). Because these data represent the most recent data available, there are small differences between the budgets and planning inventory. These differences do not impact the RFP or attainment demonstrations.

The California Air Resources Board (CARB) staff released EMFAC2014, which updates the emission rates and planning assumptions used in calculating conformity budgets. EMFAC2014 was approved for use in SIPs and transportation conformity by USEPA on December 14, 2015 (80 FR 77337).

Calculation Methodology

All the budgets in this plan have been developed in consultation with SACOG. Emissions are based on an average summer day consistent with the ozone attainment and progress demonstrations, using the following method:

1) Calculate the on road motor vehicle emissions totals for the appropriate pollutants (VOC and NO_X) from EMFAC2014.
2) Sum each pollutant (VOC and NO_X) and round each total up to the nearest ton.

Table 10-1 Transportation Conformity Budgets for the 2008 8-hour Ozone standard in the SFNA, tons per average summer day

Sacramento Federal Ozone Nonattainment Area	2018		2021		2024	
	VOC	NO_X	VOC	NO_X	VOC	NO_X
Baseline Emissions	19.85	35.38	16.24	26.96	14.03	19.55
Safety Margin				0.50		
Total	19.85	35.38	16.24	27.46	14.03	19.55
Conformity (Emissions) Budget	20	36	17	28	15	20

Note: The budgets are calculated with EMFAC2014 using SACOG 2016 MTP activity and MTC data for Eastern Solano County. They reflect the latest regional and state strategies described in Chapter 7. Budgets are rounded up to the nearest ton.

10.6 Motor Vehicle Emissions Budget Approval Process

Before the USEPA approves the MVEBs, it conducts an adequacy review process to determine if the MVEBs are adequate for conformity purposes. The USEPA can make an adequacy finding on the new MVEBs prior to approving the remainder of the Plan. This adequacy review process is subject to public participation and review requirements (40 CFR 93.118(f)).

The USEPA will not find the MVEBs to be adequate unless the criteria are satisfied under 40 CFR 93.118(e)(4). This includes endorsement by the governor of the attainment or maintenance plan (40 CFR 93.118(e)(4)(i)). Even if the adequacy finding is effective, the budgets cannot supersede the MVEBs already in an approved implementation plan for the years addressed by the previously approved implementation plan.

Interagency Consultation

The SACOG Regional Planning Partnership (RPP) serves as the platform for inter-agency consultation. This inter-agency consultation procedure is required by 40 CFR 93.105(b). The regional air districts consulted with the MPO, cities and counties, Caltrans, USEPA Region IX, U.S. Department of Transportation - Federal Highway Administration, and the USEPA during development of the MVEBs proposed in this Plan.

The emissions budgets were presented at the SACOG RPP meeting on April 19, 2017. The RPP recommended, as the designated interagency consultation body, to the SACOG Board that the proposed emissions budgets be included in this regional 8-Hour Ozone SIP. The SACOG Board of Directors took action on this recommendation at their May 18, 2017 meeting.

10.7 Vehicle Miles Traveled Offset (VMT Offset)

Clean Air Act Section 182(d)(1)(A) applies to areas classified as severe or extreme. The SFNA is currently designated severe-15 for the 2008 NAAQS (40 CFR 51.1103(d)) and is therefore subject to the requirement to offset any growth in emissions resulting from an increase in vehicle miles travelled. The VMT offset demonstration was prepared by CARB and is included in Appendix C. The analysis shows that the existing transportation control strategies and TCMs are sufficient to offset the emissions increase due to growth in VMT and demonstrates compliance with the requirements of CAA Section 182(d)(1)(A).

10.8 References

Bradley, M.A., et al. *Development and application of the SACSIM activity-based model system*. Submitted for presentation at the 11th World Conference on Transport Research, Berkeley, California. June [2007.]

Metropolitan Transportation Commission (MTC) Planning /Association of Bay Area Governments Administrative Committees, *Bay Area Plan – Preferred Land Use and Transportation and Investment Strategy*. Oakland, CA: Bay Area Metropolitan Transportation Commission, [2012.]

SMAQMD et al, *Sacramento Regional 8-Hour Ozone Attainment and reasonable Further Progress Plan*. Sacramento, CA: Sacramento Metropolitan Air Quality Management District, [2013.] Print.

SACOG, *Blueprint Preferred Scenario for 2050 Map and Growth Principles, 2004.* Sacramento, CA: Sacramento Area Council of Governments, Web < http://www.sacregionblueprint.org/adopted/ >

SACOG, *Metropolitan Transportation Plan/Sustainable Communities Strategy 2035*. Sacramento, CA: Sacramento Area Council of Governments, [2012.]

SACOG, *2016 Metropolitan Transportation Plan/Sustainable Communities Strategy Building a Sustainable System*. Sacramento, CA: Sacramento Area Council of Governments, 18 February [2016a.]

SACOG, *2017-20 Metropolitan Transportation Improvement Program, Amendment #1 to the 2016 Metropolitan Transportation Plan/Sustainable Communities Strategy, and Air Quality Conformity Analysis*. Sacramento, CA: Sacramento Area Council of Governments, 15 September [2016b.]

USEPA (74 FR 37210), *Adequacy Status of Motor Vehicle Emissions Budgets in Submitted Attainment and Reasonable Further Progress Plan for Sacramento 8-Hour Ozone for Transportation Conformity Purposes; California*. Federal Register, Volume 74, 28 July 2009.

USEPA, *Transportation Conformity Guidance for 2008 Ozone Nonattainment Areas*, July 2012, U.S. Environmental Protection Agency, U.S. EPA 420-B-12-0.

USEPA (80 FR 77337), *Official Release of EMFAC 2014 Motor Vehicle Emission Factor Model for use in the State of California*, Federal Register, Volume 80, 14 December 2015, p. 77337 – 77340.

11 GENERAL CONFORMITY

11.1 Introduction to General Conformity

General conformity is the federal regulatory process that ensures major federal actions[51] or projects will not interfere with air quality planning goals. Conformity provisions state that activities and projects that involve federal funding or approvals must be consistent with state air quality implementation plans (SIPs). Conformity with the SIP means that major federal actions will not cause new air quality violations, worsen existing violations, or delay timely attainment of the national ambient air quality standards (NAAQS).

The current federal rule (80 FR 12284) requires that federal agencies use the emissions inventory from an approved SIP's attainment or maintenance demonstration to support a conformity determination. Therefore, conformity determinations will continue to be based on the Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan (SMAQMD, 2013) until this Plan is approved by the USEPA (40 CFR 93.151).

The general conformity regulations did not change as part of the 2008 NAAQS implementation guidance (80 FR 12284). The existing de minimis emissions levels for a severe nonattainment area of 25 tons per year of VOC or NO_X, contained in 40 CFR 93.153(b)(1) will continue to apply for this Plan.

This chapter summarizes general conformity requirements and emissions criteria for demonstrating general conformity.

11.2 General Conformity Requirements

Clean Air Act (CAA) Section 176 states that no federal department may engage in, support, provide financial assistance, license, or approve any activity that does not conform to an approved SIP.

The USEPA promulgated the conformity regulations for general federal actions (40 CFR 51.851 and 40 CFR 93 subpart B) under CAA section 176(c). The "General Conformity" Rule sets the requirements a federal agency must meet to make a conformity determination. General conformity does not allow federal agencies and departments to support or approve an action that does any of the following (40 CFR 93.153(g)(1)):

- Causes or contributes to new violations of any NAAQS in an area;
- Interfere with provisions in the applicable SIP for maintenance of any standard;

[51] Federal actions are defined as any activity engaged in by a department, agency, or instrumentality of the Federal government, or any activity that they support, fund, license, permit, or approve, other than activities related to transportation plans, programs, and projects that are applicable to transportation conformity requirements. (40 CFR 93.152)

- Increases the frequency or severity of an existing violation of any NAAQS; or
- Delays timely attainment of any NAAQS or any required interim emission reductions or other milestone.

11.3 Types of Federal Actions Subject to General Conformity Requirements

Examples of general federal actions that may require a conformity determination include, but are not limited to, the following: leasing of federal land, private construction on federal land, reuse of military bases, airport construction and expansions, construction of federal office buildings, and construction or modifications of dams or levees. These actions are further discussed in 40 CFR 93.153.

General conformity requirements (40 CFR 93.153) apply if direct or indirect emissions from a federal action has the potential to exceed the *de minimis* threshold levels established for each criteria or precursor pollutant in a nonattainment area or maintenance area. The thresholds are shown in 40 CFR 93.153(b)(1)(2). For a severe nonattainment area, the threshold level is 25 tons per year of Volatile Organic Compounds (VOC) or Nitrogen Oxides (NO_X).

Direct emissions of a criteria pollutant or its precursors (40 CFR 93.152) are emissions that are caused or created by the federal action, and occur at the same time and place as the action. Indirect emissions are reasonably foreseeable emissions that occur within the same nonattainment area as the project but are further removed from the federal action in time and/or distance, and can be practicably controlled by the federal agency due to a continuing program responsibility (40 CFR 93.152). A federal agency can indirectly control emissions by placing conditions on federal approval or federal funding. An example would be controlling emissions by limiting the size of a parking facility or by making employee trip reduction requirements (USEPA, 1994, p.13).

There are certain federal actions listed in 40 CFR 93.153 (c)(2)(i-xxii) that would result in no emissions increase, or an increase in emissions that is clearly *de minimis*. These include, but are not limited to continuing and recurring activities such as permit renewals where activities conducted will be similar in scope and operation to the activities currently being conducted, and rulemaking and policy development and issuance.

11.4 Emissions Criteria for Demonstrating General Conformity

To meet the conformity determination emissions criteria, the total of direct and indirect emissions from a federal action must meet all relevant requirements and milestones contained in the applicable SIP (40 CFR 93.158(c)), and must meet other specified requirements, such as:

- For any criteria pollutant or precursor, the total of direct and indirect emissions from the action must be specifically identified and accounted for in the applicable SIP's attainment or maintenance demonstration (40 CFR 93.158(a)(1)); or
- For precursors of ozone, nitrogen dioxide, or particulate matter, the total of direct and indirect emissions from the action must be fully offset within the same nonattainment (or maintenance) area through a revision to the applicable SIP or a similarly enforceable emissions control measure in the SIP (40 CFR 93.158(a)(2)); or
- For ozone, the California Air Resources Board must make a finding that either:
  - the total of direct and indirect emissions from the action will result in a level of emissions that, together with all other emissions in the nonattainment (or maintenance) area, will not exceed the emissions budget specified in the applicable SIP (40 CFR 93.158(a)(5)(i)(A)); or
  - the total of direct and indirect emissions from the action will result in a level of emissions that, together with all other emissions in the nonattainment (or maintenance) area, will exceed the emissions budget specified in the applicable SIP but the State Governor or designee for SIP actions makes a written commitment to the USEPA to take specific future actions (40 CFR 93.158(a)(5)(i)(B)).

11.5 References

SMAQMD et al. *Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan (2013 SIP Revisions).* Sacramento, CA: Sacramento Metropolitan Air Quality Management District. 26 September [2013.]

USEPA. *Subpart B – Determining Conformity of General Federal Actions to State or Federal Implementation Plans*, 40 CFR §93.150 – §93.165, Web 24 April 2017 < https://www.gpo.gov/fdsys/pkg/CFR-2013-title40-vol21/xml/CFR-2013-title40-vol21-part93.xml >

USEPA. *State implementation plan (SIP) or Tribal implementation plan (TIP) revision*, 40 CFR § 51.851

USEPA. *Definitions*, 40 CFR §93.152

USEPA. *Applicability*. 40 CFR §93.153

USEPA. *Criteria for determining conformity of general Federal actions*. 40 CFR §93.158

USEPA. *General Conformity Guidance: Questions and Answers* United States Environmental Protection Agency Office of Air Quality Planning and Standard. 13 July [1994.] Print.

USEPA. (80 FR 12264 – 123190 *Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements: Final Rule.* Federal Register, Volume 80, 6 March 2015, p. 12264-12319.

12 REASONABLE FURTHER PROGRESS DEMONSTRATIONS

12.1 Introduction to Reasonable Further Progress

The Clean Air Act (CAA) section specifies reasonable further progress (RFP) requirements for ozone nonattainment areas. RFP refers to the general need to obtain a certain level of annual incremental reductions in emissions of relevant air pollutants for the purpose of ensuring attainment of the standard by the applicable attainment deadline.

This chapter begins with a discussion of RFP requirements for the 2008 8-hour ozone National Ambient Air Quality Standards (NAAQS). It also describes the methodology for deriving the base year emissions inventory, calculating RFP emission targets, assessing creditable reductions, and using Nitrogen Oxides (NO_X) substitution for Volatile Organic Compounds (VOC) reduction shortfalls. Finally, this chapter includes the emission reduction summary that demonstrates the RFP targets are met for each of the future milestone years (2018, 2021) and attainment year (2024).

12.2 Reasonable Further Progress Requirements

CAA Sections 172(c)(2), 182(b)(1) and 182(c)(2)(B) include RFP provisions for reducing emissions in ozone nonattainment areas. The federal 2008 8-hour ozone NAAQS regulation (80 FR 12264, 40 CFR 51.1110) requires areas classified under subpart 2 as “serious and above” submit a reasonable further progress plan that shows a VOC (and/or NO_X) emission reduction of at least 18% over the first 6 years from the 2012 baseline year (i.e., 2012-2018) and 3% per year, averaged over each consecutive 3-year period. The total emission reductions required from the base year of 2012 to the attainment year of 2024 is 36%.

12.3 Contingency Measures Requirement

In general, contingency measures are control measures that go into effect if planned emission controls fail to reach desired goals and targets. Contingency measures and provisions are required under CAA Sections 172(c)(9) and 182(c)(9) in the event the nonattainment area fails to meet a RFP milestone or attainment deadline. Contingency measures are specific additional controls to be implemented automatically without further significant rulemaking activities, such as public hearings or legislative review, or without further action by the State or the USEPA Administrator.

Federal guidance (57 FR 13498) requires that sufficient contingency measures in the plan be adopted to provide a 3% emission reduction beyond what is needed for the RFP requirement. The existing control measure strategy in this plan is expected to surpass the amount of emission reductions needed for RFP targets by a margin that meets the contingency measures requirement.

12.4 Methodology for Reasonable Further Progress Demonstrations

The methodology for demonstrating RFP includes preparing the base year and milestone year emissions inventories, calculating RFP emission reduction targets, assessing creditable reductions, and using NO_X substitution for VOC reduction shortfalls if required.

12.4.1 Base Year and Forecast Milestone Year Emissions Inventories

The first step is preparing the 2012 base year VOC and NO_X inventories that are used as the basis for calculating the required percent reduction targets.[52] CAA Section 182(b)(1)(B) defines these baseline emissions as the total amount of actual VOC or NO_X emissions from all anthropogenic sources in the nonattainment area.

The VOC and NO_X emission inventory forecasts are needed for each future milestone year to quantify the emission reductions that are expected to be achieved since the 2012 base year. The emission forecasts are derived by projecting base year emissions using expected growth assumptions and the effects of adopted control measures. In addition, the emission reduction credits (ERCs)[53] and transportation conformity emissions budgets "safety margin"[54] are added to the emission forecasts to ensure they will not interfere with RFP if they are used in the future. ERCs may be used as "offsets" to compensate for an increase in emissions from a new source or modified major source regulated by the air districts.

12.4.2 Reasonable Further Progress Emission Reduction Targets

Federal Regulation (40 CFR 51.1110(a)(2)(i)(A)) requires an 18% emission reduction between the 2012 base year and the first milestone year of 2018 and 40 CFR 51.1110(a)(2)(ii)(A) requires an average emission reduction of 3% per year for all remaining 3-year periods (subsequent milestone years) until the attainment year. For the 2018 RFP target VOC level, the required 18% RFP emission reduction is applied to the 2012 baseline for 2018 milestone year. For the subsequent milestone RFP target VOC level, the required 9% (3% per year averaged over three consecutive years) is applied to the previous milestone RFP target VOC. The attainment RFP target VOC level is the same as the 2024 milestone RFP target.

52 The USEPA initially determined the base year was 2011, but allowed states to select and justify an alternate year. On July 17, 2014, the California Air Resources Board (CARB) submitted a staff report, titled "8-Hour Ozone State Implementation Plan Emission Inventory Submittal, release date: May 23, 2014" ("submittal") to the EPA. This submittal addresses base year inventory requirements for the nonattainment areas in California.

53 Chapter 5, Section 5.6.

54 Chapter 10, Table 10.1.

12.4.3 Creditable Control Measure Reductions

Under 40 CFR 51.1110(a)(5), all emission reductions from SIP approved or federally promulgated measures that occur after the baseline emissions inventory year are creditable for purposes of the RFP requirements in this section, provided the reductions meet the requirements for creditability, i.e., that they are enforceable, permanent, quantifiable, and surplus. The VOC reductions from existing control regulations are applied to the required RFP target levels. If there are any RFP reduction shortfalls for VOC, the NO_X reductions are used in the RFP demonstration assessment to fulfill the VOC shortfall. The emission reductions used for the RFP demonstration are from local and state control measures that have been adopted, implemented and submitted to EPA for approval. Some of the control measures have pending EPA approval and are expected to be approved before EPA promulgates the SIP. EPA will determine if the reductions meet the requirements for creditability.

12.4.4 NO_X Substitution for VOC Reduction Shortfalls

Any remaining VOC reduction shortfalls are met by using NO_X emission reductions. CAA Section 182(c)(2)(C) allows for the substitution of NO_X emission reductions in place of VOC reductions to meet the RFP requirements. According to USEPA's NO_X Substitution Guidance (USEPA, 1993), the substitution of NO_X reductions for VOC reductions must be done on a percentage basis, rather than a straight ton-for-ton exchange.

Thus, if there is a certain percent VOC reduction shortfall, an equal percentage reduction in NO_X emissions can be substituted to provide the equivalent reductions necessary for meeting the RFP goals toward attainment. For example, the 8.7% apparent shortfall in VOC in the 2021 milestone year can be met by substituting8.7% NO_X reductions.

12.4.5 NO_X Substitution Attainment Consistency Requirement

CAA Section 182(c)(2)(C) states that NO_X may be substituted for VOC if the substitution will achieve ozone reductions equivalent to those that would be achieved using VOCs. The NO_X Substitution Guidance states that any combination of VOC and NO_X reductions is "equivalent" under the Act so long as the overall VOC and NO_X reduction totals applied to the RFP demonstration are consistent with those required to SIP attainment and reasonable further progress requirements. Therefore, the cumulative amount of NO_X substitution reductions used toward the RFP requirement cannot be greater than the total NO_X reductions dictated by the modeled attainment demonstration. This attainment consistency requirement is meant to prevent the substitution of NO_X reductions that would not lead to progress toward attaining the ozone standard.

The current air quality modeling analysis performed by the California Air Resources Board shows attainment in 2024 with reductions from existing and already adopted VOC and NO_X controls. Photochemical modeling results indicate that both VOC and NO_X reductions provide ozone benefits in the Sacramento region, but on a ton for ton basis NO_X reductions provide greater ozone benefits than VOC reductions. Therefore, a substantial use of NO_X substitution would be consistent with current analyses of ozone attainment strategies in the Sacramento Federal Nonattainment Area.

12.5 Calculations of Reasonable Further Progress Demonstrations

Table 12-1 contains a summary of the calculations for determining whether RFP is achieved for the required milestone targets for 2018, 2021, and the 2024 attainment demonstration year. Projected future VOC and NO_X emission reductions will provide the required RFP reductions, as well as a 3% contingency margin. Appendix D – Reasonable Further Progress Demonstrations contains Table 12-1 with calculation equations.

The RFP demonstrations are achieved by forecasted emission reductions from existing control regulations. Additional emission reductions from new measures are not required in achieving the RFP and contingency demonstrations. Both VOC and NO_X emission reductions are needed to meet the RFP reduction targets as shown in Figure 12-1. The NO_X substitution is used on a percentage basis to cover any VOC percentage shortfalls. The total amount of NO_X emission reductions (13%) used to cover the VOC shortfalls at 2024 attainment demonstration year is less than the total 2024 forecasted NO_X reductions (48%). As the modeling demonstrates, the additional NO_X reductions are more beneficial for the attainment of 2008 8-Hour ozone standard.

Table 12-1 Calculation of RFP Demonstrations [A] SFNA

VOC Emission Calculations - Tons/Day	2012	2018	2021	2024
VOC (with existing measures)[B]	110.2	91.0	86.8	84.4
VOC ERCs[C]		5	5	5
VOC plus ERCs	110.2	96.0	91.8	89.4
Required % change since previous milestone year (VOC or Nox)		18%	9%	9%
Required % change since 2012 (VOC or Nox)		18%	27%	36%
Target VOC levels		90.3	82.2	74.8
Shortfall (-)/Surplus (+) in VOC reductions needed to meet target		-5.7	-9.6	-14.6
Shortfall (-)/Surplus (+) in VOC reductions needed to meet target, %		-5.2%	-8.7%	-13.2%
VOC reductions since 2012 used for contingency in this milestone year, %		0%	0%	0%
VOC reductions shortfall previously provided by Nox substitution, %		0%	5.2%	8.7%
Actual VOC reduction Shortfall (-)/Surplus (+), %		-5.2%	-3.5%	-4.5%
NOx Emission Calculations - Tons/Day	**2012**	**2018**	**2021**	**2024**
NOx (with existing measures)[B]	101.1	69.4	58.4	48.8
NOx ERCs[C]		4	4	4
NOx Safety Margin - Transportation Conformity Emissions Budgets[D]		0	0.5	0
NOx plus ERCs and Safety Margin	101.1	73.4	62.9	52.8
Change in Nox since 2012		27.7	38.3	48.4
Change in Nox since 2012, %		27.4%	37.9%	47.8%
NOx reductions since 2012 already used for VOC substitution and contingency through last milestone year, %		0%	8.2%	11.7%
NOx reductions since 2012 available for VOC substitution and contingency in this milestone year, %		27.4%	29.7%	36.2%
NOx reductions since 2012 used for VOC substitution in this milestone year, %		5.2%	3.5%	4.5%
NOx reductions since 2012 used for contingency in this milestone year, %		3%	0%	0%
NOx reductions since 2012 surplus after meeting VOC substitution and contingency needs in this miles year, %		19.2%	26.2%	31.6%
RFP shortfall (-) in reductions needed to meeet target, if any, %		0%	0%	0%
Total shortfall (-) for RFP and Contingency, if any, %		0%	0%	0%
RFP Met?		YES	YES	YES
Contingency Met?		YES	YES	YES

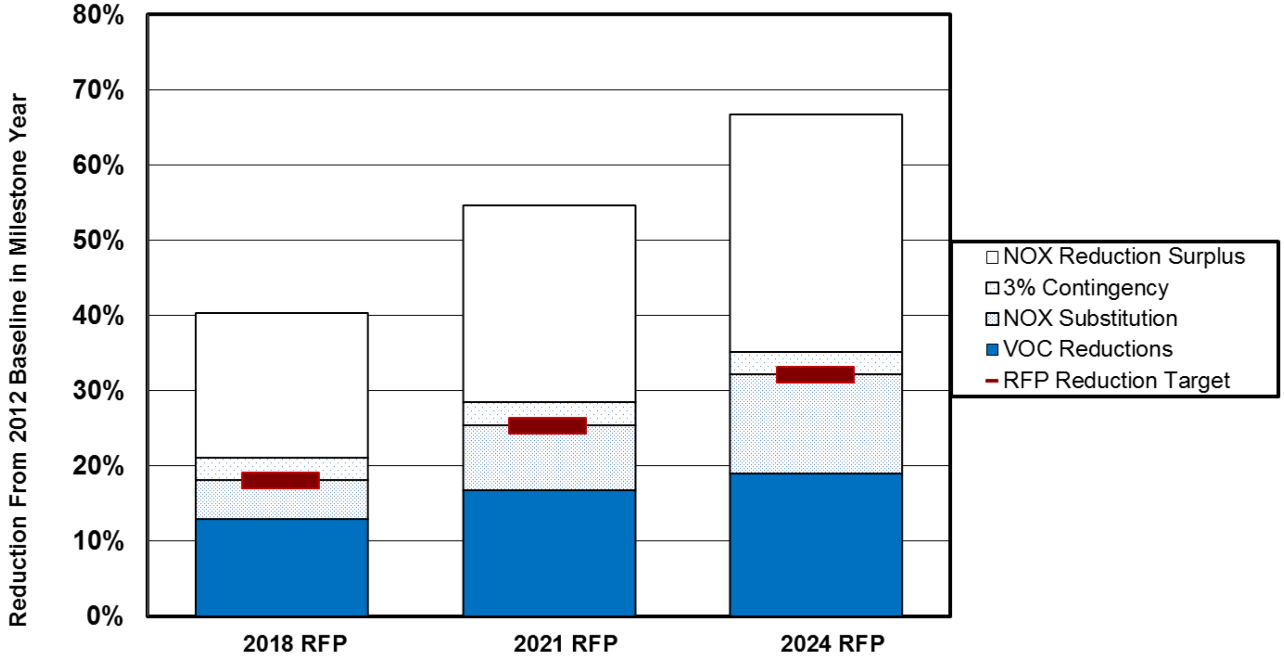
[A]CARB RFP write-up September 8, 2016, email transmittal to SMAQMD with safety margin of 0.5 tpd NOx in 2021 for Transportation Conformity.

[B]VOC and NOx are from CEPAM 2016 Ozone SIP forecast for SFNA, Version 1.04 with approved external adjustments.

[C]ERCs from Chapter 5,Section 5.6: VOC= 5 tpd, NOx = 4 tpd.

[D]Safety Margin of 0.5 tpd NOx in 2021 for Transportation Conformity Emissions Budgets is from Table 10-1.

Figure 12-1 Summary of Reasonable Further Progress Demonstrations - SFNA



12.6 References

USEPA. (57 FR 13498) *General Preamble for the Implementation of Title I of the Clean Air Act Amendments of 1990* Federal Register, Volume 57, 16 April, 1992, p. 13498.

USEPA. *NO_X Substitution Guidance*. United States Environmental Protection Agency Office of Air Quality Planning and Standards, December [1993.]

13 SUMMARY AND CONCLUSIONS

13.1 2008 8-hour Ozone Designation and Classification

The 2008 8-hour ozone National Ambient Air Quality Standard (NAAQS) lowered the health-based limit for ambient ozone from 84 parts per billion (ppb) to 75 ppb. The Sacramento Federal Nonattainment Area (SFNA) is designated as nonattainment for the 2008 NAAQS, because the area's ozone design value[55] exceeds the NAAQS. The SFNA includes all of Sacramento and Yolo counties and portions of Placer, El Dorado, Solano, and Sutter counties.

Under the United States Environmental Protection Agency's (USEPA) classification approach for the 2008 8-hour NAAQS (80 FR 12264), the SFNA would have been classified as serious based on its design value of 102 ppb at the Folsom-Natoma Monitoring Station. USEPA proposed to extend the voluntary reclassification determination for the 1997 ozone NAAQS of severe-15 to the more stringent 2008 NAAQS. No district within the SFNA opposed the reclassification and the California Air Resource Board (CARB) confirmed it wanted USEPA to interpret previous voluntary reclassification requests as requests for reclassification under the 2008 ozone NAAQS (Goldstene, 2012). As a result, the SFNA was voluntarily classified as a severe-15 area (77 FR 30165) for the 2008 NAAQS.

13.2 Ozone Trends

The progress toward attainment was measured by analyzing ambient ozone data collected at monitoring sites in the SFNA over twenty-seven years (1990-2016). There are currently 17 active ozone monitoring stations located throughout the SFNA that are operated by either local air districts or the CARB.

The number of 8-hour ozone exceedance days recorded at the peak monitoring sites fluctuates from year to year due to meteorological variability and changes in precursor emission patterns. Most exceedances of the 2008 federal 8-hour ozone standard occur at the region's eastern monitoring sites - Cool, Folsom-Natoma, Placerville, and Auburn. The ozone design values declined from 1990 to 2016 at all monitoring stations. The highest number of exceedance days was recorded in Placerville between 1990 and 1995, Cool between 1996 and 2007, and Folsom-Natoma between 2008 and 2016.

The overall 27-year (from 1990 to 2016) trend line indicates a decline, from the peak ozone design value of 110 ppb in 1993 down to 85 ppb in 2016. This shows that peak ozone concentrations have improved from being 35 ppb (or 46%) above the 2008 8-hour standard of 75 ppb to about 10 ppb (or 13%) above the standard.

[55] The 8-hour ozone design value is calculated by averaging the annual 4th-highest daily maximum 8-hour ozone concentration over 3 years.

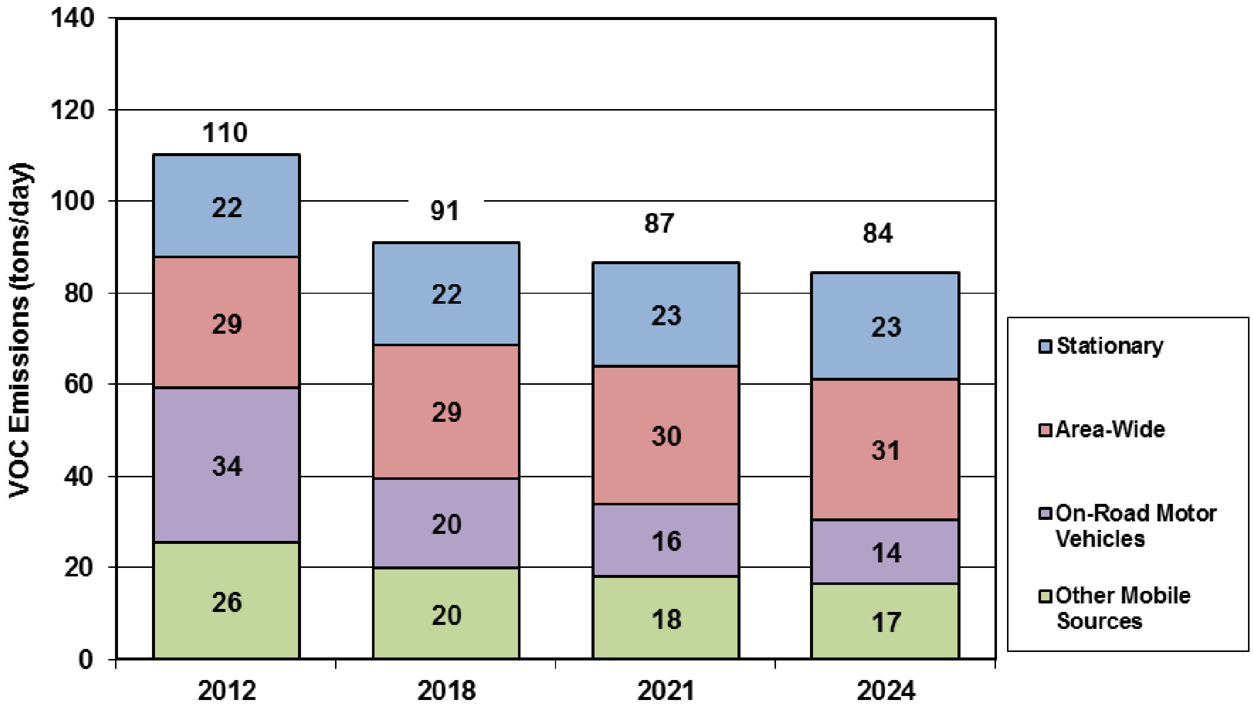
13.3 VOC and NO_X Emissions Inventory

Planning efforts to evaluate and reduce ozone air pollution included identifying and quantifying the various processes and sources of volatile organic compounds (VOC) emissions (such as solvents, surface coatings, and motor vehicles) and nitrogen oxides (NO_X) emissions (such as motor vehicles and other fuel combustion equipment).

The 2012 base year anthropogenic planning inventory for the SFNA is estimated to be 110 tons per day (tpd) of VOC emissions and 101 tpd of NO_X emissions (see Chapter 5, Tables 5-1 and 5-2). The base year emissions are used to forecast future year inventories by using forecasts for control strategies, population, housing, employment, energy demand, motor vehicle travel, and other industrial and commercial outputs. To ensure that the use of emissions reduction credits (ERCs) will not be inconsistent with the reasonable further progress and attainment goals, the amount of ERCs issued for reductions that occurred prior to the 2012 base year are added to the CARB emissions forecasts for VOC and NO_X (see Figures 13-1 and 13-2). These emissions inventories are used in attainment demonstration modeling (Chapter 8) and the Reasonable Further Progress (RFP) demonstration (Chapter 12). ERCs are discussed further in Chapter 5.

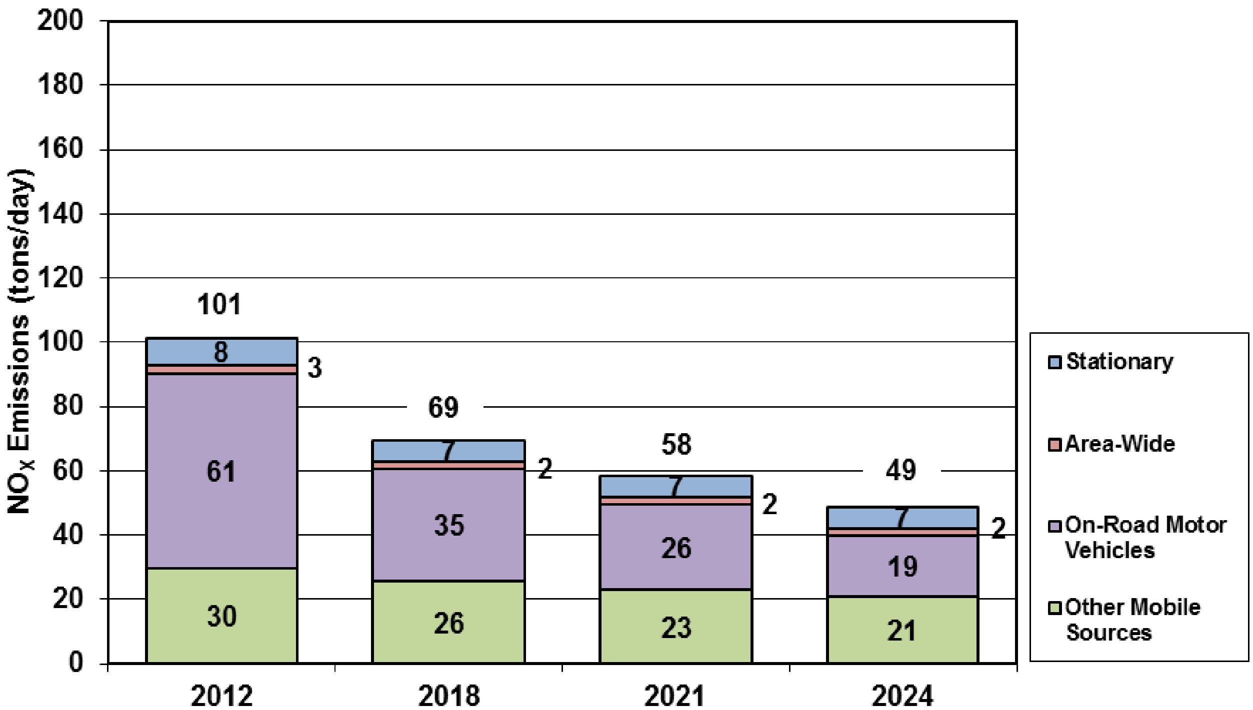
Figure 13-1 shows VOC emissions and Figure 13-2 shows NO_X emissions for 2012 (base year), 2018 and 2021 (milestone years), and 2024 (attainment year) for stationary, area-wide, on-road motor vehicles, and other mobile sources within the SFNA. Figure 13-3 shows population and vehicle miles traveled (VMT) growth for the SFNA. The VOC and NO_X emission forecasts show significant declines in mobile source emissions, despite increasing population, vehicle activity, and economic development in the SFNA. Future year on-road emissions are determined by using VMT forecasts in SACOG's 2016 Metropolitan Transportation Plan/Sustainable Community Strategy (MTP/SCS) (SACOG, 2016) and Metropolitan Transportation Commission's (MTC's) 2015 FSTIP (MTC, 2016).

Figure 13-1 VOC Planning Inventory Forecasts – SFNA



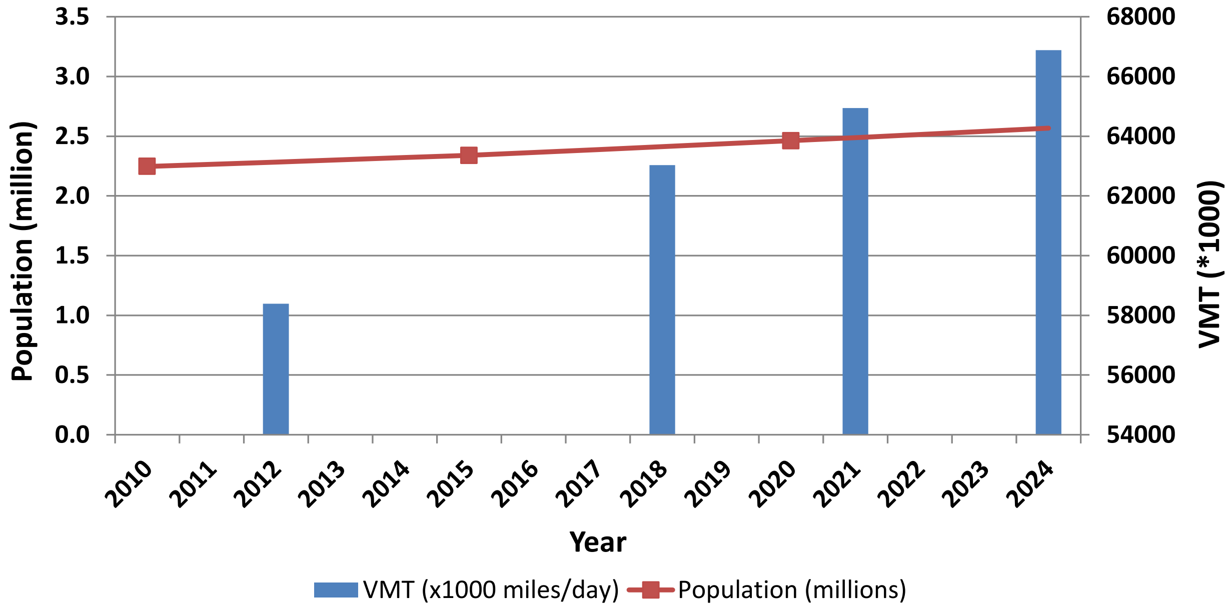
Source: (CARB, 2016), does not include 5 tpd of VOC ERCs in 2018, 2021 and 2024, as shown in Chapter 5 and Appendix A5.

Figure 13-2 NO_X Planning Inventory Forecasts - SFNA



Source: (CARB, 2016), does not include 4 tpd of NO_X ERCs in 2018, 2021 and 2024, as shown in Chapter 5 and Appendix A5.

Figure 13-3 Population Growth and VMT Forecast SFNA



13.4 Attainment Modeling and Analysis

Photochemical modeling (Appendix B) was conducted to simulate base case episodes of high ozone formation. The photochemical model was analyzed based on 2012 baseline year emissions and future year emissions forecasts to determine if the ozone standard would be attained with existing control strategies. The VOC and NO_X emission forecasts included existing control strategies and incorporates the growth assumptions used in the 2016 MTP/SCS (SACOG, 2016).

Modeling results showed a relative decline in future ozone concentrations and predicted attainment at all ozone monitors by 2026[56] without additional VOC or NO_X control strategies. The modeling results indicated that both VOC and NO_X reductions provide ozone benefits in the SFNA, but on a ton for ton basis, NO_X reductions provide greater ozone benefits than VOC reductions.

13.5 2024 Attainment Demonstration

CAA Sections 172(a)(2)(A) and 181(a) require nonattainment areas to meet the clean air standards “as expeditiously as practicable.” The regional air districts, in consultation with CARB and USEPA Region IX, are proposing 2024 be established as the SFNA attainment deadline for the 2008 NAAQS, even though the modeling results indicated the SFNA could potentially meet the standard in 2022.

56 The statutory attainment date for a “severe-15” nonattainment area is July 20, 2027 (80 FR 12268). To demonstrate attainment by this date, data is used from 2024, 2025 and 2026 to determine the design value.

Selection of 2024 as an attainment demonstration year is appropriate because it is bounded by two modeled attainment demonstrations, supports attainment before the 2008 NAAQS 8-hour ozone regulatory attainment demonstration year for a severe-15 area of 2026,[57] and provides a safeguard against inherent uncertainties in predicting future ambient ozone concentrations beyond 2022 (e.g. emission reductions, meteorology, or natural events). In addition, it is more realistic than 2022, in light of the very steep rate of emission reductions that would be required at the Placerville site to reach the standard by 2022.

Photochemical modeling shows that the design value at the Folsom-Natoma Monitoring Station[58] for 2022 is 75.2 ppb and for 2026 is 70.7 ppb. Base year and future forecasted emissions were used to estimate the percent reduction in NO_X and VOC emissions needed, from the 2012 base year to the 2024 attainment year, to attain the 2008 NAAQS (75 ppb). The forecasted 2024 NO_X emissions provided by CARB are plotted on a line[59] (Figure 13-4) to determine the 2024 design value. Utilizing this approach, the ozone design value at Folsom-Natoma in 2024 is estimated to be 72.1 ppb.

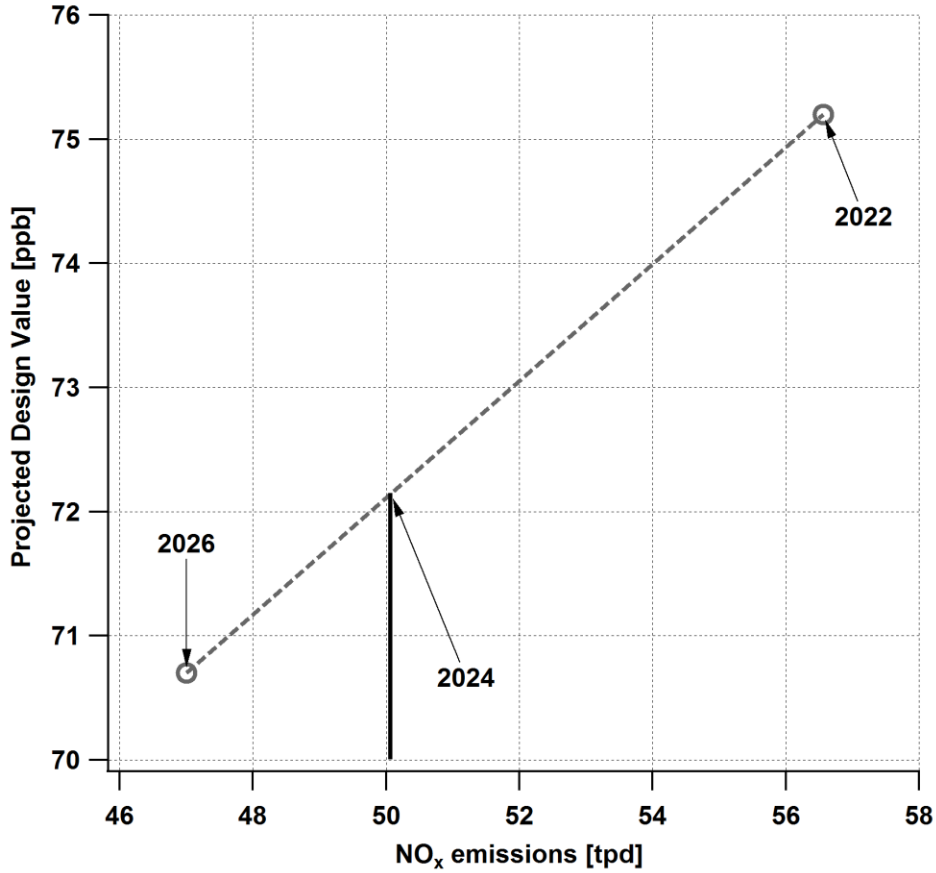
Finally, CARB is preparing a weight-of-evidence analysis, which will be submitted to EPA in conjunction with this SIP. Based on the air districts' analysis in this SIP, we anticipate that the weight-of-evidence test will support the 2024 attainment deadline designation.

57 The attainment date is July 20, 2027, but attainment must be demonstrated by using air quality data based on 2024.

58 Folsom monitoring station was identified as the peak ozone monitoring site for the modeling. The 2012 weighted design value was 90 ppb.

59 This line assumed a linear relationship between the ozone design value and NO_X emissions from 2022 to 2026. The emission inventories are presented in Chapter 5 and Appendix A.

Figure 13-4 Ozone design value as a function of NO_X emissions at the Folsom-Natoma monitor



Control Measure Evaluation

This SIP relies on the following components:

1. Reductions from existing local and regional control measures and adopted rules, and
2. Reductions from existing state and federal regulations.

Results from the RACM analysis (Appendix E) showed that attainment could not be advanced by an additional year (from 2024 to 2023). In addition, the Reasonable Further Progress and contingency measure requirements discussed in Chapters 8 and 12 demonstrate that additional measures are not needed to satisfy those requirements. Consequently, no additional local or regional control measures were included in this SIP. Reductions in emissions from existing control measures in the 2013 Plan (SMAQMD, 2013) are included in this plan.

13.6 Pollutant Transport

The air quality in the SFNA can be impacted by pollutant transport from the San Francisco Bay Area and the San Joaquin Valley. Delta breezes carry air pollutants from coastal Bay Area and San Joaquin Valley emission sources downwind to the inland areas of the SFNA, and these pollutants may contribute to ozone formation during the same day or the following days. The CARB has determined that the relative impact on air quality in the SFNA, from the Bay Area and San Joaquin Valley pollutant transport can be considered overwhelming, significant, or inconsequential depending on meteorological conditions (CARB, 2001, p.25, 37). The air flow pattern in the Sacramento Valley (Schultz eddy) also causes pollutants to recirculate and can trap them within the SFNA. Various studies (Appendix B-2, p.27 and p.28) over the past two decades also reaffirmed that a strong sea breeze with a deep marine boundary layer from the San Francisco Bay Area enhanced pollutant transport into the Sacramento Delta Region. CARB's photochemical modeling take into account both transported emissions and emission reductions from statewide and upwind regions' control measures.

13.7 Transportation Conformity and Vehicle Miles Traveled Offset

Under the CAA Section 176, federal agencies may not approve or fund transportation plans and projects unless they are consistent with state air quality implementation plans (SIP). Conformity with the SIP requires that transportation activities not cause new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS. The emissions from transportation plans and projects must be less than or equal to the motor vehicle emissions budgets (MVEB) established by the RFP, or attainment plan (40 CFR 93.118). Table 13-1 lists the proposed MVEB for the 2018 and 2021 RFP milestone years, and the 2024 attainment year.

Table 13-1 Proposed New Motor Vehicle Emission Budgets – SFNA

Sacramento Federal Ozone Nonattainment Area	2018		2021		2024	
	VOC	NO_X	VOC	NO_X	VOC	NO_X
Baseline Emissions	19.85	35.38	16.24	26.96	14.03	19.55
Margin of Safety				0.5		
Total	19.85	35.38	16.24	27.46	14.03	19.55
Conformity (Emissions) Budget	20	36	17	28	15	20

Note: The budgets are calculated with EMFAC2014 using SACOG 2016 MTP activity and MTC data for Eastern Solano County. They reflect the latest regional and state strategies described in Chapter 7. Budgets are rounded up to the nearest ton. The Methodology used to calculate the emissions budget is discussed in Chapter 10.

The MVEB reflects a 0.5 ton per day margin of safety for NO_X emissions for 2021. The latest planning and land use assumptions used to develop the MVEBs are provided by the 2016 Metropolitan Transportation Plan/Sustainable Communities Strategy (2016 MTP/SCS)[60] which was approved by the SACOG Board of Directors in February 2016

60 Projections are updated every 4 years.

(SACOG, 2016a). The emissions budgets presented use EMFAC2014 with SACOG modeled VMT and speed distributions. For 2018 and 2021 (milestone years) and 2024 (demonstration year), VMT and speed distribution data was generated by SACOG using SACSIM15. Emissions for Eastern Solano County were estimated in EMFAC2014 separately based on data provided by the Metropolitan Transportation Commission (MTC).

These new MVEBs will replace the budgets established as part of the 2013 Plan (SMAQMD, 2013). The Metropolitan Planning Organizations (MPO), SACOG and MTC, must ensure that the aggregate transportation emissions in the SFNA stay below these levels when approving new metropolitan transportation plans and transportation improvement programs, even if the mix of projects changes or growth increases. Before USEPA approves the new MVEB, it will conduct an adequacy review process to determine if the MVEBs are adequate for conformity purposes. USEPA can make an adequacy finding on the new MVEBs prior to their approval of the SIP. This adequacy review process is subject to public participation and review requirements (40 CFR 93.118(f)).

The MVEB were presented at the SACOG Regional Planning Partnership (RPP) meeting on April 19, 2017. The RPP, as the designated interagency consultation body, recommended to the SACOG Board of Directors that the proposed transportation conformity budgets be included in the regional 8-hour ozone SIP. On April 27, 2017, the SACOG Transportation Committee also unanimously recommended that the SACOG Board of Directors approve the proposed transportation conformity budgets be included in the regional 8-hour ozone SIP. The SACOG Board of Directors took action and unanimously approved the MEB at their May 18, 2017 meeting.

The SFNA is required by CAA Section 182(d)(1)(A) to offset any growth in emissions resulting from an increase in vehicle miles travelled (VMT). A detailed VMT offset demonstration was prepared by CARB and is included in Appendix C. – The analysis shows there are sufficient transportation control strategies and TCMs to offset the emissions increase due to growth in VMT.

13.8 General Conformity

There were no changes to the general conformity regulations made as part of the 2008 NAAQS implementation rule. The existing de minimis emissions levels contained in 40 CFR 93.153(b)(1) will continue to apply to the 2008 NAAQS.

13.9 Reasonable Further Progress (RFP) Demonstration

The RFP evaluation shown on Table 13-2 and Figure 13-5 is based on the emission inventory forecasts, which assume expected growth rates and existing control measures. The 3-year RFP demonstrations are achieved through VOC and NO_X emission reductions for 2018 and 2021 (milestone years), and 2024 (attainment year).

Table 13-2 shows the percentages of VOC and NO_X emission reductions used to meet the RFP reduction goals.

The RFP demonstration is met through forecasted emission reductions from existing control regulations and previously adopted control measures. Additional emission reductions from new measures are not required in achieving the RFP and contingency demonstrations. Both VOC and NO_X emission reductions are needed to meet the RFP reduction targets. NO_X substitution is used on a percentage basis to cover any VOC percentage shortfalls. Out of the 47.8% total emissions reduction in NO_X achieved from the baseline year (2012) to the attainment year (2024) 13.2% was used to meet the VOC shortfall, and 3% was used to meet the contingency requirement. The remaining 31.6% NO_X reductions exceeds the level needed to meet RFP.

Table 13-2 Calculation of RFP Demonstrations [A] SFNA

VOC Emission Calculations - Tons/Day	2012	2018	2021	2024
VOC (with existing measures)[B]	110.2	91.0	86.8	84.4
VOC ERCs[C]		5	5	5
VOC plus ERCs	110.2	96.0	91.8	89.4
Required % change since previous milestone year (VOC or Nox)		18%	9%	9%
Required % change since 2012 (VOC or Nox)		18%	27%	36%
Target VOC levels		90.3	82.2	74.8
Shortfall (-)/Surplus (+) in VOC reductions needed to meet target		-5.7	-9.6	-14.6
Shortfall (-)/Surplus (+) in VOC reductions needed to meet target, %		-5.2%	-8.7%	-13.2%
VOC reductions since 2012 used for contingency in this milestone year, %		0%	0%	0%
VOC reductions shortfall previously provided by Nox substitution, %		0%	5.2%	8.7%
Actual VOC reduction Shortfall (-)/Surplus (+), %		-5.2%	-3.5%	-4.5%

NOx Emission Calculations - Tons/Day	2012	2018	2021	2024
NOx (with existing measures)[B]	101.1	69.4	58.4	48.8
NOx ERCs[C]		4	4	4
NOx Safety Margin - Transportation Conformity Emissions Budgets[D]		0	0.5	0
NOx plus ERCs and Safety Margin	101.1	73.4	62.9	52.8
Change in Nox since 2012		27.7	38.3	48.4
Change in Nox since 2012, %		27.4%	37.9%	47.8%
NOx reductions since 2012 already used for VOC substitution and contingency through last milestone year, %		0%	8.2%	11.7%
NOx reductions since 2012 available for VOC substitution and contingency in this milestone year, %		27.4%	29.7%	36.2%
NOx reductions since 2012 used for VOC substitution in this milestone year, %		5.2%	3.5%	4.5%
NOx reductions since 2012 used for contingency in this milestone year, %		3%	0%	0%
NOx reductions since 2012 surplus after meeting VOC substitution and contingency needs in this miles year, %		19.2%	26.2%	31.6%
RFP shortfall (-) in reductions needed to meeet target, if any, %		0%	0%	0%
Total shortfall (-) for RFP and Contingency, if any, %		0%	0%	0%
RFP Met?		YES	YES	YES
Contingency Met?		YES	YES	YES

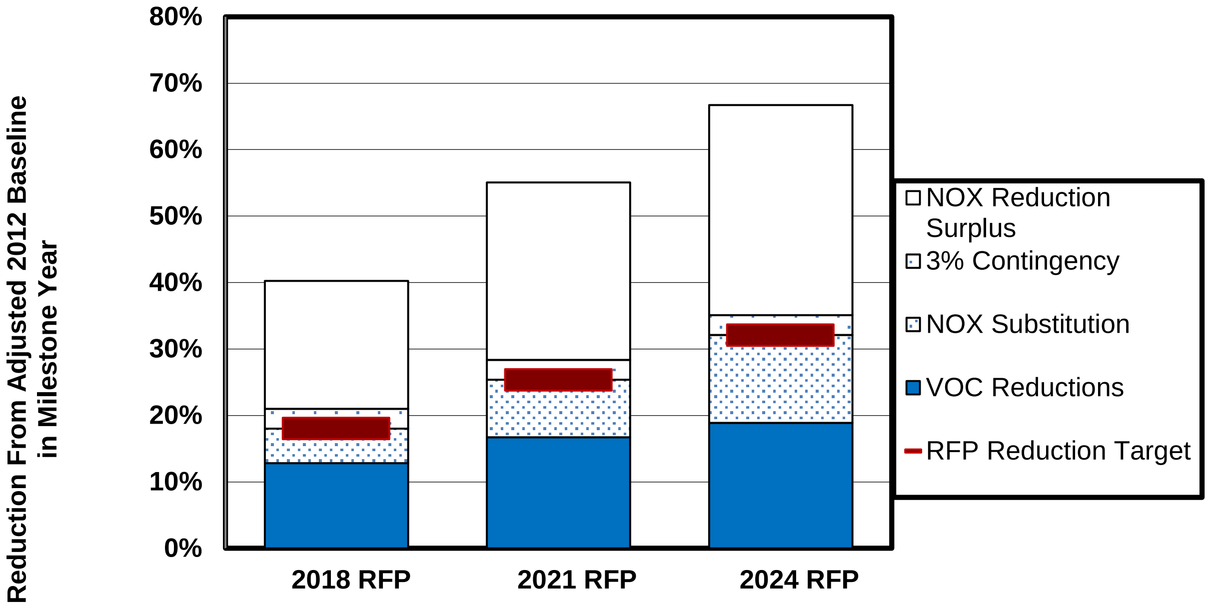
[A]CARB RFP write-up September 8, 2016, email transmittal to SMAQMD with safety margin of 0.5 tpd NOx in 2021 for Transportation Conformity.

[B]VOC and NOx are from CEPAM 2016 Ozone SIP forecast for SFNA, Version 1.04 with approved external adjustments.

[C]ERCs from Chapter 5,Section 5.6: VOC= 5 tpd, NOx = 4 tpd.

[D]Safety Margin of 0.5 tpd NOx in 2021 for Transportation Conformity Emissions Budgets is from Table 10-1.

Figure 13-5 Summary of RFP Demonstrations



13.10 Future Ozone Planning Efforts

This Plan reflects the best available information at this time. Emission inventories, modeling analyses, and control strategies will continue to be updated and re-evaluated. Revisions to this Plan can be made at any time if new information indicates a change is needed.

13.11 Milestone Reports

CAA Section 182(g) requires that progress (milestone) reports be prepared to evaluate whether actual emission reductions meet the minimum RFP targets. Milestone reports will be required to be submitted no later than 90 days after the date of the milestone years (2018 and 2021).

13.12 References

CARB, 2001. *Ozone Transport: 2001 Review.* Sacramento, CA: California Air Resources Board, April [2001.] Print.

Goldstene, James. *Letter: CARB to Air and Radiation Docket and Information Center,* 13 March 2012. Print.

MTC et al. *Plan Bay Area 2040.* Oakland, CA: Bay Area Metropolitan Transportation Commission, [2017.] Print.

SMAQMD et al. *2013 Revisions to the Sacramento Regional 8-Hour Ozone Attainment and Reasonable Further Progress Plan.* Sacramento, CA: Sacramento Metropolitan Air Quality Management District, [2013.] Print.

SACOG. *2016 Metropolitan Transportation Plan/Sustainable Communities Strategy Building a Sustainable System*. Sacramento, CA: Sacramento Area Council of Governments. 18 February [2016] Print.

USEPA. (77 FR 30160) *Implementation of the 2008 National Ambient Air Quality Standards for Ozone: Nonattainment Area Classifications Approach, Attainment Deadlines and Revocation of the 1997 Ozone Standards for Transportation Conformity Purposes, Final Rule.* Federal Register, Volume 77, 21 May 2012, p. 30160 – 30171.

USEPA. (80 FR 12264) *Implementation of the 2008 National Ambient Air Quality Standards for Ozone: State Implementation Plan Requirements: Final Rule.* Federal Register, Volume 80, 6 March 2015, pp. 12264-12319.