MDAQMD
Federal 75 ppb Ozone Attainment Plan
(Western Mojave Desert Nonattainment Area)

Adopted on
2/27/2017

Mojave Desert Air Quality Management District
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This document was prepared by the MDAQMD Planning and Rule-making section, with input from the entire MDAQMD staff. Significant portions of this document were prepared by, or are based on work done by, the California Air Resources Board and the South Coast Air Quality Management District staffs. The MDAQMD staff greatly appreciates the assistance of those agencies in the preparation of this document.

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Abbreviations and Acronyms

AQAP..... Air Quality Attainment Plan
AQMA ..... Air Quality Management Area
AQMP..... Air Quality Management Plan
CALGRID..... California Photochemical Grid Model
CARB..... California Air Resources Board
CCAA ..... California Clean Air Act
CO..... Carbon Monoxide
ERC..... Emission Reduction Credit
FCAA..... Federal Clean Air Act
FMVCP..... Federal Motor Vehicle Control Program
FONA..... Federal Ozone Nonattainment Area
MDAQMD..... Mojave Desert Air Quality Management District
MPO..... Metropolitan Planning Organization
MPR..... Model Performance Ratio
NAAQS..... National Ambient Air Quality Standard
NO_X..... Oxides of Nitrogen
NSR..... New Source Review
O_3 ..... Ozone
ppb..... Parts per billion
RACM..... Reasonably Available Control Measure
RACT..... Reasonably Available Control Technology
ROG..... Reactive Organic Gases
ROP..... Rate of Progress
RRF..... Relative Reduction Factor
SAAQS ..... State Ambient Air Quality Standard
SBCAPCD ..... San Bernardino County Air Pollution Control District
SCAB..... South Coast Air Basin
SCAG..... Southern California Association of Governments
SCAQMD ..... South Coast Air Quality Management District
SCAQS87..... 1987 Southern California Air Quality Study
SCOS97..... 1997 Southern California Ozone Study
SDMAQMA..... Southeast Desert Modified Air Quality Management Area
SIP..... State Implementation Plan
SSAB..... Salton Sea Air Basin
TCM..... Transportation Control Measure
tpaad..... Tons per Annual Average Day
tposd..... Tons per Ozone Seasonal Day
UAM ..... Urban Airshed Model
USEPA..... United States Environmental Protection Agency
VMT..... Vehicle Miles Traveled
VOC..... Volatile Organic Compounds
WMDONA..... Western Mojave Desert Ozone Nonattainment Area

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Executive Summary

The United States Environmental Protection Agency (USEPA) designated the Western Mojave Desert Nonattainment Area (WMDONA) as nonattainment for the March 2008 75 ppb 8-hour ozone National Ambient Air Quality Standard (NAAQS) pursuant to the provisions of the Federal Clean Air Act (FCAA). A portion of the Mojave Desert Air Quality Management District (MDAQMD) is included in the WMDONA. This plan addresses all Federal attainment planning requirements for the 75 ppb federal 8-hour ozone standard.

The MDAQMD has reviewed and updated all elements of the ozone plan. The portion of the MDAQMD designated as a Federal 8-hour ozone nonattainment area will be in attainment of the 75 ppb ozone NAAQS by July 2027.

This document includes the latest planning assumptions regarding population, vehicle activity and industrial activity. This document addresses all existing and forecast ozone precursor-producing activities within the MDAQMD through the year 2026. This document includes all necessary information to allow general and transportation conformity findings to be made within the MDAQMD.

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CHAPTER 1 – Introduction and Background

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INTRODUCTION

Purpose

The Western Mojave Desert nonattainment area (as defined in 40 CFR 81.305) was designated nonattainment for the NAAQS for ozone by USEPA effective on July 20, 2012. The Western Mojave Desert Ozone Non-attainment Area (WMDONA) includes part of the San Bernardino County portion of the MDAQMD, as well as the Antelope Valley portion of Los Angeles County. The MDAQMD has experienced ambient ozone concentrations in excess of the 8-hour ozone NAAQS. This document: (1) demonstrates that the MDAQMD will meet the primary required Federal ozone planning milestone, attainment of the 75 ppb 8-hour ozone NAAQS, by July 2027; (2) presents the progress the MDAQMD will make towards meeting all required ozone planning milestones; and (3) discusses the 2015 70 ppb 8-hour ozone NAAQS, preparatory to an expected non-attainment designation for the new NAAQS. This document satisfies 42 U.S.C. §§7410, 7502, 7504 and 7511a (FCAA §§110, 172, 174, and 182) regarding implementation plans, non-attainment plan provisions, planning procedures, and ozone plan submissions and requirements for the 75 ppb 8-hour NAAQS.

BACKGROUND

Regulatory History

The USEPA designated a portion of the southwestern desert part of San Bernardino County as nonattainment and classified it as Severe for the 8-hour standard. This area was classified based on an ozone design value calculated from 2008 through 2010 concentrations in the region. The Severe classification requires attainment of the 8-hour ozone NAAQS by July 2027, fifteen years after the date of designation.

The MDAQMD was established on July 1, 1993, pursuant to H&SC §41200 et seq (Statutes 1992 ch. 642). The MDAQMD was a successor agency to the San Bernardino County Air Pollution Control District (SBCAPCD), which had jurisdiction over the desert portions of San Bernardino County commencing in February 1977 through the formation of the MDAQMD. The Palo Verde Valley portion of eastern Riverside County was annexed by the MDAQMD from the South Coast Air Quality Management District (SCAQMD) effective July 1, 1994, pursuant to provisions of H&SC §41210(c) and MDAQMD Resolution 94-03.

Initial air quality planning for the region was the 1991 Air Quality Attainment Plan (AQAP) which was adopted by the SBCAPCD on August 26, 1991 in response to the State of California ozone planning requirements. Additional ozone plans were adopted by the MDAQMD to address Federal ozone planning requirements, including the MDAQMD 2004 Ozone Attainment Plan adopted on April 26, 2004 and the Federal 8-hour Ozone Attainment Plan adopted on June 9, 2008 (revision adopted January 25, 2010). This document replaces or updates all previously submitted federal ozone plans.

Regional Ozone Planning Chronology

1989 - CARB designates SEDAB as non-attainment for ozone SAAQS
1990 - CARB classifies the SEDAB as moderate ozone non-attainment
November 1990 - Adoption of Federal Clean Air Act Amendments
August 26, 1991 - Adoption of the 1991 Air Quality Attainment Plan (State) by SBCAPCD
July 1, 1993 - Formation of Mojave Desert Air Quality Management District
March 24, 1994 - Adoption of Rate-Of-Progress Plan (Federal) by MDAQMD
July 1, 1994 - Annexation of Palo Verde Valley portion of Riverside County
October 26, 1994 - Adoption of Attainment Demonstration Plan (Federal) by MDAQMD
1996 - SEDAB is subdivided into the Mojave Desert Air Basin (MDAB) and the Salton Sea Air Basin (SSAB)
January 22, 1996 - Adoption of Triennial Revision to 1991 AQAP (State)
April 26, 2004 - Adoption of MDAQMD 2004 Ozone Attainment Plan
June 9, 2008 - Adoption of MDAQMD Federal 8-hour Ozone Attainment Plan (Severe-17)
January 25, 2010 - Adoption of MDAQMD Federal 8-hour Ozone Attainment Plan (Severe-15)
July 20, 2012 - USEPA designates 75 ppb 8-hour nonattainment areas

Statement of Issues

The MDAQMD is downwind of the Los Angeles basin, and to a lesser extent, is downwind of the San Joaquin Valley. Prevailing winds transport ozone and ozone precursors from both regions into and through the Mojave Desert Air Basin (MDAB) during the summer ozone season. These transport couplings have been officially recognized by CARB.[1] Local MDAQMD emissions contribute to exceedances of both the national and state ambient air quality standards for ozone, but photochemical ozone modeling conducted by the SCAQMD and CARB indicates that the MDAB would be in attainment of both standards without the influence of this transported air pollution from upwind regions.

Federal Legal Requirements

The MDAQMD must adopt a plan that provides for the implementation, maintenance and enforcement of the NAAQS within three years after promulgation of the NAAQS. The plan is to include enforceable emission limitations, provide for a monitoring program, provide for a permit program (including a New Source Review program), contingency measures, and air quality modeling (42 U.S.C. §7410(a); FCAA §110(a)). The MDAQMD most recently met this requirement with the MDAQMD 2008 Ozone Attainment Plan. This document represents an update to that plan. The MDAQMD has adopted enforceable emission limitations, has a monitoring system in place throughout the populated portions of the Federal Ozone Nonattainment Area (FONA), maintains a permit program (including a New Source Review program with an ambient air quality modeling requirement), and has performed an attainment demonstration using air quality modeling. This document identifies a contingency measure – see chapter 3.

[1] "Ozone Transport: 2001 Review," April 2001, CARB identifies the South Coast Air Basin as having an overwhelming and significant impact on the Mojave Desert Air Basin (which includes the Mojave Desert) and the San Joaquin Valley as having an overwhelming impact on the MDAB.

This document incorporates all reasonably available control measures (RACM - all such measures have already been adopted for the FONA or are being committed to adoption in this plan). This document includes a comprehensive, accurate and current inventory of actual emissions (42 U.S.C. §7502(c)(3), 7511a(a)(1); FCAA §§172(c)(3), 182(a)(1)).

This document discusses reasonable further progress (42 U.S.C. §§7502(c)(2), 7511a(b)(1); FCAA §§172(c)(2), 182(b)(1)) for the applicable periodic milestone dates (2008, 2011, 2014, 2017 and 2020) (42 U.S.C. §7511a(g); FCAA §182(g)).

This document has been coordinated with the transportation planning process (42 U.S.C. §7504; FCAA §174). The document includes an emission budget for the FONA, and also includes the on-road mobile source emission budget for the WMDONA.

This document updates the MDAQMD emissions inventory (42 U.S.C. 7511a(a)(1); FCAA §182(a)(1)).

The MDAQMD has an enhanced non-attainment pollutant monitoring program, requires reasonably available control technology (RACT) within the FONA, has a vehicle inspection and maintenance program, a De Minimis rule, and a gasoline vapor recovery rule. The District participates in the State's Clean-Fuel Vehicle Program, and performs periodic transportation activity consistency demonstrations (including a review of vehicle miles traveled growth) in conjunction with the Southern California Association of Governments (SCAG). The MDAQMD controls oxides of nitrogen (NO_x) in addition to Volatile Organic Compounds (VOC) within the FONA, and is addressing both pollutants in this document. The MDAQMD New Source Review (NSR) program defines sources emitting 25 tons per year or more as major and requires offsets at a 1.3 to 1 ratio (42 U.S.C. §§7511a(d), 7511a(d)(2); FCAA §§182(d) 182(d)(2)). Employer trip rules (42 U.S.C. §7511a(d)(1); FCAA §182(d)(1)) have been shown to be not cost-effective for the FONA due to low population density.

Pollutant Description and Health Effects

Ozone (O_3) is a colorless gas that is a highly reactive form of oxygen. It has a strong odor when highly concentrated. Ozone can occur naturally but can also be formed from other compounds through photochemistry, a complex system of reactions with hydrocarbons and oxides of nitrogen in the presence of sunlight (ultraviolet). The MDAB experiences ozone concentrations in excess of the state and Federal ambient air quality standards.

Ozone can cause respiratory irritation and discomfort, making breathing more difficult during exercise. Ozone can reduce the respiratory system's ability to remove inhaled particles, increase pulse rate, decrease blood pressure and reduce the body's ability to fight infection. After six hours of exposure a healthy person can have significant reduction of lung function. It is an irritant towards the skin, eyes, upper respiratory system, and mucous membranes, although symptoms disappear after exposure. It may also be a carcinogen.

Setting

The MDAQMD includes the desert portion of San Bernardino County and a portion of eastern Riverside County commonly known as the Palo Verde Valley. A portion of the MDAQMD has been designated nonattainment for the 8-hour ozone NAAQS by USEPA as a portion of the WMDONA in 40 CFR 81.305. The ozone design value classifies the area as a Severe nonattainment area with 2027 as the required attainment year (42 U.S.C. 7511(a)(2); FCAA §181(a)(2)). The nonattainment area includes the communities of Phelan, Hesperia, Adelanto, Victorville, Apple Valley, Barstow, Joshua Tree, Yucca Valley and Twentynine Palms (the southwestern portion of the MDAQMD).

The entire MDAQMD covers more than 20,000 square miles and included 359,551 persons as of the 1990 census (approximately 555,000 in 2015). The region is characterized by hot, dry summers and cool winters, with little precipitation. The National Training Center at Fort Irwin, the Marine Corps Air Ground Combat Center, and portions of Edwards Air Force Base and the China Lake Naval Air Weapons Station are in the MDAQMD. The MDAQMD also includes the Mojave National Preserve and portions of Death Valley National Park and Joshua Tree National Park.

The primary roadways in the MDAQMD are Interstate 15, Interstate 40, State Route 58 and United States Route 395. All of these highways carry a significant amount of transiting heavy duty truck traffic, and Interstate 15 carries a substantial amount of commute traffic into the greater Los Angeles Basin.

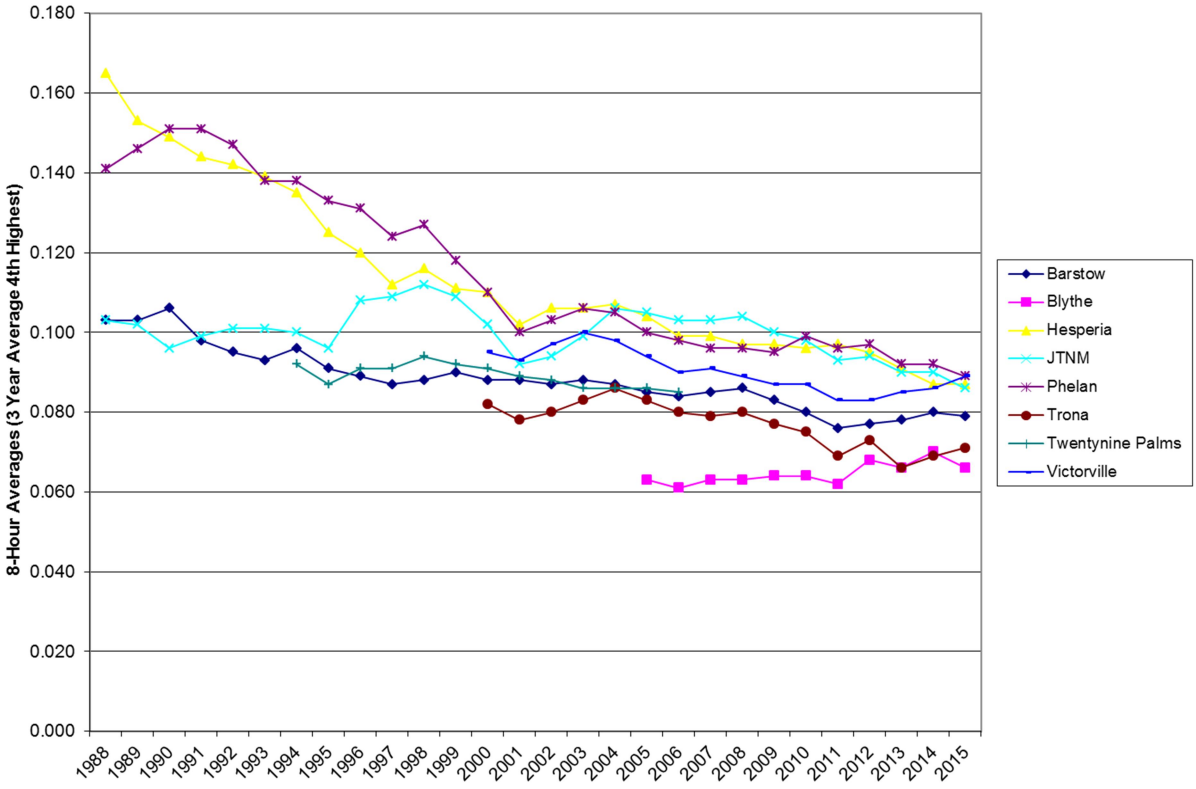
The MDAQMD includes railroad track connecting the Ports of Los Angeles and Long Beach with the rest of the continental United States, as well as large diameter high pressure natural gas transmission pipelines delivering the majority of the natural gas consumed within the State of California.

The MDAQMD is a growing bedroom community for the greater Los Angeles area, but does have significant mining and military activity.

Ozone Trend

The MDAQMD has experienced a substantial reduction in maximum 8-hour ozone concentrations, as displayed in Figure 1 (Trona and Blythe are not within the ozone nonattainment area but are shown for comparison). Note that the three stations closest to the South Coast Air Basin (the source of the majority of transported ozone and ozone precursors) have the highest historical ozone concentrations: Phelan, Hesperia and the Joshua Tree National Monument. The more distant or isolated stations (Barstow) have lower concentrations.

Figure 1 - Federal 8-Hour Ozone Design Value Trend



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CHAPTER 2 – Emission Inventories

General
Modeled Emission Inventory and Sub-Region Inventory
FONA Base Year Emission Inventory
Future Year Emission Inventories

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General

Ozone planning requirements call for the use of seasonal inventories representing emissions during a typical summer day (since ozone concentrations are typically highest under summer weather conditions). This document includes ozone seasonal day inventories, in units of tons per ozone seasonal day (tposd), unless otherwise indicated. All emissions presented in this document have been adjusted or calculated in terms of ozone seasonal day emissions.

Federal ozone planning requirements call for emissions in terms of Volatile Organic Compounds (VOC), while State ozone planning requirements call for emissions in terms of Reactive Organic Gases (ROG). Due to changes in each definition, there is no effective difference between the two terms (for example, ethane is now excluded from both definitions). For purposes of this document and attainment planning, the MDAQMD considers these terms interchangeable.

Modeled Emission Inventory and Sub-Region Inventory

The emission inventory for the FONA sub-region of the MDAQMD is provided in Appendix A of this document. Complete documentation for San Bernardino County emissions, including emission inventory calculation methodologies, are available from the following web address:

http://www.arb.ca.gov/ei/maps/basins/abmdmap.htm

CARB developed a list of the stationary source facilities in the 2012 inventory for San Bernardino County and submitted the list to MDAQMD staff for review to determine whether the facilities are located in the FONA. MDAQMD made this assessment and submitted the FONA facility list to CARB.

Stationary aggregated, areawide, on-road and other mobile sources emission sector types are all treated like area sources when assessing emissions in the FONA portion of San Bernardino County. MDAQMD evaluated the San Bernardino County area source inventory to determine the relative fractions that should be assigned to the San Bernardino FONA for these sectors. In most cases, the fractions span major emission category groups (as defined by EIC summary code). For a few categories, the fractions are specific to the Emission Inventory Code (EIC).

The California Emission Forecasting System (CEFS) was used to generate future year emission estimates for Stationary Point, Stationary Aggregated, and Areawide category sectors. These future year estimates are based on anticipated socioeconomic growth rates, and control factors that estimate the impacts of local and state control regulations. For stationary point sources, CEFS projections were run based on the 2012 emission inventory only for the facilities located in the FONA as previously determined. For Stationary Aggregated and Areawide sources, the fractions described above were applied to the San Bernardino County inventory developed for CEFS and saved as part of the FONA inventory.

Emissions for On-Road sources (for all calendar years) were imported to CEFS directly from EMFAC2014. Emissions for off-road mobile sources (for all calendar years) were imported to CEFS directly from OFFROAD. To calculate the FONA portion, the appropriate fractions were applied to CEFS and saved as part of the FONA inventory as described above.

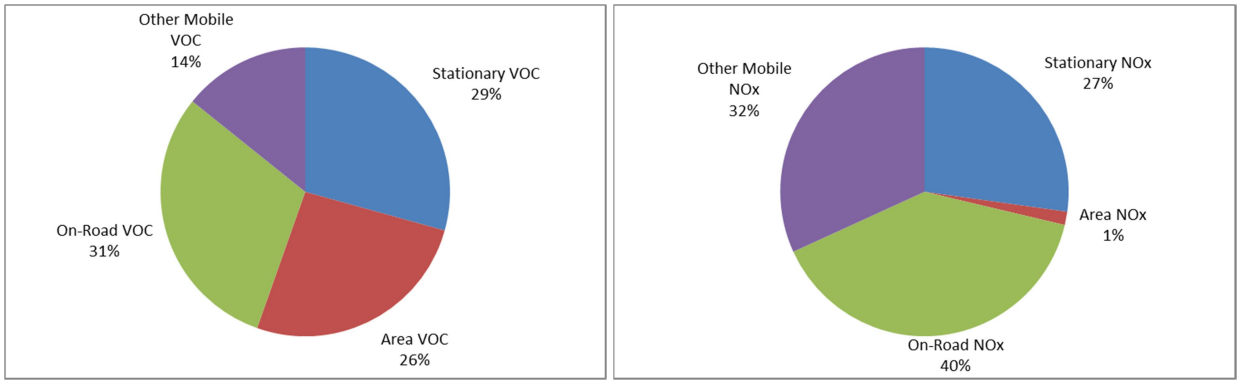
Federal Ozone Non-Attainment Area Base Year Emission Inventory

The initial Federal base year for emission inventory purposes is 2012. The base year inventory used for all growth scenarios in this document is 2012. The base year emission inventory is presented in Appendix A; a summary is presented in Table 1 below. Figure 2 presents the base year source category contributions in basic pie chart format (VOC on the left, NO_x on the right). Mobile sources were the primary emitters in the FONA in 2012.

Table 1 - 2012 Base Year Summary

	2012 VOC	2012 NOx
Stationary	12.81	27.50
Area	11.40	1.50
Other Mobile	13.27	39.93
On-Road Mobile	6.21	32.16
Totals:	43.69	101.09
(tons per ozone seasonal day)		

Figure 2 - 2012 Base Year Pie Charts (FONA)



Future Year Emission Inventories

Future year or forecasted emission inventories are estimated by multiplying a base year value for each category by a 'growth code' for a given future year. The 'growth code' is indexed to the base year (2012 for this document), so that its value for the base year is 1.00. This allows the growth code to estimate future activity in terms of emissions; if the growth code for the year 2017 is 1.50, activity in that category (and resulting emissions) is expected to be 50 percent greater than in 2012. The growth codes used to forecast point sources are available from CARB. Forecasted FONA VOC and NO_x inventory summaries for each year of interest are presented in Figures 3 and 4 respectively (the base year is included in each figure for reference). Future year emission inventories are presented in Appendix B.

Figure 3 - Forecasted VOC Emission Inventories (FONA)

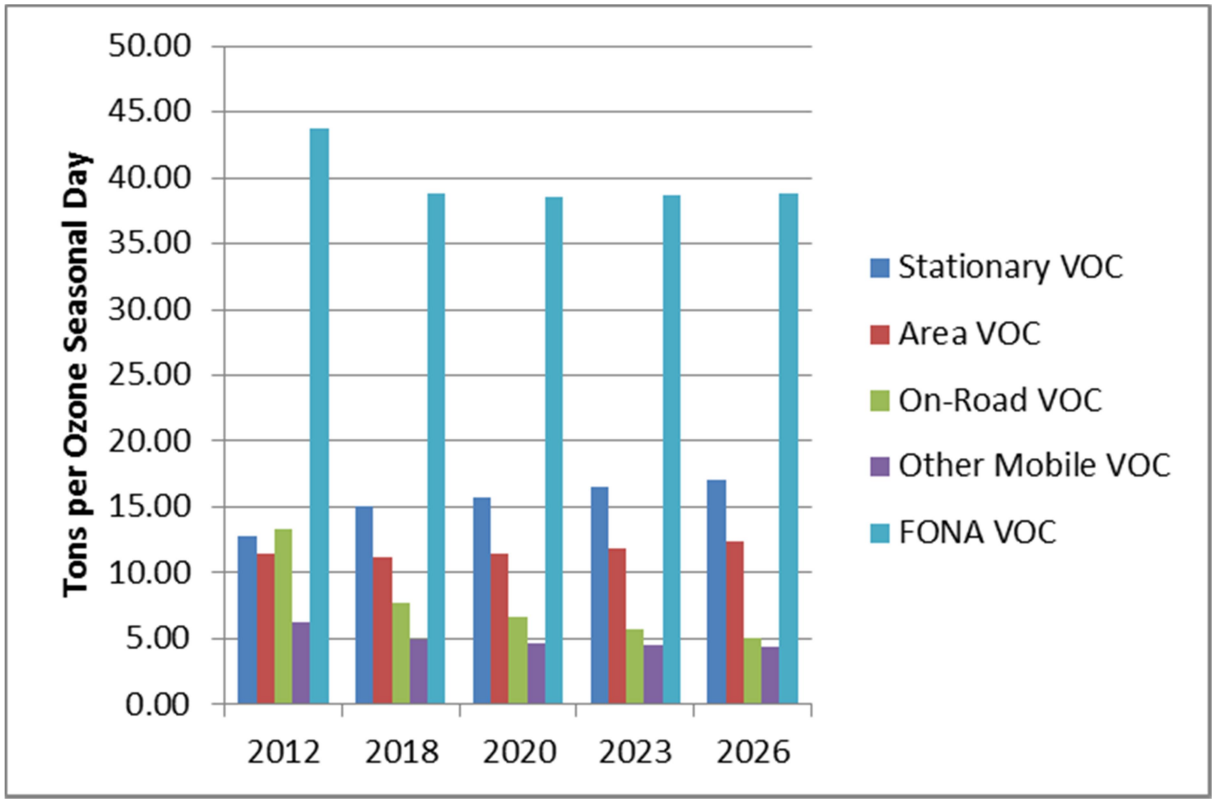
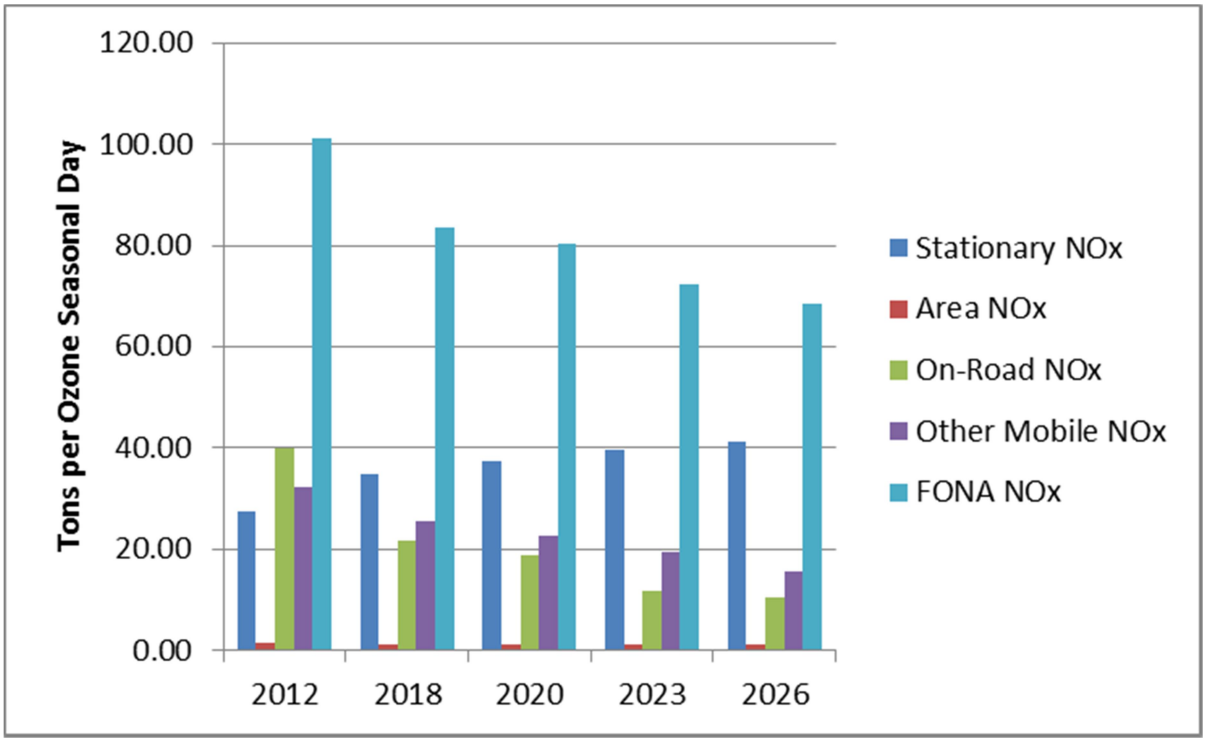


Figure 4 - Forecasted NO_x Emission Inventories (FONA)



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CHAPTER 3 – Control and Contingency Measures

Existing Control Measures
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Existing Control Measures

The current MDAQMD rules and regulations represent a broad set of control measures for MDAQMD sources. The MDAQMD has in place Reasonably Available Control Technology (RACT) requirements for the majority of sources (including gasoline dispensing vapor control), as well as an NSR program with a 25 ton per year major source level and a 1.3:1 offset ratio requirement.

Reasonably Available Control Measures

Federal law specifies that attainment plans provide for the adoption of all reasonably available control measures as expeditiously as possible. In addition to specific local rules meeting the RACT requirement, the State of California has found that the California mobile source control program meets the Federal reasonably available control measure requirement for the Western Mojave (see Appendices F and G).

Proposed Control Measures

The MDAQMD is not proposing to adopt any additional control measures for direct ozone precursor reduction purposes. However, the MDAQMD is committed to adopting all applicable Federal RACT rules. In addition, the MDAQMD will experience additional future emission reductions resulting from existing and proposed Federal and State control measures affecting mobile and area sources as discussed under Required Progress below. The existing State of California control measures with direct or indirect applicability to the MDAQMD are presented in Appendix F.

Local Rule Adoption Schedule

In 2006 and 2015, the MDAQMD reviewed all applicable Federal RACT categories.[23] The MDAQMD committed to adopting a variety of RACT rules as a result of that review – the MDAQMD is updating the adoption schedule for eleven pending rulemaking actions. The rule actions identified in Table 3 below are expected to have some positive effect on ozone precursor emissions, although the magnitude of that effect is currently unquantified.

Table 2 - MDAQMD Rule Adoption Schedule

Rule Title	Rule Nature	Adoption Date
1106 – Marine Coating Operations	Federal RACT Update	10/24/2016
1158 – Electric Utility Operations	Federal RACT Update	2/27/2017
1104 – Organic Solvent Degreasing	Federal RACT Update	3/2017
461 – Gasoline Transfer and Dispensing	Federal RACT Update	5/2017
462 – Organic Liquid Loading	Federal RACT Update	5/2017
463 – Storage of Organic Liquids	Federal RACT Update	5/2017
1115 – Metal Parts and Product Coating Operations	Federal RACT Update	5/2017
1162 – Polyester Resin Operations	Federal RACT Update	9/2017
1157 – Boilers and Process Heaters	Federal RACT Update	9/2017
1160 – Internal Combustion Engines	Federal RACT Update	10/2017

[2] "8-Hour Reasonably Available Control Technology – State Implementation Plan Analysis (RACT SIP Analysis)," August, 2006

[3] "2015 8-Hour Reasonably Available Control Technology – State Implementation Plan Analysis (2015 RACT SIP Analysis)," February 2015

Rule Title	Rule Nature	Adoption Date
1161 – Portland Cement Kilns	Federal RACT Update	10/2017

Contingency Measures

The MDAQMD reaffirms the use of the State Enhanced Inspection and Maintenance (I&M) Program as a contingency measure. The MDAQMD would implement the State of California's version of Enhanced I&M should a contingency measure be triggered by failure to attain the Federal 8-hour ozone standard.

Required Progress

Federal Clean Air Act (FCAA) §172(c)(2) and §182(b)(1) require attainment plans to provide for reasonable further progress (RFP). RFP is defined in FCAA §171(1) as annual incremental reductions for the purpose of ensuring attainment by the attainment year. This requirement to show steady progress in emission reductions between the baseline year and attainment date ensures that areas will not delay implementation of emission control programs until immediately before the attainment deadline.

There are two separate requirements for nonattainment areas depending upon their classification. The first is a one-time requirement for a 15 percent reduction in ROG emissions between the years of 1990 and 1996 for nonattainment areas classified as moderate or above (FCAA §182(b)(1)). The second is an additional three percent per year reduction of ozone precursor emissions until attainment for ozone nonattainment areas classified as serious or higher (section 182(c)(2)(B)).

In addition to the RFP requirements, FCAA §172(c)(9) requires that plans provide for contingency measures in case the area fails to make RFP. USEPA has interpreted this requirement to represent one year's worth of emission reduction progress, amounting to 3 percent reductions, from measures that are already in place or that would take effect without further rulemaking action.

Fifteen Percent ROG-only Rate of Progress Requirement

The March 2015 USEPA implementation rule (Rule) for the 2008 8-hour ozone standard interprets the FCAA RFP requirements, establishing requirements for RFP that depend on the area's classification and whether the area has an approved 15 percent ROG-only reduction plan for a previous ozone standard that covers all of the 2008 8-hour ozone nonattainment area (80 FR 12264). EPA has proposed approval of a 15 percent rate of progress plan for the Western Mojave Desert 1997 8-hour ozone standard covering the entire nonattainment area for the 2008 8-hour ozone standard. As a result, the 15 percent ROG-only requirement has been met for the WMDONA.

Reasonable Further Progress Requirements

Per the Rule, the WMDONA must demonstrate an 18 percent reduction in ozone precursor emissions for the first six years of the attainment planning period, and an average emission reduction of three percent per year after that until the attainment date (80 FR 12264). As detailed in FCAA §182(b)(1)(C), these emission reductions must be achieved through existing programs.

The WMDONA RFP demonstration is achieved by forecasted emission reductions from existing control regulations as shown in the planning inventory. Both ROG 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 percentage shortfall in ROG reduction.

Table 3 below demonstrates that the WMDONA meets the RFP targets in the milestone years of 2018, 2021, 2024, and 2026 with a three percent contingency set-aside in 2018 and carried through to 2026 per the requirements of the Rule.

Table 3 - WMDONA 2008 8-hour Ozone NAAQS Reasonable Further Progress

(summer planning inventory, tons per day)

Year	2012	2018	2021	2024	2026
ROG (with existing measures)*	46.8	40.9	40.4	40.3	40.7
Required % change since previous milestone year (ROG or NOx)		18%	9%	9%	6%
Required % change since 2012 (ROG or NOx)		18%	27%	36%	42%
Target ROG levels		38.4	34.9	31.8	29.9
Shortfall (-)/ Surplus (+) in ROG reductions needed to meet target		-2.6	-5.5	-8.6	-10.8
Shortfall (-)/ Surplus (+) in ROG reductions needed to meet target, %		-5.5%	-11.8%	-18.3%	-23.1%
ROG reductions since 2012 used for contingency in this milestone year, %		0.0%	0.0%	0.0%	0.0%
ROG reductions shortfall previously provided by NOx substitution, %		0.0%	5.5%	11.8%	18.3%
Actual ROG reductions Shortfall (-)/ Surplus (+), %		-5.5%	-6.3%	-6.5%	-4.8%

Year	2012	2018	2021	2024	2026
NOx (with existing measures)*	98.9	82.6	78.0	70.9	68.7
Change in NOx since 2012		16.3	21.0	28.1	30.2
Change in NOx since 2012, %		16.5%	21.2%	28.4%	30.5%
NOx reductions since 2012 already used for ROG substitution & contingency through last milestone year, %		0.0%	8.5%	14.8%	21.3%
NOx reductions since 2012 available for ROG substitution & contingency in this milestone year, %		16.5%	12.7%	13.5%	9.3%
NOx reductions since 2012 used for ROG substitution in this milestone year, %		5.5%	6.3%	6.5%	4.8%
NOx reductions since 2012 used for contingency in this milestone year, %		3.0%	0.0%	0.0%	0.0%
NOx reductions since 2012 surplus after meeting ROG substitution & contingency needs in this milestone year, %		8.0%	6.4%	7.1%	4.4%
RFP shortfall (-) in reductions needed to meet target, if any, %		0.0%	0.0%	0.0%	0.0%
Total shortfall (-) for RFP and Contingency, if any, %		0.0%	0.0%	0.0%	0.0%
RFP Met?		YES	YES	YES	YES
Contingency Met?		YES	YES	YES	YES

Controlled Emission Inventories

As the MDAQMD is not proposing any additional local control measures with quantified emission reductions, the controlled emission inventory is identical to the forecasted emission inventory.

Conformity Budgets

The forecasted emission inventories presented in this document are the emission budgets for general conformity purposes, as no additional control measures with quantified emission reductions are proposed. A project subject to the general conformity test must be demonstrated to conform with the applicable portion of the forecasted emission inventory. For a project that falls between forecasted years, a linearly interpolated inventory may be calculated. For a project that falls after 2026, use 2026.

Transportation Conformity

Section 176(c) of the FCAA establishes transportation conformity requirements which are intended to ensure that transportation activities do not interfere with air quality progress. The CAA requires that transportation plans, programs, and projects that obtain federal funds or approvals be consistent with, or *conform to* applicable state implementation plans (SIPs) before being 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.

A SIP analyzes the region's total emissions inventory from all sources necessary to demonstrate RFP, attainment, or maintenance of the National Ambient Air Quality Standards (NAAQS). The portion of the total emissions inventory from on-road highway and transit vehicles which provides RFP and attainment or maintenance of the NAAQS in these analyses becomes the "motor vehicle emissions budget". [4] Motor vehicle emissions budgets are the mechanism for ensuring that transportation planning activities conform to the SIP. Budgets are set for each criteria pollutant or its precursors that the area does not attain and it is set for each RFP milestone year and the attainment year.

Requirements for Demonstrating Conformity

The Southern California Association of Governments (SCAG), the MPO in Southern California, in consultation with the Los Angeles and San Bernardino County Transportation Commissions, prepares a long range regional transportation plan (RTP) at least every four years and a short range funding program, or regional transportation improvement program (RTIP) every two

[4] Federal transportation conformity regulations are found in 40 CFR Parts 51 and 93 – Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Titles 23 or 49 of the United States Code.

years. Content of both the RTP and RTIP are specified in federal transportation law found at Titles 23 and 49 of the Code of Federal Regulations (CFR) and applicable sections of California transportation planning law.

Before adopting the RTP/RTIP, SCAG prepares a regional emissions analysis using the proposed plan and program as specified in the Federal conformity regulation and compares those emissions to the emission budgets in the SIP. The MPO may determine the RTP/RTIP 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.

Conformity Budgets in the 2016 AQMP

The 2016 Air Quality Management Plan (AQMP) establishes transportation conformity emissions budgets for 2018, 2021, 2024 and 2026 for the ozone precursors VOC and NO_x in the WMDONA. The WMDONA consists of portions of Los Angeles and San Bernardino counties. The budgets are consistent with the emissions inventory used in the progress and attainment demonstrations.

The emissions budgets presented below use EMFAC2014 with SCAG modeled vehicle miles travelled (VMT) and speed distributions. The VMT and speed distribution data are from the 2016 RTP/SCS adopted by SCAG in April 2016. CARB staff released a revised emission rate program, 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.

The federal conformity rule allows a SIP to create a safety margin in an emissions budget (See the CFR §93.101 and §93.118(e)(4)(vi)). A safety margin is defined as the difference between projected emissions and the emissions necessary to demonstrate progress or attainment. This plan creates a safety margin of 0.2 tons/day of VOC and 0.2 tons/day of NO_x in 2026 only. These budgets are consistent with the demonstrations of progress and attainment.

Calculation Methodology

All the budgets in this plan have been constructed in consultation with SCAG and USEPA using emissions for a summer average day consistent with the ozone attainment and progress demonstrations using the following method:

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

Table 4 below contains the emissions budgets for the WMDONA.

Table 4 - Transportation Conformity Budgets for the 2008 8-hour Ozone standard in the Western Mojave Desert Ozone Nonattainment Area*

Western Mojave Desert (tons per summer day)	2018		2021		2024		2026	
	VOC	NOx	VOC	NOx	VOC	NOx	VOC	NOx
Baseline Emissions	9.00	20.32	7.46	15.99	6.39	10.56	5.98	9.84
Safety Margin							0.20	0.20
Total	9.00	20.32	7.46	15.99	6.39	10.56	6.18	10.04
Conformity Budget	**10**	**21**	**8**	**16**	**7**	**11**	**7**	**11**

*Budgets calculated with EMFAC2014 using SCAG 2016 RTP activity. Budgets are rounded up to the nearest ton.

VMT Offset Demonstration

In August 2012, U.S. EPA issued guidance titled "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". Among other things, USEPA's guidance points out that subsequent court decisions regarding previous VMT offset demonstrations omitted any reference to "transportation control strategies" (TCS). TCSs, which are not defined in the FCAA or USEPA regulation, are eligible to offset growth in emissions due to growth in VMT. The USEPA's new guidance indicates that technology improvements such as vehicle technology improvements, motor vehicle fuels, and other control strategies that are transportation-related could be used to offset increases in emissions due to VMT. USEPA's revised guidance sets forth a method of calculating the actual growth in emissions due to growth in VMT. Essentially, the state would compare projected attainment year emissions assuming no new control measures and no VMT growth with projected actual attainment year emissions (including new control measures and VMT growth). If the latter number is smaller than the former, no additional transportation control measures or strategies would be required. If additional transportation control measures and transportation control strategies are required, they should be clearly identified and distinguished from the measures included in the initial calculations for the base year and the three scenarios identified for the attainment year.

In addition, the guidance recommends that the base year used in the demonstration be the base year used in the attainment demonstration for the ozone standard. To address USEPA's guidance, 2012 is used in this demonstration as the base year for the 2008 8-hour standard. Consistent with USEPA guidance, emissions of VOC are used to determine compliance with the VMT offset requirement.

Transportation Control Strategies and Transportation Control Measures

By listing them separately, the FCAA (§182(d)(1)(A)) differentiates between TCS and TCM, and thus provides for a wide range of strategies and measures as options to offset growth in emissions from VMT growth. In addition, the example TCMs listed in §108(f)(1)(A) of the FCAA include measures that reduce emissions by reducing VMT, reducing tailpipe emissions, and removing dirtier vehicles from the fleet. California's motor vehicle control program

includes a variety of strategies and measures including new engine standards and in-use programs (e.g., smog check, vehicle scrap, fleet rules, idling restrictions). TCMs developed by SCAG provide additional reductions. In addition, SCAG prepares a report every two years that reports on the status of implementation of TCMs.

Based on the provisions in FCAA §182(d)(1)(A) and the clarifications provided in the USEPA guidance, any combination of transportation control strategies and TCMs may be used to meet the requirement to offset growth in emissions resulting from VMT growth. Since 1990 when this requirement was established, California has adopted more than sufficient enforceable transportation strategies and measures to meet the requirement to offset the growth in emissions from VMT growth. For the 2008 8-hour ozone standard offset demonstration, 2012 controls are used as the base case control level since 2012 is the base year of the SIP.

Emissions Due to VMT Growth

As discussed above, the USEPA guidance does provide a recommended calculation methodology that could be done to determine if sufficient transportation control strategies and TCMs have been adopted and implemented to offset the growth in emissions due solely to growth in VMT. As such, any increase in emissions solely from VMT increases in the future attainment year from the base year (assuming that there are no further motor vehicle control programs implemented after the base year) would need to be offset. In addition, a calculation is needed to show the emissions levels if VMT had remained constant from the base year to the future attainment year. As discussed earlier, a comparison of the projected attainment year emissions assuming no new control measures and no VMT growth with projected actual attainment year emissions (including new control measures and VMT growth) would be made. If the latter number is smaller than the former, no additional transportation control measures or strategies would be required.

Methodology

The following calculations are based on the USEPA guidance recommended calculation methodology. As shown for the 8-hour ozone standard, 2012 is the base year used for the attainment demonstration and 2026 is the attainment year.

This analysis uses California's approved motor vehicle emissions model, EMFAC.
The EMFAC model estimates the emissions from two combustion processes: running exhaust and start exhaust, and four evaporative processes: hot soak, running losses, diurnal, and resting losses.

Emissions from running exhaust, start exhaust, hot soak, and running losses are a function of how much a vehicle is driven. Emissions from these processes are directly related to VMT, trips, and starts. These processes are included in the calculation of the emissions levels used in the VMT offset demonstration. Emissions from resting loss and diurnal loss processes are not related to VMT, trips or vehicle starts and are not included in the analysis because these emissions occur regardless if the vehicle makes a trip (i.e., a start) or not.

EMFAC combines trip-based VMT from the regional transportation planning agencies, starts data based on household travel surveys, and vehicle population data from the Department of Motor Vehicles with corresponding emission rates to calculate emissions.[5]

With the EMFAC model, the calculation of emissions growth and whether it is offset is simplified to a comparison of future year emissions with "no growth" in VMT or new control strategies to future emissions with VMT growth and new control strategies. This follows U.S. EPA's 2012 guidance and is consistent with the court's interpretation of FCAA §182(d)(1)(A).

Analysis Using 2012 as the Base Year for the 2008 8-hour Ozone Standard with Attainment Year of 2026.

Step 1. Provide the emissions level for the base year.

The following table shows the VOC emissions, VMT, starts, and vehicle population for calendar year 2012 from the EMFAC2014 model.

Summary of 2012 Base Year Transportation Activity

	VMT (thousand miles/day)	Starts (thousands/day)	Vehicle Population (thousands)	VOC Emissions* (tons/day)
2012 Base Year	26,536	4,470	706	12.4

* Does not include diurnal or resting loss emissions.

Step 2. Calculate three emissions levels in the attainment year.

For the attainment year,

(1) Calculate emissions level with the motor vehicle control program frozen at 2012 levels and with projected VMT, starts, and vehicle population for the attainment year. This represents what the emissions in the attainment year would have been if transportation control strategies and TCMs had not been implemented after 2012;

(2) Calculate emissions level with the motor vehicle control program frozen at 2012 levels and assuming VMT, starts, and vehicle population do not increase from 2012 levels; and

(3) Calculate an emissions level that represents emissions with full implementation of all transportation control strategies and TCMs since 2012 and which represents the projected future year baseline emissions inventory using the VMT, starts, and vehicle population for the attainment year.

Calculation 1. Calculate the emissions in the attainment year assuming no new measures since the base year, and including growth in VMT, starts, and vehicle population.

To perform this calculation, CARB staff identified the on-road motor vehicle control programs adopted since 2012 and adjusted EMFAC2014 to reflect the VOC emissions levels in 2026

[5] More information on data sources can be found in the EMFAC technical document which is located on the web at: https://www.arb.ca.gov/msei/downloads/emfac2014/emfac2014-vol3-technical-documentation-052015.pdf

without the benefits of the post-2012 control programs. The projected VOC emissions are 6.5 tons/day.

Calculation 2. Calculate the emissions with no growth in VMT, starts, or vehicle population. In this calculation, the VOC emission levels in calendar year 2026 without benefit of the post 2012 control program are calculated. EMFAC2014 allows a user to input different VMT, starts, and vehicle population than default. For this calculation, EMFAC2014 was run without the benefit of the post 2012 control program for calendar year 2026 with the 2012 level of VMT of 26,535,577 miles per day, the 2012 level of starts at 4,469,778 per day, and the 2012 level of population at 706,039 vehicles. The VOC emissions associated with 2012 VMT, starts, and vehicle population in calendar year 2026 are 5.3 tons/day.

Calculation 3. Calculate emission reductions with full Implementation of Transportation Control Strategies & TCMs.
The VOC emission levels for 2026 assuming the benefits of the post-2012 motor vehicle control program and the projected VMT, starts, and vehicle population in 2026 are calculated using EMFAC2014. The projected VOC emissions level is 4.6 tons/day. VOC emissions for the three sets of calculations described above are summarized in the following table.

As provided in the U.S. EPA guidance, to determine compliance with the provisions of FCAA §182(d)(1)(A), the emissions levels calculated in Calculation 3 should be less than the emissions levels in Calculation 2:

VOC: 4.6 < 5.3 tons/day

Summary of 2026 Attainment Year Emissions Levels

Description	VMT* (1000 miles/day)	Starts (1000/day)	Vehicle Population (1000s)	VOC Emissions** (tons/day)
(1) Emissions with Motor Vehicle Control Program Frozen at 2012 Levels. (VMT, starts and vehicle population at 2026 levels.)	34,724	5,238	843	6.5
(2) Emissions with Motor Vehicle Control Program Frozen at 2012 Levels. (VMT, starts, and vehicle population at 2012 levels)	26,536	4,470	706	5.3

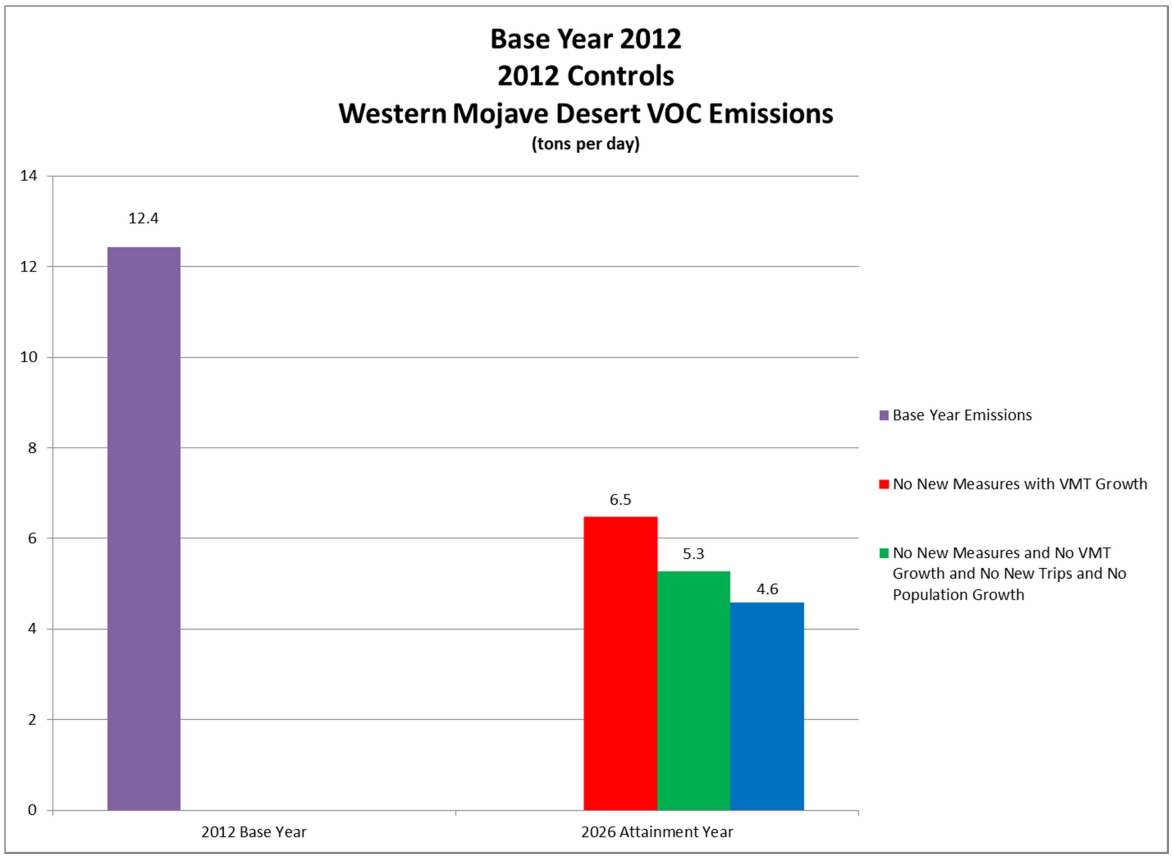
(3) Emissions with Full Motor Vehicle Control Program in Place (VMT, starts and vehicle population at 2026 levels)	34,724	5,238	843	4.6

* CY 2026 VMT based on the SCAG 2016 RTP
** Does not include diurnal or resting loss emissions.

Summary

The previous sections provide an analysis to demonstrate compliance with the provisions of FCAA §182(d)(1)(A). To further illustrate the demonstration, Figure 5 below show graphically the emissions benefits of the motor vehicle control programs in offsetting VOC emissions due to increased VMT, starts, and vehicle population in the WMDONA for the 2008 8-hour ozone standard (2012 base year). The left bar (in purple) shows the emissions in the base year with base year controls. The three bars on the right in each figure show the emissions levels in the attainment year for the three calculations identified above: the red bar shows attainment year emissions with base year controls and attainment year VMT, starts, and vehicle population, the green bar shows attainment year emissions with base year controls, VMT, starts, and vehicle population, and the blue bar shows attainment year emissions with attainment year controls, VMT, starts, and vehicle population. Based on the USEPA guidance, if the blue bar is lower than the green bar, then the identified transportation control strategies and TCMs are sufficient to offset the growth in emissions.

Figure 5 - VOC Emissions from WMDONA On-Road Mobile Sources (2012 Base Year)*



* Does not include resting or diurnal loss emissions

CHAPTER 4 – Attainment Demonstration

Modeling Approach Overview
Modeling Domain
Model Inputs
Modeling Results

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ATTAINMENT DEMONSTRATION

This chapter paraphrases and reiterates information from the most recent SCAQMD/CARB ozone model runs, the runs performed for the 2016 SCAQMD AQMP. For further information, please refer to Appendix V of that document.[6]

The FCAA required the use of photochemical air quality modeling to evaluate whether a proposed control strategy will result in attainment of the applicable ozone standard. Recognizing the uncertainty inherent in large-scale air quality models, recent Federal guidance has also required an evaluation of supplementary data, known as a weight of evidence analysis. A weight of evidence analysis can also be used to support an attainment demonstration if photochemical modeling indicates that the control strategy will result in future ozone concentration that will approach but not quite reach the standard - CARB will include a weight of evidence analysis in the State of California adoption staff report.

Modeling Approach Overview

The WMDONA, which includes a portion of the MDAQMD, is a small portion of the complex greater Southern California airshed. Ozone and ozone precursors are known to flow (or be transported), under the influence of winds, throughout Southern California. The most technically accurate method of evaluating ozone concentrations, ozone emissions, and future ozone behavior is through a large modeling project that includes all of the affected areas in Southern California (and a portion of northern Mexico). The modeling effort has been performed as a joint project by all of the air districts in the region and CARB, with SCAQMD and CARB staff and resources doing the primary work. This regional modeling effort has allowed the most accurate understanding and prediction of future ozone concentrations for Southern California.

The modeled attainment demonstration in this plan was prepared using photochemical dispersion and meteorological tools developed in response to USEPA modeling guidelines, and recommendations from air quality modeling experts. The Urban Airshed Model (UAM) is the regional modeling system preferred by USEPA and CARB for analyzing ozone non-attainment areas. The UAM predicts future ambient ozone concentrations under historical conditions that led to high ambient ozone concentrations. These conditions are typically multi-day 'episodes' in which the State and Federal ozone standards were exceeded. The UAM also evaluates ozone precursor emissions, local and regional meteorology, and regional topography to calculate ozone concentrations. These calculations are performed on an hourly basis throughout the modeled episode, thus allowing the UAM to stimulate changing conditions (i.e. night, day and wind).

Meteorological fields were generated using the Weather Research and Forecasting (WRF) meteorological model, and the required modeling emissions inventories were developed by CARB and SCAQMD staff. The ozone air quality modeling utilized the Comprehensive Air Quality Model with Extensions (CAMx) model and SAPRC99 chemistry, with initial and boundary conditions based on estimates of clean-air concentrations. Analysis of the model outputs included the estimation of 1-hour and 8-hour ozone concentrations for each ozone monitoring site within the domain, as well as statistical measures comparing observed and

[6] "2016 AQMP Appendix V - Modeling and Attainment Demonstrations," SCAQMD, December 2016

simulated ozone concentrations. These analyses were used to evaluate model performance by sub-region within the domain.

Modeling Domain

The modeling domain is based on the domain defined for the 1997 Southern California Ozone Study and includes the SCAB and the surrounding coastal, desert and mountain areas, including the MDAQMD. This model domain includes the upwind sources within SCAQMD, which are responsible for the overwhelming ozone transport into the MDAQMD. The northern boundary of the model extends into Santa Barbara and Kern counties, while the southern boundary extends in Mexico. The eastern boundary of the modeling domain extends into the desert portions of San Bernardino and Riverside counties, while the western boundary extends into the Pacific Ocean. The domain horizontal grid is 154 by 102 cells, with a cell resolution of four kilometers. The domain has a vertical resolution of 18 layers.

Model Inputs

SCAQMD performed the UAM attainment demonstration using data maintained by CARB and MDAQMD. The emissions inventory used for the UAM is consistent with the emissions inventory presented in the appendices to this document.

Modeling Results

Future years are simulated twice using the UAM: first, using the uncontrolled emissions inventory; and second, using a reduced emissions inventory controlled by the proposed ozone control strategy. Comparing the uncontrolled and controlled ambient ozone concentrations identifies the effectiveness of the proposed ozone control strategy. Attainment year ambient ozone concentrations using the reduced emissions inventory controlled by the proposed ozone control strategy should achieve the ozone standard.

As required by federal guidance, a relative reduction factor (RRF) approach was used in projecting future design values. The RRF reflects the ratio between the future year model prediction (in this case the end of 2026) and the reference year model prediction (in this case 2012). A reference or base year design value is then multiplied by the RRF to project a future year design value. The modeling satisfies the minimum five episode requirement for use in developing a site-specific RRF for most sites, as recommended by the USEPA guidance for modeling 8-hour ozone design values.

Table 5 presents the photochemical ozone modeling results for the FONA, including sites within the MDAQMD.

Table 5 - 2026 Federal Ozone Attainment Demonstration

(all values ozone in ppb)

Station		Baseline 2012	Modeled Forecast 2026	Modeled Controlled 2023
Phelan	0012	93.7	83.6	75.9
Joshua Tree National Monument	9002	91.3	79.7	74.3
Hesperia	4001	91.0	81.7	73.8
Lancaster	9033	88.3	73.5	67.0
Victorville	0306	84.7	77.6	71.0
Barstow	0001	78.3	67.9	64.8

The modeling results show that the MDAQMD will attain the 8-hour ozone NAAQS (75 ppb) prior to the July 2027 attainment deadline for Severe ozone nonattainment areas.

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Appendices

A - Base Year Emission Inventory
B - Future Year Emission Inventories
C - Annual Ambient Monitoring Data Summary
D - Mojave Desert Modeling Analyses
E - Ozone RACM Assessment
F - ARB Adopted Mobile Source Programs

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APPENDIX A - BASE YEAR EMISSION INVENTORY

All emissions are presented in tons per ozone seasonal day for the 2012 base year

	VOC	NOx
Stationary		
ELECTRIC UTILITIES	0.05	1.24
MANUFACTURING AND INDUSTRIAL	0.29	3.87
FOOD AND AGRICULTURAL PROCESSING	0.01	0.09
SERVICE AND COMMERCIAL	0.19	1.45
OTHER (FUEL COMBUSTION)	0.07	0.73
SEWAGE TREATMENT	0.12	0.00
LANDFILLS	0.16	0.02
INCINERATORS	0.00	0.06
OTHER (WASTE DISPOSAL)	0.05	0.00
DEGREASING	3.41	0.00
COATINGS AND RELATED PROCESS SOLVENTS	1.79	0.00
PRINTING	0.03	0.00
ADHESIVES AND SEALANTS	0.07	0.00
OTHER (CLEANING AND SURFACE COATINGS)	0.01	0.00
PETROLEUM MARKETING	5.52	0.00
CHEMICAL	0.50	0.01
FOOD AND AGRICULTURE	0.01	0.00
MINERAL PROCESSES	0.34	17.96
METAL PROCESSES	0.00	0.48
ELECTRONICS	0.01	0.00
OTHER (INDUSTRIAL PROCESSES)	0.18	1.60
Stationary Subtotal	**12.81**	**27.51**
Area-Wide		
CONSUMER PRODUCTS	4.49	0.00
ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS	2.45	0.00
PESTICIDES/FERTILIZERS	0.13	0.00
ASPHALT PAVING / ROOFING	0.31	0.00
RESIDENTIAL FUEL COMBUSTION	0.55	1.11
FARMING OPERATIONS	2.06	0.00
FIRES	0.02	0.00
MANAGED BURNING AND DISPOSAL	0.95	0.39
COOKING	0.45	0.00
Area-Wide Subtotal	**11.40**	**1.50**

On-Road Mobile		
LIGHT DUTY PASSENGER (LDA)	4.34	3.64
LIGHT DUTY TRUCKS - 1 (LDT1)	1.45	1.06
LIGHT DUTY TRUCKS - 2 (LDT2)	1.94	2.40
MEDIUM DUTY TRUCKS (MDV)	1.74	2.72
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	0.72	0.95
LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	0.06	0.10
MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	0.14	0.22
HEAVY HEAVY DUTY GAS TRUCKS (HHDV)	0.04	0.08
LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	0.09	3.82
LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2)	0.03	1.12
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	0.09	1.90
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	1.07	19.60
MOTORCYCLES (MCY)	1.35	0.46
HEAVY DUTY DIESEL URBAN BUSES (UB)	0.07	1.10
HEAVY DUTY GAS URBAN BUSES (UB)	0.04	0.11
SCHOOL BUSES - GAS (SBG)	0.02	0.02
SCHOOL BUSES - DIESEL (SBD)	0.02	0.26
OTHER BUSES - GAS (OBG)	0.02	0.06
OTHER BUSES - MOTOR COACH - DIESEL (OBC)	0.00	0.05
ALL OTHER BUSES - DIESEL (OBD)	0.00	0.05
MOTOR HOMES (MH)	0.04	0.19
On-Road Mobile Subtotal	**13.28**	**39.93**
Other Mobile		
AIRCRAFT	1.47	1.36
TRAINS	1.78	28.42
RECREATIONAL BOATS	0.27	0.05
OFF-ROAD RECREATIONAL VEHICLES	0.75	0.04
OFF-ROAD EQUIPMENT	1.57	2.16
FARM EQUIPMENT	0.03	0.12
FUEL STORAGE AND HANDLING	0.35	0.00
Other Mobile Subtotal	**6.21**	**32.16**
WMDONA Total	***43.70***	***101.10***

APPENDIX B - FUTURE YEAR EMISSION INVENTORIES

(all emissions in tons per ozone seasonal day unless otherwise indicated)

VOC:

SUB CATEGORY	2012	2018	2020	2023	2026
ELECTRIC UTILITIES	0.05	0.04	0.04	0.05	0.05
MANUFACTURING AND INDUSTRIAL	0.29	0.36	0.39	0.41	0.43
FOOD AND AGRICULTURAL PROCESSING	0.01	0.00	0.01	0.01	0.01
SERVICE AND COMMERCIAL	0.19	0.30	0.35	0.41	0.45
OTHER (FUEL COMBUSTION)	0.07	0.07	0.07	0.07	0.08
SEWAGE TREATMENT	0.12	0.14	0.15	0.16	0.17
LANDFILLS	0.16	0.17	0.17	0.18	0.19
INCINERATORS	0.00	0.01	0.01	0.01	0.01
OTHER (WASTE DISPOSAL)	0.05	0.05	0.06	0.06	0.06
DEGREASING	3.41	4.62	5.07	5.69	6.19
COATINGS AND RELATED PROCESS SOLVENTS	1.79	2.32	2.52	2.76	2.95
PRINTING	0.03	0.05	0.05	0.06	0.07
ADHESIVES AND SEALANTS	0.07	0.10	0.11	0.12	0.13
OTHER (CLEANING AND SURFACE COATINGS)	0.01	0.01	0.01	0.01	0.01
PETROLEUM MARKETING	5.52	5.45	5.31	5.04	4.73
CHEMICAL	0.50	0.67	0.73	0.79	0.83
FOOD AND AGRICULTURE	0.01	0.02	0.02	0.02	0.02
MINERAL PROCESSES	0.34	0.44	0.47	0.50	0.52
ELECTRONICS	0.01	0.01	0.01	0.02	0.02
OTHER (INDUSTRIAL PROCESSES)	0.18	0.16	0.15	0.16	0.17
CONSUMER PRODUCTS	4.49	4.38	4.47	4.68	4.89
ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS	2.45	2.08	2.15	2.26	2.37
PESTICIDES/FERTILIZERS	0.13	0.20	0.20	0.20	0.20
ASPHALT PAVING / ROOFING	0.31	0.47	0.52	0.57	0.62
RESIDENTIAL FUEL COMBUSTION	0.55	0.54	0.54	0.54	0.54
FARMING OPERATIONS	2.06	2.06	2.06	2.06	2.06
FIRES	0.02	0.02	0.02	0.02	0.02
MANAGED BURNING AND DISPOSAL	0.95	0.96	0.96	0.97	0.98
COOKING	0.45	0.54	0.57	0.61	0.65
LIGHT DUTY PASSENGER (LDA)	4.34	2.30	1.95	1.65	1.47
LIGHT DUTY TRUCKS - 1 (LDT1)	1.45	0.71	0.59	0.47	0.38
LIGHT DUTY TRUCKS - 2 (LDT2)	1.94	1.12	0.94	0.80	0.71
MEDIUM DUTY TRUCKS (MDV)	1.74	1.33	1.16	0.93	0.78
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	0.72	0.54	0.51	0.44	0.39
LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	0.06	0.04	0.04	0.03	0.02
MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	0.14	0.05	0.04	0.04	0.03
HEAVY HEAVY DUTY GAS TRUCKS (HHDV)	0.04	0.01	0.01	0.01	0.01
LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	0.09	0.07	0.07	0.05	0.04
LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2)	0.03	0.02	0.02	0.01	0.01
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	0.09	0.04	0.02	0.01	0.01
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	1.07	0.21	0.20	0.14	0.16
MOTORCYCLES (MCY)	1.35	1.12	1.08	1.03	0.98
HEAVY DUTY DIESEL URBAN BUSES (UB)	0.07	0.04	0.03	0.02	0.02
HEAVY DUTY GAS URBAN BUSES (UB)	0.04	0.03	0.03	0.02	0.01
SCHOOL BUSES - GAS (SBG)	0.02	0.00	0.00	0.00	0.00
SCHOOL BUSES - DIESEL (SBD)	0.02	0.00	0.00	0.00	0.00
OTHER BUSES - GAS (OBG)	0.02	0.01	0.01	0.01	0.01
MOTOR HOMES (MH)	0.04	0.01	0.01	0.01	0.00
AIRCRAFT	1.47	1.47	1.47	1.51	1.56
TRAINS	1.78	0.90	0.70	0.61	0.49
RECREATIONAL BOATS	0.27	0.20	0.18	0.15	0.13
OFF-ROAD RECREATIONAL VEHICLES	0.75	0.65	0.63	0.59	0.57
OFF-ROAD EQUIPMENT	1.57	1.40	1.38	1.41	1.45
FARM EQUIPMENT	0.03	0.02	0.02	0.02	0.01
FUEL STORAGE AND HANDLING	0.35	0.25	0.24	0.22	0.20
Overall totals:	43.69	38.82	38.49	38.61	38.87

NOx:

SUB CATEGORY	2012	2018	2020	2023	2026
ELECTRIC UTILITIES	1.24	0.98	0.98	1.06	1.08
MANUFACTURING AND INDUSTRIAL	3.87	4.44	4.67	4.72	4.74
FOOD AND AGRICULTURAL PROCESSING	0.09	0.05	0.06	0.06	0.06
SERVICE AND COMMERCIAL	1.45	2.15	2.46	2.83	3.09
OTHER (FUEL COMBUSTION)	0.73	0.79	0.78	0.83	0.87
LANDFILLS	0.02	0.02	0.03	0.03	0.03
INCINERATORS	0.06	0.08	0.08	0.09	0.10
CHEMICAL	0.01	0.01	0.01	0.01	0.01
MINERAL PROCESSES	17.96	24.38	26.53	28.22	29.33
METAL PROCESSES	0.48	0.48	0.47	0.51	0.55
OTHER (INDUSTRIAL PROCESSES)	1.60	1.41	1.32	1.41	1.53
RESIDENTIAL FUEL COMBUSTION	1.11	0.92	0.91	0.90	0.89
MANAGED BURNING AND DISPOSAL	0.39	0.39	0.40	0.40	0.40
LIGHT DUTY PASSENGER (LDA)	3.64	2.00	1.64	1.28	1.04
LIGHT DUTY TRUCKS - 1 (LDT1)	1.06	0.47	0.37	0.27	0.19
LIGHT DUTY TRUCKS - 2 (LDT2)	2.40	1.15	0.88	0.65	0.50
MEDIUM DUTY TRUCKS (MDV)	2.72	1.60	1.28	0.86	0.61
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	0.95	0.63	0.57	0.46	0.37
LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	0.10	0.07	0.06	0.05	0.04
MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	0.22	0.12	0.10	0.08	0.06
HEAVY HEAVY DUTY GAS TRUCKS (HHDV)	0.08	0.05	0.05	0.05	0.05
LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	3.82	2.60	2.29	1.75	1.33
LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2)	1.12	0.68	0.56	0.38	0.25
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	1.90	1.14	0.83	0.44	0.50
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	19.60	9.71	8.87	4.41	4.60
MOTORCYCLES (MCY)	0.46	0.38	0.37	0.36	0.35
HEAVY DUTY DIESEL URBAN BUSES (UB)	1.10	0.61	0.48	0.35	0.25
HEAVY DUTY GAS URBAN BUSES (UB)	0.11	0.08	0.07	0.05	0.04
SCHOOL BUSES - GAS (SBG)	0.02	0.01	0.01	0.00	0.00
SCHOOL BUSES - DIESEL (SBD)	0.26	0.23	0.21	0.17	0.14
OTHER BUSES - GAS (OBG)	0.06	0.04	0.03	0.02	0.02
OTHER BUSES - MOTOR COACH - DIESEL (OBC)	0.05	0.03	0.03	0.01	0.01
ALL OTHER BUSES - DIESEL (OBD)	0.05	0.03	0.02	0.01	0.01
MOTOR HOMES (MH)	0.19	0.11	0.09	0.06	0.04
AIRCRAFT	1.36	1.37	1.37	1.41	1.46
TRAINS	28.42	22.03	19.41	16.36	12.54
RECREATIONAL BOATS	0.05	0.04	0.04	0.04	0.04
OFF-ROAD RECREATIONAL VEHICLES	0.04	0.05	0.05	0.06	0.06
OFF-ROAD EQUIPMENT	2.16	1.98	1.86	1.54	1.33
FARM EQUIPMENT	0.12	0.09	0.09	0.07	0.06
Overall totals:	101.09	83.40	80.29	72.24	68.56

APPENDIX C - ANNUAL AMBIENT MONITORING DATA SUMMARY

	Maximum One Hour Ozone (ppm)							8-Hour Trend (FONA)		
									Max	3-Yr Av 4th H
	Barstow	Blythe	Hesperia	JTNM	Phelan	Trona	Victorville	1986	0.225	0.168
1988	0.15		0.27	0.14	0.19	0.12	0.18	1987	0.161	0.163
1989	0.14		0.21	0.14	0.22	0.10	0.17	1988	0.167	0.165
1990	0.13		0.27	0.13	0.24	0.11	0.18	1989	0.161	0.153
1991	0.13		0.19	0.13	0.24	0.12	0.19	1990	0.198	0.151
1992	0.13		0.23	0.14	0.19	0.10	0.19	1991	0.173	0.151
1993	0.13		0.17	0.14	0.20	0.10	0.16	1992	0.165	0.147
1994	0.13		0.18	0.17	0.19	0.10	0.16	1993	0.147	0.139
1995	0.12		0.17	0.15	0.24	0.09	0.15	1994	0.155	0.138
1996	0.13		0.17	0.15	0.18	0.10	0.16	1995	0.170	0.137
1997	0.12		0.18	0.15	0.19	0.10	0.15	1996	0.146	0.131
1998	0.11		0.16	0.14	0.20	0.11	0.16	1997	0.133	0.124
1999	0.12		0.13	0.14	0.14	0.10	0.12	1998	0.144	0.127
2000	0.11		0.16	0.13	0.14	0.09	0.14	1999	0.122	0.118
2001	0.10		0.12	0.11	0.15	0.09	0.11	2000	0.132	0.110
2002	0.11		0.15	0.13	0.15	0.11	0.13	2001	0.117	0.102
2003	0.11	0.08	0.16	0.14	0.14	0.10	0.15	2002	0.123	0.106
2004	0.10	0.08	0.14	0.14	0.12	0.11	0.11	2003	0.130	0.106
2005	0.10	0.08	0.14	0.13	0.15	0.09	0.13	2004	0.119	0.107
2006	0.11	0.08	0.15	0.13	0.14	0.09	0.14	2005	0.123	0.105
2007	0.10	0.09	0.13	0.13	0.12	0.09	0.11	2006	0.124	0.103
2008	0.10	0.07	0.13	0.14	0.13	0.10	0.11	2007	0.109	0.103
2009	0.10	0.07	0.12	0.12	0.12	0.08	0.11	2008	0.110	0.104
2010	0.10	0.07	0.12	0.12	0.14	0.09	0.11	2009	0.104	0.100
2011	0.09	0.07	0.13	0.12	0.12	0.08	0.10	2010	0.114	0.099
2012	0.09	0.08	0.12	0.11	0.12	0.09	0.11	2011	0.113	0.097
2013	0.10	0.07	0.10	0.10	0.11	0.08	0.12	2012	0.108	0.097
2014	0.09	0.09	0.12	0.11	0.14	0.08	0.12	2013	0.097	0.092
2015	0.09	0.07	0.13	0.10	0.13	0.08	0.13	2014	0.100	0.092
								2015	0.105	0.090

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APPENDIX D – WESTERN MOJAVE DESERT MODELING ANALYSES

(prepared by SCAQMD staff)

Statistical Evaluation

The statistics used to evaluate 8-hour average CMAQ ozone performance include the following:

Statistic for O_3	Definition
Daily-Max Bias Error Unpaired	Average of the differences in observed and predicted daily maximum values. Negative values indicate under-prediction. $BiasError = \frac{1}{N}\sum(Obs - Pred)$
Daily-Max Bias Error Paired	Average of the differences in daily maximum observed value and the corresponding predicted concentration at the hour that the observational maximum was reached. Negative values indicate under-prediction. $BiasError = \frac{1}{N}\sum(Obs - Pred)$
Daily-Max Gross Error Unpaired	Average of the absolute differences in observed and predicted daily maximum values $GrossError = \frac{1}{N}\sum\lvert Obs - Pred\rvert$
Daily-Max Gross Error Paired	Average of the absolute differences in daily maximum observed value and the corresponding predicted concentration at the hour that the observational maximum was reached. $GrossError = \frac{1}{N}\sum\lvert Obs - Pred\rvert$
Normalized Daily-Max Bias Error Unpaired	Average of the quantity: difference in observed and predicted daily maximum values normalized by the observed daily maximum values. Negative values indicate under-prediction. $NormBiasError = \frac{1}{N}\sum\left(\frac{Obs-Pred}{Obs}\right)\cdot 100$
Normalized Daily-Max Bias Error Paired	Average of the quantity: difference in daily maximum observed value and the corresponding predicted concentration at the hour that the observational maximum was reached normalized by the observed daily maximum concentration. Negative values indicate under-prediction.

$$NormBiasError = \frac{1}{N}\sum\left(\frac{Obs-Pred}{Obs}\right)\cdot 100$$

Normalized Daily-Max Gross Error Unpaired	Average of the quantity: absolute difference in observed and predicted daily maximum values normalized by the observed daily maximum concentration

$$NormGrossError = \frac{1}{N}\sum\left|\frac{Obs-Pred}{Obs}\right|\cdot 100$$

Normalized Daily-Max Gross Error Paired	Average of the quantity: absolute difference in daily maximum observed value and the corresponding predicted concentration at the hour that the observational maximum was reached normalized by the observed daily maximum concentration

$$NormGrossErr \quad = \frac{1}{N}\sum\left|\frac{Obs-Pred}{Obs}\right|\cdot 100$$

Peak Prediction Accuracy Unpaired	Difference in the maximum of the observed daily maximum and the maximum of the predicted daily maximum normalized by the maximum of the observed daily maximum

$$PPA = \frac{(maximum(Pred)-\text{maximum}(Obs))}{\text{maximum}(Pred)}$$

Predicted concentrations are extracted from model output in the grid cell that each monitoring station resides.

We evaluated the base year average regional model performance for May through September 2012 for days when Basin maximum 8-hour ozone levels were at least 60 ppb. Ozone performance criteria are presented in Table 1. Only stations with more than 74.5% (EPA's data completeness requirement) of the hourly measurements during each month of the ozone season were included in the analysis.

Ozone measurements from monitors in Blythe, Black Rock Canyon (Joshua Tree National Monument), Hesperia, Kelso (Mojave National Preserve), Victorville, Phelan, and Barstow were compiled for the analysis.

TABLE 1

2012 Base Year 8-Hour Average Ozone Performance for Days When Regional 8-Hour Maximum ≥ 60 ppb

Region Mojave_Desert

Month	Mean Pred. [ppb]	Mean Obs. [ppb]	Number of Daily Max > 60 ppb	Daily-Max Mean Pred. Unpaired [ppb]	Daily-Max Mean Pred. Paired [ppb]	Daily-Max Mean Obs. [ppb]	Daily-Max Bias Err. Unpaired [ppb]	Daily-Max Bias Err. Paired [ppb]	Daily-Max Gross Err. Unpaired [ppb]	Daily-Max Gross Err. Paired [ppb]	Norm Daily-Max Bias Err. Unpaired [%]	Norm Daily-Max Bias Err. Paired [%]	Norm Daily-Max Gross Err. Unpaired [%]	Norm Daily-Max Gross Err. Paired [%]	Peak Predict. Accuracy Unpaired [ppb]
May	56.2	58.8	210	66.4	64.6	70.7	-4.3	-6	6.6	7.7	-7.1	-10.3	10.2	12.6	-2.4
Jun	52	56.6	210	64.1	62.1	69.5	-5.4	-7.4	8.8	9.7	-10.3	-14.1	15.2	17.5	-1.5
Jul	47.4	52	207	58.5	54.9	64.2	-5.3	-8.7	10.2	12	-10.5	-18.2	18.9	24.2	-19.1
Aug	48.3	49.9	217	61	57.5	63.5	-2.5	-6	7.9	9.6	-5.4	-12.2	14.4	18.5	-12.3
Sep	42.6	43.8	175	53.5	50.7	57	-3.5	-6.3	8.9	10.4	-8.8	-17.6	18.7	25.5	-3.4

Density scatter plots displaying all 25,047 eight-hour ozone measurements from all monitors in the region is shown in Figure 1.

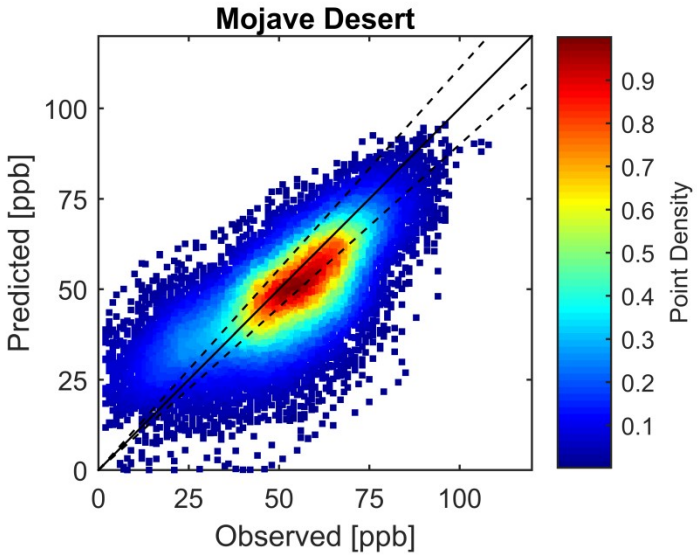

Figure 1: Density scatter plot of all 8-hour ozone values in the air district. Dashed lines indicate the bounds of 10% agreement

The model predicts 8-hour measurements well. Some values are slightly under-predicted between 40 and 65 ppb. However, performance is relatively robust at higher observational values. Since the ozone standards are based on the daily maximum ozone values, model prediction of higher concentrations is more consequential. Figure 2 illustrate the model performance of daily maximum 8-hour ozone.

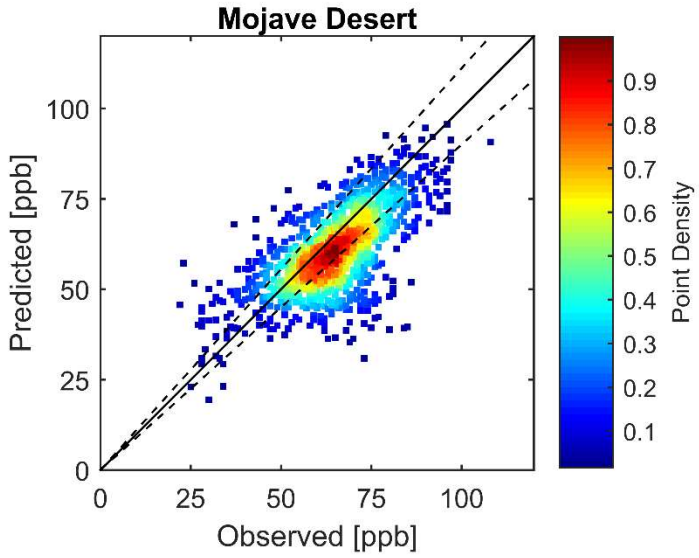

Figure 2: Density scatter plot of 8-hour daily maximum values in the air district. Dashed lines indicate the bounds of 10% agreement.

Daily maxima are slightly under-predicted, but most of the data lie within 10% of the measured values.

The model performance of 8-hour ozone at each specific station in the air basin is illustrated in Figures 3-9.

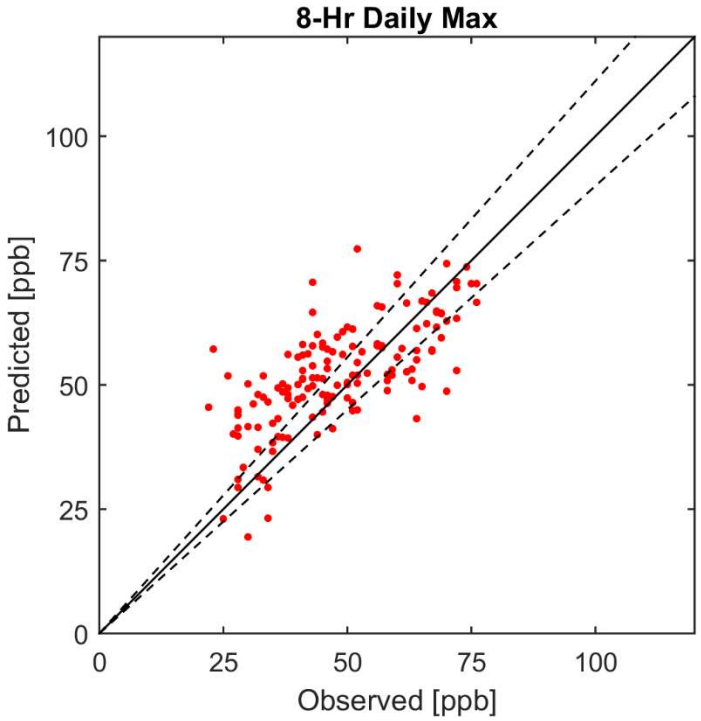

Figure 3: Eight-hour ozone daily maxima model performance at Blythe (06-065-9003).

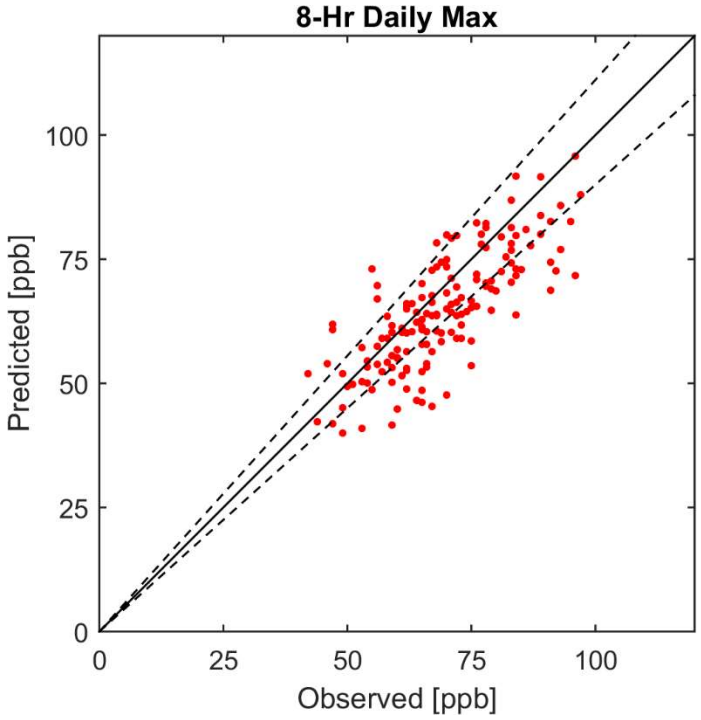

Figure 4: Eight-hour ozone daily maxima model performance at Black Rock Canyon (06-071-9002).

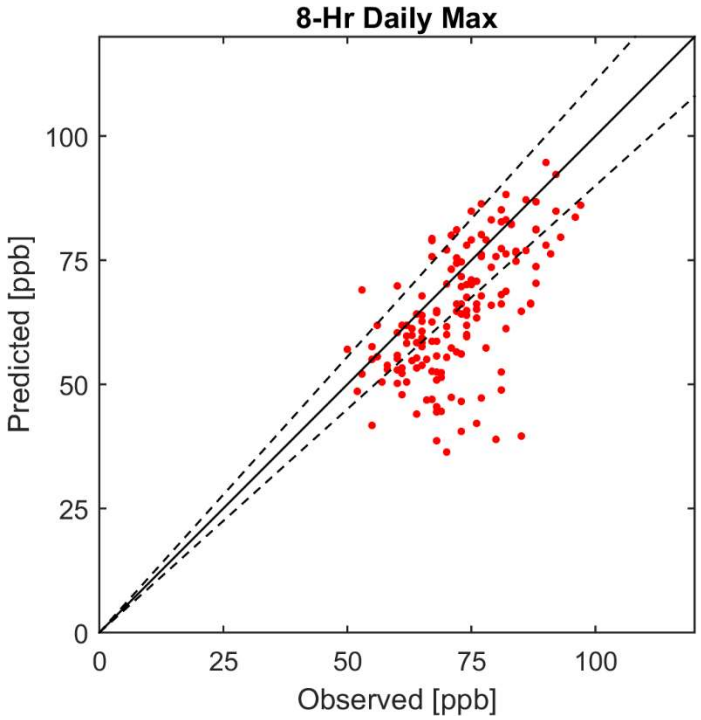

Figure 5: Eight-hour daily maxima model performance at Hesperia (06-071-4001).

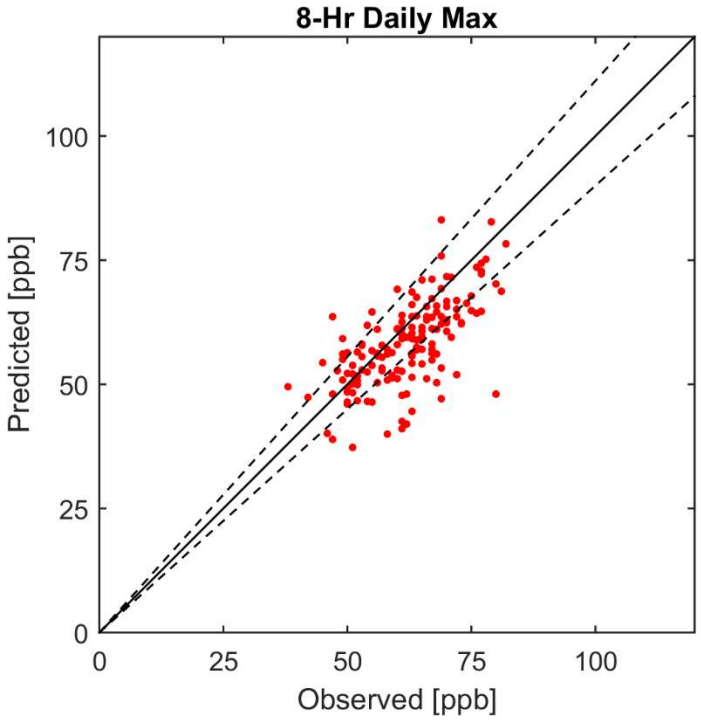

Figure 6: Eight-hour daily maxima model performance at Kelso (06-071-1001).

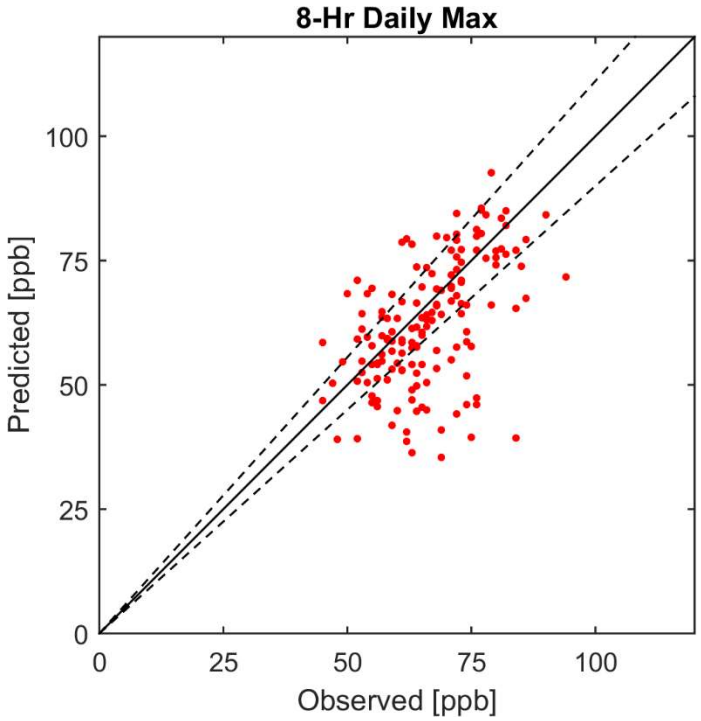

Figure 7: Eight-hour daily maxima model performance at Victorville (06-071-0306).

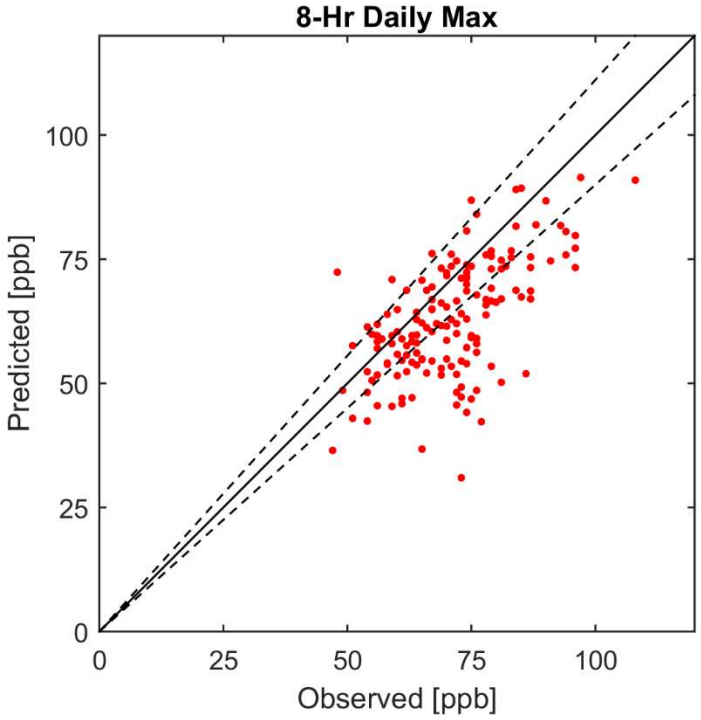

Figure 8: Eight-hour daily maxima model performance at Phelan (06-071-0012).

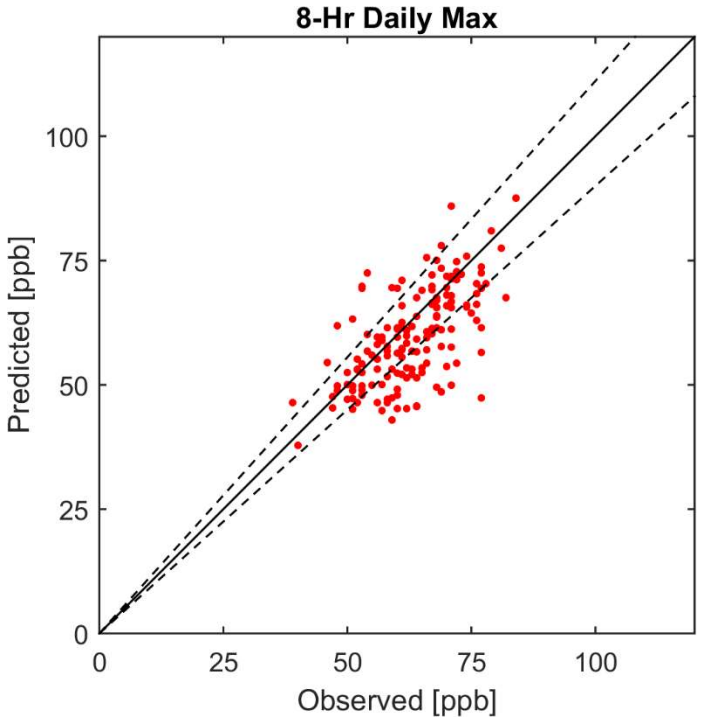

Figure 9: Eight-hour daily maxima model performance at Barstow (06-071-0001).

Base and Future Year Design Values

Table 2 details the base and future year design values for all stations with design values that meet the data completeness criteria. The base design value represents the 5-year weighted 8-hr ozone design value from 2012. Future design values were determined with comprehensive meteorological and chemical transport modelling and spatially resolved emissions projections. The Western Mojave Desert stations are expected to exceed the 75 ppb 8-hour ozone standard in 2026 if no additional emission reductions are introduced beyond already adopted controls. However, if emission reductions required to attain the 80 ppb 1997 8-hour ozone standard are implemented in 2023 in the South Coast Air Basin, the ozone in the Western Mojave Desert is expected to attain the 75 ppb standard. Detailed ozone concentrations in the base year (2012) and future milestone years (2023 and 2026) are presented in Table 2.

TABLE 2

Base Year and Future Year Design Values

Station Name	Station Number	2012 Design Value	2026 Design Value	2023 with controls in the South Coast Air Basin
Barstow	06-071-0001	78.3	67.9	64.8
Phelan-Beekley Road and Phelan Road	06-071-0012	93.7	83.6	75.9
Victorville-14306 Park Ave	06-071-0306	84.7	77.6	71.0
Hesperia-Olive Street	06-071-4001	91.0	81.7	73.8
Joshua Tree-National Monument	06-071-9002	91.3	79.7	74.3
Lancaster-43301 Division Street	06-037-9033	88.3	73.5	67.0

Unmonitored Area Analysis

An unmonitored area analysis was conducted to estimate 8-hour ozone design values in unmonitored locations. This analysis uses both the measurement design values and the modelled ozone profiles throughout the modeling domain. Details of this analysis are presented in Appendix 5, Chapter 5 of the 2016 SCAQMD AQMP. The same procedures and methodology were used for the South Coast Air Basin unmonitored area analysis.

The same interpolation scheme was used to calculate the spatial distribution of design values throughout the Mojave Desert Air Pollution Management District. Figure 1 illustrates the interpolated measured design value field.

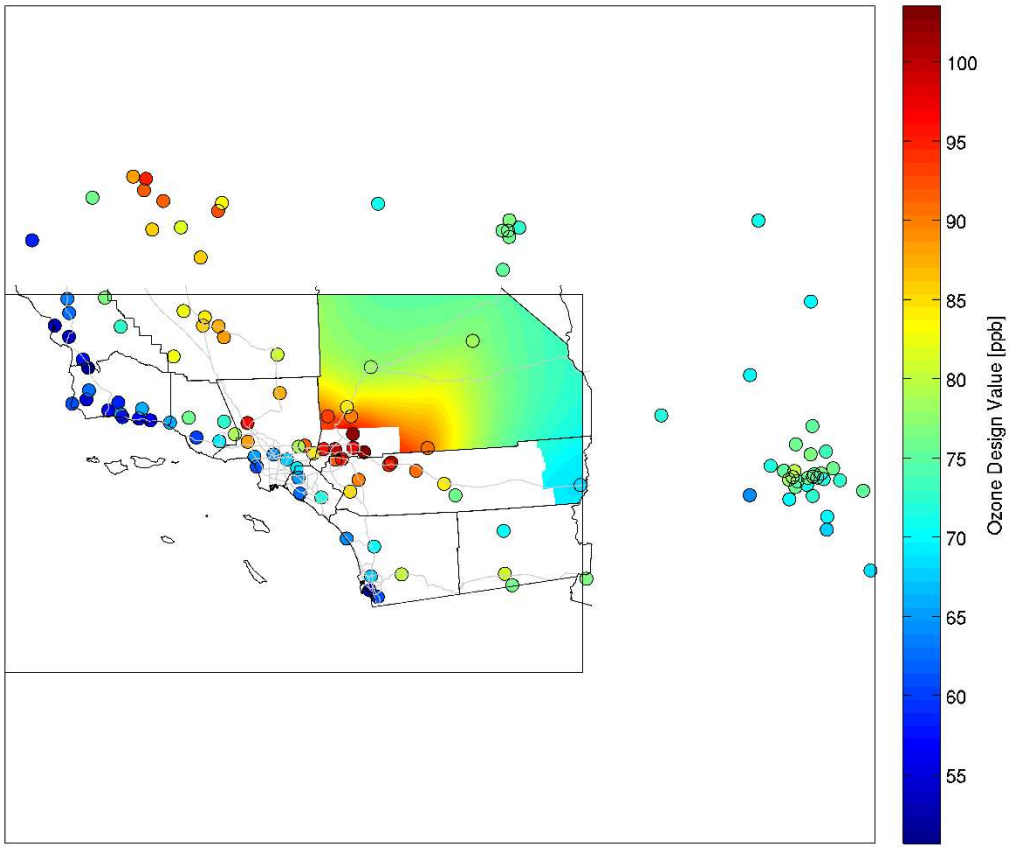

Figure 1: Interpolated 5-year weighted 2012 design values

The relative response factors representing the ratio between the 2023 simulated ozone and the base-year (2012) simulated ozone are presented below in Figure 2.

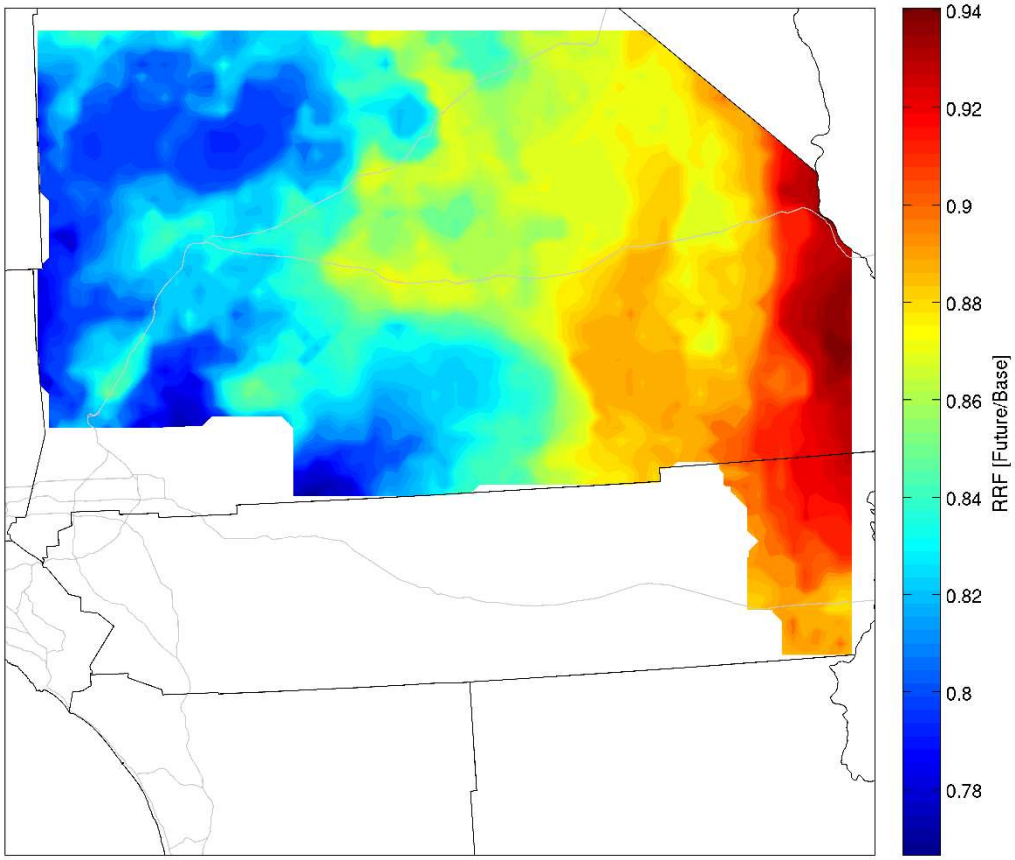

Figure 2: 2023 RRF Fields

The relative response factors suggest that ozone will decrease faster in western areas of the air basin. The western portions of the district along the Arizona border will exhibit the slowest decrease in future ozone concentrations.

The calculated RRF field is then used to project the interpolated measurement field to simulate future year concentrations. Figure 3 shows the predicted future ozone concentrations for 2023 in the Mojave Desert Air Basin.

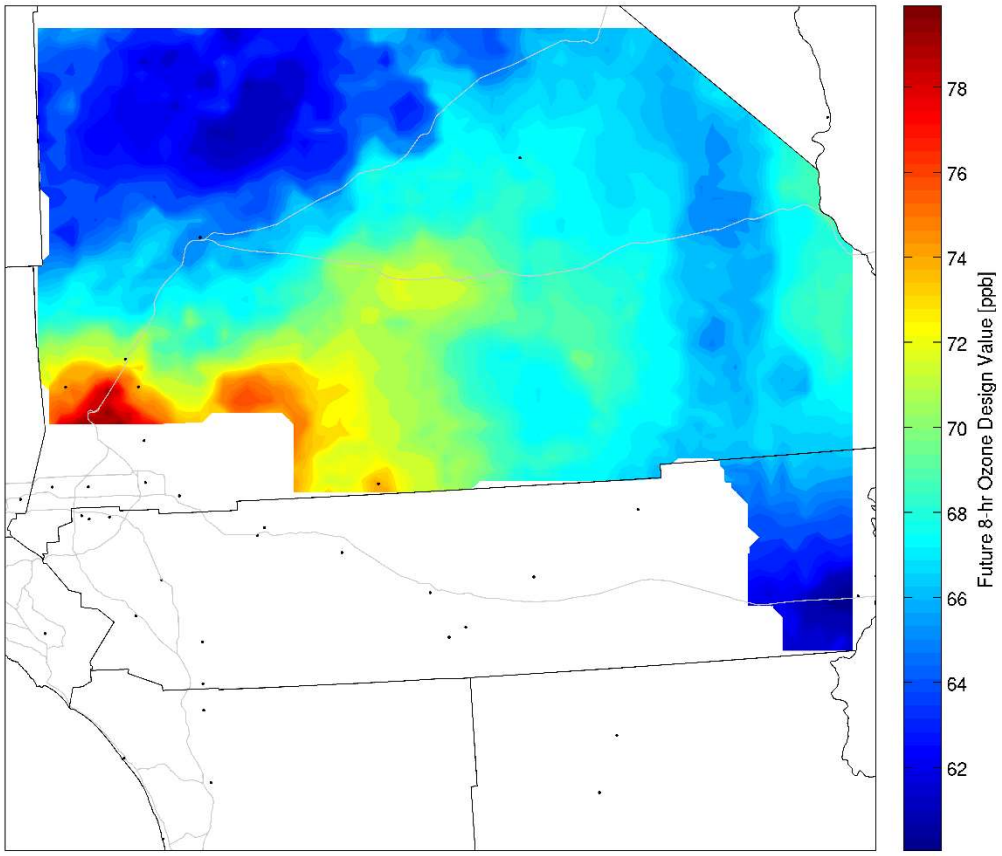

Figure 3: 2023 Predicted 8-hr Ozone Design Values. Monitoring stations are notated with black dots.

The southwestern corner of the Mojave Desert Air Basin bordering the South Coast Air Basin is projected to exhibit the highest concentrations. The maximum ozone design value is projected to be 80.2 ppb.

APPENDIX E - OZONE RACM ASSESSMENT

(prepared by CARB staff)

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California Mobile Source Control Program
Ozone Reasonable Available Control Measures Assessment

Overview

To fulfill Clean Air Act (the Act) control measure requirements for ozone nonattainment areas an assessment of control measures in the SIP must be performed. For ozone nonattainment areas, the control measures must be shown to be Reasonable Available Control Measures (RACM). Since ARB is responsible for measures to reduce emissions from mobile sources needed to attain the national ambient air quality standards (standards), this chapter will discuss how California's mobile source measures meet RACM.

Given the severity of California's air quality challenges, ARB has implemented the most stringent mobile source emissions control program in the nation. ARB's comprehensive strategy to reduce emissions from mobile sources includes stringent emissions standards for new vehicles, in-use programs to reduce emissions from existing vehicle and equipment fleets, cleaner fuels that minimize emissions, and incentive programs to accelerate the penetration of the cleanest vehicles beyond that achieved by regulations alone. Taken together, California's mobile program meets RACM requirements in the context of ozone nonattainment.

RACM Requirements

Subpart 1, section 172(c)(1) of the Act requires SIPs to provide for the implementation of RACM as expeditiously as practicable. U.S. EPA has interpreted RACM to be those emission control measures that are technologically and economically feasible and when considered in aggregate, would advance the attainment date by at least one year.

ARB developed its State SIP Strategy through a multi-step measure development process, including extensive public consultation, to develop and evaluate potential strategies for mobile source categories under ARB's regulatory authority that could contribute to expeditious attainment of the standard. First, ARB developed a series of technology assessments for heavy-duty mobile source applications and the fuels necessary to power them[7] along with ongoing review of advanced vehicle technologies for the light-duty sector in collaboration with U.S. EPA and the National Highway Traffic Safety Administration. ARB staff then used a scenario planning tool to examine the magnitude of technology penetration necessary, as well as how quickly technologies need to be introduced to meet attainment of the standard.

ARB staff released a discussion draft Mobile Source Strategy[8] for public comment in October 2015. This strategy specifically outlined a coordinated suite of proposed

[7] Technology and Fuel assessments http://www.arb.ca.gov/msprog/tech/tech.htm
[8] 2016 Mobile Source Strategy http://www.arb.ca.gov/planning/sip/2016sip/2016mobsrc.htm

actions to not only meet federal air quality standards, but also achieve greenhouse gas emission reduction targets, reduce petroleum consumption, and decrease health risk from transportation emissions over the next 15 years. ARB staff held a public workshop on October 16, 2015 in Sacramento, and on October 22, 2015, ARB held a public Board meeting to update the Board and solicit public comment on the Mobile Source Strategy in Diamond Bar.

Staff continued to work with stakeholders to refine the measure concepts for incorporation into related planning efforts including the 75 ppb 8-hour ozone SIPs. On May 16, 2016, ARB released an updated Mobile Source Strategy and on May 17, 2016 ARB released the proposed State SIP strategy for a 45-day public comment period.

The current mobile source program and proposed measures included in the State SIP Strategy provide attainment of the ozone standard as expeditiously as practicable and meet RFP requirements.

Waiver Approvals

While the Act preempts most states from adopting emission standards and other emission-related requirements for new motor vehicles and engines, it allows California to seek a waiver or authorization from the federal preemption to enact emission standards and other emission-related requirements for new motor vehicles and engines and new and in-use off-road vehicles and engines that are at least as protective as applicable federal standards, except for locomotives and engines used in farm and construction equipment which are less than 175 horsepower (hp).

Over the years, California has received waivers and authorizations for over 100 regulations. The most recent California standards and regulations that have received waivers and authorizations are Advanced Clean Cars (including ZEV and LEV III) for Light-Duty vehicles, and On-Board Diagnostics, Heavy-Duty Idling, Malfunction and Diagnostics System, In-Use Off-Road Diesel Fleets, Large Spark Ignition Fleet, Mobile Cargo Handling Equipment for Heavy-Duty engines. Other Authorizations include Off-Highway Recreational Vehicles and the Portable Equipment Registration Program.

Finally, ARB obtained an authorization from U.S. EPA to enforce adopted emission standards for off-road engines used in yard trucks and two-engine sweepers. ARB adopted the off-road emission standards as part of its “Regulation to Reduce Emissions of Diesel Particulate Matter, Oxides of Nitrogen and Other Criteria Pollutants from In-Use Heavy-Duty Diesel-Fueled Vehicles,” (Truck and Bus Regulation). The bulk of the regulation applies to in-use heavy-duty diesel on-road motor vehicles with a gross vehicle weight rating in excess of 14,000 pounds, which are not subject to preemption under section 209(a) of the Act and do not require a waiver under section 209(b).

Light- and Medium-Duty Vehicles

Light- and medium-duty vehicles are currently regulated under California's Advanced Clean Cars program including the Low-Emission Vehicle III (LEV III) and Zero-Emission Vehicle (ZEV) programs. Other California programs such as the 2012 Governor Brown Executive Order to put 1.5 million zero-emission vehicles on the road by 2025, and California's Reformulated Gasoline program (CaRFG) will produce substantial and cost-effective emission reductions from gasoline-powered vehicles.

ARB is also active in implementing programs for owners of older dirtier vehicles to retire them early. The "car scrap" programs, like the Enhanced Fleet Modernization Program, and Clean Vehicle Rebate Project provide monetary incentives to replace old vehicles with zero-emission vehicles. The Air Quality Improvement Program (AQIP), is a voluntary incentive program to fund clean vehicle.

Taken together, California's emission standards, fuel specifications, and incentive programs for on-road light- and medium-duty vehicles represent all measures that are technologically and economically feasible within California.

Heavy-Duty Vehicles

California's heavy-duty vehicle emissions control program includes requirements for increasingly tighter new engine standards and address vehicle idling, certification procedures, on-board diagnostics, emissions control device verification, and in-use vehicles. This program is designed to achieve an on-road heavy-duty diesel fleet with 2010 engines emitting 98 percent less NOx and PM2.5 than trucks sold in 1986.

Most recently in the ongoing efforts to go beyond federal standards and achieve further reductions, ARB adopted the Optional Reduced Emissions Standards for Heavy-Duty Engines regulation in 2014 that establishes the new generation of optional NOx emission standards for heavy-duty engines.

The recent in-use control measures include On-Road Heavy-Duty Diesel Vehicle (In-Use) Regulation, Drayage (Port or Rail Yard) Regulation, Public Agency and Utilities Regulation, Solid Waste Collection Vehicle Regulation, Heavy-Duty (Tractor-Trailer) Greenhouse Gas Regulation, ATCM to Limit Diesel-Fueled Commercial Motor Vehicle Idling, Heavy-Duty Diesel Vehicle Inspection Program, Periodic Smoke Inspection Program, Fleet Rule for Transit Agencies, Lower-Emission School Bus Program, and Heavy-Duty Truck Idling Requirements. In addition, ARB's significant investment in incentive programs provides an additional mechanism to achieve maximum emission reductions from this source sector.

Taken together, California's emission standards, fuel specifications, and incentive programs for heavy-duty vehicles represent all measures that are technologically and economically feasible within California.

Off-Road Vehicles and Engines

California regulations for off-road equipment include not only increasingly stringent standards for new off-road diesel engines, but also in-use requirements and idling restrictions.

The Off-Road Regulation is an extensive program designed to accelerate the penetration of the cleanest equipment into California's fleets, and impose idling limits on off-road diesel vehicles. The program goes beyond emission standards for new engines through comprehensive in-use requirements for legacy fleets.

Engines and equipment used in agricultural processes are unique to each process and are often re-designed and tailored to their particular use. Fleet turnover to cleaner engines is the focus for these engines.

Taken together, California's comprehensive suite of emission standards, fuel specifications, and incentive programs for off-road vehicles and engines represent all measures that are technologically and economically feasible within California and when considered in aggregate, would advance the attainment date by at least one year.

Other Sources and Fuels

The emission limits established for other mobile source categories, coupled with U.S. EPA waivers and authorization of preemption establish that California's programs for motorcycles, recreational boats, off-road recreational vehicles, cargo handling equipment, and commercial harbor craft sources meet the requirements for RACM.

Cleaner burning fuels also play an important role in reducing emissions from motor vehicles and engines as ARB has adopted a number of more stringent standards for fuels sold in California, including the Reformulated Gasoline program, low sulfur diesel requirements, and the Low Carbon Fuel Standard. These fuel standards, in combination with engine technology requirements, ensure that California's transportation system achieves the most effective emission reductions possible.

Taken together, California's emission standards, fuel specifications, and incentive programs for other mobile sources and fuels represent all measures that are technologically and economically feasible within California.

Summary

California's long history of comprehensive and innovative emissions control has resulted in the most stringent mobile source control program in the nation. U.S. EPA has previously acknowledged the strength of the program in their approval of ARB's regulations and through the waiver process. In its 2014 approval of the Western Mojave

Desert's 8-hour ozone plan, which included the State's current mobile source control program, U.S. EPA found that there were no further reasonably available control measures that would advance attainment of the standard in the Western Mojave Desert.

Since then, ARB has continued to substantially enhance and accelerate reductions from our mobile source control programs through the implementation of more stringent engine emissions standards, in-use requirements, incentive funding, and other policies and initiatives as described in the preceding sections.

ARB finds that with the current mobile source control program, there are no additional reasonable available control measures that would advance attainment of the 75 ppb 8-hour ozone standard in the Western Mojave Desert. There are no reasonable regulatory control measures excluded from use in this plan; therefore, there are no emissions reductions associated with unused regulatory control measures. As a result, California's mobile source control programs fully meet the requirements for RACM.

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APPENDIX F - CARB ADOPTED MOBILE SOURCE PROGRAMS

(prepared by CARB staff)

Key Mobile Source Regulations and Programs Providing Emission Reductions

Given the severity of California's air quality challenges and the need for ongoing emission reductions, the Air Resources Board (ARB) has implemented the most stringent mobile source emissions control program in the nation. ARB'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 Amendments (Act) of 1970, which established the basic national framework for controlling air pollution. In recognition of the pioneering nature of ARB'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 Section 209(b). This waiver provision preserves 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 ARB has consistently sought and obtained waivers and authorizations for its new motor vehicle regulations. ARB's history of progressively strengthening standards as technology advances, coupled with the waiver process requirements, ensures that California's regulations remain the most stringent in the nation. A list of regulatory actions ARB has taken since 1985 is provided at the end of this analysis to highlight the scope of ARB's actions to reduce mobile source emissions.

Recently, ARB 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 2020 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.

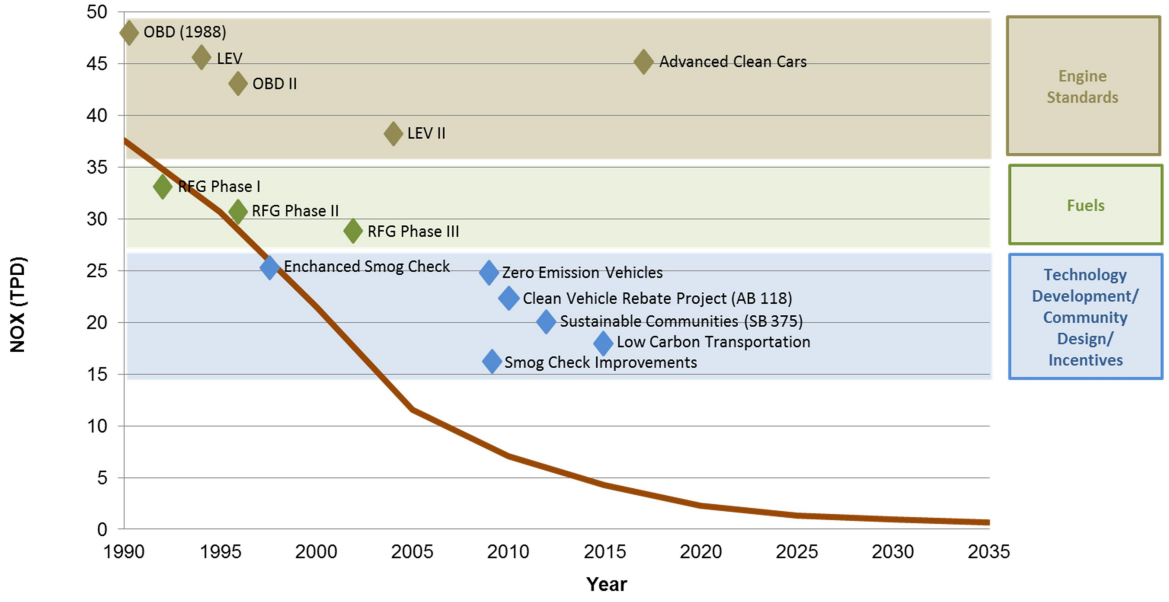
Further, ARB, Mojave Desert AQMD, and Antelope Valley AQMD staffs work closely on identifying and distributing incentive funds to accelerate cleanup of engines. Key

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.

Light-Duty Vehicles

Figure 1 illustrates the trend in NOx emissions from light-duty vehicles and key programs contributing to those reductions. As a result of these efforts, light-duty vehicle emissions in the Western Mojave Desert have been reduced significantly since 1990 and will continue to go down through 2020 due to the benefits of ARB's longstanding light-duty mobile source program. Key light-duty programs include Advanced Clean Cars, On-Board Diagnostics, Reformulated Gasoline, Incentive Programs, and the Enhanced Smog Check Program.

Figure 1: Key Programs to Reduce Light-Duty NOx Emissions



Since setting the nation's first motor vehicle exhaust emission standards in 1966 that led to the first pollution controls, California has dramatically tightened emission standards for light-duty vehicles. Through ARB regulations, today's new cars pollute 99 percent less than their predecessors did thirty years ago. In 1970, ARB required auto manufacturers to meet the first standards to control NOx 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) that has removed the emissions equivalent of 3.5 million vehicles from California's roads. Since ARB first adopted it in 1990, the Low Emission Vehicle Program (LEV and LEV II) and

Zero-Emission Vehicle (ZEV) Program have resulted in the production and sales of hundreds of thousands of zero-emission vehicles (ZEVs) in California.

Advanced Clean Cars

ARB'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 Zero Emission Vehicles (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 ARB's ZEV regulation, part of ACC, which affects passenger cars and light-duty trucks.

ARB's ACC Program, approved in January 2012, is a pioneering approach of a 'package' of regulations that although separate in construction, are 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 causing pollutants 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 approved by ARB in January 2012 also included amendments affecting the current ZEV regulation through the 2017 model year in order 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 in order to achieve cost reductions. The ACC Program benefits will increase over time as new cleaner cars enter the fleet displacing older and dirtier vehicles.

On Board Diagnostics

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, ARB 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. ARB 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.

Reformulated Gasoline

Since 1996, ARB 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 ARB. 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 vehicle to take full advantage of cleaner-burning gasoline properties.

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 a cleaner vehicle.

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 subsequent 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 that have either failed or passed their last Smog Check Test and 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. Approximately $30 million is available annually through 2015 to fund the EFMP via a $1 increase in vehicle registration fees. ARB 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 an ARB 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 ARB allocated up to $15-21 million to the CVRP as outlined in the AQIP FY2012-2013 Funding Plan.

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 or 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.

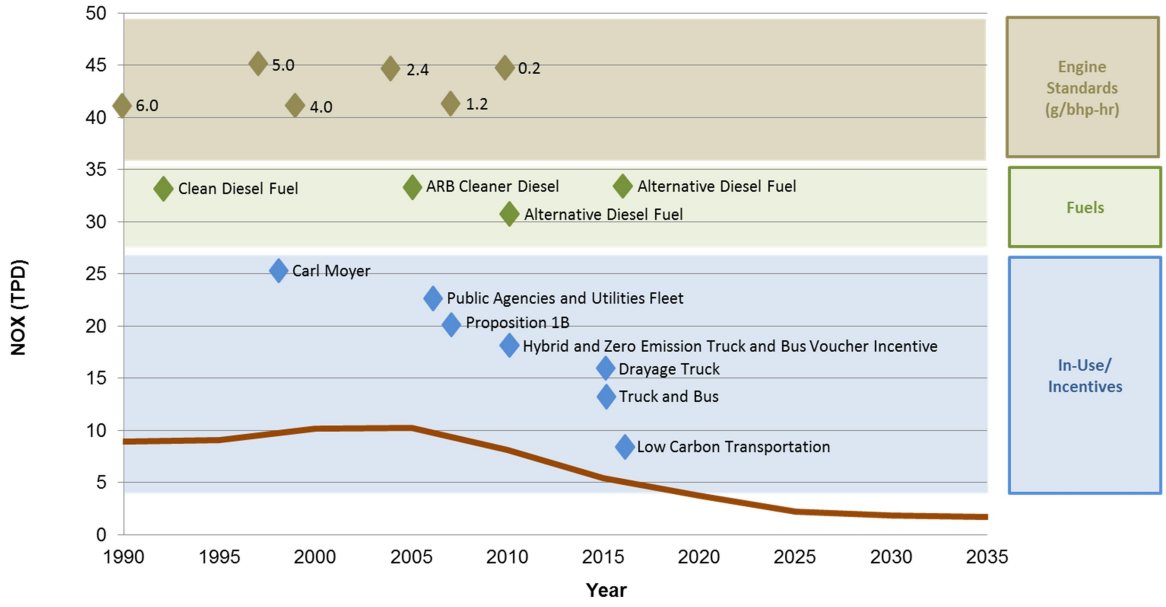
The next major change was due to AB 2289, adopted in October 2010, a new law restructuring California's Smog Check Program, streamlining and strengthening inspections, increasing penalties for misconduct, and reducing costs to motorists. This new law sponsored by ARB and BAR, promised faster and less expensive Smog Check inspections by talking 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.

Heavy-Duty Trucks

Figure 2 illustrates the trend in NOx emissions from heavy-duty vehicles and key programs contributing to those reductions. As a result of these efforts, heavy-duty vehicle emissions in the Western Mojave Desert have also been reduced significantly since 1990 and will continue to go down through 2020 due to the benefits of ARB's longstanding heavy-duty mobile source program. Key programs include Heavy-Duty

Engine Standards, Clean Diesel Fuel, Truck and Bus Regulation and Incentive Programs.

Figure 2: Key Programs to Reduce Heavy-Duty Emissions



Heavy-Duty Engine Standards

Since 1990, heavy-duty engine NOx 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 NOx standards, there have been several generations of optional lower NOx standards put in place over the past 15 years. Most recently in 2015, engine manufacturers can certify to three optional NOx 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 ARB to preferentially provide incentive funding to buyers of cleaner trucks, to encourage the development of cleaner engines.

Clean Diesel Fuel

Since 1993, ARB has required that diesel fuel have a limit on the aromatic hydrocarbon content and sulfur content of the fuel. Diesel powered vehicles account for a disproportionate amount of the diesel particulate matter which is considered a toxic air contaminant. In 2006, ARB required a low-sulfur diesel fuel to be used not only by on-road diesel vehicles but also for off-road engines. The diesel fuel regulation allows

alternative diesel formulations as long as emission reductions are equivalent to the ARB formulation.

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, ARB 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 increasingly larger 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 that are privately or federally owned, including on-road and off-road agricultural yard goats, and privately and publicly owned school buses. Moreover, the regulation applies to any person, 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 sellers of a vehicle subject to the regulation would have to disclose the regulation's potential applicability to buyers of the vehicles. Approximately 170,000 businesses in nearly all industry sectors in California, and almost a million vehicles that operate on California roads each year are affected. 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.

ARB compliance assistance and outreach activities that are key support of the Truck and Bus Regulation include:

- The Truck Regulations Upload and Compliance Reporting System, an online reporting tool developed and maintained by ARB 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.

ARB 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, ARB's approach to ensuring compliance is based on a comprehensive outreach and education effort.

Incentive Programs

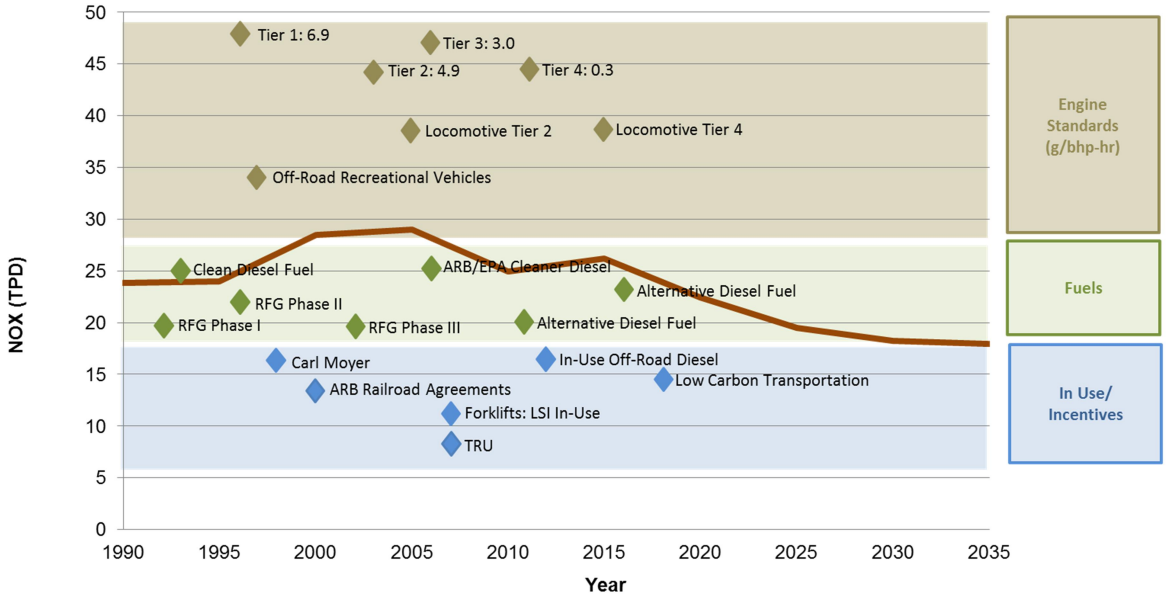
There are a number of different incentive programs focusing on heavy-duty vehicles that produce extra emission reductions beyond traditional regulations. The incentive programs encourage the purchase of a cleaner truck
.
Several State and local incentive funding pools have been used historically -- and 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 Mojave Desert and Antelope Valley participation is expected. ARB has also administered a Truck Loan Assistance Program since 2009.

Off-Road Sources

Off-road sources encompass equipment powered by an engine that does not operate on the road. Sources vary from ships to lawn and garden equipment and for example, include sources like locomotives, aircraft, tractors, harbor craft, off-road recreational vehicles, construction equipment, forklifts, and cargo handling equipment.
Figure 3 illustrates the trend in NOx emissions from off-road equipment and key programs contributing to those reductions. As a result of these efforts, off-road emissions in the Western Mojave Desert have been reduced significantly since 1990 and will continue to go down through 2020 due to the benefits of ARB's and U.S. EPA longstanding programs. Key programs include Off-Road Engine Standards, Locomotive Engine Standards, Clean Diesel Fuel, Cleaner In-Use Off-Road Regulation and In-Use LSI Fleet Regulation.

Figure 3: Key Programs to Reduce Off-Road Emissions



Off-Road Engine Standards

The Clean Air Act 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 Section 209(e)(2), but must receive authorization from U.S. EPA 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 Large Spark Ignition (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.

Locomotive Engine Standards

The Clean Air Act and the U.S. EPA 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" (U.S. EPA interpreted new engines in locomotives to mean remanufactured engines, as well). U.S. EPA has approved two sets of national locomotive emission regulations (1998 and 2008). In 1998, U.S. EPA approved the initial set of national locomotive emission regulations. These regulations primarily emphasized NOx reductions through Tier 0, 1, and 2 emission standards. Tier 2 NOx emission standards reduced older uncontrolled locomotive NOx emissions by up to 60 percent, from 13.2 to 5.5 g/bhphr.

In 2008, U.S. EPA 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. U.S. EPA 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 NOx and PM emission standards. The U.S. EPA Tier 4 NOx and PM emission standards further reduced emissions by approximately 95 percent from uncontrolled levels.

Clean Diesel Fuel

Since 1993, ARB has required that diesel fuel have a limit on the aromatic hydrocarbon content and sulfur content of the fuel. Diesel powered vehicles account for a disproportionate amount of the diesel particulate matter which is considered a toxic air contaminant. In 2006, ARB required a low-sulfur diesel fuel to be used not only by on-road diesel vehicles but also for off-road engines. The diesel fuel regulation allows alternative diesel formulations as long as emission reductions are equivalent to the ARB formulation.

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

The Off-Road Regulation which was first approved in 2007 and subsequently amended in 2010 in light of the impacts of the economic recession. These off-road vehicles are used in construction, manufacturing, the rental industry, road maintenance, and 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 NOx 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 by 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 ARB 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 ARB staff.
- The Diesel Hotline (866-6DIESEL), which provides the regulated public with questions about the regulations and access to ARB 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 reminders for deadlines.

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 in order 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.