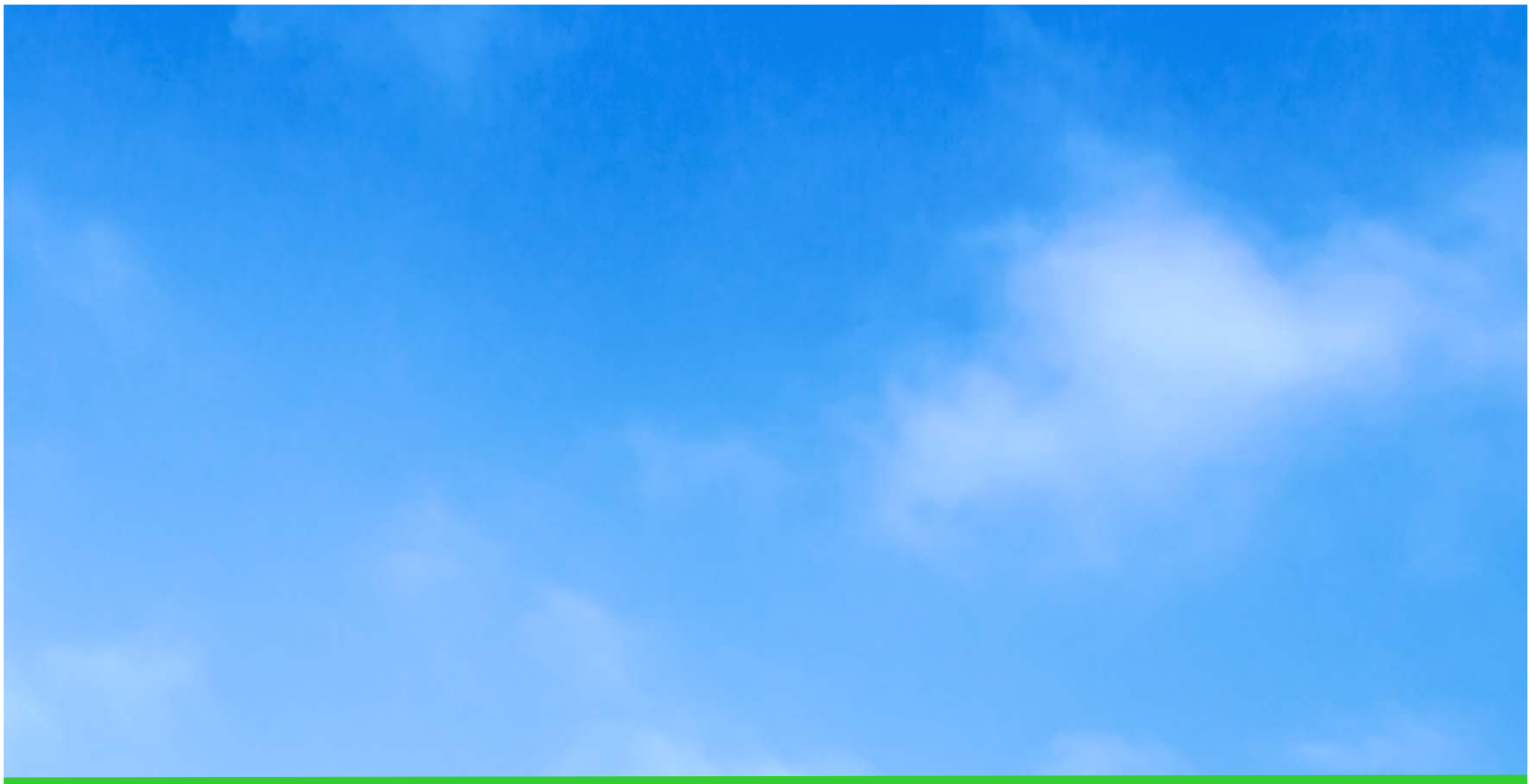
Chapter 2

Air Quality and Health Effects

The air pollution problem in the Basin is the result of a combination of emissions, meteorological conditions and the mountainous terrain surrounding the region. High air pollution levels can have an adverse effect on public health and result in not meeting federal and State air quality standards.

In This Chapter



Introduction

The South Coast Air Basin's air pollution problems are a consequence of the combination of emissions from the nation's second largest urban area, meteorological conditions adverse to the dispersion of those emissions, and mountainous terrain surrounding the Basin that traps pollutants as they are pushed inland with the sea breeze. The average wind speed for Los Angeles is the lowest of the nation's 10 largest urban areas. In addition, the summertime daily maximum mixing heights[1] in Southern California are the lowest, on average, due to strong temperature inversions in the lower atmosphere that effectively trap pollutants near the surface. Southern California also has abundant sunshine, which drives the photochemical reactions that form pollutants such as ozone (O_3) and a significant portion of fine particulate mass (PM2.5, particles less than 2.5 microns in diameter).

In the Basin, high concentrations of ozone are normally recorded during the late spring and summer months, when more intense sunlight drives enhanced photochemical reactions. Elevated PM10 (particles less than 10 microns in diameter) and PM2.5 concentrations can occur in the Basin throughout the year, but occur most frequently in fall and winter. Although there are some changes in emissions by day-of-week and season, the observed variations in pollutant concentrations are primarily the result of seasonal differences in weather conditions.

Chapter 1 introduces the National Ambient Air Quality Standards (NAAQS or federal standards), as well as the District's attainment status and progress toward meeting those standards. U.S. EPA has set NAAQS for six principal pollutants, which are called "criteria" pollutants, including ozone, PM (PM10 and PM2.5), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb).

In this chapter, ambient air quality as monitored by SCAQMD is summarized for the year 2015, along with prior year trends, in both the Basin and the Riverside County portion of the Salton Sea Air Basin (SSAB), which is primarily the Coachella Valley. The District's recent air quality is compared to the NAAQS and to the California Ambient Air Quality Standards (CAAQS or State standards). Data presented indicate the current attainment or nonattainment status for the various NAAQS and CAAQS, showing the progress made to date and assisting the District in planning for future attainment. Maps are included to spatially compare the air quality throughout the Basin in 2015, for ozone and PM2.5, the main pollutants for which the U.S. EPA has designated the Basin to be a federal nonattainment area. Nationwide air quality data is also briefly summarized in this chapter, comparing air quality in the Basin to that of other major U.S. and California urban areas. Additional details on current air quality and trends and comparisons to the federal and State standards, including spatial and temporal variability and location-specific air monitoring data can be found in Appendix II: Current Air Quality.

The health effects due to exposure to criteria air pollutants are briefly discussed in this chapter. More detailed information on the health effects of air pollution can be found in Appendix I: Health Effects. In addition to the information presented in this chapter for the Coachella Valley, current air quality and trend

[1] The maximum mixing height is an index of how well pollutants can be dispersed vertically in the atmosphere.

information specific to that planning area is also included in Chapter 7, along with the ozone attainment demonstration SIP for that area.

The Basin is designated non-attainment for current and former federal and State ozone standards, as well as the current PM2.5 standards. The Los Angeles County portion of the Basin is also designated a nonattainment area for the federal lead standard on the basis of source-specific monitoring at two locations as determined by U.S. EPA using 2007–2009 data. However, all stations in the Basin, including the near-source monitoring in Los Angeles County, have remained below the lead NAAQS for the 2012 through 2015 period. The District will request that U.S. EPA re-designate the Los Angeles County portion of the Basin as attainment for lead.

In June 2013, the U.S. EPA approved re-designation of the Basin as an attainment area for the 24-hour PM10 federal standard. The Basin also continues to be in attainment of the CO, NO_2, and SO_2 NAAQS. The Coachella Valley remains a nonattainment area for both the ozone and the PM10 NAAQS. However, with recent data from a new monitoring station and consideration of high-wind exceptional events, a re-designation to attainment of the PM10 NAAQS should be possible in the near future. Further details on the federal and State standards are presented in this chapter by pollutant, along with the District's current attainment status.

Ambient Air Quality Standards

Federal and State Standards

Ambient air quality standards have been set by both the federal government and the State of California for six air pollutants: Ozone, CO, NO_2, SO_2, PM (includes both PM10 and PM2.5), and lead. The State has also set a standard for sulfates (SO_4^{2-}), which are a component of particulate matter, and a nuisance odor standard for hydrogen sulfide (H_2S). The NAAQS and CAAQS for each of these pollutants and their effects on health and welfare are summarized in Table 2-1.

Two changes to the NAAQS have occurred since the 2012 AQMP. In a final rulemaking action on January 15, 2013, effective March 18, 2014, U.S. EPA strengthened the annual average PM2.5 standard from 15 to 12 $\mu g/m^3$. This rule also required near-roadway PM2.5 monitoring at two locations in the Basin, which was implemented by the January 1, 2015 U.S. EPA deadline. Since this NAAQS rule was proposed in 2012, it is often referred to as the 2012 annual PM2.5 federal standard.

Most recently, on October 1, 2015, U.S. EPA finalized the new 2015 ozone standard at 0.070 ppm for an 8-hour average, retaining the same form as the previous 8-hour standards. The 2015 ozone NAAQS became effective as of December 28, 2015. Attainment/nonattainment designations are expected to be finalized for the new standard by October 1, 2017, likely based on 2014–2016 ozone measurement data. It is expected that the Basin and the Coachella Valley, as well as much of California, will be designated nonattainment. SIP submittals to demonstrate attainment of the 2015 ozone standard will likely be due in the 2020–2021 time frame, with attainment dates between 2020 and 2037, depending on the severity of the ozone problem.

In this chapter and in Appendix II: Current Air Quality, air quality statistics are presented for the maximum concentrations measured at stations in each of the SCAQMD air basins, as well as for the number of days

exceeding State or federal standards. These metrics are instructive with regard to trends and control strategy effectiveness. However, it should be noted that an exceedance of the concentration level of a federal standard does not necessarily mean that the NAAQS was violated or that it would cause nonattainment. The form of the standard must also be considered. For example, for 24-hour PM2.5, the form of the standard is the annual 98th percentile measurement of all of the 24-hour PM2.5 daily samples at each station. For 8-hour ozone, the form of the standard is the annual fourth highest measured 8-hour average daily maximum concentration at each station.

For NAAQS attainment/nonattainment decisions, the most recent three years of data are considered (one year for CO and 24-hour SO_2), along with the form of the standard, to calculate a *design value* for each station.[2] The overall design value for an air basin is the highest design value of all the stations in that basin. Table 2-2 shows the NAAQS, along with the design value and form of each federal standard. The California State air quality standards are values not to be exceeded, typically evaluated over a 3-year period, and the data is evaluated in terms of a *State designation value*, which allows for some statistical data outliers and exceptional events. Attainment deadlines for the State standards are 'as soon as practicable.'

[2] Note that for modeling attainment demonstrations, the U.S. EPA modeling guidance requires a 5-year weighted average for the design value instead of the 3-year.

TABLE 2-1

Ambient Air Quality Standards and Key Health and Welfare Effects

AIR POLLUTANT	FEDERAL STANDARD (NAAQS)	STATE STANDARD (CAAQS)	KEY HEALTH & WELFARE EFFECTS[#]
	Concentration, Averaging Time, Year of NAAQS Review	Concentration, Averaging Time	
Ozone (O_3)	**0.070 ppm, 8-Hour (2015)** 0.075 ppm, 8-Hour (2008) 0.08 ppm, 8-Hour (1997) 0.12 ppm, 1-Hour (1979)	**0.070 ppm, 8-Hour** **0.09 ppm, 1-Hour**	(a) Pulmonary function decrements and localized lung injury in humans and animals; (b) Risk to public health implied by alterations in pulmonary morphology and host defense in animals; (c) Increased mortality risk; (d) Increased respiratory related hospital admissions and emergency room visits; (e) Vegetation damage; (f) Property damage
Fine Particulate Matter (PM2.5)	**35 µg/m³, 24-Hour (2006)** **12.0 µg/m³, Annual (2012)** 15.0 µg/m³, Annual (1997)	**12 µg/m³, Annual**	(a) Exacerbation of symptoms in sensitive patients with respiratory or cardiovascular disease; (b) Decline in pulmonary function or growth in children; (c) Increased risk of premature death; (d) Increased risk of lung cancer; (e) increased asthma-related hospital admissions; (f) increased school absences and lost work days; (g) possible link to reproductive effects; (h) visibility reduction
Respirable Particulate Matter (PM10)	**150 µg/m³, 24-Hour (1997)**	**50 µg/m³, 24-Hour** **20 µg/m³, Annual**	
Carbon Monoxide (CO)	**35 ppm, 1-Hour (1971)** **9 ppm, 8-Hour (1971)**	**20 ppm, 1-Hour** **9.0 ppm, 8-Hour**	(a) Aggravation of angina pectoris and other aspects of coronary heart disease; (b) Decreased exercise tolerance in persons with peripheral vascular disease and lung disease; (c) Possible impairment of central nervous system functions; (d) Possible increased risk to fetuses
Nitrogen Dioxide (NO_2)	**100 ppb, 1-Hour (2010)** **0.053 ppm, Annual (1971)**	**0.18 ppm, 1-Hour** **0.030 ppm, Annual**	(a) Potential to aggravate chronic respiratory disease and respiratory symptoms in children with asthma; (b) Increased airway responsiveness in asthmatics; (c) Contribution to atmospheric discoloration
Sulfur Dioxide (SO_2)	**75 ppb, 1-Hour (2010)**	**0.25 ppm, 1-Hour** **0.04 ppm, 24-Hour**	Respiratory symptoms (bronchoconstriction, possible wheezing or shortness of breath) during exercise or physical activity in persons with asthma
Lead (Pb)	**0.15 µg/m³,** **rolling 3-month average (2008)**	**1.5 µg/m³, 30-day average**	(a) Learning disabilities; (b) Impairment of blood formation and nerve conduction; (c) cardiovascular effects, including coronary heart disease and hypertension
Sulfates-PM10 (SO_4^{2-})	**N/A**	**25 µg/m³, 24-Hour**	(a) Decrease in lung function; (b) Aggravation of asthmatic symptoms; (c) Vegetation damage; (d) Degradation of visibility; (e) Property damage
Hydrogen Sulfide (H_2S)	**N/A**	**0.03 ppm, 1-hour**	Exposure to lower ambient concentrations above the standard may result in objectionable odor and may be accompanied by symptoms such as headaches, nausea, dizziness, nasal irritation, cough, and shortness of breath

ppm – parts per million by volume; ppb – parts per billion by volume (0.01 ppm = 10 ppb)
Standards in bold are the current, most stringent standards; there may be continuing obligations for former standards
State standards are "not-to-exceed" values based on State designation value calculations
Federal standards follow the 3-year design value form of the NAAQS

[#] List of health and welfare effects is not comprehensive; detailed health effects information can be found in Appendix I: Health Effects or in the U.S. EPA NAAQS documentation at http://www.epa.gov/ttn/naaqs/

TABLE 2-2

National Ambient Air Quality Standards (NAAQS) and Design Value Requirements

Pollutant	Averaging Time**	NAAQS Level	Design Value Form of NAAQS*
Ozone (O_3)	1-Hour (1979) [revoked 2005]	0.12 ppm	Not to be exceeded more than once per year averaged over 3 years
	8-Hour (2015)	**0.070 ppm**	**Annual fourth highest 8-hour average concentration, averaged over 3 years**
	8-Hour(2008) [revised 2015]	0.075 ppm	
	8-Hour(1997) [revoked 2015]	0.08 ppm	
Fine Particulate Matter (PM2.5)	**24-Hour (2006)**	**35 µg/m³**	**3-year average of the annual 98th percentile of daily 24-hour concentration**
	Annual (2012)	**12.0 µg/m³**	**Annual average concentration, averaged over 3 years** *(annual averages based on average of 4 quarters)*
	Annual (1997) [revised 2012]	15.0 µg/m³	
Respirable Particulate Matter (PM10)	**24-Hour (1987)**	**150 µg/m³**	**Not to be exceeded more than once per year averaged over 3 years**
	Annual (1987) [revoked 2006]	50 µg/m³	Annual average concentration, averaged over 3 years
Carbon Monoxide (CO)	**1-Hour (1971)**	**35 ppm**	**Not to be exceeded more than once a year**
	8-Hour (1971)	**9 ppm**	
Nitrogen Dioxide (NO_2)	**1-Hour (2010)**	**100 ppb**	**3-year avg. of the annual 98th percentile of the daily maximum 1-hour average concentrations (rounded)**
	Annual (1971)	**0.053 ppm**	**Annual avg. concentration, averaged over 3 years**
Sulfur Dioxide (SO_2)	**1-Hour (2010)**	**75 ppb**	**99th percentile of 1-hour daily maximum concentrations, averaged over 3 years**
	24-Hour (1971)#	0.14 ppm	Not to be exceeded more than once per year
	Annual (1971)#	0.03 ppm	Annual arithmetic average
Lead (Pb)	**3-Month Rolling Average (2008)##**	**0.15 µg/m³**	**Highest rolling 3-month average of the 3 years**

Bold text denotes the current and most stringent NAAQS

* The NAAQS is attained when the design value (form of concentration listed) is equal to or less than the level of the NAAQS; for pollutants with the design values based on "exceedances" (1-hour ozone, 24-hour PM10, CO, and 24-hour SO_2), the NAAQS is attained when the concentration associated with the design value is less than or equal to the standard level:

- For 1-hour ozone and 24-hour PM10, the NAAQS is attained when the fourth highest daily concentrations of the 3-year period is less than or equal to the standard level
- For CO and 24-hour SO_2, the standard is attained when the second highest daily concentration of the most recent year is equal to or less than the standard level

** Year of U.S. EPA NAAQS update review shown in parenthesis and revoked or revised status in brackets; for revoked or revised NAAQS, areas may have continuing obligations until that standard is attained: for 1-hour ozone, the Basin has continuing obligations under the former 1979 standard; for 8-hour ozone, the NAAQS was lowered from 0.08 ppm to 0.075 ppm to 0.070 ppm, but the previous 8-hour ozone NAAQS and most related implementation rules remain in place until that standard is attained

Annual and 24-hour SO_2 NAAQS are expected to be revoked 12/2021, one year from final attainment designations for the (2010) 1-hour SO_2 NAAQS expected 12/2020

3-month rolling averages of the first year (of the three year period) include November and December monthly averages of the prior year; the 3-month average is based on the average of "monthly" averages

Under the Exceptional Events Rule,[3] U.S. EPA allows certain air quality data to not be considered for NAAQS attainment status when that data is influenced by exceptional events that meet strict evidence requirements, such as high winds, wildfires, volcanoes, or some cultural events (such as Independence Day or New Year's fireworks). For a few PM measurements in the Basin and the Coachella Valley in 2012 through 2015, the District applied the U.S. EPA Exceptional Events Rule to flag some PM10 and PM2.5 data due to high-wind natural events, wildfires, and fireworks on Independence Day and New Year's Eve. All of the exceptional event flags through 2015 have been submitted with the affected data to U.S. EPA's Air Quality System (AQS) database. The preparation of the District's documentation for those events that effect regulatory decisions is under way and U.S. EPA concurrence will be requested. The process to achieve PM10 re-designation for the Coachella Valley to attainment status will likely depend upon U.S EPA's concurrence with the exceptional event flags and the appropriate treatment of high-wind natural events that are uncontrollable in spite of stringent control measures on anthropogenic emissions.

Attainment Status

Figure 2-1 shows the South Coast and Coachella Valley 3-year design values (2013–2015) for ozone, PM2.5, and PM10, as a percentage of the corresponding current and former federal standards. The current status of NAAQS attainment for all the criteria pollutants is presented in Table 2-3 for the Basin and in Table 2-4 for the Riverside County portion of the SSAB (Coachella Valley).

[3] The U.S. EPA Exceptional Events Rule, *Treatment of Data Influenced by Exceptional Events*, became effective May 21, 2007. The previous U.S. EPA *Natural Events Policy* for Particulate Matter was issued May 30, 1996. On September 16, 2016, U.S. EPA promulgated revisions to the Exceptional Event Rule.

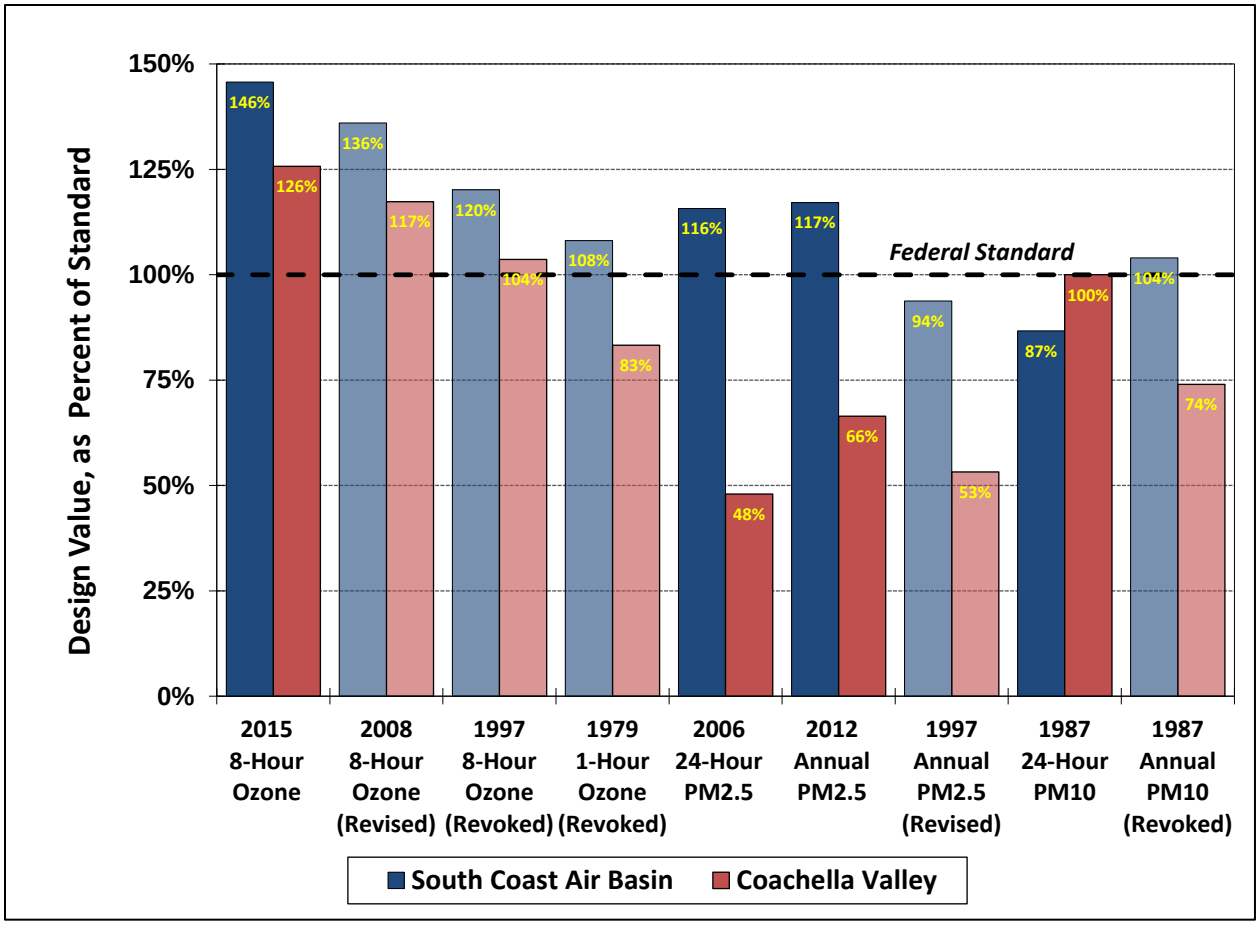


FIGURE 2-1

SOUTH COAST AIR BASIN AND COACHELLA VALLEY 2013–2015 3-YEAR DESIGN VALUES

(PERCENTAGE OF CURRENT AND FORMER FEDERAL STANDARDS, BY CRITERIA POLLUTANT; PM10 DATA FLAGGED FOR EXCEPTIONAL EVENTS EXCLUDED BUT SUPPORTING DOCUMENTATION AND U.S. EPA CONCURRENCE STILL NEEDED; PM10 DATA SHOWN USES COMBINED FEDERAL REFERENCE METHOD AND FEDERAL EQUIVALENT DATA; DARKER COLORS INDICATE THE MOST STRINGENT STANDARD)

TABLE 2-3

National Ambient Air Quality Standards (NAAQS) Attainment Status - South Coast Air Basin

Criteria Pollutant	Averaging Time	Designation[a]	Attainment Date[b]
Ozone (O_3)	(1979) **1-Hour** (0.12 ppm)[c]	Nonattainment ("extreme")	2/26/2023 (revised deadline)
	(2015) **8-Hour** (0.070 ppm)[d]	Pending – Expect Nonattainment ("extreme")	Pending (beyond 2032)
	(2008) **8-Hour** (0.075 ppm)[d]	Nonattainment ("extreme")	7/20/2032
	(1997) **8-Hour** (0.08 ppm)[d]	Nonattainment ("extreme")	6/15/2024
PM2.5[e]	(2006) **24-Hour** (35 µg/m^3)	Nonattainment ("serious")	12/31/2019
	(2012) **Annual** (12.0 µg/m^3)	Nonattainment ("moderate")	12/31/2021
	(1997) **Annual** (15.0 µg/m^3)	Attainment (final determination pending)	4/5/2015 (attained 2013)
PM10[f]	(1987) **24-hour** (150 µg/m^3)	Attainment (Maintenance)	7/26/2013 (attained)
Lead (Pb)[g]	(2008) **3-Months Rolling** (0.15 µg/m^3)	Nonattainment (Partial) (Attainment determination to be requested)	12/31/2015
CO	(1971) **1-Hour** (35 ppm)	Attainment (Maintenance)	6/11/2007 (attained)
	(1971) **8-Hour** (9 ppm)	Attainment (Maintenance)	6/11/2007 (attained)
NO_2[h]	(2010) **1-Hour** (100 ppb)	Unclassifiable/Attainment	N/A (attained)
	(1971) **Annual** (0.053 ppm)	Attainment (Maintenance)	9/22/1998 (attained)
SO_2[i]	(2010) **1-Hour** (75 ppb)	Designations Pending (expect Unclassifiable/Attainment)	N/A (attained)
	(1971) **24-Hour** (0.14 ppm) (1971) **Annual** (0.03 ppm)	Unclassifiable/Attainment	3/19/1979 (attained)

a) U.S. EPA often only declares Nonattainment areas; everywhere else is listed as Unclassifiable/Attainment or Unclassifiable

b) A design value below the NAAQS for data through the full year or smog season prior to the attainment date is typically required for an attainment demonstration

c) The 1979 1-hour ozone NAAQS (0.12 ppm) was revoked, effective 6/15/05 ; however, the Basin has not attained this standard and therefore has some continuing obligations with respect to the revoked standard; original attainment date was 11/15/2010; the revised attainment date is 2/6/23

d) The 2008 8-hour ozone NAAQS (0.075 ppm) was revised to 0.070 ppm, effective 12/28/15 with classifications and implementation goals to be finalized by 10/1/17; the 1997 8-hour ozone NAAQS (0.08 ppm) was revoked in the 2008 ozone NAAQS implementation rule, effective 4/6/15; there are continuing obligations under the revoked 1997 and revised 2008 ozone NAAQS until they are attained

e) The attainment deadline for the 2006 24-hour PM2.5 NAAQS was 12/31/15 for the former "moderate" classification; U.S.EPA approved reclassification to "serious," effective 2/12/16 with an attainment deadline of 12/31/2019; the 2012 (proposal year) annual PM2.5 NAAQS was revised on 1/15/13, effective 3/18/13, from 15 to 12 µg/m^3; new annual designations were final 1/15/15, effective 4/15/15; on July 25, 2016 U.S. EPA finalized a determination that the Basin attained the 1997 annual (15.0 µg/m^3) and 24-hour PM2.5 (65 µg/m^3) NAAQS, effective August 24, 2016

f) The annual PM10 NAAQS was revoked, effective 12/18/06; the 24-hour PM10 NAAQS deadline was 12/31/2006; the Basin's Attainment Re-designation Request and PM10 Maintenance Plan was approved by U.S. EPA on 6/26/13, effective 7/26/13

g) Partial Nonattainment designation – Los Angeles County portion of the Basin only for near-source monitors; expect to remain in attainment based on current monitoring data; attainment re-designation request pending

h) New 1-hour NO_2 NAAQS became effective 8/2/10, with attainment designations 1/20/12; annual NO_2 NAAQS retained

i) The 1971 annual and 24-hour SO2 NAAQS were revoked, effective 8/23/10; however, these 1971 standards will remain in effect until one year after U.S. EPA promulgates area designations for the 2010 SO2 1-hour NAAQS; final area designations expected by 12/31/20 due to new source-specific monitoring requirements; Basin expected to be in attainment due to ongoing clean data

TABLE 2-4

National Ambient Air Quality Standards (NAAQS) Attainment Status
Coachella Valley Portion of the Salton Sea Air Basin

Criteria Pollutant	Averaging Time	Designation[a]	Attainment Date[b]
Ozone (O_3)	(1979) **1-Hour** (0.12 ppm)[c]	Attainment	11/15/2007 (attained 12/31/2013)
	(2015) **8-Hour** (0.070 ppm)[d]	Pending – Expect Nonattainment (Severe)	Pending
	(2008) **8-Hour** (0.075 ppm)[d]	Nonattainment (Severe-15)	7/20/2027
	(1997) **8-Hour** (0.08 ppm)[d]	Nonattainment (Severe-15)	6/15/2019
PM2.5[e]	(2006) **24-Hour** (35 µg/m^3)	Unclassifiable/Attainment	N/A (attained)
	(2012) **Annual** (12.0 µg/m^3)	Unclassifiable/Attainment	N/A (attained)
	(1997) **Annual** (15.0 µg/m^3)	Unclassifiable/Attainment	N/A (attained)
PM10[f]	(1987) **24-hour** (150 µg/m^3)	Nonattainment ("serious")	12/31/2006
Lead (Pb)	(2008) **3-Months Rolling** (0.15 µg/m^3)	Unclassifiable/Attainment	Unclassifiable/ Attainment
CO	(1971) **1-Hour** (35 ppm)	Unclassifiable/Attainment	N/A (attained)
	(1971) **8-Hour** (9 ppm)	Unclassifiable/Attainment	N/A (attained)
NO_2[g]	(2010) **1-Hour** (100 ppb)	Unclassifiable/Attainment	N/A (attained)
	(1971) **Annual** (0.053 ppm)	Unclassifiable/Attainment	N/A (attained)
SO_2[h]	(2010) **1-Hour** (75 ppb)	Designations Pending	N/A
	(1971) **24-Hour** (0.14 ppm) (1971) **Annual** (0.03 ppm)	Unclassifiable/Attainment	Unclassifiable/ Attainment

a) U.S. EPA often only declares Nonattainment areas; everywhere else is listed as Unclassifiable/Attainment or Unclassifiable

b) A design value below the NAAQS for data through the full year or smog season prior to the attainment date is typically required for an attainment demonstration

c) The 1979 1-hour ozone NAAQS (0.12 ppm) was revoked, effective 6/15/05; the Southeast Desert Modified Air Quality Management Area, including the Coachella Valley, had not timely attained this standard by the 11/15/07 "severe-17" deadline, based on 2005-2007 data; on 8/25/14, U.S. EPA proposed a clean data finding based on 2011–2013 data and a determination of attainment for the former 1-hour ozone NAAQS for the Southeast Desert nonattainment area; this rule was finalized by U.S. EPA on 4/15/15, effective 5/15/15, that included preliminary 2014 data

d) The 2008 8-hour ozone NAAQS (0.075 ppm) was revised to 0.070 ppm, effective 12/28/15 with classifications and implementation goals to be finalized by 10/1/17; the 1997 8-hour ozone NAAQS (0.08 ppm) was revoked in the 2008 ozone NAAQS implementation rule, effective 4/6/15; there are continuing obligations under the 1997 and 2008 ozone NAAQS until they are attained

e) The annual PM2.5 standard was revised on 1/15/13, effective 3/18/13, from 15 to 12 µg/m^3

f) The annual PM10 standard was revoked, effective 12/18/06; the 24-hour PM10 NAAQS attainment deadline was 12/31/2006; the Coachella Valley Attainment Re-designation Request and PM10 Maintenance Plan was postponed by U.S. EPA pending additional monitoring and analysis in the southeastern Coachella Valley

g) New 1-hour NO_2 NAAQS became effective 8/2/10; attainment designations 1/20/12; annual NO_2 NAAQS retained

h) The 1971 Annual and 24-hour SO_2 NAAQS were revoked, effective 8/23/10; however, these 1971 standards will remain in effect until one year after U.S. EPA promulgates area designations for the 2010 SO_2 1-hour standard; final area designations expected by 12/31/2020 with SSAB expected to be designated Unclassifiable/Attainment

The current status of CAAQS attainment for the pollutants with State standards is presented in Table 2-5 for the Basin and the Riverside County portion of the SSAB (Coachella Valley).

TABLE 2-5

California Ambient Air Quality Standards (CAAQS) Attainment Status
South Coast Air Basin and Coachella Valley portion of Salton Sea Air Basin

Pollutant	Averaging Time and Level[b]	Designation[a]	
		South Coast Air Basin	Coachella Valley
Ozone (O_3)	**1-Hour** (0.09 ppm)[c]	Nonattainment	Nonattainment
	8-Hour (0.070 ppm)[d]	Nonattainment	Nonattainment
PM2.5	**Annual** (12.0 µg/m^3)	Nonattainment	Attainment
PM10	**24-Hour** (50 µg/m^3)	Nonattainment	Nonattainment
	Annual (20 µg/m^3)	Nonattainment	Nonattainment
Lead (Pb)	**30-Day Average** (1.5 µg/m^3)	Attainment	Attainment
CO	**1-Hour** (20 ppm)	Attainment	Attainment
	8-Hour (9.0 ppm)	Attainment	Attainment
NO_2	**1-Hour** (0.18 ppm)	Attainment	Attainment
	Annual (0.030 ppm)	Attainment	Attainment
SO_2	**1-Hour** (0.25 ppm)	Attainment	Attainment
	24-Hour (0.04 ppm)	Attainment	Attainment
Sulfates	**24-Hour** (25 µg/m^3)	Attainment	Attainment
H_2S[c]	**1-Hour** (0.03 ppm)	Unclassified	Unclassified [c)]

a) CA State designations shown were updated by CARB in 2016, based on the 2013–2015 3-year period; stated designations are based on a 3-year data period after consideration of outliers and exceptional events; Source: http://www.arb.ca.gov/desig/statedesig.htm#current

b) CA State standards, or CAAQS, for ozone, CO, SO_2, NO_2, PM10 and PM2.5 are values not to be exceeded; lead, sulfates, and H_2S standards are values not to be equaled or exceeded; CAAQS are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations

c) SCAQMD began monitoring H_2S in the southeastern Coachella Valley in November 2013 due to odor events related to the Salton Sea; three full years of data are not yet available for a State designation, but nonattainment is anticipated for the H_2S CAAQS in at least part of the Coachella Valley

The 1979 federal 1-hour ozone standard (0.12 ppm) was revoked by the U.S. EPA and replaced by the 8-hour average ozone standard (0.08 ppm), effective June 15, 2005. However, the Basin and the former Southeast Desert Modified Air Quality Management Area (which included the Coachella Valley) had not attained the 1-hour federal ozone NAAQS by the attainment dates in 2010 and 2007, respectively, and, therefore, had continuing obligations under the former standard. On August 25, 2014, U.S. EPA

proposed a clean data determination based on 2011-2013 data and a determination of attainment for the 1-hour ozone NAAQS for the Southeast Desert nonattainment area. This rule was finalized, with the inclusion of the preliminary 2014 ozone data, by U.S. EPA on April 15, 2015, effective May 15, 2015. The Basin has not yet attained the 1-hour ozone NAAQS.

The 1997 8-hour ozone NAAQS was subsequently strengthened from 0.08 ppm to 0.075 ppm, effective May 27, 2008. The 1997 8-hour ozone standard was revoked in implementation rules for the 2008 ozone NAAQS, effective April 6, 2015. On October 1, 2015, U.S. EPA again strengthened the 8-hour ozone NAAQS to 0.070 ppm, effective December 28, 2015, retaining the same form as the previous 1997 and 2008 standards. Attainment designations for the new 2015 standard are expected to be finalized by late 2017, with SIP attainment demonstrations likely due in 2020 or 2021. The 2008 ozone NAAQS is a primary focus of this AQMP, as it is the SIP submittal to demonstrate future attainment of the 2008 standard. While the statistics presented in this chapter, and in Appendix II: Current Air Quality, primarily refer to the current (2015) and former (2008) 8-hour ozone standards, the former 1997 8-hour and 1979 1-hour ozone standards will also be presented, to show the progress toward those standards and for historical comparison.

In 2015, one or more stations in the Basin exceeded the most current federal standards on a total of 146 days (40 percent of the year), including: 8-hour ozone (113 days over the 2015 ozone NAAQS), 24-hour PM2.5 (30 days, including near-road sites; 25 days for ambient sites only), PM10 (2 days), and NO_2 (1 day). Despite substantial improvement in air quality over the past few decades, some air monitoring stations in the Basin still exceed the NAAQS for ozone more frequently than any other areas in the United States. Seven of the top 10 stations in the nation most frequently exceeding the 2015 8-hour ozone NAAQS in 2015 were located within the Basin, including stations in San Bernardino, Riverside, and Los Angeles Counties. Regarding the former ozone NAAQS,[4] 81 days exceeded the revised 2008 8-hour ozone NAAQS, 47 days exceeded the revoked 1997 8-hour ozone NAAQS, and 10 days exceeded the revoked 1-hour ozone NAAQS at one or more stations in the Basin in 2015. Table 2-6 summarizes the number of days exceeding current and former federal and State 1-hour and 8-hour ozone standard levels by county in the Basin and the Coachella Valley in 2015.

[4] While the former federal 8-hour and 1-hour ozone NAAQS have been revised or revoked by U.S. EPA, nonattainment areas, including the Basin, still have continuing obligations under each standard until it is attained.

TABLE 2-6

2015 Number of Days Exceeding Current and Former Ozone Standards
at the Peak Station by Basin and County

Basin/County	2015 # Days > Current (2015) 8-Hour Ozone NAAQS (0.070 ppm)	Area of Max Current Federal Standard Exceedances	2015 # Days > Former (2008) 8-Hour Ozone NAAQS (0.075 ppm)	2015 # Days > Former (1997) 8-Hour Ozone NAAQS (0.08 ppm)	2015 # Days > Former (1979) 1-Hour Ozone NAAQS (0.12 ppm)	2015 # Days > Current 8-Hour State Ozone Standard (0.07 ppm)	2015 # Days > Current 1-Hour State Ozone Standard (0.09 ppm)
South Coast Air Basin							
Los Angeles	74	Santa Clarita Valley	54	25	4	80	52
Orange	12	Saddleback Valley	4	0	0	14	5
Riverside	76	Metropolitan Riverside County	51	29	2	81	43
San Bernardino	**102**	**Central San Bernardino Mountains**	**75**	**42**	**8**	**102**	**65**
Salton Sea Air Basin							
Riverside	58	Coachella Valley (Palm Springs)	30	5	0	54	3

Bold text denotes the peak value

The 2015 8-hour ozone NAAQS became effective at the end of 2015; the 2008 ozone NAAQS was still in effect during the 2014 and 2015 ozone seasons; 2014–2016 data will likely be evaluated by U.S. EPA for 2015 ozone NAAQS attainment determinations; although the 2015 8-hour NAAQS and the 8-hour CAAQS are both at an equivalent level, the rounding conventions differ

PM2.5 levels in the Basin have improved significantly in recent years. By 2013 and again in 2014 and 2015, there were no stations measuring PM2.5 in the Basin violating the former 1997 annual PM2.5 NAAQS (15.0 µg/m^3) for the 3-year design value period with the filter-based federal reference method (FRM).[5] On July 25, 2016 U.S. EPA finalized a determination that the Basin attained the 1997 annual (15.0 µg/m^3) and 24-hour PM2.5 (65 µg/m^3) NAAQS, effective August 24, 2016. Of the 17 FRM PM2.5 monitors at ambient stations in the Basin and the Coachella Valley for the 2013–2015 period, five stations had design values over the current 2012 annual PM2.5 NAAQS (12.0 µg/m^3), including: Mira Loma (Basin maximum at 14.1 µg/m^3), Rubidoux, Fontana, Ontario (2013 and 2014 data only, prior to closing), Central Los Angeles, and Compton. The new near-road PM2.5 measurements, now fully implemented at two

[5] SCAQMD also employs continuous monitors at several stations in the Basin to provide real-time data for the public and to support daily air quality forecasting. U.S. EPA has granted SCAQMD a waiver from using these continuous monitors for regulatory/attainment determination purposes, since they do not meet the accuracy requirements to be considered federal equivalent method (FEM) measurements.

stations, will be evaluated for NAAQS compliance once sufficient data has been collected. These source-specific measurements are often higher than the nearest ambient measurements and may affect the Basin-wide design value. The Coachella Valley is in attainment of both the annual and 24-hour PM2.5 NAAQS.

In 2015, 14 of the stations in the Basin with FRM PM2.5 monitors had one or more PM2.5 daily average concentrations exceeding the level of the federal 24-hour PM2.5 NAAQS (35.0 µg/m^3), with a total of 25 days over that standard in the Basin (30 days with the new near-road stations included). However, in the 2013–2015 period, only two stations (in Metropolitan Riverside County at Mira Loma and Rubidoux), had design values over the 24-hour PM2.5 NAAQS.[6] While it was previously anticipated that the Basin 24-hour PM2.5 NAAQS would be attained by 2015, this did not occur, based on the data for 2013 through 2015. The higher number of days exceeding the 24-hour NAAQS, over what was expected based on the current control strategy, is largely attributed to the severe drought conditions in California in the past three years. The deficit of normal storm systems from late fall through the winter and early spring allowed for more stagnant conditions in the Basin and multi-day buildups of higher PM2.5 concentrations. This was caused by the lack of storm-related dispersion and rain-out of PM and its precursors.

The Basin is in attainment of the current PM10 24-hour NAAQS. The Coachella Valley monitored data also shows that it will meet the PM10 NAAQS, pending SCAQMD documentation submittal and subsequent U.S. EPA approval of days flagged for high-wind exceptional events. However, U.S. EPA has requested that SCAQMD conduct additional monitoring in the southeastern portion of the Coachella Valley before a re-designation can be considered. This station has been in operation since 2013 in the community of Mecca, so the District intends to propose that a re-designation decision can be based on the 2014–2016 or 2015–2017 period when the data is finalized and exceptional event exclusions can be addressed.

The District continues to be in attainment of the NAAQS for SO_2, CO, and NO_2. While the concentration level of the current 1-hour NO_2 federal standard (100 ppb) was exceeded in the Basin at one station on one day in 2015 (in the South Los Angeles County Coastal Area at the Long Beach – Hudson station), the NAAQS NO_2 design value[7] has not been exceeded. Therefore, the Basin remains in attainment of the NO_2 NAAQS. The near-road NO_2 and CO measurements, now completely phased in, will also be evaluated for NAAQS compliance once sufficient data has been collected. These source-specific NO_2 and CO measurements are often higher than the nearest ambient measurements. However, the longest running NO_2 near-road station, on I-5 in Anaheim, did not exceed the level of the NAAQS since the measurements began on January 1, 2014. Likewise, a shorter period of data from the other stations has also not exceeded the level of the NO_2 NAAQS to date. Similarly, the near-road CO measurements have not exceeded the level of the CO NAAQS to date.

U.S. EPA designated the Los Angeles County portion of the Basin (excluding the San Clemente and Santa Catalina Islands and the Antelope Valley) as nonattainment for the revised (2008) federal lead standard (0.15 µg/m^3, rolling 3-month average). This designation was based on two source-specific monitors in Vernon and in the City of Industry exceeding the 2008 standard over the 2007–2009 period. For the

[6] The 24-hour PM2.5 design value is based on the annual 98th percentile concentration for each station averaged over the 3-year period; for stations that monitor every day, this is typically the eighth highest concentration.

[7] The 1-hour NO_2 design value is the 3-year average of the annual 98th percentile of the daily 1-hour maximums.

most recent two design value periods, 2012–2014 and 2013–2015, no stations in Los Angeles County showed violations of the federal lead standard, with a maximum 3-month rolling average 2013–2015 design value of 0.08 $\mu g/m^3$ (at the highest source-specific monitor at the beginning of 2013). A request to U.S. EPA to re-designate Los Angeles County to attainment of the lead NAAQS is being prepared. The remainder of the Basin outside the Los Angeles County nonattainment area, as well as the Coachella Valley, remain in attainment of the 2008 lead standard, including both ambient monitors and source-oriented monitors.

Current Air Quality

In 2015, ozone, PM2.5, PM10, and NO_2 peak values exceeded federal standard concentration levels at one or more of the routine monitoring stations in the Basin, while ozone and PM10 exceeded those standard levels in the Coachella Valley. However, an exceedance of the concentration level does not necessarily mean a violation of the NAAQS, because the design value form of the standard must also be considered for attainment determination. For example, the 2015 1-hour maximum NO_2 concentration in the Basin was 101 ppb at the Long Beach – Hudson station, but the Basin did not violate the federal NO_2 NAAQS, based on the form of the standard, because the station's 98^{th} percentile daily maximum hourly concentration was not over the federal standard of 100 ppb for the 2013–2015 period.

At this time, the only pollutants in the Basin with design values in violation of the respective NAAQS are ozone, (all current and former federal standards) and PM2.5 (current annual and 24-hour federal standards). In the Coachella Valley, only ozone has design values in violation of the NAAQS for the current and former 8-hour federal ozone standards. The Coachella Valley is expected to be in attainment of the 24-hour PM10 NAAQS, after accounting for days with high-wind natural events through the U.S. EPA Exceptional Event Rule.

Figure 2-2 shows the trend of the Basin maximum 3-year design value concentrations for ozone (1-hour and 8-hour) and PM2.5 (24-hour and annual) since 1995, as percentages of the corresponding current federal standards (note that PM2.5 monitoring began in 1999 so the first 3-year design value was in 2001). Although there is some year-to-year variability, these pollutants show significant improvement over the years, with PM2.5 showing the most dramatic decreases.

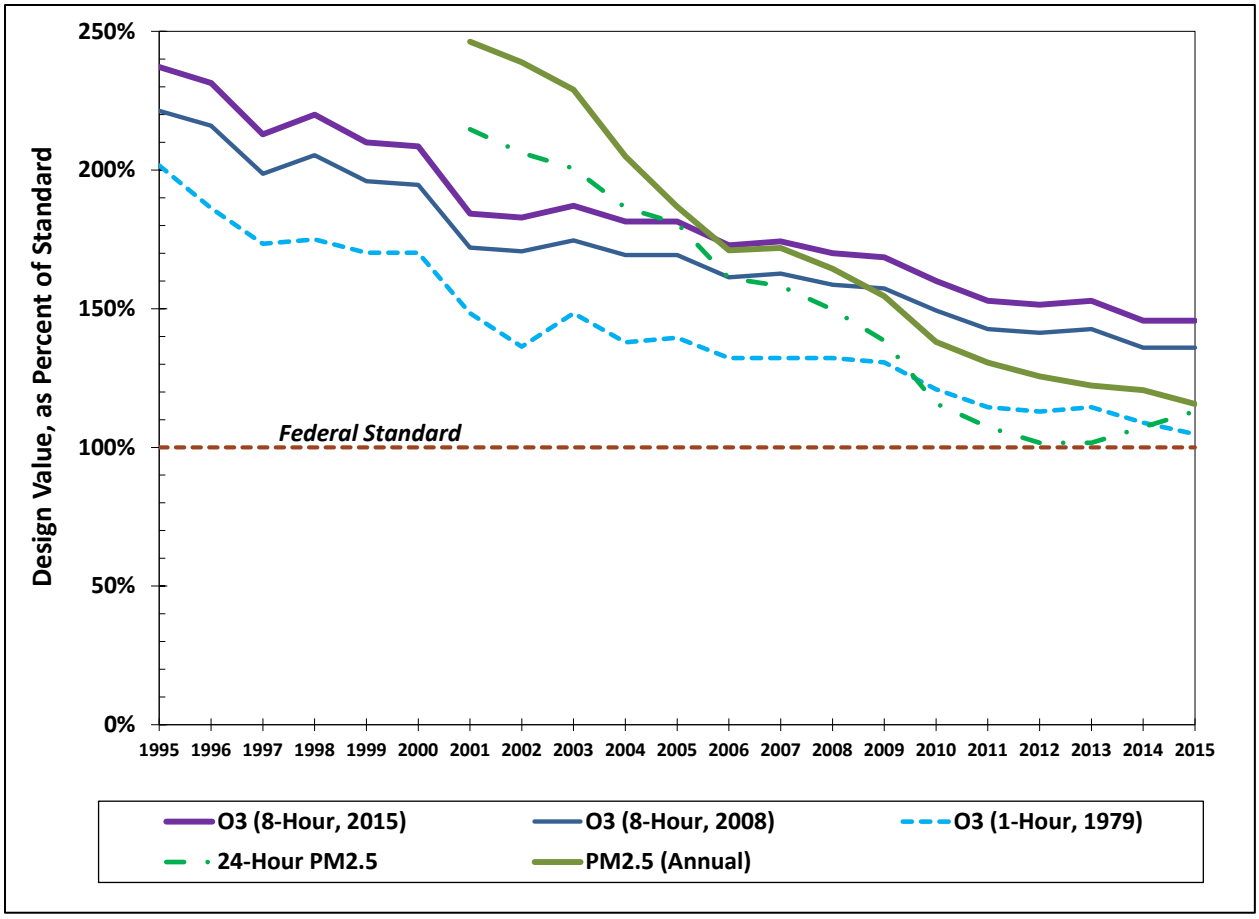


FIGURE 2-2

TRENDS OF SOUTH COAST AIR BASIN MAXIMUM 3-YEAR DESIGN VALUES FOR OZONE (2015 8-HOUR, 2008 8-HOUR, AND 1979 1-HOUR NAAQS) AND PM2.5 (24-HOUR AND ANNUAL), 1995–2015
(AS PERCENTAGES OF CURRENT FEDERAL STANDARDS)

Monitoring Network Status

There have been some changes to the SCAQMD ambient air monitoring network since the previous AQMP, which was finalized in 2012 and summarized air quality through 2011. A new special-purpose monitoring station was added, starting in January 2013, in the southeastern Coachella Valley in the City of Mecca to measure PM10 and hydrogen sulfide (H_2S). A second H_2S monitor was added on Torres-Martinez tribal property to measure naturally occurring odors from the Salton Sea close to the shoreline.

Long-term monitoring stations at North Long Beach and Burbank had to be closed due to lease decisions beyond the District's control; replacements for these two stations are being sought at this time. Filter-based PM2.5 measurements have continued at North Long Beach until a suitable replacement station can be obtained. The PM10 and PM2.5 monitors at the Ontario Fire Station were also removed in 2014, due to lack of space at the Ontario site. The Riverside-Magnolia station was also closed at the end of 2014, with those measurements (PM2.5, lead, CO and NO_2) consolidated at the nearby Riverside-Rubidoux station in 2015. Replacements for the Ontario Fire Station and Riverside-Magnolia air monitoring stations are not required and the measurements from these locations are well-represented by other SCAQMD stations.

To implement recent U.S. EPA requirements to monitor NO_2, CO, and PM2.5 near major roadways in large urban areas, four new near-road monitoring stations were installed. The NO_2 measurements began on January 1, 2014 at a near-road site at Vernon Street in Anaheim, Orange County, adjacent to Interstate Highway 5. This was followed by a new near-road site near Etiwanda Avenue in San Bernardino County next to Interstate Highway 10 in July 2014. CO measurements began at both the I-5 and I-10 near-road sites in December 2014. These two sites represent high traffic volume routes. Near-road NO_2 and PM2.5 measurements began in 2015 next to California Highway 60, west of Vineyard Avenue near the San Bernardino/Riverside County border, and next to Interstate Highway 710, at Long Beach Blvd. in Los Angeles County. These two sites represent high traffic volumes with a high fraction of diesel truck traffic.

The near-road monitoring is source-specific, that is, the pollutant measurements are directly impacted by the close proximity of the traffic-related emissions from the roadways. As a result, higher measured air pollutant concentrations are generally expected at the near-road sites than those found further away from the freeways. The near-road measurements provide representative pollutant exposure information for people who live, work, or go to school adjacent to freeways or who spend significant time traveling on the busiest southern California roadways. Once sufficient near-road data is collected for a full 3-year design value[8] calculation, it can be included in analyses for attainment of the NAAQS.

[8] A design value is a statistic that describes the air quality status of a given area relative to the level and form of the NAAQS. For most criteria pollutants, the design value is a 3-year average and takes into account the form of the short-term standard (e.g., 98th percentile, fourth high value, etc.). Design values can also be calculated for standards that are exceedance-based (e.g., 1-hour ozone and 24-hour PM10) so that they can be expressed as a concentration instead of an exceedance count, in order to allow a direct comparison to the level of the standard. Note that the modeling design values used for the AQMP attainment demonstration are based on a 5-year period, weighted toward the center year, as specified in U.S. EPA modeling guidelines.

Ozone (O_3)

Health Effects, Ozone

The adverse effects of ozone air pollution exposure on health have been studied for many years, as documented by a significant body of peer-reviewed scientific research, including studies conducted in Southern California. The 2013 U.S. EPA document, *Integrated Science Assessment of Ozone and Related Photochemical Oxidants*,[9] describes these health effects and discusses the state of the scientific knowledge and research. A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

Individuals working outdoors, children (including teenagers), older adults, people with preexisting lung disease, such as asthma, and individuals with certain nutritional deficiencies are considered to be the sub-groups most susceptible to ozone effects. Short-term exposures (lasting for a few hours) to ozone at levels typically observed in Southern California can result in breathing pattern changes, reduction of breathing capacity, increased susceptibility to infections, inflammation of the lung tissue, and some immunological changes. Elevated ozone levels are associated with increased school absences and daily hospital admission rates, as well as increased mortality. An increased risk for asthma has been found in children who participate in multiple sports and live in high-ozone communities.

Ozone exposure under exercising conditions is known to increase the severity of respiratory symptoms. Although lung volume and airway resistance changes observed after a single exposure diminish with repeated exposures, biochemical and cellular changes appear to persist, which can lead to subsequent lung structural changes.

Air Quality, Ozone

In 2015, SCAQMD routinely monitored ambient ozone at 29 locations in the Basin and the Coachella Valley portion of the SSAB. The 2015 Basin maximum ozone concentrations continued to exceed federal standards by wide margins, although significant improvement has been achieved through the years. Figure 2-3 shows the trend from 1976 through 2015 of the annual number of Basin days exceeding various metrics for ozone. These metrics include the 1-hour Stage 1[10] level (0.20 ppm), the 1-hour Health Advisory level (0.15 ppm), the former (1979) 1-hour NAAQS (0.12 ppm), the former (1997 and 2008) 8-hour NAAQS (0.08 and 0.075 ppm), and the new 2015 8-hour NAAQS (0.070 ppm). All the ozone trends

[9] U.S. EPA. (2013). Integrated Science Assessment of Ozone and Related Photochemical Oxidants (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-10/076F. http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=247492.

[10] While the 1-hour ozone episode levels and the related 1-hour ozone health warnings still exist, they are essentially replaced by the more protective health warnings associated with the current 8-hour ozone NAAQS. The 1-hour ozone episode warning levels include the State Health Advisory (0.15 ppm), Stage 1 (0.20 ppm), Stage 2 (0.35 ppm), and Stage 3 (0.50 ppm). The State 1-hour ozone Health Advisory was last exceeded in the Basin in 2013. The Basin's last 1-hour ozone Stage 1 episode occurred in 2003. The last 1-hour ozone Stage 2 episode occurred in 1988 and the last Stage 3 episode occurred in 1974.

show significant improvements achieved through the period. However, they also show the need for continued efforts in order to meet all the 8-hour ozone standards and the 1979 1-hour standard.

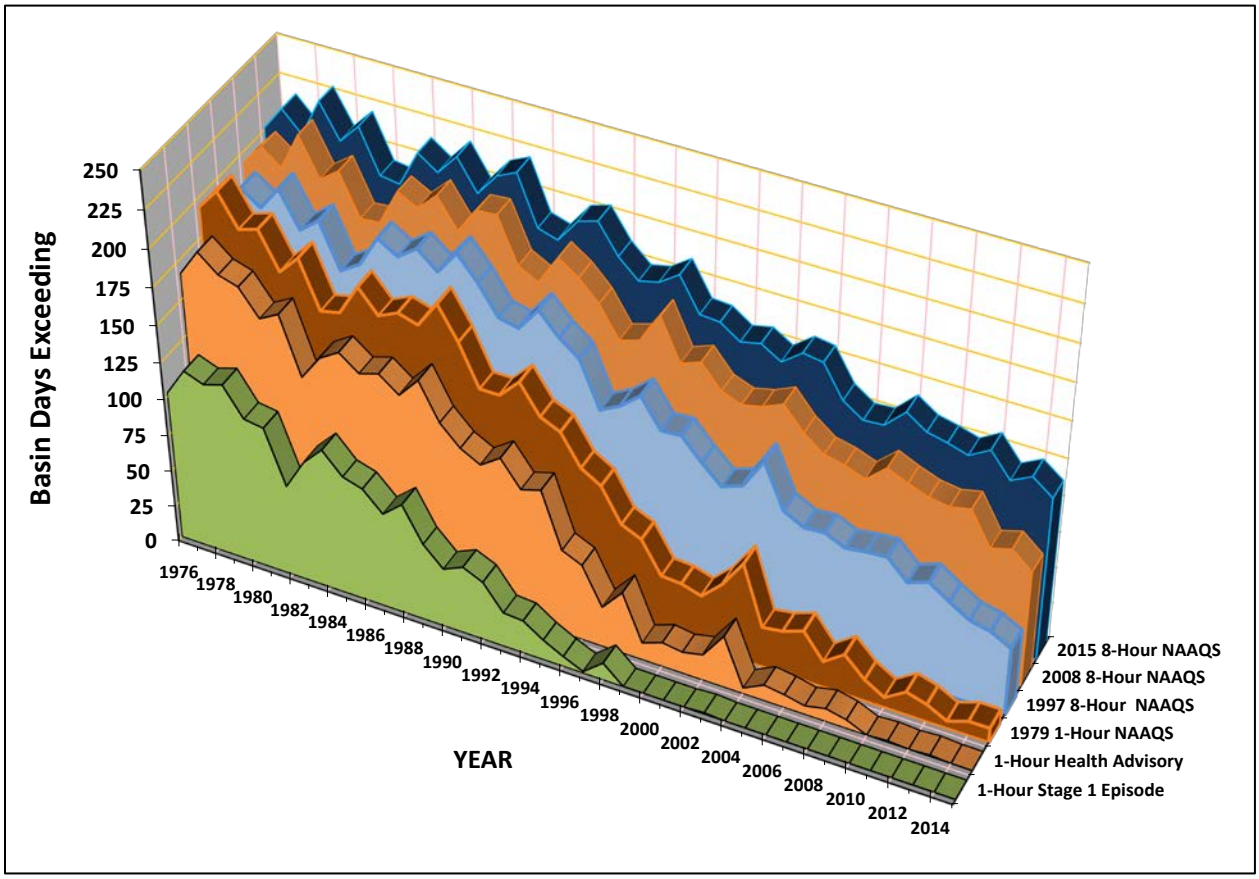


FIGURE 2-3

TREND OF NUMBER OF BASIN DAYS EXCEEDING CURRENT AND FORMER OZONE NAAQS AND 1-HOUR OZONE EPISODE LEVELS (HEALTH ADVISORY AND STAGE-1), 1976 THROUGH 2015

All counties in the Basin, as well as the Coachella Valley, exceeded the level of the new 2015 (0.070 ppm) and the former 2008 (0.075 ppm) and 1997 (0.08 ppm) 8-hour ozone NAAQS in 2015. While not all stations had days exceeding the previous 8-hour standards, all monitoring stations had at least one day over the 2015 federal standard, except the coastal station near the Port of Los Angeles/Long Beach in South Coastal Los Angeles County (Elisabeth Hudson Elementary School station).

On one or more days in the Basin, the 2015 ozone federal standard was exceeded on a total of 113 days exceeded in 2015 (81 days over the 2008 standard and 47 days over the 1997 standard). 2015 had the fewest days exceeding the 8-hour ozone standards than were recorded in any previous year since these measurements began. The 8-hour State ozone standard (0.070 ppm, although the rounding convention differs from federal standard) was exceeded in the Basin on 115 days in 2015. The Coachella Valley exceeded the 2015 8-hour ozone NAAQS on 47 days (26 days for the 2008 ozone NAAQS, five days for the 1997 ozone NAAQS, and 51 days for the State 8-hour ozone NAAQS). The station with the highest

number of days in 2015 over the 2015, 2008, and 1997 8-hour federal ozone standards (86, 61, and 30 days, respectively) was in the Central San Bernardino Mountains (Crestline-Lake Gregory). The 2015 maximum 8-hour average ozone concentration of 0.127 ppm was also measured at the Central San Bernardino Mountains station.

When compared to the design value form of the federal standard, all four of the Basin's counties were above the 2015 8-hour ozone NAAQS for the 2013–2015 design values. Three of the Basin's four counties (all but Orange County) were above both the 2008 and 1997 8-hour ozone NAAQS for the 2013-2015 design values. The Basin's highest 2013–2015 8-hour ozone design value (0.102 ppm, measured in the Central San Bernardino Mountains at Crestline-Lake Gregory) was 146 percent of the 2015 8-hour ozone NAAQS (136 percent of the 2008 NAAQS and 121 percent of the 1997 NAAQS). This was the same as the 2014 peak Basin design value and they were the lowest maximum 8-hour ozone design values in the Basin since ozone measurements began. Table 2-7 shows the 2015 maximum 8-hour ozone concentrations and design values by air basin and county, compared to current and former federal, and current State standards.

TABLE 2-7

2015 Maximum 8-Hour Average Ozone Concentrations and Design Values by Basin and County

Basin/ County	2015 Maximum 8-Hour Ozone Average (ppm)	2013–2015 8-Hour Ozone Design Value (ppm)	Percent of Current (2015) 8-Hour Ozone NAAQS (0.070 ppm)	Percent of Former (2008) 8-Hour Ozone NAAQS (0.075 ppm)	Percent of Former (1997) 8-Hour Ozone NAAQS (0.08 ppm)	Area of Design Value Maximum	2013–2015 8-Hour Ozone State Designation Value# (ppm)	Percent of State 8-hour Ozone Standard (0.070 ppm)
South Coast Air Basin								
Los Angeles	0.108	0.094	134	125	112	Santa Clarita Valley	0.109	**156**
Orange	0.088	0.075	107	100*	89	Saddleback Valley	0.082	117
Riverside	0.105	0.093	133	124	111	Metropolitan Riverside County	0.106	151
San Bernardino	**0.127**	**0.102**	**146**	**136**	**121**	**Central San Bernardino Mountains**	**0.114**	**163**
Salton Sea Air Basin								
Riverside	0.092	0.088	126	117	105	Coachella Valley (Palm Springs)	0.093	133

Bold text denotes the peak value

* 100 percent of the NAAQS is not violating that standard

\# The *State 8-Hour Designation Value* is the highest State 8-hour ozone average, rounded to three decimal places, during the last 3 years (State designation value source: https://www.arb.ca.gov/adam/select8/sc8start.php)

All monitored locations measured maximum 1-hour average ozone concentrations well below the Stage 1 episode level (0.20 ppm, 1-hour) and below the ozone health advisory level (0.15 ppm, 1-hour) in 2015. Except for one day in 2003 (at a special-purpose monitor in the San Bernardino Mountains), the Stage 1 ozone episode level has not been exceeded in the Basin since 1998.

The Basin exceeded the level of the revoked (1979) 1-hour federal ozone standard (0.12 ppm) on 10 days in 2015, with exceedances in Los Angeles, Riverside, and San Bernardino Counties; Orange County did not exceed the 1979 standard. The most exceedances of the former 1-hour standard in 2015 (6 days) occurred in the Central San Bernardino Valley at the San Bernardino air monitoring station. The 2015 peak 1-hour ozone concentration in the Basin was 0.144 ppm, measured in the Central San Bernardino Mountains (Crestline-Lake Gregory air monitoring station). This value was slightly higher than the 2014 peak of 0.141 ppm, which was the Basin's lowest annual peak 1-hour concentration since ozone measurements started in the mid-1950s. In the Coachella Valley, 1-hour ozone concentrations did not exceed the revoked 1-hour federal standard in 2015 and the peak 1-hour concentration of 0.102 ppm was the lowest annual peak ever monitored in that area. The State 1-hour ozone standard (0.09 ppm) was exceeded in the Basin on 71 days and in the Coachella Valley on 3 days.

The calculated peak 2013–2015 1-hour ozone design value[11] (0.130 ppm in the Central San Bernardino Mountains at the Crestline-Lake Gregory air monitoring station) was 104 percent of the former 1-hour NAAQS. The Coachella Valley design value did not exceed the former 1-hour federal ozone standard in 2015 and has remained in attainment of the former NAAQS since 2008. Table 2-8 shows the 2015 maximum 1-hour ozone concentrations and calculated design values by air basin and county, compared to the former federal and current State standards.

[11] The former 1979 1-hour ozone NAAQS allows for one exceedance per year on average when averaged over three years. The calculated design value is the fourth highest value over a 3-year period, allowing the design value to be expressed in terms of a concentration. When shown in parts-per-million to 3 decimal places the design value is compared to 0.125 ppm, which would exceed the NAAQS.

TABLE 2-8

2015 Maximum 1-Hour Average Ozone Concentrations and Design Values by Basin and County

Basin/ County	2015 Maximum 1-Hour Ozone Average (ppm)	2013–2015 1-Hour Ozone Design Value (ppm)	Percent of Former (1979) 1-Hour Ozone NAAQS (0.125 ppm)	Area of Design Value Max	2013–2015 1-Hour Ozone State Designation Value# (ppm)	Percent of State 1-Hour Ozone Standard (0.09 ppm)
South Coast Air Basin						
Los Angeles	0.136	0.127	102	East San Gabriel Valley	**0.13**	**144**
Orange	0.103	0.102	82	North Orange County & Saddleback Valley	0.10	111
Riverside	0.132	0.121	97	Metropolitan Riverside County	**0.13**	**144**
San Bernardino	**0.144**	**0.130**	**104**	**Central San Bernardino Mountains**	**0.13**	**144**
Salton Sea Air Basin						
Riverside	0.102	0.104	83	Coachella Valley (Palm Springs)	0.11	122

Bold text denotes the peak value

The *State 1-Hour Designation Value* is the highest hourly ozone measurement during the last 3 years, rounded to two decimal places. In practice, the designation value is the highest measured concentration in the 3-year period that remains, after excluding measurements identified as affected by highly irregular or infrequent events (State designation value source: https://www.arb.ca.gov/adam/select8/sc8start.php)

The number of days exceeding the current and former ozone standards in the Basin varies widely by area. Figures 2-4 through 2-6 map the number of days in 2015 exceeding the new 2015 8-hour ozone NAAQS and the former 2008 and 1997 8-hour ozone NAAQS in different areas of the Basin. The number of exceedances of the federal 8-hour ozone standards was lowest in the coastal areas, due in large part to the prevailing sea breeze which transports emissions inland before photochemistry produces high ozone concentrations. The concentrations increase downwind towards the Riverside County valleys and the San Bernardino County valleys and adjacent mountain areas, as well as the area around Santa Clarita in Los Angeles County. The Central San Bernardino Mountains area recorded the greatest number of exceedances of the current and former 8-hour federal standards (86 days for the 2015 ozone NAAQS, 61 days for the 2008 NAAQS, and 30 days for the 1997 NAAQS).

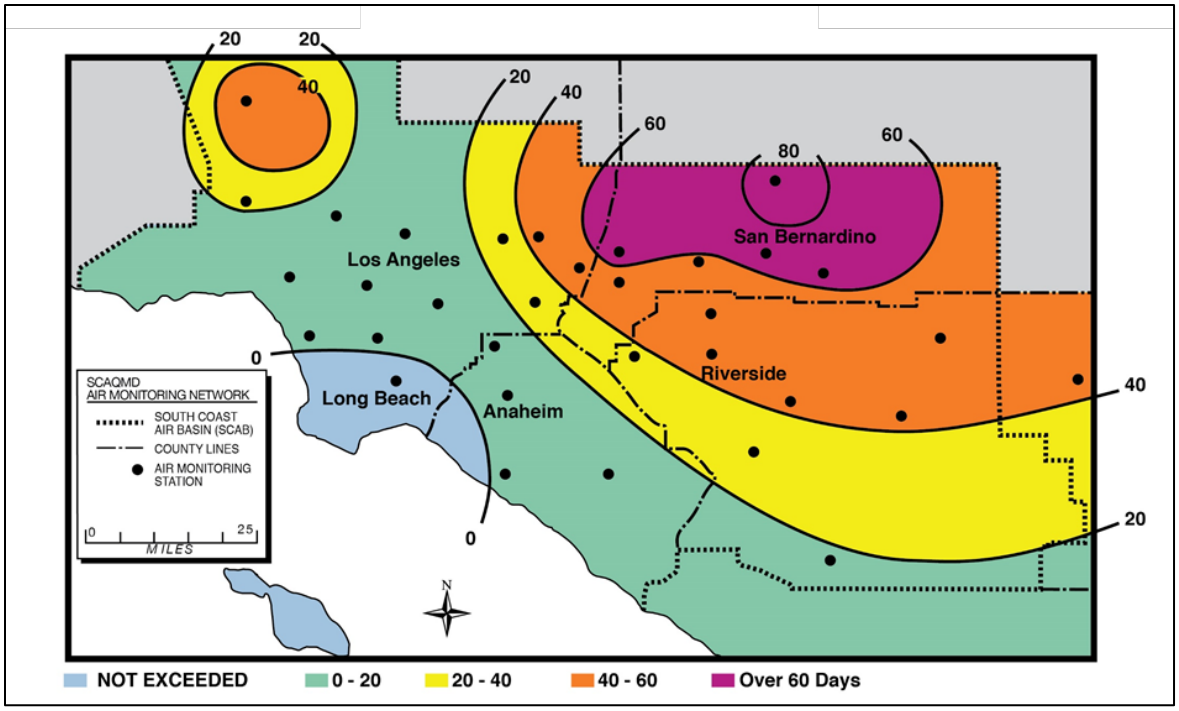


FIGURE 2-4

NUMBER OF DAYS IN 2015 EXCEEDING THE 2015 8-HOUR OZONE FEDERAL STANDARD

(8-HOUR AVERAGE OZONE > 0.070 PPM)

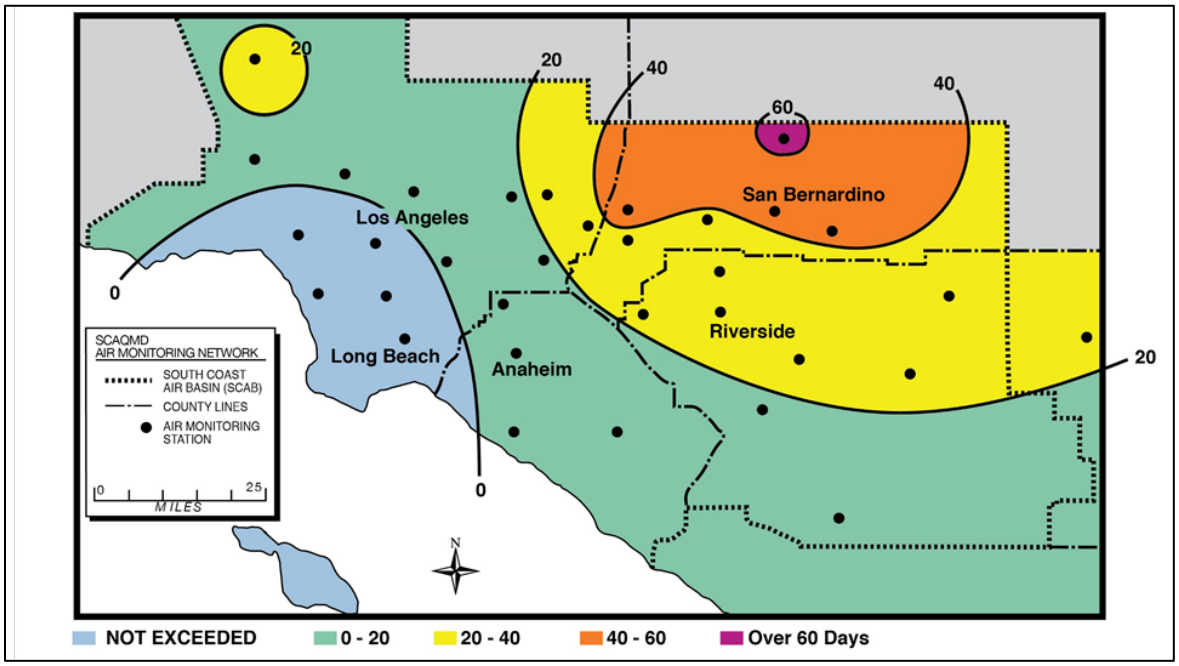


FIGURE 2-5

NUMBER OF DAYS IN 2015 EXCEEDING THE REVISED 2008 8-HOUR OZONE FEDERAL STANDARD

(8-HOUR AVERAGE OZONE > 0.075 PPM)

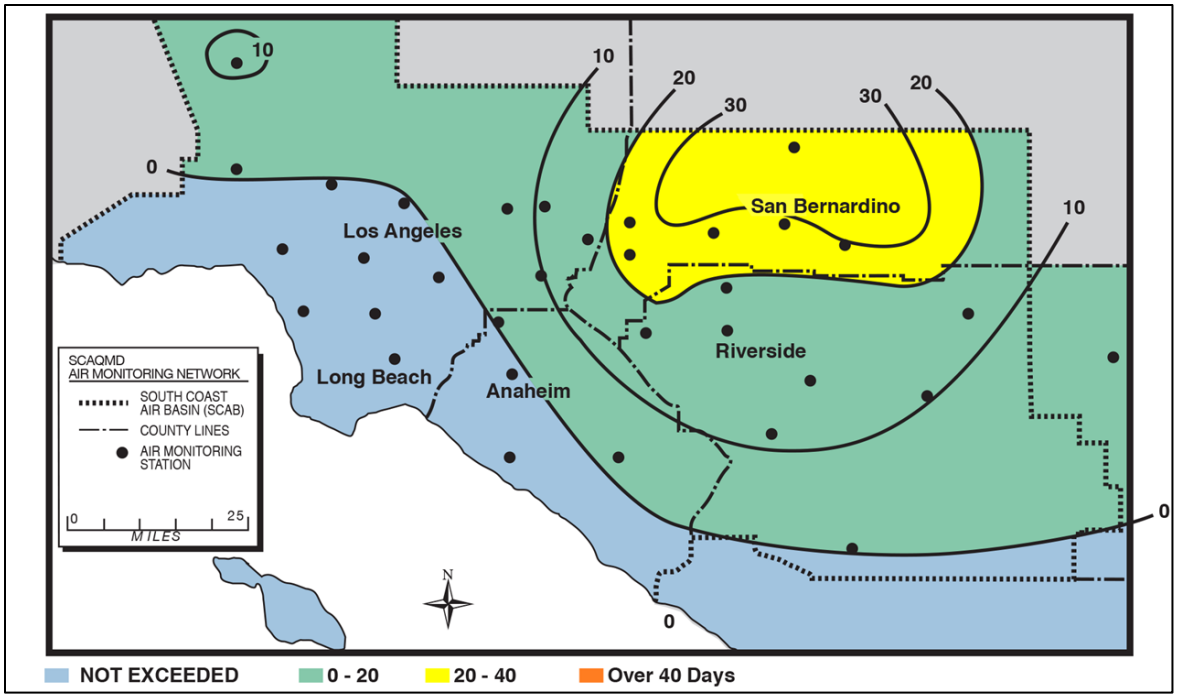


FIGURE 2-6

NUMBER OF DAYS IN 2015 EXCEEDING THE REVOKED 1997 8-HOUR OZONE FEDERAL STANDARD

(8-HOUR AVERAGE OZONE > 0.08 PPM)

Figure 2-7 maps the number of days in 2015 exceeding the revoked 1979 1-hour ozone NAAQS in different areas of the Basin. The former 1-hour federal standard was not exceeded in a large portion of the Basin. It was exceeded the most (six days) in the Central San Bernardino Valley at the San Bernardino air monitoring station. Exceedances of the 1-hour ozone standard extended to all areas monitored in San Bernardino County and in Metropolitan Riverside County, as well as in Santa Clarita and the eastern San Gabriel Valley in Los Angeles County. The Coachella Valley did not exceed the former 1-hour ozone standard in 2015.

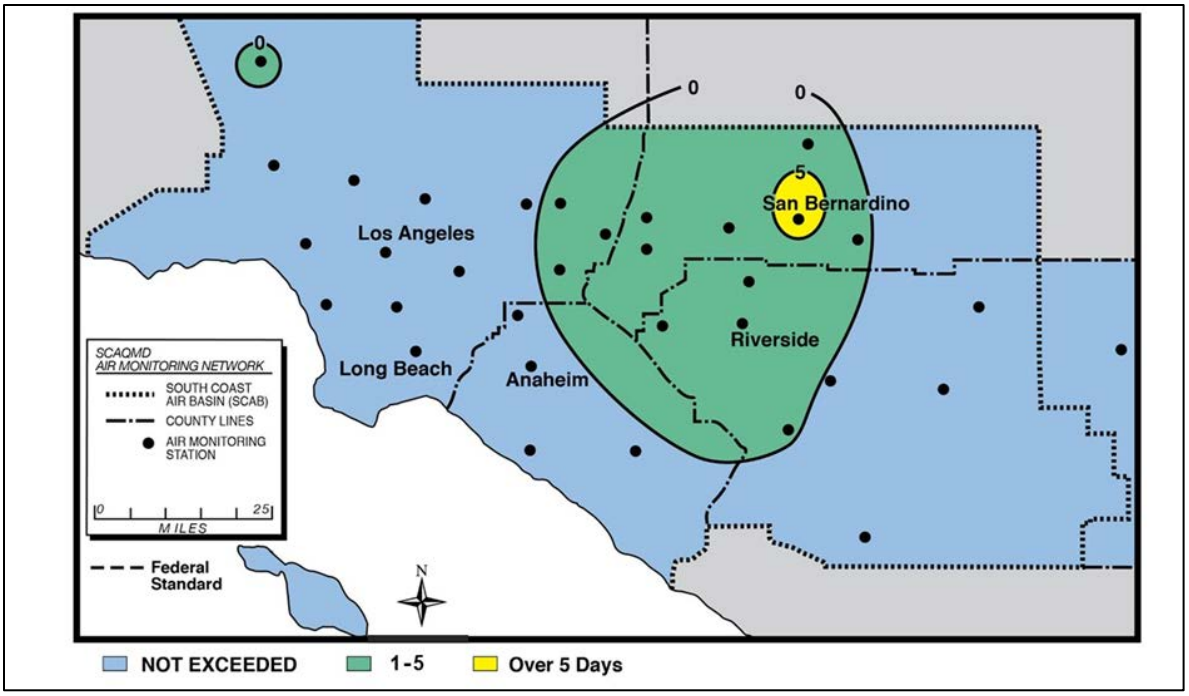


FIGURE 2-7

NUMBER OF DAYS IN 2015 EXCEEDING THE REVOKED 1979 1-HOUR FEDERAL OZONE STANDARD

(1-HOUR AVERAGE OZONE > 0.12 PPM; GREEN SHADED AREA INDICATES AREAS WITH EXCEEDANCES)

Particulate Matter (PM2.5 and PM10)

Health Effects, Particulate Matter

A significant body of peer-reviewed scientific research, including studies conducted in Southern California, points to adverse impacts of particulate matter air pollution on both increased illness (morbidity) and increased death rates (mortality). The 2009 U.S. EPA *Integrated Science Assessment for Particulate Matter*[12] describes these health effects and discusses the state of the scientific knowledge. A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

There was considerable debate surrounding the review of particulate matter health effects and the consideration of ambient air quality standards when U.S. EPA promulgated the initial PM2.5 standards in 1997. Since that time, numerous additional studies have been published and key studies supporting the 1997 standards were closely scrutinized and the analyses was repeated and extended. These re-analyses confirmed the initial findings associating adverse health effects with PM2.5 exposures.

Several studies have found correlations between elevated ambient particulate matter levels and an increase in mortality rates, respiratory infections, number and severity of asthma attacks, and the number of hospital admissions in different parts of the United States and in various areas around the world. In recent years, studies have reported an association between long-term exposure to PM2.5 and increased total mortality (reduction in life-span and increased mortality from lung cancer).

Higher levels of PM2.5 have also been related to increased mortality due to cardiovascular or respiratory diseases, hospital admissions for acute respiratory conditions, school absences, lost work days, a decrease in respiratory function in children, and increased medication use in children and adults with asthma. Long-term exposure to PM has been found to be associated with reduced lung function growth in children, and increased risk of cardiovascular diseases in adults. Elderly persons, young children, and people with pre-existing respiratory and/or cardiovascular disease appear to be more susceptible to the effects of PM10 and PM2.5.

The U.S. EPA, in its most recent review, has concluded that both short-term and long-term exposure to PM2.5 are causally related to increased mortality risk. An expanded discussion of studies relating to PM exposures and mortality, including a brief description of how studies accounted for potential confounding factors, is contained in Appendix I of this document.

Air Quality, PM2.5

The District began regular monitoring of PM2.5 in 1999 following the U.S. EPA's adoption of the national PM2.5 standards in 1997. In 2015, ambient PM2.5 concentrations were monitored at 26 locations throughout the District, including two stations in the SSAB in the Coachella Valley and two near-road sites. Filter-based FRM PM2.5 sampling was employed at 19 of these stations and eight of the FRM measurement stations sampled daily to improve temporal coverage with the FRM measurements beyond

[12] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/139F. http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546.

the required 1-in-3-day sampling schedule, including the two near-road sites. Fourteen stations, including one near-road site, employed continuous PM2.5 monitors and seven of these were collocated with FRM measurements. The continuous federal equivalent method (FEM) PM2.5 monitors in the Basin do not meet the U.S. EPA criteria to be used for NAAQS comparison[13] and SCAQMD has been granted annual waivers by U.S. EPA precluding their use in NAAQS attainment consideration, although the waiver decision for 2015 data is not yet finalized. The continuous data is used for forecasting, real-time air quality alerts, and for evaluating hour-by-hour variations.

The 2015 FRM 24-hour PM2.5 concentrations are summarized in Table 2-9. PM2.5 concentrations were higher in the inland valley areas of metropolitan Riverside County and San Bernardino County. The Basin 2015 PM2.5 maximum 24-hour average concentration of 70.3 µg/m^3 was measured in the East San Gabriel Valley area at the Azusa air monitoring station on July 5, associated with fireworks on Independence Day. The next highest 24-hour PM2.5 concentration in 2015 was 56.6 µg/m^3, measured in the Metropolitan Riverside County area at the Mira Loma air monitoring station. PM2.5 concentrations also exceeded the level of the 24-hour NAAQS (35 µg/m^3) in Los Angeles and Orange Counties in 2015.

Although maximum 24-hour concentrations exceed the standard at multiple stations, the 98th percentile form of the 2013–2015 design value only exceeded the standard at two Basin stations in Metropolitan Riverside County (Mira Loma and Riverside-Rubidoux stations), with design values of 41 µg/m^3 and 36 µg/m^3, respectively (117 percent and 103 percent of the 24-hour NAAQS). Mira Loma had been the only station with a design value violating the 24-hour PM2.5 NAAQS since the 2008-2010 design value period. There is no State 24-hour PM2.5 standard.

The higher PM2.5 concentrations in the Basin are mainly due to the secondary formation of smaller particulates resulting from precursor gas emissions (i.e., NOx, SOx, NH_3, and VOC) that are converted to PM in the atmosphere. The precursors are from mobile, stationary and area sources, with the largest portion resulting from fuel combustion. Most of the 24-hour PM2.5 exceedances in the Basin occur in the late fall and winter months. The lack of storm events and rainfall in the last three years has contributed to an increase in the number of high PM2.5 concentration days over the standard, as the precursors and particulates are not dispersed or washed out as frequently.

In contrast to PM10, PM2.5 concentrations were relatively low in the Coachella Valley area of the SSAB. PM10 concentrations are normally higher in the desert areas due to windblown and fugitive dust emissions; PM2.5 is relatively low in the desert area due to fewer combustion-related emissions sources and less secondary aerosol formation in the atmosphere. The PM2.5 federal standards were not exceeded in the Coachella Valley in 2015 and the highest 24-hour and annual average 2013–2015 design values (17 and 8.0 µg/m^3, respectively, both at the Indio air monitoring station) are well below the PM2.5 NAAQS.

[13] The continuous PM2.5 monitors deployed by SCAQMD are FEM-designated Beta Attenuation Monitor (BAM) instruments, but in use they do not meet the correlation and bias requirements set by U.S. EPA for equivalency to FRM filter measurements. The U.S. EPA waiver from NAAQS compliance for the continuous samplers is re-evaluated annually as part of the SCAQMD Annual Air Quality Monitoring Network Plan [http://www.aqmd.gov/home/library/clean-air-plans/monitoring-network-plan].

TABLE 2-9

2015 Maximum 24-hour Average PM2.5 Concentrations and 2013–2015 Design Values by Basin and County[#]

Basin/County	2015 Maximum PM2.5 24-Hour Average (µg/m³)[*]	2013–2015 PM2.5 24-Hour Design Value (µg/m³)	Percent of Current (2006) PM2.5 NAAQS (35 µg/m³)	Area of Design Value Max
South Coast Air Basin				
Los Angeles	**70.3**[**]	34	97	Central Los Angeles and South San Gabriel Valley
Orange	45.8	28	80	Central Orange County
Riverside	56.6	**41**	**117**	**Metropolitan Riverside County**
San Bernardino	50.5	35	100	Central San Bernardino Valley
Salton Sea Air Basin				
Riverside	24.6	17	49	Coachella Valley (Indio)

Bold text denotes the peak value

[#] Based on FRM filter data

[*] 100 percent of the NAAQS is not in violation of that standard

[**] Peak value associated with Independence Day fireworks – flagged as an exceptional event

The 2015 annual average PM2.5 concentrations are summarized in Table 2-10, based on the FRM measurements. The maximum annual average of 14.5 µg/m³ was measured at the CA-60 Near-Road site, located west of Vineyard Avenue near the San Bernardino/Riverside County border (near the cities of Ontario, Mira Loma, and Upland). The second highest maximum annual average PM2.5 concentration (13.3 µg/m³) was measured in the Metropolitan Riverside County area at the Mira Loma station. The Basin maximum 2013–2015 annual average design value was 14.1 µg/m³ at the Mira Loma station (118 percent of the current 2012 annual average PM2.5 NAAQS, 12.0 µg/m³). This design value is below the former 1997 annual average PM2.5 NAAQS (15.0 µg/m³), for which the Basin remains in attainment. This is the lowest PM2.5 Basin design value since these measurements began in 1999. Since the near-road PM2.5 sites only became operational in 2015, the data period is insufficient for design value calculations. The CA-60 freeway near-road station could potentially become the design value site for the Basin for the PM2.5 annual average NAAQS, once sufficient data is collected. The annual PM2.5 State standard is based on the highest annual average over the 3-year period. It is still violated in all counties of the Basin, but not in the Coachella Valley. Figure 2-8 shows the distribution of annual average PM2.5 concentrations in different areas of the Basin.

TABLE 2-10

2015 Maximum Annual Average PM2.5 Concentrations and 2013–2015 Design Values by Basin and County

Basin/ County	2015 Maximum PM2.5 Annual Average ($\mu g/m^3$)#	2013–2015 PM2.5 Annual Design Value ($\mu g/m^3$)#	Percent of Current (2012) PM2.5 Annual NAAQS (12.0 $\mu g/m^3$)#	Percent of Former (1997) Annual NAAQS (15.0 $\mu g/m^3$)	Area of Design Value Max	2013–2015 3-Year High State Annual Average PM2.5 Designation Value ($\mu g/m^3$)##	Percent of State PM2.5 Annual Standard (12 $\mu g/m^3$)
South Coast Air Basin							
Los Angeles	12.4	12.3	103	82	Central Los Angeles	**19**	**158**
Orange	9.4	10.0	83	67	Central Orange County	16	133
Riverside	**13.3**	**14.1**	**118**	**94**	**Metropolitan Riverside County**	**19**	**158**
San Bernardino	11.0	12.5	104	83	Southwest San Bernardino Valley	17	142
Salton Sea Air Basin							
Riverside	7.5	8.0	67	53	Coachella Valley (Indio)	8	67

Bold text denotes the peak value

Based on FRM filter data, excluding near-road stations due to insufficient period of record for design value calculation; the federal design value is based on the average of the 3 annual averages in the period

Based on combined FRM filter and continuous FEM data (federal FEM waiver is not applied to State designation value); data may include exceptional events; the State annual designation value is the highest year in the 3-year period

(State designation value source: https://www.arb.ca.gov/adam/select8/sc8display.php)

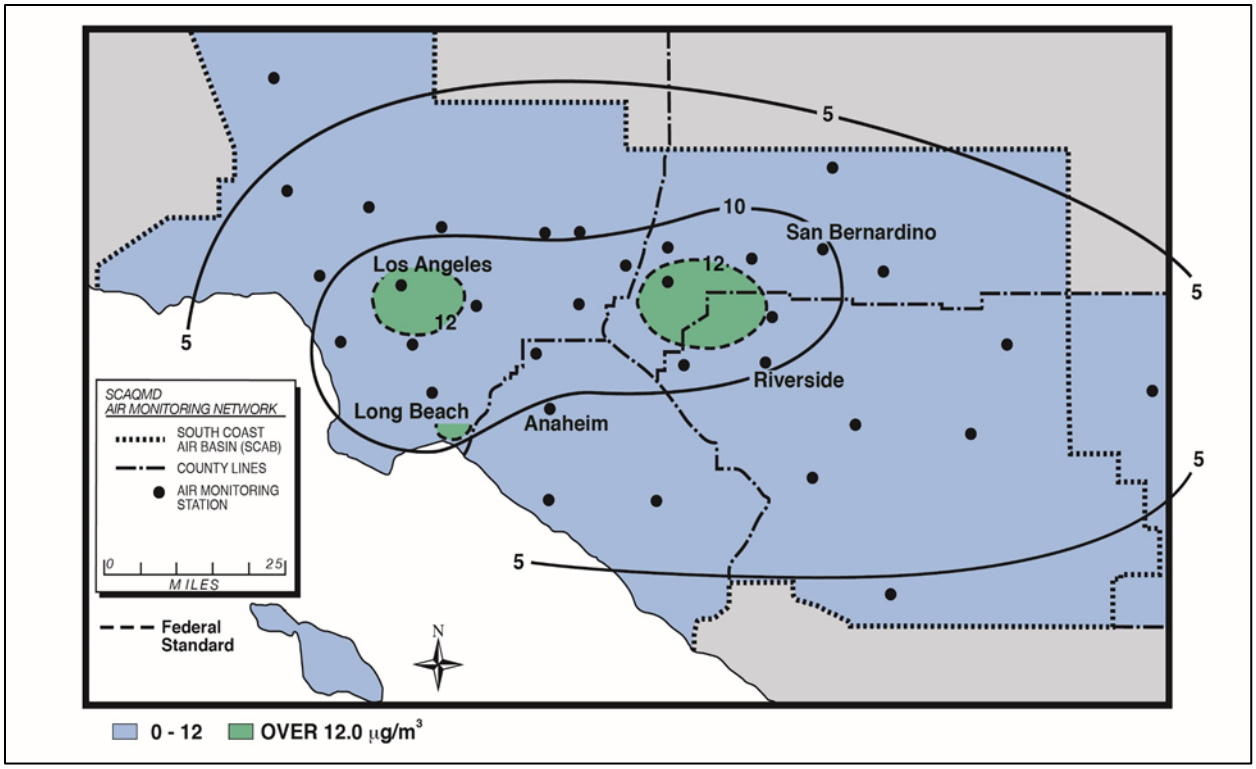


FIGURE 2-8
2015 PM2.5: ANNUAL AVERAGE CONCENTRATION COMPARED TO THE CURRENT FEDERAL STANDARD
(ANNUAL PM2.5 NAAQS = 12 µg/m^3, ANNUAL ARITHMETIC MEAN)

Near-Road PM2.5

On December 14, 2012, U.S. EPA strengthened the NAAQS for PM2.5 and, as part of the revisions, a requirement was added to monitor near the most heavily trafficked roadways in large urban areas. Particle pollution is expected to be higher along these roadways as a result of direct emissions from cars and heavy-duty diesel trucks and buses. SCAQMD has installed the two required PM2.5 monitors by January 1, 2015, at locations selected based upon the existing near-roadway NO_2 sites that were ranked higher for heavy-duty diesel traffic. The locations are: (1) I-710, located at Long Beach Blvd. in Los Angeles County near Compton and Long Beach; and (2) CA-Route 60, located west of Vineyard Avenue near the San Bernardino/Riverside County border near Ontario, Mira Loma and Upland. These near-road sites measure PM2.5 daily with FRM filter-based measurements.

Table 2-11 summarizes the 2015 annual and 24-hour PM2.5 data from the near-road sites and nearby ambient monitoring stations. The 2015 PM2.5 annual averages from the Route 710 and Route 60 Near-Road sites were 12.89 and 14.48 µg/m^3, respectively. The nearby ambient stations in South Coastal Los Angeles County (North Long Beach Station) and in Metropolitan Riverside County (Mira Loma station) measured 12.81 and 13.34 µg/m^3, respectively, for the 2015 annual average. Thus, the PM2.5 measurements from these sites for 2015 indicate that the near-road sites do indeed measure higher than the nearby ambient stations, on average. If this pattern holds for the long term, the CA-60 near-road station could potentially become the 3-year design value site for the Basin for the PM2.5 annual average NAAQS, once sufficient data is collected.

While it reasonably could be expected that the highest near-road site would also become the basin-maximum design value site for the 24-hour PM2.5 NAAQS, this may not be the case for the Basin. The 2015 98th percentile 24-hour PM2.5 concentration is higher at the I-710 Near-Road than at the nearby N. Long Beach station. However, the 98th percentile 24-hour concentration remains higher at Mira Loma (43.2 µg/m^3) than at the CA-60 Near-Road site (39.9 µg/m^3). The number of days over the 24-hour PM2.5 NAAQS was also significantly higher at the Mira Loma station, with 17 days over the 24-hour NAAQS compared to 10 days at the CA-60 Near-Road site. PM2.5 24-hour concentrations at the Mira Loma station are likely higher than the near-road site on the highest days, due to the influence of enhanced secondary particle formation at Mira Loma.

TABLE 2-11

2015 Annual Arithmetic Mean, Maximum and 98th Percentile 24-Hour PM2.5 Concentrations, and Number of Samples Exceeding the 24-Hour PM2.5 NAAQS at South Coast Air Basin Near-Road Sites and Nearby Ambient Stations

Near-Road PM2.5*					Nearby Ambient PM2.5*				
	Annual Average PM2.5 (µg/m^3)	Peak 24-Hour PM2.5 (µg/m^3)	98th Pctl. 24-Hour PM2.5 (µg/m^3)	No. Samples Exceeding 24-Hour PM2.5 NAAQS		Annual Average PM2.5 (µg/m^3)	Peak 24-Hour PM2.5 (µg/m^3)	98th Pctl. 24-Hour PM2.5 (µg/m^3)	No. Samples Exceeding 24-Hour PM2.5 NAAQS
Near-Road Station	**2015**	**2015**	**2015**	**2015**	**Ambient Station**	**2015**	**2015**	**2015**	**2015**
Route 710 N. R. (@ Long Beach Bl., Los Angeles County)	12.89	48.8	35.7	7	**North Long Beach**	10.81	54.6	32.1	3
Route 60 N. R. (West of Vineyard Av., San Bernardino/Riverside County)	**14.48**	52.7	39.9	10	**Mira Loma**	13.34	**56.6**	**43.2**	**17**

Bold text denotes the peak value

* Filter-based FRM measurements shown

The annual PM2.5 NAAQS is 12.0 µg/m^3; the 24-hour PM2.5 NAAQS is 35 µg/m^3

Impacts of Drought on PM2.5 Air Quality

The drought conditions that have persisted in Southern California and the southwestern United States over the past few years have negatively affected air quality in many areas. The low amount and frequency of rainfall leads to less washing of road surfaces and brings drier ground surfaces, which reduces the natural crusting of soils that is improved by moisture. This can lead to enhanced resuspension of fugitive dust by moving vehicles and winds. Fugitive dust can raise concentrations of both PM10 and PM2.5. More importantly, the ongoing drought conditions have caused a reduction of the natural air pollution cleansing effect of precipitation due to washout – particulate matter and its precursors captured

and removed by raindrops. The reduced frequency of storms also translates to fewer days of enhanced pollutant dispersion. Without the storm systems and related winds, there is less mixing of air pollutants with cleaner air in the atmosphere and less of the transport that moves pollutants out of the region. The lack of windy, unstable weather conditions during storms results in longer episodes of stagnant air when particulate pollution builds to unhealthful levels. The dry conditions have also contributed to increased frequency and intensity of wildfire events throughout the State, with resulting impacts to both particulate and ozone air quality. The net impact of the drought on air quality in the Basin over the past several years has been to disrupt the steady progress seen in prior years toward attainment of the 24-hour PM2.5 NAAQS, for which the design value is based on the 3-year average of the 98th percentile measurement.

Table 2-12 shows the rainfall statistics for the National Weather Service Downtown Los Angeles meteorological station, 2006–2015. Figure 2-9 shows the 2002–2015 trend of both 98th percentile 24-hour PM2.5 values and the 3-year design value, along with the trends of PM2.5-equivalent emissions[14] and the number of rainfall days during the first and fourth quarters of the year. The first and fourth quarters are the most important to consider, since the vast majority of the days that exceed the federal 24-hour standard in the Basin occur during this period. This is also the time period that the Basin typically experiences the most rainfall and more frequent storm events.

[14] PM2.5 equivalent emissions are directly emitted PM2.5 emissions plus PM2.5 precursor emissions weighted by potential to create PM2.5 (see 2012 AQMP, Appendix V: Modeling and Attainment Demonstrations).

TABLE 2-12

Trends of Annual and Quarters 1 & 4 Rainfall Totals and Number of Rain Days for Downtown Los Angeles, 2006–2015

30-Year Average	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Annual Rainfall (inches)										
14.93	11.61	5.66	14.43	9.39	23.09	12.26	8.15	3.60	9.77	7.66
Quarter 1 & Quarter 4 (Jan., Feb., Mar., Oct., Nov., Dec.) Rainfall (inches)										
13.38	8.61	4.40	14.28	9.21	21.39	11.80	6.42	2.80	9.37	3.82
Annual Rain Days										
35.7	36	24	35	25	53	32	38	27	24	26
Quarter 1 & Quarter 4 Rain Days										
29	27	19	31	21	44	27	31	21	18	17

Rainfall data from National Weather Service, Downtown Los Angeles Meteorological Station (USC Campus);
Rainfall totals in inches; rain days defined as measured rainfall $\geq$ 0.01 inches;
30-year normal precipitation averages based on 1981-2010 data

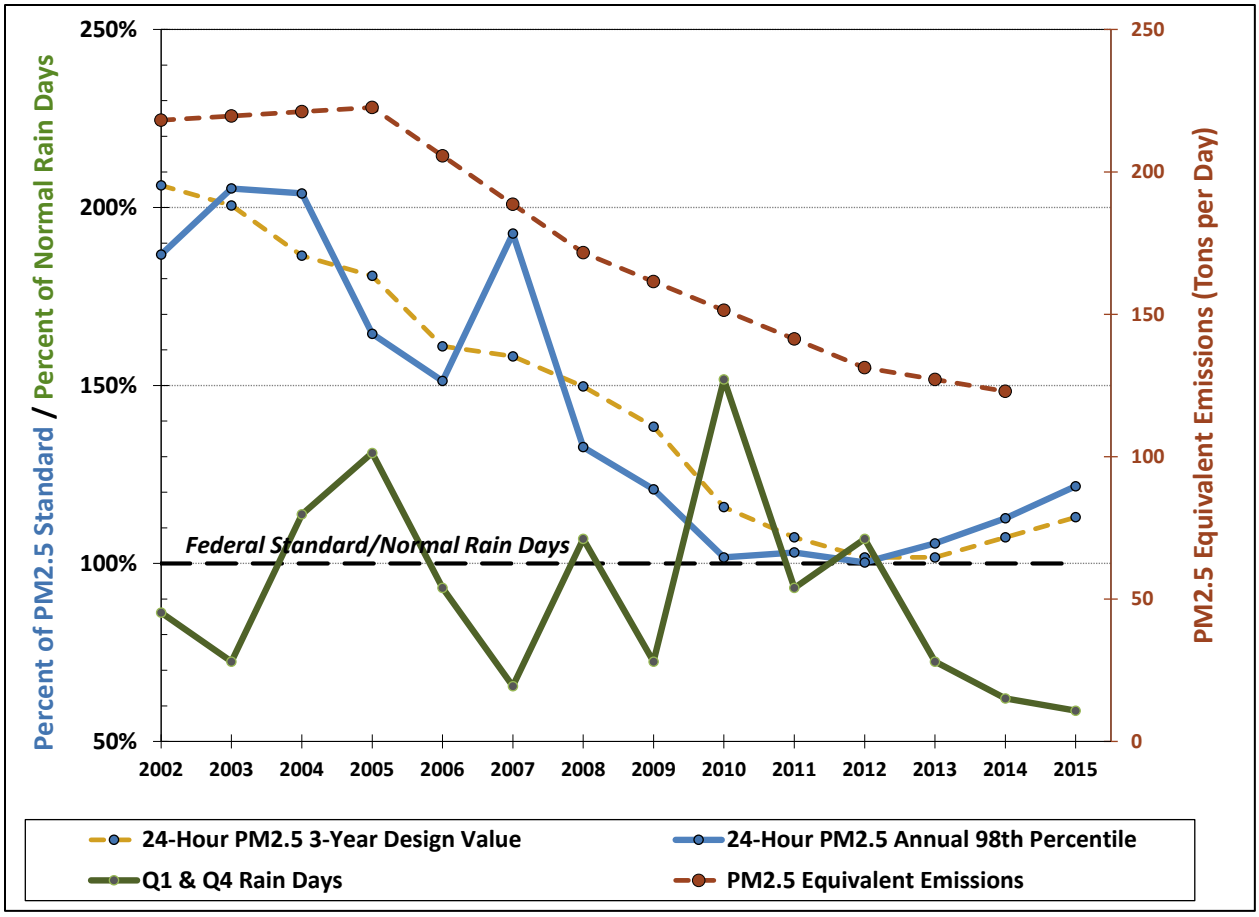


FIGURE 2-9

TREND OF SOUTH COAST AIR BASIN MAXIMUM 24-HOUR PM2.5 YEAR DESIGN VALUES AND CORRESPONDING ANNUAL 98TH PERCENTILE CONCENTRATION AS PERCENT OF THE 24-HOUR PM2.5 NAAQS (35 μg/m^3), WITH ANNUAL TRENDS OF PM2.5 EQUIVALENT EMISSIONS AND PERCENT OF NORMAL NUMBER OF RAIN DAYS FOR QUARTERS 1 (JAN.–MAR.) AND 4 (OCT.–DEC.)

(PM2.5 FROM RIVERSIDE-RUBIDOUX AIR MONITORING STATION THROUGH 2006, THEN MIRA LOMA AFTER THAT STATION WAS INSTALLED)

Annual precipitation totals have been below the normal, or average, value of 14.93 inches (30-year average, 1981–2010) at Downtown Los Angeles from 2011 through most of 2015. Similar relative rainfall deficits were seen at stations throughout Southern California in this time period. After a very wet year in 2010, Downtown Los Angeles measured 82 percent of normal annual rainfall in 2011, with the number of rain days in the first and fourth quarters at 93 percent of the average of 29 days that typically occur during those months. Annual rainfall in 2012 was only 55 percent of normal, but the number of rain days in the first and fourth quarters was a little above normal. Although these initial signs of the emerging drought existed in 2011 and 2012, the cumulative effect of multiple dry years had not yet taken a significant toll on air quality and the amount of storm systems and rain events was not significantly below average. The 98th percentile 24-hour PM2.5 concentrations continued the steady decline in 2012, as had been seen in most years since the PM2.5 measurements started in 1999. This consistent trend

of improving fine particulate air quality is associated with the continued implementation of PM2.5-related emission reductions in the Basin. In 2012, the Basin maximum annual 98th percentile 24-hour PM2.5 was at an all-time low of 35.1 µg/m^3 at Mira Loma, the Basin's highest station, which was under the federal PM2.5 standard (35.5 µg/m^3 is needed to exceed the standard due to rounding conventions).

The 2013 annual rainfall total measured at Downtown Los Angeles was just 3.6 inches, 24 percent of normal. Rainfall events of 0.01 inches or more were 27 percent fewer in 2013 than the average of 29 days that typically occur during the first and fourth quarters of the year, when the Basin historically experiences its highest 24-hour PM2.5 concentrations. As the drought intensified, the impact on PM2.5 air quality became evident in 2013. The 2013 Mira Loma annual 98th percentile concentration increased to 37.5 µg/m^3. The Basin's PM2.5-related emissions continued to decrease, while the long-term trend of steady progress seen in prior years started to reverse due to the drought-related meteorological conditions.

By 2014 the rainfall deficit from the ongoing drought in Southern California had become severe, with annual rainfall totals at 65 percent of normal at Downtown Los Angeles. With only 62 percent of the normal number of rain days and the smaller rain amounts due to the weaker and less frequent storm systems in 2014 and that year's maximum 98th percentile PM2.5 concentration increased to 40.0 µg/m^3.

Southern California annual rainfall totals for 2015 were again quite low, with only 7.66 inches measured at Downtown Los Angeles, 51 percent of normal for the year. The first quarter of 2015 had very little rain, 2.79 inches, which is 30 percent of normal rainfall for that quarter. Only 50 percent of the normal number of rain days were recorded in the first quarter of 2015. A strong El Niño pattern developed by the end of 2015, but the rainfall increased only slightly in the fourth quarter. However, the storm track frequently reached Southern California. Even though there was little precipitation, the improved ventilation from the systems led to significantly improved PM2.5 concentrations in the fourth quarter of 2015. Unfortunately, the effect on the annual 98th percentile PM2.5 concentration was already significant due to the first quarter of 2015. That value for the year 2015 increased to 43.2 µg/m^3 at Mira Loma, the highest 98th percentile concentration measured in the Basin since 2008.

With daily measurements in the Basin for PM2.5, the 98th percentile concentration is typically the eighth highest measurement at the Mira Loma air monitoring station. In recent years, the eighth or ninth highest concentration at Mira Loma may still have been over the level of the federal standard, but with the ongoing effect of the long-term drought and lack of storm systems, the 17th highest concentration, in only the first quarter of 2015, was still over the level of the NAAQS at Mira Loma. This was the highest number of days over the standard at a single station since 2007. Basin-wide, 25 days exceeded the 24-hour standard in 2015, the most in a single year since 2009. Notably, there were no additional exceedances of the 24-hour PM2.5 standard occurring at Mira Loma through the remaining three quarters of 2015, including the fourth quarter which typically includes several days over the standard.

The preliminary PM2.5 data for the first quarter of 2016 indicates that only three days exceeded the 24-hour NAAQS at Mira Loma in that quarter, as compared to 17 days for the first quarter of 2015. Only four days Basin-wide had exceedances of the NAAQS in the first quarter of 2016 at one or more stations, compared to 25 days in 2015. Likewise, the preliminary 2016 first quarter average at Mira Loma was 15.1 µg/m^3, compared to 18.4 µg/m^3 for the first quarter of 2015. As was seen in the fourth quarter of 2015, the Basin did not receive the anticipated high rainfall in the first quarter of 2016 with the El Niño

conditions, but the number of days with unsettled, breezy weather conditions was significantly greater than in 2014 and 2015, leading to fewer days with elevated PM2.5 levels.

While the 2012 AQMP PM2.5 attainment demonstration and the 2015 associated supplemental SIP submission indicated that attainment of the 24-hour standard was predicted to occur by the end of 2015, it could not anticipate the effect of the ongoing drought on the measured PM2.5. The 2006 to 2010 base period used for the 2012 attainment demonstration had near-normal rainfall. While the trend of PM2.5-equivalent emission reductions continued through 2015, the severe drought conditions contributed to the PM2.5 increases observed after 2012. As a result of the disrupted progress toward attainment of the federal 24-hour PM2.5 standard, SCAQMD submitted a request and the U.S. EPA approved, in January 2016, a "bump up" to the nonattainment classification from "moderate" to "serious," with a new attainment deadline as soon as practicable, but not beyond December 31, 2019. Further discussion of drought effects on future air quality is contained in Appendix V: Modeling and Attainment Demonstrations.

Air Quality, PM10

In 2015, SCAQMD routinely monitored PM10 concentrations at 25 locations in the Basin and the Coachella Valley. Of these, 19 employed FRM filter samplers. The FRM PM10 minimum sampling schedule set by U.S. EPA requires one 24-hour filter sample every sixth day. At the Riverside-Rubidoux, Mira Loma, and Indio stations, the 24-hour filter sample is collected once every three days. In addition, nine stations have FEM[15] continuous monitors, which supplement the collocated FRM measurements at five stations and are the primary measurement at four more stations. Unlike PM2.5 FEM measurements, there is no waiver for PM10 FEM instruments and those measurements serve as the official reading for attainment determination on the days with no collocated FRM filter sample.

The maximum 24-hour PM10 levels in 2015 are summarized by county and basin in Table 2-13, along with the design values and state designation values. The federal 24-hour standard level (155 µg/m^3 is the exceedance level) was only exceeded at two stations in the Basin on two different days in 2015, in the Perris Valley on September 9 (188 µg/m^3) and in the Central San Bernardino Valley on December 26 (187 µg/m^3), measured with FRM monitors. These high 24-hour averages were both due to high-wind exceptional events and also do not jeopardize the attainment design value at this time, which allows for one exceedance per year at a station, averaged over three years. The Basin has remained in attainment of the PM10 NAAQS since 2006. The Basin maximum 2013–2015 design value for 24-hour PM10 is 126 µg/m^3 (81 percent of the NAAQS), in Metropolitan Riverside County at the Mira Loma monitoring station. The much more stringent State 24-hour PM10 standard (50 µg/m^3) was exceeded at many stations in the Basin and in the Coachella Valley.

The Coachella Valley had eight days in 2015 exceeding the 24-hour PM10 NAAQS, with concentrations as high as 337 µg/m^3 at the Indio monitoring station – all of which were due to windblown dust and sand associated with high-wind exceptional events. The Palm Springs monitoring station only exceeded on

[15] The continuous FEM PM10 monitors deployed by SCAQMD are primarily Beta Attenuation Monitor (BAM) instruments, although some PM10 Tapered Element Oscillating Microbalance (TEOM) instruments are also used, most notably in the Coachella Valley.

two of those days. The recent FEM monitor at Saul Martinez Elementary School, in the town of Mecca in the southeastern portion of the Coachella Valley, exceeded the standard on five days in 2015, all related to high-wind events. The Coachella Valley 2013–2015 design value for 24-hour PM10 is 150 µg/m^3, at Indio, after the exclusion of the exceptional events, which would not violate the PM10 NAAQS, if U.S. EPA concurs with exceptional events upon submittal of supporting documentation.

TABLE 2-13

2015 Maximum 24-hour Average PM10 Concentrations and 2013–2015 Design Values by Basin and County

Basin/County	2015 Maximum PM10 24-Hour Average (µg/m^3)*	2013–2015 PM10 24-Hour Design Value (µg/m^3)*	2013–2015 Percent of PM10 NAAQS (150 µg/m^3)#	Area of Design Value Max	2013–2015 High State PM10 24-Hour Designation Value (µg/m^3)##	2013–2015 Percent of State PM10 24-Hour Standard (50 µg/m^3)
South Coast Air Basin						
Los Angeles	101	93	60	East San Gabriel Valley	75.6	151
Orange	66	85	55	Central Orange County	12.1	24
Riverside	**139****	**126**	**81**	**Metropolitan Riverside County**	**123.8**	**248**
San Bernardino	96**	103	66	Central San Bernardino Valley	19.2	38
Salton Sea Air Basin						
Riverside	**152****	**150**	**100**	**Coachella Valley (Indio)**	**128.2**	**256**

Bold text denotes the peak value

* Based on the FRM data when available, otherwise FEM data is included

** Higher 24-hour PM10 concentrations were measured in 2015, up to 337 µg/m^3 in the Coachella Valley and up to 188 µg/m^3 in Riverside County (Perris station), that were related to high-wind events and have been flagged for exclusion from NAAQS comparison in accordance with the U.S. EPA Exceptional Events Rule; U.S. EPA concurrence is required for exclusion of exceptional events after submittal of supporting documentation

155 µg/m^3 is needed to exceed the level of the PM10 NAAQS

The State 24-hour Expected Peak Day Concentration (EPDC) is a calculated 3-year value after accounting for statistical outliers; the State 24-hour Designation Value is the highest concentration at or below the EPDC over the 3-year period; State data may include exceptional events; State PM10 24-hour average designation value includes FRM and BAM FEM data, but not TEOM FEM instruments since the TEOM is not a California Approved Sampler (CAS) for standard compliance (SCAQMD uses TEOM instruments to supplement FEM measurements in the Coachella Valley)

The maximum annual average PM10 in 2015 is summarized by county and air basin in Table 2-14, along with the design values and state designation values. In 2015, the revoked annual average PM10 NAAQS (50 µg/m^3) was not exceeded in the Basin, with an annual averaged concentration of 48.8 µg/m^3 in Metropolitan Riverside County at the Mira Loma station. However, the 3-year annual PM10 design value for 2013–2015 exceeded the former NAAQS at Mira Loma, at 51.8 µg/m^3. No other stations in the Basin or the Coachella Valley exceeded the former standard in 2015 or for the 2013–2015 design value. The

much more stringent State annual PM10 standard (20 µg/m^3) was exceeded in most stations in each county in the Basin and in the Coachella Valley.

TABLE 2-14

2015 Maximum Annual Average PM10 Concentrations and 2013–2015 Design Values by Basin and County

Basin/County	2015 Maximum PM10 Annual Average (µg/m^3)*	2013–2015 PM10 Annual Design Value (µg/m^3)	2013–2015 Percent of Former PM10 Annual NAAQS** (50 µg/m^3)	Area of Design Value Max	2013–2015 3-Yr. High State PM10 Annual Designation Value (µg/m^3)#	2013–2015 Percent of Current PM10 State Standard (20 µg/m^3)
South Coast Air Basin						
Los Angeles	37.1	38.0	76	East San Gabriel Valley	43	215
Orange	24.8	26.1	52	Central Orange County	27	135
Riverside	**48.8**	**51.8**	**104**	**Metropolitan Riverside County**	**45**	**225**
San Bernardino	37.8	39.4	79	Central San Bernardino Valley	39	195
Salton Sea Air Basin						
Riverside	36.5	37.2	74	Coachella Valley (Indio)	**45**	**225**

Bold text denotes the peak value

* Based on the FRM data when available, otherwise FEM data is used; flagged exceptional event days are excluded

** The federal annual PM10 standard was revoked in 2006

\# State data may include exceptional events; State PM10 annual average designation value includes FRM and BAM FEM data, but not TEOM FEM instruments since the TEOM is not a California Approved Sampler (CAS) for standard compliance (SCAQMD uses TEOM instruments to supplement FEM measurements in the Coachella Valley); State annual designation value is the highest year in the 3-year period

Other Criteria Air Pollutants

Carbon Monoxide (CO)

Health Effects, CO

The adverse effects of ambient carbon monoxide air pollution exposure on health have been reviewed in the 2010 U.S. EPA *Integrated Science Assessment for Carbon Monoxide.*[16] This document presents a detailed review of the available scientific studies and conclusions on the causal determination of the health effects of CO. A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

Individuals with a deficient blood supply to the heart are the most susceptible to the adverse effects of CO exposure. The effects observed include earlier onset of chest pain with exercise, and electrocardiograph changes indicative of worsening oxygen supply delivery to the heart.

Inhaled CO has no known direct toxic effect on the lungs, but exerts its effect on tissues by interfering with oxygen transport, by competing with oxygen to combine with hemoglobin present in the blood to form carboxyhemoglobin (COHb). Hence, people with conditions requiring an increased oxygen supply can be adversely affected by exposure to CO. Individuals most at risk include patients with diseases involving heart and blood vessels, fetuses, and patients with chronic hypoxemia (oxygen deficiency), such as is seen at high altitudes.

Reductions in birth weight and impaired neurobehavioral development have been observed in animals chronically exposed to CO resulting in COHb levels similar to those observed in smokers. Recent studies have found increased risks for adverse birth outcomes with exposure to elevated CO levels, including pre-term births and heart abnormalities.

Air Quality, CO

Ambient carbon monoxide concentrations were measured at 25 locations in the Basin and neighboring SSAB areas in 2015, including one station in the Coachella Valley and two year-road monitors. Tables 2-15 and 2-16 summarize the 2015 maximum 1-hour and 8-hour average concentrations of CO by air basin and county. In 2015, no areas in the Basin or the Coachella Valley exceeded the CO air quality standards, including the near-road stations. The highest concentrations of CO continued to be recorded in the areas of Los Angeles County, where vehicular traffic is most dense, with the maximum 8-hour and 1-hour concentration (4.3 ppm and 3.0 ppm, respectively) recorded in the South Central Los Angeles County area. The new near-road monitors in Orange and San Bernardino counties did not increase the Basin's maximum CO values or design values in 2015 over that from Los Angeles County, although the near-road concentrations were often higher than the nearest ambient stations.

All areas of the Basin have continued to remain below the federal standards (35 ppm 1-hour and 9 ppm 8-hour) since 2003. U.S EPA re-designated the Basin to attainment of the federal CO standards, effective June 11, 2017. There also have been no exceedances of the State 1 episode (federal alert) level (8-hour

[16] U.S. EPA. (2010). Integrated Science Assessment for Carbon Monoxide (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-09/019F. http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=218686.

CO ≥ 15 ppm). The Basin and the Coachella Valley are also well below the State CO standards (20 ppm 1-hour and 9.0 ppm 8-hour).

TABLE 2-15

2015 Maximum 1-Hour CO Concentrations and 2015 Design Values by Basin and County

Basin/County	2015 Maximum CO 1-Hour Average (ppm)	2015 CO 1-Hour Design Value* (ppm)	Percent of CO 1-Hour NAAQS (35 ppm)	Area of Design Value Max	Percent of CO 1-Hour State Standard (20 ppm)
South Coast Air Basin					
Los Angeles	**4.4**	**4.3**	**11**	**South Central L.A. County**	**22**
Orange	3.1 *(3.1 at I-5 N.R.)*	2.9 *(2.9 at I-5 N.R.)*	8 *(8)*	North Orange County	15 *(15)*
Riverside	2.5	2.2	6	Metropolitan Riverside County	11
San Bernardino	2.8 *(2.7 at I-10 N.R.)*	2.2 *(2.7 at I-10 N.R.)***	6 *(8)*	Central San Bernardino Valley	11 *(14)*
Salton Sea Air Basin					
Riverside	2.0	1.9	5	Coachella Valley	10

Bold text denotes Basin maximum; I-5 and I-10 near-road monitors are shown in parenthesis

* The 1-hour CO design value is the 2nd highest 1-hour average concentration at a station in a single year

** The 2015 1-hour CO design value maximum in San Bernardino County was at the I-10 near-road station

TABLE 2-16

2015 Maximum 8-Hour CO Concentrations and 2015 Design Values by Basin and County

Basin/County	2015 Maximum CO 8-Hour Average (ppm)	2015 CO 8-Hour Design Value* (ppm)	Percent of CO 8-Hour NAAQS (9 ppm)	Area of Design Value Max	Percent of CO 8-Hour State Standard (9.0 ppm)
South Coast Air Basin					
Los Angeles	**3.3**	**3.0**	**33**	**South Central L.A. County**	**33**
Orange	2.2 *(2.3 at I-5 N.R.)*	2.0 *(2.3 at I-5 N.R.)*	22 *(26)*	Central Orange County	22 *(26)*
Riverside	1.7	1.5	17	Metropolitan Riverside County	17
San Bernardino	1.8 *(2.6 at I-10 N.R.)*	1.8 *(2.5 at I-10 N.R.)*	20 *(28)*	Central San Bernardino Valley	20 *(28)*
Salton Sea Air Basin					
Riverside	0.7	0.5	6	Coachella Valley	6

Bold text denotes Basin maximum; I-5 and I-10 near-road monitors are shown in parenthesis

* The 8-hour CO design value is the 2nd highest 8-hour average concentration at a station in a single year

Near-Road CO

On August 12, 2011 U.S. EPA issued a decision to retain the existing NAAQS for CO, determining that those standards provided the required level of public health protection. However, U.S. EPA added a monitoring requirement for near-road CO monitors in urban areas with population of 1 million or more, utilizing stations that would be implemented to meet the 2010 NO_2 near-road monitoring requirements. The two new CO monitors are at the I-5 Near-Road site, located in Orange County near Anaheim, and the I-10 Near-Road site, located near Etiwanda Avenue in San Bernardino County near Ontario, Rancho Cucamonga and Fontana.

The near-road CO measurements began at these two locations in late December 2014. From that time to the end of 2015, the data shows that while the near-road measurements were often higher than the nearest ambient monitors, as would be expected in the near-road environment, they did not exceed the levels of the 1-hour or 8-hour CO NAAQS. Tables 2-17 and 2-18 compare the available near-road measurements for annual peak 1-hour and 8-hour CO, respectively, to the comparable measurements from the nearby ambient stations at Anaheim and Fontana. The form of the CO standard is such that the peak concentration is not to be exceeded more than once per year. The tables include the second highest concentration for comparison to this design value form of the standard.

The 2015 near-road peak 1-hour CO concentration measured was 3.1 ppm, measured at the I-5 Near-Road site, while the peak 8-hour CO concentration was 2.6 ppm at the I-10 Near-Road site, both well below the respective NAAQS levels (35 ppm and 9 ppm, respectively). The 2015 near-road CO design values were higher than that of the nearest ambient stations for both federal standards. Based on this limited period

of data, it appears that the near-road CO design values will be very unlikely to affect the Basin's attainment status for the State and federal CO standards.

TABLE 2-17

2014 and 2015 Maximum and Second Highest 1-Hour CO Concentrations
at South Coast Air Basin Near-Road Sites and Nearby Ambient Stations

Near-Road CO						Nearby Ambient CO				
		Peak 1-Hour CO (ppm)		2nd Maximum 1-Hour CO (ppm)			Peak 1-Hour CO (ppm)		2nd Maximum 1-Hour CO (ppm)	
Near-Road Station	**Start Date**	**2014**	**2015**	**2014**	**2015**	**Ambient Station**	**2014**	**2015**	**2014**	**2015**
Route 5 N. R. (at Vernon St., Orange County)	12/18/2014	N/A	3.1	N/A	**2.9**	**Anaheim**	3.1	3.1	2.6	2.6
Route 10 N. R. (at Etiwanda Av., San Bernardino County)	12/23/2014	N/A	**2.7**	N/A	**2.7**	**Fontana**	2.6	2.8	2.2	2.2

Bold text denotes maximum concentration between near-road and nearby ambient stations
N/A = complete data not available for valid calculation
The 1-hour CO NAAQS is 35 ppm, not to be exceeded more than once at a station in a single year

TABLE 2-18

2014 and 2015 Maximum and Second Highest 8-Hour CO Concentrations
at South Coast Air Basin Near-Road Sites and Nearby Ambient Stations

Near-Road CO						Nearby Ambient CO				
		Peak 8-Hour CO (ppm)		2nd Maximum 8-Hour CO (ppm)			Peak 8-Hour CO (ppm)		2nd Maximum 8-Hour CO (ppm)	
Near-Road Station	**Start Date**	**2014**	**2015**	**2014**	**2015**	**Ambient Station**	**2014**	**2015**	**2014**	**2015**
Route 5 N. R. (at Vernon St., Orange County)	12/18/2014	N/A	2.3	N/A	2.3	**Anaheim**	**2.1**	**2.2**	**2.1**	**2.0**
Route 10 N. R. (at Etiwanda Av., San Bernardino County)	12/23/2014	N/A	**2.6**	N/A	**2.5**	**Fontana**	1.2	1.2	1.1	1.1

Bold text denotes maximum concentration between near-road and nearby ambient stations
N/A = complete data not available for valid calculation
The 8-hour CO NAAQS is 9 ppm, not to be exceeded more than once at a station in a single year

Nitrogen Dioxide (NO_2)

Health Effects, NO_2

The adverse effects of ambient nitrogen dioxide air pollution exposure on health were reviewed in the 2008 U.S. EPA *Integrated Science Assessment for Oxides of Nitrogen – Health Criteria*,[17] and more recently in the 2016 U.S. EPA *Integrated Science Assessment for Oxides of Nitrogen – Health Criteria*.[18] These documents present detailed reviews of the available scientific studies and conclusions on the causal determination of the health effects of NO_2, including evidence supporting the short-term NO_2 standard (1-hour, 100 ppb), which was adopted in 2010. A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

The 2016 U.S. EPA review noted the respiratory effects of NO_2, and evidence suggestive of impacts on cardiovascular health, mortality and cancer. Evidence for low-level nitrogen dioxide (NO_2) exposure effects is derived from laboratory studies of asthmatics and from epidemiological studies. Additional evidence is derived from animal studies. In the 2016 ISA, the U.S. EPA cited the coherence of the results

[17] U.S. EPA. (2008). Integrated Science Assessment for Oxides of Nitrogen – Health Criteria (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/071. http://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=194645.

[18] U.S. EPA. (2016). Integrated Science Assessment for Oxides of Nitrogen – Health Criteria (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-15/068. https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=310879.

from a variety of studies, and a plausible biological mechanism to support the determination of a causal relationship between short-term NO_2 exposures and asthma exacerbations ("asthma attacks"). The long-term link with respiratory outcomes was strengthened by recent experimental and epidemiological studies, and the strongest evidence available is from studies of asthma development.

Experimental studies have found that NO_2 exposures increase responsiveness of airways, pulmonary inflammation, and oxidative stress, and can lead to the development of allergic responses. These biological responses provide evidence of a plausible mechanism for NO_2 to cause asthma. Additionally, results from controlled exposure studies of asthmatics demonstrate an increase in the tendency of airways to contract in response to a chemical stimulus (airway responsiveness) or after inhaled allergens. Animal studies also provide evidence that NO_2 exposures have negative effects on the immune system, and therefore increase the host's susceptibility to respiratory infections. Epidemiological studies showing associations between NO_2 levels and hospital admissions for respiratory infections support such a link, although the studies examining respiratory infections in children are less consistent.

Based on the review of the NO_2 standards, U.S. EPA established the 1-hour NO_2 standard to protect the public health against short-term exposure. The standard is set at 100 ppb over a 1-hour average and became effective on April 7, 2010.

Air Quality, NO_2

In 2015, ambient NO_2 concentrations were monitored at 27 locations, including one in the Coachella Valley and four near-road monitoring stations. The Basin has not exceeded the federal annual standard for NO_2 (0.0534 ppm) since 1991, when the Los Angeles County portion of the Basin recorded the last violation of that standard in the U.S. The current 1-hour average NO_2 NAAQS (100 ppb) was exceeded on one day in 2015 in the South Coastal Los Angeles County area at the Long Beach – Hudson air monitoring station (a location close to periodic diesel truck and bus activity). However, the 98th percentile form of the standard was not exceeded and the 2013–2015 design value is not in violation of the NAAQS.

The higher relative concentrations in the Los Angeles area are indicative of the concentrated emission sources, especially heavy-duty vehicles. Although the Basin is in attainment of the State and federal standards, NO_2 is still of concern, since oxides of nitrogen (NOx) are precursors to both ozone and particulate matter. Further control of NO_x will be required to attain the ozone and particulate standards. The Basin has not exceeded the federal annual standard for NO_2 (0.053 ppm or 53 ppb) since 1991, when the Los Angeles County portion of the Basin recorded the last violation of that standard in the U.S. No State NO_2 standards were exceeded in 2015. Tables 2-19 and 2-20 summarize the 2015 maximum 1-hour and annual average concentrations of NO_2 by air basin and county. These tables do not include the new near-road stations, since the period of record is not yet sufficient to calculate the 3-year NO_2 design values. The near-road NO_2 data is summarized further below.

TABLE 2-19

2015 Maximum 1-Hour NO_2 Concentrations and 2013–2015 Design Values by Basin and County

Basin/County	2015 Maximum NO_2 1-Hour Average (ppb)	2013–2015 NO_2 1-Hour Design Value (ppb)	Percent of NO_2 1-Hour NAAQS (100 ppb)	Area of Design Value Max	2013–2015 NO_2 1-Hour State Designation Value (ppm)	Percent of NO_2 1-Hour State Standard (0.18 ppm)
South Coast Air Basin						
Los Angeles	**101.8***	**74**	**74**	**South Coastal LA Co.**	**0.14**	**78**
Orange	59.1	58	58	Central Orange County	0.09	50
Riverside	68.1	54	54	Metropolitan Riverside County	0.07	39
San Bernardino	89.1	64	64	Central San Bernardino Valley	0.09	50
Salton Sea Air Basin						
Riverside	41.5	39	39	Coachella Valley	0.05	28

Bold text denotes the peak value

This table does not include near-road stations since the data period is insufficient for 3-year design value calculation (see near-road discussion below)

The 1-hour NO_2 design value is the annual 98th percentile daily maximum 1-hour concentration, averaged over 3 years at a station

* Although the maximum 1-hour concentrations exceeded the standard on one day, the 98th percentile form of the design value did not exceed the NAAQS

TABLE 2-20

2015 Maximum Annual Average NO_2 Concentrations and 2013–2015 Design Values by Basin and County

Basin/County	2015 Maximum NO_2 Annual Average (ppm)	2013–2015 NO_2 Annual Design Value (ppm)	Percent of NO_2 Annual NAAQS (0.053 ppm)	Area of Design Value Max	2013–2015 NO_2 Annual State Designation Value# (ppm	Percent of NO_2 Annual State Standard (0.030 ppm)
South Coast Air Basin						
Los Angeles	**0.0222**	**0.022**	**42**	**Central Los Angeles County**	**0.023**	**77**
Orange	0.0150	0.016	30	Central Orange County	0.018	60
Riverside	0.0144	0.016	30	Metropolitan Riverside County	0.017	57
San Bernardino	0.0187	0.020	38	Central San Bernardino Valley	0.021	70
Salton Sea Air Basin						
Riverside	0.0062	0.007	13	Coachella Valley	0.008	27

Bold text denotes the peak value

The annual NO_2 design value is the annual average of the quarterly averages, averaged over 3 years at a station

This table does not include near-road stations since the data period is insufficient for the design value calculation

Near-Road NO_2

With the revised NO_2 federal standard in 2010, near-road NO_2 measurements were required to be phased in for larger cities. The four near-road monitoring stations are: (1) I-5 Near-Road, located in Orange County near Anaheim; (2) I-710 Near-Road, located at Long Beach Blvd. in Los Angeles County near Compton and Long Beach; (3) CA-60 Near-Road, located west of Vineyard Avenue near the San Bernardino/Riverside County border near Ontario, Mira Loma and Upland; and (4) I-10 Near-Road, located near Etiwanda Avenue in San Bernardino County near Ontario, Rancho Cucamonga and Fontana.

The longest operating near-road station in the Basin, adjacent to I-5 in Orange County, has not exceeded the level of the 1-hour NO_2 NAAQS (100 ppb) since the measurements began on January 1, 2014. The peak 1-hour NO_2 concentration at that site in 2014 was 78.8 ppb and the peak concentration for 2015 was 70.2 ppb. This can be compared to the annual peak values measured at the nearest ambient monitoring station in Central Orange County (Anaheim station), where the 2014 and 2015 peaks were 75.8 and 59.1, respectively. In terms of the design value form of the NAAQS, the 98th percentile daily maximum 1-hour concentrations at the Anaheim near-road site were 66.0 ppb and 61.4 ppb, respectively, for 2014 and 2015, compared to 59.8 ppb and 54.6 ppb from the Anaheim ambient monitoring station. The annual average NO_2 NAAQS (0.053 ppm, or 53 ppb) was also not exceeded. Thus, while the Anaheim near-road NO_2 measurements are higher than the ambient Orange County measurements, as would be expected close to traffic emissions sources, it does not appear that NO_2 design values will violate the NAAQS or CAAQS at this location.

Likewise, the shorter period of data available from the remaining three near-road stations indicates that these locations will also likely measure higher NO_2 than the nearest ambient stations, but they have not exceeded the level of the 1-hour or annual NO_2 NAAQS or CAAQS through the end of 2015. Tables 2-21 and 2-22 compare the available near-road NO_2 measurements for peak 1-hour and annual average NO_2, respectively, to the nearest ambient measurements. The 98th percentile concentration is included for comparison to the design value form of the 1-hour NO_2 NAAQS of 100 ppb. Based on this limited period of data, it appears that the near-road NO_2 measurements will be unlikely to affect the Basin's attainment status for the State and federal NO_2 standards.

TABLE 2-21

2014 and 2015 Maximum and 98th Percentile 1-Hour NO_2 Concentrations
at South Coast Air Basin Near-Road Sites and Nearby Ambient Stations

Near-Road NO_2						Nearby Ambient NO_2				
		Annual Peak 1-Hour NO_2 (ppb)		98th Percentile 1-Hour NO_2 (ppb)			Annual Peak 1-Hour NO_2 (ppb)		98th Percentile 1-Hour NO_2 (ppb)	
Near-Road Station	**Start Date**	**2014**	**2015***	**2014**	**2015***	**Ambient Station**	**2014**	**2015**	**2014**	**2015**
I-5 N. R. (at Vernon St., Orange County)	1/1/2014	**78.8**	**70.2**	**66.0**	**61.4**	**Anaheim**	**75.8**	59.1	59.8	54.6
I-710 N. R. (at Long Beach Bl., Los Angeles County)	2/18/2015	N/A	**94.7**	N/A	**74.8**	**Compton**	68.2	73.6	59.2	58.7
CA-60 N. R. (West of Vineyard Av., San Bernardino/Riverside County)	7/9/2015	N/A	**79.2**	N/A	**77.2**	**Upland**	74.1	71.6	56.7	55.7
I-10 N. R. (at Etiwanda Av., San Bernardino County)	10/8/2014	**93.0**	87.2	**69.5**	**73.0**	**Fontana**	70.4	**89.1**	63.6	66.1

Bold text denotes the peak value

N/A = data not available (monitoring not started)

* 2015 data is incomplete for I-710 and CA-60 Near-Road Sites

The 1-hour NO_2 NAAQS is 100 ppb

TABLE 2-22

2014 and 2015 Annual NO_2 Concentrations at South Coast Air Basin
Near-Road Sites and Nearby Ambient Stations

Near-Road NO_2				Nearby Ambient NO_2		
		Annual Average NO_2 (ppb)			Annual Average NO_2 (ppb)	
Near-Road Station	**Start Date**	**2014**	**2015***	**Ambient Station**	**2014**	**2015**
I-5 N. R. (at Vernon St., Orange County)	1/1/2014	**27.2**	**25.4**	**Anaheim**	15.2	14.6
I-710 N. R. (at Long Beach Bl., Los Angeles County)	2/18/2015	N/A	23.9	**Compton**	15.6	16.9
CA-60 N. R. (West of Vineyard Av., San Bernardino/Riverside County)	7/9/2015	N/A	N/A	**Upland**	16.6	15.9
I-10 N. R. (at Etiwanda Av., San Bernardino County)	10/8/2014	N/A	**29.8**	**Fontana**	20.2	18.7

Bold text denotes the peak value
N/A = data not available (monitoring not started)
* 2015 data is incomplete for I-710 and CA-60 Near-Road Sites
The annual average NO_2 NAAQS is 0.053 ppm, or 53 ppb

Sulfur Dioxide (SO_2)

Health Effects, SO_2

The adverse effects of SO_2 air pollution exposure on health were reviewed in the 2008 U.S. EPA *Integrated Science Assessment (ISA) for Sulfur Oxides – Health Criteria*.[19] This document presents a detailed review of the available scientific studies and conclusions on the causal determination of the health effects of SO_2, including the justification to rescind the 24-hour standard and replace it with the new 2010 1-hour standard (75 ppb). A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

Individuals affected by asthma are especially sensitive to the effects of SO_2. Exposure to low levels (0.2 to 0.6 ppm) of SO_2 for a few (5–10) minutes can result in airway constriction in some exercising asthmatics. Increased resistance to air flow and reduction in breathing capacity leading to severe breathing

[19] U.S. EPA. (2008). Integrated Science Assessment (ISA) for Sulfur Oxides – Health Criteria (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/047F. http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=198843#Download.

difficulties, are observed after acute high exposure to SO_2 in asthmatics. In contrast, healthy individuals do not exhibit similar acute responses even after exposure to higher concentrations of SO_2.

Animal studies suggest that SO_2 at ambient concentrations can cause allergic sensitization and airway inflammation. Some population-based studies indicate that the mortality and morbidity effects associated with fine particles show a similar association with ambient SO_2 levels. In these studies, efforts to separate the effects of SO_2 from those of fine particles have not been successful. It is not clear whether the two pollutants act synergistically or one pollutant alone is the predominant factor.

Based on the review of the SO_2 standards, U.S. EPA has established the 1-hour SO_2 standard to protect the public health against short-term exposure. The 1-hour average NAAQS was set at 75 ppb and the annual (0.03 ppm) and 24-hour (0.14 ppm) federal standards were revoked, effective August 2, 2010.

Air Quality, SO_2

No exceedances of federal or State standards for sulfur dioxide occurred in 2015, or in any recent year, at any of the six SCAQMD ambient monitoring locations. The annual and 24-hour federal standards were last exceeded in the 1960's and the State standards were last exceeded in 1990. Though sulfur dioxide concentrations remain well below the standards, sulfur dioxide is a precursor to sulfate, which is a component of fine particulate matter. Tables 2-23 and 2-24 summarize the 2015 maximum 1-hour and annual average concentrations of SO_2 by air basin and county. Sulfur dioxide was not measured at the Coachella Valley sites in 2015. Historical measurements and source emission profiles show that expected concentrations in the Coachella Valley will be well below State and federal standards.

TABLE 2-23

2015 Maximum 1-Hour SO_2 Concentrations and 2013–2015 Design Values by Basin and County

Basin/County	2015 Maximum SO_2 1-Hour Average (ppb)	2013–2015 SO_2 1-Hour Design Value (ppb)	Percent of SO_2 1-Hour NAAQS (75 ppb)	Area of Design Value Max	Percent of SO_2 1-Hour State Standard (0.25 ppm = 250 ppb)
South Coast Air Basin					
Los Angeles	**37.5**	**11**	**15**	**South Coastal LA County**	**4**
Orange	4.5	3	4	North Coastal Orange County	1
Riverside	1.9	3	4	Metropolitan Riverside County	1
San Bernardino	4.0	3	4	Central San Bernardino Valley	1
Salton Sea Air Basin					
Riverside	N.D.	N.D.	N.D.	Coachella Valley	N.D.

Bold text denotes the peak value

N.D. = No Data. Historical measurements and lack of emissions sources indicate concentrations are well below standards

The 1-hour SO_2 design value is the annual 99th percentile 1-hour daily maximum concentration, averaged over 3 years at a station

TABLE 2-24

2015 Maximum 24-Hour Average SO_2 Concentrations and 2013–2015 Design Values by Basin and County

Basin/County	2015 Maximum SO_2 24-Hour Average (ppm)	2013–2015 SO_2 24-Hour Design Value (ppm)	Percent of SO_2 24-Hour former NAAQS (0.14 ppm)	Area of Design Value Max	Percent of SO_2 24-Hour State Standard (0.04 ppm)
South Coast Air Basin					
Los Angeles	**0.005**	**0.003**	**2**	**South Coastal LA County**	**8**
Orange	0.001	0.001	1	North Coastal Orange County	3
Riverside	0.001	0.001	1	Metropolitan Riverside County	3
San Bernardino	0.001	0.001	2	Central San Bernardino Valley	3
Salton Sea Air Basin					
Riverside	N.D.	N.D.	N.D.	Coachella Valley	N.D.

Bold text denotes the peak value

N.D. = No Data. Historical measurements and lack of emissions sources indicate concentrations are well below standards

The 24-hour SO_2 design value is the 2nd highest 24-hour average concentration at a station in a single year

Sulfates (SO_4^{2-})

Health Effects, SO_4^{2-}

In 2002, CARB reviewed and retained the State standard for sulfates, retaining the concentration level (25 µg/m^3) but changing the basis of the standard from a Total Suspended Particulate (TSP) measurement to a PM10 measurement. In their 2002 staff report,[20] CARB reviewed the health studies related to exposure to ambient sulfates, along with particulate matter, and found an association with mortality and the same range of morbidity effects as PM10 and PM2.5, although the associations were not as consistent as with PM10 and PM2.5. The 2009 U.S. EPA *Integrated Science Assessment for Particulate Matter*[21] also contains a review of sulfate studies.

Most of the health effects associated with fine particles and SO_2 at ambient levels are also associated with sulfates. Thus, both mortality and morbidity effects have been observed with an increase in ambient sulfate concentrations. However, efforts to separate the effects of sulfates from the effects of other pollutants have generally not been successful.

Air Quality, SO_4^{2-}

Sulfates, as measured from FRM PM10 filters, was sampled at 18 stations in 2015 in the SCAQMD jurisdiction, including two locations in the Coachella Valley. Two stations were closed in 2014, Burbank and Ontario Fire Station, with only partial-year data available. The North Long Beach station was closed in 2013. New locations are pending for the Burbank and North Long Beach stations. Since the sulfate measurement is analyzed in the laboratory from the collected 24-hour PM10 filters, the sulfate network is identical to the FRM PM10 monitoring network. The measurements are done every sixth day, except that two stations in Metropolitan Riverside County (Rubidoux and Mira Loma) and one in the Coachella Valley (Indio) measure every third day.

In 2015, the State 24-hour PM10-sulfate standard (25 µg/m^3) was not exceeded anywhere in the Basin or the Coachella Valley, nor has it been exceeded since 1990. The peak Basin sulfate concentration of 21.0 µg/m^3 (84 percent of the State standard) was measured in the East San Gabriel Valley. This was higher than the peaks in recent years, due to the impact of Independence Day fireworks on the July 5 measurements. Several other stations in the Basin also had annual peaks on this day and it is anticipated that they will not be included in the State designation value calculation. There is no corresponding federal standard for sulfates. Maximum 24-hour concentrations and 3-year maximum State designation values by air basin and county are summarized in Table 2-25.

[20] CARB. (2002). Staff Report: Public Hearing to Consider Amendments to the Ambient Air Quality Standards for Particulate Matter and Sulfates. California Air Resources Board, Sacramento, CA. http://www.arb.ca.gov/regact/aaqspm/isor.pdf.

[21] U.S. EPA. (2009). Integrated Science Assessment for Particulate Matter (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-08/139F. http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=216546.

TABLE 2-25

2015 Maximum 24-Hour Average Sulfate (SO_4^{2-} from PM10) Concentrations by Basin and County

Basin/County	2015 Maximum SO_4^{2-} 24-Hour Average (µg/m³)	2013–2015 SO_4^{2-} 24-Hour State Designation Value (µg/m³)	2015 Percent of SO_4^{2-} State Standard (25 µg/m³)	Area of Max
South Coast Air Basin				
Los Angeles	**21.0***	**6.9***	**33**	**South Coastal Los Angeles County**
Orange	4.2	4.2	17	Central Orange County
Riverside	5.9*	4.2*	17	Metropolitan Riverside County
San Bernardino	14.7*	4.6*	18	Central San Bernardino Valley
Salton Sea Air Basin				
Riverside	4.6**	2.6**	10	Coachella Valley (Palm Springs)

Bold text denotes the peak value

* The 2015 Basin maximum sulfate concentration of 21.0 µg/m³ in Los Angeles County, as well as the peaks in Riverside and San Bernardino Counties, occurred on July 5, 2015, due to fireworks on Independence Day; it is anticipated that these may be excluded from the State designation value calculations for a peak 2015 Basin designation value of 6.9 µg/m³

** The 2015 Coachella Valley maximum sulfate concentration of 4.6 µg/m³ at the Palm Springs station was associated with a high-wind exceptional event; it is anticipated that this may be excluded from the State designation value calculations for a peak 2015 Basin designation value of 2.6 µg/m³

Lead (Pb)

Health Effects, Lead

The adverse effects of ambient lead exposures on health were reviewed in the 2013 U.S. EPA document, *Integrated Science Assessment for Lead: Final Report*.[22] This document presents a detailed assessment of the available scientific studies and presents conclusions on the causal determination of the health effects of lead, including the rationale to retain the current federal lead standard. A summary of health effects information and additional references can also be found in Appendix I: Health Effects.

Fetuses, infants, and children are more sensitive than others to the adverse effects of lead exposure. Long-term exposure to low levels of lead can adversely affect the development and function of the central

[22] U.S. EPA. (2013). Integrated Science Assessment for Lead (Final Report). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-10/075F. http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=255721#Download.

nervous system, leading to learning disorders, distractibility, inability to follow simple commands, and lower intelligence quotients. In adults, increased lead levels are associated with increased blood pressure and risk of coronary heart disease. Lead is linked to important hematological effects, such as impaired red blood cell function.

Lead poisoning can cause anemia, lethargy, seizures, and death. Lead can be stored in the bone from early-age environmental exposure, and elevated blood lead levels can occur due to breakdown of bone tissue during pregnancy, hyperthyroidism (increased secretion of hormones from the thyroid gland), and osteoporosis (breakdown of bony tissue). Fetuses and breast-fed babies can be exposed to higher levels of lead because of previous environmental lead exposure of their mothers.

Air Quality, Lead

Lead (Pb), as analyzed from Total Suspended Particulate (TSP) samples, was measured at eight ambient locations and an additional five source-specific stations in the Basin in 2015. This includes a new source-specific lead monitor that was installed in Fontana near a recycling facility starting in January 2015.

Based on the review of the NAAQS for lead, U.S. EPA established the current standard of 0.15 µg/m^3 for a rolling 3-month average, effective October 15, 2008. There have been no violations of the lead standards at the District's regular population-based ambient air monitoring stations since 1982, primarily as a result of removal of lead from gasoline. However, monitoring at two stations immediately adjacent to stationary sources of lead recorded exceedances of the current standard in Los Angeles County over the 2007–2009 time period. These data were used for designations under the revised standard that also included new requirements for near-source monitoring. As a result, a nonattainment designation was finalized for much of the Los Angeles County portion of the Basin when the current standard was implemented.

Table 2-26 summarizes the Basin's maximum 3-month rolling average lead concentrations recorded in 2015 and in the 2013–2015 design value period, by county. The current lead concentrations in Los Angeles county are now well below the NAAQS, including the monitoring at the source-oriented locations, the highest of which is now 53 percent of the NAAQS for the maximum 3-month rolling average occurring near the beginning of the 3-year design value period. More recent lead data from the source-specific locations have been even lower due, in part, to the implementation of stricter SCAQMD rules for these sources. The peak 3-month average in 2015 (0.04 µg/m^3) was only 27 percent of the NAAQS. The other three counties in the Basin have also remained well below the NAAQS. The less-stringent State 30-day standards for lead were not exceeded in any area of the District in 2015, or in recent years.

While near-source lead measurements in Los Angeles County had previously violated the current NAAQS, there have been no exceedances of the federal standard in the Basin for either the 2012–2014 or 2013–2015 design value periods. As a result, SCAQMD will be petitioning U.S. EPA for a re-designation to attainment for the federal lead standard for the Los Angeles County nonattainment area. Stringent SCAQMD rules governing lead-producing sources will help to ensure that there are no future violations of the federal standard. Furthermore, one business that had been responsible for the highest measured lead concentrations in Los Angeles County has closed and is in the process of demolition and site clean-up.

TABLE 2-26

2015 Maximum 3-Month Rolling Average Lead (Pb) Concentrations
and 2013–2015 Design Values by Basin and County

Basin/County	2015 Max Pb 3-Month Rolling Average Design Value (µg/m³)	2013–2015 Max Pb 3-Month Rolling Average Design Value (µg/m³)	Percent of Current Pb NAAQS (0.15 µg/m³)	Area of Design Value Max	2015 Max Pb 30-Day Average (µg/m³)	Percent of State Pb Standard (1.5 µg/m³)
South Coast Air Basin						
Los Angeles*	**0.04**	**0.08**	**53**	**Southeast Los Angeles**	**0.05**	**3**
Orange	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Riverside	0.01	0.01	7	Metropolitan Riverside County	0.01	1
San Bernardino	0.03	0.03	20	Northwest San Bernardino Valley, Central San Bernardino Valley	0.04	3
Salton Sea Air Basin						
Riverside	N.D.	N.D.	N.D.	Coachella Valley	N.D.	N.D.

Bold text denotes the peak value

N.D. = No Data. Historical measurements and emissions profiles indicate concentrations would be well below standards

* The higher lead concentrations in Los Angeles and San Bernardino Counties were measured at sites immediately downwind lead sources; the maximum 3-month average design value was measured at a near-source station in Los Angeles County (Santa Fe Springs) for February through April of 2013; the single year of data from the San Bernardino County near-source lead monitor is insufficient for a complete 3-year design value calculation, but is included here

Air Quality Compared to Other U.S. Metropolitan Areas

In spite of significant improvement, the Basin still has some of the worst air quality in the nation. In 2015, seven of the country's top ten locations most frequently exceeding the 2015 8-hour ozone NAAQS were located within the Basin, including stations in San Bernardino, Riverside and Los Angeles Counties.[23] The location with the highest number of days over the 2015 8-hour ozone NAAQS was in the Basin's Central San Bernardino Mountains (86 days in the community of Crestline). The Basin exceeded the 2008 8-hour ozone NAAQS on 81 days, more days than any other areas in the country. The Basin exceeded the 2015 ozone NAAQS on 113 days. Similarly, seven out of the top ten locations with the highest maximum 8-hour average ozone concentrations in the nation were also located in the Basin. Of the top ten locations, only one area (Houston, Texas) was located outside of California. The highest maximum 8-hour average ozone concentration recorded was 0.127 ppm (in the Central San Bernardino Mountains area), almost 180 percent of the 2015 ozone NAAQS.

Figures 2-10 and 2-11 show the maximum pollutant concentrations in 2015 for the Basin compared to other major metropolitan areas in the U.S. and California air basins, respectively. Maximum concentrations in all of these areas exceeded both the 2015 and 2008 8-hour ozone NAAQS. The current annual PM2.5 standard was exceeded in the South Coast Air Basin, Houston, and Chicago metropolitan areas, as well as in California's San Joaquin Valley. The 24-hour PM2.5 standard, was exceeded in the Basin, Phoenix, and Chicago, as well as in all of the California air basins shown except San Diego.

The 24-hour PM10 standard was not exceeded in any of the U.S. areas and California air basins shown, once data flagged for exceptional events was excluded from the analysis. Of the areas shown for 2015, the level of the 1-hour NO_2 federal standard was exceeded in the Basin, Houston, and New York areas, as well as in the San Joaquin Valley. SO_2 concentrations were below the 1-hour federal standard in the Basin and in all of the urban areas shown in Figures 2-10 and 2-11. However, the SO_2 standard was exceeded in other U.S. urban and rural areas, with the highest 2015 concentrations recorded in the State of Arizona (Gila County). The CO standards were not exceeded in the U.S. in 2015 and are not shown in the figures. Nationwide, the federal lead standard (not shown) was exceeded at six locations in 2015, at source-oriented monitoring stations, in Pennsylvania and Arizona.

[23] The top 10 stations in the nation for number of exceedances in 2015 of the 2015 8-hour ozone NAAQS (0.070 ppm) include Basin stations in the areas of Central San Bernardino Mountains (in the Crestline-Lake Gregory community), Central San Bernardino Valley (San Bernardino and Fontana), East San Bernardino Valley (Redlands), Northwest San Bernardino Valley (Upland), San Gorgonio Pass (Banning), and Metropolitan Riverside County (Riverside-Rubidoux), as well as stations in the San Joaquin Valley Air Basin (Bakersfield and Fresno) and the Antelope Valley Air Basin (Lancaster).

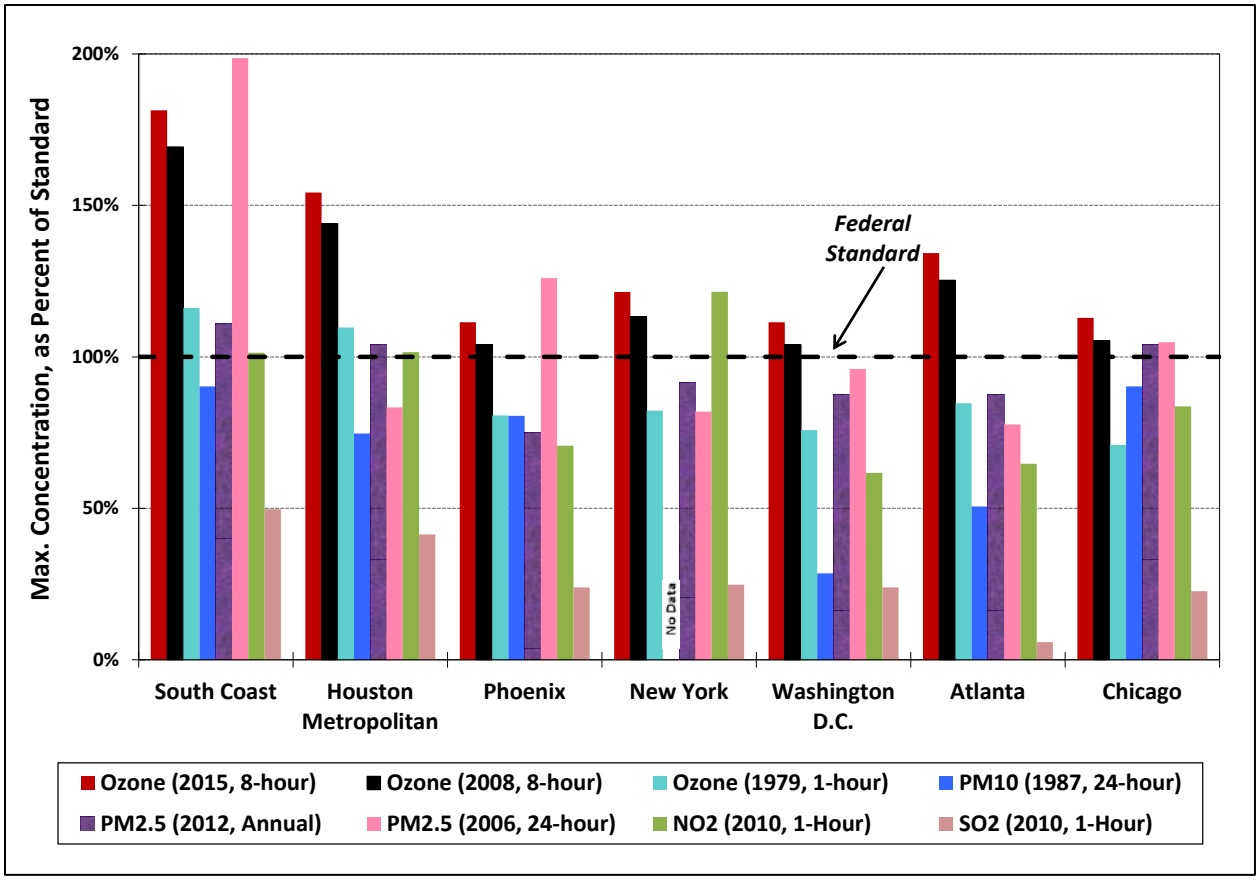


FIGURE 2-10

2015 SOUTH COAST AIR BASIN AIR QUALITY COMPARED TO OTHER U.S. URBAN AREAS

(MAXIMUM POLLUTANT CONCENTRATIONS AS PERCENTAGES OF THE NAAQS, FLAGGED EXCEPTIONAL EVENTS ARE EXCLUDED)

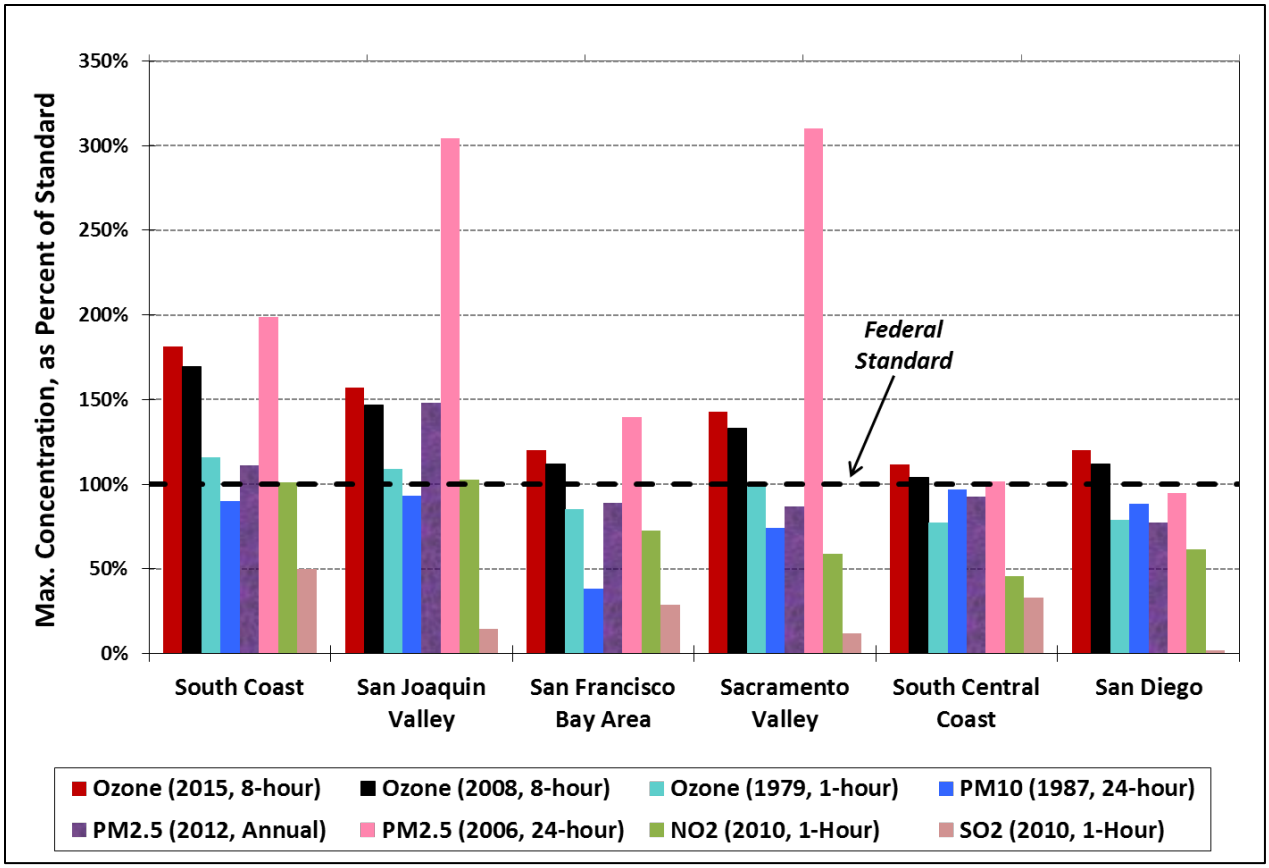


FIGURE 2-11

2015 SOUTH COAST AIR BASIN AIR QUALITY COMPARED TO OTHER CALIFORNIA AIR BASINS

(MAXIMUM POLLUTANT CONCENTRATIONS AS PERCENTAGES OF THE NAAQS, FLAGGED EXCEPTIONAL EVENTS ARE EXCLUDED)

As noted previously, maximum pollutant concentrations do not necessarily indicate NAAQS violations and subsequent attainment/nonattainment designation changes, which is determined by the design value form of the NAAQS. Figures 2-12 and 2-13 show the 2013–2015 3-year design values for the Basin compared to other urban areas in the U.S. and California, respectively. While the 2015 maximum ozone concentrations for all the urban areas shown above in Figures 2-10 and 2-11 are over the 2015 and 2008 ozone NAAQS, 2013–2015 ozone design values in some of these urban areas shown in Figures 2-12 and 2-13 are not in violation of these 8-hour ozone NAAQS. For the revoked 1979 1-hour ozone NAAQS, only the Basin had 1-hour design values over the federal standard for the 2013–2015 period. The design values for annual averaged PM2.5 are over the 2012 annual PM2.5 NAAQS for the Basin, along with Houston, the San Joaquin Valley, and California's South Central Coast. The 24-hour PM2.5 design values are over the 24-hour PM2.5 NAAQS in the Basin and the San Joaquin Valley; no other urban areas shown exceeded that standard. PM10 design values are over the standard in Phoenix and the San Joaquin Valley, although some of these may have been influenced by pending exceptional events. The design

values for NO_2, SO_2, and CO (not shown) did not violate the NAAQS for any of the urban areas shown for the 2013–2015 period.

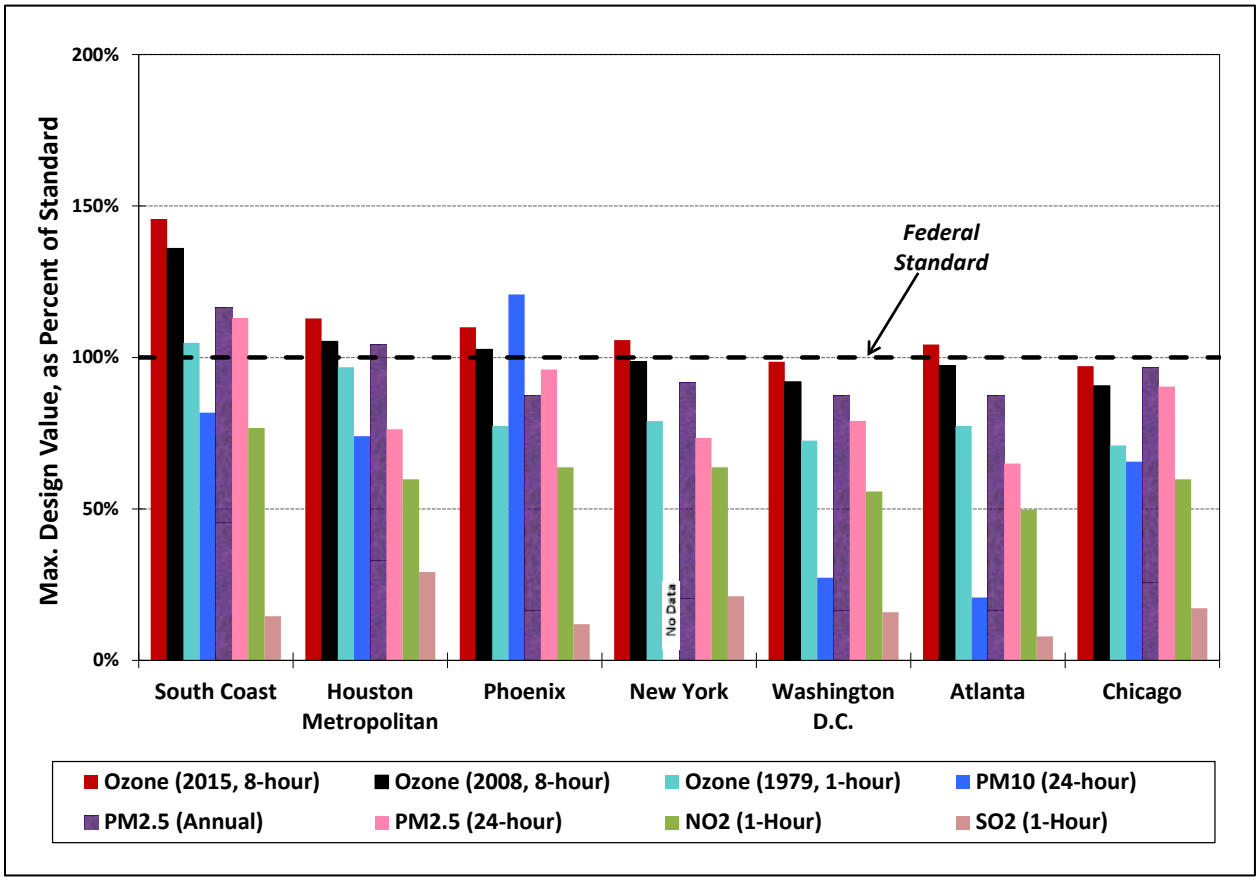


FIGURE 2-12

2015 SOUTH COAST AIR BASIN AIR QUALITY COMPARED TO OTHER U.S. URBAN AREAS

(MAXIMUM 3-YEAR DESIGN VALUE CONCENTRATIONS AS PERCENTAGES OF THE CORRESPONDING NAAQS, FLAGGED EXCEPTIONAL EVENTS ARE EXCLUDED)

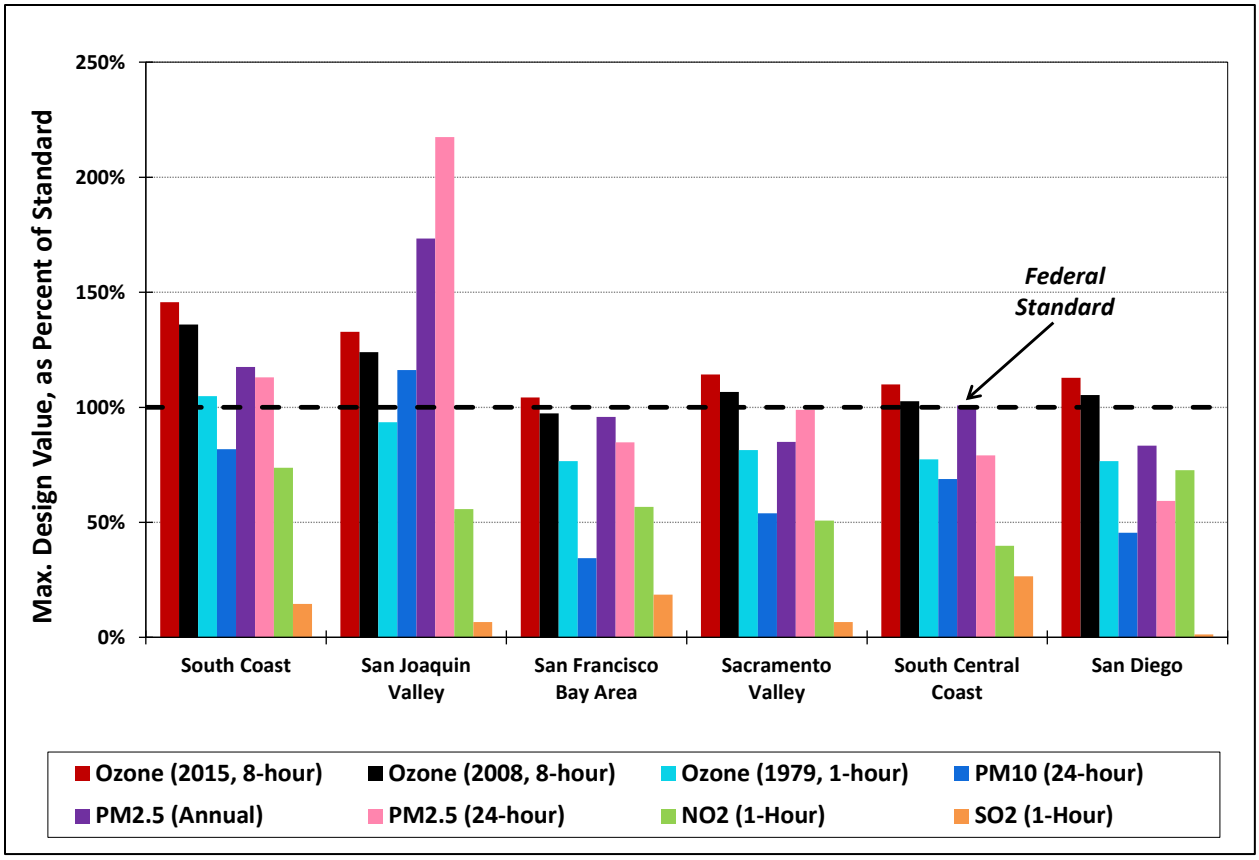


FIGURE 2-13

2015 SOUTH COAST AIR BASIN AIR QUALITY COMPARED TO OTHER CALIFORNIA AIR BASINS

(MAXIMUM 3-YEAR DESIGN VALUE CONCENTRATIONS AS PERCENTAGES OF THE CORRESPONDING NAAQS, FLAGGED EXCEPTIONAL EVENTS ARE EXCLUDED)

Summary

In the year 2015, the Basin exceeded the most recent federal standards on 40 percent of the days, mainly due to exceedances of ozone and to a lesser extent, PM2.5. The maximum measured concentrations for these pollutants in 2015 were among the highest in the country. In 2015, the Basin exceeded the level of the new 2015 8-hour ozone NAAQS on 113 days, with all four counties. It exceeded the 2008 and 1997 8-hour ozone NAAQS on 81 and 47 days, respectively. Seven of the top 10 stations in the nation most frequently exceeding the 8-hour federal ozone NAAQS in 2015 were located within the Basin, including stations in San Bernardino and Riverside Counties. However, the Basin's maximum 3-year 8-hour ozone design value was the same for the 2012–2014 and 2013–2015 periods and the lowest recorded in the Basin since measurements began in the 1950s. Also, the number of Basin days in 2015 exceeding the current and former 8-hour NAAQS was the lowest recorded since the measurements began.

The Basin exceeded the PM2.5 24-hour standard on 30 days in 2015, including the near-road measurements (25 days for ambient stations only). Significant improvement has been seen over the past decade for both 24-hour and annual PM2.5 concentrations and only one location in the Basin is currently exceeding the 24-hour design value form of the PM2.5 federal standards. However, the 24-hour PM2.5 design value trend in the Basin increased in 2014 and again in 2015. This is due in large part to the extreme drought conditions in Southern California and the associated lack of periodic storm events in the winter months that would bring better dispersion and washout of pollutants. The Basin's federal 3-year design values for annual PM2.5 have continued to exhibit downward trends through 2015.

The Coachella Valley area in the Riverside County portion of the Salton Sea Air Basin exceeded federal and State standards for ozone and PM10. However, the high PM10 concentrations exceeding the federal 24-hour PM10 standard occurred on days influenced by high-wind natural events, which the District has flagged in the U.S. EPA AQS database such that U.S. EPA will consider excluding such data when determining the NAAQS attainment status in accordance with U.S. EPA's Exceptional Events Rule. For the stations in the Coachella Valley, the federal 3-year design values for 8-hour ozone have continued to exhibit downward trends through 2015.

The NO_2 concentrations in Los Angeles County exceeded the recently established short-term (1-hour) federal standard on one day at one location in 2015, but did not exceed the standards anywhere on any other day in the Basin. The 98th percentile form of the federal NO_2 standard was not exceeded and the Basin's attainment status remains intact. The Los Angeles County lead nonattainment area portion of the Basin no longer exceeds the 3-month rolling average lead NAAQS as of the 2013–2015 design value period, including the source-specific monitors. A request to U.S. EPA for re-designation to attainment is being prepared. Maximum concentrations for SO_2, CO, and sulfate (measured from PM10) continued to remain below the State and federal standards.