apcd air pollution control district
SANTA BARBARA COUNTY

Agenda Item: G-1
Agenda Date: October 24, 2024
Agenda Placement: Regular
Estimated Time: 15 minutes
Continued Item: No

Board Agenda Item

TO: Air Pollution Control District Board

FROM: Aeron Arlin Genet, Air Pollution Control Officer

CONTACT: Patrick Collins, Air Quality Specialist, Planning Division, (805) 979-8339

SUBJECT: 2023 Annual Air Quality Report

RECOMMENDATION:

Receive and file a presentation and attached 2023 Annual Air Quality Report for Santa Barbara County.

BACKGROUND:

In 2023, the District operated a network of 13 ambient air quality and meteorological monitoring stations throughout Santa Barbara County, including the addition of a new special purpose monitor in Carpinteria. These stations are designed to measure concentrations of the following pollutants: ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter less than 10 microns in diameter (PM_{10}) and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$). Wind speed, wind direction, and ambient temperature are also measured at most stations. Each year, the District prepares an annual air quality report after all of the air quality data has been reviewed and verified.

DISCUSSION:

The United States Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for certain air pollutants where public health criteria have been established. The EPA currently has NAAQS established for six pollutants: ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, lead, and particulate matter.

The California Air Resources Board (CARB) has established air quality standards for the same criteria pollutants as the NAAQS. The state standards are either the same or more stringent than the federal standards. CARB has also adopted standards for four additional pollutants: sulfates, hydrogen sulfide, vinyl chloride, and visibility reducing particles.

In 2023, the state 24-hour PM_{10} standard of 50 $\mu g/m^3$ was exceeded on twelve days in total, between three different monitoring stations: Santa Maria, Lompoc H Street, and Santa Barbara. It should be noted that there were ten exceedances at the Santa Maria station, while the Lompoc H Street station recorded two exceedances, and the Santa Barbara station had just one exceedance in 2023. The state 24-hour PM_{10} standard was exceeded at both the Lompoc H Street and Santa Maria stations on August 29, 2023. Nine out of the twelve exceedance days were due to high wind events, while the remaining three were a result of wildfire smoke transported from Canada and Northern California. In 2023, there were no exceedances countywide of the state and federal 8-hour ozone standard of 70 ppb; as a result, the California Air Resources Board took action in January 2023 to designate Santa Barbara County as nonattainment-transitional for the state ozone standards, based on the three-year data set from 2019-2021. The state and federal ambient air quality standards were met for all other air pollutants in 2023.

The attached 2023 Annual Air Quality Report provides a brief discussion of our local air quality during 2023. The report summarizes the four highest concentrations for each pollutant at each monitoring station. Included in the report are maps and tables showing the locations of each monitoring station and the pollutants measured. The report also includes a discussion of long-term air quality trends for Santa Barbara County. The presentation to your Board will summarize the 2023 Annual Air Quality Report as well as other recent updates related to the District's air monitoring network.

ATTACHMENT:

A. 2023 Annual Air Quality Report

ATTACHMENT A

2023 Annual Air Quality Report

October 24, 2024

Santa Barbara County Air Pollution Control District
Board of Directors

260 San Antonio Road, Suite A
Santa Barbara, California 93110

Annual Air Quality Report

2023

Aeron Arlin Genet, Air Pollution Control Officer

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Appendix A – Ambient Air Quality Standards Table A1

SANTA BARBARA COUNTY AIR POLLUTION CONTROL DISTRICT BOARD OF DIRECTORS

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1 2023 AIR QUALITY SUMMARY

This annual report provides information on the measured air quality concentrations in Santa Barbara County for 2023, as well as information on air quality trends. The report is available for download on the District's website at www.ourair.org/air-monitoring.

In 2023, the state 24-hour PM_{10} standard of 50 µg/m^3 was exceeded on twelve days in total at three different monitoring stations. It should be noted that there were ten exceedances at the Santa Maria station while the Lompoc H Street station recorded two exceedances, and the Santa Barbara station had just one exceedance in 2023. The state 24-hour PM_{10} standard was exceeded at both the Lompoc H Street and Santa Maria stations on August 29, 2023. Nine out of the twelve exceedance days were due to high wind events, while the remaining three were a result of wildfire smoke transported from Canada and Northern California. In 2023, there were no exceedances countywide of the state and federal 8-hour ozone standard of 70 ppb; as a result, the California Air Resources Board took action in January 2023 to designate Santa Barbara County as nonattainment-transitional for the state ozone standards, based on the three-year data set from 2019-2021. The state and federal ambient air quality standards were met for all other measured pollutants.

Table 1-1 presents a summary of the number of exceedances for each monitoring station in Santa Barbara County. A tabular summary of the federal and state ambient air quality standards is included in Appendix A.

TABLE 1-1: SANTA BARBARA COUNTY EXCEEDANCE SUMMARY FOR 2023[1]

Number of Days that Exceeded Air Quality Standard									
Station	**O_3-1hr (state)**	**O_3-8hr (state)**	**O_3-8hr (federal)**	**NO_2**	**SO_2**	**CO**	**PM_{10} (state)**	**PM_{10} (federal)**	**$PM_{2.5}$ (federal)**
Carpinteria	0	0	0	0	-	-	-	-	-
CarpPM [3]	-	-	-	-	-	-	-	-	0
Goleta	0	0	0	-	-	-	0	0	0
Las Flores Canyon	0	0	0	0	0	0	0	0	-
Lompoc H Street	0	0	0	0	0	0	2	0	0
Lompoc HS&P	0	0	0	0	0	-	-	-	-
Paradise	0	0	0	0	-	-	-	-	-
Santa Barbara	0	0	0	-	-	-	1	0	0
Santa Maria	0	0	0	-	-	-	10	0	0
Santa Ynez	0	0	0	-	-	-	-	-	0
Countywide Total	0	0	0	0	0	0	13 [2]	0	0

[1] *A dash indicates that the pollutant is not measured at this location.*

[2] *The state 24-hour PM_{10} standard was exceeded at both Lompoc H Street and Santa Maria on August 29, 2023.*

[3] *Sampled Q4 only.*

2 AMBIENT AIR QUALITY STANDARDS AND AIR MONITORING STATIONS

Ambient Air Quality Standards

The Federal Clean Air Act (CAA) (Title 1, Section 109) requires the Environmental Protection Agency (EPA) to prescribe primary National Ambient Air Quality Standards (NAAQS) for certain air pollutants where public health criteria have been established. These pollutant levels were chosen to protect the health of the most susceptible individuals in a population, including children, the elderly, and those with chronic respiratory and circulatory ailments. A secondary standard is also prescribed to protect human welfare (visibility, crop damage, building damage). These pollutants are known as criteria pollutants.

The EPA currently has NAAQS for six criteria pollutants: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), lead (Pb), particulate matter less than ten microns in diameter (PM_{10}), and fine particulate matter less than 2.5 microns in diameter ($PM_{2.5}$).

In addition to the EPA standards, the California Air Resources Board (CARB) has set air quality standards for the same federal criteria pollutants as well as four others: sulfates, hydrogen sulfide (H_2S), vinyl chloride (chloroethene, C_2H_3Cl), and visibility-reducing particles.

A list of the federal and state standards applicable in 2023 can be found in Appendix A. During 2023, there were no changes to federal or state ambient air quality standards.

Air Monitoring Stations

In 2023, there were 13 monitoring stations operating in Santa Barbara County measuring ambient air and meteorological conditions. Two of the thirteen stations measured odorous air pollutants from industrial facilities. Nine stations were operated by the Santa Barbara County Air Pollution Control District (District). The remaining stations were operated by private industry. The monitoring stations are divided into three categories: State and Local Air Monitoring Stations (SLAMS), industrial air monitoring stations (Industrial Stations), and special purpose monitors. The SLAMS stations are designed to monitor the air in urban areas of the county while the Industrial Stations are required by District permits to monitor air quality impacts from the pollutants emitted from the operation of those permitted facilities. While Industrial Stations are typically not compared to air quality standards, three such stations in the District's network have their ozone monitors designated as SLAMS and are compared to the NAAQS. Special purpose monitors are intended to fulfill specific or short-term monitoring goals and are typically not compared to the NAAQS. In 2023, the District installed a special purpose $PM_{2.5}$ monitor in Carpinteria to provide information on normal patterns of $PM_{2.5}$ concentrations as well as wildfire smoke impacts in the City of Carpinteria and surrounding communities. Figure 2-1 shows the locations of all monitoring stations in Santa Barbara County operating in

2023. Table 2-1 lists the monitoring stations operating in Santa Barbara County during 2023, the pollutants and parameters measured at each station, and their designations.

FIGURE 2-1: 2023 SANTA BARBARA COUNTY AIR MONITORING STATIONS

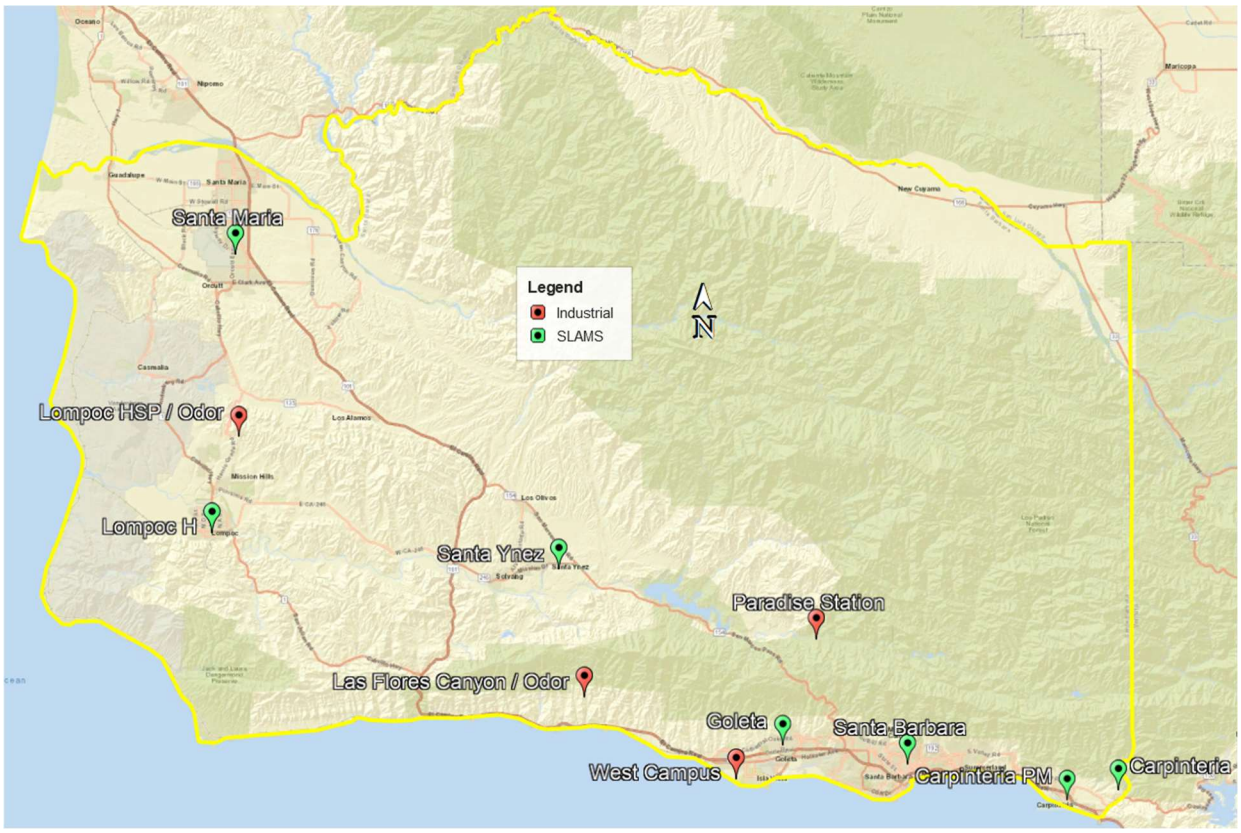


TABLE 2-1: MONITORING STATION PARAMETER LIST FOR 2023

Station	O_3	NO_2	SO_2	CO	THC	H_2S	TRS	PM_{10}	$PM_{2.5}$	WS	WD	ATM
Carpinteria	X	X								X	X	X
CarpPM*									X			
Goleta	X							X	X	X	X	X
Las Flores Canyon	X	X	X	X	X			X		X	X	X
Las Flores Canyon Odor						X				X	X	X
Lompoc H Street	X	X	X	X				X	X	X	X	X
Lompoc HS&P	X	X	X		X					X	X	X
Lompoc Odor						X	X			X	X	X
Paradise Road	X	X								X	X	X
Santa Barbara	X							X	X	X	X	X
Santa Maria	X		X			X		X	X	X	X	X
Santa Ynez	X								X			
West Campus			X		X	X	X			X	X	
SLAMS Monitors						Non-NAAQS Monitors						

*	Q4 only	THC	Total Hydrocarbons
WS	Wind Speed	TRS	Total Reduced Sulfur
WD	Wind Direction	ATM	Ambient Temperature

Monitoring Station Changes During 2023

A special purpose $PM_{2.5}$ monitor was installed in Carpinteria to provide information on normal patterns of $PM_{2.5}$ concentrations as well as wildfire smoke impacts in the City of Carpinteria and surrounding communities. The station began operation in the fourth quarter (Q4) of 2023.

Ongoing Changes From 2018

The permit holder responsible for the operation of the Las Flores Canyon Odor site has received District approval to temporarily shut down the site while production at the associated processing plant is not in operation. The site was temporarily shut down in July 2018 and will be re-started when production at the associated processing plant resumes.

3 GASEOUS POLLUTANT SUMMARY

Gaseous air quality analyzers are operated in climate-controlled monitoring stations located throughout the county. These analyzers measure air quality 24 hours a day, except when they go through a nightly testing routine where they are challenged with known concentrations of calibration gas to ensure data precision and accuracy. They collect real-time measurements that are used to calculate 1-hour and 8-hour concentrations, as applicable, for comparison to air quality standards. Ozone was measured at nine stations throughout the county during 2023, NO_2 was measured at five stations, SO_2 was measured at five stations, and CO was measured at two stations. Section 2 of this report provides additional information on the monitoring network.

A summary of the highest gaseous pollutant values measured in Santa Barbara County during 2023 is provided in Tables 3-1 through 3-5. The tables show the four highest concentrations for each pollutant in 2023 and the dates they occurred.

TABLE 3-1: FOUR HIGHEST 1-HOUR O_3 CONCENTRATIONS FOR 2023[1]

O_3 1-hour (ppb)												
Station	**1st**	**Date**	**Time**	**2nd**	**Date**	**Time**	**3rd**	**Date**	**Time**	**4th**	**Date**	**Time**
Paradise	71	7/16/2023	12:00	71	11/13/2023	15:00	70	7/16/2023	11:00	69	8/29/2023	14:00
Las Flores Canyon	71	11/3/2023	13:00	70	11/3/2023	15:00	70	11/3/2023	16:00	68	11/3/2023	17:00
Santa Ynez	66	8/30/2023	16:00	64	11/13/2023	14:00	63	7/17/2023	12:00	63	7/17/2023	13:00
Santa Barbara	64	11/4/2023	15:00	60	11/3/2023	15:00	60	10/7/2023	13:00	59	9/8/2023	13:00
Lompoc HS&P	64	11/3/2023	17:00	64	11/3/2023	16:00	63	11/3/2023	20:00	62	11/3/2023	15:00
Lompoc H Street	60	11/14/2023	14:00	59	11/14/2023	13:00	59	10/6/2023	16:00	58	11/14/2023	12:00
Santa Maria	60	10/6/2023	14:00	56	11/3/2023	13:00	56	11/3/2023	14:00	56	4/20/2023	22:00
Goleta	55	4/19/2023	22:00	53	2/20/2023	15:00	53	4/6/2023	16:00	53	4/20/2023	13:00
Carpinteria	46	10/28/2023	18:00	45	3/26/2023	19:00	42	10/28/2023	19:00	41	1/22/2023	16:00

[1] State Standard = 0.09 ppm (90 ppb)

TABLE 3-2: FOUR HIGHEST 8-HOUR O_3 CONCENTRATIONS FOR 2023[1]

O_3 8-hour (ppb)												
Station	**1st**	**Date**	**Time**	**2nd**	**Date**	**Time**	**3rd**	**Date**	**Time**	**4th**	**Date**	**Time**
Paradise	68	11/13/2023	12:00	62	7/16/2023	10:00	62	7/17/2023	10:00	62	8/7/2023	10:00
Las Flores Canyon	66	11/3/2023	12:00	60	8/30/2023	12:00	58	11/14/2023	11:00	55	8/29/2023	11:00
Lompoc HS&P	61	11/3/2023	13:00	55	11/14/2023	7:00	54	2/19/2023	14:00	54	10/6/2023	13:00
Santa Ynez	59	8/30/2023	10:00	58	11/13/2023	11:00	55	11/3/2023	11:00	54	8/7/2023	10:00
Santa Barbara	52	3/27/2023	10:00	52	4/6/2023	10:00	51	4/19/2023	15:00	50	10/7/2023	9:00
Lompoc H Street	52	3/18/2023	10:00	50	11/15/2023	7:00	49	4/20/2023	9:00	48	3/4/2023	10:00
Santa Maria	52	10/6/2023	10:00	51	4/20/2023	21:00	50	11/3/2023	10:00	49	11/15/2023	7:00
Goleta	51	4/20/2023	9:00	48	4/19/2023	16:00	47	2/20/2023	10:00	47	3/27/2023	9:00
Carpinteria	36	1/22/2023	13:00	36	3/26/2023	15:00	35	11/1/2023	9:00	34	3/25/2023	11:00

[1] Federal and State Standard = 0.070 ppm (70 ppb)

TABLE 3-3: FOUR HIGHEST 1-HOUR NO_2 CONCENTRATIONS FOR 2023[1]

NO_2 (ppb)												
Station	1st	Date	Time	2nd	Date	Time	3rd	Date	Time	4th	Date	Time
Paradise	34	4/4/2023	9:00	28	4/14/2023	0:00	24	4/6/2023	10:00	22	10/5/2023	8:00
Lompoc H Street	25	10/31/2023	13:00	23	1/23/2023	7:00	23	4/7/2023	6:00	20	11/2/2023	6:00
Carpinteria	10	11/15/2023	11:00	9	2/2/2023	13:00	9	11/13/2023	12:00	8	2/2/2023	14:00
Las Flores Canyon	10	11/15/2023	11:00	9	11/13/2023	11:00	7	11/13/2023	12:00	7	11/13/2023	13:00
Lompoc HS&P	4	1/12/2023	20:00	4	1/12/2023	19:00	4	10/4/2023	7:00	4	11/13/2023	11:00

[1] Federal Standard = 0.100 ppm (100 ppb); State Standard = 0.18 ppm (180 ppb)

TABLE 3-4: FOUR HIGHEST 1-HOUR SO_2 CONCENTRATIONS FOR 2023[1]

SO_2 (ppb)												
Station	1st	Date	Time	2nd	Date	Time	3rd	Date	Time	4th	Date	Time
Lompoc H Street	2	8/29/2023	14:00	2	8/29/2023	15:00	2	8/29/2023	18:00	2	8/29/2023	0:00
Las Flores Canyon	2	11/16/2023	3:00	2	11/13/2023	10:00	2	11/3/2023	16:00	2	11/3/2023	17:00
Lompoc HS&P	2	1/14/2023	14:00	2	11/3/2023	16:00	2	11/13/2023	11:00	2	11/3/2023	13:00
Santa Maria	1	6/14/2023	12:00	0	1/21/2023	7:00	0	2/3/2023	9:00	0	3/3/2023	11:00
West Campus	0.4	2/2/2023	9:00	0.2	2/16/2023	9:00	0	1/19/2023	9:00	0	2/1/2023	9:00

[1] Federal Standard = 0.075 ppm (75 ppb); State Standard = 0.25 ppm (250 ppb)

TABLE 3-5: FOUR HIGHEST 1-HOUR CO CONCENTRATIONS FOR 2023[1]

CO (ppm)												
Station	1st	Date	Time	2nd	Date	Time	3rd	Date	Time	4th	Date	Time
Lompoc H Street	1.7	8/29/2023	14:00	1.5	8/29/2023	16:00	1.5	10/31/2023	13:00	1.5	10/31/2023	14:00
Las Flores Canyon	0.6	1/4/2023	3:00	0.5	1/3/2023	12:00	0.5	1/3/2023	17:00	0.5	1/4/2023	9:00

[1] Federal Standard = 35 ppm; State Standard = 20 ppm

4 PARTICULATE MATTER SUMMARY

Five stations collected PM_{10} data in 2023. The five stations used a PM_{10} Beta Attenuation Monitor (BAM) sampler that operated 24 hours a day and provided real-time hourly values for ambient PM_{10} concentrations. Six stations collected $PM_{2.5}$ data using a $PM_{2.5}$ BAM, collecting continuous hourly data. The hourly concentrations are used to calculate daily 24-hour concentrations for comparison with the air quality standards.

A summary of the highest particulate matter values in Santa Barbara County during 2023 is provided in Tables 4-1 through 4-4. The summaries contain the four highest 24-hour PM concentrations, and the annual averages for each station. The state air quality standards are based on data collected at local conditions (i.e., pressure and temperature measured at the time of the sampling), while the federal standards are based on data corrected to standard conditions (i.e., pressure and temperature corrected to standard conditions at sea level).

TABLE 4-1: FOUR HIGHEST 24-HOUR AVERAGE LOCAL PM_{10} CONCENTRATIONS FOR 2023[1]

Particulate Matter Less Than 10 Microns (µg/m³)								
Station	**1st**	**Date**	**2nd**	**Date**	**3rd**	**Date**	**4th**	**Date**
Santa Maria	115	2/21/2023	86	4/3/2023	77	9/27/2023	75	9/26/2023
Santa Barbara	56	10/12/2023	47	2/21/2023	41	10/11/2023	40	8/29/2023
Lompoc H Street	52	8/29/2023	52	9/21/2023	49	9/22/2023	46	9/20/2023
LFC1	50	10/12/2023	43	10/13/2023	35	10/11/2023	34	9/21/2023
Goleta	44	10/12/2023	37	9/21/2023	35	9/23/2023	34	4/23/2023

[1] State 24-Hour Standard = 50 µg/m³ at local conditions

TABLE 4-2: FOUR HIGHEST 24-HOUR AVERAGE STANDARD PM_{10} CONCENTRATIONS FOR 2023[1]

Particulate Matter Less Than 10 Microns (µg/m³)								
Station	**1st**	**Date**	**2nd**	**Date**	**3rd**	**Date**	**4th**	**Date**
Santa Maria	108	2/21/2023	81	4/3/2023	75	9/27/2023	73	9/26/2023
Santa Barbara	55	10/12/2023	45	2/21/2023	40	8/29/2023	40	10/11/2023
Lompoc H Street	50	8/29/2023	49	9/21/2023	46	9/22/2023	44	9/20/2023
LFC1	48	10/12/2023	41	10/13/2023	34	10/11/2023	32	9/21/2023
Goleta	42	10/12/2023	35	9/21/2023	33	8/29/2023	32	4/23/2023

[1] Federal 24-Hour Standard = 150 µg/m³ at standard conditions

TABLE 4-3: FOUR HIGHEST 24-HOUR AVERAGE $PM_{2.5}$ CONCENTRATIONS FOR 2023[1]

Particulate Matter Less Than 2.5 Microns (µg/m³)								
Station	**1st**	**Date**	**2nd**	**Date**	**3rd**	**Date**	**4th**	**Date**
Santa Ynez	41	9/20/2023	38	9/22/2023	32	9/21/2023	31	9/23/2023
Lompoc H Street	33	9/21/2023	30	9/20/2023	29	9/22/2023	25	9/23/2023
Santa Maria	27	9/20/2023	25	9/21/2023	25	9/22/2023	21	9/23/2023
Santa Barbara	26	9/22/2023	24	9/23/2023	23	9/21/2023	21	9/24/2023
CarpPM[2]	26	10/6/2023	20	10/6/2023	20	11/4/2023	19	10/19/2023
Goleta	23	9/21/2023	22	9/22/2023	21	9/23/2023	18	9/1/2023

[1] Federal 24-Hour Standard = 35 µg/m³ at local conditions

[2] Sampled Q4 only

TABLE 4-4: ANNUAL ARITHMETIC MEAN PM CONCENTRATIONS FOR 2023[1,2]

Particulate Matter (µg/m^3)		
Station	**PM_{10}**	**$PM_{2.5}$**
CarpPM[3]	-	4.5
Santa Ynez	-	4.2
Santa Maria	20.0	4.1
Santa Barbara	18.5	7.9
Lompoc H Street	16.5	4.6
Goleta	14.1	5.7
Las Flores Canyon	12.3	-

[1] State PM_{10} Annual Arithmetic Mean Standard = 20 µg/m^3 at local conditions

[2] Federal and State $PM_{2.5}$ Annual Arithmetic Mean Standard = 12 µg/m^3 at local conditions

[3] Sampled Q4 only

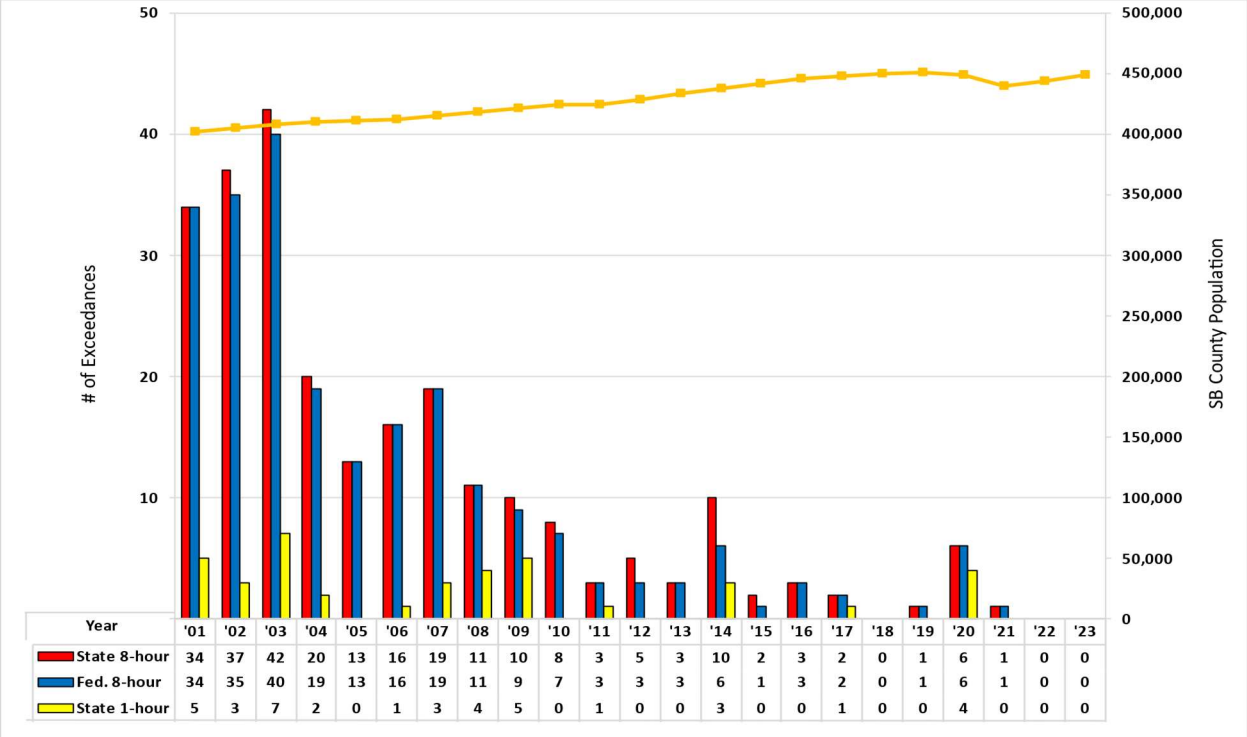
5 AIR QUALITY TRENDS

In 2023, Santa Barbara County generally had good air quality. While the impact of wildfire smoke was still present, historical data shows the progress that has been made. Over time, voluntary and regulatory measures, technology improvements, and better community and transportation planning have led to tremendous improvements in Santa Barbara County's air quality. This section provides information in several different formats to demonstrate the long-term trends for Santa Barbara County's air quality.

Number of Days Exceeding Ozone Standards

Figure 5-1 indicates the number of days that the county exceeded the federal and state ozone standard since 2001. The downward trend from the peak ozone exceedances in 2003 of 42 days to zero exceedance days in 2023 demonstrates that the combined strategy of stationary and mobile source reductions of ozone precursor pollutants, in the form of both regulatory and voluntary measures, has achieved dramatic improvements in ozone levels. Figure 5-1 also includes information on population growth.

FIGURE 5-1: OZONE STANDARD EXCEEDANCE DAYS



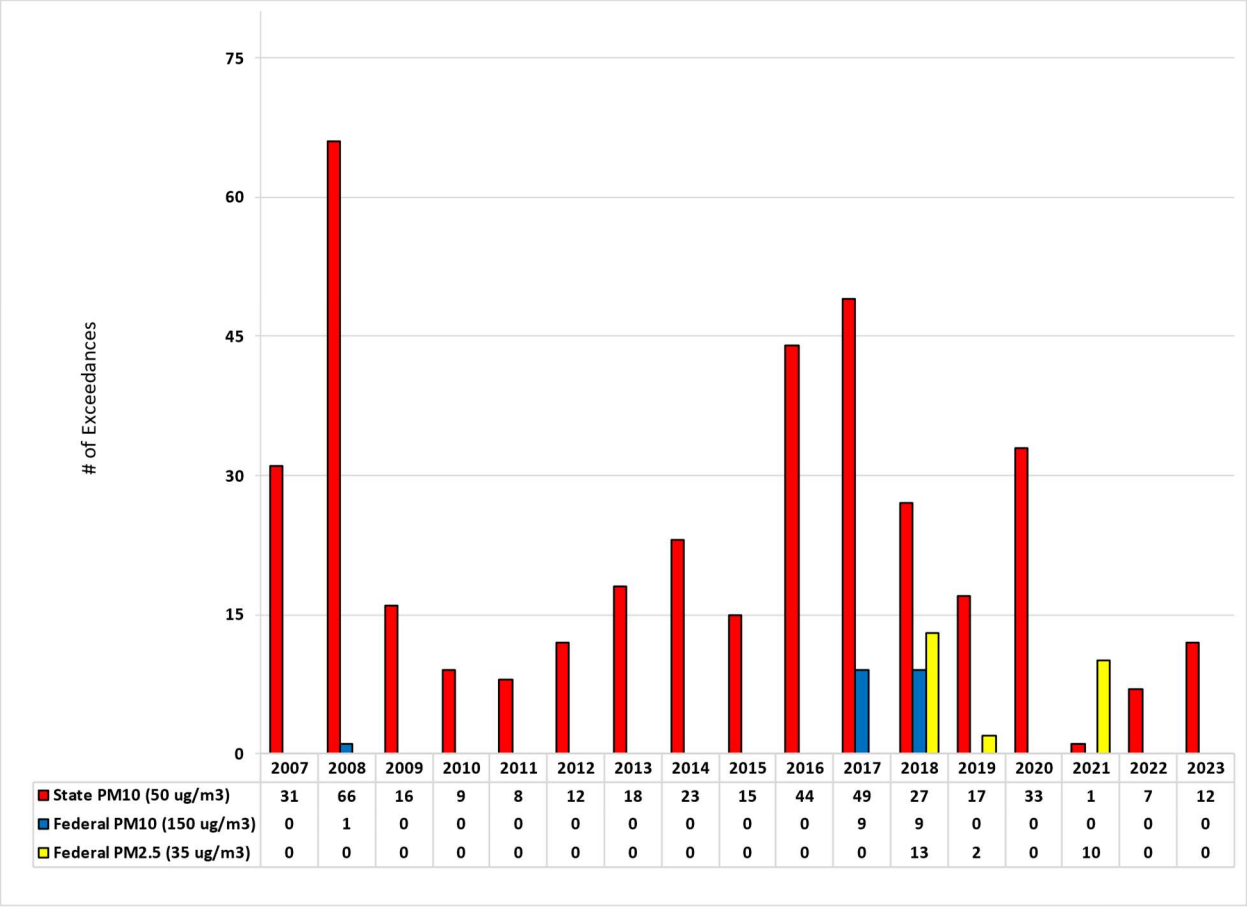
Year	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20	'21	'22	'23
State 8-hour	34	37	42	20	13	16	19	11	10	8	3	5	3	10	2	3	2	0	1	6	1	0	0
Fed. 8-hour	34	35	40	19	13	16	19	11	9	7	3	3	3	6	1	3	2	0	1	6	1	0	0
State 1-hour	5	3	7	2	0	1	3	4	5	0	1	0	0	3	0	0	1	0	0	4	0	0	0

Number of Days Exceeding PM Standards

Prior to 2006, particulate monitoring in Santa Barbara County followed a six-day sampling schedule as set by federal and state agencies. Samples were taken over a 24-hour sampling period and required lab analysis to calculate the pollutant concentration. Our current network monitors PM data every day and every hour. The transition from six-day sampling to continuous sampling was phased in over a four-year period. The Santa Barbara and Santa Maria stations have continuously sampled both PM_{10} and $PM_{2.5}$ since 2006. The Lompoc station began continuous sampling for $PM_{2.5}$ in 2007, and PM_{10} was added in 2009. In 2010, continuous sampling for both PM_{10} and $PM_{2.5}$ were added at the Goleta station.

Figure 5-2 indicates the number of days that the county exceeded the state and federal PM standards since 2006. Figure 5-2 shows that the county's particulate levels vary year-to-year, and the number of days that the county exceeds the air quality standards is influenced by natural events such as wildfires and droughts. Specifically, the Zaca Fire in 2007 burned for most of July and August and greatly affected particulate levels both locally and throughout the state. In 2008 and 2009, the Tea, Gap and Jesusita Fires caused high particulate levels while burning. More recently, the Thomas Fire and several other California wildfires caused high particulate levels. While fires are burning and smoke is present, $PM_{2.5}$ levels are generally high and may cause health concerns. After fires are extinguished, residual ash can be re-entrained by wind and cause high PM_{10} levels. During California's prolonged droughts that occurred over the past couple of decades, dry conditions likely contributed to many of these PM exceedances.

FIGURE 5-2: PARTICULATE MATTER EXCEEDANCES



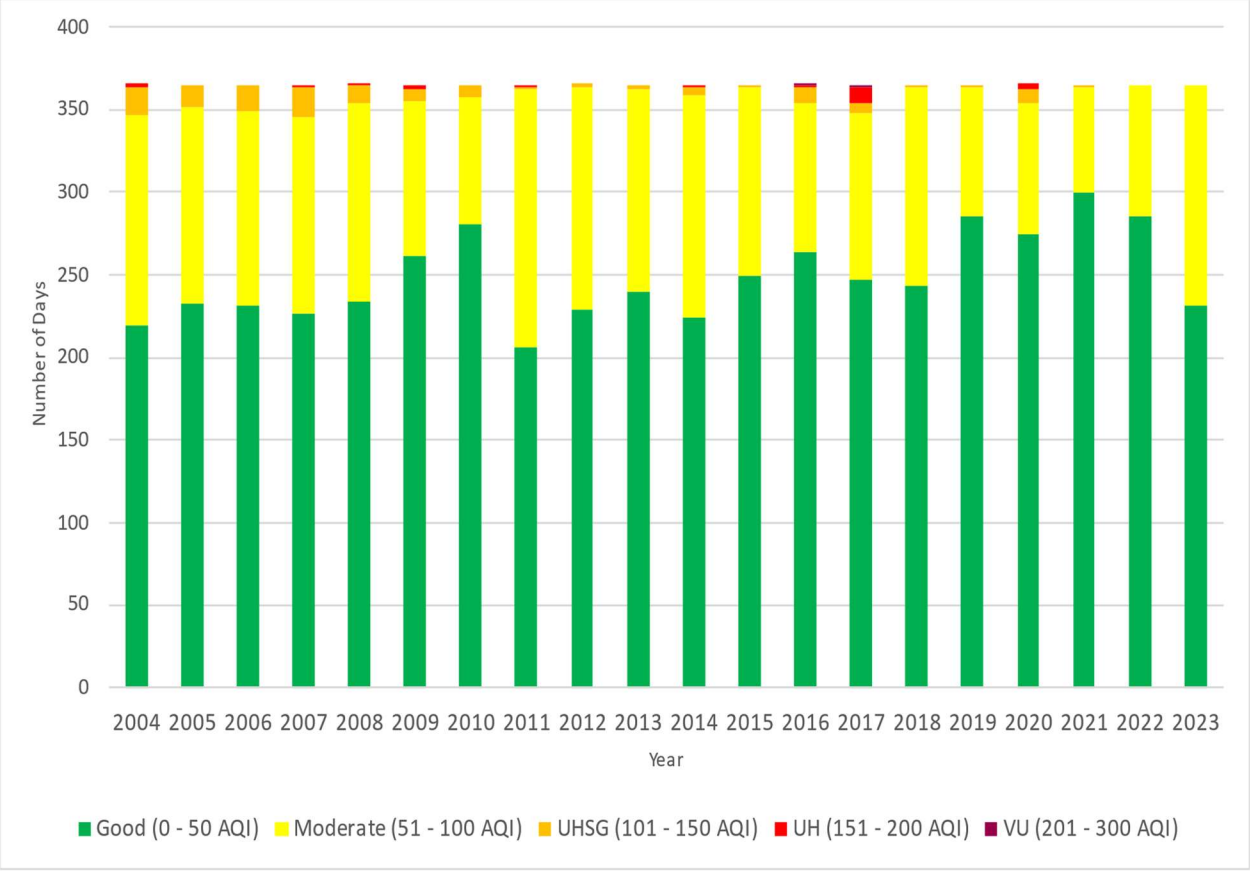
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
State PM10 (50 ug/m3)	31	66	16	9	8	12	18	23	15	44	49	27	17	33	1	7	12
Federal PM10 (150 ug/m3)	0	1	0	0	0	0	0	0	0	0	9	9	0	0	0	0	0
Federal PM2.5 (35 ug/m3)	0	0	0	0	0	0	0	0	0	0	0	13	2	0	10	0	0

Air Quality Index Trends

The Air Quality Index, or AQI, is a standardized value that was developed by the EPA as a user-friendly tool to communicate to the public on whether air pollution levels are healthy or unhealthy. Ground-level ozone and particulate matter are the two pollutants that pose the greatest threat to public health; the AQI value is based on the pollutant with the highest measured levels at that time. The AQI levels range from "good," represented by a green color, to "hazardous," represented by a maroon color. More information on the AQI can be found on the District's website at www.ourair.org/todays-air-quality.

Figure 5-3 shows the numbers of days each year that Santa Barbara County air quality was at each of the different AQI levels. As demonstrated in this figure, the majority of days (232 days, or 63.6%) in Santa Barbara County were green, or good air quality, during 2023. The remainder of the days were moderate (133 days, 36.4%), with no days in unhealthy for sensitive groups or higher. A moderate AQI means that there is a moderate health concern for individuals that are unusually sensitive to air pollution. The AQI trends in Figure 5-3 represent the highest AQI readings from all monitoring stations in the county each day.

FIGURE 5-3: AIR QUALITY INDEX TRENDS



Detailed Trends for Individual Pollutants

Figures 5-4 through 5-9 provide a more detailed picture of trends for each pollutant over time, and how the measured values for each pollutant have changed. These charts show trends for the highest measured values, using data from all monitoring stations in the county. Different types of values are referenced for each of the pollutants (e.g., 2nd and 4th maximum values for ozone), because each of the air quality standards define which values are relevant for that pollutant standard.

FIGURE 5-4: MEASURED OZONE LEVELS (PARTS PER BILLION)

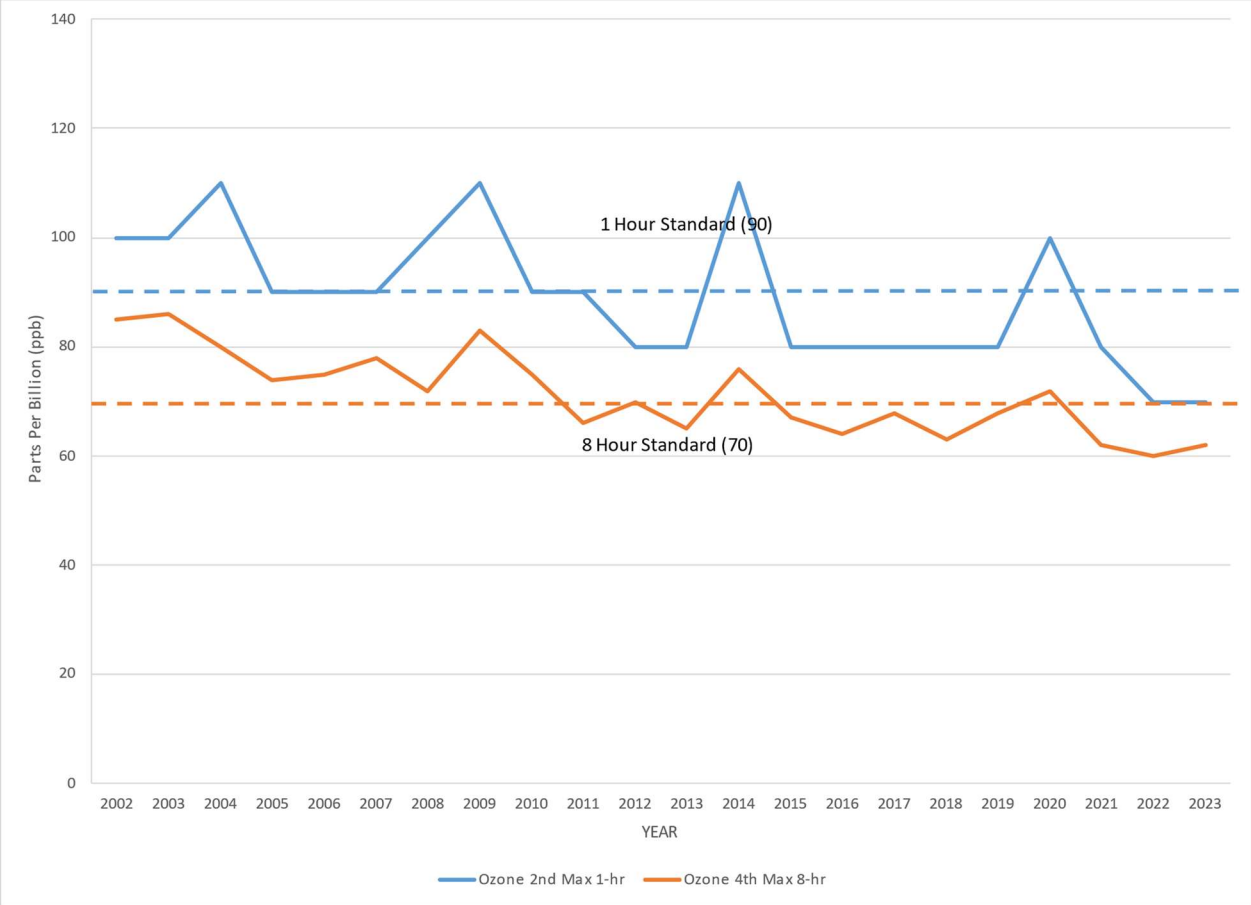


FIGURE 5-5: MEASURED NITROGEN DIOXIDE LEVELS (PARTS PER BILLION)

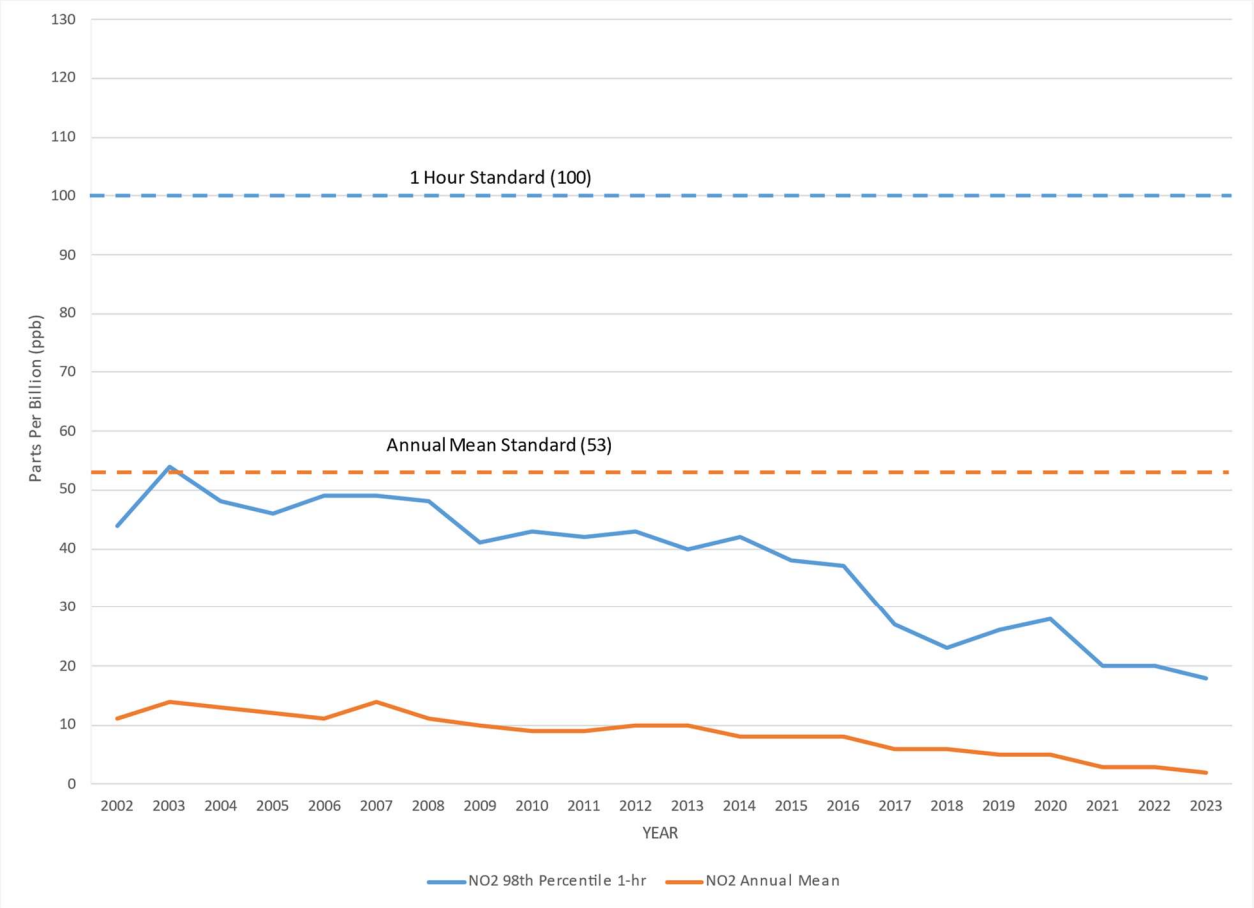
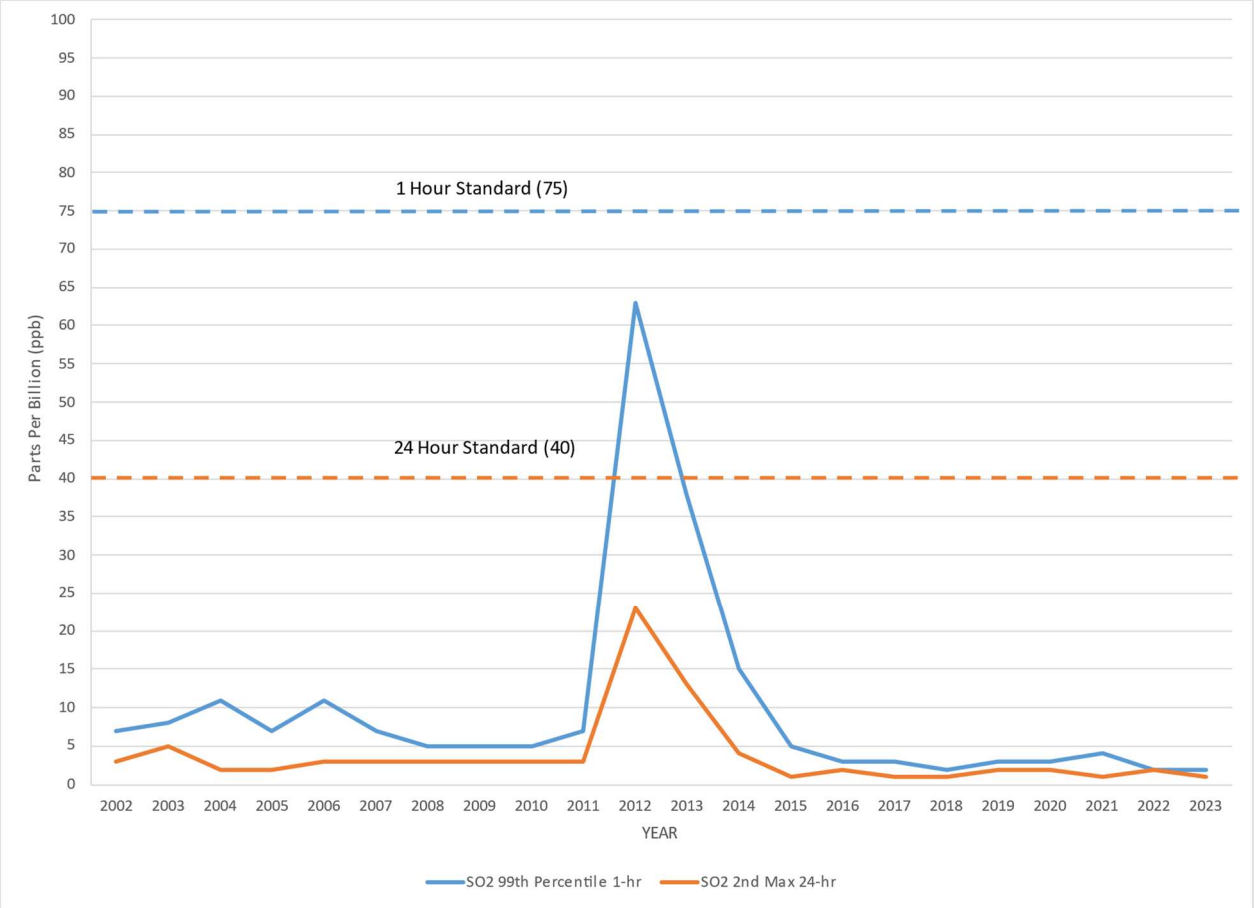
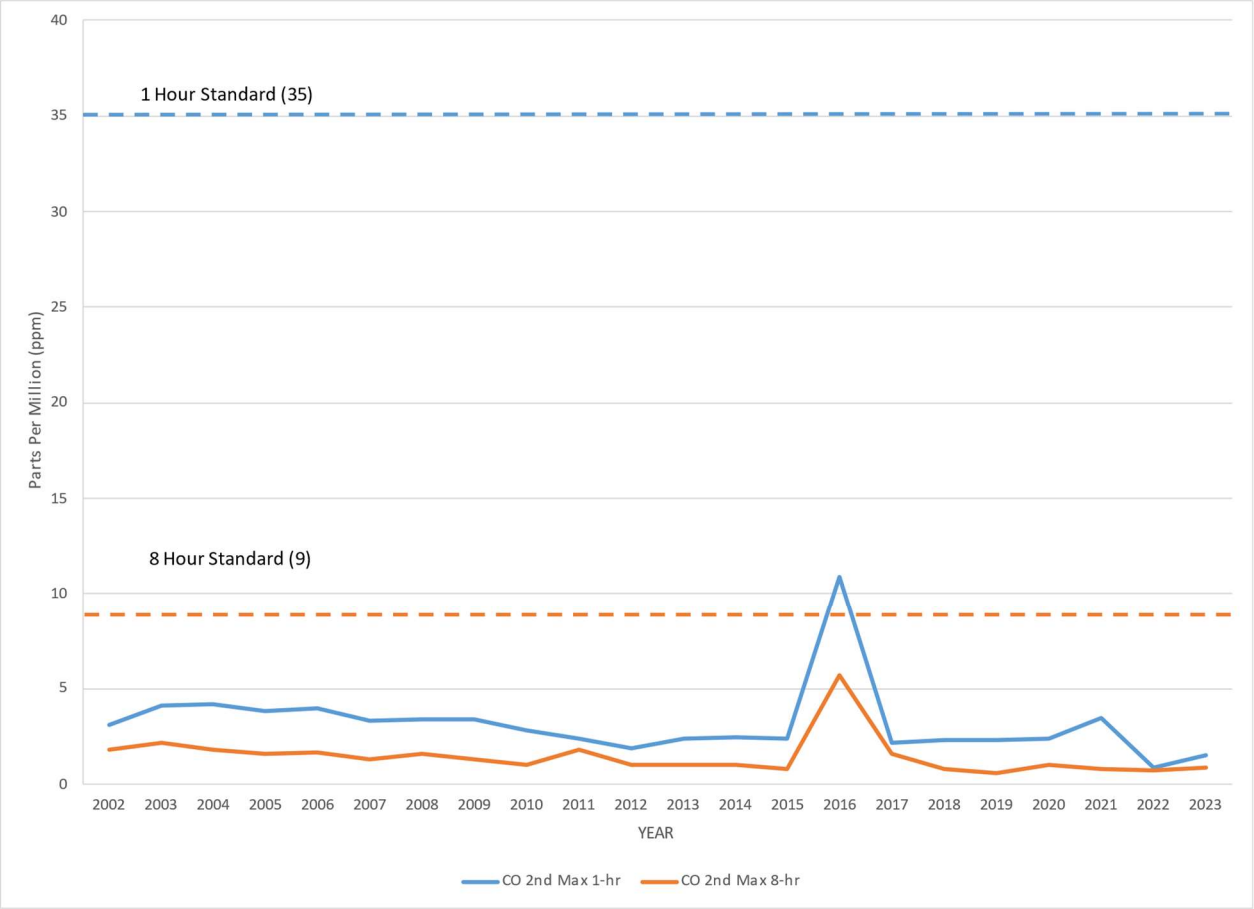


FIGURE 5-6: MEASURED SULFUR DIOXIDE LEVELS (PARTS PER BILLION)[1]



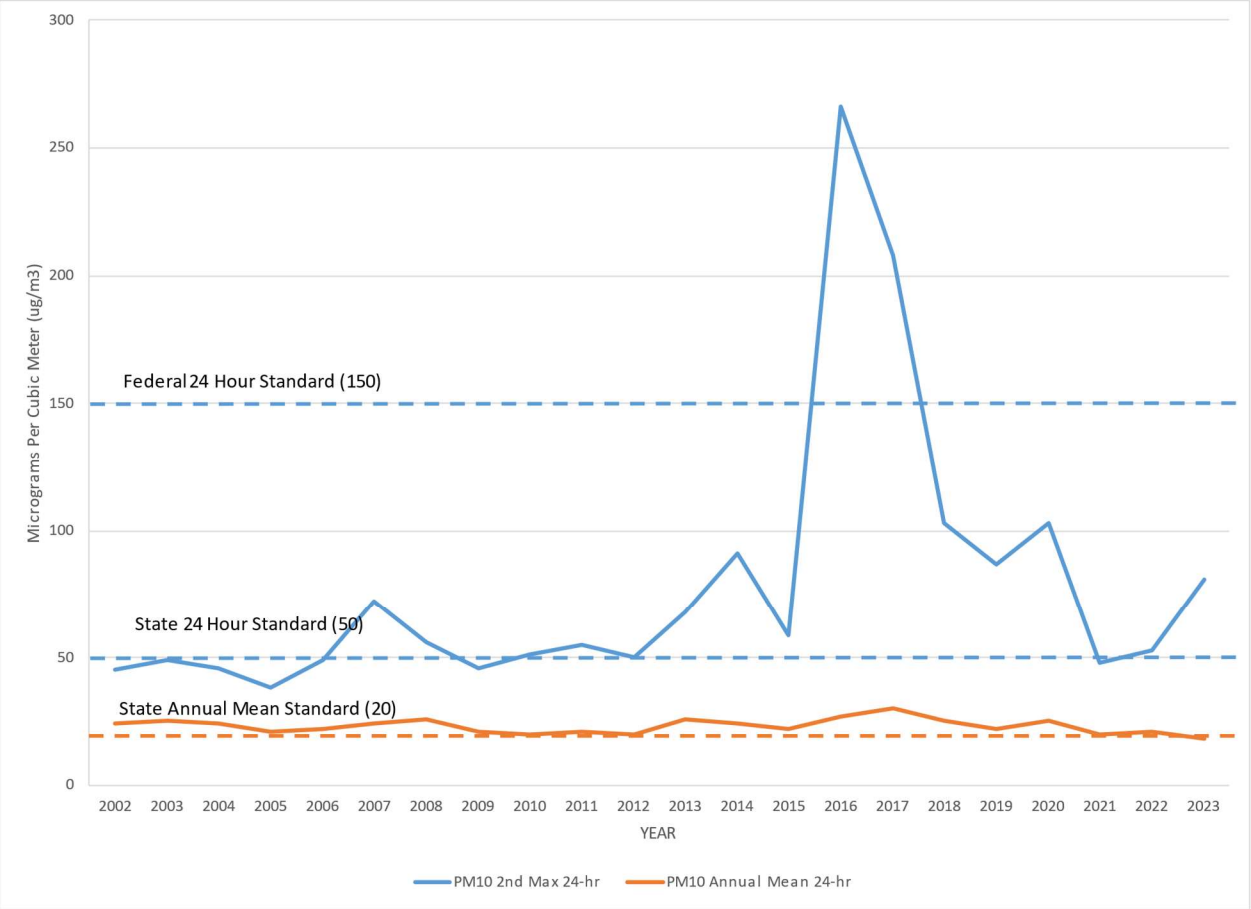
[1] High SO_2 levels recorded in 2012 were related to a release at the stationary source facility at Las Flores Canyon.

FIGURE 5-7: MEASURED CARBON MONOXIDE LEVELS (PARTS PER MILLION)[1]



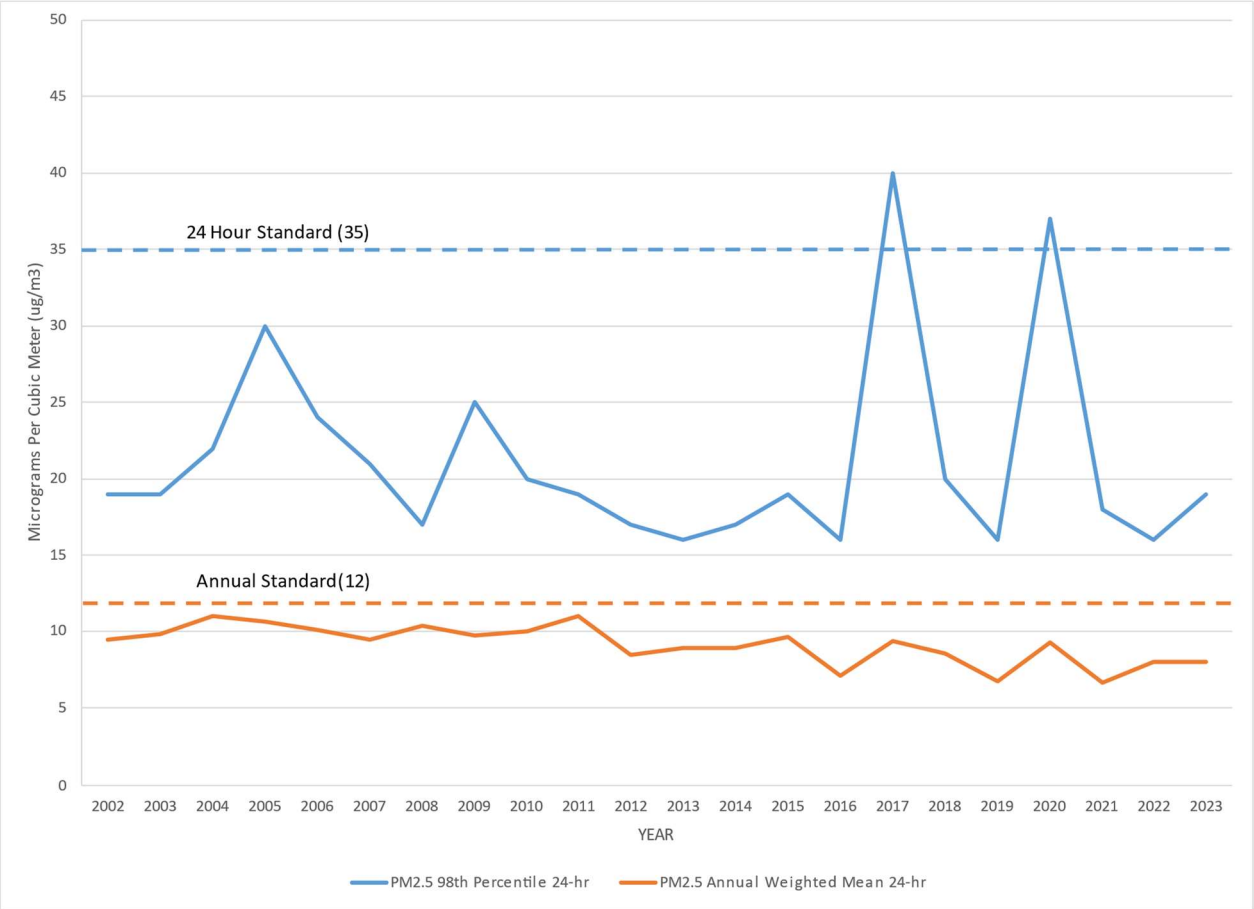
[1] High CO values recorded in 2016 were the result of the Sherpa wildfire burning near the Las Flores Canyon monitoring station.

FIGURE 5-8: MEASURED PM_{10} LEVELS ($\mu g/m^3$)[1,2]



[1] Prior to 2006, samples were collected every 6 days. By 2010 all samples were continuous.
[2] High PM_{10} values recorded in 2016 and 2017 were the result of wildfires.

FIGURE 5-9: MEASURED $PM_{2.5}$ LEVELS ($\mu g/m^3$)[1,2]



[1] Prior to 2006, samples were collected every 6 days. By 2010 all samples were continuous.
[2] High $PM_{2.5}$ values recorded in 2017 and 2020 were the result of wildfires.

6 PORTABLE AIR MONITORING AND LOW-COST AIR QUALITY SENSORS

As outlined in this report, the District has a robust air monitoring network that measures ambient air quality for multiple pollutants at stationary locations throughout Santa Barbara County. However, specific incidents or events may call for deployment of a portable air monitor. Examples include wildfires, prescribed burns, accidental releases, and odor complaints. The District's portable air monitors consist of two types of equipment, the AirPointer and Environmental Beta Attenuation Monitors (E-BAMs).

AirPointer

The AirPointer is a specialized trailer-mounted system that measures:

- Particulate matter (PM_{10} and $PM_{2.5}$) simultaneously
- Hydrogen sulfide (H_2S)
- Benzene, toluene, ethylbenzene and xylene (BTEX)
- Ozone
- Meteorological conditions (wind, temperature)

The AirPointer system can be deployed quickly to a secure location with power and has the ability to store and transmit data to the District in real-time. In 2023, the AirPointer was deployed once to Lookout Park in Summerland, to monitor BTEX and H_2S in response to strong petroleum odors in the area.

Environmental Beta Attenuation Monitors (E-BAMs)

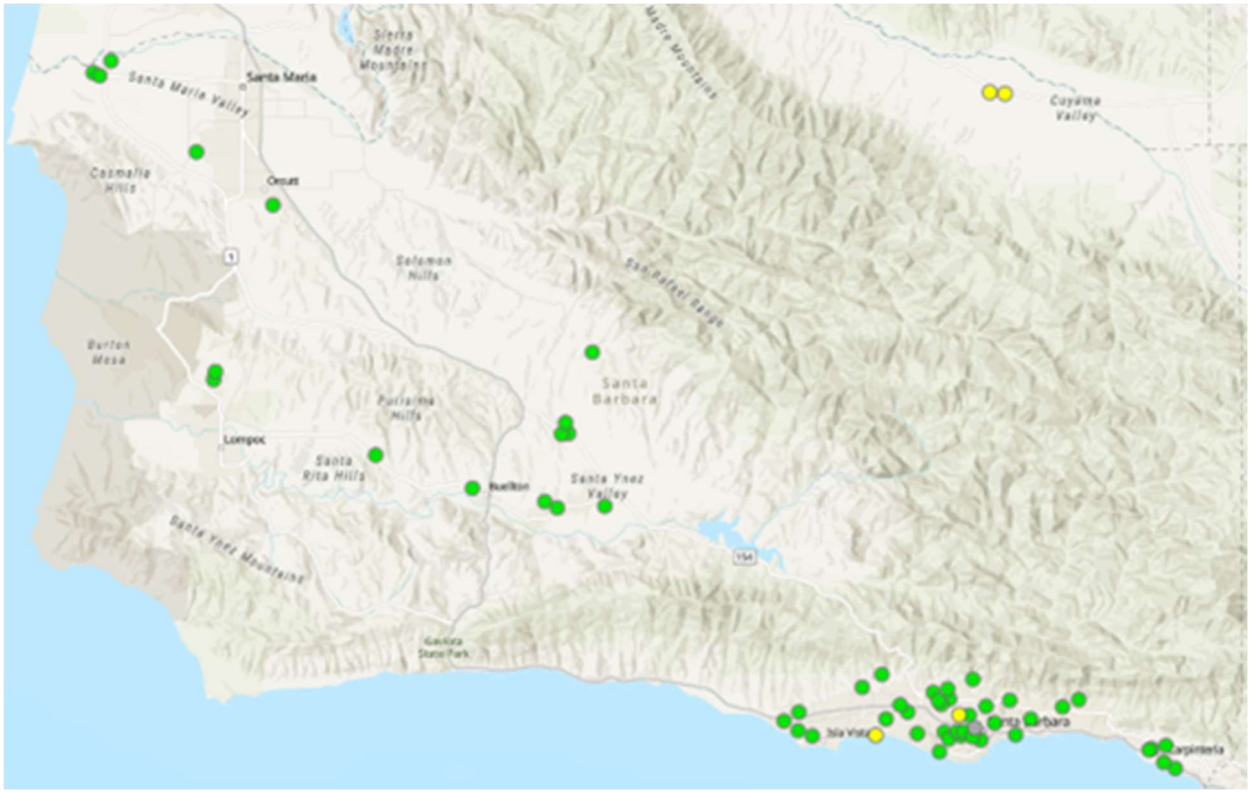
E-BAMs are portable particulate monitors that are easy to operate and are effective for measuring particulate matter (PM_{10} or $PM_{2.5}$), being emitted from short-term events such as wildfires or prescribed burns. In 2023, the District deployed 5 E-BAMs, all to monitor particulate matter from prescribed burns occurring in Santa Barbara County.

Low-Cost Air Quality Sensors

The air pollution community has been exploring the use of low-cost air quality sensors for the past decade and has found some benefits as well as gaining a better understanding of the sensors' limitations. With the cost of air quality sensors being a fraction of traditional air pollution monitors, monitoring in many more locations can be accomplished. However, low-cost sensors vary widely in performance and reliability and research has shown significant accuracy issues and other limitations from these sensors. Despite these limitations, the low-cost sensors have been successfully used to assess wildfire smoke impacts throughout Santa

Barbara County. As of the end of 2023, the District has deployed 48 low-cost sensors throughout the county, configured to monitor $PM_{2.5}$. In addition to the District's air quality sensor network, the low cost of the equipment has made the sensors accessible for members of the public and organizations to purchase and install at their residence or workplace. Santa Barbara County's low-cost sensor network is used by District staff to better communicate health impacts to communities impacted with wildfire smoke. The county's network of low-cost air quality sensors is depicted in the circles on the map in Figure 6-1.

FIGURE 6-1: 2023 SANTA BARBARA COUNTY LOW-COST AIR QUALITY SENSORS



APPENDIX A

Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards		National Standards		
		Concentration [3]	Method [4]	Primary [3,5]	Secondary [3,6]	Method [7]
Ozone (O_3)[8]	1 Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m^3)		0.070 ppm (137 µg/m^3)		
Respirable Particulate Matter (PM10)	24 Hour	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		—		
Fine Particulate Matter (PM2.5)[9]	24 Hour	—	—	35 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	12.0 µg/m^3	15 µg/m^3	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	—	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	
Nitrogen Dioxide (NO_2)[10]	1 Hour	0.18 ppm (339 µg/m^3)	Gas Phase Chemiluminescence	100 ppb (188 µg/m^3)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 µg/m^3)		0.053 ppm (100 µg/m^3)	Same as Primary Standard	
Sulfur Dioxide (SO_2)	1 Hour	0.25 ppm (655 µg/m^3)	Ultraviolet Fluorescence	75 ppb (196 µg/m^3)	—	Ultraviolet Flourescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	—		—	0.5 ppm (1300 µg/m^3)	
	24 Hour	0.04 ppm (105 µg/m^3)		0.14 ppm (for certain areas)	—	
	Annual Arithmetic Mean	—		0.030 ppm (for certain areas)	—	
Lead[12,13]	30 Day Average	1.5 µg/m^3	Atomic Absorption	—	—	High Volume Sampler and Atomic Absorption
	Calendar Quarter	—		1.5 µg/m^3 (for certain areas)[12]	Same as Primary Standard	
	Rolling 3-Month Average	—		0.15 µg/m^3		
Visibility Reducing Particles	8 Hour		Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates	24 Hour	25 µg/m^3	Ion Chromatography			
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[12]	24 Hour	0.01 ppm (26 µg/m^3)	Gas Chromatography			

For more information please call ARB-PIO at (916) 322-2990

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1. California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and particulate matter (PM10, PM2.5, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2. National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration measured at each site in a year, averaged over three years, is equal to or less than the standard. For PM10, the 24 hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is equal to or less than one. For PM2.5, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the U.S. EPA for further clarification and current national policies.

3. Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4. Any equivalent measurement method which can be shown to the satisfaction of the ARB to give equivalent results at or near the level of the air quality standard may be used.

5. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

6. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7. Reference method as described by the U.S. EPA. An "equivalent method" of measurement may be used but must have a "consistent relationship to the reference method" and must be approved by the U.S. EPA.

8. On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm.

9. On December 14, 2012, the national annual PM2.5 primary standard was lowered from 15 $\mu g/m^3$ to 12.0 $\mu g/m^3$. The existing national 24-hour PM2.5 standards (primary and secondary) were retained at 35 $\mu g/m^3$, as was the annual secondary standard of 15 $\mu g/m^3$. The existing 24-hour PM10 standards (primary and secondary) of 150 $\mu g/m^3$ also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.

10. To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 ppb. Note that the national 1-hour standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

11. On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

    Note that the 1-hour national standard is in units of parts per billion (ppb). California standards are in units of parts per million (ppm). To directly compare the 1-hour national standard to the California standard the units can be converted to ppm. In this case, the national standard of 75 ppb is identical to 0.075 ppm.

12. The ARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects determined. These actions allow for the implementation of control measures at levels below the ambient concentrations specified for these pollutants.

13. The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

14. In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

For more information please call ARB-PIO at (916) 322-2990 **California Air Resources Board (5/4/16)**