apcd air pollution control district
SANTA BARBARA COUNTY

MEMORANDUM

DATE: June 10, 2022

TO: Community Advisory Council (CAC) Members

FROM: Jim Fredrickson, (805) 979-8328, FredricksonJ@sbcapcd.org

SUBJECT: June 22 CAC Meeting to Discuss the 2022 Ozone Plan – Chapters 1-3

Every three years, the District is required to update our plan to attain and maintain the state 1-hour and 8-hour ozone standards. The 2022 Ozone Plan (2022 Plan) will be the tenth triennial update to the initial state Air Quality Attainment Plan adopted by the Santa Barbara County Air Pollution Control District (District) Board of Directors in 1991. The 2022 Plan will be composed of seven chapters that address air quality trends, the emission inventory, stationary source control measures, transportation control measures, voluntary incentive programs, and the attainment strategy.

The District will discuss the 2022 Plan at the June 22, 2022 Community Advisory Council special meeting, which will be informational only (i.e., no formal CAC recommendation sought). At the meeting, we will review the attached draft data and language in Chapters 1-3 and the associated appendices. These chapters address general air quality trends and the emission inventory, with additional focus items on the California wildfires and marine shipping emissions.

Chapters 4-7, which discuss stationary source and transportation control measures as well as voluntary incentive programs and the attainment strategy, will be presented to the CAC at a future meeting, tentatively scheduled for August 24, 2022. At that meeting, we also plan to present the entire 2022 Plan for the CAC to consider.

After CAC consideration, we will bring the 2022 Ozone Plan to the District Board for proposed adoption. To review the contents of the previously adopted 2019 Ozone Plan, please visit www.ourair.org/planning-clean-air. If there are questions or concerns that you would like to discuss beforehand, please contact me at (805) 979-8328 / e-mail: FredricksonJ@sbcapcd.org

Attachments:

A. Draft Chapters 1-3 and Appendices A-B of the 2022 Ozone Plan

ATTACHMENT A

Draft Chapters 1-3 and Appendices A-B of the 2022 Ozone Plan

June 22, 2022

Santa Barbara County Air Pollution Control District
Community Advisory Council

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

2022 Ozone Plan

June 2022 – Draft Chapters 1-3

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CHAPTER 1– INTRODUCTION

Updating our Plan for Clean Air in Santa Barbara County

The 2022 Ozone Plan (2022 Plan) is the tenth triennial update to the initial state Air Quality Attainment Plan adopted by the Santa Barbara County Air Pollution Control District (District) Board of Directors in 1991. Prior ozone plan updates were completed for 1994, 1998, 2001, 2004, 2007, 2010, 2013, 2016, and 2019. In the past, the District has prepared air quality attainment plans that have addressed both the state and federal ozone standards. This 2022 Plan addresses the state ozone standards only because the District is designated "attainment" for the federal 8-hour ozone standards, including the most recent standard of 0.070 parts per million (ppm) promulgated by the U.S. Environmental Protection Agency (EPA) in 2015. Table 1-1 provides a summary of the state and federal ambient air quality standards for ozone, the years in which the standards were adopted, and the current attainment status for Santa Barbara County.

TABLE 1-1: STATE AND FEDERAL OZONE STANDARDS

Ambient Air Quality Standard	Year Adopted	Statutory Standard	Attainment Status
State 1-Hour	1988	0.09 ppm	Nonattainment
State 8-Hour	2005	0.070 ppm	
Federal 1-Hour	1979	0.12 ppm	Attainment [1]
Federal 8-Hour	1997	0.08 ppm	Attainment [2]
	2008	0.075 ppm	Attainment
	2015	0.070 ppm	Attainment

Each of the ozone plan updates have implemented an "every feasible measure" strategy to ensure continued progress toward attainment of the state ozone standards.[3] Since 1991, the District has adopted or amended more than 30 control measures aimed at reducing emissions from stationary sources of air pollution and to help Santa Barbara County reach attainment of the state ozone standards. These measures have substantially reduced ozone precursor pollutants, which includes nitrogen oxides (NOx) and reactive organic compounds (ROCs).

Along with the implementation of statewide measures, the District's control measure strategy has successfully improved Santa Barbara County's air quality, as we've witnessed a downward trend in ozone exceedances. In 2016, the County was designated as nonattainment-transitional because less than three ozone exceedances occurred in a single calendar year. The nonattainment-

[1] Designated as attainment in 2002. Standard revoked in 2005.
[2] Standard revoked in 2015.
[3] Pursuant to California Health and Safety Code, Section 40914(b), the District employs an alternative emission reduction strategy that incorporates "*every feasible measure*" and follows an "*expeditious adoption schedule.*"

transitional designation meant that the County was close to attaining the state standard, but to be designated as attainment, air quality measurements from the most recent 3-year period must show that both the 1-hour and the 8-hour standards are not violated. After decades of hard work and improved air quality conditions, in 2019 Santa Barbara County was designated as attainment for the state ozone standards. However, unpredictable weather patterns and air pollutant emission dispersion can lead to different pollutant concentration outcomes from one year to the next. The 2019 attainment designation was applicable for only a single year, and due to standard violations in 2019 and 2020, the County continues to be designated as nonattainment. A summary of the changes in attainment status is shown below in Table 1-2.

TABLE 1-2: CHANGES IN ATTAINMENT STATUS FOR THE STATE OZONE STANDARDS

Designation Years	Attainment Status
1989 - 2015	Nonattainment
2016 - 2018	Nonattainment - Transitional
2019	Attainment
2020 - 2021	Nonattainment

The California Clean Air Act requires that we report our progress in meeting state mandates and revise our 1991 Air Quality Attainment Plan to reflect changing conditions on a triennial basis. The triennial plan progress report and revision requirements (as codified in California Health and Safety Code, Section 40910 et seq.) must assess the overall effectiveness of our air quality program and the extent of air quality improvement resulting from the 2022 Plan. The revision must also incorporate new data and emission inventory projections. Table 1-3 provides a more complete list of the triennial plan report and revision requirements and where they are addressed in the 2022 Plan.

TABLE 1-3: TRIENNIAL PLAN REPORT AND REVISION REQUIREMENTS

Requirement	CH&SC Section	Ozone Plan Section
Air Quality Trends	§40913(a), §40924(b)(1)	Chapter 2, Appendix A
Population Exposure	§40924(b)(1)	Chapter 2
Population, Vehicular Activity, and Emission Trends	§40913(a)(4), §40925(a)	Chapters 2, 3, and 5
Emission Inventory	§40913(a)(5), §40918(a)(5)	Chapter 3, Appendix B
Stationary Source Control Measures	§40913(a)(6), §40918(a)(2), §40924(b)(2)	Chapter 4
Transportation Control Measures	§40913(a)(6), §40918(a)(3)	Chapter 5
Voluntary Incentive Strategies	§40913(a)(7)	Chapter 6
Contingency Measures	§40915, §40925.5(c)	Chapters 4 and 5
Control Strategy Cost-Effectiveness	§40913(b), §40922	Chapter 4
Every Feasible Measure and Expeditious Adoption	§40914(b), §40925.5(b)	Chapters 4 and 5
Attainment and Maintenance Strategy	§40913(a)	Chapter 7

CHAPTER 2– LOCAL AIR QUALITY

Breathing ground-level ozone can cause numerous health effects that are observed in broad segments of the population. Ozone can damage the respiratory system, cause inflammation, irritation, and symptoms such as coughs and wheezing. High levels of ozone are especially harmful for children, the elderly, and people with asthma or other respiratory problems. Ground-level ozone also impacts the economy by increasing hospital visits and medical expenses, loss of work time due to illness, and damage to agricultural crops.

Ozone is not emitted directly into the atmosphere. It is formed through a series of complex chemical reactions involving the precursor pollutants nitrogen oxides (NOx) and reactive organic compounds (ROCs), heat, and sunlight. Ozone typically follows a diurnal cycle, where the levels tend to increase throughout the day and decrease during the nighttime hours. However, there are additional factors that influence ozone levels. For example, meteorological conditions, such as temperature, inversions, and stagnant air can lead to a buildup of pollutants, and topography can prevent the dispersion of the pollutants and trap air masses close to the ground. Due to these factors as well as the potential for transport winds to move the polluted air masses, ozone is considered a "regional" pollutant. This means that the locations where ozone levels are highest are not necessarily the locations where the precursor pollutants are emitted.

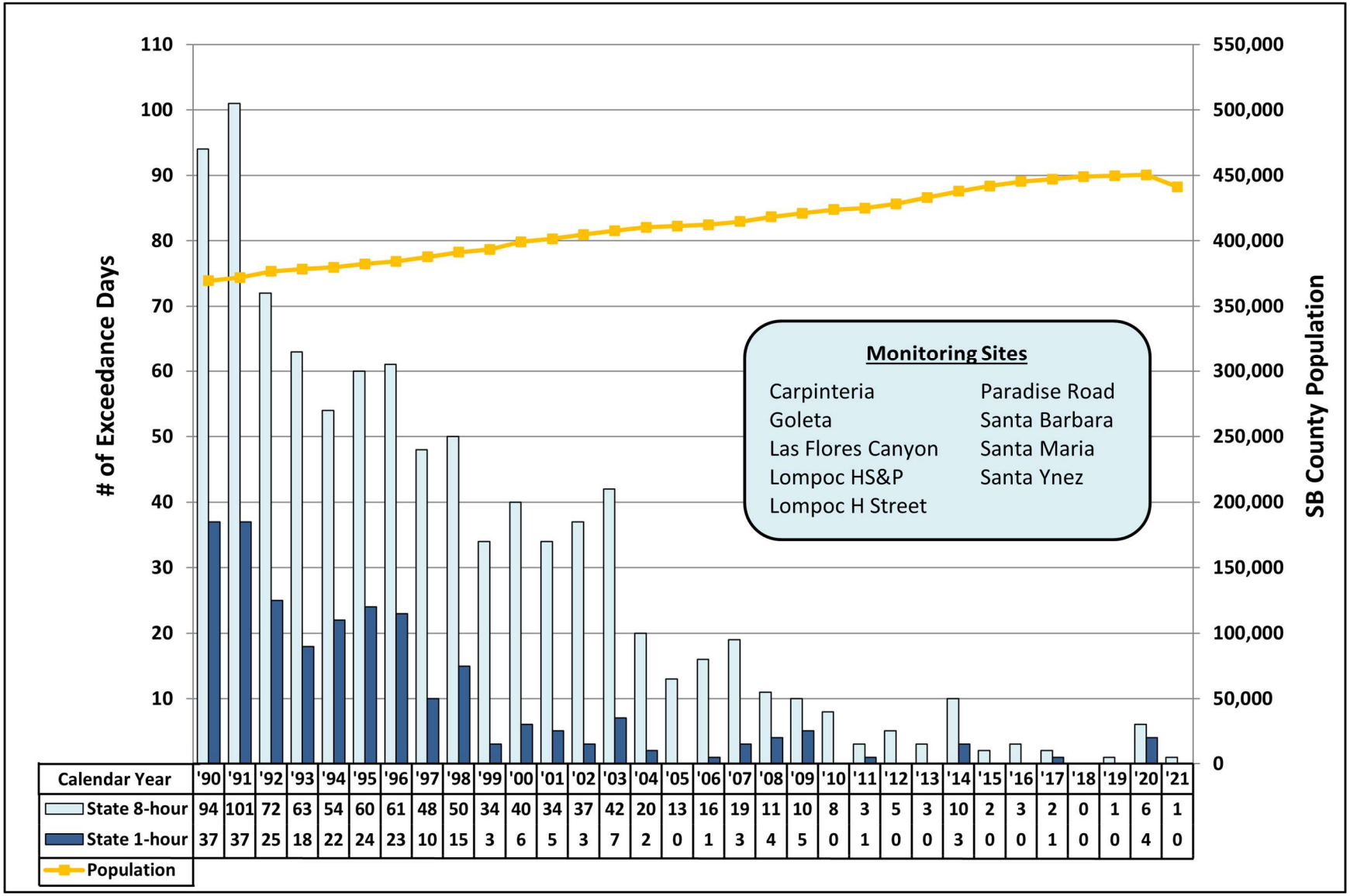
The California Clean Air Act requires the California Air Resources Board (CARB) to evaluate and identify air quality-related indicators for the District to use in assessing its progress toward attainment of the state ozone standard.[4] This chapter highlights those indicators and demonstrates the progress the District has made over the last few decades in improving the air quality throughout Santa Barbara County. Over time, both voluntary and regulatory measures, as well as technology improvements and better community planning, have led to tremendous improvements in Santa Barbara County's air quality. As a result of these efforts, people's overall exposure to ozone continues to decrease.

Exceedance Trends

Santa Barbara County's air quality has improved dramatically over the years as evidenced by the declining number of state 1-hour and 8-hour ozone exceedances. An *exceedance* is a measured concentration at a monitoring station that surpasses the ozone standard. As displayed in Figure 2-1, 1-hour ozone exceedances have decreased from a high of 37 days in 1990 to a low of zero days in five out of the last seven years. Since 1990, the number of 8-hour ozone exceedance days range from a high of 101 days in 1991 to a low of zero days in 2018. These improvements in air quality have occurred despite a 20 percent increase in countywide population growth. Although much progress has been made, Santa Barbara County experienced a handful of exceedances for the most recent 3-year period. A brief analysis of the most recent exceedances of the 8-hour ozone standard (i.e., 70 ppb) and factors that contributed to each exceedance are described below in Tables 2-1 and 2-2.

[4] California Health and Safety Code, Sections 39607(f) and (g).

FIGURE 2-1: 8-HOUR AND 1-HOUR OZONE EXCEEDANCE TRENDS VS POPULATION SANTA BARBARA COUNTY, 1990-2021 [5]



Calendar Year	'90	'91	'92	'93	'94	'95	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20	'21
State 8-hour	94	101	72	63	54	60	61	48	50	34	40	34	37	42	20	13	16	19	11	10	8	3	5	3	10	2	3	2	0	1	6	1
State 1-hour	37	37	25	18	22	24	23	10	15	3	6	5	3	7	2	0	1	3	4	5	0	1	0	0	3	0	0	1	0	0	4	0
Population																																

[5] Population data from the State of California, Department of Finance, E-4 Population Estimates for 2011-2021, with 2010 Census Benchmark [May 2021].

TABLE 2-1: SANTA BARBARA COUNTY EXCEEDANCE DAYS, 2019-2021

Year	Exceedance Day	8-hour Ozone Concentrations (ppb)								
		Paradise Road	Las Flores Canyon	Carpinteria	Santa Barbara	Goleta	Santa Ynez	Lompoc HS&P	Lompoc H St.	Santa Maria
2019	10/6/2019	71	72	72	66	62	69	64	28	45
2020	8/18/2020	72	45	51	35	38	60	44	17	32
	8/19/2020	85	50	56	45	43	67	40	17	21
	8/20/2020	75	59	43	38	37	41	30	16	20
	8/21/2020	85	46	43	35	34	66	50	14	27
	10/2/2020	62	74	86	72	66	63	64	30	48
	10/3/2020	69	74	83	81	67	62	62	20	35
2021	6/17/2021	72	41	31	40	38	61	40	18	NA

** Values greater than the state 8-hour ozone standard of 70 ppb are highlighted in yellow.*

TABLE 2-2: CONTRIBUTING FACTORS TO THE EXCEEDANCE DAYS, 2019-2021

Exceedance Days	Contributing Factors
10/6/2019	Strong south-eastern transport winds with hot weather
8/18/2020 -8/21/2020	Northern California Wildfires with strong northern transport winds: • LNU (Sonoma–Lake–Napa Unit) Lightning Complex • SCU (Santa Clara Unit) Lightning Complex • CZU (San Mateo–Santa Cruz Unit) Lightning Complex
10/2/2020 -10/3/2020	Creek Fire in Fresno County
6/17/2021	Heat wave with stagnant conditions

Air Quality Indicators – Peak Concentrations

One of the indicators that is used to assess air quality trends is the Expected Peak Day Concentration (EPDC). The EPDC is calculated by CARB for each monitoring site and it represents the maximum ozone concentration expected to occur at the site. The EPDC is based on a statistical calculation using the daily maximum 1-hour and 8-hour ozone concentrations for a rolling period of three calendar years. For example, the 2020 EPDC for a monitoring site uses data from 2018, 2019, and 2020. The EPDC is useful for tracking air quality progress at individual monitoring stations since it is relatively stable, thereby providing a trend indicator that is not heavily influenced by year-to-year changes in meteorological conditions.

Figures 2-2 and 2-3 show the 1-hour and 8-hour EPDC trends for the years 1990 through 2020 for the six selected monitoring sites in Santa Barbara County that typically record the highest ozone concentrations. These figures show that both the 1-hour and 8-hour expected peak day concentrations have significantly decreased over time. For the 1-hour EPDCs, all monitoring stations are below the 1-hour ozone standard. For the 8-hour EPDCs, three monitoring stations remain above the 8-hour ozone standard. A listing of the EPDC values for these six monitoring sites can be found in Appendix A.

The EPDC is an indicator representing the maximum ozone concentration expected to occur at a monitoring station.

Violations and Designation Values

For Santa Barbara County to attain the state ozone standard, air quality measurements must show that both the 1-hour and the 8-hour standards were not violated during the previous three calendar years. To evaluate whether an ozone *violation* occurred, the first step is to identify all ozone *exceedances* within the last three-year period. According to the CARB designation process, an exceedance that is higher than the site's EPDC is identified as being affected by an *extreme concentration event* (e.g., weather conditions conducive to high concentrations of ozone). Extreme concentration events are not violations of the state ozone standard and are excluded from the designation value process.

The *designation value* for a monitoring site is the highest representative reading at that monitoring site over the last three years. Since extreme events are not considered representative, the designation value for each site is the highest concentration observed that is less than or equal to the EPDC at that site. If the designation value is higher than a state standard, then it indicates that a violation has occurred within the last three years at that monitoring site. Table 2-3 presents the EPDCs and 8-hour ozone designation values for all Santa Barbara County monitoring stations for the last three years.

FIGURE 2-2: STATE 1-HOUR OZONE EXPECTED PEAK DAY CONCENTRATION
TOP 6 SANTA BARBARA COUNTY MONITORING SITES, 1990-2020

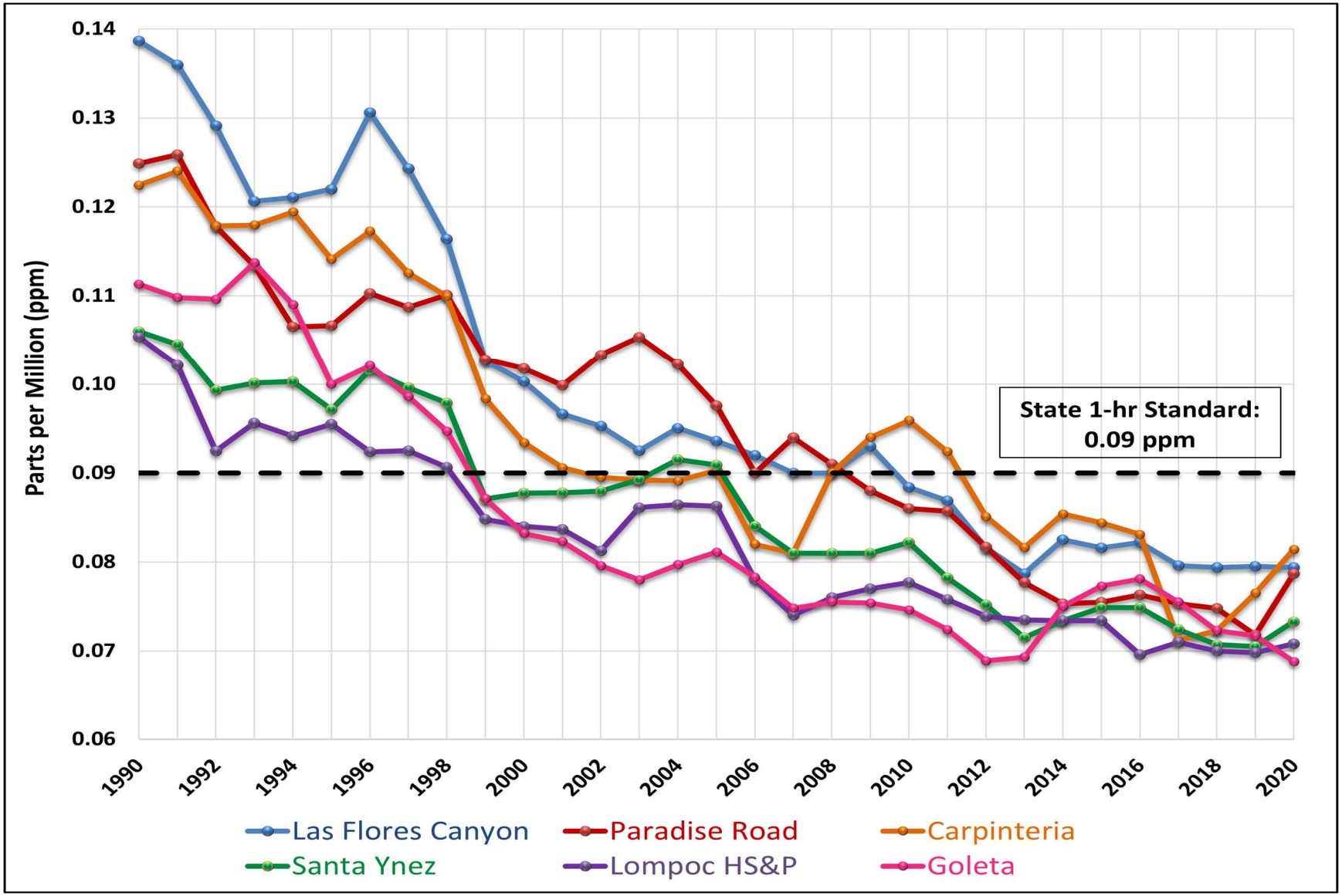


FIGURE 2-3: STATE 8-HOUR OZONE EXPECTED PEAK DAY CONCENTRATIONS
TOP 6 SANTA BARBARA COUNTY MONITORING SITES, 1990-2020

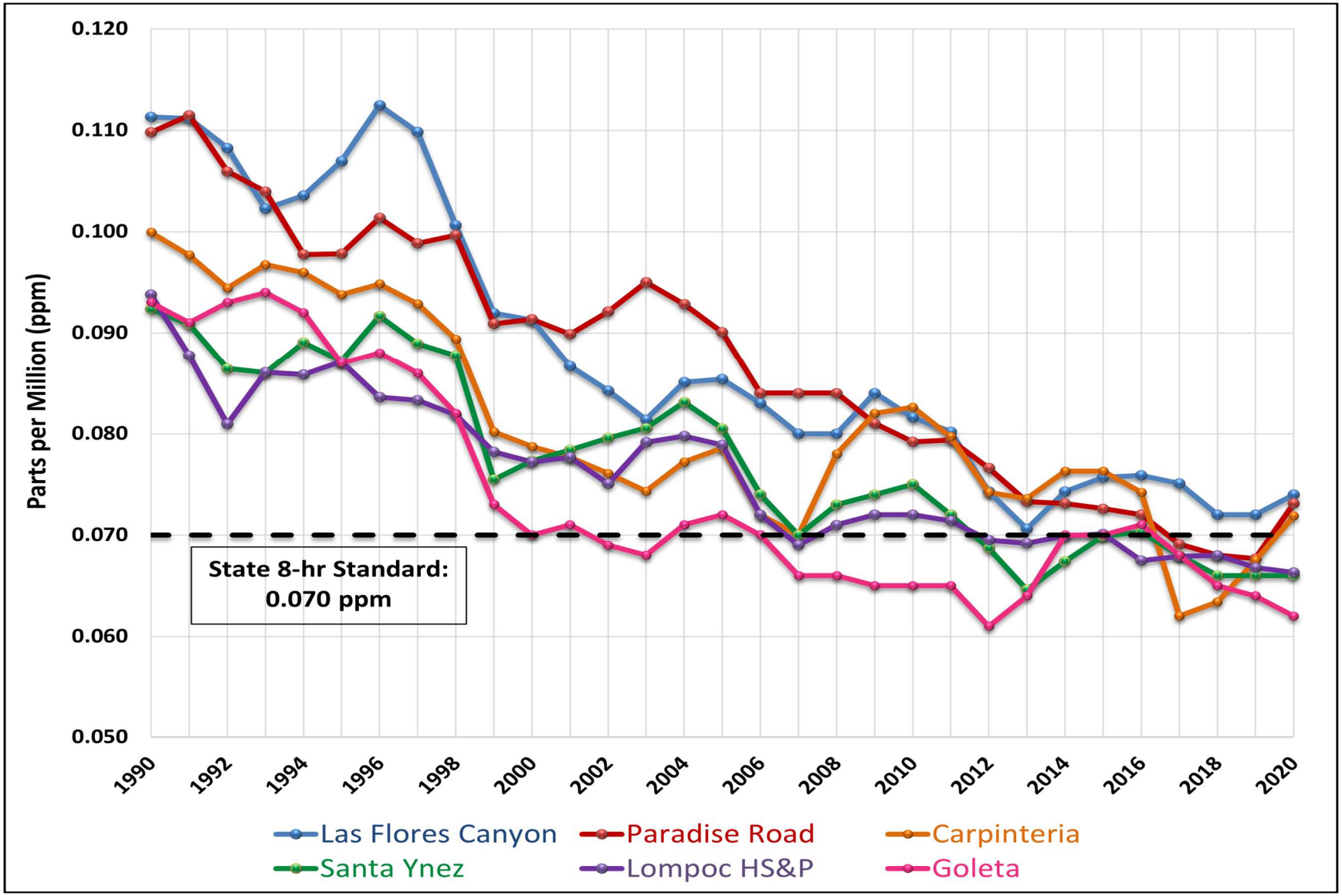


TABLE 2-3: SANTA BARBARA COUNTY 8-HOUR EPDCS AND DESIGNATION VALUES, 2018-2020

Monitor Location	State Criteria for 8-hour Ozone	Annual Values (ppm)		
		2018	2019	2020
Paradise Road	EPDC	0.068	0.068	0.073
	Designation Value	0.067	0.071	0.086
Las Flores Canyon	EPDC	0.072	0.072	0.074
	Designation Value	0.069	0.072	0.074
Carpinteria	EPDC	0.063	0.068	0.072
	Designation Value	0.063	0.067	0.086
Santa Barbara	EPDC	0.067	0.066	0.064
	Designation Value	0.067	0.066	0.062
Goleta	EPDC	0.065	0.064	0.062
	Designation Value	0.065	0.062	0.062
Santa Ynez	EPDC	0.066	0.066	0.066
	Designation Value	0.065	0.061	0.066
Lompoc HS&P	EPDC	0.068	0.067	0.066
	Designation Value	0.067	0.067	0.067
Lompoc H St.	EPDC	0.056	0.054	0.038
	Designation Value	0.056	0.053	0.038
Santa Maria	EPDC	0.054	0.049	0.051
	Designation Value	0.063	0.049	0.050

Invalid EPDC due to insufficient data are highlighted in gray.
Designation values greater than the state ozone standard are highlighted in yellow.

As indicated in the table above, the monitoring sites at Paradise Road, Carpinteria, and Lompoc HS&P currently have invalid EPDCs. These three sites, all of which were operated by a third-party consultant, experienced issues where some of the monitoring data did not meet the necessary quality assurance criteria. After removing the affected data, the sites no longer met the minimum requirement to have a valid EPDC. These quality assurance data issues have since been resolved by installing new equipment or adjusting the operating protocols to meet new EPA requirements. However, for the 2020 monitoring year, the invalid EPDCs cannot be used to exclude the extreme concentration events at these sites, and so the designation value exceeds the invalid EPDC. Even if the EPDCs were valid, the Paradise Road and Carpinteria monitoring stations still recorded exceedances that would be considered violations of the state 8-hour ozone standard and would result in a non-attainment status for the entire County.

The designation values show that three monitoring stations (Paradise Road, Las Flores Canyon, and Carpinteria) currently have designation values over the state 8-hour standard. As for the state 1-hour standard, Figure 2-2 shows that it has not been violated for the last decade since all monitoring sites have valid 1-hour EPDCs below the standard. However, to be considered

attainment for ozone, Santa Barbara County needs to meet both the 1-hour and 8-hour standard. This means that Santa Barbara County cannot record an ozone value that is above the standard but below the EPDC value during the last three-year period.

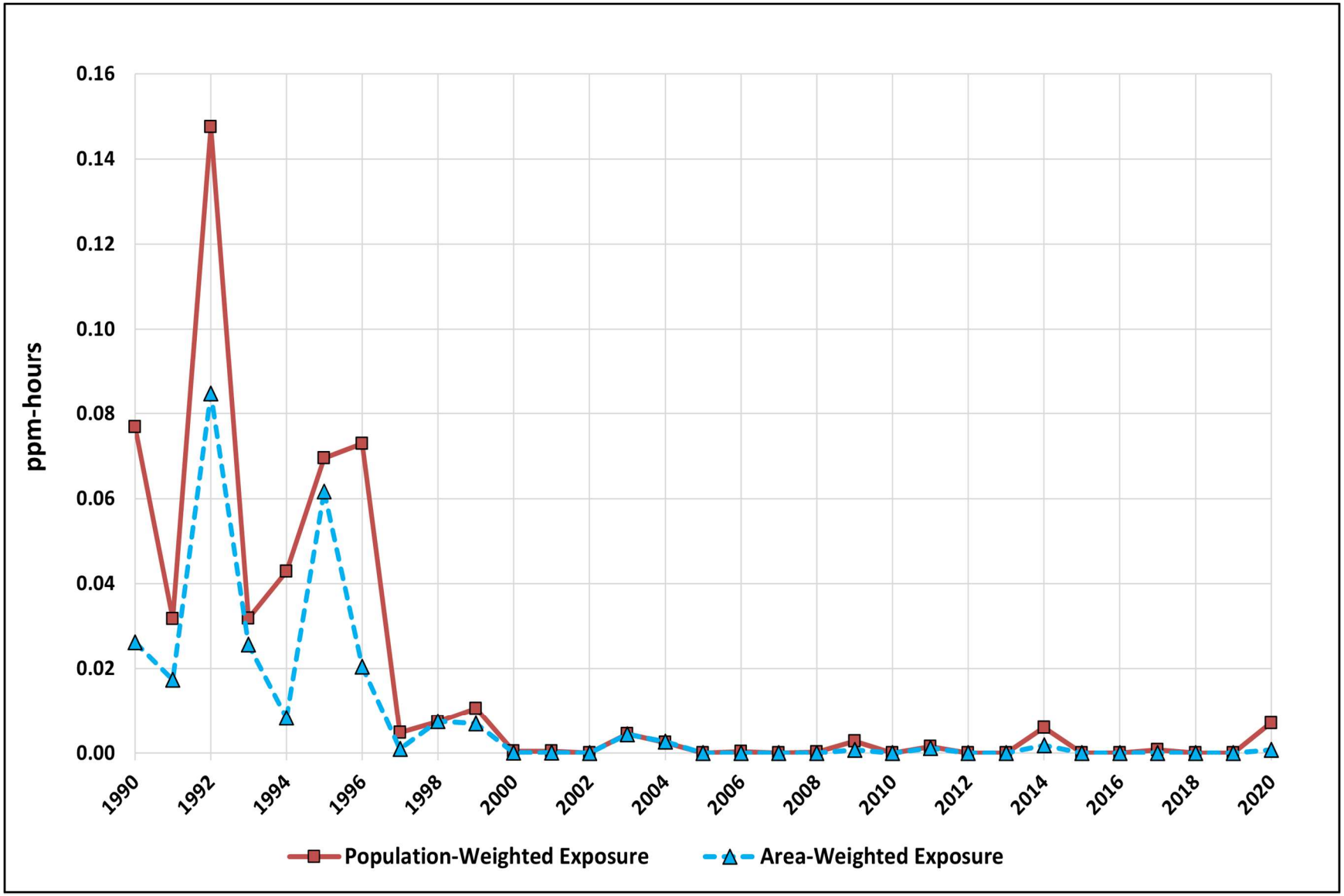
Air Quality Indicators – Population and Area Exposure

CARB has developed a methodology to assess exposure to air pollutants within Santa Barbara County. The "exposure indicators" are the population-weighted exposure (PWE) indicator and the area-weighted exposure (AWE) indicator. These metrics provide an indication of the potential for chronic adverse health impacts. Unlike the EPDC, which tracks progress at individual locations, the population-weighted and area-weighted exposure indicators consolidate hourly ozone measurements from all sites within the District into a single average exposure value.

The calculation methodology assumes that an "exposure" occurs when a 1-hour ozone measurement is higher than 0.09 ppm (the level of the state 1-hour ozone standard). The PWE and AWE consider both the magnitude and the duration of hourly ozone concentrations above the state standard. However, the PWE is higher if the exposure is recorded near population centers, while the AWE is higher if the exposure covers more land area, based on the monitoring station network. The resulting annual exposure indicator is the sum of all the hourly exposures during the year and presents the results as an average per exposed person (PWE indicator) or average per exposed unit of land area (AWE indicator).

The population- and area-weighted exposure data obtained from CARB is presented in Figure 2-4. This figure shows that both exposure indicators have decreased over time and that these air quality indicators have been very low during the last 20 years due to dramatic improvements in local air quality. The values are near zero since ozone levels in the County rarely exceed 0.09 ppm for a 1-hour period.

FIGURE 2-4: POPULATION- AND AREA-WEIGHTED EXPOSURE
SANTA BARBARA COUNTY, 1-HOUR OZONE, 1990-2020



CHAPTER 3– EMISSION INVENTORY

This chapter presents the reactive organic compound (ROC) and nitrogen oxide (NOx) emission inventory used in the development of this 2022 Plan. The District's emission inventory accounts for pollutants emitted from all emission sources, including fuel combustion at industrial facilities, consumer product usage, and motor vehicles. The emission inventory is compiled through a collaborative effort by the District and CARB, and the emissions are classified under one of the following source categories:

- **Stationary Sources** – larger facilities and processes that are typically subject to District permitting requirements.
- **Area-Wide Sources** – small, geographically dispersed processes that are typically not subject to District permitting requirements.
- **Mobile Sources** – this source type is subdivided into two categories:
  - **On-Road Motor Vehicles** – passenger cars, motorcycles, trucks, and buses.
  - **Other Mobile Sources** – ships, planes, trains, and off-road equipment.

The inventory includes emissions from two geographical regions: Santa Barbara County and the Outer Continental Shelf (OCS). The Santa Barbara County region encompasses all onshore sources of air pollution within Santa Barbara County and the State Tidelands (all waters within three nautical miles of the shoreline). The OCS extends from the State Tideland boundary out to 100 nautical miles from the shoreline.

The inventories presented in this chapter are "planning emissions inventories," commonly referred to as "summer seasonal" inventories. A planning inventory accounts for seasonal variation because most ozone standard exceedances occur during the April to October "ozone season." A planning inventory does not include the emissions from natural sources such as biogenics, oil and gas seeps, and wildfires since they are not regulated nor controlled through the implementation of emission control measures. Additional information on natural sources can be found in Appendix B.

Baseline Inventory

For every inventory, a baseline year must be chosen. Since the purpose of the base year inventory is to represent relatively current emissions, there is a general preference to use as recent a year as practical. However, some years may not be representative of normal operations. For example, the 2020 inventory is expected to be atypical in many ways due to the effects of the COVID-19 pandemic. Activity levels for all source categories will be altered as a result of the reduced economic conditions and changes in behavior from widespread state and local "stay at home" orders. This 2022 Plan uses 2018 as the base year because the 2018 inventory is the most recent and complete inventory available for all of the source categories. Furthermore, CARB is using a 2018 base year for inclusion in their 2022 State Implementation

Plan (SIP) submittal to the EPA, so the 2018 inventory data has been thoroughly reviewed and refined for accuracy.

This Plan uses a 2018 Base Year since it is the most recent and complete inventory year for all of the source categories.

The emission inventory is divided into four major categories: stationary, area, on-road motor vehicle, and other mobile sources. Emissions from each category are calculated with approved methodologies that use the most current data available for the category. For example, the 2018 base year stationary source emissions are calculated with annual data that facilities reported to the District. The area source emissions are estimated jointly by CARB and the District. On-road motor vehicle emissions are calculated by applying CARB's EMission FACtor (EMFAC) model output to the transportation activity data provided by the Santa Barbara County Association of Governments (SBCAG).[6] Finally, CARB provides emission estimates for other mobile sources such as ocean-going vessels, locomotives, aircraft, and agricultural equipment.

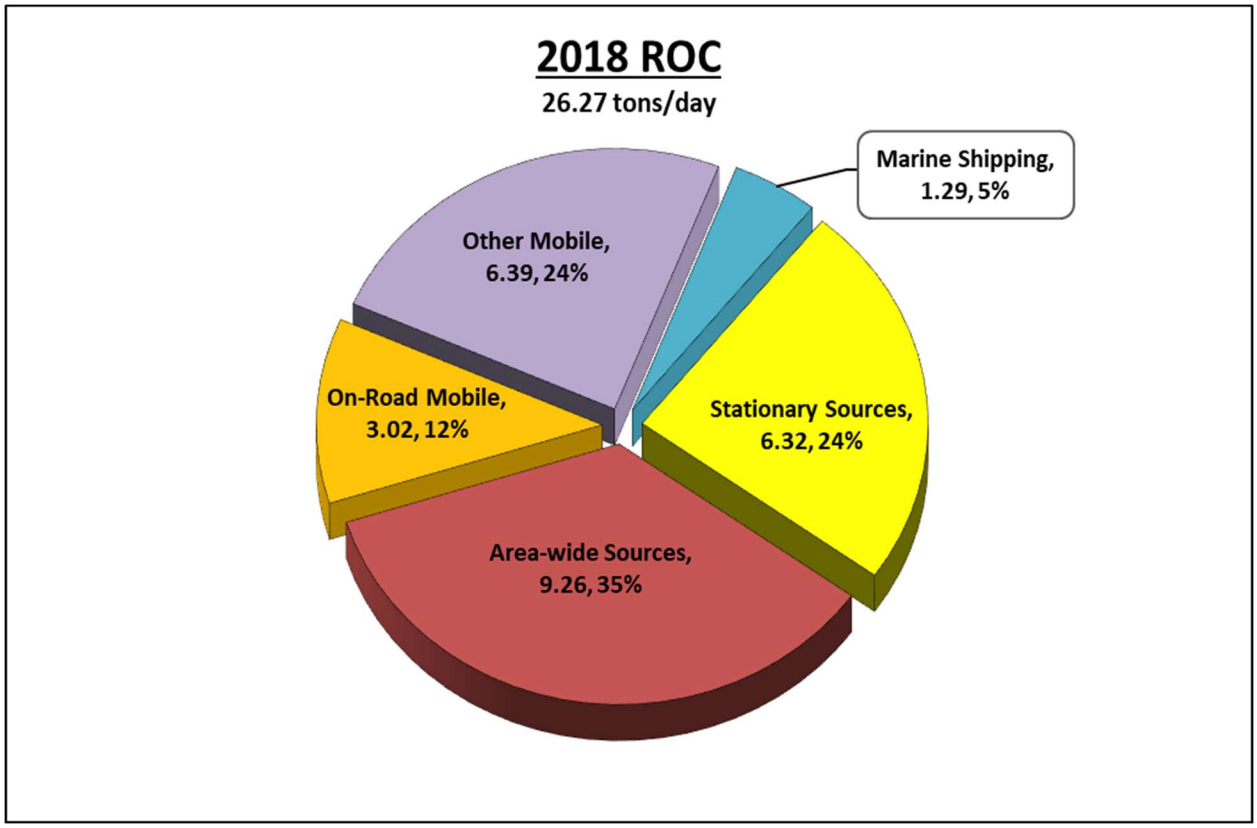
Figure 3-1 shows the emissions and relative contribution of ROC and NOx during 2018 for each source category. Due to the large amount of marine shipping emissions in the District's emission inventory, the District separated ocean-going vessels from the other mobile source categories so that the relative impact can be more easily identified. Some of the highlights of Figure 3-1 include the following:

- Stationary and area-wide sources account for about 59 percent of the baseline ROC inventory. The majority of these emissions are from coating and solvent operations, oil & gas operations, and pesticide usage.
- Other mobile sources account for 24 percent of the ROC emissions, with the remaining 19 percent coming from on-road vehicles and ocean-going vessels category.
- 66 percent of the NOx inventory is attributed to ocean-going vessels in the OCS (see "Impacts from Marine Shipping" at the end of this chapter for further discussion).
- An estimated 14 percent of the NOx emissions in the baseline inventory are from on-road motor vehicles, while area-wide sources, stationary sources, and the remaining other mobile sources contribute the remaining 20 percent to the baseline NOx emissions.

The combined amount of ozone precursors (ROC + NOx) is shown in Figure 3-2. The stationary source emissions are approximately 14 percent of the total inventory, which is a positive reflection of the District's stationary source control program. Based on staff estimates, the stationary source emission inventory would be four times greater if no emission control rules had been adopted and implemented by the District.

[6] More information regarding the process and assumptions for the on-road mobile source emission estimates and projections can be found in Chapter 5.

FIGURE 3-1: BASELINE ROC AND NOX EMISSIONS (TONS PER DAY) AND DISTRIBUTION (%)



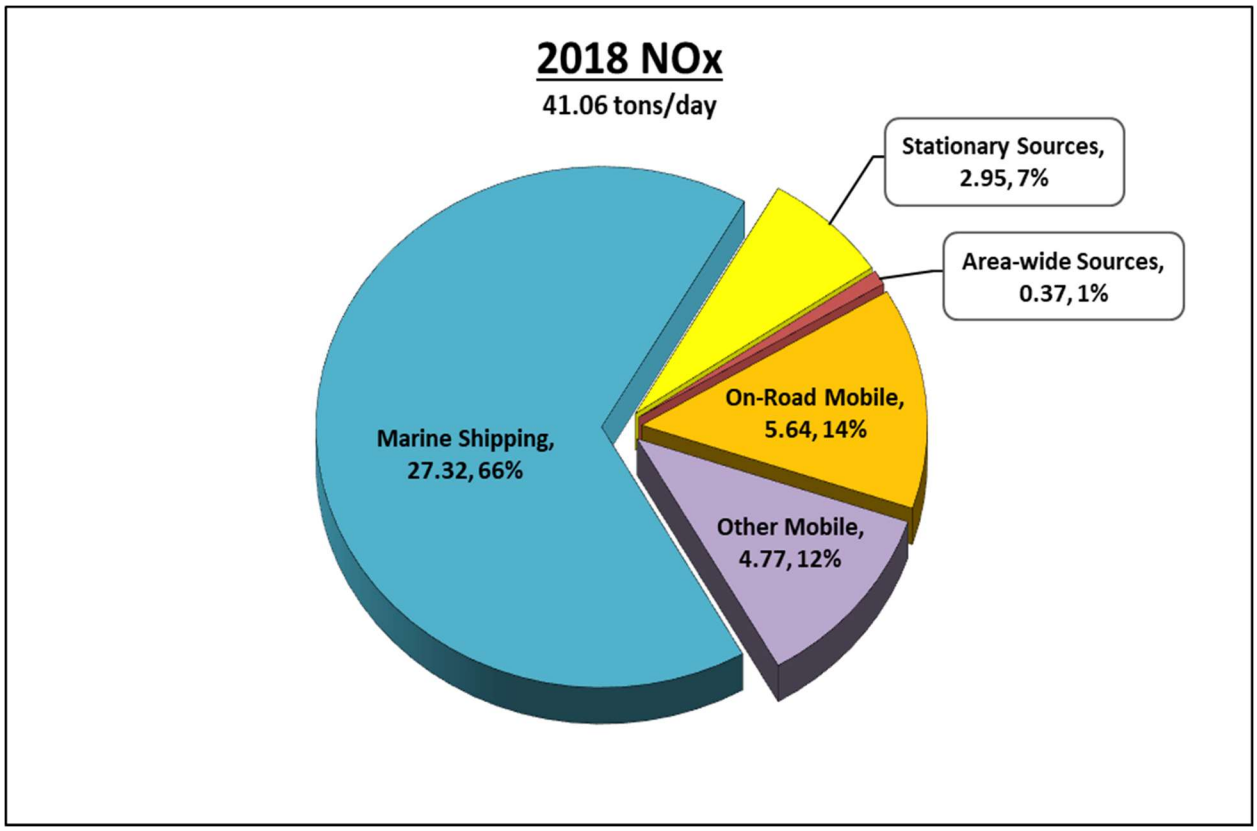
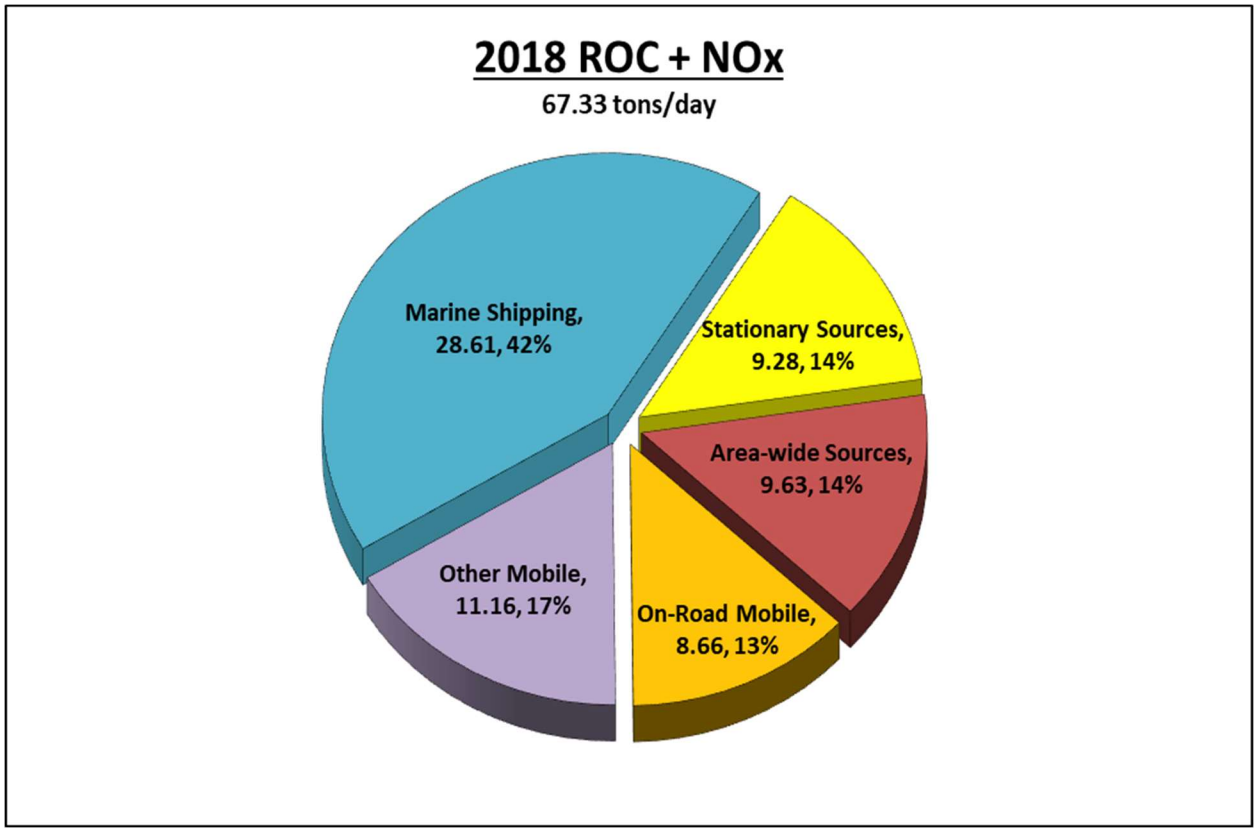


FIGURE 3-2: COMBINED BASELINE ROC AND NOX EMISSIONS (TONS PER DAY) AND DISTRIBUTION (%)



Growth Profiles

To understand how the emission inventory may change over time, the 2018 inventory is projected into the future using activity-specific growth profiles. Growth profiles contain the estimated changes in the values of pollution-producing activities, known as "activity indicators." Examples of activity indicators include population, housing, and economic output, and the ratio of these activity indicators creates the growth rate (relative to the base year). CARB has developed dozens of growth profiles by collecting information from reputable sources such as the California Energy Commission and the Department of Finance. These growth profiles are then applied to the affected source categories to build the forecasted inventory. If the District has more accurate information or estimates based on local data, the District can work with CARB to refine the growth profiles.

In this plan, the growth profiles are established to demonstrate what the projected emission inventory could look like in the years 2025, 2035, and 2045. Growth profile data is shown in Table 3-1.

TABLE 3-1: SANTA BARBARA COUNTY GROWTH PROFILES

Activity Indicator	Units	Value				Growth Rate from 2018			Data Source
		2018	2025	2035	2045	2025	2035	2045	
Population	Residents	452,953	470,188	501,060	524,389	4%	11%	16%	1
Housing	Households	148,071	154,657	164,811	172,485	4%	11%	16%	1
Vehicle Miles Travelled	Million Daily Miles	9.91	10.19	10.33	10.52	3%	4%	6%	2
Natural Gas Combustion: *Residential*	Million Therms	54.18	55.07	53.43	48.77	2%	-1%	-10%	3
Natural Gas Combustion: *Commercial*	Million Therms	22.66	24.74	26.66	29.40	9%	18%	30%	3
Natural Gas Combustion: *Industrial*	Million Therms	9.85	10.39	11.02	11.56	5%	12%	18%	3
Petroleum Production: *Onshore*	MMbbl Oil	3.31	3.31	3.31	3.31	0%	0%	0%	4
Petroleum Wells: *Onshore*	Active + Idle Wells	2,186	2,037	1,843	1,666	-7%	-16%	-24%	4
Petroleum Wells: *Offshore*	Active + Idle Wells	396	324	352	318	-18%	-11%	-20%	4
Ocean Going Vessels: *Auto Carriers*	Growth Rate	--	--	--	--	6%	17%	14%	5
Ocean Going Vessels: *Containerships*	Growth Rate	--	--	--	--	22%	74%	136%	5
Ocean Going Vessels: *Tankers*	Growth Rate	--	--	--	--	-2%	2%	2%	5

Data Source References:

1) Department of Finance, which is similar to the SBCAG Regional Growth Forecast 2050 [January 2019]
2) SBCAG Regional Travel Demand Model and Connected 2050 Regional Transportation Plan and Sustainable Communities Strategy
3) REMI (Regional Economic Models, Inc.) output using California Energy Commission data
4) Staff estimate based on data from the California Geologic Energy Management Division (CalGEM) and Bureau of Ocean Energy Management (BOEM)
5) Freight Analysis Framework model, compiled by the Bureau of Transportation Statistics and the Federal Highway Administration

Discussion on Oil & Gas Growth Profiles

Over the last few decades, oil & gas operations have gone through multiple cycles of growth and contraction based on market demands, product transportation methods, and technological innovations. On a statewide level, the California Air Resources Board estimates that oil production in California will decrease by approximately 2.9% each year.[7] However since the 2013 Plan, the District has used a zero percent growth rate for oil & gas-related activities due to uncertainty in the sector for Santa Barbara County over the long term. For this 2022 Plan, staff reviewed the historical records from both the California Geologic Energy Management Division (CalGEM) and Bureau of Ocean Energy Management (BOEM) to establish new growth factors based on local data.

For onshore oil & gas activity, staff recommends using the countywide onshore oil production, as measured in million barrels of oil, as the activity factor that correlates best with the actual NOx emissions from the oil & gas sector. NOx emissions are created by combustion equipment, such as steam generators in cyclic steaming operations and internal combustion engines being used to drive the oil pumps. Although there may be a statewide decline in oil production, staff recommends maintaining a neutral, local growth rate in onshore oil production as there may be new combustion-related projects to enhance or maintain the output of existing, active wells. Best Available Control Technology (BACT) is typically required for any new major oil & gas projects, driving down the project emissions.

Onshore NOx tracks with onshore Oil Production.

Onshore ROC tracks with onshore Well Count.

For ROC emissions related to onshore oil & gas activity, staff recommends using the total active and idle oil & gas wells as the activity factor that correlates best with the actual ROC emissions from the oil & gas sector. Although there are generally more emissions from active wells than idle wells, idle wells are still a concern due to fugitive emissions from leaking components. Once a well is fully plugged and abandoned, the associated emissions can be removed from the District's emission inventory. Staff estimates that approximately 1% of idle wells will be removed from service each year. This trend is supported by the typical declining production capabilities of older oil wells and the recent idle well regulation changes adopted by CalGEM in 2019.[8] The idle well regulation changes discourage operators from leaving their wells in an idle state and creates incentives for operators to manage and eliminate their idle wells by entering into Idle Well Management Plans.

For offshore oil & gas activity, staff recommends using the total active and idle oil & gas wells as the activity factor that correlates best with both the actual NOx and ROC emissions. Offshore emissions in the oil & gas sector have been greatly affected by the rupture of the Plains All

Offshore NOx and ROC tracks with offshore Well Count.

[7] Based on statewide annual production reports from 2000 – 2016 from CalGEM, previously known as the CA Department of Conservation, Division of Oil Gas, and Geothermal Resources (DOGGR).
[8] www.conservation.ca.gov/calgem/idle_well

American Pipeline, which occurred in May 2015. The shutdown of the pipeline has prevented multiple offshore facilities from producing oil, reducing their economic viability and forcing two operators to begin the decommissioning of their offshore platforms. Once the platforms are fully decommissioned, the stationary source emissions will be reduced even further. However, the Plains All American Pipeline may be rebuilt or replaced, which would allow some of the offshore platforms to resume operations. The County of Santa Barbara has discretionary authority over onshore oil & gas projects in unincorporated areas and is therefore the lead agency under the California Environmental Quality Act (CEQA) for most oil & gas projects. If a new pipeline project is approved, there may be an increase in offshore emissions from the Exxon Mobil Santa Ynez Unit compared to the Base Year of 2018, and the growth rate used in this Plan accounts for this change to occur sometime between 2025 and 2035.

Inventory Forecast

Inventory forecasts are created through CARB's California Emission Projection Analysis Model (CEPAM). CEPAM applies the county-specific growth profiles, along with emission control profiles derived from existing local, statewide, and federal rules, to forecast the emission inventory for future years. For this 2022 Plan, the growth and control profiles are applied to the 2018 Base Year Inventory to forecast District-wide ozone precursor emissions for 2025, 2035, and 2045. Table 3-2 displays a summary of the results grouped by source category. At the end of this chapter, Table 3-3 provides a detailed summary of emissions grouped by source sub-category, and Figures 3-3 and 3-4 provide graphical displays of the historical and projected emissions.

TABLE 3-2: ROC AND NOX EMISSION FORECAST SUMMARY (TONS PER DAY)

Source Category	ROC				% Change (2018 – 2045)
	2018	2025	2035	2045	
Stationary Sources	6.32	6.09	6.10	6.32	**0%**
Area-wide Sources	9.26	10.41	10.75	11.06	**20%**
On-Road Vehicles	3.02	1.99	1.24	0.92	**-70%**
Other Mobile [9]	6.39	4.97	3.22	2.64	**-59%**
Marine Shipping	1.29	1.51	2.02	2.80	**117%**
ERCs	-	0.40	0.40	0.40	**-**
Total	**26.27**	**25.37**	**23.72**	**24.14**	**-8%**

Source Category	NOx				% Change (2018 – 2045)
	2018	2025	2035	2045	
Stationary Sources	2.95	2.85	2.83	2.92	**-1%**
Area-wide Sources	0.37	0.35	0.32	0.31	**-17%**
On-Road Vehicles	5.64	2.82	1.69	1.36	**-76%**
Other Mobile [9]	4.77	3.47	2.68	2.33	**-51%**
Marine Shipping	27.32	30.09	39.53	21.80	**-20%**
ERCs	-	0.81	0.81	0.81	**--**
Total	**41.71**	**40.39**	**47.87**	**29.52**	**-28%**

The emission inventory forecasts have been adjusted upward based on the ERCs that were in the District Source Register as of October 2021. These ERCs represent previous voluntary emission reductions that can be purchased and/or used by a project applicant to compensate for emission increases from a new or modified stationary source. If the ERCs are used for future projects, offset trading ratios may also be applied, further reducing the amount of potential emission increases related to the use of ERCs.

[9] Marine Shipping emissions have been broken-out of the "Other Mobile" category in this table.

In reviewing the summary tables by source category and source sub-category, some of the overall inventory trends from the growth and control profiles can be identified. For example:

- There are expected increases in ROC emissions from stationary and area sources of pollution due to increases in population, which will increase consumer product and solvent usage.
- There are expected increases in ROC emissions due to pesticides compared to the base year of 2018. The reason for the projected pesticide increase is that the CARB methodology forecasts Agricultural Pesticides on a 5-year average, and 2018 was a low pesticide usage year based on the data reported by the California Department of Pesticide Regulations (DPR).
- The impact of existing regulations for both on-road vehicles and other offroad mobile equipment will substantially reduce the ROC and NOx emissions from these categories over time. Even though the total population of these units is anticipated to increase, the transition to more zero-emission equipment and vehicles will dramatically reduce the emission contributions from these sectors.
- There are large emission fluctuations over the next 20 years due to the future growth and controls on the marine shipping sector, which are discussed in more detail in the next section, *Impacts from Marine Shipping*.

Impacts from Marine Shipping

Large ships traveling along the coast of Santa Barbara County produce significant air emissions. Every year, approximately 1,400 different ocean-going vessels (OGVs) make around 6,500 total transits through the Santa Barbara Channel Region.[10] Due to the massive engines on these ships, these transits are responsible for more than 65 percent of the NOx inventory - making marine shipping the single largest source of NOx emissions in the County.

The District has studied the local meteorological conditions that have led to high ozone readings and exceedances of the state and federal ozone standards. Exceedances typically occur between April and October ("ozone season"), and the conditions that are most conducive to exceedances include stagnant air, temperature inversions, and the presence of ozone precursor pollutants. The Santa Barbara area frequently experiences a pressure gradient that moves air from offshore to onshore. This means that air pollution produced by ships transiting off the coast can contribute to the ozone levels that are measured onshore.

Marine Shipping Emission Methodology

Marine shipping emissions are estimated by CARB using its OGV methodology. This methodology was recently revised in March 2022, and it has been updated to include recent Automated Information System (AIS) speed data from the vessels. Speed data is critical to documenting the emission impacts of these ships since it helps quantify the amount of fuel

[10] Based on compiled AIS (Automatic Identification System) data, which records the location, speed, and direction of the ocean-going vessels.

burned and pollutants emitted from the various vessel types.

Historically, many ships were travelling through the Santa Barbara Channel at a speed of 16 to 18 knots, but the new methodology with the recent AIS data now accounts for the ships that participate in the Protecting Blue Whales and Blue Skies Vessel Speed Reduction (VSR) program.[11] For this voluntary VSR program, the District and its partners incentivize companies to slow down to 10 knots or less off the California coast. By slowing down, the vessels reduce fuel use and help protect endangered whales. Shipping companies receive recognition and financial awards based on their cooperation with program parameters. This program, as well as other factors that promote slow-steaming operations, have significantly reduced the local NOx emissions from the marine shipping sector.

CARB's updated OGV methodology also incorporates estimates of future growth in marine shipping activities and the associated control profiles. NOx emissions from this sector are forecasted to increase by approximately 45 percent, peaking in the year 2035. This projected growth is primarily due to anticipated increases in container ship traffic to transport commodities, such as furniture, electronics, and other manufactured goods, to the Ports of Los Angeles and Long Beach.

OGVs are one of the few source categories that are expected to increase in emissions due to the anticipated growth in the container ship industry.

As for the control profiles, there are existing regulations under the International Maritime Organization (IMO) and United States Environmental Protection Agency (EPA) that require lower NOx standards for newly built vessel engines. New engines have to meet the Tier 3 standard, which emit approximately 80% less NOx as compared to the Tier 1 and Tier 2 engines that are being used on most ships today. However, OGVs are designed to remain in service for 25 years or more, and so it can take many years to realize the benefits of new technologies incorporated into new vessel designs. Tier 3 engines aren't anticipated to see widespread use until 2035, and in the meantime, the marine shipping sector continues to be the largest source of NOx within the County.

[11] www.bluewhalesblueskies.org

TABLE 3-3: EMISSIONS BY SOURCE SUB-CATEGORY (TONS PER DAY)

	ROC				NOx			
STATIONARY SOURCES	**2018**	**2025**	**2035**	**2045**	**2018**	**2025**	**2035**	**2045**
ELECTRIC UTILITIES	0.01	0.03	0.02	0.02	0.03	0.07	0.05	0.05
COGENERATION	-	-	-	-	-	-	-	-
OIL AND GAS PRODUCTION (COMBUSTION)	0.06	0.06	0.05	0.05	1.03	0.99	1.00	0.98
PETROLEUM REFINING (COMBUSTION)	-	-	-	-	0.01	0.01	0.01	0.01
MANUFACTURING AND INDUSTRIAL	0.02	0.02	0.02	0.02	0.54	0.53	0.54	0.62
FOOD AND AGRICULTURAL PROCESSING	0.02	0.02	0.01	0.01	0.34	0.28	0.25	0.26
SERVICE AND COMMERCIAL	0.06	0.07	0.07	0.07	0.77	0.77	0.77	0.78
OTHER (FUEL COMBUSTION)	-	-	-	-	0.10	0.09	0.09	0.09
SEWAGE TREATMENT	-	-	-	-	-	-	-	-
LANDFILLS	0.05	0.05	0.05	0.05	0.01	0.01	0.01	0.01
INCINERATORS	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
SOIL REMEDIATION	-	-	-	-	-	-	-	-
OTHER (WASTE DISPOSAL)	0.50	0.51	0.52	0.53	-	-	-	-
LAUNDERING	0.01	0.01	0.01	0.01	-	-	-	-
DEGREASING	0.53	0.58	0.63	0.79	-	-	-	-
COATINGS AND RELATED PROCESS SOLVENTS	0.37	0.42	0.45	0.55	-	-	-	-
PRINTING	0.49	0.46	0.47	0.52	-	-	-	-
ADHESIVES AND SEALANTS	0.40	0.45	0.48	0.52	-	-	-	-
OTHER (CLEANING AND SURFACE COATINGS)	0.09	0.10	0.11	0.14	-	-	-	-
OIL AND GAS PRODUCTION	2.85	2.55	2.44	2.20	0.06	0.06	0.06	0.06
PETROLEUM REFINING	0.05	0.05	0.05	0.05	-	-	-	-
PETROLEUM MARKETING	0.53	0.44	0.39	0.38	-	-	-	-
OTHER (PETROLEUM PRODUCTION)	-	-	-	-	-	-	-	-
CHEMICAL	0.01	0.01	0.01	0.01	-	-	-	-
FOOD AND AGRICULTURE	0.26	0.27	0.32	0.39	-	-	-	-
MINERAL PROCESSES	-	-	-	-	0.05	0.05	0.05	0.06
ELECTRONICS	-	-	-	-	-	-	-	-
OTHER (INDUSTRIAL PROCESSES)	-	-	-	-	-	-	-	-
STATIONARY SOURCE TOTAL	**6.32**	**6.09**	**6.10**	**6.32**	**2.95**	**2.85**	**2.83**	**2.92**

TABLE 3-3: EMISSIONS BY SOURCE SUB-CATEGORY (TONS PER DAY)

	ROC				NOx			
AREA SOURCES	**2018**	**2025**	**2035**	**2045**	**2018**	**2025**	**2035**	**2045**
CONSUMER PRODUCTS	2.88	3.03	3.37	3.70	-	-	-	-
ARCHITECTURAL COATINGS AND SOLVENTS	0.65	0.69	0.72	0.73	-	-	-	-
PESTICIDES/FERTILIZERS	4.74	5.55	5.61	5.63	-	-	-	-
ASPHALT PAVING / ROOFING	0.15	0.17	0.19	0.21	-	-	-	-
RESIDENTIAL FUEL COMBUSTION	0.20	0.20	0.20	0.20	0.37	0.29	0.26	0.25
FARMING OPERATIONS	0.59	0.45	0.34	0.28	-	-	-	-
CONSTRUCTION AND DEMOLITION	-	-	-	-	-	-	-	-
PAVED ROAD DUST	-	-	-	-	-	-	-	-
UNPAVED ROAD DUST	-	-	-	-	-	-	-	-
FUGITIVE WINDBLOWN DUST	-	-	-	-	-	-	-	-
FIRES	-	-	0.01	0.01	-	-	-	-
MANAGED BURNING AND DISPOSAL	-	0.28	0.28	0.28	-	0.06	0.06	0.06
COOKING	0.03	0.03	0.03	0.03	-	-	-	-
OTHER (MISCELLANEOUS PROCESSES)	-	-	-	-	-	-	-	-
AREA SOURCE TOTAL	**9.26**	**10.41**	**10.75**	**11.06**	**0.37**	**0.35**	**0.32**	**0.31**

ON-ROAD MOTOR VEHICLES	**2018**	**2025**	**2035**	**2045**	**2018**	**2025**	**2035**	**2045**
LIGHT DUTY PASSENGER (LDA)	0.88	0.52	0.39	0.26	0.67	0.33	0.23	0.13
LIGHT DUTY TRUCKS - 1 (LDT1)	0.13	0.06	0.04	0.01	0.08	0.03	0.02	0.01
LIGHT DUTY TRUCKS - 2 (LDT2)	0.70	0.52	0.35	0.18	0.64	0.35	0.22	0.08
MEDIUM DUTY TRUCKS (MDV)	0.53	0.36	0.26	0.15	0.60	0.27	0.16	0.06
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	0.22	0.13	0.08	0.02	0.24	0.13	0.08	0.02
LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	0.02	0.01	0.01	-	0.03	0.01	0.01	-
MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	0.03	0.01	0.01	0.01	0.06	0.02	0.02	0.01
HEAVY HEAVY DUTY GAS TRUCKS (HHDV)	-	-	-	-	0.02	0.01	0.01	0.01
LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	0.03	0.02	0.01	-	0.56	0.25	0.14	0.02
LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2)	0.01	0.01	-	-	0.14	0.05	0.03	-
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	0.04	0.01	0.01	0.01	0.70	0.35	0.34	0.33
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	0.04	0.02	0.02	0.02	1.23	0.65	0.58	0.51

TABLE 3-3: EMISSIONS BY SOURCE SUB-CATEGORY (TONS PER DAY)

	ROC				NOx			
ON-ROAD MOTOR VEHICLES (Continued)	**2018**	**2025**	**2035**	**2045**	**2018**	**2025**	**2035**	**2045**
MOTORCYCLES (MCY)	0.34	0.29	0.26	0.24	0.10	0.08	0.08	0.07
HEAVY DUTY DIESEL URBAN BUSES (UB)	0.01	0.01	-	-	0.29	0.13	0.07	0.01
HEAVY DUTY GAS URBAN BUSES (UB)	0.01	-	-	-	0.02	0.01	0.01	-
SCHOOL BUSES - GAS (SBG)	-	-	-	-	0.01	-	-	-
SCHOOL BUSES - DIESEL (SBD)	-	-	-	-	0.13	0.09	0.06	0.03
OTHER BUSES - GAS (OBG)	0.01	-	-	-	0.01	0.01	0.01	-
OTHER BUSES - MOTOR COACH - DIESEL (OBC)	-	-	-	-	0.03	0.01	0.01	0.01
ALL OTHER BUSES - DIESEL (OBD)	-	-	-	-	0.05	0.01	0.02	0.03
MOTOR HOMES (MH)	0.01	-	-	-	0.03	0.01	0.01	-
ON-ROAD MOTOR VEHICLE TOTAL	**3.02**	**1.99**	**1.45**	**0.92**	**5.64**	**2.82**	**2.09**	**1.36**

OTHER MOBILE SOURCES	**2018**	**2025**	**2035**	**2045**	**2018**	**2025**	**2035**	**2045**
AIRCRAFT	0.23	0.24	0.26	0.28	0.12	0.13	0.15	0.16
TRAINS	0.02	0.01	0.01	0.01	0.46	0.30	0.30	0.27
OCEAN GOING VESSELS	1.29	1.51	2.02	2.80	27.32	30.09	39.53	21.80
COMMERCIAL HARBOR CRAFT	0.03	0.03	0.03	0.02	0.43	0.44	0.43	0.37
RECREATIONAL BOATS	3.81	2.80	1.92	1.59	0.77	0.71	0.67	0.67
OFF-ROAD RECREATIONAL VEHICLES	0.25	0.20	0.12	0.07	0.01	0.01	0.01	0.01
OFF-ROAD EQUIPMENT	1.44	1.25	0.56	0.39	1.07	0.69	0.44	0.39
OFF-ROAD EQUIPMENT (PERP)	0.02	0.01	0.01	0.02	0.26	0.12	0.10	0.11
FARM EQUIPMENT	0.36	0.25	0.15	0.10	1.65	1.05	0.58	0.35
FUEL STORAGE AND HANDLING	0.22	0.17	0.15	0.16	-	-	-	-
OTHER MOBILE SOURCE TOTAL	**7.67**	**6.48**	**5.23**	**5.44**	**32.09**	**33.55**	**42.21**	**24.12**

TOTAL – ALL SOURCE CATEGORIES	**26.27**	**24.96**	**23.32**	**23.74**	**41.06**	**39.58**	**47.06**	**28.72**
EMISSION REDUCTION CREDITS	-	0.40	0.40	0.40	-	0.81	0.81	0.81
GRAND TOTAL FOR SANTA BARBARA COUNTY	**26.27**	**25.37**	**23.72**	**24.14**	**41.06**	**40.39**	**47.87**	**29.52**

* Cells with a "-" denote that the source category contributes less than 0.005 tons/day of ROC or NOx.

FIGURE 3-3: ROC EMISSION TRENDS BY SOURCE CATEGORY

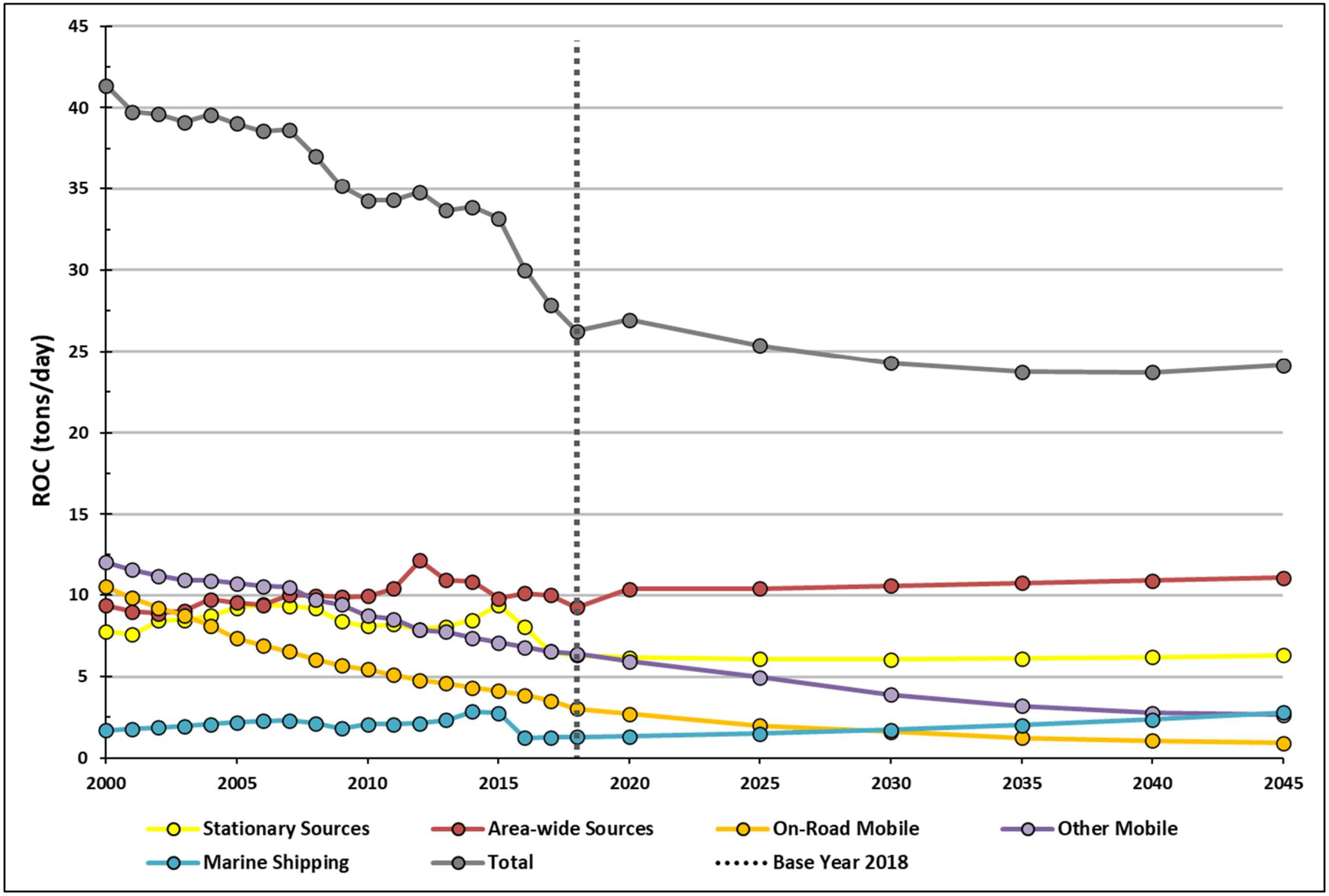
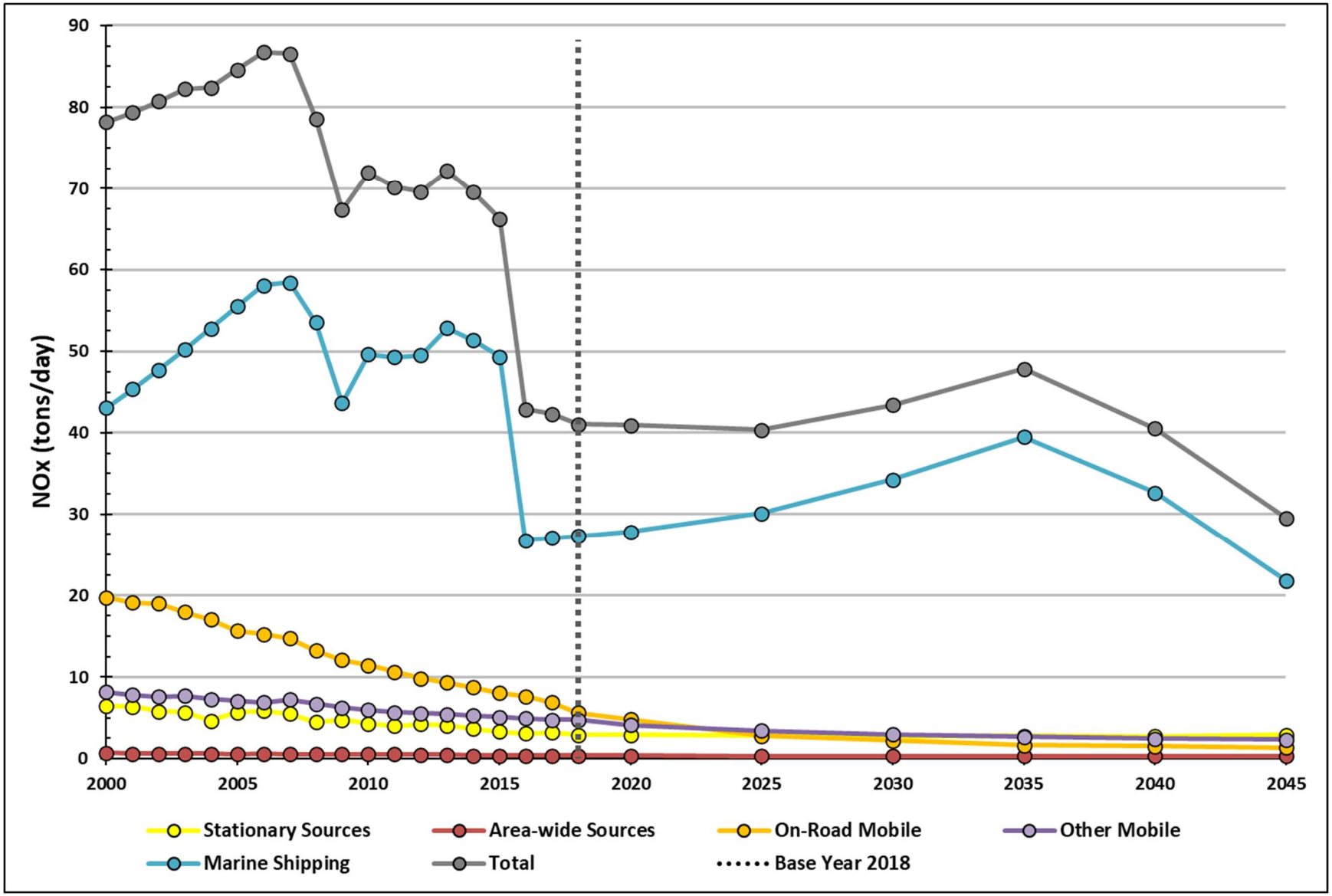


FIGURE 3-4: NOX EMISSION TRENDS BY SOURCE CATEGORY



CHAPTER 4– STATIONARY SOURCE EMISSION CONTROL MEASURES

[Placeholder – to be completed by next CAC Meeting]

CHAPTER 5 – ON-ROAD TRANSPORTATION CONTROL MEASURES

[Placeholder – to be completed by next CAC Meeting]

CHAPTER 6 – VOLUNTARY INCENTIVE STRATEGIES

[Placeholder – to be completed by next CAC Meeting]

CHAPTER 7 – ATTAINMENT AND MAINTENANCE STRATEGY

[Placeholder – to be completed by next CAC Meeting]

APPENDIX A – 1-HOUR AND 8-HOUR EXPECTED PEAK DAY CONCENTRATIONS

This appendix presents the numerical values of the 1-hour and 8-hour expected peak day concentrations for the six monitoring sites in the County that typically record the highest ozone concentrations. This data is used to create Figures 2-2 and 2-3. Values greater than the state ozone standard are highlighted in yellow.

TABLE A-1: STATE 1-HOUR OZONE EPDCS – TOP 6 MONITORING SITES

Year	Las Flores Canyon	Paradise Road	Carpinteria	Santa Ynez	Lompoc HS&P	Goleta	State 1-hr Standard
1990	0.139	0.125	0.122	0.106	0.105	0.111	**0.09**
1991	0.136	0.126	0.124	0.105	0.102	0.110	**0.09**
1992	0.129	0.118	0.118	0.099	0.092	0.110	**0.09**
1993	0.121	0.113	0.118	0.100	0.096	0.114	**0.09**
1994	0.121	0.107	0.119	0.100	0.094	0.109	**0.09**
1995	0.122	0.107	0.114	0.097	0.096	0.100	**0.09**
1996	0.131	0.110	0.117	0.102	0.092	0.102	**0.09**
1997	0.124	0.109	0.113	0.100	0.093	0.099	**0.09**
1998	0.116	0.110	0.110	0.098	0.091	0.095	**0.09**
1999	0.103	0.103	0.098	0.087	0.085	0.087	**0.09**
2000	0.100	0.102	0.093	0.088	0.084	0.083	**0.09**
2001	0.097	0.100	0.091	0.088	0.084	0.082	**0.09**
2002	0.095	0.103	0.090	0.088	0.081	0.080	**0.09**
2003	0.092	0.105	0.089	0.089	0.086	0.078	**0.09**
2004	0.095	0.102	0.089	0.092	0.086	0.080	**0.09**
2005	0.094	0.098	0.090	0.091	0.086	0.081	**0.09**
2006	0.092	0.090	0.082	0.084	0.078	0.078	**0.09**
2007	0.090	0.094	0.081	0.081	0.074	0.075	**0.09**
2008	0.090	0.091	0.090	0.081	0.076	0.076	**0.09**
2009	0.093	0.088	0.094	0.081	0.077	0.075	**0.09**
2010	0.088	0.086	0.096	0.082	0.078	0.075	**0.09**
2011	0.087	0.086	0.092	0.078	0.076	0.072	**0.09**
2012	0.082	0.082	0.085	0.075	0.074	0.069	**0.09**
2013	0.079	0.078	0.082	0.072	0.074	0.069	**0.09**
2014	0.083	0.075	0.085	0.073	0.073	0.075	**0.09**
2015	0.082	0.076	0.084	0.075	0.073	0.077	**0.09**
2016	0.082	0.076	0.083	0.075	0.070	0.078	**0.09**
2017	0.080	0.075	0.071	0.072	0.071	0.076	**0.09**
2018	0.079	0.075	0.072	0.071	0.070	0.072	**0.09**
2019	0.080	0.072	0.077	0.071	0.070	0.072	**0.09**
2020	0.079	0.079	0.081	0.073	0.071	0.069	**0.09**

TABLE A-2: STATE 8-HOUR OZONE EPDCS – TOP 6 MONITORING SITES

Year	Las Flores Canyon	Paradise Road	Carpinteria	Santa Ynez	Lompoc HS&P	Goleta	State 8-hr Standard
1990	0.111	0.110	0.100	0.092	0.094	0.093	**0.070**
1991	0.111	0.111	0.098	0.091	0.088	0.091	**0.070**
1992	0.108	0.106	0.094	0.086	0.081	0.093	**0.070**
1993	0.102	0.104	0.097	0.086	0.086	0.094	**0.070**
1994	0.104	0.098	0.096	0.089	0.086	0.092	**0.070**
1995	0.107	0.098	0.094	0.087	0.087	0.087	**0.070**
1996	0.112	0.101	0.095	0.092	0.084	0.088	**0.070**
1997	0.110	0.099	0.093	0.089	0.083	0.086	**0.070**
1998	0.101	0.100	0.089	0.088	0.082	0.082	**0.070**
1999	0.092	0.091	0.080	0.075	0.078	0.073	**0.070**
2000	0.091	0.091	0.079	0.077	0.077	0.070	**0.070**
2001	0.087	0.090	0.078	0.078	0.078	0.071	**0.070**
2002	0.084	0.092	0.076	0.080	0.075	0.069	**0.070**
2003	0.081	0.095	0.074	0.081	0.079	0.068	**0.070**
2004	0.085	0.093	0.077	0.083	0.080	0.071	**0.070**
2005	0.085	0.090	0.079	0.081	0.079	0.072	**0.070**
2006	0.083	0.084	0.072	0.074	0.072	0.070	**0.070**
2007	0.080	0.084	0.070	0.070	0.069	0.066	**0.070**
2008	0.080	0.084	0.078	0.073	0.071	0.066	**0.070**
2009	0.084	0.081	0.082	0.074	0.072	0.065	**0.070**
2010	0.082	0.079	0.083	0.075	0.072	0.065	**0.070**
2011	0.080	0.079	0.080	0.072	0.071	0.065	**0.070**
2012	0.074	0.077	0.074	0.069	0.070	0.061	**0.070**
2013	0.071	0.073	0.074	0.065	0.069	0.064	**0.070**
2014	0.074	0.073	0.076	0.067	0.070	0.070	**0.070**
2015	0.076	0.073	0.076	0.070	0.070	0.070	**0.070**
2016	0.076	0.072	0.074	0.070	0.068	0.071	**0.070**
2017	0.075	0.069	0.062	0.068	0.068	0.068	**0.070**
2018	0.072	0.068	0.063	0.066	0.068	0.065	**0.070**
2019	0.072	0.068	0.068	0.066	0.067	0.064	**0.070**
2020	0.074	0.073	0.072	0.066	0.066	0.062	**0.070**

APPENDIX B – NATURAL SOURCE EMISSIONS

Natural sources are non-anthropogenic sources that include biogenic emissions, petroleum oil & gas seeps (geogenic), and wildfires. A planning inventory does not include the emissions from natural sources since they are not regulated nor controlled through the implementation of emission control measures. A brief description of the three natural source categories is provided below.

Biogenic Emissions:

Biogenic emissions mainly consist of isoprenes, terpenes, and other ROCs that are emitted from plants and trees. NOx emissions are also emitted from the natural soils. The California Air Resources Board estimates biogenic ROC emissions using the MEGAN model (Model of Emissions of Gases and Aerosols from Nature) and biogenic NOx emissions using the DNDC model (Denitrification-Decomposition).

Seeps (or Geogenic Emissions):

Oil and gas seeps have occurred naturally off the coast of California for thousands of years. They are associated with cracks in the Earth's crustal layers in which oil floats to the surface of the water and gas bubbles out and escapes into the air. The emissions are estimated by the District using a combination of various studies surrounding Coal Oil Point, which is located in the Santa Barbara Channel.

Wildfires:

A wildfire is an unplanned, natural event that burns a variety of vegetation types. The California Air Resources Board estimates wildfire emissions using the FOFEM model (First Order Fire Effects Model). This model uses Geographic Information Systems (GIS) data on the fire perimeters, vegetation composition, fuel density (tons/acre), and fuel moisture to estimate the emissions. Wildfires do not include prescribed burns, as prescribed burns are planned events to ignite the fire for resource or safety benefits and defined as an area source.

In order to provide additional perspective on the magnitude of emissions from natural sources, Table B-1 provides the local and statewide emission estimates for natural sources, and Figure B-1 provides the estimates on the statewide wildfire acreage burned over the last two decades.

TABLE B-1: 2018 NATURAL SOURCE ROC AND NOX (TONS PER DAY)

	ROC		NOx	
NATURAL SOURCES	**Santa Barbara County**	**Statewide**	**Santa Barbara County**	**Statewide**
BIOGENICS	54.80	3,432.80	0.36	25.41
SEEPS	26.36	30.80	0.00	0.00
WILDFIRES	0.09	1,244.50	0.06	122.10
NATURAL SOURCE TOTAL	**81.25**	**4,708.10**	**0.42**	**147.51**

FIGURE B-1: STATEWIDE WILDFIRE DATA – ACREAGE OF BURNED WILDLAND