PALMDALE GENERAL PLAN UPDATE

Air Quality

SPRING 2020 | FINAL REPORT

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Chapter 12: Air Quality

This section of the Existing Conditions Report addresses topics related to regional and local air quality.

Key Findings

- The Mojave Desert Air Basin (MDAB) does not meet the State and federal standards for Ozone or Particulate Matter (PM_{10}).
- The portion of the Antelope Valley Air Quality Management District (AVAQMD) designated as a Federal 8-hour ozone nonattainment area is scheduled to be in attainment of the National Ambient Air Quality Standards by July 2027.
- There are no additional air quality issues that are specific to the City of Palmdale.

Climate and Topography

Palmdale is located in the Mojave Desert Air Basin (MDAB), which is under the jurisdiction of the Antelope Valley Air Quality Management District (AVAQMD). The MDAB contains mountain ranges and valleys that typically contain dry lakes. The MDAB experiences prevailing winds originating from the coastal and central regions. Palmdale's air quality is greatly impacted by transport air pollution from the poorer air quality areas of Los Angeles Basin and San Joaquin Valley. Pollutants are transported from upwind areas, to the inland areas of Southern California, such as Palmdale, that degrades the local air quality. The Antelope Valley is bordered by the Tehachapi Pass to the north. The MDAB is classified as a dry-hot desert climate. Portions are classified as dry-very hot desert, indicating at least three months with maximum average temperatures over 100°F (AVAQMD 2016).

Air Pollutants of Primary Concern

The Federal and State Clean Air Acts mandate the control and reduction of certain air pollutants. Under these laws, the United States Environmental Protection Agency (USEPA) and the California Air Resources Board (CARB) have established ambient air quality standards for certain "criteria" pollutants. The primary criterion pollutants include ozone (O_3), carbon monoxide (CO), suspended particulates including small particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$), lead (Pb) and sulfur dioxide (SO_2). Ambient air pollutant concentrations are affected by the rates and distributions of corresponding air pollutant emissions, as well as by the climate and topographic influences discussed above. The primary determinant of concentrations of non-reactive pollutants, such as carbon monoxide (CO) and suspended particulate matter, is proximity to major

sources. Ambient CO levels usually closely follow the spatial and temporal distributions of vehicular traffic.

Ozone

Ozone (O_3) is a colorless gas with a pungent odor. Most ozone in the atmosphere is formed as a result of the interaction of ultraviolet light, reactive organic gases (ROG), and oxides of nitrogen (NO_x). As a highly reactive molecule, ozone readily combines with many different components of the atmosphere. Consequently, high levels of O_3 tend to exist only while high ROG and NO_x levels are present to sustain the O_3 formation process. Once the precursors have been depleted, O_3 levels rapidly decline. Because these reactions occur on a regional rather than local scale, O_3 is considered a regional pollutant.

High O_3 levels can be attributed to emissions from vehicle, industrial plants, fossil fuels and consumer products. Los Angeles County recorded 8-hour ozone peaks up to 0.129 parts per million (ppm) and hourly ozone peaks up to 0.157 ppm in 2017, while the MDAB recorded 8-hour ozone peaks up to 0.119 ppm and hourly ozone peaks up to 0.156 ppm in 2017 (CARB 2018). Higher concentrations in Los Angeles County are likely due to denser populations and higher traffic volumes.

Warmer conditions promote O_3 formation; therefore, O_3 peaks are most common during summer months. A majority of 8-hour and hourly ozone peaks were recorded in June or July. Therefore, ozone levels are recorded when ozone is suspected to be at its highest.

Carbon Monoxide

CO is an odorless, colorless gas and causes a number of health problems including fatigue, headache, confusion, and dizziness. The incomplete combustion of petroleum fuels in on-road vehicles and at power plants is a major cause of CO. CO is also produced during the winter from wood stoves and fireplaces. CO tends to dissipate rapidly into the atmosphere; consequently, violations of the State CO standards are generally associated with major roadway intersections during peak-hour traffic conditions. Heightened CO concentrations in Palmdale are likely to occur in the vicinity of roadways with high traffic volumes such as Highway 138, Highway 14, the Sierra Highway, Highway 22, Fifth Street West, 50th Street East, East Avenue, Palmdale Boulevard, and Rancho Vista Boulevard.

Localized CO “hotspots” can occur at intersections with heavy peak-hour traffic. Specifically, hotspots can be created at intersections where traffic levels are sufficiently high such that the local CO concentration exceeds the National Ambient Air Quality Standards (NAAQS) of 35.0 parts per million (ppm) or the California Ambient Air Quality Standards (CAAQS) of 20.0 ppm. There are no existing CO hotspots in the City of Palmdale as of 2017.

Nitrogen Dioxide

NO_2 is a by-product of fuel combustion, with the primary source being motor vehicles and industrial boilers and furnaces. The principal form of nitrogen oxide produced by fuel combustion is NO, but NO reacts rapidly to form NO_2, creating

the mixture of NO and NO_2 commonly referred to as NO_x. NO_2 is an acute irritant. A relationship between NO_2 and chronic pulmonary fibrosis may exist, and an increase in bronchitis in young children at concentrations below 0.3 ppm may occur. NO_2 absorbs blue light and causes a reddish brown cast to the atmosphere and reduced visibility. It can also contribute to the formation of particulate matter no more than 10 microns in diameter (PM_{10}) and acid rain. Los Angeles County recorded NO_2 peaks of up to 115.5 parts per billion (ppb) in 2017 (CARB 2018). Similar to CO emissions, NO concentrations are likely to be highest in areas with high traffic volumes such as Highway 138, Highway 14, the Sierra Highway, Highway 22, Fifth Street West, 50th Street East, East Avenue, Palmdale Boulevard, and Rancho Vista Boulevard.

Suspended Particulates

PM_{10} is small particulate matter measuring no more than 10 microns in diameter, while $PM_{2.5}$ is fine particulate matter measuring no more than 2.5 microns in diameter. Suspended particulates are mostly dust particles, nitrates, and sulfates. They are a by-product of fuel combustion and wind erosion of soil and unpaved roads, and are directly emitted into the atmosphere through these processes. Suspended particulates are also created in the atmosphere through chemical reactions. The characteristics, sources, and potential health effects associated with the small particulates (those between 2.5 and 10 microns in diameter) and fine particulates ($PM_{2.5}$) can be very different. The small particulates generally come from windblown dust and dust kicked up from mobile sources. The fine particulates are generally associated with combustion processes as well as being formed in the atmosphere as a secondary pollutant through chemical reactions. Fine particulate matter is more likely to penetrate deep into the lungs and poses a serious health threat to all groups, but particularly to the elderly, children, and those with respiratory problems. More than half of the small and fine particulate matter that is inhaled into the lungs remains there, which can cause permanent lung damage. These materials can damage health by interfering with the body's mechanisms for clearing the respiratory tract or by acting as carriers of an absorbed toxic substance. Los Angeles County recorded $PM_{2.5}$ peaks up to 109.6 micrograms per cubic meter ($\mu g/m^3$) and PM_{10} peaks up to 82.4 $\mu g/m^3$, and the MDAB recorded $PM_{2.5}$ peaks up to 29.3 micrograms per cubic meter ($\mu g/m^3$) and PM_{10} peaks up to 262.3 $\mu g/m^3$ in 2017 (CARB 2018). High concentrations of particulate matter in the City of Palmdale are most likely to occur in the vicinity of agricultural land in the northeastern section of the City. Unpaved roads are also scattered throughout the City, typically towards the City boundaries, and are likely to contribute to overall suspended particulate emissions.

Lead

Lead (Pb) is a metal found naturally in the environment, as well as in manufacturing products. The major sources of Pb emissions historically have been mobile and industrial sources. However, as a result of the USEPA's regulatory efforts to remove lead from gasoline, atmospheric lead concentrations have declined substantially over the past several decades. As a result of phasing out leaded gasoline, metal processing currently is the primary source of lead emissions. The highest level of lead in the air is generally found near lead

smelters. Other stationary sources include waste incinerators, utilities, and lead-acid battery manufacturers. California has an ambient air quality standard of 1.5 µg/m^3 of lead on average over a 30-day period. AVAQMD was in attainment for the lead State and National Ambient Air Quality Standards in 2017 and 2018 (CARB 2018).

Toxic Air Contaminants

The California Health and Safety Code defines a TAC as "an air pollutant which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health." The majority of the estimated health risks from TACs can be attributed to relatively few compounds, the most important being particulate matter from diesel-fueled engines. According to CARB, diesel engine emissions are believed to be responsible for about 70 percent of California's estimated known cancer risk attributable to toxic air contaminants and comprise about eight percent of outdoor $PM_{2.5}$ (CARB 2016). Diesel trucks are most common along the City's major roadways, such as Highway 138, Highway 14, the Sierra Highway, and Highway 22. The level of TACs in the Mojave region is lower than the surrounding Los Angeles County. Los Angeles County recorded $PM_{2.5}$ peaks up to 109.6 µg/m^3 while the MDAB recorded peaks up to 29.3 µg/m^3.

Sulfur Dioxide

Sulfur dioxide (SO_2) is a colorless, pungent, irritating gas formed primarily by the combustion of sulfur-containing fossil fuels. In humid atmospheres, SO_2 can form sulfur trioxide and sulfuric acid mist, with some of the latter eventually reacting to produce sulfate particulates, which can inhibit visibility. Fuel combustion is the major source, while chemical plants, sulfur recovery plants, and metal processing are minor contributors. There are no chemical or sulfur processing facilities in Palmdale. There are two companies that process metals on site via welding and metal fabrication; American Welding, Inc. and Vista Industries. At sufficiently high concentrations, sulfur dioxide irritates the upper respiratory tract. Even at lower concentrations, when in conjunction with particulates, SO_2 may do even greater harm by injuring lung tissues (USEPA 2018). Sulfur oxides, in combination with moisture and oxygen, can yellow leaves on plants, dissolve marble, and eat away iron and steel. California has an ambient air quality standard of 0.25 ppm of SO_2 on a 1-hour average and 0.04 ppm on a 24-hour average. AVAQMD was in attainment for the SO_2 State and National Ambient Air Quality Standards in 2017 and 2018 (CARB 2018).

Existing Ambient Air Quality

As mentioned above, the USEPA and CARB have established ambient air quality standards for major pollutants, including O_3, CO, NO_2, SO_2, Pb, PM_{10}, and $PM_{2.5}$. Standards have been set at levels intended to be protective of public health. California standards are more restrictive than federal standards for each of these pollutants except for lead and the eight-hour average for CO.

Local air districts and CARB monitor ambient air quality to ensure that air quality standards are met and, if they are not met, to also develop strategies to meet the

standards. Air quality monitoring stations measure pollutant ground-level concentrations (typically, ten feet above ground level). Depending on whether the standards are met or exceeded, the local air basin is classified as in "attainment" or "non-attainment." Some areas are unclassified, which means no monitoring data are available but the area is considered to be in attainment. Table 12.1 summarizes the California Ambient Air Quality Standards (CAAQS) and the National Ambient Air Quality Standards (NAAQS) for each criteria pollutant as well as the attainment status of the MDAB. As shown in the table, the MDAB is in non-attainment for the State standard for ozone and PM_{10}.

Table 12.1 Ambient Air Quality Standards and Basin Attainment Status

Pollutant	Averaging Time	California Standards			Federal Standards		
		Concentration	Attainment Status	Days in Exceedance	Concentration	Attainment Status	Days in Exceedance
Ozone	1-Hour 8-Hour	0.125 ppm 0.104 ppm	**N** **N**	5 48	n/a 0.104 ppm	n/a **N**	n/a 48
Carbon Monoxide	1-Hour 8-Hour	1.2 ppm 1.0 ppm	A A	0 0	1.2 ppm 1.0 ppm	U/A U/A	0 0
Nitrogen Dioxide	1-Hour Annual	47.6 ppb 47.6 ppb	A A	0 0	47.6 ppb 47.6 ppb	U/A U/A	0 0
Sulfur Dioxide	Annual 24-Hour 3-Hour 1-Hour	n/a * n/a 9.9 ppb	n/a A n/a A	n/a * n/a 0	* * 0.006 ppm 0.0099 ppm	U/A U/A U/A U/A	* * 0 0
PM_{10}	Annual 24-Hour	* 89.3 µg/m^3	**N** **N**	* *	n/a 89.3 µg/m^3	n/a U/A	n/a 0
$PM_{2.5}$	Annual 24-Hour	11.9 µg/m^3 n/a	A n/a	0 n/a	11.9 µg/m^3 40.4 µg/m^3	U/A U/A	0 1
Lead	30-Day Quarter Rolling 3-Month	* n/a n/a	A n/a n/a	* n/a n/a	n/a * *	n/a U/A U/A	n/a * *

Note: Data for ozone, NO_2 (1-Hour), PM_{10} (24-Hour), and $PM_{2.5}$ (24-Hour) from the CARB Lancaster-43301 Division Street monitoring station (2018). Data for CO and NO_2 (Annual) from the USEPA Lancaster-43301 Division Street monitoring station (2018). Data for SO_2 (3-Hour and

1-Hour) from the USEPA Victorville-Park Avenue monitoring station (2018). Data for $PM_{2.5}$ (Annual) from the USEPA Lancaster-43301 Division Street monitoring station (2013).

ppm = parts per million
ppb = parts per billion
µg/m³ = micrograms per cubic meter
n/a = not applicable
A = "Attainment"
N = "Non-attainment"
U = "Unclassified"
* = data not available

Sources: CARB 2019, https://www.arb.ca.gov/adam/topfour/topfour1.php; USEPA 2019, https://www.epa.gov/outdoor-air-quality-data/interactive-map-air-quality-monitors; AVAQMD 2017, https://avaqmd.ca.gov/files/e0986ab83/AVAQMD+2017+Attainment+Status+Table.pdf

CARB provides emissions estimates from various sources, including stationary, areawide, and mobile. According to the inventory, mobile sources are the largest contributor to annual CO and NO_x emissions. Areawide emissions tend to be released from smaller operations and therefore are commonly found and not location specific. Examples of areawide emissions include the use of consumer products, fireplaces, road dust, and farming operations. Stationary source emissions are attributed to large operations emitted at one concentrated location. Examples of stationary sources include pollutants generated by industrial and manufacturing activities. Examples of mobile sources include cars, buses, trucks, ships, trains, aircraft and various other vehicles. Table 12.2 shows CARB's 2012 estimated annual average emissions per sector.

Table 12.2 Estimated Annual Average Emissions for MDAB (2012)

Source	TOG	ROG	CO	NOx	SOx	PM	NH_3
Stationary	69.4	16.1	23.5	60.3	10.1	146.7	2.1
Areawide	49.2	15.0	24.5	2.1	0.1	121.4	15.8
Mobile	39.3	35.5	230.3	113.6	0.8	9.0	1.7
Total for MDAB	158.0	66.6	278.4	176.1	10.9	277.1	19.6

All emissions are represented in tons/day.

Policy Guidance

Air Quality Management Plan

As the local air quality management agency, the Antelope Valley Air Quality Management District (AVAQMD) is required to monitor air pollutant levels to ensure that state and federal air quality standards are met and, if they are not met, to develop strategies to meet the standards (AVAQMD 2008). In the Los Angeles County portion of the MDAB, the AVAQMD is required to prepare a plan for improvement for the air pollutants for which the MDAB is in non-attainment. The AVAQMD has developed the following federal and State attainment planning documents (CARB 2015).

2015 8-Hour Reasonably Available Control Technology State Implementation Plan (SIP) Analysis (RACT SIP Analysis)

The Federal Clean Air Act (FCAA) requires areas with a non-attainment designation for ozone to implement Reasonably Available Technology (RACT) on sources, specifically those which are major sources of ozone precursors. The 2015 RACT SIP Analysis includes methods for evaluation and interpretation of results related to RACT implementation.

2014 Updates to the 1997 8-Hour Ozone Standards SIPs: Coachella Valley and Western Mojave Desert 8-Hour Ozone Nonattainment Areas

The 2014 update applied to the 1997 8-Hour Ozone Standards SIPs included revised emissions inventories, attainment demonstrations, reasonable further progress demonstration based on USEPA guidance, transportation conformity budgets, and vehicle miles traveled offset demonstrations. The updates also supported the 2007 Coachella Valley 8-Hour Ozone Plan and the 2008 Western Mojave Desert 8-Hour Ozone Plan. The portion of the AVAQMD designated as a Federal 8-hour ozone nonattainment area will be in attainment of the 75 ppb ozone NAAQS by July 2027.

2008 Ozone Early Progress Plans

The 2008 Ozone Early Progress Plan shows progress toward attainment status for the Federal 8-Hour standard for ozone. The Plans contained an emissions inventory for Ventura County, Antelope Valley – Western Mojave Desert, Coachella Valley, Eastern Kern County, and Imperial County demonstrating progress towards attainment.

2007 Western Mojave Desert Ozone Attainment Plan (includes the Antelope Valley Attainment Plan)

The Western Mojave Desert Ozone Attainment Plan acts as a revision to California's SIP by outlining a method for attaining the federal 8-hour ozone standards in the ozone non-attainment area. The Plan references the AVAQMD attainment demonstration plan which includes transportation conformity budgets and Reasonable Further Progress (RFP) plans for the entirety of the nonattainment area in the Western Mojave Desert.

2004 Antelope Valley Ozone Attainment Plan

The 2004 Ozone Attainment Plan includes estimates related to population, vehicle activity, and industrial activity. The Plan outlines forecasts for ozone precursor-producing activities through 2007.

Additionally, through the attainment planning process, the AVAQMD has developed the Rules and Regulations regarding dust, architectural coatings, and Volatile Organic Compound (VOC) emissions to regulate sources of air pollution in the Los Angeles County portion of the MDAB.

References

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