4. Air Quality

This chapter describes the existing regulatory framework and existing conditions for air quality in Livermore. This chapter uses the term "Livermore" to cover the City of Livermore together with the immediately surrounding area within the Urban Growth Boundary (UGB) and Sphere of Influence (SOI). See the Introduction for more information on these boundaries.

4.1 AIR POLLUTANTS OF CONCERN

4.1.1 CRITERIA AIR POLLUTANTS

Pollutants emitted into the ambient air by stationary and mobile sources are regulated by the federal ("National") Clean Air Act and California Clean Air Act. The pollutants emitted into the ambient air by stationary and mobile sources are categorized as primary and/or secondary pollutants. Primary air pollutants are emitted directly from sources. Carbon monoxide (CO); reactive organic gases (ROG), also known as volatile organic compounds (VOC); nitrogen oxides (NO_x); sulfur dioxide (SO_2); coarse inhalable particulate matter (PM_{10}); fine inhalable particulate matter ($PM_{2.5}$); and lead (Pb) are primary air pollutants. Of these, CO, SO_2, nitrogen dioxide (NO_2), PM_{10}, and $PM_{2.5}$ are "criteria air pollutants," which means that ambient air quality standards (AAQS) have been established for them. ROG and NO_X are criteria pollutant precursors that form secondary criteria air pollutants through chemical and photochemical reactions in the atmosphere. Ozone (O_3) and NO_2 are the principal secondary pollutants.

A description of each of the primary and secondary criteria air pollutants and their known health effects is presented below.

Carbon Monoxide (CO) is a colorless, odorless gas produced by incomplete combustion of carbon substances, such as gasoline or diesel fuel. CO is a primary criteria air pollutant. CO concentrations tend to be the highest during winter mornings with little to no wind, when surface-based inversions trap the pollutant at ground levels. The highest ambient CO concentrations are generally found near traffic-congested corridors and intersections. When inhaled at high concentrations, CO combines with hemoglobin in the blood and reduces its oxygen-carrying capacity. This results in reduced oxygen reaching the brain, heart, and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease, or anemia, as well as for fetuses. Even healthy people exposed to high CO concentrations can experience headaches, dizziness, fatigue, unconsciousness, and even death. [1]

Volatile Organic Compounds (VOC) are compounds composed primarily of hydrogen and carbon atoms. Internal combustion associated with motor vehicle usage is the major source of ROGs. Other sources of ROGs include evaporative emissions from paints and solvents, the application of asphalt paving, and the

[1] Bay Area Air Quality Management District, 2017, Revised California Environmental Quality Act Air Quality Guidelines.

use of household consumer products such as aerosols. Adverse effects on human health are not caused directly by ROGs, but rather by reactions of ROGs to form secondary pollutants such as O_3. There are no AAQS established for ROGs.

Nitrogen Oxides (NO_x) are a by-product of fuel combustion and contribute to the formation of O_3, PM_{10}, and $PM_{2.5}$. The two major components of NO_x are nitric oxide (NO) and NO_2. The principal component of NO_x produced by combustion is NO, but NO reacts with oxygen to form NO_2, creating the mixture of NO and NO_2, commonly called NO_X. NO_2 absorbs blue light; the result is a brownish-red cast to the atmosphere and reduced visibility. NO is a colorless, odorless gas formed from atmospheric nitrogen and oxygen when combustion takes place under high temperature and/or high pressure.[2] NO_2 acts as an acute irritant and in equal concentrations is more injurious than NO. At atmospheric concentrations, however, NO_2 is only potentially irritating. There is some indication of a relationship between NO_2 and chronic pulmonary fibrosis. Some increase in bronchitis in children (2 and 3 years old) has also been observed at concentrations below 0.3 parts per million (ppm). [3]

Sulfur Dioxide (SO_2) is a colorless, pungent, irritating gas formed by the combustion of sulfurous fossil fuels. It enters the atmosphere as a result of burning high-sulfur-content fuel oils and coal and from chemical processes at chemical plants and refineries. Gasoline and natural gas have very low sulfur content and do not release significant quantities of SO_2. When SO_2 forms sulfates (SO_4) in the atmosphere, together these pollutants are referred to as sulfur oxides (SO_x). Thus, SO_2 is both a primary and secondary criteria air pollutant. At sufficiently high concentrations, SO_2 may irritate the upper respiratory tract. At lower concentrations and when combined with particulates, SO_2 may do greater harm by injuring lung tissue. [4]

Suspended Particulate Matter (PM_{10} and $PM_{2.5}$) consists of finely divided solids or liquids such as soot, dust, aerosols, fumes, and mists. In the San Francisco Bay Area Air Basin (SFBAAB or Air Basin), most particulate matter is caused by combustion, factories, construction, grading, demolition, agricultural activities, and motor vehicles. Two forms of fine particulates are now recognized and regulated. Inhalable coarse particles, or PM_{10}, include the particulate matter with an aerodynamic diameter of 10 microns (i.e., 10 millionths of a meter or 0.0004 inch) or less. Inhalable fine particles, or $PM_{2.5}$, have an aerodynamic diameter of 2.5 microns or less (i.e., 2.5 millionths of a meter or 0.0001 inch). Diesel particulate matter (DPM) is also classified as a carcinogen. Extended exposure to particulate matter can increase the risk of chronic respiratory disease. PM_{10} bypasses the body's natural filtration system more easily than larger particles and can lodge deep in the lungs. The United States Environmental Protection Agency (USEPA) scientific review concluded that $PM_{2.5}$ penetrates even more deeply into the lungs, and this is more likely to contribute to health effects—at concentrations well below current PM_{10} standards. These health effects include premature death in people with heart or lung disease, nonfatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function, and increased respiratory symptoms (e.g., irritation of the airways, coughing, or difficulty breathing). Motor vehicles are currently responsible for about half of particulates in the SFBAAB. Wood burning in fireplaces and stoves is another large source of fine particulates. [5]

[2] Bay Area Air Quality Management District, 2017, Revised California Environmental Quality Act Air Quality Guidelines.
[3] Bay Area Air Quality Management District, 2017, Revised California Environmental Quality Act Air Quality Guidelines.
[4] Bay Area Air Quality Management District, 2017, Revised California Environmental Quality Act Air Quality Guidelines.
[5] Bay Area Air Quality Management District, 2017, Revised California Environmental Quality Act Air Quality Guidelines.

Ozone (O_3) is commonly referred to as "smog" and is a gas that is formed when ROGs and NO_x, both by-products of internal combustion engine exhaust, undergo photochemical reactions in the presence of sunlight. O_3 is a secondary criteria air pollutant. O_3 concentrations are generally highest during the summer months when direct sunlight, light winds, and warm temperatures create favorable conditions to the formation of this pollutant. O_3 poses a health threat to those who already suffer from respiratory diseases as well as to healthy people. O_3 levels usually build up during the day and peak in the afternoon hours. Short-term exposure can irritate the eyes and cause constriction of the airways. Besides causing shortness of breath, it can aggravate existing respiratory diseases, such as asthma, bronchitis, and emphysema. Chronic exposure to high ozone levels can permanently damage lung tissue. O_3 can also damage plants and trees and materials such as rubber and fabrics.[6]

Lead (Pb) is a metal found naturally in the environment as well as in manufactured products. The major sources of lead emissions have historically been mobile and industrial sources. As a result of the phasing out of leaded gasoline, metal processing is currently the primary source of lead emissions. The highest levels of lead in air are generally found near lead smelters. Other stationary sources are waste incinerators, utilities, and lead-acid battery manufacturers. Because emissions of lead are found only in projects that are permitted by the Bay Area Air Quality Management District (BAAQMD or Air District), lead is not an air quality pollutant of concern for the General Plan.

Table 4-1 summarizes the potential health effects associated with the criteria air pollutants.

TABLE 4-1 CRITERIA AIR POLLUTANT HEALTH EFFECTS SUMMARY

Pollutant	Health Effects	Examples of Sources
Carbon Monoxide (CO)	▪ Chest pain in heart patients ▪ Headaches, nausea ▪ Reduced mental alertness ▪ Death at very high levels	▪ Any source that burns fuel such as cars, trucks, construction and farming equipment, and residential heaters and stoves
Ozone (O_3)	▪ Cough, chest tightness ▪ Difficulty taking a deep breath ▪ Worsened asthma symptoms ▪ Lung inflammation	▪ Atmospheric reaction of organic gases with nitrogen oxides in sunlight
Nitrogen Dioxide (NO_2)	▪ Increased response to allergens ▪ Aggravation of respiratory illness	▪ Same as carbon monoxide sources
Particulate Matter (PM_{10} & $PM_{2.5}$)	▪ Hospitalizations for worsened heart diseases ▪ Emergency room visits for asthma ▪ Premature death	▪ Cars and trucks (particularly diesels) ▪ Fireplaces and woodstoves ▪ Windblown dust from overlays, agriculture, and construction
Sulfur Dioxide (SO_2)	▪ Aggravation of respiratory disease (e.g., asthma and emphysema) ▪ Reduced lung function	▪ Combustion of sulfur-containing fossil fuels, smelting of sulfur-bearing metal ores, and industrial processes
Lead (Pb)	▪ Behavioral and learning disabilities in children ▪ Nervous system impairment	▪ Contaminated soil

Sources: California Air Resources Board, 2009, December 2. *ARB Fact Sheet: Air Pollution and Health*; South Coast Air Quality Management District. 2005, May. *Guidance Document for Addressing Air Quality Issues in General Plans and Local Planning*. http://www.aqmd.gov/docs/default-source/planning/air-quality-guidance/complete-guidance-document.pdf, accessed on August 27, 2021.

[6] Bay Area Air Quality Management District, 2017. Revised California Environmental Quality Act Air Quality Guidelines.

4.1.2 TOXIC AIR CONTAMINANTS

The California Health and Safety Code defines a toxic air contaminant (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." A substance that is listed as a hazardous air pollutant pursuant to Section 112(b) of the federal Clean Air Act (42 US Code Section 7412[b]) is a TAC. People exposed to toxic air pollutants at sufficient concentrations and durations may have an increased chance of getting cancer or experiencing other serious health effects. These health effects can include damage to the immune system, as well as neurological, reproductive (e.g., reduced fertility), developmental, respiratory, and other health problems.[7] The California Air Resources Board (CARB) has implemented control measures for a number of compounds that pose high risks and show potential for effective control measures. The majority of the estimated health risks from TACs can be attributed to relatively few compounds. The most important compounds are particulate matter from diesel-fueled engines.

4.1.2.1 DIESEL PARTICULATE MATTER

In 1998, CARB identified DPM as a TAC. Previously, the individual chemical compounds in diesel exhaust were considered TACs. Almost all diesel exhaust particles are 10 microns or less in diameter. Because of their extremely small size, these particles can be inhaled and eventually trapped in the bronchial and alveolar regions of the lungs. According to the BAAQMD, PM emitted from diesel engines contributes to more than 85 percent of the cancer risk within the SFBAAB. Cancer risk from TACs is highest near major DPM sources.[8]

4.2 REGULATORY FRAMEWORK

Federal, state, and local air districts have passed laws and regulations intended to control and enhance air quality. Land use in Livermore is subject to the rules and regulations of the USEPA, CARB, the California Environmental Protection Agency (CalEPA), and the BAAQMD. Federal, state, regional, and local laws, regulations, plans, or guidelines that are potentially applicable to the General Plan are summarized herein.

4.2.1 FEDERAL AND STATE REGULATIONS

AAQS have been adopted at federal and state levels for criteria air pollutants. In addition, both the federal and state governments regulate the release of TACs. The General Plan is in the SFBAAB and is subject to the rules and regulations imposed by the Air District, the National AAQS adopted by the USEPA, and the California AAQS adopted by the CARB. Federal, state, regional, and local laws, regulations, plans, and guidelines that are potentially applicable to the General Plan are summarized herein.

[7] United States Environmental Protection Agency, 2019, *Health and Environmental Effects of Hazardous Air Pollutants*, https://www.epa.gov/haps/health-and-environmental-effects-hazardous-air-pollutants.

[8] Bay Area Air Quality Management District, 2014, *Improving Air Quality & Health in Bay Area Communities, Community Air Risk Evaluation Program Retrospective & Path Forward (2004 to 2013).*

4.2.1.1 AMBIENT AIR QUALITY STANDARDS FOR CRITERIA AIR POLLUTANTS

The Clean Air Act (CAA) was passed in 1963 by the United States Congress and has been amended several times. The 1970 CAA amendments strengthened previous legislation and laid the foundation for the regulatory scheme of the 1970s and 1980s. In 1977, Congress again added several provisions, including nonattainment requirements for areas not meeting National AAQS and the Prevention of Significant Deterioration program. The 1990 amendments represent the latest in a series of federal efforts to regulate the protection of air quality in the United States. The CAA allows states to adopt more stringent standards or to include other pollutants. The California Clean Air Act (CCAA), signed into law in 1988, requires all areas of the state to achieve and maintain the California AAQS by the earliest practical date. The California AAQS tend to be more restrictive than the National AAQS, based on even greater health and welfare concerns.

These National AAQS and California AAQS are the levels of air quality considered to provide a margin of safety in the protection of the public health and welfare. They are designed to protect "sensitive receptors" most susceptible to further respiratory distress, such as asthmatics, the elderly, very young children, people already weakened by other disease or illness, and persons engaged in strenuous work or exercise. Healthy adults can tolerate occasional exposure to air pollutant concentrations considerably above these minimum standards before adverse effects are observed.

Both California and the federal government have established health-based AAQS for seven air pollutants. As shown in Table 4-2, these pollutants include ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), coarse inhalable particulate matter (PM_{10}), fine inhalable particulate matter ($PM_{2.5}$), and lead (Pb). In addition, the state has set standards for sulfates, hydrogen sulfide, vinyl chloride, and visibility-reducing particles. These standards are designed to protect the health and welfare of the populace with a reasonable margin of safety.

TABLE 4-2 AMBIENT AIR QUALITY STANDARDS FOR CRITERIA POLLUTANTS

Pollutant	Averaging Time	California Standard [a]	Federal Primary Standard [b]	Major Pollutant Sources
Ozone (O_3) [c]	1 hour	0.09 ppm	*	Motor vehicles, paints, coatings, and solvents.
	8 hours	0.070 ppm	0.070 ppm	
Carbon Monoxide (CO)	1 hour	20 ppm	35 ppm	Internal combustion engines, primarily gasoline-powered motor vehicles.
	8 hours	9.0 ppm	9 ppm	
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.030 ppm	0.053 ppm	Motor vehicles, petroleum-refining operations, industrial sources, aircraft, ships, and railroads.
	1 hour	0.18 ppm	0.100 ppm	
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	*	0.030 ppm	Fuel combustion, chemical plants, sulfur recovery plants, and metal processing.
	1 hour	0.25 ppm	0.075 ppm	
	24 hours	0.04 ppm	0.14 ppm	
Respirable Coarse Particulate Matter (PM_{10})	Annual Arithmetic Mean	20 µg/m^3	*	Dust and fume-producing construction, industrial, and agricultural operations, combustion, atmospheric photochemical reactions, and natural activities (e.g., wind-raised dust and ocean sprays).
	24 hours	50 µg/m^3	150 µg/m^3	
Respirable Fine Particulate Matter ($PM_{2.5}$) [d]	Annual Arithmetic Mean	12 µg/m^3	12 µg/m^3	Dust and fume-producing construction, industrial, and agricultural operations, combustion, atmospheric photochemical reactions, and natural activities (e.g., wind-raised dust and ocean sprays).
	24 hours	*	35 µg/m^3	
Lead (Pb)	30-Day Average	1.5 µg/m^3	*	Present source: lead smelters, battery manufacturing & recycling facilities. Past source: combustion of leaded gasoline.
	Calendar Quarter	*	1.5 µg/m^3	
	Rolling 3-Month Average	*	0.15 µg/m^3	
Sulfates (SO_4) [e]	24 hours	25 µg/m^3	*	Industrial processes.
Visibility Reducing Particles	8 hours	ExCo =0.23/km visibility of 10≥ miles	No Federal Standard	Visibility-reducing particles consist of suspended particulate matter, which is a complex mixture of tiny particles that consists of dry solid fragments, solid cores with liquid coatings, and small droplets of liquid. These particles vary greatly in shape, size and chemical composition, and can be made up of many different materials such as metals, soot, soil, dust, and salt.

TABLE 4-2 AMBIENT AIR QUALITY STANDARDS FOR CRITERIA POLLUTANTS

Pollutant	Averaging Time	California Standard [a]	Federal Primary Standard [b]	Major Pollutant Sources
Hydrogen Sulfide	1 hour	0.03 ppm	No Federal Standard	Hydrogen sulfide (H2S) is a colorless gas with the odor of rotten eggs. It is formed during bacterial decomposition of sulfur-containing organic substances. Also, it can be present in sewer gas and some natural gas, and can be emitted as the result of geothermal energy exploitation.
Vinyl Chloride	24 hours	0.01 ppm	No Federal Standard	Vinyl chloride (chloroethene), a chlorinated hydrocarbon, is a colorless gas with a mild, sweet odor. Most vinyl chloride is used to make polyvinyl chloride (PVC) plastic and vinyl products. Vinyl chloride has been detected near landfills, sewage plants, and hazardous waste sites, due to microbial breakdown of chlorinated solvents.

Source: California Air Resources Board, 2016, *Ambient Air Quality Standards*, https://ww2.arb.ca.gov/sites/default/files/2020-07/aaqs2.pdf, accessed August 27, 2021.

Notes: ppm: parts per million; µg/m3; micrograms per cubic meter; *Standard has not been established for this pollutant/duration by this entity.

a. California standards for O_3, CO (except 8-hour Lake Tahoe), SO_2 (1 and 24 hour), NO_2, and particulate matter (PM_{10}, $PM_{2.5}$, 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.
b. National standards (other than O3, PM, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The O3 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 µg/m3 is equal to or less than one. For $PM_{2.5}$, 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.
c. On October 1, 2015, the national 8-hour ozone primary and secondary standards were lowered from 0.075 to 0.070 ppm.
d. On December 14, 2012, the national annual PM2.5 primary standard was lowered from 15 µg/m3 to 12.0 µg/m3. The existing national 24-hour PM2.5 standards (primary and secondary) were retained at 35 µg/m3, as was the annual secondary standard of 15 µg/m3. The existing 24-hour PM10 standards (primary and secondary) of 150 µg/m3 also were retained. The form of the annual primary and secondary standards is the annual mean, averaged over 3 years.
e. On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. 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.

California has also adopted a host of other regulations that reduce criteria pollutant emissions, including:

- Assembly Bill (AB) 1493: Pavley Fuel Efficiency Standards
- Heavy-Duty (Tractor-Trailer) GHG Regulation
- Senate Bill (SB) 1078 and SB 107: Renewable Portfolio Standards
- Title 13 California Code of Regulations (CCR), Article 3.1 Advanced Clean Truck Regulation
- Title 20 CCR: Appliance Energy Efficiency Standards
- Title 24, Part 6, CCR: Building and Energy Efficiency Standards
- Title 24, Part 11, CCR: Green Building Standards Code

4.2.1.2 TANNER AIR TOXICS ACT AND AIR TOXICS "HOT SPOT" INFORMATION AND ASSESSMENT ACT

Public exposure to TACs is a significant environmental health issue in California. In 1983, the California Legislature enacted a program to identify the health effects of TACs and reduce exposure to these contaminants to protect public health. A substance that is listed as a hazardous air pollutant pursuant to Section 112(b) of the federal CAA (42 US Code Section 7412[b]) is a TAC. Under state law, CalEPA, acting through CARB, is authorized to identify a substance as a TAC if it is an air pollutant that may cause or contribute to an increase in mortality or serious illness, or may pose a present or potential hazard to human health.

California regulates TACs primarily through AB 1807 (Tanner Air Toxics Act) and AB 2588 (Air Toxics "Hot Spot" Information and Assessment Act of 1987). The Tanner Air Toxics Act sets up a formal procedure for CARB to designate substances as TACs. Once a TAC is identified, CARB adopts an "airborne toxics control measure" for sources that emit designated TACs. If there is a safe threshold for a substance (i.e., a point below which there is no toxic effect), the control measure must reduce exposure to below that threshold. If there is no safe threshold, the measure must incorporate toxics best available control technology to minimize emissions. To date, CARB has established formal control measures for 11 TACs that are identified as having no safe threshold.

Under AB 2588, TAC emissions from individual facilities are quantified and prioritized by the air quality management district or air pollution control district. High-priority facilities are required to perform a health risk assessment, and if specific thresholds are exceeded, are required to communicate the results to the public through notices and public meetings.

CARB has promulgated the following specific rules to limit TAC emissions:

- 13 CCR Chapter 10, Section 2485, Airborne Toxic Control Measure to Limit Diesel-Fueled Commercial Motor Vehicle Idling
- 13 CCR Chapter 10, Section 2480, Airborne Toxic Control Measure to Limit School Bus Idling and Idling at Schools
- 13 CCR Section 2477 and Article 8, Airborne Toxic Control Measure for In-Use Diesel-Fueled Transport Refrigeration Units (TRU) and TRU Generator Sets and Facilities Where TRUs Operate

4.2.2 REGIONAL REGULATIONS

4.2.2.1 BAAQMD: AIR QUALITY MANAGEMENT PLANNING

The BAAQMD (or Air District) is the agency responsible for assuring that the National and California AAQS are attained and maintained in the Air Basin. Air quality conditions in the Air Basin have improved significantly since the Air District was created in 1955. The Air District prepares air quality management plans (AQMPs) to attain ambient air quality standards in the Air Basin. The Air District prepares ozone attainment plans for the National O_3 standard and clean air plans for the California O_3 standard. These air quality management plans are prepared in coordination with Association of Bay Area Governments (ABAG)

and the Metropolitan Transportation Commission (MTC). The Air District adopted the 2017 Clean Air Plan, Spare the Air, Cool the Climate (2017 Clean Air Plan) on April 19, 2017, making it the most recent adopted comprehensive plan. The 2017 Clean Air Plan incorporates significant new scientific data, primarily in the form of updated emissions inventories, ambient measurements, new meteorological episodes, and new air quality modeling tools.

2017 Spare the Air, Cool the Climate: A Blueprint for the Clean Air and Climate Protection in the Bay Area

The Air District adopted the 2017 *Clean Air Plan, Spare the Air, Cool the Climate* (2017 Clean Air Plan) on April 19, 2017, making it the most recently adopted comprehensive plan. The 2017 Clean Air Plan incorporates significant new scientific data, primarily in the form of updated emissions inventories, ambient measurements, new meteorological episodes, and new air quality modeling tools.

The 2017 Clean Air Plan serves as an update to the adopted Bay Area 2010 Clean Air Plan and continues in providing the framework for SFBAAB to achieve attainment of the California and National AAQS. The 2017 Clean Air Plan updates the Bay Area's ozone plan, which is based on the "all feasible measures" approach to meet the requirements of the California Clean Air Act. Additionally, it set a goal of reducing health risk impacts to local communities by 20 percent by 2020. Furthermore, the 2017 Clean Air Plan also lays the groundwork for reducing greenhouse gas (GHG) emissions in the Bay Area to meet the state's 2030 GHG reduction target and 2050 GHG reduction goal. It also includes a vision for the Bay Area in a post-carbon year 2050 that encompasses the following: [9]:

- Construct buildings that are energy efficient and powered by renewable energy.
- Walk, bicycle, and use public transit for the majority of trips and use electric-powered autonomous public transit fleets.
- Incubate and produce clean energy technologies.
- Live a low-carbon lifestyle by purchasing low-carbon foods and goods in addition to recycling and putting organic waste to productive use.

A comprehensive multipollutant control strategy has been developed to be implemented in the next three to five years to address public health and climate change and to set a pathway to achieve the 2050 vision. The control strategy includes 85 control measures to reduce emissions of ozone, particulate matter, TACs, and GHG from a full range of emission sources. These control measures cover the following sectors: (1) stationary (industrial) sources, (2) transportation, (3) energy, (4) agriculture, (5) natural and working lands, (6) waste management, (7) water, and (8) super-GHG pollutants. Overall, the proposed control strategy is based on the following key priorities:

[9] Bay Area Air Quality Management District. 2017, April 19. *Final 2017 Clean Air Plan, Spare the Air, Cool the Climate: A Blueprint for Clean Air and Climate Protection in the Bay Area*. http://www.baaqmd.gov/plans-and-climate/air-quality-plans/plans-under-development.

- Reduce emissions of criteria air pollutants and TACs from all key sources.
- Reduce emissions of "super-GHGs," such as methane, black carbon, and fluorinated gases.
- Decrease demand for fossil fuels (gasoline, diesel, and natural gas).
- Increase efficiency of the energy and transportation systems.
- Reduce demand for vehicle travel, and high-carbon goods and services.
- Decarbonize the energy system.
- Make the electricity supply carbon-free.
- Electrify the transportation and building sectors.

Air District Community Air Risk Evaluation Program

The Air District Community Air Risk Evaluation program was initiated in 2004 to evaluate and reduce health risks associated with exposure to outdoor TACs in the Bay Area, primarily DPM. Carcinogenic compounds from gasoline-powered cars and light-duty trucks were also identified as significant cancer risks: 1,3-butadiene contributed 4 percent of the cancer risk-weighted emissions and benzene contributed 3 percent. Collectively, five compounds—DPM, 1,3-butadiene, benzene, formaldehyde, and acetaldehyde—were found to be responsible for more than 90 percent of the cancer risk attributed to emissions. All of these compounds are associated with emissions from internal combustion engines. The most important sources of cancer risk-weighted emissions were combustion-related sources of DPM, including on-road mobile sources (31 percent), construction equipment (29 percent), and ships and harbor craft (13 percent). Overall, cancer risk from TAC dropped by more than 50 percent between 2005 and 2015, when emissions inputs accounted for state diesel regulations and other reductions.[10]

Modeled cancer risks from TAC in the Bay Area in 2005 were highest near sources of DPM: near core urban areas, along major roadways and freeways, and near maritime shipping terminals. Peak modeled risks were found to be located east of San Francisco, near West Oakland, and near the Maritime Port of Oakland. The Air District has identified seven impacted communities in the Bay Area; however, Livermore lies outside of these seven impacted communities.

The major contributor to acute and chronic non-cancer health effects in the Air Basin is acrolein (C_3H_4O). Major sources of acrolein are on-road mobile sources and aircraft near freeways and commercial and military airports.[11] Currently, CARB does not have certified emission factors or an analytical test method

[10] Bay Area Air Quality Management District, 2014, *Improving Air Quality & Health in Bay Area Communities, Community Air Risk Program Retrospective & Path Forward* (2004 – 2013), http://www.baaqmd.gov/~/media/Files/Planning%20and%20Research/CARE%20Program/Documents/CARE_Retrospective_April2014.ashx, accessed on March 12, 2019.

[11] Bay Area Air Quality Management District, 2006, *Community Air Risk Evaluation Program, Phase I Findings and Policy Recommendations Related to Toxic Air Contaminants in the San Francisco Bay Area*, http://www.baaqmd.gov/Divisions/Planning-and-Research/%20%20%20%20%20%20%20%20%20%20%20%20%20%20Planning-Programs-and-Initiatives/CARE-Program/~/media/54D434A0EB8348B78A71C4DE32831544.ashx, accessed on March 12, 2019.

for acrolein. Since the appropriate tools needed to implement and enforce acrolein emission limits are not available, the Air District does not conduct health risk screening analysis for acrolein emissions.[12]

Assembly Bill 617 Community Action Plans

AB 617 was signed into law in July 2017 to develop a new community-focused program to reduce exposure more effectively to air pollution and preserve public health in environmental justice communities. AB 617 directs CARB and all local air districts to take measures to protect communities disproportionally impacted by air pollution through monitoring and implementing air pollution control strategies.

On September 27, 2018, CARB approved BAAQMD's recommended communities for monitoring and emission-reduction planning. The State approved communities for year one of the program as well as communities that would move forward over the next five years. Bay Area recommendations included all the Community Air Risk Evaluation areas, areas with large sources of air pollution (refineries, seaports, airports, etc.), areas identified via statewide screening tools as having pollution and/or health burden vulnerability, and areas with low life expectancy.[13]

- Year 1 Communities:
  - *West Oakland.* The West Oakland community was selected for BAAQMD's first Community Action Plan. In 2017, cancer risk from sources in West Oakland (local sources) was 204 in a million. The primary sources of air pollution in West Oakland include heavy trucks and cars, port and rail sources, large industries, and to a lesser extent, other sources such as residential sources (i.e., wood burning). The majority (over 90 percent) of cancer risk is from DPM.[14]
  - *Richmond.* Richmond was selected for a community monitoring plan in year 1 of the AB 617 program. The Richmond area is in western Contra Costa County and includes most of the city of Richmond and portions of El Cerrito. It also includes communities just north and east of Richmond, such as San Pablo and several unincorporated communities, including North Richmond. The primary goals of the Richmond monitoring effort are to leverage historical and current monitoring studies, to better characterize the area's mix of sources, and to more fully understand the associated air quality and pollution impact. [15]

[12] Bay Area Air Quality Management District, 2010, *Air Toxics NSR Program, Health Risk Screening Analysis Guidelines*. http://www.baaqmd.gov/~/media/Files/Engineering/Air%20Toxics%20Programs/hrsa_guidelines.ashx, accessed on March 12, 2019.

[13] BAAQMD. 2019, April 16, *San Francisco Bay Area Community Health Protection Program*, https://www.baaqmd.gov/~/media/files/ab617-community-health/2019_0325_ab617onepager-pdf.pdf?la=en.

[14] BAAQMD. 2019, October 2, *West Oakland Community Action Plan*, https://www.baaqmd.gov/community-health/community-health-protection-program/west-oakland-community-action-plan.

[15] BAAQMD. 2019, April 16, *San Francisco Bay Area Community Health Protection Program*, https://www.baaqmd.gov/~/media/files/ab617-community-health/2019_0325_ab617onepager-pdf.pdf?la=en.

- Year 2 to 5 Communities: East Oakland/San Leandro, Eastern San Francisco, the Pittsburg-Bay Point area, San Jose, Tri-Valley, and Vallejo are slated for action in years 2 to 5 of the AB 617 program.[16]
    - *Tri-Valley.* BAAQMD determined that the Tri-Valley cities of Livermore, Pleasanton, Dublin, and San Ramon are impacted communities because both ozone and fine particulate matter (PM 2.5) levels exceed air quality standards. In March 2020, BAAQMD funded the Tri-Valley Air Quality Community Alliance (TVAQCA) to engage the Tri-Valley community and propose strategies for continued long-term improvement of local air quality.

4.2.2.2 BAAQMD RULES

In addition to the plans and programs described, the Air District administers several specific regulations on various sources of pollutant emissions that would apply to individual development projects, including:

- Regulation 7, Odorous Substances
- Regulation 2, Rule 2, New Source Review
- Regulation 2, Rule 5, New Source Review of Toxic Air Contaminants
- Regulation 6, Rule 1, General Requirements
- Regulation 6, Rule 2, Commercial Cooking Equipment
- Regulation 8, Rule 3, Architectural Coatings
- Regulation 8, Rule 4, General Solvent and Surface Coatings Operations
- Regulation 8, Rule 7, Gasoline Dispensing Facilities
- Regulation 11, Rule 2, Asbestos, Demolition, Renovation and Manufacturing

4.2.2.3 METROPOLITAN TRANSPORTATION COMMISSION

ABAG and the MTC are regional planning agencies tasked with coordinating land use and transportation planning in the Bay Area, including development of the Bay Area's Regional Transportation Plan/Sustainable Communities Strategy, known as Plan Bay Area. The 2040 Plan Bay Area was adopted jointly by the ABAG and MTC on July 26, 2017. ABAG and MTC are again in the process of updating Plan Bay Area 2050. MTC and ABAG are expected to adopt Plan Bay Area 2050 on October 21, 2021.[17] Under the Draft Plan Bay Area 2050's strategies, just under half of all Bay Area households would live within one half-mile of frequent transit by 2050, with this share increasing to over 70 percent for households with low incomes. Transportation and environmental strategies that support active and shared modes, combined with a transit-supportive land use pattern, are forecasted to lower the share of Bay Area residents that drive to work alone from over 50 percent in 2015 to 36 percent in 2050. GHG emissions from transportation would decrease significantly as a result of these transportation and land use changes,

[16] BAAQMD. 2019, April 16, *San Francisco Bay Area Community Health Protection Program*, https://www.baaqmd.gov/~/media/files/ab617-community-health/2019_0325_ab617onepager-pdf.pdf?la=en.

[17] Association of Bay Area Governments (ABAG) and the Metropolitan Transportation Commission (MTC). 2021, August, *Plan Bay Area 2050*. https://www.planbayarea.org/plan-bay-area-2050-1, accessed on August 27, 2021.

and the Bay Area would meet the state mandate of a 19-percent reduction in per-capita emissions by 2035 — but only if all strategies are implemented.[18]

Alameda County Transportation Commission

The Alameda County Transportation Commission (Alameda CTC) is the congestion management agency for Alameda County, tasked with developing a comprehensive transportation improvement program among local jurisdictions that will reduce traffic congestion and improve land use decision-making and air quality (see also Chapter 7, Circulation). Alameda CTC's latest congestion management program (CMP) is the 2019 CMP, which was amended in 2020 to reflect changes pursuant to SB 743.[19] Alameda CTC's countywide transportation model must be consistent with the regional transportation model developed by the MTC with ABAG data. The countywide transportation model is used to help evaluate cumulative transportation impacts of local land use decisions on the CMP system. In addition, Alameda CTC's updated CMP includes multimodal performance measures and trip reduction and transportation demand management strategies consistent with the goals of reducing regional vehicle miles traveled (VMT) in accordance with SB 375. Alameda CTC has responsibility for developing a database of housing and job growth projections. The CMP statute prescribes that this land use database must be consistent with the regional land use database and assumptions of the regional travel demand model prepared by ABAG and MTC. Alameda CTC works with local jurisdictions to develop the countywide database by allocating ABAG's housing and job projections to a refined-scale zone system for countywide model traffic analysis. Alameda CTC's land use database development process typically happens during the Countywide Travel Demand Model update. During this process, local jurisdictions are required to review a draft allocation of ABAG totals to the Countywide Travel Demand Model Traffic Analysis Zones (TAZs). Local jurisdictions then have 60 days to provide input on this draft allocation.[20]

4.2.3 LOCAL REGULATIONS

4.2.3.1 LIVERMORE 2003-2025 GENERAL PLAN

The City of Livermore 2003-2025 General Plan goals, policies, and programs that are relevant to the protection of air quality are primarily in the Air Quality section in Chapter 8, Open Space and Conservation Element, as shown in Table 4-3.[21]

[18] Association of Bay Area Governments (ABAG) and the Metropolitan Transportation Commission (MTC). 2021,May. *Draft Plan Bay Area 2050*. https://www.planbayarea.org/draftplan2050, accessed on August 27, 2021.

[19] Alameda County Transportation Commission, 2019, September (Amended June 2020), *Congestion Management Program*, https://www.alamedactc.org/planning/congestion-management-program/

[20] Alameda County Transportation Commission, 2019, September (Amended June 2020), *Congestion Management Program*, https://www.alamedactc.org/planning/congestion-management-program/

[21] *City of Livermore General Plan 2003-2025* (Adopted February 2004), https://www.cityoflivermore.net/government/community-development/planning/2003-2025-general-plan, accessed on August 31, 2021.

TABLE 4-3	LIVERMORE 2003-2025 GENERAL PLAN GOALS AND POLICIES RELEVANT TO AIR QUALITY
Goal OSC-6	Protect and improve Livermore's air quality.
Objective OSC-6.1.	Minimize air pollution emissions.
Policy OSC-6.1-P1	The City shall require project developers to develop and implement a construction-period air pollution control plan, consistent with dust and emission-abatement actions outlined in the CEQA handbook of the Bay Area Air Quality Management District.
Policy OSC-6.1-P2	The City shall prohibit the location of sensitive receptors (e.g., residential uses, schools, hospitals) in the vicinity of industries that generate toxic emissions; conversely, prohibit the location of industries that generate toxic emissions in the vicinity of sensitive receptors.
Policy OSC-6.1-P3	The City shall work with local and regional municipalities and agencies to reduce automobile-related vehicle emissions.
Policy OSC-6.1-P4	All industrial uses within Livermore shall meet regional, State and federal air pollution standards.
Policy OSC-6.1-P5	The City shall attempt to increase the employment to population ratio to reduce commuting rates and associated vehicle-related pollution emissions. The City shall approve only those development proposals, which are designed and located to minimize energy consumption and adverse impacts on air, land, and water resources. High-density, transit-oriented developments shall be strongly encouraged and promoted through the use of specific planning, density transfer, the planned development concept, and zoning designations.
Policy OSC-6.1-P6	The City shall monitor air quality and shall consider implementing a population cap if air quality declines.
Policy OSC-6.1-P7	The City shall support programs to encourage the development and maximum use of regional and local mass transit systems. To this end, the City shall actively support: (a) the funding and construction of a BART or light/commuter rail extension to Livermore; (b) the designation of special lanes on I-580 for the exclusive use of commuter buses during peak traffic periods; and (c) close coordination in the operations of local and regional transit systems in order to minimize the travel time between communities and major generating areas served by the regional system.

4.2.3.2 LIVERMORE MUNICIPAL CODE

The Livermore Municipal Code (LMC) includes various directives to minimize adverse impacts to air quality. The LMC is organized by Title, Chapter, and Section. Most provisions related to air quality impacts are included in Chapter 12.20, *Street Trees and Tree Preservation*; Chapter 12.34, *Trip Reduction*; Chapter 15.32, *Civic Green Buildings*; Chapter 15.80, *Civic Bay-Friendly Landscaping*; and Chapter 15.30, *Requirements for Wood Burning Appliances and Prohibited Fuels*, as follows:[22]

- Section 12.20.170, *Tree preservation and protection*. All persons in possession of property within the City shall keep the trees on the property in a safe and healthy condition.
- Section 15.30.160, *Compliance.* Any person who plans to install a wood-burning appliance must be in compliance with this chapter and shall obtain all necessary construction permits.
- Section 12.34.020, A*dministration and enforcement*. The City defers the administration and enforcement of BAAQMD Regulation 13, Rule 1, regarding trip reduction, to that District.

[22] Livermore Municipal Code, 1997, https://www.codepublishing.com/CA/Livermore/?Livermore01/Livermore0101.html&?f, accessed August 31, 2021.

- Chapter 15.80, *Implementation*. Bay-friendly landscaping strategies will be implemented in the City landscapes to help contribute to a reduction in GHG emissions, improve air quality, and enhance urban sustainability.
- Section 15.32.040*, Implementation*. City projects shall meet a minimum LEED™ "Silver" rating under the LEED™ rating system, or a city-approved equivalent. The green building compliance official shall be responsible for verifying the appropriate green building rating.

4.3 EXISTING CONDITIONS

4.3.1 REGIONAL SETTING: SAN FRANCISCO BAY AREA AIR BASIN

The BAAQMD is the regional air quality agency for the SFBAAB, which comprises all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara Counties; the southern portion of Sonoma County; and the southwestern portion of Solano County. Air quality in this area is determined by such natural factors as topography, meteorology, and climate, in addition to the presence of existing air pollution sources and ambient conditions.[23]

4.3.1.1 CLIMATE AND TOPOGRAPHY

The following are natural factors in the SFBAAB that affect air pollution:

- Meteorology: The SFBAAB is characterized by complex terrain, consisting of coastal mountain ranges, inland valleys, and bays, which distort normal wind flow patterns. The Coast Range[24] splits in the Bay Area, creating a western coast gap, the Golden Gate, and an eastern coast gap, the Carquinez Strait, which allows air to flow in and out of the Bay Area and the Central Valley. The climate is dominated by the strength and location of a semi-permanent, subtropical high-pressure cell. During the summer, the Pacific high-pressure cell is centered over the northeastern Pacific Ocean, resulting in stable meteorological conditions and a steady northwesterly wind flow. Upwelling of cold ocean water from below the surface because of the northwesterly flow produces a band of cold water off the California coast. The cool and moisture-laden air approaching the coast from the Pacific Ocean is further cooled by the presence of the cold water band, resulting in condensation and the presence of fog and stratus clouds along the Northern California coast. In the winter, the Pacific high-pressure cell weakens and shifts southward, resulting in wind flow offshore, the absence of upwelling, and the occurrence of storms. Weak inversions coupled with moderate winds result in a low air pollution potential.
- Wind Patterns: During the summer, winds flowing from the northwest are drawn inland through the Golden Gate and over the lower portions of the San Francisco Peninsula. Immediately south of Mount Tamalpais in Marin County, the northwesterly winds accelerate considerably and come more directly from the west as they stream through the Golden Gate. This channeling of wind through the Golden

[23] This section describing the air basin is from Bay Area Air Quality Management District, 2017, May, Appendix C: Sample Air Quality Setting, in *California Environmental Quality Act Air Quality Guidelines*.

[24] The Coast Ranges traverses California's west coast from Humboldt County to Santa Barbara County.

Gate produces a jet that sweeps eastward and splits off to the northwest toward Richmond and to the southwest toward San José when it meets the East Bay hills. Wind speeds may be strong locally in areas where air is channeled through a narrow opening, such as the Carquinez Strait, the Golden Gate, or the San Bruno gap. The air flowing in from the coast to the Central Valley, called the sea breeze, begins developing at or near ground level along the coast in late morning or early afternoon and the sea breeze deepens and increases in velocity while spreading inland. Under normal atmospheric conditions, the air in the lower atmosphere is warmer than the air above it. In the winter, the SFBAAB frequently experiences stormy conditions with moderate to strong winds, as well as periods of stagnation with very light winds. Winter stagnation episodes (i.e., conditions where there is little mixing, which occurs when there is a lack of or little wind) are characterized by nighttime drainage flows in coastal valleys. Drainage is a reversal of the usual daytime air-flow patterns; air moves from the Central Valley toward the coast and back down toward the Bay from the smaller valleys within the SFBAAB.

- Temperature: Summertime temperatures in the SFBAAB are determined in large part by the effect of differential heating between land and water surfaces. On summer afternoons, the temperatures at the coast can be 35 degrees Fahrenheit cooler than temperatures 15 to 20 miles inland; at night, this contrast usually decreases to less than 10 degrees Fahrenheit. In the winter, the relationship of minimum and maximum temperatures is reversed. During the daytime the temperature contrast between the coast and inland areas is small, whereas at night the variation in temperature is large.
- Precipitation: The SFBAAB is characterized by moderately wet winters and dry summers. Winter rains (November through March) account for about 75 percent of the average annual rainfall. The amount of annual precipitation can vary greatly from one part of the SFBAAB to another, even within short distances. In general, total annual rainfall can reach 40 inches in the mountains, but it is often less than 16 inches in sheltered valleys. During rainy periods, ventilation (rapid horizontal movement of air and injection of cleaner air) and vertical mixing (an upward and downward movement of air) are usually high, and thus pollution levels tend to be low (i.e., air pollutants are dispersed more readily into the atmosphere rather than accumulate under stagnant conditions). However, during the winter, frequent dry periods do occur, where mixing and ventilation are low and pollutant levels build up. [25]

4.3.1.2 AIR POLLUTION POTENTIAL

The potential for high pollutant concentrations developing at a given location depends upon the quantity of pollutants emitted into the atmosphere in the surrounding area or upwind, and the ability of the atmosphere to disperse the contaminated air. The topographic and climatological factors discussed above influence the atmospheric pollution potential of an area. Atmospheric pollution potential, as the term is used here, is independent of the location of emission sources and is instead a function of factors described below.

- Wind Circulation: Low wind speed contributes to the buildup of air pollution because it allows more pollutants to be emitted into the air mass per unit of time. Light winds occur most frequently during periods of low sun (fall and winter, and early morning) and at night. These are also periods when air

[25] Bay Area Air Quality Management District, 2017, Revised California Environmental Quality Act Air Quality Guidelines.

pollutant emissions from some sources are at their peak, namely, commuter traffic (early morning) and wood-burning appliances (nighttime). The problem can be compounded in valleys, when weak flows carry the pollutants up-valley during the day, and cold air drainage flows move the air mass down-valley at night. Such restricted movement of trapped air provides little opportunity for ventilation and leads to buildup of pollutants to potentially unhealthful levels.

- Inversions: An inversion is a layer of warmer air over a layer of cooler air. Inversions affect air quality conditions significantly because they influence the mixing depth (i.e., the vertical depth in the atmosphere available for diluting air contaminants near the ground). There are two types of inversions that occur regularly in the SFBAAB. Elevation inversions[26] are more common in the summer and fall, and radiation inversions[27] are more common during the winter. The highest air pollutant concentrations in the SFBAAB generally occur during inversions.
- Solar Radiation: The frequency of hot, sunny days during the summer months in the SFBAAB is another important factor that affects air pollution potential. It is at the higher temperatures that ozone is formed. In the presence of ultraviolet sunlight and warm temperatures, ROGs and NOx react to form secondary photochemical pollutants, including ozone. Because temperatures in many of the SFBAAB inland valleys are so much higher than near the coast, the inland areas are especially prone to photochemical air pollution. In late fall and winter, solar angles are low, resulting in insufficient ultraviolet light and warming of the atmosphere to drive the photochemical reactions. Ozone concentrations do not reach significant levels in the SFBAAB during these seasons.
- Sheltered Terrain: The hills and mountains in the SFBAAB contribute to the high pollution potential of some areas. During the day, or at night during windy conditions, areas in the lee sides of mountains are sheltered from the prevailing winds, thereby reducing turbulence and downwind transport. At night, when wind speeds are low, the upper atmospheric layers are often decoupled from the surface layers during radiation conditions. If elevated terrain is present, it will tend to block pollutant transport in that direction. Elevated terrain also can create a recirculation pattern by inducing up-valley air flows during the day and reverse down-valley flows during the night, allowing little inflow of fresh air. The areas having the highest air pollution potential tend to be those that experience the highest temperatures in the summer and the lowest temperatures in the winter. The coastal areas are exposed to the prevailing marine air, creating cooler temperatures in the summer, warmer temperatures in winter, and stratus clouds all year. The inland valleys are sheltered from the marine air and experience hotter summers and colder winters. Thus, the topography of the inland valleys creates conditions conducive to high air pollution potential.[28]

[26] When the air blows over elevated areas, it is heated as it is compressed into the side of the hill/mountain. When that warm air comes over the top, it is warmer than the cooler air of the valley.

[27] During the night, the ground cools off, radiating the heat to the sky.

[28] Bay Area Air Quality Management District, 2017, Revised California Environmental Quality Act Air Quality Guidelines.

4.3.2 AREA DESIGNATIONS

Areas that meet AAQS are classified attainment areas, and areas that do not meet these standards are classified nonattainment areas. Severity classifications for O_3 range from marginal, moderate, and serious to severe and extreme. The attainment status for the air basin is shown in Table 4-4. The air basin is currently designated a nonattainment area for California and National O_3, California and National $PM_{2.5}$, and California PM_{10} AAQS.

TABLE 4-4 ATTAINMENT STATUS OF CRITERIA POLLUTANTS IN THE SAN FRANCISCO BAY AREA AIR BASIN

Pollutant	State	Federal
Ozone – 1-hour	Nonattainment	Classification revoked (2005)
Ozone – 8-hour	Nonattainment (serious)	Nonattainment (marginal) [a]
PM_{10} – 24-hour	Nonattainment	Unclassified/ Attainment [b]
$PM_{2.5}$ – 24-hour	Nonattainment	Nonattainment
CO – 8-hour and 1-hour	Attainment	Attainment
NO_2 – 1-hour	Attainment	Unclassified
SO_2 – 24-hour and 1-hour	Attainment	Attainment
Lead	Attainment	Attainment
Sulfates	Attainment	Unclassified/Attainment
All others	Unclassified/Attainment	Unclassified/Attainment

Sources: California Air Resources Board, 2019, August, Area Designations Maps: State and Federal, https://ww2.arb.ca.gov/resources/documents/maps-State-and-Federal-area-designations, accessed on November 17. 2020; Bay Area Air Quality Management District, 2020, Air Quality Standards and Attainment Status, https://www.baaqmd.gov/about-air-quality/research-and-data/air-quality-standards-and-attainment-status, accessed November 17, 2020.

a. Severity classification current as of February 13, 2017.
b. In December 2014, US EPA issued final area designations for the 2012 primary annual $PM_{2.5}$ National AAQS. Areas designated "unclassifiable/attainment" must continue to take steps to prevent their air quality from deteriorating to unhealthy levels. The effective date of this standard is April 15, 2015.

4.3.3 PHYSICAL SETTING: EXISTING AMBIENT AIR QUALITY

Existing levels of ambient air quality and historical trends and projections in Livermore are best documented by measurements made by the BAAQMD. The BAAQMD monitoring station closest to Livermore is the Livermore-793 Rincon Avenue Station, which monitors O_3, NO_2, and $PM_{2.5}$. PM_{10} was recorded from closest monitoring stations, which was the Concord-2975 Treat Boulevard Station. Data from this station is summarized in Table 4-5. The data show regular violations of the state and federal O_3 standards, as well as occasional violations for state PM_{10} and state and federal $PM_{2.5}$ standards. The state and federal CO and NO_2 standards have not been exceeded in the last five years in the vicinity of the Livermore.

TABLE 4-5 AMBIENT AIR QUALITY MONITORING SUMMARY

Pollutant/Standard	Number of Days Threshold Were Exceeded and Maximum Levels during Such Violations				
	2016	2017	2018	2019	2020
Ozone (O_3)					
State 1-Hour ≥ 0.09 ppm	2	5	2	4	1
State/Federal 8-hour ≥ 0.070 (ppm)	40.102	60.109	30.099	70.105	20.095
Maximum 1-Hour Conc. (ppm)	0.085	0.086	0.078	0.078	0.077
Maximum 8-Hour Conc. (ppm)					
Nitrogen Dioxide (NO_2)					
State 1-Hour ≥ 0.18 (ppm)	0	0	0	0	0
Maximum 1-Hour Conc. (ppb)	0.0413	0.0454	0.0564	0.0475	0.0459
Coarse Particulates (PM_{10})					
State 24-Hour > 50 µg/m^3	0	0	1	0	1
Federal 24-Hour > 150 µg/m^3	0	0	0	0	1
Maximum 24-Hour Conc. (µg/m^3)	19.0	41.2	105.0	36.0	167.0
Fine Particulates ($PM_{2.5}$)					
Federal 24-Hour > 35 µg/m^3	0	2	14	0	17
Maximum 24-Hour Conc. (µg/m^3)	22.3	41.5	172.6	28.8	122.0

Source: California Air Resources Board, 2021, Air Pollution Data Monitoring Cards (2016, 2017, 2018, 2019, and 2020), accessed September 14, 2021, https://www.arb.ca.gov/adam/topfour/topfour1.php.
Notes: ppm = parts per million; ppb = parts per billion; µg/m^3 = micrograms per cubic meter; * = insufficient data; NA = Not Available
Data for O_3, NO_2, and $PM_{2.5}$ was obtained from the Livermore-793 Rincon Avenue Monitoring Station and data for PM_{10} was from the Concord-2975 Treat Boulevard Monitoring Station. Data may include exceptional events (e.g., wildfires).

BAAQMD also provides data that show areas in the SFBAAB that have elevated pollution levels and are identified as "impacted areas" (see Figure 4-1, *BAAQMD Impacted Communities Map*). Based on BAAQMD's Community Risk Evaluation Program maps, portions of Livermore are within the eight-hour ozone exceedance area but outside of the 24-hour $PM_{2.5}$ exceedance area.

4.3.4 PHYSICAL SETTING: STATIONARY EMISSIONS

Point sources of emissions (also referred to as stationary source emissions) within Livermore are identified in Figure 4-2, *Permitted Sources of Emissions*. Permitted stationary source emissions generate criteria air pollutant emissions and TACs from boilers, emergency generators, and gas stations.

4.3.5 SENSITIVE RECEPTORS

Some land uses are considered more sensitive to air pollution than others because of the types of population groups or activities involved. Sensitive population groups include children, the elderly, and the acutely and chronically ill, especially those with cardiorespiratory diseases. Disadvantaged communities

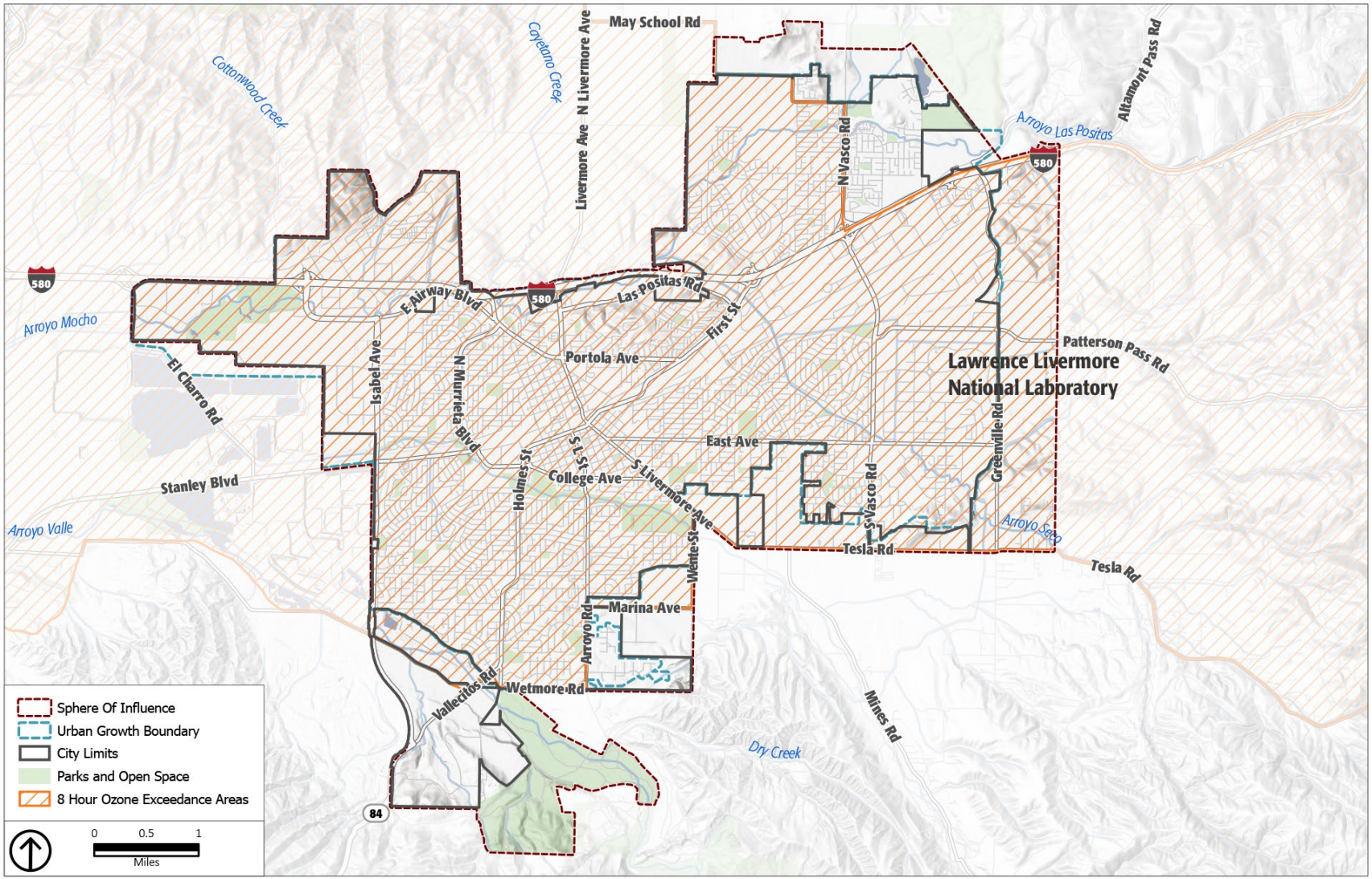
identified in CalEnviroScreen 4.0 (CES), as discussed in Chapter 10, Equity and Community Health, may be disproportionately affected by and vulnerable to poor air quality.[29]

People in environmental justice areas identified by CES 4.0 may be disproportionately affected by and vulnerable to poor air quality. CES's "pollution burden" map identifies communities that are exposed to pollution from human activities, such as air pollution (ozone, $PM_{2.5}$, DPM), water pollution (drinking water contaminants), and hazardous materials (pesticide use, children's lead exposure, toxic releases), and traffic density. Figure 4-3 shows the DPM burden for Livermore relative to California, which is closely correlated with potential relative health risk. As Figure 4-3 shows, traffic along I-580 is a significant source of DPM emissions that affects the areas closest to the freeway, particularly south of I-580. The DPM emissions in these Census tracts are higher than 71 to 77 percent of the Census tracts in California.

Residential areas are also considered sensitive receptors to air pollution because residents (including children and the elderly) tend to be at home for extended periods of time, resulting in sustained exposure to any pollutants present. Other sensitive receptors include retirement facilities, hospitals, and schools. Recreational land uses are considered moderately sensitive to air pollution. Although exposure periods are generally short, exercise places a high demand on respiratory functions, which can be impaired by air pollution. In addition, noticeable air pollution can detract from the enjoyment of recreation. Industrial, commercial, retail, and office areas are considered the least sensitive to air pollution. Exposure periods are relatively short and intermittent since the majority of the workers tend to stay indoors most of the time. In addition, the working population is generally the healthiest segment of the population.

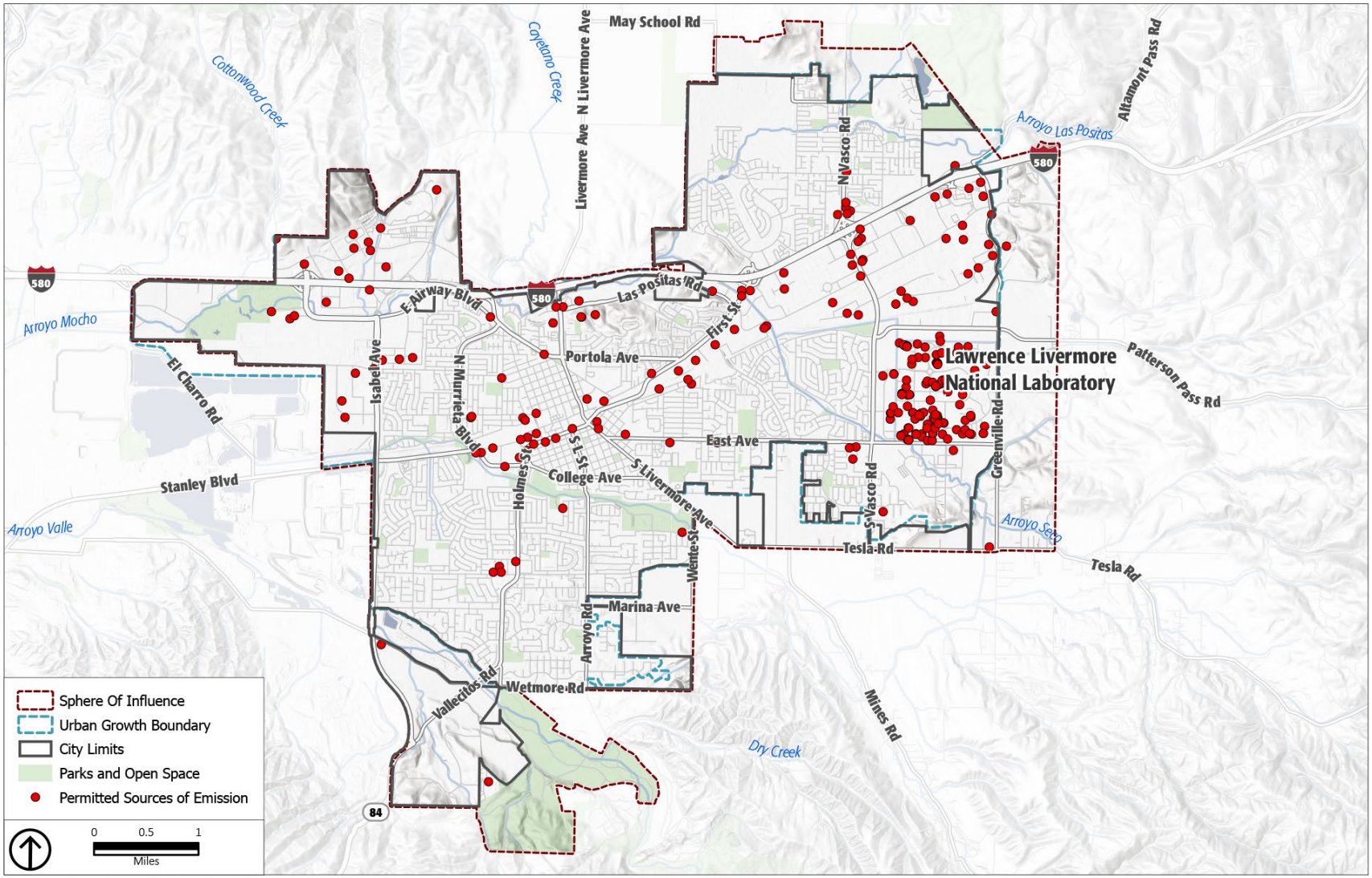
[29] Under SB 535, disadvantaged communities are defined as the top 25 percent scoring areas from CES, along with other areas with high amounts of pollution and low populations.

Figure 4-1 BAAQMD Impacted Communities Map



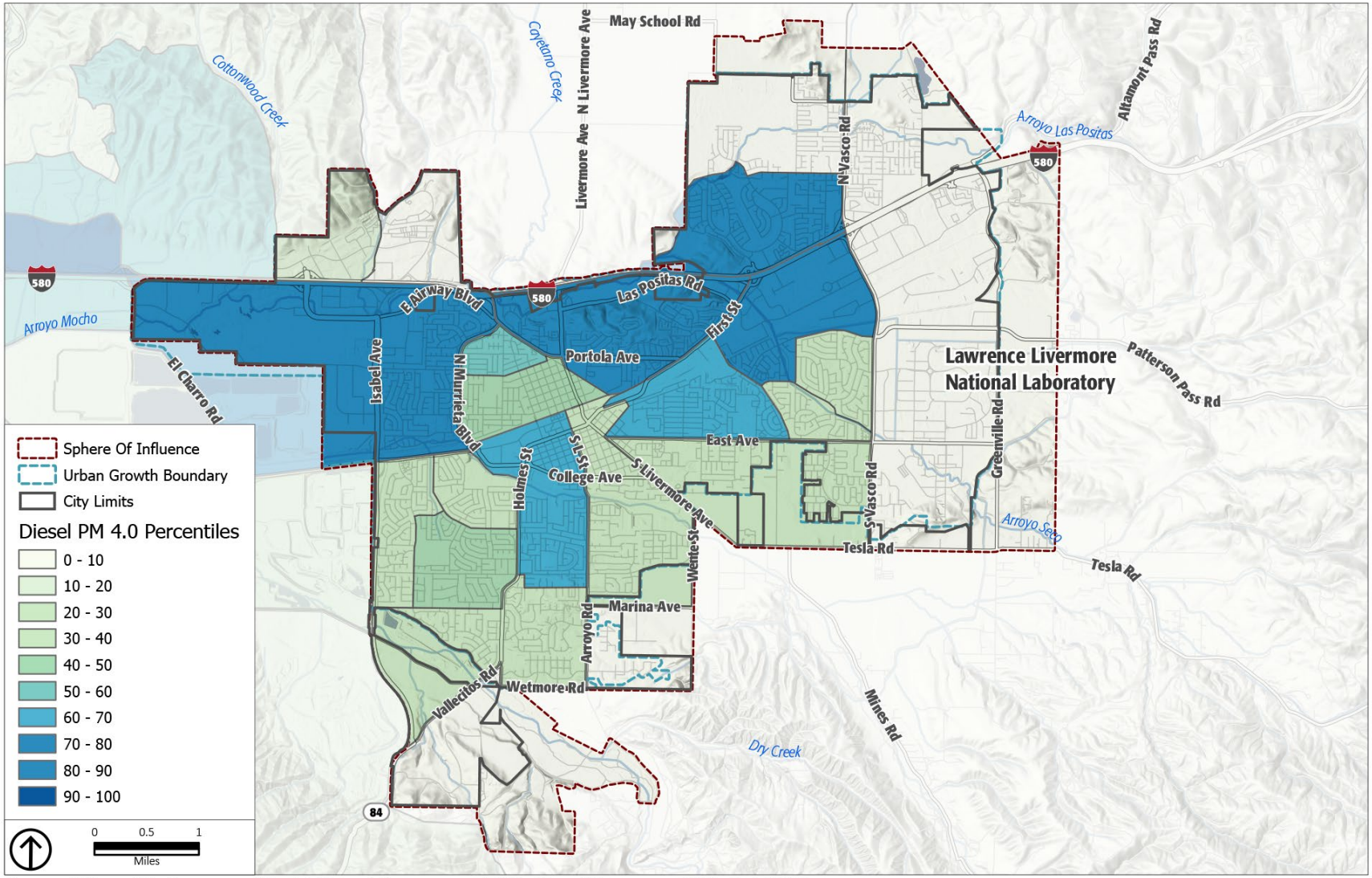
Source: Bay Area Air Quality Management District, 2014; City of Livermore, 2021; Esri, 2021.

Figure 4-2 Permitted Sources of Emissions



Source: Bay Area Air Quality Management District, 2018; City of Livermore, 2021; Esri, 2021.

Figure 4-3 Diesel Particulate Matter Indicator



Source: Office of Environmental Health Hazard Assessment, 2021; City of Livermore, 2021; Esri, 2021.

4.3.6 CARB SITING RECOMMENDATIONS

In addition, to reduce exposure to TACs, CARB developed and approved the *Air Quality and Land Use Handbook: A Community Health Perspective*[30] to provide guidance regarding the siting of sensitive land uses in the vicinity of freeways, distribution centers, rail yards, ports, refineries, chrome-plating facilities, dry cleaners, and gasoline-dispensing facilities (see Table 4-6). This guidance document was developed to assess compatibility and associated health risks when placing sensitive receptors near existing pollution sources. CARB's recommendations on the siting of new sensitive land uses were based on a compilation of recent studies that evaluated data on the adverse health effects from proximity to air pollution sources. The key observation in these studies is that proximity to air pollution sources substantially increases exposure and the potential for adverse health effects. There are three carcinogenic TACs that constitute the majority of the known health risks from motor vehicle traffic, DPM from trucks, and benzene and 1,3-butadiene from passenger vehicles. CARB recommendations are based on data that show that localized air pollution exposures can be reduced by as much as 80 percent by following CARB minimum distance separations.

TABLE 4-6 CARB RECOMMENDATIONS FOR SITING NEW SENSITIVE LAND USES

Source/Category	Advisory Recommendations
Freeways and High-Traffic Roads	Avoid siting new sensitive land uses within 500 feet of a freeway, urban roads with 100,000 vehicles per day, or rural roads with 50,000 vehicles per day.
Distribution Centers	Avoid siting new sensitive land uses within 1,000 feet of a distribution center (that accommodates more than 100 trucks per day, more than 40 trucks with operating transport refrigeration units [TRUs] per day, or where TRU unit operations exceed 300 hours per week). Take into account the configuration of existing distribution centers and avoid locating residences and other sensitive land uses near entry and exit points.
Rail Yards	Avoid siting new sensitive land uses within 1,000 feet of a major service and maintenance rail yard. Within one mile of a rail yard, consider possible siting limitations and mitigation approaches.
Ports	Avoid siting of new sensitive land uses immediately downwind of ports in the most heavily impacted zones. Consult local air districts or CARB on the status of pending analyses of health risks.
Refineries	Avoid siting new sensitive land uses immediately downwind of petroleum refineries. Consult with local air districts and other local agencies to determine an appropriate separation.
Chrome Platers	Avoid siting new sensitive land uses within 1,000 feet of a chrome plater.
Dry Cleaners Using Perchloroethylene	Avoid siting new sensitive land uses within 300 feet of any dry cleaning operation. For operations with two or more machines, provide 500 feet. For operations with three or more machines, consult with the local air district. Do not site new sensitive land uses in the same building with perchloroethylene dry cleaning operations.
Gasoline Dispensing Facilities	Avoid siting new sensitive land uses within 300 feet of a large gas station (defined as a facility with a throughput of 3.6 million gallons per year or greater). A 50-foot separation is recommended for typical gas dispensing facilities.

Source: California Air Resources Board, 2005, April. *Air Quality and Land Use Handbook: A Community Health Perspective*, accessed September 22, 2021, https://www.arb.ca.gov/ch/handbook.pdf.

[30] California Air Resources Board (CARB). 2005, April. *Air Quality and Land Use Handbook: A Community Health Perspective*. https://www.arb.ca.gov/ch/handbook.pdf.

4.4 IMPLICATIONS FOR THE GENERAL PLAN UPDATE

The General Plan Update should consider goals and policies that reduce air pollution and the community's exposure to air pollution, such as:

- Developing land use and transportation strategies to reduce VMT to an appropriate local threshold.
- Understanding how sensitive receptors could be affected by substantial air pollutant generators when considering potential land use changes.
- Incorporating CARB's buffer distances (see Table 4-6) when siting new sensitive receptors. Consider policies to help reduce indoor air pollutant concentrations when new sensitive receptors are within the setback/buffer zone.
- Considering proximity of odor sources when siting new sensitive receptors.
- Continuing to coordinate with the BAAQMD to reduce air pollution from sources that are not directly controlled by the City's land use decisions.
- Updating the building code (e.g., reach codes, fuel switching) to reduce building energy use.
- Implementing BAAQMD's significance thresholds and mitigation measures in the BAAQMD's "CEQA Air Quality Guidelines" for emissions generated by new development projects.

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