Chapter 1

Air Quality

In This Background Report

Page

Exhibits

Tables

Introduction

This background report creates a foundation for updating the goals, policies, and programs of the Suisun City General Plan related to Air Quality. A description of the current regulatory setting is followed by a summary of current air quality conditions affecting the Suisun City area.

The section "General Plan Issues and Opportunities" provides some key questions for the City in updating the General Plan, in consideration of current conditions and the existing regulatory environment.

Although greenhouse gases are a category of air pollution, this topic is addressed in a separate background report. However, since greenhouse gases and other air pollutants have similar sources, the key issues for the General Plan Update related to these topics are closely related.

Environmental Setting

Suisun City lies within the San Francisco Bay Area air basin (SFBAAB) which comprises all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, and Santa Clara Counties and the southern portion of Sonoma County. The ambient concentrations of air pollutant emissions are determined by the amount of emissions released by air pollutant sources and the atmosphere's ability to transport and dilute such emissions. Natural factors that affect transport and dilution include terrain, wind, atmospheric stability, and sunlight. Therefore, existing air quality conditions in the area are determined by such natural factors as topography, meteorology, and climate, in addition to the amount of emissions released by existing air pollutant sources, as discussed separately below.

Topography, Meteorology, and Climate

The SFBAAB is characterized by complex terrain consisting of coastal mountain ranges, inland valleys, and bays, all of which distort normal wind flow patterns. In this area, the Coast Range splits, resulting in the western (Golden Gate) coast gap and the eastern (Carquinez Strait) coast gap. These gaps allow air to flow out of the SFBAAB. Air flows into Solano County through the Carquinez Strait, moving across the Sacramento–San Joaquin River Delta, and transporting pollution from the Bay Area. Suisun Marsh is located south of the City and connected to Grizzly Bay, which, in turn, is connected to the Carquinez Strait area near Benicia.

Regional flow patterns affect air quality patterns by moving pollutants downwind of sources. Localized meteorological conditions, such as moderate winds, disperse pollutants and reduce pollutant concentrations. An inversion layer develops when a layer of warm air traps cooler air close to the ground. Such temperature inversions hamper dispersion by creating a ceiling over the area and trapping air pollutants near the ground. During summer mornings and afternoons, these inversions are present over much of the County. During summer's longer daylight hours, plentiful sunshine provides the energy needed to fuel photochemical reactions between ROG and NOX, which result in ozone formation.

Local meteorology in the Suisun City area is represented by measurements recorded at the Suisun City station. The normal annual precipitation, which occurs primarily from November through March, is approximately 21 inches. In 2009, January temperatures averaged at 47°F and maxed at 79°F while July temperatures averaged at 67°F and maxed at 99°F (BAAQMD 2010). The predominant wind direction and speed, measured at the Fairfield-Chadbourn Road station, is from the southwest at around 8 mph (Weather Underground 2010).

Criteria Air Pollutants

Concentrations of criteria air pollutant emissions are used as indicators of ambient air quality conditions. A brief description of each criteria air pollutant, including source types, health effects, and future trends is provided below along with the most current attainment area designations and monitoring data for the Suisun City area.

Ozone

Ozone is a photochemical oxidant, a substance whose oxygen combines chemically with another substance in the presence of sunlight, and the primary component of smog. Ozone is not emitted directly into the air, but is formed through complex chemical reactions between precursor emissions of ROG and NO_X in the presence of sunlight. ROG are volatile organic compounds that are photochemically reactive. ROG emissions result primarily from incomplete combustion and the evaporation of chemical solvents and fuels. NO_X are a group of gaseous compounds of nitrogen and oxygen that result from the combustion of fuels.

Ozone located in the upper atmosphere (stratosphere) acts in a beneficial manner by shielding the earth from harmful ultraviolet radiation that is emitted by the sun. However, ozone located in the lower atmosphere (troposphere) is a major health and environmental concern.

Meteorology and terrain play a major role in ozone formation. Generally, low wind speeds or stagnant air coupled with warm temperatures and clear skies provide the optimum conditions for formation. As a result, summer is generally the peak ozone season. Because of the reaction time involved, peak ozone concentrations often occur far downwind of the precursor emissions. Therefore, ozone is a regional pollutant that often affects large areas. In general, ozone concentrations over or near urban and rural areas reflect an interplay of emissions of ozone precursors, transport, meteorology, and atmospheric chemistry (Godish 2004).

The adverse health effects associated with exposure to ozone pertain primarily to the respiratory system. Scientific evidence indicates that ambient levels of ozone affect not only sensitive receptors, such as asthmatics and children, but healthy adults, as well. Exposure to ambient levels of ozone ranging from 0.10 to 0.40 parts per million (ppm) for one or two hours has been found to significantly alter lung functions by increasing respiratory rates and pulmonary resistance, decreasing tidal volumes, and impairing respiratory mechanics. Ambient levels of ozone above 0.12 ppm are linked to symptomatic responses that include such symptoms as throat dryness, chest tightness, headache, and nausea.

In addition to the above adverse health effects, evidence also exists relating ozone exposure to an increase in the permeability of respiratory epithelia. Such increased permeability leads to an increase in responsiveness of the respiratory system to challenges, and the interference or inhibition of the immune system's ability to defend against infection (Godish 2004: 169 - 170).

Emissions of ozone precursors ROG and NOX have decreased over the past several years as a result of more stringent motor vehicle standards and cleaner burning fuels. Consequently, peak 1-hour and 8-hour ozone concentrations in the SFBAAB have declined overall by about 18% respectively during the last 20 years (California Air Resources Board 2009a).

Particulate Matter

Respirable particulate matter with an aerodynamic diameter of 10 micrometers or less is referred to as PM10. Fine particulate matter (PM2.5) includes a subgroup of smaller particles that have an aerodynamic diameter of 2.5 micrometers or less. PM2.5 can include a mixture of carbon and metals, nitrates, organics, sulfates, diesel exhaust, and wood smoke.

The size of particulate matter is directly linked to its potential for causing health problems. Small particles less than 10 micrometers in diameter pose the greatest problems because they can infiltrate deep into the lungs and even into the bloodstream.

According to BAAQMD, evidence suggests that PM2.5 is by far the most harmful air pollutant in the Bay Area relative to the overall impact on public health (BAAQMD 2010). Exposure to such particles can affect both the lungs and the heart. Small particles of concern include "inhalable coarse particles" (found near roadways and dusty industries), which are larger than 2.5 micrometers and smaller than 10 micrometers in diameter, and "fine particles" (found in smoke and haze), which are 2.5 micrometers in diameter and smaller. Particulate matter, particularly fine particles, contains microscopic solids or liquid droplets that get deep into the lungs and cause serious health problems. Numerous scientific studies have linked particle pollution exposure to a variety of problems including:

- increased respiratory symptoms, such as irritation of the airways, coughing, or difficulty breathing;
- decreased lung function;
- aggravated asthma;
- development of chronic bronchitis;
- irregular heartbeat;
- nonfatal heart attacks; and
- premature death in people with heart or lung disease.

People with heart or lung diseases, children, and older adults are the most likely to be affected by particle pollution exposure (EPA 2010).

Direct emissions of both PM10 and PM2.5 increased slightly in the Bay Area between 1975 and 2005 and are projected to increase through 2020. These increases are due to growth in emissions from area-wide sources, primarily fugitive dust sources.

Even though population and VMT are growing, due to adoption of more stringent emission standards, direct emissions of PM from diesel motor vehicles have been decreasing since 1990 (California Air Resources Board 2009).

Carbon Monoxide

CO is a colorless, odorless, and poisonous gas produced by incomplete burning of carbon in fuels, primarily from mobile (transportation) sources. In fact, 77 percent of the nationwide CO emissions are from mobile sources. The other 23 percent consist of CO emissions from wood-burning stoves, incinerators, and industrial sources.

CO enters the bloodstream through the lungs by combining with hemoglobin, which normally supplies oxygen to the cells. However, CO combines with hemoglobin much more readily than oxygen does, resulting in a drastic reduction in the amount of oxygen available to the cells. Adverse health effects associated with exposure to CO concentrations include such symptoms as dizziness, headaches, and fatigue. CO exposure is especially harmful to individuals who suffer from cardiovascular and respiratory diseases (U.S. Environmental Protection Agency 2006a). The highest concentrations are generally associated with cold, stagnant weather conditions that occur during the winter. In contrast to ozone, which tends to be a regional pollutant, CO problems tend to be localized.

Emissions of CO have been declining in the SFBAAB over the past 30 years. Motor vehicles and other mobile sources are the largest sources of CO emissions in the air basin. Emissions from motor vehicles have been declining, with the introduction of new automotive emission controls, despite increases in VMT (California Air Resources Board 2009a).

Nitrogen Dioxide

NO2 is a brownish, highly reactive gas that is present in all urban environments. The major human-made sources of NO2 are combustion devices, such as boilers, gas turbines, and mobile, and stationary reciprocating internal-combustion engines. Combustion devices emit primarily nitric oxide (NO), which reacts through oxidation in the atmosphere to form NO2 (U.S. Environmental Protection Agency 2006a).

The combined emissions of NO and NO2 are referred to as NOX, which are reported as equivalent NO2. Because NO2 is formed and depleted by reactions associated with photochemical smog (ozone), the NO2 concentration in a particular geographical area may not be representative of the local NOX emission sources.

Inhalation is the most common route of exposure to NO2. Because NO2 has relatively low solubility in water, the principal site of toxicity is in the lower respiratory tract. The severity of the adverse health effects depends primarily on the concentration inhaled rather than the duration of exposure. An individual may experience a variety of acute symptoms, including coughing, difficulty with breathing, vomiting, headache, and eye irritation, during or shortly after exposure. After a period of approximately 4–12 hours, an exposed individual may experience chemical pneumonitis or pulmonary edema with breathing abnormalities, cough, cyanosis, chest pain, and rapid heartbeat. Severe, symptomatic NO2 intoxication after acute exposure has been linked on occasion with prolonged respiratory impairment, with such symptoms as chronic bronchitis and decreased lung functions.

More stringent mobile source emission standards and cleaner burning fuels have largely contributed to the decline in NO_x emissions. ROG emissions have been decreasing for the last 30 years due to more stringent motor vehicle standards and new rules for control of ROG from various industrial coating and solvent operations (ARB 2009).

Sulfur Dioxide

SO_2 is produced by such stationary sources as coal and oil combustion, steel mills, refineries, and pulp and paper mills.

The major adverse health effects associated with SO_2 exposure pertain to the upper respiratory tract. SO_2 is a respiratory irritant with constriction of the bronchioles occurring with inhalation of SO_2 at five ppm or more. On contact with the moist mucous membranes, SO_2 produces sulfurous acid, which is a direct irritant. Concentration rather than duration of the exposure is an important determinant of respiratory effects. Exposure to high SO_2 concentrations may result in edema of the lungs or glottis and respiratory paralysis.

The emission levels for SO_x have declined after 1990. Most of the reduction in SO_x emissions is for on-road motor vehicles and other mobile sources (ARB 2009).

Lead

Lead 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 phase-out of leaded gasoline, as discussed in detail below, 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.

Twenty years ago, mobile sources were the main contributor to ambient lead concentrations in the air. In the early 1970s, EPA set national regulations to gradually reduce the lead content in gasoline. In 1975, unleaded gasoline was introduced for motor vehicles equipped with catalytic converters. EPA banned the use of leaded gasoline in highway vehicles in December 1995 (U.S. Environmental Protection Agency 2006a).

As a result of EPA's regulatory efforts to remove lead from gasoline, emissions of lead from the transportation sector have declined dramatically (95 percent between 1980 and 1999), and levels of lead in the air decreased by 94 percent between 1980 and 1999. Transportation sources, primarily airplanes, now contribute only 13 percent of lead emissions. A recent National Health and Nutrition Examination Survey reported a 78 percent decrease in the levels of lead in people's blood between 1976 and 1991. This dramatic decline can be attributed to the move from leaded to unleaded gasoline (U.S. Environmental Protection Agency 2006).

In California, lead emissions and ambient lead concentrations have decreased dramatically over the past 25 years. The rapid decrease in lead concentrations can be attributed primarily to phasing out the lead in gasoline. This phase-out began during the 1970s, and subsequent ARB regulations have eliminated virtually all lead from gasoline now sold in California.

All areas of the state are currently designated as attainment for the State lead standard (EPA does not designate areas for the national lead standard). Although the ambient lead standards are no longer violated, lead emissions from stationary sources still pose "hot spot" problems in some areas. As a result, ARB has identified lead as a TAC.

Air Quality Monitoring and Attainment

Criteria air pollutant concentrations are measured at several monitoring stations in the SFBAAB. The nearest monitoring station to Suisun City with recent data for ozone, is the Fairfield-Chadbourne Road station and the nearest station with data for CO, PM10, and PM2.5 is the Concord-2975 Treat Boulevard station located in Contra Costa County, both in the SFBAAB. The ambient air quality measurements from these stations are representative of the air quality near Suisun City. Table AQ-1 summarizes the air quality data from the last 3 years available.

As shown, ozone levels have generally remained constant, carbon monoxide concentrations have decreased somewhat, and particulate matter concentrations have generally decreased, although there was a higher maximum concentration of fine particulate matter in 2008 compared to the other years.

Both ARB and EPA use this type of monitoring data to designate areas according to their attainment status for criteria air pollutants. The purpose of these designations is to identify those areas with air quality problems and thereby initiate planning efforts for improvement. The three basic designation categories are "nonattainment," "attainment," and "unclassified." "Unclassified" is used in an area that cannot be classified on the basis of available information as meeting or not meeting the standards. In addition, the California designations include a subcategory of the nonattainment designation, called "nonattainment-transitional." The nonattainment-transitional designation is given to nonattainment areas that are progressing and nearing attainment.

State attainment designations for the year 2009 and national attainment designations for the year 2009 for BAAQMD are shown in Table AQ-2 for each criteria air pollutant. If the designation for each jurisdiction is the same for a given pollutant, the designation is listed once.

Emission Sources

Criteria air pollutant emission sources in Suisun City include stationary, area, and mobile sources. According to the 2008 emissions inventory (Exhibit AQ-1) for Solano County, the majority of ROG and NOx emissions are attributable to mobile sources, while area-wide sources are the greatest contributor of particulate matter emissions (ARB 2008).

Stationary Sources

Major stationary sources of air pollutant emissions within the broader Solano County area include fuel combustion from electric utilities and other processes, waste disposal, and petroleum production. As discussed previously, the local districts issue permits to various types of stationary sources which must demonstrate implementation of BACT.

Area-Wide Sources

Area-wide sources of emissions include consumer products, application of architectural coatings, residential fuel combustion, farming operations, construction and demolition, road dust, fugitive dust, landscaping, fires, and other miscellaneous sources. Paved road dust is the largest contributor to particulate matter emissions.

Table AQ-1
Summary of Annual Ambient Air Quality Data (2007–2009)

	2007	2008	2009
Ozone			
Maximum concentration (1-hr/8-hr avg, ppm)	0.089/0.067	0.116/0.090	0.104/0.085
Number of days State standard exceeded (1-hr)	0	2	2
Number of days national 1-hr/8-hr standard exceeded	0/0	0/1	0/2
Carbon Monoxide			
Maximum concentration (8-hr avg, ppm)	1.41	1.13	1.09
Number of days State standard exceeded	0	0	0
Number of days national standard exceeded	0	0	0
Fine Particulate Matter ($PM_{2.5}$)			
Maximum concentration ($\mu g/m^3$)	46.8	60.3	39.0
Number of days national standard exceeded (measured[1])	7	3	1
Respirable Particulate Matter (PM_{10})			
Maximum concentration ($\mu g/m^3$)	52.4	50.5	32.5
Number of days State standard exceeded (measured[1])	2	1	0
Number of days national standard exceeded (measured[1])	0	0	0

Notes: $\mu g/m^3$ = micrograms per cubic meter; ppm = parts per million

[1] Measured days are those days that an actual measurement was greater than the level of the State daily standard or the national daily standard. Measurements are typically collected every 6 days. Calculated days are the estimated number of days that a measurement would have been greater than the level of the standard had measurements been collected every day. The number of days above the standard is not necessarily the number of violations of the standard for the year.

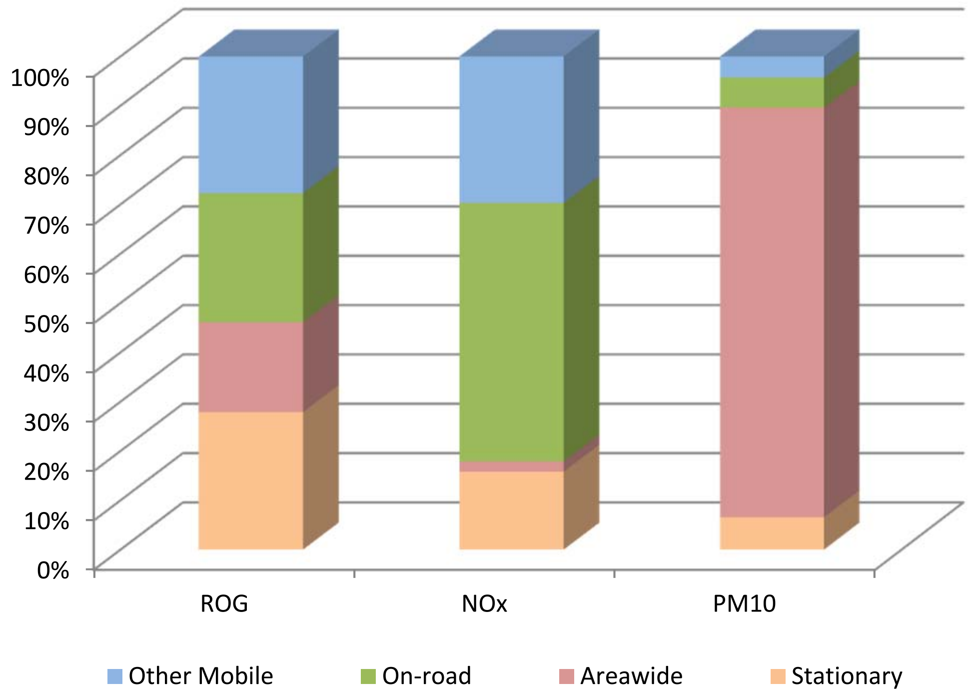
Source: ARB 2010

Mobile Sources

On-road and other mobile sources are the largest contributors of ozone precursor emissions within the County. On-road sources consist of passenger vehicles, trucks, buses, and motorcycles, while off-road vehicles and other mobile sources comprise heavy-duty equipment, boats, aircraft, trains, recreational vehicles, and farm equipment. The major roadway serving the Suisun City area is State Route 12 (SR 12).

Toxic Air Contaminants

Toxic Air Contaminants (TACs) are airborne pollutants that pose a threat to human health, and are generally separated into two categories, carcinogen or non carcinogen. Carcinogenic compounds are those that are recognized to cause cancer, and have no assumed safe threshold below which health effects would not occur. Carcinogen health risks are expressed as excess cancer cases per million population of potentially exposed individuals. Non Carcinogens are the TACs that do not cause cancer and are typically characterized by the associated physiological effects of the potentially exposed population. Non Carcinogenic TACs will typically have safe levels of exposure that are assumed to have no negative health affects below these levels.



Source: ARB 2008

Exhibit AQ-1 **Relative Contributions from Emission Sources**

Stationary sources of TACs include gasoline stations, dry cleaners, and diesel backup generators, which are subject to BAAQMD permit requirements. On-road motor vehicles and off-road sources, such as construction equipment, ships, and trains are also common sources of TACs (BAAQMD 2010).

According to the 2009 California Almanac of Emissions and Air Quality (California Air Resources Board 2009a), the majority of the estimated health risk from TACs can be attributed to relatively few compounds, the most important being PM from diesel-fueled engines (diesel PM). Diesel PM differs from other TACs in that it is not a single substance, but rather a complex mixture of hundreds of substances. Although diesel PM is emitted by diesel-fueled internal-combustion engines, the composition of the emissions varies depending on engine type, operating conditions, fuel composition, lubricating oil, and whether an emission control system is present. Unlike the other TACs, no ambient monitoring data are available for diesel PM because no routine measurement method currently exists. However, ARB has made preliminary concentration estimates based on a PM exposure method. This method uses the ARB emissions inventory's PM10 database, ambient PM10 monitoring data, and the results from several studies on chemical speciation to estimate concentrations of diesel PM. Of the TACs for which data are available in California, diesel PM, benzene, 1,3-butadiene, acetaldehyde, carbon tetrachloride, hexavalent chromium, para-dichlorobenzene, formaldehyde, methylene chloride, and perchloroethylene pose the greatest existing ambient risks.

Diesel PM poses the greatest health risk among the aforementioned TACs. Based on receptor modeling techniques, ARB estimated its health risk to be 480 excess cases in the SFBAAB. Since 1990, the health risk associated with diesel PM has been reduced by

36% in the SFBAAB. Overall, trends in TAC concentrations and associated health risks have decreased since 1990 (California Air Resources Board 2009a).

The BAAQMD has recommended that TAC impacts be assessed both for specific projects through the permitting process and at a community level through planning. The planning process should take into account existing and proposed sources of TACs, especially when considering planning for places where people live, play, or convalesce.

Regulatory Setting

Air quality in Suisun City is regulated by the U.S. Environmental Protection Agency (EPA), California Air Resources Board (ARB), and the Bay Area Air Quality Management District (BAAQMD). Each of these agencies develops rules, regulations, policies, and/or goals to comply with applicable legislation. Although EPA regulations may not be superseded, both State and local regulations may be more stringent.

Criteria Air Pollutants

Air quality regulations focus on the following air pollutants: ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter (PM), and lead. Because these are the most prevalent air pollutants known to be deleterious to human health, and extensive health-effects criteria documents are available, these pollutants are commonly referred to as "criteria air pollutants."

Federal Plans, Policies, Regulations, and Laws

At the federal level, EPA has been charged with implementing national air quality programs. EPA's air quality mandates are drawn primarily from the federal Clean Air Act (CAA), which was enacted in 1970. The most recent major amendments to the CAA were made by Congress in 1990.

The CAA required EPA to establish national ambient air quality standards (NAAQS). As shown in Table AQ-2, EPA has established primary and secondary NAAQS for the following criteria air pollutants: ozone, CO, NO_2, SO_2, respirable particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), and lead. The primary standards protect the public health, while the secondary standards protect the public welfare. The CAA also required each state to prepare an air quality control plan, referred to as a State Implementation Plan (SIP). The federal Clean Air Act Amendments of 1990 (CAAA) added requirements for states with nonattainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. The SIP is modified periodically to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies. EPA is responsible for reviewing all state SIPs to determine whether they conform to the mandates of the CAA and its amendments, and to determine whether implementing the SIPs will achieve air quality goals. If EPA determines a SIP to be inadequate, a Federal Implementation Plan (FIP) that imposes additional control measures may be prepared for the nonattainment area. If an approvable SIP is not submitted or implemented within the mandated time frame, sanctions may be applied to transportation funding and stationary air pollution sources in the air basin.

Hazardous Air Pollutants

Air quality regulations also focus on toxic air contaminants (TACs), or in federal parlance, hazardous air pollutants (HAPs). A TAC/HAP is defined as an air pollutant that may cause or contribute to an increase in mortality or in serious illness, or that may pose a hazard to human health. The primary TAC/HAP of concern for projects in Suisun City is diesel particulate matter (diesel PM) from mobile sources of emissions.

TACs/HAPs are usually present in minute quantities in the ambient air. However, their high toxicity or health risk may pose a threat to public health even at low concentrations. In general, for those TACs/HAPs that may cause cancer, there is no concentration that does not present some risk. In other words, there is no safe level of exposure. This contrasts with the criteria air pollutants, for which acceptable levels of exposure can be determined and for which the ambient standards have been established. Instead, EPA and ARB regulate HAPs and TACs, respectively, through statutes and regulations that generally require the use of the maximum or best available control technology for toxics (MACT and BACT) to limit emissions. These statutes and regulations, in conjunction with additional rules set forth by the BAAQMD, establish the regulatory framework for TACs/HAPs (see below for more information on the state and regional approach to regulating TACs).

The EPA has programs for identifying and regulating HAPs. Title III of the CAAA directed the EPA to promulgate national emissions standards for HAPs (NESHAP). Major sources are defined as stationary sources with potential to emit more than 10 tons per year (tpy) of any HAP or more than 25 tpy of any combination of HAP. All other sources are considered area sources. The emissions standards are to be promulgated in two phases. In the first phase (1992–2000), the EPA developed technology-based emission standards designed to produce the maximum emission reduction achievable. These standards are generally referred to as requiring MACT. For area sources, the standards may be different, based on generally available control technology. In the second phase (2001–2008), the EPA was required to promulgate health risk–based emissions standards, where deemed necessary to address risks remaining after implementation of the technology-based NESHAP standards.

The CAAA also required the EPA to promulgate vehicle or fuel standards containing reasonable requirements that control toxic emissions, at a minimum to benzene and formaldehyde. Performance criteria were established to limit mobile-source emissions of toxics, including benzene, formaldehyde, and 1,3-butadiene. In addition, Section 219 required the use of reformulated gasoline in selected areas with the most severe ozone nonattainment conditions to further reduce mobile-source emissions.

Table AQ-2
Ambient Air Quality Standards and Designations

Pollutant	Averaging Time	California		National Standards[2]	
		Standards[1]	Attainment Status (BAAQMD)	Standards[3]	Attainment Status (BAAQMD)
Ozone	1-hour	0.09 ppm (180 µg/m³)	N	–	–[5]
	8-hour	0.070 ppm[h] (137 µg/m³)	N[9]	0.08 ppm (157 µg/m³)	N[4]
Carbon Monoxide (CO)	1-hour	20 ppm (23 mg/m³)	A	35 ppm (40 mg/m³)	A
	8-hour	9 ppm (10 mg/m³)		9 ppm (10 mg/m³)	A[6]
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.030 ppm (57 µg/m³)	–	0.053 ppm (100 µg/m³)	A
	1-hour	0.18 ppm (339 µg/m³)	A	–	U
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	–	–	0.030 ppm (80 µg/m³)	A
	24-hour	0.04 ppm (105 µg/m³)	A	0.14 ppm (365 µg/m³)	A
	3-hour	–	–	–	
	1-hour	0.25 ppm (655 µg/m³)	A	–	
Respirable Particulate Matter (PM_{10})	Annual Arithmetic Mean	20 µg/m³	N[7]	–[i]	U
	24-hour	50 µg/m³	N	150 µg/m³	
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 µg/m³	N[7]	15 µg/m³	A
	24-hour	–	–	35 µg/m³	N
Lead[j]	30-day Average	1.5 µg/m³	A	–	–
	Calendar Quarter	–	–	1.5 µg/m³	–
Sulfates	24-hour	25 µg/m³	A	No National Standards	
Hydrogen Sulfide	1-hour	0.03 ppm (42 µg/m³)	U		
Vinyl Chloride[j]	24-hour	0.01 ppm (26 µg/m³)	–		
Visibility-Reducing Particle Matter	8-hour	Extinction coefficient of 0.23 per kilometer —visibility of 10 miles or more (0.07—30 miles or more for Lake Tahoe) because of particles when the relative humidity is less than 70%.	U		

Notes:

1 California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1-hour and 24-hour), nitrogen dioxide, suspended particulate matter - PM_{10}, and visibility reducing particles are values that are not to be exceeded. If the standard is for a 1-hour, 8-hour or 24-hour average (i.e., all standards except for lead and the PM_{10} annual standard), then some measurements may be excluded. In particular, measurements are excluded that ARB determines would occur less than once per year on the average.

2 National standards shown are the "primary standards" designed to protect public health. National standards other than for ozone, particulates and those based on annual averages are not to be exceeded more than once a year. The 1-hour ozone standard is attained if, during the most recent three-year period, the average number of days per year with maximum hourly concentrations above the standard is equal to or less than one. The 8-hour ozone standard is attained when the 3-year average of the 4th highest daily concentrations is 0.075 ppm (75 ppb) or less. The 24-hour PM_{10} standard is attained when the 3-year average of the 99th percentile of monitored concentrations is less than 150 µg/m³. The 24-hour $PM_{2.5}$ standard is attained when the 3-year average of 98th percentiles is less than 35 µg/m³. Except for the national particulate standards, annual standards are met if the annual average falls below the standard at every site. The national annual particulate standard for PM_{10} is met if the 3-year average falls below the standard at every site. The annual $PM_{2.5}$ standard is met if the 3-year average of annual averages spatially-averaged across officially designed clusters of sites falls below the standard.

3 National air quality standards are set by US EPA at levels determined to be protective of public health with an adequate margin of safety.

4 In June 2004, the Bay Area was designated as a marginal nonattainment area of the national 8-hour ozone standard. US EPA lowered the national 8-hour ozone standard from 0.80 to 0.75 PPM (ie.e. 75 ppb) effective May 27, 2008. EPA will issue final designations based upon the new 0.75 ppm ozone standard by March 2010.

5 National The national 1-hour ozone standard was revoked by U.S. EPA on June 15, 2005.

6 In April 1998, the Bay Area was redesignated to attainment for the national 8-hour carbon monoxide standard.

7 In June 2002, CARB established new annual standards for $PM_{2.5}$ and PM_{10}.

8 Statewide VRP Standard (except Lake Tahoe Air Basin): Particles in sufficient amount to produce an extinction coefficient of 0.23 per kilometer when the relative humidity is less than 70 percent. This standard is intended to limit the frequency and severity of visibility impairment due to regional haze and is equivalent to a 10-mile nominal visual range.

9 The 8-hour CA ozone standard was approved by the Air Resources Board on April 28, 2005 and became effective on May 17, 2006.

10 U.S EPA lowered the 24-hour $PM_{2.5}$ standard from 65 µg/m³ to 35 µg/m³ in 2006. EPA designated the Bay Area as nonattainment of the $PM_{2.5}$ standard on October 8, 2009. The effective date of the designation is December 14, 2009 and the Air District has three years to develop a plan, called a State Implementation Plan (SIP), that demonstrates the Bay Area will achieve the revised standard by December 14, 2014. The SIP for the new $PM_{2.5}$ standard must be submitted to the US EPA by December 14, 2012.

11 To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100ppm (effective January 22, 2010).

Source: Bay Area Air Quality Management District 2010

State Plans, Policies, Regulations, and Laws

ARB is the agency responsible for coordination and oversight of State and local air pollution control programs in California and for implementation of the California Clean Air Act (CCAA). The CCAA, which was adopted in 1988, required ARB to establish California ambient air quality standards (CAAQS), ARB has established CAAQS for sulfates, hydrogen sulfide, vinyl chloride, visibility-reducing particulate matter, and the above-mentioned criteria air pollutants.

In most cases, the CAAQS are more stringent than the NAAQS. Differences in the standards are generally explained through interpretation of the health-effects studies considered during the standard-setting process. In addition, the CAAQS incorporate a margin of safety to protect sensitive individuals.

The CCAA requires that all local air districts in the state endeavor to achieve and maintain the CAAQS by the earliest practical date. The act specifies that local air districts shall focus particular attention on reducing the emissions from transportation and area wide emission sources, and provides districts with the authority to regulate indirect sources.

Other ARB responsibilities include, but are not limited to: overseeing compliance by local air districts with California and federal laws; approving local air quality plans, submitting SIPs to EPA; monitoring air quality; determining and updating area designations and maps; and setting emissions standards for new mobile sources, consumer products, small utility engines, off-road vehicles, and fuels.

Toxic Air Contaminants

TACs are primarily regulated through state and local risk management programs. These programs are designed to eliminate, avoid, or minimize the risk of adverse health effects from exposures to TACs. TACs in California are regulated through the Tanner Air Toxics Act (AB 1807) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588).

A chemical becomes a regulated TAC in California based on designation by the California Office of Environmental Health Hazard Assessment (OEHHA). As part of its jurisdiction under Air Toxics Hot Spots Program (Health and Safety Code Section 44360(b)(2)), OEHHA derives cancer potencies and reference exposure levels (RELs) for individual air contaminants based on scientific knowledge of effects on the health of infants, children, and other sensitive subpopulations, in accordance with the mandate of the Children's Environmental Health Protection Act (Health and Safety Code Sections 39669.5 et seq.) (BAAQMD 2010).

To date, ARB has identified over 21 TACs, and adopted the EPA's list of HAPs as TACs. Most recently, diesel PM was added to the ARB list of TACs. Once a TAC is identified, the ARB adopts an Airborne Toxics Control Measure (ATCM) for sources that emit that particular TAC. If there is a safe threshold for a substance at which there is no toxic effect, the control measure must reduce exposure below that threshold. If there is no safe threshold, the measure must incorporate BACT to minimize emissions.

The Hot Spots Act requires that existing facilities that emit toxic substances above a specified level prepare a toxic-emission inventory, prepare a risk assessment if emissions are significant, notify the public of significant risk levels, and prepare and implement risk reduction measures.

The ARB has adopted diesel exhaust control measures and more stringent emission standards for various on-road mobile sources of emissions including transit buses, and off-road diesel equipment (e.g., tractors, generators). The Air Resources Board (ARB) approved a new regulation in December 2008 to significantly reduce emissions from existing on-road diesel vehicles operating in California. The regulation requires affected trucks and buses to meet performance requirements between 2011 and 2023. By January 1, 2023, all vehicles must have a 2010 model year engine or equivalent.

Over time, the replacement of older vehicles will result in a vehicle fleet that produces substantially less TACs than under current conditions. Mobile-source emissions of TACs (e.g., benzene, 1-3-butadiene, diesel PM) have been reduced significantly over the last decade, and will be reduced further in California through a progression of regulatory measures [e.g., Low Emission Vehicle (LEV)/Clean Fuels and Phase II reformulated gasoline regulations) and control technologies. With implementation of ARB's Risk Reduction Plan, it was expected that diesel PM concentrations will be reduced by 75 percent in 2010 and 85 percent in 2020 from the estimated year 2000 level. At the time of the writing of this document the ARB had not verified whether the 75% target had been met (Taricco 2010).

Adopted regulations are also expected to continue to reduce formaldehyde emissions from cars and light-duty trucks. As emissions are reduced, it is expected that risks associated with exposure to the emissions will also be reduced.

To help provide information on land use compatibility and TAC sources, ARB published the *Air Quality and Land Use Handbook: A Community Health Perspective* in 2005 (ARB 2005). Although it is not a law or adopted policy, the handbook offers recommendations for reduction in impacts to sensitive receptors when siting uses that generate TACs, such as freeways and high-traffic roads, commercial distribution centers, rail yards, ports, refineries, dry cleaners, gasoline stations, and industrial facilities, to help keep children and other sensitive populations out of harm's way.

Regional and Local Plans, Policies, Regulations, and Ordinances

BAAQMD is involved in comprehensive planning, regulation, enforcement, technical innovation, and education related to air quality issues in the Bay Area (Exhibit AQ-2). The clean air strategy of BAAQMD includes the preparation of plans and programs for the attainment of ambient air quality standards, adoption and enforcement of rules and regulations, and issuance of permits for stationary sources. The district also inspects stationary sources, responds to citizen complaints, monitors ambient air quality and meteorological conditions, and implements other programs and regulations required by the CAA, CAAA, and CCAA. BAAQMD is the primary agency responsible for assuring that the National and California Ambient Air Quality Standards are attained and maintained in the Bay Area.

Source: AECOM 2008

Exhibit AQ-2 **BAAQMD Jurisdiction**

California Environmental Quality Act Guidelines and Thresholds of Significance

In June 2010, the BAAQMD released a revision to the previously adopted Air Quality Guidelines. This advisory document provides lead agencies, consultants, and project applicants with uniform procedures and California Environmental Quality Act (CEQA) significance thresholds for addressing air quality in environmental documents. The guide contains the following applicable components:

- criteria and thresholds for determining whether a project may have a significant adverse impact on air quality;
- specific procedures and modeling protocols for quantifying and analyzing impacts on air quality;
- methods available to mitigate impacts on air quality; and
- information for use in air quality assessments that will be updated more frequently, such as air quality data, regulatory setting, climate, and topography.

In the future, BAAQMD will act as a responsible agency under CEQA for many projects developed under the General Plan, coordinating with the City on environmental review where this relates to BAAQMD's permitting process, commenting on draft documents, and recommending mitigation measures to address potentially significant environmental impacts.

Rules and Regulations

In addition to the guidance provided by the Air District relative to CEQA compliance, projects in Suisun City are subject to certain BAAQMD rules and regulations in effect at the time of construction. Specific rules applicable to the construction of a proposed project may include, but are not limited to:

- Regulation 2, Rule 1: General Permit Requirements;
- Regulation 6: Particulate Matter and Visible Emissions;
- Regulation 8, Rule 3: Architectural Coatings; and
- Regulation 11, Rule 2: Asbestos.

BAAQMD regulates toxic air contaminants (TACs) consistent with federal and state law. BAAQMD limits emissions and public exposure to TACs through a number of programs and prioritizes TAC-emitting stationary sources based on the quantity and toxicity of the TAC emissions and the proximity of the facilities to sensitive receptors. State and local risk management programs are designed to eliminate, avoid, or minimize the risk of adverse health effects from exposures to TACs. A chemical becomes a regulated TAC in California based on designation by the California Office of Environmental Health Hazard Assessment (OEHHA). The specific toxicity values of each particular TAC as identified by OEHHA are listed in BAAQMD's Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants.

According to BAAQMD, evaluation of a new source of TACs should involve an assessment of whether the new source would increase risk levels, the hazard index, or $PM_{2.5}$ concentrations at nearby receptors; whether the source would be permitted by the BAAQMD; and whether the project would implement Best Available Control Technology for Toxics (T-BACT) (BAAQMD 2010). Some projects would generate TACs but would not be subject to permitting by BAAQMD, such as large retail centers, distribution centers, and other uses that attract large numbers of diesel-powered vehicles and equipment. BAAQMD has provided guidance on assessing community risk associated with such uses and mitigating for such risks, as appropriate.

Air Quality Plans

The BAAQMD is the primary agency responsible for comprehensive air pollution control in the Bay Area. The BAAQMD develops rules and regulations, establishes permitting requirements for stationary sources, inspects emission sources, and enforces such measures through educational programs or fines. The BAAQMD is also tasked with addressing the State's requirements established under the CCAA (e.g., bringing the Bay Area into attainment).

To bring the area into attainment for O_3 and PM, the BAAQMD had developed the 2000 Clean Air Plan (CAP), the 2005 Ozone Attainment Plan, and the Particulate Matter Implementation Schedule (BAAQMD November 9, 2005 Staff Report). The current Basin CAP, which was adopted by the BAAQMD Board of Directors on December 20, 2000, identifies the control measures that would be implemented through 2006 to reduce major sources of pollutants.

The Bay Area 2005 Ozone Attainment Plan includes control measures for ozone precursors (reactive organic gases (ROGs) and NOX), whereas the Particulate Matter Implementation Schedule addresses a variety of pollutants (including direct emissions of PM and gases that are PM precursors). The BAAQMD has drafted a new CAP anticipated to be approved in September 2010. The new CAP will:

- update the Bay Area 2005 Ozone Strategy in accordance with the requirements of the CCAA to implement "all feasible measures" to reduce ozone.
- consider the impacts of ozone control measures on particulate matter (PM), air toxics, and greenhouse gases in a single, integrated plan.
- review progress in improving air quality in recent years.
- establish emission control measures to be adopted or implemented in the 2009-2012 timeframe.

General Plan Issues and Opportunities

Land use planning decisions directly affect local air quality conditions and local generation of air pollution. Since transportation is a major source of both criteria pollutants and toxic air contaminants, the relationship between land use planning and transportation planning provides the opportunity to develop land use patterns that help to protect both public health and the environment.

A variety of land use, transportation, and design approaches are commonly used to reduce vehicular travel demand. There are many co-benefits of such strategies. To the extent that communities can make non-automobile trips (pedestrian, bicycle, transit) more practical for more residents, congestion can be improved for those that still need to drive. Land and transportation policies that reduce vehicle miles traveled (VMT) and promote alternatives to automobile travel can also reduce harmful air pollution (other than GHGs), enhance mobility, and reduce time spent commuting. Land-efficient development patterns, which reduce VMT and air pollution, can also reduce up-front and ongoing infrastructure costs (per unit).

Communities that provide for efficient transportation choices can reduce household and business costs. According to the 2008 Bureau of Labor Statistics' Consumer Expenditure Survey, transportation represents the second highest spending category at 16% (behind only housing at 35%) of total expenses for consumers (Bureau of Labor Statistics 2008). For the San Francisco Metropolitan Statistical Area, the transportation expenditure was 15.4%, and for the three largest metropolitan areas in California reported by the Bureau (Los Angeles, San Francisco, and San Diego), the transportation expenditure was 15.1%.

The proportion of household spending devoted to transportation has substantially increased during the last century as automobile dependence has increased (Johnson 2001). Pedestrian friendliness has been shown to increase home values (Cortright 2009). Encouraging reinvestment and revitalization of existing developed areas can reduce VMT, but also strengthens the local economy, provides additional sources of revenue to the City through additional development, and can alleviate blighted conditions (to the extent they are present prior to redevelopment).

With the direct air quality benefits, as well as the wide range of important co-benefits in mind, should the City incorporate the following concepts in the General Plan Update?

- **Accommodate land-efficient development patterns**. Land-efficient development patterns can increase the efficiency of infrastructure, enable travel by modes other than by car, and reduce trip lengths. All of these changes would also reduce air pollutant emissions. Land-efficient development patterns can be facilitated through as policy approach, standards, fee structures, and public facilities planning. Joint-use of public facilities for multiple purposes reduces the amount of land overall needed for such uses, which then can be used for development of homes, businesses, or other uses.
- **Mixed-Use Development**. Placing a variety of land use activities in proximity to each other (housing, shopping, employment, recreation, schools, etc) provides greater choice of mobility—people can walk, bike, or take transit to meet daily needs. This strategy also makes the trips that must occur in a car shorter.
- **Increasing connectivity**. With the surrounding waterbodies, the railroad, and State Highway 12, connectivity is a challenge for Suisun City. However, a highly-connected transportation network can shorten trip lengths and allow land uses to be placed closer in proximity to one another and along direct routes. A roadway network that is not well-connected requires users to travel long distances to destinations that are close as the crow flies, increases trip lengths, and creates obstacles for walking, bicycling, and transit access.
- **Facilities**. Safe and convenient bike lanes, pedestrian pathways, transit shelters, and other transportation facilities that are incorporated into a comprehensive transportation network can also encourage mode shift from vehicles, thereby reducing air pollution. There may be additional opportunities to expand and connect existing trails with future trail corridors. The City has a unique because of its location on the Capital Corridor to take advantage of regional transit facilities.
- **Housing and Employment**. Work-related trips and associated air pollution can be reduced by placing jobs and housing closer to one another. The most effective local strategies seek to attract businesses and industries that are a good match for the current and anticipated labor force and to accommodate a variety of housing types that meet the needs of that labor force.

References

Bay Area Air Quality Management District. 1999 (December). BAAQMD CEQA Guidelines. Available at <www.baaqmd.gov/pln/ceqa/index.htm>. San Francisco, CA.

______.2006. BAAQMD Plans. Available at <www.baaqmd.gov/pln/ceqa/index.htm>. San Francisco, CA.

______.2010 (June). California Environmental Quality Act Guidelines. Available at: http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES/Updated-CEQA-Guidelines.aspx

Bureau of Labor Statistics. Consumer Expenditure Survey, 2008. Available online at: http://www.bls.gov/cex/#tables.

California Air Resources Board. 2005. Air Quality and Land Use Handbook: A Community Health Perspective. Sacramento, CA.

______.2009a. The 2009 California Almanac of Emissions and Air Quality. Sacramento, CA.

______.2006b. Area Designation Maps / State and National. Available at www.arb.ca.gov/desig/adm/adm.htm#state. Accessed October 2006.

______.2006c. Air Quality Data Statistics. Available at www.arb.ca.gov/adam/welcome.html. Accessed October 2006.

______.2006d. Air Resources Board 2005 Emissions Inventory. Available at <www.arb.ca.gov/ei/ei.htm>. Accessed October 2006.

______.2009. 2008 Emissions Inventory. Available: <http://www.arb.ca.gov/ei/maps/statemap/cntymap.htm>. Accessed August 6, 2010.

David S. Johnson, John M. Rogers and Lucilla Tan, "A Century of Family Budgets in the United States," Monthly Labor Review (www.bls.gov/opub/mlr/2001/05/art3full.pdf), May, 2001.

Godish, T. 1991. Air Quality. Lewis Publishers. Chelsea, MI.

Joe Cortright, Impresa, Inc., for CEOs for Cities. "Walking the Walk: How Walkability Raises Home Values in U.S. Cities." August 2009.

National Oceanic and Atmospheric Administration. 1992. Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1961–1990. Asheville, NC.

Sacramento Metropolitan Air Quality Management District. 2006. CEQA Planning Information. Available < http://www.airquality.org/cleanairplan/index.shtml>. Accessed October 2006.

Taricco, Peggy California Air Recourses Board Personal communication. 2010 regarding status of California reaching the diesel reduction plan target of 75% reduction of diesel emissions by 2010. August 25, 2010.

U.S. Environmental Protection Agency (EPA). 2006a. Criteria Air Pollutant Information and Attainment Designations. Available <http://www.epa.gov>. Accessed October 2006.

U.S. Environmental Protection Agency (EPA), 2006b National Ambient Air Quality Standards (NAAQS). Available at www.epa.gov/air/criteria.html. Accessed: October 2006.

Weather Underground. 2010 Available online at http://www.wunderground.com/weatherstation/WXDailyHistory.asp?ID=MCQ138&day=9&year=2010&month=9&graphspan=year accessed September 9, 2010.