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Introduction

This working paper creates a foundation for updating the goals, policies, and programs in the Amador County General Plan related to air quality.

General plan policies related to air quality are designed to help predict and maintain county air quality to within standards set by the state and federal governments. Chronic exposure to air pollutants is a serious health risk to millions of California residents, particularly the young, the elderly, and people with heart disease and respiratory problems. Safeguarding public health has been the primary focus of federal and state air quality legislation and activities for many years. Air pollution also impacts local economies by damaging agricultural crops, natural vegetation, buildings, and other exposed materials. In addition, the economic health of an area can be affected adversely if insufficient air quality improvement triggers more stringent federally mandated air pollution controls on business. Air pollution also can impair visibility and obscure views. With proper planning, mitigation, and cooperation, air quality can be maintained to a comfortable level for all parties involved.

The responsibility of the local governments must be to "analyze and quantify" pollutant levels and the extent of emissions through actual measurement and/or the use of air modeling. Technical data relating to mobile and stationary sources must be collected and synthesized into a set of policies and programs that minimizes air pollutant impacts. The general plan must include implementation measures and possible solutions to existing and foreseeable air pollution problems. Furthermore, the policies and standards must be sufficient to serve as a guideline for compliance with air quality control requirements and directly correlate to the land use, circulation, and housing elements.

General plan policies related to air quality must be used to guide decisions concerning land use and the location of new roads and transit facilities since these are common sources of air pollutants. The air pollutant levels from existing land uses, including mining, agricultural, and industrial activities, must be closely analyzed to ensure compatibility, especially where residential and other sensitive receptors have encroached into areas previously occupied by these uses.

This paper was guided by public comments and input from the General Plan Advisory Committee (GPAC), which served to focus the analysis of relevant information. This paper includes a review of the Amador County General Plan with regards to air quality and analysis relative to current state requirements.

Scope

This working paper addresses topics of importance to residents as related to the air quality in Amador County, as well as requirements of State of California Government Code for general plans regarding air quality and the California Environmental Quality Act (CEQA). Major issues of concern related to air quality include major mobile sources

(e.g., roadways, railways, airports), stationary sources (e.g., industrial plants) and the location of sensitive land use types (e.g., residential, schools, and hospitals).

Public Comments

As part of the general plan update process, Amador County conducted five public workshops in September 2006 to receive comments and concerns from county residents to identify key issues of concern. In addition, the GPAC began meeting in July 2006 to craft a vision statement for the general plan and to prioritize issues to be addressed in the plan. Comments and concerns received from county residents will be considered as part of updating the general plan, including the following:

- ✓ Maintaining air quality in order to continue enjoying scenic vistas,
- ✓ Improving air quality by encouraging alternative transportation modes (electric vehicle, bicycle),
- ✓ Managing pollution from activities such as winter fires, and
- ✓ Land use designations keeping pace with growth.

State Requirements

The State of California Government Code does not require general plan air quality elements. However, the requirements set forth in the CEQA are discussed below.

California Environmental Quality Act Requirements

The Amador County General Plan update is considered a project of regional significance under CEQA. A program environmental impact report (program EIR) will be prepared that describes potential impacts to the environment that may result from adopting and implementing the general plan.

One of the purposes of this working paper is to establish the environmental setting, or existing conditions, within the county related to air quality, which would serve as a baseline for determining potential environmental impacts. For purposes of CEQA, this working paper provides baseline information related to potential environmental impacts as identified in Appendix G-III of the State CEQA Guidelines. The thresholds of significance listed in Appendix G-III are as follows:

Would adoption and implementation of the General Plan result in:

- ✓ Conflict with or obstruct implementation of the applicable air quality plan?
- ✓ Violate any air quality standard or contribute substantially to an existing or projected air quality violation?
- ✓ Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state

ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

- ✓ Expose sensitive receptors to substantial pollutant concentrations?
- ✓ Create objectionable odors affecting a substantial number of people?

Analysis of these potential impacts will occur within the Program EIR after a Draft General Plan is completed and circulated for public review. However, the County desires to use the baseline information in this report as one means of creating policies and implementation measures that will, to the greatest extent possible and in consideration of other important County goals, incorporate mitigations of potentially significant impacts into the General Plan itself.

Regulatory Background

Air quality within Amador County is regulated by the U.S. Environmental Protection Agency (EPA), California Air Resources Board (ARB), and Amador County Air Pollution Control District (ACAPCD). 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

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 made by Congress were in 1990.

The CAA required EPA to establish national ambient air quality standards (NAAQS). As shown in Table AQ-1, EPA has established primary and secondary NAAQS for the following criteria air pollutants: ozone, CO, NO_2, SO_2, respirable and fine particulate matter (PM_{10} and $PM_{2.5}$), and lead. The primary standards protect the public health and the secondary standards protect 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.

Table AQ-1
Summary of Ambient Air Quality Standards and Amador County Attainment Status

Pollutant	Averaging Time	California		National [1]		
		Standards [2,3]	Attainment Status [4]	Primary [3,5]	Secondary [3,6]	Attainment Status [7]
Ozone	1-hour	0.09 ppm (180 $\mu g/m^3$)	N	– [9]	Same as Primary Standard	–
	8-hour	0.07 ppm[8] (137 $\mu g/m^3$)	–	0.08 ppm (157 $\mu g/m^3$)		N
Carbon Monoxide (CO)	1-hour	20 ppm (23 mg/m^3)	U	35 ppm (40 mg/m^3)	–	U/A
	8-hour	9 ppm (10 mg/m^3)		9 ppm (10 mg/m^3)		
Nitrogen Dioxide (NO_2) [12]	Annual Arithmetic Mean	0.03 ppm (56 $\mu g/m^3$)	–	0.053 ppm (100 $\mu g/m^3$)	Same as Primary Standard	U/A
	1-hour	0.18 ppm (338 $\mu g/m^3$)	A	–		–
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	–	–	0.030 ppm (80 $\mu g/m^3$)	–	U
	24-hour	0.04 ppm (105 $\mu g/m^3$)	A	0.14 ppm (365 $\mu g/m^3$)	–	
	3-hour	–	–	–	0.5 ppm (1300 $\mu g/m^3$)	
	1-hour	0.25 ppm (655 $\mu g/m^3$)	A	–	–	–
Respirable Particulate Matter (PM_{10})	Annual Arithmetic Mean	20 $\mu g/m^3$	U	[11]	Same as Primary Standard	U
	24-hour	50 $\mu g/m^3$		150 $\mu g/m^3$		
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 $\mu g/m^3$	U	15 $\mu g/m^3$	Same as Primary Standard	U/A
	24-hour	–	–	35 $\mu g/m^3$		
Lead [10]	30-day Average	1.5 $\mu g/m^3$	A	–	–	–
	Calendar Quarter	–	–	1.5 $\mu g/m^3$	Same as Primary Standard	U/A
Sulfates	24-hour	25 $\mu g/m^3$	A	No National Standards		
Hydrogen Sulfide	1-hour	0.03 ppm (42 $\mu g/m3$)	U			
Vinyl Chloride 10	24-hour	0.01 ppm (26 $\mu g/m3$)	U/A			
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: $\mu g/m^3$ = micrograms per cubic meter; mg/m^3 = milligrams per cubic meter; ppm = parts per million

[1] National standards (other than ozone, particulate matter [PM], and those based on annual averages or annual arithmetic means) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. The PM_{10} 24-hour standard is attained when 99% of the daily concentrations, averaged over 3 years, are equal to or less than the standard. The $PM_{2.5}$ 24-hour standard is attained when 98% of the daily concentrations, averaged over 3 years, are equal to or less than the standard. Contact EPA for further clarification and current federal policies.

[2] California standards for ozone, CO (except Lake Tahoe), SO_2 (1- and 24-hour), NO_2, PM, 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 (CAAQS) are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

[3] Concentration expressed first in units in which it was promulgated (i.e., ppm or $\mu g/m^3$). Equivalent units given in parentheses are based upon a reference temperature of 25°C and a reference pressure of 760 torr. Most measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

[4] Unclassified (U): A pollutant is designated unclassified if the data are incomplete and do not support a designation of attainment or nonattainment.
Attainment (A): A pollutant is designated attainment if the state standard for that pollutant was not violated at any site in the area during a 3-year period.
Nonattainment (N): A pollutant is designated nonattainment if there was a least one violation of a state standard for that pollutant in the area.
Nonattainment/Transitional (NT): A subcategory of the nonattainment designation. An area is designated nonattainment/transitional to signify that the area is close to attaining the standard for that pollutant.

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

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

[7] Nonattainment (N): Any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.
Attainment (A): Any area that meets the national primary or secondary ambient air quality standard for the pollutant.
Unclassifiable (U): Any area that cannot be classified on the basis of available information as meeting or not meeting the national primary or secondary ambient air quality standard for the pollutant.

[8] This concentration effective May 17, 2006.

[9] The 1-hour ozone national ambient air quality standard was revoked on June 15, 2005.

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

[11] Because of a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual PM_{10} standard on September 21, 2006.

[12] The CAAQS were amended on February 22, 2007, to lower the 1-hour standard to 0.18 ppm and establish a new annual standard of 0.03 ppm. These changes become effective after regulatory changes are submitted and approved by the Office of Administrative Law, expected later this year.

Sources: ARB 2007a, 2007b; EPA 2007b

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 must review all state SIPs to determine whether they conform to the mandates of the CAA and the amendments thereof, and to determine whether implementing them will achieve air quality goals. If EPA determines a SIP to be inadequate, a Federal Implementation Plan that imposes additional control measures may be prepared for the nonattainment area. Failure to submit an approvable SIP or to implement the plan within the mandated time frame may cause sanctions to be applied to transportation funding and stationary air pollution sources in the air basin.

State

ARB is the agency responsible for coordination and oversight of state and local air pollution control programs in California and for implementing the California Clean Air Act (CCAA). The CCAA, which was adopted in 1988, required ARB to establish California ambient air quality standards (CAAQS) (Table AQ-1). 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 by the health effects studies considered during the standard-setting process and the interpretation of the studies. 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 should focus particular attention on reducing the emissions from transportation and areawide emission sources, and provides districts with the authority to regulate indirect sources.

Regional and Local

The role of ACAPCD is to achieve clean air to protect public health and the environment. ACAPCD's primary responsibility is for attaining and maintaining NAAQS and CAAQS. ACAPCD is responsible for adopting and enforcing rules and regulations concerning air pollutant sources, issuing permits for stationary sources of air pollutants, inspecting stationary sources of air pollutants, responding to citizen complaints, and monitoring ambient air quality and meteorological conditions.

ACAPCD rules and regulations include, but are not limited to:

- ✓ Rule 218—Fugitive Dust Emissions,
- ✓ Rule 302—Air Pollution Permit,
- ✓ Rule 307—Agricultural Burning,

- ✓ Rule 500—Procedures for Issuing Permits to Operate for Sources Subject to Title V of the CAAA.

Air quality legislation now mandates all transportation plans to consider air quality. In the past, transportation planning emphasized the construction of new roadway capacity to reduce congestion and to meet the needs of planned development. This new emphasis requires land use and transportation plans to create patterns of development and transportation infrastructure that reduce the need for new capacity and improve air quality.

Toxic Air Contaminants

Air quality regulations also focus on toxic air contaminants (TACs), or in federal parlance hazardous air pollutants (HAPs). A TAC 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 of concern for projects in Amador County is diesel particulate matter from mobile sources of emissions. Examples of TACs are discussed in detail below in the section "Existing Air Quality/Toxic Air Contaminants." TACs 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 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 (Table AQ-1). 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 districts, establish the regulatory framework for TACs.

Federal Programs for Hazardous Air Pollutants

EPA has programs for identifying and regulating HAPs. Title III of the CAAA directed EPA to promulgate national emissions standards for HAPs (NESHAP). The NESHAP may differ for major sources than for area sources of HAPs. 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 HAPs; all other sources are considered area sources. The CAAA called on EPA to promulgate emissions standards in two phases. In the first phase (1992–2000), 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), EPA is 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 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 of the CAAA required the use of reformulated gasoline in selected areas with the most severe ozone nonattainment conditions to further reduce mobile-source emissions.

State and Local Programs for Toxic Air Contaminants

TACs in California are regulated primarily through the Tanner Air Toxics Act (AB 1807 [Statutes of 1983]) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588 [Statutes of 1987]). AB 1807 sets forth a formal procedure for ARB to designate substances as TACs. Research, public participation, and scientific peer review must occur before ARB can designate a substance as a TAC. To date, ARB has identified more than 21 TACs and adopted EPA's list of HAPs as TACs. Most recently, diesel PM was added to the ARB list of TACs.

Once a TAC is identified, ARB then 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.

AB 2588 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.

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). In February 2000, ARB adopted a new public-transit bus fleet rule and emission standards for new urban buses. These new rules and standards provide for more stringent emission standards for some new urban bus engines, beginning with 2002 model year engines; zero-emission bus demonstration and purchase requirements applicable to transit agencies; and reporting requirements, under which transit agencies must demonstrate compliance with the public-transit bus fleet rule. Upcoming milestones include the low-sulfur diesel fuel requirement and tighter emission standards for heavy-duty diesel trucks (2007) and off-road diesel equipment (2011) nationwide. Over time, the replacement of older vehicles will result in a vehicle fleet that produces substantially lower levels of 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/Clean Fuels and Phase II reformulated gasoline regulations) and control technologies. With implementation of ARB's Risk Reduction Plan, it is expected that diesel PM concentrations will be reduced by 75% in 2010 and 85% in 2020 from the estimated year-2000 level. 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.

ARB published the Air Quality and Land Use Handbook: A Community Health Perspective, which provides guidance concerning land use compatibility with TAC sources (ARB 2005). While not a law or adopted policy, the handbook offers advisory recommendations for the siting of sensitive receptors near uses associated with 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. A number of comments on the handbook were provided to ARB by air districts, other agencies, real estate representatives, and others. The comments included concern over whether ARB was playing a role in local land use planning, the validity of relying on static air quality conditions over the next several decades in light of technological improvements, and support for providing information that can be used in local decision making.

At the local level, air pollution control or management districts may adopt and enforce ARB control measures. Under ACAPCD Rule 302 ("Air Pollution Permit"), Rule 427 ("Regulating Construction or Reconstructions of Major Sources of HAPs"), Rule 500 ("Procedures for Issuing Permits to Operate for Sources Subject to Title V of the CAAA"), and Rule 900 ("General ACTMs"), all sources that possess the potential to emit TACs are required to obtain permits from ACAPCD. Permits may be granted to these operations if they are constructed and operated in accordance with applicable regulations, including new-source review standards and air-toxics control measures. ACAPCD limits emissions and public exposure to TACs through a number of programs. ACAPCD prioritizes TAC-emitting stationary sources based on the quantity and toxicity of the TAC emissions and the proximity of the facilities to sensitive receptors.

Sources that require a permit are analyzed by ACAPCD (e.g., in a health risk assessment) based on their potential to emit toxics. If it is determined that the project would emit toxics in excess of ACAPCD's threshold of significance for TACs, sources must implement the best available control technology for TACs (T-BACT) to reduce emissions. If a source cannot reduce the risk below the threshold of significance even after T-BACT has been implemented, ACAPCD will deny the permit required by the source. This helps to prevent new problems and reduces emissions from existing older sources by requiring them to apply new technology when retrofitting with respect to TACs.

Odors

ACAPCD has established a nuisance rule to address odor issues. Rule 205 states that a person shall not discharge from any source whatsoever such quantities of air contaminants or other material which can cause injury, detriment, nuisance, or annoyance to any considerable number of persons, or to the public, or which endanger the comfort, repose, health or safety of any such persons, or the public, or which have a natural tendency to cause injury or damage to business or property. The provisions of Rule 205 do not apply to odors emanating from agricultural operations necessary for the growing of crops or the raising of fowl or animals.

Greenhouse Gas Emissions

Assembly Bill 32, the California Climate Solutions Act of 2006

In September 2006, Governor Arnold Schwarzenegger signed AB 32, the California Climate Solutions Act of 2006. AB 32 requires that statewide GHG emissions be reduced to 1990 levels by 2020. This reduction will be accomplished through an enforceable statewide cap on GHG emissions that will be phased in starting in 2012. To effectively implement the cap, AB 32 directs ARB to develop and implement regulations to reduce statewide GHG emissions from stationary sources. AB 32 specifies that regulations adopted in response to AB 1493 should be used to address GHG emissions from vehicles. However, AB 32 also includes language stating that if the AB 1493 regulations cannot be implemented, then ARB should develop new regulations to control vehicle GHG emissions under the authorization of AB 32.

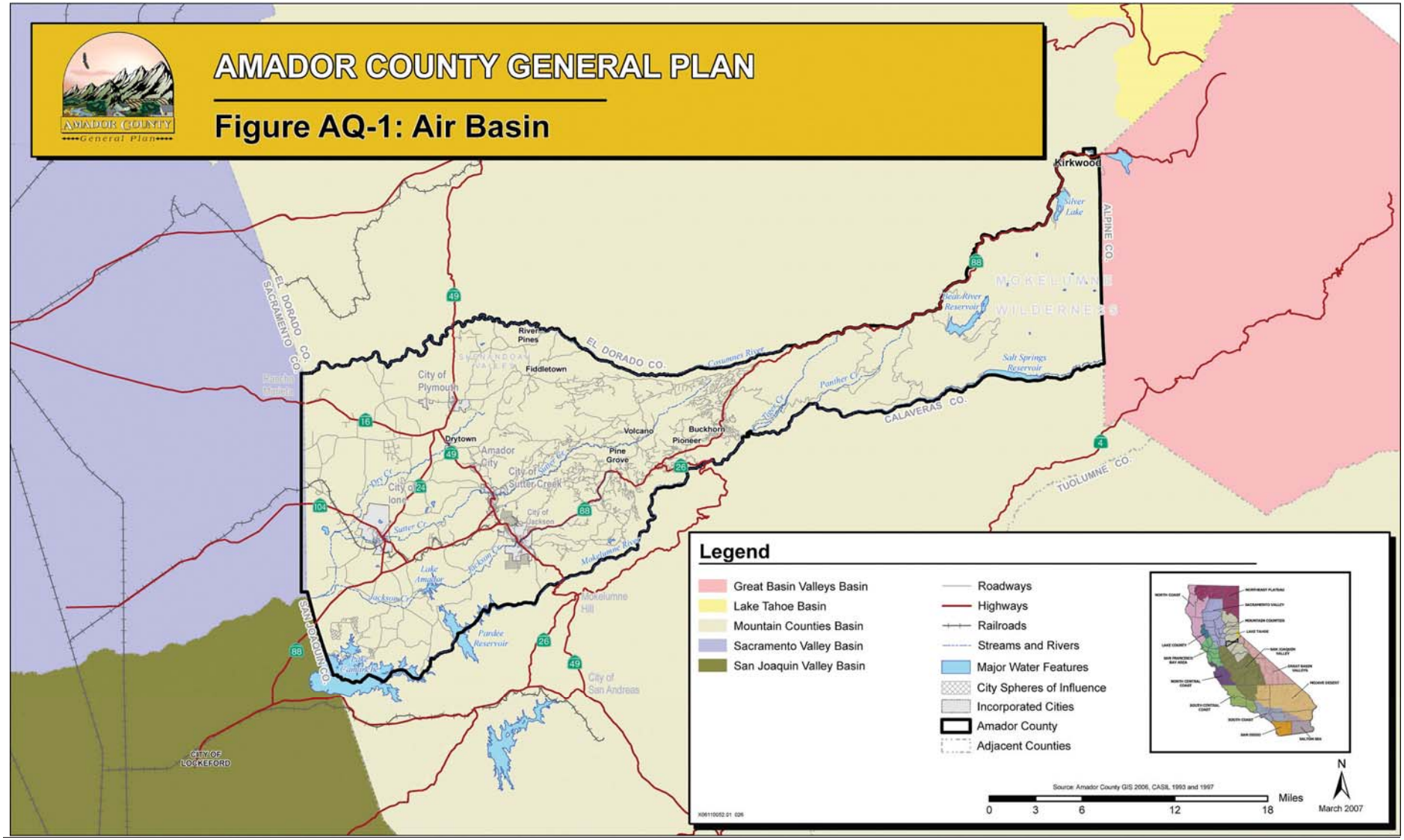
AB 32 requires that ARB adopt a quantified cap on GHG emissions representing 1990 emissions levels and disclose how it arrives at the cap; institute a schedule to meet the emissions cap; and develop tracking, reporting, and enforcement mechanisms to ensure that the state achieves the reductions in GHG emissions necessary to meet the cap. AB 32 also includes guidance to institute emissions reductions in an economically efficient manner and conditions to ensure that businesses and consumers are not unfairly affected by the reductions.

Current Conditions

The following sections are provided for consideration by the GPAC with regard to air quality. Together, they describe the current air conditions in Amador County. Amador County is located in the Mountain Counties Air Basin (MCAB) (Refer to Figure AQ-1). Ambient concentrations of air pollutant emissions are determined by the amount of emissions released by 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 the presence of sunlight. Therefore, existing air quality conditions in the county are determined by such natural factors as topography, climate, and meteorology, in addition to the amount of emissions released by existing air pollutant sources, as discussed separately below.

Topography, Climate, and Meteorology

Amador County is located in the middle of the MCAB (Refer to Figure AQ-1). The MCAB lies along the northern Sierra Nevada mountain range, close to or contiguous with the Nevada border, and covers an area of roughly 11,000 square miles. The western slope of Amador County, from Alpine County on the east to the Sacramento and San Joaquin County boundaries on the west, lies within the MCAB. Elevations range from over 10,000 feet at the Sierra crest down to several hundred feet above sea level at the Sacramento County boundary.


AMADOR COUNTY GENERAL PLAN
Figure AQ-1: Air Basin
Kirkwood
Silver Lake
ALPINE CO.
MOKELUMNE WILDERNESS
Upper Bear River Reservoir
Salt Springs Reservoir
EL DORADO CO.
SACRAMENTO CO.
River Pines
Fiddletown
City of Plymouth
Drytown
Amador City
Volcano
Buckhorn
Pioneer
Pine Grove
City of Sutter Creek
City of Ione
City of Jackson
Lake Amador
Pardee Reservoir
Mokelumne Hill
City of San Andreas
CALAVERAS CO.
TUOLUMNE CO.
SAN JOAQUIN CO.
CITY OF LOCKEFORD
Legend
Great Basin Valleys Basin
Lake Tahoe Basin
Mountain Counties Basin
Sacramento Valley Basin
San Joaquin Valley Basin
Roadways
Highways
Railroads
Streams and Rivers
Major Water Features
City Spheres of Influence
Incorporated Cities
Amador County
Adjacent Counties
Source: Amador County GIS 2006, CASIL 1993 and 1997
0 3 6 12 18 Miles
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March 2007

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Throughout the county, the topography is highly variable, and includes rugged mountain peaks and valleys with extreme slopes and differences in altitude in the Sierras, as well as rolling foothills to the west. The general climate of the MCAB varies considerably with elevation and proximity to the Sierra ridge. The terrain features of the basin make it possible for several climates to exist in relatively close proximity. The pattern of mountains and hills causes a wide variation in rainfall, temperature, and localized winds throughout the basin. Temperature variations have an important influence on basin wind flow, dispersion along mountain ridges, vertical mixing, and photochemistry.

The Sierra Nevada receives large amounts of precipitation from storms moving in from the Pacific in the winter, with lighter amounts from intermittent "Monsoonal" moisture flows from the south and cumulus buildup in the summer. Precipitation levels are high in the highest mountain elevations but decline rapidly toward the western portion of the basin. Winter temperatures in the mountains can be below freezing for weeks at a time, and substantial depths of snow can accumulate, but in the western foothills, winter temperatures usually dip below freezing only at night and precipitation is mixed as rain or light snow. In the summer, temperatures in the mountains are mild, with daytime peaks in the 70s to low 80s °F, but the western end of the county can routinely exceed 100 °F. From an air quality perspective, the topography and meteorology of the MCAB combine such that local conditions predominate in determining the effect of emissions in the basin.

Regional airflows are affected by the mountains and hills, which direct surface air flows, cause shallow vertical mixing, and create areas of high pollutant concentrations by hindering dispersion.

Inversion layers, where warm air overlays cooler air, frequently occur and trap pollutants close to the ground. In the winter, these conditions can lead to CO "hotspots" along heavily traveled roads and at busy intersections. During summer's longer daylight hours, stagnant air, high temperatures, and plentiful sunshine provide the conditions and energy for the photochemical reaction between reactive organic compounds (ROG) and oxides of nitrogen (NO_X) that results in the formation of ozone. Because of its long formation time, ozone is a regional pollutant rather than a local hotspot problem.

In the summer, the strong upwind valley air flowing into the basin from the Central Valley to the west is an effective transport medium for ozone precursors and ozone generated in the Bay Area and the Sacramento and San Joaquin valleys. These transported pollutants predominate as the cause of ozone in the MCAB and are largely responsible for the exceedances of the CAAQS and NAAQS. ARB has officially designated the MCAB as "ozone impacted" by transport from those areas.

Criteria Air Pollutants

Concentrations of the following criteria air pollutants: ozone, CO, NO_2, SO_2, PM_{10}, $PM_{2.5}$, and lead 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 Amador County.

Ozone

Ozone is a photochemical oxidant, a substance whose oxygen combines chemically with another substance in the presence of sunlight, and is the primary component of smog. Ozone is not directly emitted 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 results from the combustion of fuels. A highly reactive molecule, ozone readily combines with many different components of the atmosphere. Consequently, high levels of ozone tend to exist only while high ROG and NO_X levels are present to sustain the ozone formation process. Once these precursors have been depleted, ozone levels rapidly decline. Because these reactions occur on a regional scale, ozone is considered a regional pollutant.

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 1991).

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 people with asthma and children, but healthy adults as well. Exposure to ambient levels of ozone ranging from 0.10 to 0.40 part per million (ppm) for 1–2 hours has been found to significantly alter lung functions by increasing respiratory rates and pulmonary resistance, decreasing tidal volumes (the amount of air inhaled and exhaled), 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 permeability of respiratory epithelia; such increased permeability leads to an increased response of the respiratory system to challenges, and a decrease in the immune system's ability to defend against infection (Godish 1991).

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% of the nationwide

CO emissions are from mobile sources. The other 23% 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 (EPA 2007b).

The highest CO concentrations are generally associated with cold, stagnant weather conditions that occur during the winter. In contrast to problems caused by ozone, which tends to be a regional pollutant, CO problems tend to be localized.

Nitrogen Dioxide

NO_2 is a brownish, highly reactive gas that is present in all urban environments. The major human-made sources of NO_2 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 NO_2 (EPA 2007b). The combined emissions of NO and NO_2 are referred to as NO_X and reported as equivalent NO_2. Because NO_2 is formed and depleted by reactions associated with photochemical smog (ozone), the NO_2 concentration in a particular geographical area may not be representative of the local NO_X emission sources.

Inhalation is the most common route of exposure to NO_2. Because NO_2 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 NO_2 intoxication after acute exposure has been linked on occasion with prolonged respiratory impairment with such symptoms as chronic bronchitis and decreased lung functions.

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 5 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.

Respirable and Fine Particulate Matter

Respirable particulate matter with an aerodynamic diameter of 10 micrometers or less is referred to as PM_{10}. PM_{10} consists of particulate matter emitted directly into the air, such as fugitive dust, soot, and smoke from mobile and stationary sources, construction operations, fires and natural windblown dust, and particulate matter formed in the atmosphere by condensation and/or transformation of SO_2 and ROG (EPA 2007a). Fine particulate matter ($PM_{2.5}$) includes a subgroup of smaller particles that have an aerodynamic diameter of 2.5 micrometers or less (ARB 2006).

The adverse health effects associated with PM_{10} depend on the specific composition of the particulate matter. For example, health effects may be associated with metals, polycyclic aromatic hydrocarbons (PAH), and other toxic substances adsorbed onto fine particulate matter (referred to as the "piggybacking effect"), or with fine dust particles of silica or asbestos. Generally, adverse health effects associated with PM_{10} may result from both short-term and long-term exposure to elevated concentrations and may include breathing and respiratory symptoms, aggravation of existing respiratory and cardiovascular diseases, alterations to the immune system, carcinogenesis, and premature death (EPA 2007b). $PM_{2.5}$ poses an increased health risk because the particles can deposit deep in the lungs and may contain substances that are particularly harmful to human health.

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, the U.S. Environmental Protection Agency (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 (EPA 2007b).

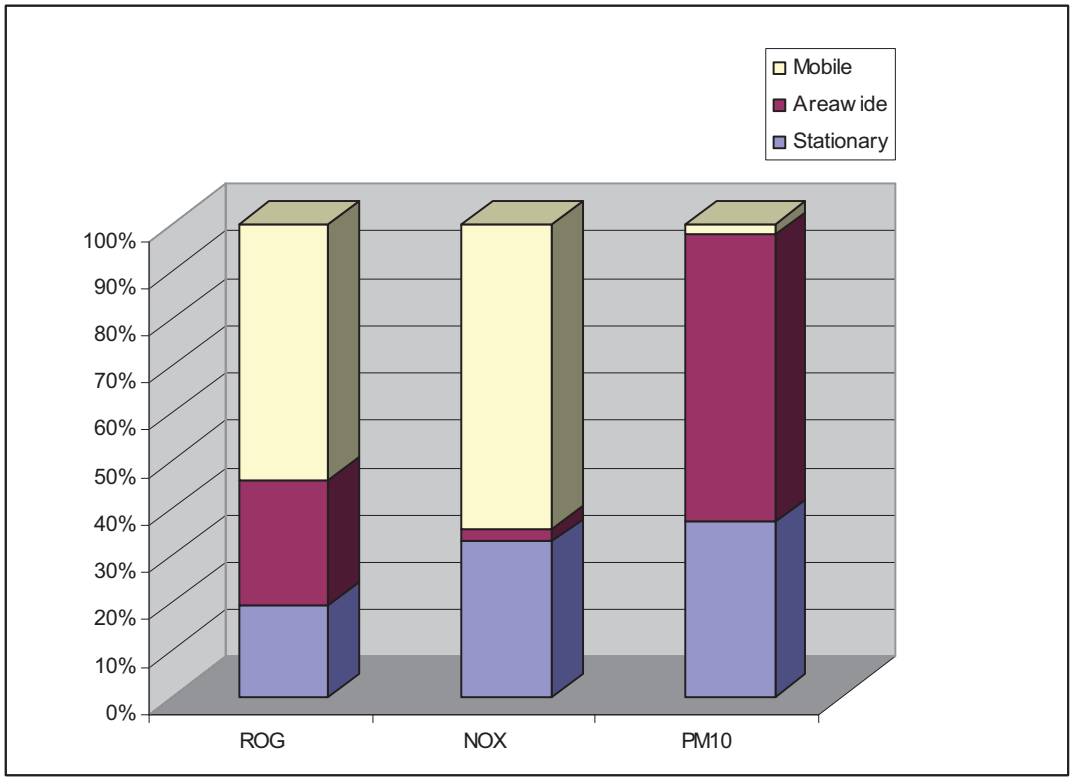
As a result of EPA's regulatory efforts to remove lead from gasoline, emissions of lead from the transportation sector have declined dramatically (95% between 1980 and 1999), and levels of lead in the air decreased by 94% between 1980 and 1999. Transportation sources, primarily airplanes, now contribute only 13% of lead emissions. A National Health and Nutrition Examination Survey reported a 78% 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 (EPA 2007a).

The decrease in lead emissions and ambient lead concentrations over the past 25 years is California's most dramatic success story with regard to air quality management. 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 California Air Resources Board (ARB) regulations have virtually eliminated 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 identified lead as a toxic air contaminant (TAC).

Emissions Inventory and Sources

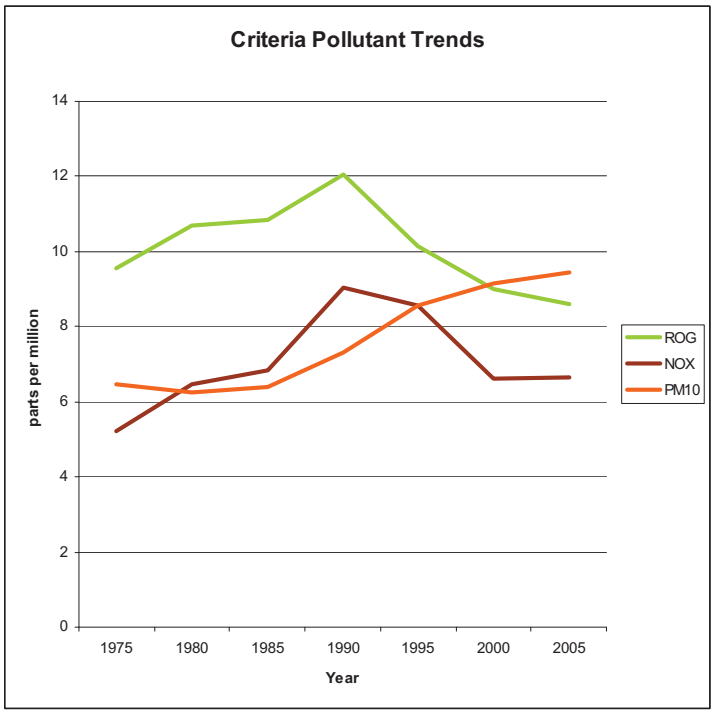
Figure AQ-2 summarizes emissions of criteria air pollutants within Amador County for various source categories (ARB 2007c). According to Amador's emissions inventory,

Figure AQ-2: Amador County Emissions Inventory [1]



[1] On-road sources include automobiles, motorcycles, and trucks; other mobile sources (off-road mobile sources) include small off-road engines and equipment, off-road recreational vehicles, farm and construction equipment, forklifts, locomotives, commercial marine vessels, and marine pleasure craft. Stationary sources include non-mobile sources such as power plants, refineries, and manufacturing facilities. Area-wide sources of pollution are those where the emissions are spread over a wide area, such as consumer products, fireplaces, road dust, and farming operations. Natural sources are non-manmade emission sources, which include biological and geological sources, wildfires, windblown dust, and biogenic emissions from plants and trees. Source: ARB 2007c

Figure AQ-3 Amador County Criteria Air Pollutant Trends



Source: ARB 2006

mobile sources are the largest contributor to the estimated annual average air pollutant levels of ROG and NO_X, accounting for approximately 54% and 64%, respectively, of the total emissions. Areawide sources account for approximately 61% of the county's PM_{10} emissions.

Mobile Sources

On-road and other mobile sources are the largest contributors of ozone precursor emissions within Amador County. On-road sources consist of passenger vehicles, trucks, buses, and motorcycles, while off-road vehicles and other mobile sources are comprised of heavy-duty equipment, boats, aircraft, trains, recreational vehicles, and farm equipment.

State and federal legislation require local governments to include strategies to increase the efficiency of transportation infrastructure and to reduce vehicle trips in their transportation plans. Counties and cities can support these strategies by requiring developers to include infrastructure that reduces congestion or trips.

Transportation control measures (TCMs) are most effective when infrastructure is in place that supports alternative transportation modes. This would include community-wide transportation improvements and on-site improvements at individual worksites and businesses.

Stationary Sources

Major stationary sources of air pollutant emissions within Amador County include industrial processes, fuel combustion from electric utilities and other processes, waste disposal, surface coating and cleaning, petroleum production, and other sources. 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. Unpaved road dust is the largest contributor to particulate matter emissions within Amador County.

Existing land use patterns within the developed portions of Amador County are not highly conducive to walking, cycling, or transit use. The predominant development patterns force all local trips for shopping, recreation, school, as well as commute trips onto the arterial street system. This leads to ever wider, more congested arterial streets that in turn discourage people from walking or cycling to even nearby destinations.

Monitoring Station Data and Attainment Area Designations

Air pollutant concentrations are measured at several monitoring stations in the MCAB. The Jackson air quality monitoring station on Clinton Road is the only monitoring station in Amador County with sufficient data to meet EPA and ARB criteria for quality assurance. The San Andreas air quality monitoring station on Gold Strike Road in Calaveras County is located 15 miles south of Jackson. In general, the ambient air quality measurements from these monitoring stations are representative of the air quality in the county. Table AQ-2 summarizes the air quality data for these monitoring stations from the most recent three 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 2004 and federal attainment designations for the year 2006 for Amador County are shown in Table AQ-1 for each criteria air pollutant.

Table AQ-2
Summary of Annual Ambient Air Quality Data (2004–2006)

	2004	2005	2006
Jackson Monitoring Station			
Ozone			
Maximum concentration (1-hr/8-hr avg, ppm)	0.110/0.088	0.116/0.097	0.127/0.099
Number of days State standard exceeded (1-hr)	3	8	7
Number of days national 1-hr/8-hr standard exceeded	0/2	0/4	1/4
Carbon Monoxide			
Maximum concentration (1-hr/8-hr avg, ppm)	5.70/4.29	2.40/1.01	-/-
Number of days State standard exceeded	0	0	0
Number of days national standard exceeded	0	0	0
San Andreas Monitoring Station			
Ozone			
Maximum concentration (1-hr/8-hr avg, ppm)	0.111/0.088	0.126/0.098	0.134/0.106
Number of days State standard exceeded (1-hr)	7	9	13
Number of days national 1-hr/8-hr standard exceeded	0/4	1/8	2/14
Carbon Monoxide			
Maximum concentration (1-hr/8-hr avg, ppm)	1.60/1.06	1.20/0.59	-/-
Number of days State standard exceeded	0	0	0
Number of days national standard exceeded	0	0	0
Fine Particulate Matter (PM2.5)			
Maximum concentration (μg/m3)	24.0	21.0	23.0
Number of days national standard exceeded (measured2)	0	0	0
Respirable Particulate Matter (PM10)			
Maximum concentration (μg/m3)	33.0	34.0	42.0
Number of days State standard exceeded (measured1)	0	0	0
Number of days national standard exceeded (measured1)	0	0	0

Notes: μg/m3 = 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 2007d, EPA 2007c

Air Quality Trends

In general, air pollutant emissions and in particular one-hour ozone concentrations decreased between 1990 and 2000, mostly due to tighter vehicle emission controls. However, while the number of days in exceedance of the federal one-hour ozone standard have decreased (by approximately 45% between 1990 and 2000), the maximum concentrations did not decrease during the 1990s. Particulate matter emissions have not decreased in Amador County during the recent past, and in fact particulates are estimated to continue increasing in the immediate future. PM_{10} emissions are mostly attributable to airborne dust from roads, agricultural operations, and waste burning.

Toxic Air Contaminants

According to the 2006 California Almanac of Emissions and Air Quality (ARB 2006), 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 PM_{10} database, ambient PM_{10} 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 these 10 TACs mentioned (ARB 2006).

Odors

Odors are generally regarded as an annoyance rather than a health hazard. However, manifestations of a person's reaction to foul odors can range from psychological (e.g., irritation, anger, or anxiety) to physiological (e.g., circulatory and respiratory effects, nausea, vomiting, and headache).

The ability to detect odors varies considerably among the population and overall is quite subjective. Some individuals have the ability to smell very minute quantities of specific substances; others may not have the same sensitivity but may have sensitivities to odors of other substances. In addition, people may have different reactions to the same odor; an odor that is offensive to one person (e.g., fast food restaurant) may be perfectly acceptable to another. It is important to also note that an unfamiliar odor is more easily detected and is more likely to cause complaints than a familiar one. This is because of the phenomenon

known as odor fatigue, in which a person can become desensitized to almost any odor and recognition only occurs with an alteration in the intensity.

Quality and intensity are two properties present in any odor. The quality of an odor indicates the nature of the smell experience. For instance, if a person describes an odor as flowery or sweet, then the person is describing the quality of the odor. Intensity refers to the strength of the odor. For example, a person may use the word "strong" to describe the intensity of an odor. Odor intensity depends on the odorant concentration in the air. When an odorous sample is progressively diluted, the odorant concentration decreases. As this occurs, the odor intensity weakens and eventually becomes so low that the detection or recognition of the odor is quite difficult. At some point during dilution, the concentration of the odorant reaches a detection threshold. An odorant concentration below the detection threshold means that the concentration in the air is not detectable by the average human.

Greenhouse Gases and Global Climate Change

Various gases in the earth's atmosphere, classified as atmospheric greenhouse gases (GHGs), play a critical role in determining the earth's surface temperature. Solar radiation enters the earth's atmosphere from space. A portion of the radiation is absorbed by the earth's surface, and a smaller portion of this radiation is reflected back toward space. The earth emits this radiation, which was initially absorbed, back to space, but the properties of the radiation have changed from high-frequency solar radiation lower frequency infrared radiation. The frequencies at which bodies emit radiation are proportional to temperature. The earth has a much lower temperature than the sun; therefore, the earth emits lower frequency radiation. Most solar radiation passes through GHGs; however, infrared radiation is absorbed by these gases. As a result, radiation that otherwise would have escaped back into space is instead "trapped," resulting in a warming of the atmosphere. This phenomenon, known as the Greenhouse Effect, is responsible for maintaining a habitable climate on Earth. Without the Greenhouse Effect, Earth would not be able to support life as we know it.

Prominent GHGs contributing to the Greenhouse Effect are carbon dioxide (CO_2), methane (CH_4), ozone, nitrous oxide, hydrofluorocarbons, chlorofluorocarbons, and sulfur hexafluoride. Human-caused emissions of these GHGs in excess of natural ambient concentrations are responsible for intensifying the Greenhouse Effect and have led to a trend of unnatural warming of the earth's climate, known as global climate change or global warming (Ahrens 2003). Emissions of GHGs contributing to global climate change are attributable in large part to human activities associated with the industrial/manufacturing, utility, transportation, residential, and agricultural sectors (CEC 2006a). In California, the transportation sector is the largest emitter of GHGs, followed by electricity generation (CEC 2006a). Emissions of CO_2 are byproducts of fossil fuel combustion. Methane, a highly potent GHG, results from off-gassing (the release of chemicals from nonmetallic substances under ambient or greater pressure conditions) associated with agricultural practices and landfills. CO_2 sinks, or reservoirs, include sequestration by vegetation or dissolution into the ocean, among other processes.

Climate change is a global problem. GHGs are global pollutants, unlike criteria air pollutants and TACs, which are pollutants of regional and local concern, respectively. California is the 12th to 16th largest emitter of CO_2 in the world (CEC 2006a). California produced 492 million gross metric tons of carbon dioxide equivalent in 2004 (CEC 2006a). Carbon dioxide equivalent is a measurement used to account for the fact that different GHGs have different potential to retain infrared radiation in the atmosphere and contribute to the Greenhouse Effect. This potential, known as the global warming potential of a GHG, is dependent on the lifetime, or persistence, of the gas molecule in the atmosphere. For example, as described in Appendix C, "Calculation References," of the General Reporting Protocol of the California Climate Action Registry (2006), 1 ton of CH_4 has the same contribution to the Greenhouse Effect as approximately 21 tons of CO_2. Therefore, CH_4 is a much more potent GHG than CO_2. Expressing emissions in carbon dioxide equivalent takes the contributions of all GHG emissions to the Greenhouse Effect and converts them to a single unit equivalent to the effect that would occur if only CO_2 were being emitted.

Combustion of fossil fuel in the transportation sector was the single largest source of California's GHG emissions in 2004, accounting for 40.7% of total GHG emissions in the state (CEC 2006a). This sector was followed by the electric power sector (including both in-state and out-of-state sources) (22.2%) and the industrial sector (20.5%) (CEC 2006a).

According to the Intergovernmental Panel on Climate Change (IPCC), which was established in 1988 by the World Meteorological Organization and the United Nations Environment Programme, global average temperature is expected to increase by 3–7°F by the end of the century, depending on future GHG emission scenarios (IPCC 2007). Resource areas other than air quality and atmospheric temperature could be indirectly affected by the accumulation of GHG emissions. For example, an increase in the global average temperature is expected to result in a decreased volume of precipitation falling as snow in California and an overall reduction in snowpack in the Sierra Nevada. Snowpack in the Sierra Nevada provides both water supply (runoff) and storage (within the snowpack before melting), which is a major source of supply for the state. According to the California Energy Commission (2006b), the snowpack portion of the water supply could potentially decline by 30–90% by the end of the 21st century. A study cited in a report by the California Department of Water Resources projects that approximately 50% of the statewide snowpack will be lost by the end of the century (Knowles and Cayan 2002). Although current forecasts are uncertain, it is evident that this phenomenon could lead to significant challenges in securing an adequate water supply for a growing population. An increase in precipitation falling as rain rather than snow could also lead to increased potential for floods because water that would normally be held in the Sierra Nevada until spring could flow into the Central Valley concurrently with winter storm events. This scenario would place more pressure on California's levee/flood control system (DWR 2006).

Another outcome of global climate change is sea level rise. Sea level rose approximately 7 inches during the last century (CEC 2006b), and it is predicted to rise an additional 7–22 inches by 2100, depending on the future levels of GHG emissions (IPCC 2007). If this

occurs, resultant effects could include increased coastal flooding, saltwater intrusion (especially a concern in the low-lying Sacramento–San Joaquin River Delta, where pumps delivering potable water could be threatened), and disruption of wetlands (CEC 2006b). As the existing climate throughout California changes over time, the ranges of various plant and wildlife species could shift or be reduced, depending on the favored temperature and moisture regimes of each species. In the worst cases, some species would become extinct or be extirpated from the state if suitable conditions are no longer available.

Review of the Current General Plan

The Amador County General Plan does not currently have an air quality element. Air quality elements are not required under California law; however, OPR recommends that air quality objectives be placed in other elements such as land use, circulation, conservation, and community design if an air quality element is not implemented.

The Amador County Conservation Element was created to protect natural resources such as timber and mineral resources. The Element uses land use designations for forests, water projects, floodways, and mineral resource zones to distinguish those resources and areas on the General Plan land use map. The Conservation Element states that forestry is important to the County's economy and should be protected from conversion or other actions that would adversely affect timber production, and that sound forestry practices should be used to ensure the longevity of timber production.

There are no goals or implementation measures in this element.

The Amador County Open Space Element describes five land use classifications used for open space (i.e., Wilderness, Forest, Recreation, Crest, and Watershed). There are no goals or policies in the element, but there is an action program to implement it.

Items on this program include:

- ✓ Collaboration with Federal and State agencies,
- ✓ Protection of agriculture, and
- ✓ Providing for urban area parks and open space.

Various issues and topics of interest within the 2006 Amador County Circulation Element include:

- ✓ Amador County is in process of fulfilling a 1997 Memorandum of Understanding (1997 MOU) with the Calaveras and Alpine County Local Transportation Commissions. The 1997 MOU supports the SR 4 Angels Camp Bypass and two passing land projects on SR 4 and SR 88 in Calaveras and Amador Counties as well as the SR 49 Sutter Creek/Amador City Bypass.

- ✓ After funding all projects in the 1997 MOU with Alpine and Calaveras Counties, Amador County has three top priority STIP projects: Pine Grove SR 88 corridor improvements, Jackson SR 88 corridor improvements, and the Ione Interim West Bypass. It is Amador County's policy that the project that is ready to present to the California Transportation Commission (CTC) for right-of-way and construction funding the soonest should be the project that is programmed for construction first.

- ✓ Some portions of roads within Amador County are experiencing average daily level of service (LOS, a measure of congestion and vehicle traffic flow) that is less than the County's desired standard. These roads include: The following state highway segments within unincorporated Amador County currently operate at LOS D or worse:

  - SR 16 at Juncture SR-124 South - LOS D,
  - SR 88 from the Sacramento County line to SR 49 - LOS D,
  - SR 88 at East Junction SR 104 - LOS E,
  - SR 88 at North Junction SR 49 - LOS E,
  - SR 88 at Ridge Road - LOS E, and
  - SR 88 at Volcano Road - LOS F.

  Local roadway segments within unincorporated Amador County that currently operate at LOS D or worse include:

  - Ridge Road west of Old Ridge Road (major collector) - LOS D,
  - Ridge Road east of Old Ridge Road (major collector) - LOS E,
  - Ridge Road west of New York Ranch Road (major collector) - LOS D, and
  - Wicklow Way south of SR 88 (local road) - LOS D.

- ✓ Pavement conditions in Amador County were not up to the Circulation Element's desired standard condition, but the cost of upgrading all the facilities to the desired level could be over $27 million.

- ✓ More cyclists have been observed touring but few designated bicycle routes currently exist in Amador County. The Amador County Transportation Commission (ACTC) "plans to develop a comprehensive Bicycle and Pedestrian Master Plan" for Amador County. The ACTC is waiting on funds to complete this project.

- ✓ Amador County has been designated as an "8-hour ozone nonattainment area." This means that the air quality in the County does not meet the standards that will promote good health. Federal funding could be withheld if this issue is not addressed.

- ✓ The Circulation Element has a section entitled "Policy Element" containing Goals, Policies and Objectives for the roadway system, public transit, aviation, bicycle and pedestrian facilities, rail and goods movement, Transportation Systems Management (TSM), Transportation Demand Management (TDM), and Intelligent Transportation Systems (ITS).

The overarching goal of the Circulation Element is to "Provide a transportation and circulation system that is safe, efficient, convenient, comfortable, and meets the transportation needs of people and goods, and that is compatible with other scenic, historic, economic, environmental and recreational resource values."

Following this goal is a full listing of goals, policies and implementations.

Summary

No specific air quality measures are addressed in the current general plan. However, many of the land use and transportation issues discussed above would have a direct impact on air quality conditions in Amador County.

General Plan Issues for GPAC Discussion

Issues in this section have direct and indirect air quality benefits, and address a broad range of planning and air quality issues facing Amador County.

Issue AQ-1: Integrated planning

Air quality legislation now mandates all transportation plans to consider air quality. In the past, transportation planning emphasized the construction of new roadway capacity to reduce congestion and to meet the needs of planned development. This new emphasis requires land use and transportation plans to create patterns of development and transportation infrastructure that reduce the need for new capacity and improve air quality.

Issue AQ-2: Congestion Management/Transportation Control Measures

State and federal legislation require local governments to include strategies to increase the efficiency of transportation infrastructure and to reduce vehicle trips in their transportation plans. Counties and cities can support these strategies by requiring developers to include infrastructure that reduces congestion or trips.

Transportation control measures (TCMs) are most effective when infrastructure is in place that supports alternative transportation modes. This would include community-

wide transportation improvements and on-site improvements at individual worksites and businesses.

Issue AQ-3: Land Use Patterns

Existing land use patterns within the developed portions of Amador County are not highly conducive to walking, cycling, or transit use. The predominant development patterns force all local trips for shopping, recreation, school, as well as commute trips onto the arterial street system. This leads to ever wider, more congested arterial streets that in turn discourage people from walking or cycling to even nearby destinations.

Issue AQ-4: Compact Development

Sprawling, low-density development, and discontiguous development discourage the use of alternative transportation modes and increase travel distances. Infrastructure costs and most environmental impacts are reduced when development is more compact.

Issue AQ-5: Site Designs

Most places in the Amador County are designed to provide the most direct and convenient access by car at the exclusion of other modes of transportation. It is possible to design sites in ways that encourage less-polluting transportation modes and still support access by motor vehicle.

Issue AQ-6: Transportation Infrastructure

Natural gas burning appliances used for space heating, water heating, and cooking are a sizable source of NO_X emissions. Our consumption of electricity also causes pollutant emissions from the operation of power plants fueled by fossil fuels. Local efforts to reduce energy consumption can save consumers money, combat global warming, and improve air quality. Simple and cost-effective designs, technologies, and methods are available to achieve energy savings and reduce air pollutant emissions.

Implementations Measures

Land use planning decisions directly dictate air quality impacts. A General Plan update can provide a range of planning strategies the County can employ to promote air quality. Some strategies involve cooperating with other local agencies to coordinate growth and improve the flow of transportation systems. Other strategies would be implemented directly by the County. Still other measures would be implemented as landowners and developers seek entitlements from the County for development projects.

The examples provided below are illustrative only, and not comprehensive. They are intended to promote discussion among the GPAC regarding preferred approaches to Air Quality planning.

- ✓ Cooperative long-term planning with Amador County Transportation Agency (ACTA) to coordinate land use and transit planning;
- ✓ Cooperate with nearby municipalities to encourage development near urban centers, and to ensure that transportation infrastructure expansion is integrated among communities to achieve the best traffic flow;
- ✓ Encourage transit travel by developing moderate to high-density housing, shopping, and employment centers along a regional transit system, with pedestrian access;
- ✓ Encourage pedestrian and transit travel modes by locating new development in already developed areas, so that activities are closer together;
- ✓ Remediation and redevelopment of under-utilized or abandoned lands, usually in already developed areas, that have been contaminated during previous use;
- ✓ Development that locates complementary land uses such as housing, retail, office, services, and public facilities within walking distance of each other; 900
- ✓ Create a set of land development and urban design elements with the purpose of creating pedestrian oriented neighborhoods;
- ✓ Encourage pedestrian and transit travel by creating "nodes" of high density mixed development that can be more easily linked by a transit network;
- ✓ Encourage pedestrian and transit travel by making central business districts concentrated activity centers which can be the focal point for a regional transit system;
- ✓ Reduce the disparity between the number of residences and the number of employment opportunities available by directing new employment to areas with housing, and vice versa;
- ✓ Focus on multi-modal improvements to the County's transportation system;
- ✓ Improve traffic flow rather than traffic capacity on congested thoroughfares and intersections including synchronization of traffic signals;
- ✓ Include safe and sufficient bicycle and pedestrian infrastructure on all new roads;
- ✓ Redirect peak-hour truck traffic to less congested roadways;
- ✓ Develop gridded street patterns, featuring high connectivity;

- ✓ Create bus turnouts that allow buses to avoid traffic lanes;
- ✓ Provide bicycle storage facilities and end-of-trip bicyclist facilities such as showers and locker rooms;
- ✓ Develop comprehensive, integrated bike lane and path systems;
- ✓ Construct/require the construction of improvements that would make the County attractive to walking, including street trees, benches, pedestrian-friendly parking lots, buildings that have windows and doors that face streets and sidewalks, and footbridges;
- ✓ Require or encourage mixed-use development;
- ✓ Promote infill development and reuse of existing structures;
- ✓ Limit new development to parcels that border already-developed areas, and first consider redevelopment of brownfields prior to consideration of greenfields;
- ✓ Identify areas where new development would have less of an impact on air quality and transportation, and limiting growth to those areas;
- ✓ Enhance and increase density of the central business district;
- ✓ Identify parking lots that can become park-and-ride centers;
- ✓ Include energy conservation features in new homes;
- ✓ Assess impact fees based on the estimated trip generation of the development (with sensitivity to pedestrian-oriented features, density, gridded street network, etc.);
- ✓ Encourage the installation of fiberoptic wiring in new homes to make telecommuting easier and encourage development of telecommuting centers;
- ✓ Promote and provide incentives for deed-restricted low-income housing development[1];
- ✓ Encourage air quality best management practices for agricultural operations, such as low-emission farm equipment, onsite renewable energy sources (e.g., solar panels), and dust suppression;
- ✓ Avoid land use incompatibilities associated with siting of sensitive receptors near existing sources of air pollution or odors, and visa versa;

[1] Based on documented research, low income families have fewer cars/household and are more likely to use mass transit, thus resulting in less vehicle miles traveled

- ✓ Develop a greenhouse gas emissions reduction plan for all sectors of the County's emissions; and
- ✓ Comply with all future ARB and ACAPCD goals and rulemakings to improve air quality.

References

Ahrens, D. C. 2003. Meteorology Today; an Introduction to Weather, Climate, & the Environment. Brooks Cole, Inc. Pacific Grove, CA.

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

California Air Resources Board. 2006. *The 2006 California Almanac of Emissions and Air Quality*. Sacramento, CA. California Air Resource Board. 2007d. *Air Quality Data Statistics*. Available at <www.arb.ca.gov/adam/welcome.html>. Accessed May 2007.

California Air Resources Board. 2007a. *Ambient Air Quality Standard Charl*. Available at <http://www.arb.ca.gov/research/aaqs/aaqs2.pdf>. Accessed May 2007.

California Air Resources Board. 2007b. *Area Designation Maps / State and National*. Available at <www.arb.ca.gov/desig/adm/adm.htm#state>. Accessed May 2007.

California Air Resources Board. 2007c. *Air Resources Board 2005 Emissions Inventory*. Available at <www.arb.ca.gov/ei/ei.htm>. Accessed May 2007.

California Climate Action Registry (CCAR). 2006 (June). California Climate Action Registry General Reporting Protocol, Version 2.1. Los Angeles, CA. Available at <http://www.climateregistry.org/docs/PROTOCOLS/GRP%20V2.1.pdf>.

California Department of Water Resources. 2006 (July). Progress on Incorporating Climate Change into Management of California's Water Resources (Technical Memorandum Report). Available: <http://baydeltaoffice.water.ca.gov/climatechange/reports.cfm>.

California Energy Commission. 2006a. Inventory of California Greenhouse Gas Emissions and Sinks:1990 to 2004. (Staff Final Report). Publication CEC-600-2006-013-SF. Available: <http://www.climatechange.ca.gov/policies/greenhouse_gas_inventory/index.html> and <http://www.energy.ca.gov/global_climate_change/inventory/documents/index.html>.

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

Intergovernmental Panel on Climate Change. 2007 (February). Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the IPCC. Geneva, Switzerland.

Knowles, N., and D. R. Cayan. 2002. *Potential Effects of Global Warming on the Sacramento/San Joaquin Watershed and the San Francisco Estuary*. Geophysics Research Letter 29(18), 1891, doi:10.1029/2001GL014339.

U.S. Environmental Protection Agency (EPA). 2007a. *Criteria Air Pollutant Information*. Available < http://www.epa.gov/air/urbanair/6poll.html>. Accessed May 2007.

U.S. Environmental Protection Agency (EPA). 2007b. *Criteria Air Pollutant Attainment Designations*. Available < http://www.epa.gov/oar/oaqps/greenbk/>. Accessed May 2007.

U.S. Environmental Protection Agency (EPA). 2007c. *Criteria Air Pollutant Data Attainment Designations*. Available < http://www.epa.gov/air/data/>. Accessed May 2007.