BAY AREA AIR QUALITY MANAGEMENT DISTRICT

California Environmental Quality Act Guidelines Update

Proposed Thresholds of Significance

May 3, 2010

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1 INTRODUCTION

Bay Area Air Quality Management District (BAAQMD or Air District) staff analyzed various options for California Environmental Quality Act (CEQA) air quality thresholds of significance for use within BAAQMD's jurisdiction. The analysis and evaluation undertaken by Air District staff is documented in the *Revised Draft Options and Justification Report – California Environmental Quality Act Thresholds of Significance* (Draft Options Report) (BAAQMD October 2009).

Air District staff hosted public workshops in February, April, September and October 2009, and April 2010 at several locations around the Bay Area. Air District staff also hosted additional workshops in each of the nine Bay Area counties specifically designed for, and to solicit input from, local agency staff. In addition, Air District staff met with regional stakeholder groups to discuss and receive input on the threshold options being evaluated. Throughout the course of the public workshops and stakeholder meetings Air District staff received many comments on the various options under consideration. Based on comments received and additional staff analysis, the threshold options and staff-recommended thresholds were further refined. The culmination of this nearly year and a half-long effort was presented in the Proposed Thresholds of Significance Report published on November 2, 2009 as the Air District staff's proposed air quality thresholds of significance.

The Air District Board of Directors (Board) held public hearings on November 18 and December 2, 2009 and January 6, 2010, to receive comments on staff's Proposed Thresholds of Significance (November 2, 2009; revised December 7, 2009). After public testimony and Board deliberations, the Board requested staff to present additional options for risk and hazard thresholds for Board consideration. This Report includes risks and hazards threshold options, as requested by the Board, in addition to staff's previously recommended thresholds of significance. The proposed thresholds presented herein, upon adoption by the Air District Board of Directors, are intended to replace all of the Air District's currently recommended thresholds. The proposed air quality thresholds of significance, and Board-requested risk and hazard threshold options, are provided in Table 1 at the end of this introduction.

1.1 BAAQMD/CEQA REGULATORY AUTHORITY

The BAAQMD has direct and indirect regulatory authority over sources of air pollution in the San Francisco Bay Area Air Basin (SFBAAB). CEQA requires that public agencies consider the potential adverse environmental impacts of any project that a public agency proposes to carry out, fund or approve. CEQA requires that a lead agency prepare an Environmental Impact Report (EIR) whenever it can be fairly argued (the "fair argument"

standard), based on substantial evidence,[1] that a project may have a significant effect[2] on the environment, even if there is substantial evidence to the contrary (CEQA Guidelines §15064). CEQA requires that the lead agency review not only a project's direct effects on the environment, but also the cumulative impacts of a project and other projects causing related impacts. When the incremental effect of a project is cumulatively considerable, the lead agency must discuss the cumulative impacts in an EIR. (CEQA Guidelines §15064).

The "fair argument" standard refers to whether a fair argument can be made that a project may have a significant effect on the environment (*No Oil, Inc. v. City of Los Angeles* (1974) 13 Cal.3d 68, 84). The fair argument standard is generally considered a low threshold requirement for preparation of an EIR. The legal standards reflect a preference for requiring preparation of an EIR and for "resolving doubts in favor of environmental review." *Meija v. City of Los Angeles* (2005) 130 Cal. App. 4th 322, 332. "The determination of whether a project may have a significant effect on the environment calls for careful judgment on the part of the public agency involved, based to the extent possible on scientific and factual data." (CEQA Guidelines §15064(b).

In determining whether a project may have a significant effect on the environment, CEQA Guidelines Section 15064.7 provides that lead agencies may adopt and/or apply "thresholds of significance." A threshold of significance is "an identifiable quantitative, qualitative or performance level of a particular environmental effect, non-compliance with which means the effect will normally be determined to be significant by the agency and compliance with which means the effect normally will be determined to be less than significant" (CEQA Guidelines §15064.7).

While thresholds of significance give rise to a presumption of insignificance, thresholds are not conclusive, and do not excuse a public agency of the duty to consider evidence that a significant effect may occur under the fair argument standard. *Meija*, 130 Cal. App. 4th at 342. "A public agency cannot apply a threshold of significance or regulatory standard 'in a way that forecloses the consideration of any other substantial evidence showing there may be a significant effect.'" *Id.* This means that if a public agency is presented with factual information or other substantial evidence establishing a fair argument that a project may have a significant effect on the environment, the agency must prepare an EIR to study those impacts even if the project's impacts fall below the applicable threshold of significance.

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[1] "Substantial evidence" includes facts, reasonable assumptions predicated upon facts, or expert opinions supported by facts, but does not include argument, speculation, unsubstantiated opinion or narrative, evidence that is clearly inaccurate or erroneous, or evidence of social or economic impacts that do not contribute to, or are not caused by, physical impacts on the environment. Cal. Pub. Res. C. §21080(c); *see also* CEQA Guidelines §15384.

[2] A "significant effect" on the environment is defined as a "substantial, or potentially substantial, adverse change in the environment." Cal. Pub. Res. C. §21068; *see also* CEQA Guidelines §15382.

Thresholds of significance must be supported by substantial evidence. This Report provides the substantial evidence in support of the thresholds of significance developed by the BAAQMD. If adopted by the BAAQMD Board of Directors, the Air District will recommend that lead agencies within the nine counties of the BAAQMD's jurisdiction use the thresholds of significance in this Report when considering the air quality impacts of projects under their consideration.

1.2 JUSTIFICATION FOR UPDATING CEQA THRESHOLDS

Any analysis of environmental impacts under CEQA includes an assessment of the nature and extent of each impact expected to result from the project to determine whether the impact will be treated as significant or less than significant. CEQA gives lead agencies discretion whether to classify a particular environmental impact as significant. Ultimately, formulation of a standard of significance requires the lead agency to make a policy judgment about where the line should be drawn distinguishing adverse impacts it considers significant from those that are not deemed significant. This judgment must, however, be based on scientific information and other factual data to the extent possible (CEQA Guidelines §15064(b)).

In the sense that advances in science provide new or refined factual data, combined with advances in technology and the gradual improvement or degradation of an environmental resource, the point where an environmental effect is considered significant is fluid over time. Other factors influencing this fluidity include new or revised regulations and standards, and emerging, new areas of concern.

In the ten years since BAAQMD last reviewed its recommended CEQA thresholds of significance for air quality, there have been tremendous changes that affect the quality and management of the air resources in the Bay Area. Traditional criteria air pollutant ambient air quality standards, at both the state and federal levels, have become increasingly more stringent. A new criteria air pollutant standard for fine particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) has been added to federal and state ambient air quality standards. We have found, through technical advances in impact assessment, that toxic air contaminants are not only worse than previously thought from a health perspective, but that certain communities experience high levels of toxic air contaminants, giving rise to new regulations and programs to reduce the significantly elevated levels of ambient toxic air contaminant concentrations in the Bay Area.

In response to the elevated levels of toxic air contaminants in some Bay Area communities, the Air District created the Community Air Risk Evaluation (CARE) Program. Phase 1 of the BAAQMD's CARE program compiled and analyzed a regional emissions inventory of toxic air contaminants (TACs), including emissions from stationary sources, area sources, and on-road and off-road mobile sources. Phase 2 of the CARE Program conducted regional computer modeling of selected TAC species, species which collectively posed the greatest risk to Bay Area residents. In both Phases 1 and 2, demographic data were combined with estimates of TAC emissions or concentrations to identify communities that are disproportionally impacted from high concentrations of TACs. Bay Area Public Health Officers, in discussions with Air District staff and in comments

to the Air District's Advisory Council (February 11, 2009, Advisory Council Meeting on Air Quality and Public Health), have recommended that $PM_{2.5}$, in addition to TACs, be considered in assessments of community-scale impacts of air pollution.

Another significant issue that affects the quality of life for Bay Area residents is the growing concern with global climate change. In just the past few years, estimates of the global atmospheric temperature and greenhouse gas concentration limits needed to stabilize climate change have been adjusted downward and the impacts of greenhouse gas emissions considered more dire. Previous scientific assessments assumed that limiting global temperature rise to 2-3°C above pre-industrial levels would stabilize greenhouse gas concentrations in the range of 450-550 parts per million (ppm) of carbon dioxide-equivalent (CO_2e). Now the science indicates that a temperature rise of 2°C would not prevent dangerous interference with the climate system. Recent scientific assessments suggest that global temperature rise should be kept below 2°C by stabilizing greenhouse gas concentrations below 350 ppm CO_2e, a significant reduction from the current level of 385 ppm CO_2e.

For the reasons stated above, and to further the goals of other District programs such as encouraging transit-oriented and infill development, BAAQMD has undertaken an effort to review all of its currently-recommended CEQA thresholds, revise them as appropriate, and develop new thresholds where appropriate. The overall goal of this effort is to develop CEQA significance criteria that ensure new development implements appropriate and feasible emission reduction measures to mitigate significant air quality impacts. The Air District's recommended CEQA significance thresholds have been vetted through a public review process and will be presented to the BAAQMD Board of Directors for adoption.

Table 1 – Proposed Air Quality CEQA Thresholds of Significance

Pollutant	**Construction-Related**	**Operational-Related**	
Project-Level			
Criteria Air Pollutants and Precursors (Regional)	**Average Daily Emissions (lb/day)**	**Average Daily Emissions (lb/day)**	**Maximum Annual Emissions (tpy)**
ROG	54	54	10
NO_X	54	54	10
PM_{10} (exhaust)	82	82	15
$PM_{2.5}$ (exhaust)	54	54	10
$PM_{10}/PM_{2.5}$ (fugitive dust)	Best Management Practices	None	
Local CO	None	9.0 ppm (8-hour average), 20.0 ppm (1-hour average)	

Table 1 – Proposed Air Quality CEQA Thresholds of Significance		
Pollutant	**Construction-Related**	**Operational-Related**
GHGs **Projects other than Stationary Sources**	None	Compliance with Qualified Greenhouse Gas Reduction Strategy OR 1,100 MT of CO_2e/yr OR 4.6 MT CO_2e/SP/yr (residents + employees)
GHGs **Stationary Sources**	None	10,000 MT/yr
Risks and Hazards – New Source (All Areas) (Individual Project) **Staff Proposal**	Same as Operational Thresholds*	Compliance with Qualified Community Risk Reduction Plan OR Increased cancer risk of >10.0 in a million Increased non-cancer risk of > 1.0 Hazard Index (Chronic or Acute) Ambient $PM_{2.5}$ increase: > 0.3 µg/m^3 annual average Zone of Influence: 1,000-foot radius from fence line of source or receptor
Risks and Hazards – New Receptor (All Areas) (Individual Project) **Staff Proposal**	Same as Operational Thresholds*	Compliance with Qualified Community Risk Reduction Plan OR Increased cancer risk of >10.0 in a million Increased non-cancer risk of > 1.0 Hazard Index (Chronic or Acute) Ambient $PM_{2.5}$ increase: > 0.3 µg/m^3 annual average Zone of Influence: 1,000-foot radius from fence line of source or receptor
Risks and Hazards (Individual Project) **Tiered Thresholds Option**	Same as Operational Thresholds*	**Impacted Communities:** Siting a New Source Compliance with Qualified Community Risk Reduction Plan OR Increased cancer risk of >5.0 in a million Increased non-cancer risk of > 1.0 Hazard Index (Chronic or Acute) Ambient $PM_{2.5}$ increase: > 0.2 µg/m^3 annual average Zone of Influence: 1,000-foot radius from fence line of source or receptor

Table 1 – Proposed Air Quality CEQA Thresholds of Significance		
Pollutant	**Construction-Related**	**Operational-Related**
Risks and Hazards (Individual Project) **Tiered Thresholds Option** (Continued)	Same as Operational Thresholds*	**Impacted Communities:** Siting a New Receptor **All Other Areas:** Siting a New Source or Receptor Compliance with Qualified Community Risk Reduction Plan OR Increased cancer risk of >10.0 in a million Increased non-cancer risk of > 1.0 Hazard Index (Chronic or Acute) Ambient $PM_{2.5}$ increase: > 0.3 µg/m^3 annual average Zone of Influence: 1,000-foot radius from fence line of source or receptor
Risks and Hazards – New Source (All Areas) (Cumulative Thresholds)	Same as Operational Thresholds*	Compliance with Qualified Community Risk Reduction Plan OR Cancer: > 100 in a million (from all local sources) Non-cancer: > 10.0 Hazard Index (from all local sources) (Chronic) $PM_{2.5}$: > 0.8 µg/m^3 annual average (from all local sources) Zone of Influence: 1,000-foot radius from fence line of source or receptor
Risks and Hazards – New Receptor (All Areas) (Cumulative Thresholds)	Same as Operational Thresholds*	Compliance with Qualified Community Risk Reduction Plan OR Cancer: > 100 in a million (from all local sources) Non-cancer: > 10.0 Hazard Index (from all local sources) (Chronic) $PM_{2.5}$: > 0.8 µg/m^3 annual average (from all local sources) Zone of Influence: 1,000-foot radius from fence line of source or receptor
Accidental Release of Acutely Hazardous Air Pollutants	None	Storage or use of acutely hazardous materials locating near receptors or receptors locating near stored or used acutely hazardous materials considered significant
Odors	None	Complaint History—Five confirmed complaints per year averaged over three years

Table 1 – Proposed Air Quality CEQA Thresholds of Significance		
Pollutant	**Construction-Related**	**Operational-Related**
Plan-Level		
Criteria Air Pollutants and Precursors	None	1. Consistency with Current Air Quality Plan control measures 2. Projected VMT or vehicle trip increase is less than or equal to projected population increase
GHGs	None	Compliance with Qualified Greenhouse Gas Reduction Strategy (or similar criteria included in a General Plan) OR 6.6 MT CO2e/ SP/yr (residents + employees)
Risks and Hazards	None	1. Overlay zones around existing and planned sources of TACs (including adopted Risk Reduction Plan areas) 2. Overlay zones of at least 500 feet (or Air District-approved modeled distance) from all freeways and high volume roadways
Odors	None	Identify the location of existing and planned sources of odors
Accidental Release of Acutely Hazardous Air Pollutants	None	None
Regional Plans (Transportation and Air Quality Plans)		
GHGs, Criteria Air Pollutants and Precursors, and Toxic Air Contaminants	None	No net increase in emissions

Notes: CO = carbon monoxide; CO_2e = carbon dioxide equivalent; GHGs = greenhouse gases; lb/day = pounds per day; MT = metric tons; NO_X = oxides of nitrogen; $PM_{2.5}$= fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; ppm = parts per million; ROG = reactive organic gases; SO_2 = sulfur dioxide; SP = service population; TACs = toxic air contaminants; TBP = toxic best practices; tons/day = tons per day; tpy = tons per year; yr= year.

* Note: The Air District recommends that for construction projects that are less than one year duration, Lead Agencies should annualize impacts over the scope of actual days that peak impacts are to occur, rather than the full year.

2 GREENHOUSE GAS THRESHOLDS

BAAQMD does not currently have an adopted threshold of significance for GHG emissions. BAAQMD currently recommends that lead agencies quantify GHG emissions resulting from new development and apply all feasible mitigation measures to lessen the potentially significant adverse impacts. One of the primary objectives in updating the current CEQA Guidelines is to identify a GHG significance threshold, analytical

methodologies, and mitigation measures to ensure new land use development meets its fair share of the emission reductions needed to address the cumulative environmental impact from GHG emissions. GHG emissions contribute, on a cumulative basis, to the significant adverse environmental impacts of global climate change. As reviewed herein, climate change impacts include an increase in extreme heat days, higher ambient concentrations of air pollutants, sea level rise, impacts to water supply and water quality, public health impacts, impacts to ecosystems, impacts to agriculture, and other environmental impacts. No single land use project could generate enough GHG emissions to noticeably change the global average temperature. The combination of GHG emissions from past, present, and future projects contribute substantially to the phenomenon of global climate change and its associated environmental impacts.

2.2 PROPOSED THRESHOLDS OF SIGNIFICANCE

Project Type	Proposed Thresholds
Projects other than Stationary Sources	Compliance with Qualified Greenhouse Gas Reduction Strategy OR 1,100 MT of CO_2e/yr OR 4.6 MT CO_2e/SP/yr (residents + employees)
Stationary Sources	10,000 MT of CO_2e/yr
Plans	Compliance with Qualified Greenhouse Gas Reduction Strategy (or similar criteria included in a General Plan) OR 6.6 MT CO_2e/SP/yr (residents + employees)
Regional Plans (Transportation and Air Quality Plans)	No net increase in GHG emissions

2.3 JUSTIFICATION AND SUBSTANTIAL EVIDENCE SUPPORTING THRESHOLDS

BAAQMD's approach to developing a threshold of significance for GHG emissions is to identify the emissions level for which a project would not be expected to substantially conflict with existing California legislation adopted to reduce statewide GHG emissions. If a project would generate GHG emissions above the threshold level, it would be considered to contribute substantially to a cumulative impact, and would be considered significant. If mitigation can be applied to lessen the emissions such that the project meets its share of emission reductions needed to address the cumulative impact, the project would normally be considered less than significant.

As explained in the District's *Revised Draft Options and Justifications Report* (BAAQMD 2009), there are several types of thresholds that may be supported by

substantial evidence and be consistent with existing California legislation and policy to reduce statewide GHG emissions. In determining which thresholds to recommend, Staff studied numerous options, relying on reasonable, environmentally conservative assumptions on growth in the land use sector, predicted emissions reductions from statewide regulatory measures and resulting emissions inventories, and the efficacies of GHG mitigation measures. The thresholds recommended herein were chosen based on the substantial evidence that such thresholds represent quantitative and/or qualitative levels of GHG emissions, compliance with which means that the environmental impact of the GHG emissions will normally not be cumulatively considerable under CEQA. Compliance with such thresholds will be part of the solution to the cumulative GHG emissions problem, rather than hinder the state's ability to meet its goals of reduced statewide GHG emissions. Staff notes that it does not believe there is only one threshold for GHG emissions that can be supported by substantial evidence.

GHG CEQA significance thresholds recommended herein are intended to serve as interim levels during the implementation of the AB 32 Scoping Plan and SB 375, which will occur over time. Until AB 32 has been fully implemented in terms of adopted regulations, incentives, and programs and until SB 375 required plans have been fully adopted, or the California Air Resources Board (ARB) adopts a recommended threshold, the BAAQMD recommends that local agencies in the Bay Area apply the GHG thresholds recommended herein.

If left unchecked, GHG emissions from new land use development in California will result in a cumulatively considerable amount of GHG emissions and a substantial conflict with the State's ability to meet the goals within AB 32. Thus, BAAQMD proposes to adopt interim GHG thresholds for CEQA analysis, which can be used by lead agencies within the Bay Area. This would help lead agencies navigate this dynamic regulatory and technological environment where the field of analysis has remained wide open and inconsistent. BAAQMD's framework for developing a GHG threshold for land development projects that is based on policy and substantial evidence follows.

2.3.1 SCIENTIFIC AND REGULATORY JUSTIFICATION

Climate Science Overview

Prominent GHGs contributing to the greenhouse effect are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), 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. It is *extremely unlikely* that global climate change of the past 50 years can be explained without the contribution from human activities (IPCC 2007a).

According to Article 2 of the United Nations Framework Convention on Climate Change (UNFCCC), "Avoiding Dangerous Climate Change" means: *"stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."* Dangerous climate change defined

in the UNFCCC is based on several key indicators including the potential for severe degradation of coral reef systems, disintegration of the West Antarctic Ice Sheet, and shut down of the large-scale, salinity- and thermally-driven circulation of the oceans. (UNFCCC 2009). The global atmospheric concentration of carbon dioxide has increased from a pre-industrial value of about 280 ppm to 379 ppm in 2005 (IPCC 2007a). "Avoiding dangerous climate change" is generally understood to be achieved by stabilizing global average temperatures between 2 and 2.4°C above pre-industrial levels. In order to limit temperature increases to this level, ambient global CO_2 concentrations must stabilize between 350 and 400 ppm (IPCC 2007b).

Executive Order S-3-05

Executive Order S-3-05, which was signed by Governor Schwarzenegger in 2005, proclaims that California is vulnerable to the impacts of climate change. It declares that increased temperatures could reduce the Sierra's snowpack, further exacerbate California's air quality problems, and potentially cause a rise in sea levels. To combat those concerns, the Executive Order established total GHG emission targets. Specifically, emissions are to be reduced to the 2000 level by 2010, the 1990 level by 2020, and to 80 percent below the 1990 level by 2050.

Assembly Bill 32, the California Global Warming Solutions Act of 2006

In September 2006, Governor Arnold Schwarzenegger signed Assembly Bill 32, the California Global Warming Solutions Act of 2006, which set the 2020 greenhouse gas emissions reduction goal into law. AB 32 finds and declares that "Global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California." AB 32 requires that statewide GHG emissions be reduced to 1990 levels by 2020, and establishes regulatory, reporting, voluntary, and market mechanisms to achieve quantifiable reductions in GHG emissions to meet the statewide goal.

In December of 2008, ARB adopted its *Climate Change Scoping Plan* (*Scoping Plan*), which is the State's plan to achieve GHG reductions in California, as required by AB 32 (ARB 2008). The Scoping Plan contains strategies California will implement to achieve a reduction of 169 MMT CO_2e emissions, or approximately 28 percent from the state's projected 2020 emission level of 596 MMT of CO_2e under a business-as-usual scenario (this is a reduction of 42 MMT of CO_2e, or almost 10 percent, from 2002-2004 average emissions), so that the state can return to 1990 emission levels, as required by AB 32.

While the Scoping Plan establishes the policy intent to control numerous GHG sources through regulatory, incentive, and market means, given the early phase of implementation and the level of control that local CEQA lead agencies have over numerous GHG sources, CEQA is an important and supporting tool in achieving GHG reductions overall in compliance with AB 32. In this spirit, BAAQMD is considering the adoption of thresholds of significance for GHG emissions for stationary source and land use development projects.

Senate Bill 375

Senate Bill (SB) 375, signed in September 2008, aligns regional transportation planning efforts, regional GHG reduction targets, and land use and housing allocation. SB 375 requires Metropolitan Planning Organizations (MPOs) to adopt a Sustainable Communities Strategy (SCS) or Alternative Planning Strategy (APS), which will prescribe land use allocation in that MPO's Regional Transportation Plan (RTP). ARB, in consultation with MPOs, will provide each affected region with reduction targets for GHGs emitted by passenger cars and light trucks in the region for the years 2020 and 2035. These reduction targets will be updated every eight years, but can be updated every four years if advancements in emission technologies affect the reduction strategies to achieve the targets. ARB is also charged with reviewing each MPO's SCS or APS for consistency with its assigned targets. If MPOs do not meet the GHG reduction targets, transportation projects would not be eligible for State funding programmed after January 1, 2012. New provisions of CEQA incentivize qualified projects that are consistent with an approved SCS or APS, categorized as "transit priority projects."

The revised District CEQA Guidelines includes methodology consistent with the recently updated State CEQA Guidelines, which provides that certain residential and mixed use projects, and transit priority projects consistent with an applicable SCS or APS need not analyze GHG impacts from cars and light duty trucks (CEQA Guidelines §15183.5(c)).

2.3.2 PROJECT-LEVEL GHG THRESHOLDS

Staff recommends setting GHG significance thresholds based on AB 32 GHG emission reduction goals while taking into consideration emission reduction strategies outlined in ARB's Scoping Plan. Staff proposes two quantitative thresholds for land use projects: a bright line threshold based on a "gap" analysis and an efficiency threshold based on emission levels required to be met in order to achieve AB 32 goals.

Staff also proposes one qualitative threshold for land use projects: if a project complies with a Qualified Greenhouse Gas Reduction Strategy (as defined in Section 2.3.4 below) that addresses the project it would be considered less than significant. As explained in detail in Section 2.3.4 below, compliance with a Qualified Greenhouse Gas Reduction Strategy (or similar adopted policies, ordinances and programs), would provide the evidentiary basis for making CEQA findings that development consistent with the plan would result in feasible, measureable, and verifiable GHG reductions consistent with broad state goals such that projects approved under qualified Greenhouse Gas Reduction Strategies or equivalent demonstrations would achieve their fair share of GHG emission reductions.

2.3.2.1 LAND USE PROJECTS "GAP-BASED" THRESHOLD

Staff took eight steps in developing this threshold approach, which are summarized here and detailed in the sections that follow. It should be noted that the "gap-based approach" used for threshold development is a conservative approach that focuses on a limited set of state mandates that appear to have the greatest potential to reduce land use development-

related GHG emissions at the time of this writing. It is also important to note that over time, as the effectiveness of the State's implementation of AB 32 (and SB 375) progresses, BAAQMD will need to reconsider the extent of GHG reductions needed over and above those from the implementation thereof for the discretionary approval of land use development projects. Although there is an inherent amount of uncertainty in the estimated capture rates (i.e., frequency at which project-generated emissions would exceed a threshold and would be subject to mitigation under CEQA) and the aggregate emission reductions used in the gap analysis, they are based on BAAQMD's expertise, the best available data, and use conservative assumptions for the amount of emission reductions from legislation in derivation of the gap (e.g., only adopted legislation was relied upon). This approach is intended to attribute an appropriate share of GHG emission reductions necessary to reach AB 32 goals to new land use development projects in BAAQMD's jurisdiction that are evaluated pursuant to CEQA.

Step 1 Estimate from ARB's statewide GHG emissions inventory the growth in emissions between 1990 and 2020 attributable to "land use-driven" sectors of the emission inventory as defined by OPR's guidance document (*CEQA and Climate Change*). Land use-driven emission sectors include Transportation (On-Road Passenger Vehicles; On-Road Heavy Duty), Electric Power (Electricity; Cogeneration), Commercial and Residential (Residential Fuel Use; Commercial Fuel Use) and Recycling and Waste (Domestic Waste Water Treatment).

Result: 1990 GHG emissions were 295.53 MMT CO_2e/yr and projected 2020 business-as-usual GHG emissions would be 400.22 MMT CO_2e/yr; thus a 26.2 percent reduction from statewide land use-driven GHG emissions would be necessary to meet the AB 32 goal of returning to 1990 emission levels by 2020. (See Table 2)

Step 2 Estimate the anticipated GHG emission reductions affecting the same land use-driven emissions inventory sectors associated with adopted statewide regulations identified in the AB 32 Scoping Plan.

Result: Estimated a 23.9 percent reduction can be expected in the land use-driven GHG emissions inventory from adopted Scoping Plan regulations, including AB 1493 (Pavley), LCFS, Heavy/Medium Duty Efficiency, Passenger Vehicle Efficiency, Energy-Efficiency Measures, Renewable Portfolio Standard, and Solar Roofs. (See Table 3)

Step 3 Determine any short fall or "gap" between the 2020 statewide emission inventory estimates and the anticipated emission reductions from adopted Scoping Plan regulations. This "gap" represents additional GHG emission reductions needed statewide from the land use-driven emissions inventory sectors, which represents new land use development's share of the emission reductions needed to meet statewide GHG emission reduction goals.

Result: With the 23.9 percent reductions from AB 32 Scoping Measures, there is a "gap" of 2.3 percent in necessary additional GHG emissions reductions to meet AB 32 goals of a 26.2 percent reduction from statewide land use-driven GHG emissions to return to 1990 levels in 2020. (See Table 2)

Step 4 Determine the percent reduction this "gap" represents in the "land use-driven" emissions inventory sectors from BAAQMD's 2020 GHG emissions inventory. Identify the mass of emission reductions needed in the SFBAAB from land use-driven emissions inventory sectors.

Result: Estimated that a 2.3 percent reduction in BAAQMD's projected 2020 emissions projections requires emissions reductions of 1.6 MMT CO_2e/yr from the land use-driven sectors. (See Table 4)

Step 5 Assess BAAQMD's historical CEQA database (2001-2008) to determine the frequency distribution trend of project sizes and types that have been subject to CEQA over the past several years.

Result: Determined historical patterns of residential, commercial and industrial development by ranges of average sizes of each development type. Results were used in Step 6 below to distribute anticipated Bay Area growth among different future project types and sizes.

Step 6 Forecast new land use development for the Bay Area using DOF/EDD population and employment projections and distribute the anticipated growth into appropriate land use types and sizes needed to accommodate the anticipated growth (based on the trend analysis in Step 5 above). Translate the land use development projections into land use categories consistent with those contained in the Urban Emissions Model (URBEMIS).

Result: Based on population and employment projections and the trend analysis from Step 5 above, forecasted approximately 4,000 new development projects, averaging about 400 projects per year through 2020 in the Bay Area.

Step 7 Estimate the amount of GHG emissions from each land use development project type and size using URBEMIS and post-model manual calculation methods (for emissions not included in URBEMIS). Determine the amount of GHG emissions that can reasonably and feasibly be reduced through currently available mitigation measures ("mitigation effectiveness") for future land use development projects subject to CEQA (based on land use development projections and frequency distribution from Step 6 above).

Result: Based on the information available and on sample URBEMIS calculations, found that mitigation effectiveness of between 25 and 30 percent is feasible.

Step 8 Conduct a sensitivity analysis of the numeric GHG mass emissions threshold needed to achieve the desired emissions reduction (i.e., "gap") determined in Step 4. This mass emission GHG threshold is that which would be needed to achieve the emission reductions necessary by 2020 to meet the Bay Area's share of the statewide "gap" needed from the land use-driven emissions inventory sectors.

Result: The results of the sensitivity analysis conducted in Step 8 found that reductions between about 125,000 MT/yr (an aggregate of 1.3 MMT in 2020) and over 200,000 MT/yr (an aggregate of over 2.0 MMT in 2020) were achievable and feasible. A mass emissions threshold of 1,100 MT of CO_2e/yr would result in approximately 59 percent of all projects being above the significance threshold (e.g., this is approximately the operational GHG emissions that would be associated with a 60 residential unit subdivision) and must implement feasible mitigation measures to meet CEQA requirements. With an estimated 26 percent mitigation effectiveness, the 1,100 MT threshold would achieve 1.6 MMT CO_2e/yr in GHG emissions reductions.

2.3.2.2 DETAILED BASIS AND ANALYSIS

Derivation of Greenhouse Gas Reduction Goal

To meet the target emissions limit established in AB 32 (equivalent to levels in 1990), total GHG emissions would need to be reduced by approximately 28 percent from projected 2020 forecasts (ARB 2009a). The AB 32 Scoping Plan is ARB's plan for meeting this mandate (ARB 2008). While the Scoping Plan does not specifically identify GHG emission reductions from the CEQA process for meeting AB 32 derived emission limits, the scoping plan acknowledges that "other strategies to mitigate climate change . . . should also be explored." The Scoping Plan also acknowledges that "Some of the measures in the plan may deliver more emission reductions than we expect; others less . . . and new ideas and strategies will emerge." In addition, climate change is considered a significant environmental issue and, therefore, warrants consideration under CEQA. SB 97 represents the State Legislature's confirmation of this fact, and it directed the Governor's Office of Planning and Research (OPR) to develop CEQA Guidelines for evaluation of GHG emissions impacts and recommend mitigation strategies. In response, OPR released the *Technical Advisory: CEQA and Climate Change* (OPR 2008), and proposed revisions to the State CEQA guidelines (April 14, 2009) for consideration of GHG emissions. The California Natural Resources Agency adopted the proposed State CEQA Guidelines revisions on December 30, 2009 and the revisions were effective beginning March 18, 2010. It is known that new land use development must also do its fair share toward achieving AB 32 goals (or, at a minimum, should not hinder the State's progress toward the mandated emission reductions).

Foreseeable Scoping Plan Measures Emission Reductions and Remaining "Gap"

Step 1 of the Gap Analysis entailed estimating from ARB's statewide GHG inventory the growth in emissions between 1990 and 2020 attributable to land use driven sectors of the emissions inventory. As stated above, to meet the requirements set forth in AB 32 (i.e., achieve California's 1990-equivalent GHG emissions levels by 2020) California would need to achieve an approximate 28 percent reduction in emissions across all sectors of the GHG emissions inventory compared with 2020 projections. However, to meet the AB 32 reduction goals in the emissions sectors that are related to land use development (e.g., on-road passenger and heavy-duty motor vehicles, commercial and residential area sources [i.e., natural gas], electricity generation/consumption, wastewater treatment, and water distribution/consumption), staff determined that California would need to achieve an approximate 26 percent reduction in GHG emissions from these land use-driven sectors (ARB 2009a) by 2020 to return to 1990 land use emission levels.

Next, in Step 2 of the Gap Analysis, Staff determined the GHG emission reductions within the land use-driven sectors that are anticipated to occur from implementation of the Scoping Plan measures statewide, which are summarized in Table 2 and described below. Since the GHG emission reductions anticipated with the Scoping Plan were not accounted for in ARB's or BAAQMD's 2020 GHG emissions inventory forecasts (i.e., business as usual), an adjustment was made to include (i.e., give credit for) GHG emission reductions associated with key Scoping Plans measures, such as the Renewable Portfolio Standard, improvements in energy efficiency through periodic updates to Title 24, AB 1493 (Pavley) (which recently received a federal waiver to allow it to be enacted in law), the Low Carbon Fuel Standard (LCFS), and other measures. With reductions from these State regulations (Scoping Plan measures) taken into consideration and accounting for an estimated 23.9 percent reduction in GHG emissions, in Step 3 of the Gap Analysis Staff determined that the Bay Area would still need to achieve an additional 2.3 percent reduction from projected 2020 GHG emissions to meet the 1990 GHG emissions goal from the land-use driven sectors. This necessary 2.3 percent reduction in projected GHG emissions from the land use sector is the "gap" the Bay Area needs to fill to do its share to meet the AB 32 goals. Refer to the following explanation and Tables 2 through 4 for data used in this analysis.

Because the transportation sector is the largest emissions sector of the state's GHG emissions inventory, it is aggressively targeted in early actions and other priority actions in the Scoping Plan including measures concerning gas mileage (Pavley), fuel carbon intensity (LCFS) and vehicle efficiency measures.

Table 2 – California 1990, 2002-2004, and 2020 Land Use Sector GHG[1] ($MMT CO_2e/yr$)				
Sector	**1990 Emissions**	**2002-2004 Average**	**2020 BAU Emissions Projections**	**% of 2020 Total**
Transportation	**137.98**	**168.66**	**209.06**	**52%**
On-Road Passenger Vehicles	108.95	133.95	160.78	40%
On-Road Heavy Duty	29.03	34.69	48.28	12%
Electric Power	**110.63**	**110.04**	**140.24**	**35%**
Electricity	95.39	88.97	107.40	27%
Cogeneration[2]	15.24	21.07	32.84	8%
Commercial and Residential	**44.09**	**40.96**	**46.79**	**12%**
Residential Fuel Use	29.66	28.52	32.10	8%
Commercial Fuel Use	14.43	12.45	14.63	4%
Recycling and Waste[1]	**2.83**	**3.39**	**4.19**	**1%**
Domestic Wastewater Treatment	2.83	3.39	4.19	1%
TOTAL GROSS EMISSIONS	**295.53**	**323.05**	**400.22**	
% Reduction Goal from Statewide land use driven sectors (from 2020 levels to reach 1990 levels in these emission inventory sectors)			26.2%	
% Reduction from AB32 Scoping Plan measures applied to land use sectors (see Table 3)			-23.9%	
% Reduction needed statewide beyond Scoping Plan measures (Gap)			2.3%	

Notes: MMT CO_2e /yr = million metric tons of carbon dioxide equivalent emissions per year.
[1] Landfills not included. See text.
[2] Cogeneration included due to many different applications for electricity, in some cases provides substantial power for grid use, and because electricity use served by cogeneration is often amenable to efficiency requirements of local land use authorities.
Sources: Data compiled by EDAW and ICF Jones & Stokes from ARB data.

Pavley Regulations. The AB 32 Scoping Plan assigns an approximate 20 percent reduction in emissions from passenger vehicles associated with the implementation of AB 1493. The AB 32 Scoping Plan also notes that "AB 32 specifically states that if the Pavley regulations do not remain in effect, ARB shall implement alternative regulations to control mobile sources to achieve equivalent or greater reductions of greenhouse gas emissions (HSC §38590)." Thus, it is reasonable to assume full implementation of AB 1493 standards, or equivalent programs that would be implemented by ARB. Furthermore, on April 1, 2010, U.S. EPA and the Department of Transportation's National Highway Safety Administration (NHTSA) announced a joint final rule establishing a national program that will dramatically reduce greenhouse gas emissions and improve fuel economy for new cars and trucks sold in the United States after 2011. Under this national program, automobile manufacturers will be able to build a single light-duty national fleet that satisfies all requirements under both the national program and the standards of California and other states. Nonetheless, BAAQMD may need to revisit this methodology as the federal standards come on line to ensure that vehicle standards are as aggressive as contemplated in development of this threshold.

Table 3 – 2020 Land Use Sector GHG Emission Reductions from State Regulations and AB 32 Measures

Affected Emissions Source	California Legislation	% Reduction from 2020 GHG inventory	End Use Sector (% of Bay Area LU Inventory)	Scaled % Emissions Reduction (credit)
Mobile	AB 1493 (Pavley)	19.7%	On road passenger/light truck transportation (45%)	8.9%
	LCFS	7.2%	On road passenger/light truck transportation (45%)	3.2%
	LCFS	7.2%	On road Heavy/Medium Duty Transportation (5%)	0.4%
	Heavy/Medium Duty Efficiency	2.9%	On road Heavy/Medium Duty Transportation (5%)	0.2%
	Passenger Vehicle Efficiency	2.8%	On road passenger/light truck transportation (45%)	1.3%
Area	Energy-Efficiency Measures	9.5%	Natural gas (Residential, 10%)	1.0%
			Natural gas (Non-residential,13%)	1.2%
Indirect	Renewable Portfolio Standard	21.0%	Electricity (excluding cogen) (17%)	3.5%
	Energy-Efficiency Measures	15.7%	Electricity (26%)	4.0%
	Solar Roofs	1.5%	Electricity (excluding cogen) (17%)	0.2%
Total credits given to land use-driven emission inventory sectors from Scoping Plan measures				**23.9%**

Notes: AB = Assembly Bill; LCFS = Low Carbon Fuel Standard; SB = Senate Bill; RPS = Renewable Portfolio Standard
Please refer to Appendix D for detailed calculations. Sources: Data compiled by ICF Jones & Stokes.

LCFS. According to the adopted LCFS rule (CARB, April 2009), the LCFS is expected to result in approximately 10 percent reduction in the carbon intensity of transportation fuels. However, a portion of the emission reductions required from the LCFS would be achieved over the life cycle of transportation fuel production rather than from mobile-source emission factors. Based on CARB's estimate of nearly 16 MMT reductions in on-road emissions from implementation of the LCFS and comparison to the statewide on-road emissions sector, the LCFS is assumed to result in a 7.2 percent reduction compared to 2020 BAU conditions (CARB 2009e).

Table 4 – SFBAAB 1990, 2007, and 2020 Land Use Sector GHG Emissions Inventories and Projections (MMT CO_2e/yr)				
Sector	**1990 Emissions**	**2007 Emissions**	**2020 Emissions Projections**	**% of 2020 Total[2]**
Transportation	**26.1**	**30.8**	**35.7**	**50%**
On-Road Passenger Vehicles	23.0	27.5	32.0	
On-Road Heavy Duty	3.1	3.3	3.7	
Electric Power	**25.1**	**15.2**	**18.2**	**26%**
Electricity	16.5	9.9	11.8	
Cogeneration	8.6	5.3	6.4	
Commercial and Residential	**8.9**	**15.0**	**16.8**	**24%**
Residential Fuel Use	5.8	7.0	7.5	
Commercial Fuel Use	3.1	8.0	9.3	
Recycling and Waste[1]	**0.2**	**0.4**	**0.4**	**1%**
Domestic Waste Water Treatment	0.2	0.4	0.4	
TOTAL GROSS EMISSIONS	**60.3**	**61.4**	**71.1**	
SFBAAB's "Fair Share" % Reduction (from 2020 levels to reach 1990 levels) with AB-32 Reductions (from Table 3)			2.3%	
SFBAAB's Equivalent Mass Emissions Land Use Reduction Target at 2020 (MMT CO2e/yr)			1.6	

Notes: MMT CO_2e /yr = million metric tons of carbon dioxide equivalent emissions per year; SFBAAB = San Francisco Bay Area Air Basin.
[1] Landfills not included.
[2] Percentages do not sum exactly to 100% in table due to rounding.
Please refer to Appendix D for detailed calculations.
Sources: Data compiled by EDAW 2009, ICF Jones & Stokes 2009, BAAQMD 2008.

Renewable Portfolio Standard, Energy Efficiency and Solar Roofs. Energy efficiency and renewable energy measures from the Scoping Plan were also included in the gap analysis. The Renewable Portfolio Standard (rules) will require the renewable energy portion of the retail electricity portfolio to be 33 percent in 2020. For PG&E, the dominant electricity provider in the Basin, approximately 12 percent of their current portfolio qualifies under the RPS rules and thus the gain by 2020 would be approximately 21 percent. The Scoping Plan also estimates that energy efficiency gains with periodic improvement in building and appliance energy standards and incentives will reach 10 to 15 percent for natural gas and electricity respectively. The final state measure included in this gap analysis is the solar roof initiative, which is estimated to result in reduction of the overall electricity inventory of 1.5 percent.

Landfill emissions are excluded from this analysis. While land use development does generate waste related to both construction and operations, the California Integrated Waste Management Board (CIWMB) has mandatory diversion requirements that will, in all probability, increase over time to promote waste reductions, reuse, and recycle. The Bay Area has relatively high levels of waste diversion and extensive recycling efforts. Further, ARB has established and proposes to increase methane capture requirements for all major landfills. Thus, at this time, landfill emissions associated with land use

development waste generation is not included in the land use sector inventory used to develop this threshold approach.

Industrial stationary sources thresholds were developed separately from the land use threshold development using a market capture approach as described below. However, mobile source and area source emissions, as well as indirect electricity emissions that derive from industrial use are included in the land use inventory above as these particular activities fall within the influence of local land use authorities in terms of the affect on trip generation and energy efficiency.

AB 32 mandates reduction to 1990-equivalent GHG levels by 2020, with foreseeable emission reductions from State regulations and key Scoping Plan measures taken into account, were applied to the land use-driven emission sectors within the SFBAAB (i.e., those that are included in the quantification of emissions from a land use project pursuant to a CEQA analysis [on-road passenger vehicles, commercial and residential natural gas, commercial and residential electricity consumption, and domestic waste water treatment], as directed by OPR in the Technical Advisory: *Climate Change and CEQA* [OPR 2008]). This translates to a 2.3 percent gap in necessary GHG emission reductions by 2020 from these sectors.

2.3.2.3 LAND USE PROJECTS BRIGHT LINE THRESHOLD

In Steps 4 and 5 of the gap analysis, Staff determined that applying a 2.3 percent reduction to these land use emissions sectors in the SFBAAB's GHG emissions inventory would result in an equivalent fair share of 1.6 million metric tons per year (MMT/yr) reductions in GHG emissions from new land use development. As additional regulations and legislation aimed at reducing GHG emissions from land use-related sectors become available in the future, the 1.6 MMT GHG emissions reduction goal may be revisited and recalculated by BAAQMD.

In order to derive the 1.6 MMT "gap," a projected development inventory for the next ten years in the SFBAAB was calculated. (See Table 4 and *Revised Draft Options and Justifications Report* (BAAQMD 2009).) CO_2e emissions were modeled for projected development in the SFBAAB and compiled to estimate the associated GHG emissions inventory. The GHG (i.e., CO_2e) CEQA threshold level was adjusted for projected land use development that would occur within BAAQMD's jurisdiction over the period from 2010 through 2020.

Projects with emissions greater than the threshold would be required to mitigate to the threshold level or reduce project emissions by a percentage (mitigation effectiveness) deemed feasible by the Lead Agency under CEQA compared to a base year condition. The base year condition is defined by an equivalent size and character of project with annual emissions using the defaults in URBEMIS and the California Climate Action Registry's General Reporting Protocol for 2008. By this method, land use project mitigation subject to CEQA would help close the "gap" remaining after application of the key regulations and measures noted above supporting overall AB 32 goals.

This threshold takes into account Steps 1-8 of the gap analysis described above to arrive at a numerical mass emissions threshold. Various mass emissions significance threshold levels (i.e., bright lines) could be chosen based on the mitigation effectiveness and performance anticipated to be achieved per project to meet the aggregate emission reductions of 1.6 MMT needed in the SFBAAB by 2020. (See Table 5 and *Revised Draft Options and Justifications Report* (BAAQMD 2009).) Staff recommends a 1,100 MT CO_2e per year threshold. Choosing a 1,100 MT mass emissions significance threshold level (equivalent to approximately 60 single-family units), would result in about 59 percent of all projects being above the significance threshold and having to implement feasible mitigation measures to meet their CEQA obligations. These projects account for approximately 92 percent of all GHG emissions anticipated to occur between now and 2020 from new land use development in the SFBAAB.

Project applicants and lead agencies could use readily available computer models to estimate a project's GHG emissions, based on project specific attributes, to determine if they are above or below the bright line numeric threshold. With this threshold, projects that are above the threshold level, after consideration of emission-reducing characteristics of the project as proposed, would have to reduce their emissions to below the threshold to be considered less than significant.

Establishing a "bright line" to determine the significance of a project's GHG emissions impact provides a level of certainty to lead agencies in determining if a project needs to reduce its GHG emissions through mitigation measures and when an EIR is required.

Table 5 – Operational GHG Threshold Sensitivity Analysis

Option	Mitigation Effectiveness Assumptions		Mass Emission Threshold Level (MT CO_2e/yr)	% of Projects Captured (>threshold)	% of Emissions Captured (> threshold)	Emissions Reduction per year (MT/yr)	Aggregate Emissions Reduction (MMT) at 2020	Threshold Project Size Equivalent (single family dwelling units)
	Performance Standards Applied to All Projects with Emissions < Threshold Level	Mitigation Effectiveness Applied to Emissions > Threshold Level						
1A	N/A	30%	975	60%	93%	201,664	2.0	53
1A	N/A	25%	110	96%	100%	200,108	2.0	66
1A	N/A	30%	1,225	21%	67%	159,276	1.6	67
1A	N/A	26%	1,100	59%	92%	159,877	1.6	60
1A	N/A	30%	2,000	14%	61%	143,418	1.4	109
1A	N/A	25%	1,200	58%	92%	136,907	1.4	66
1A	N/A	30%	3,000	10%	56%	127,427	1.3	164
1A	N/A	25%	1,500	20%	67%	127,303	1.3	82
1B	26%	N/A	N/A	100%	100%	208,594	2.1	N/A[1]
1C	5%	30%	1,900	15%	62%	160,073	1.6	104
1C	10%	25%	1,250	21%	67%	159,555	1.6	68
1C	5%	30%	3,000	10%	56%	145,261	1.5	164
1C	10%	25%	2,000	4%	61%	151,410	1.5	109
1C	10%	30%	10,000	2%	33%	125,271	1.3	547

Notes: MMT = million metric tons per year; MT CO_2e/yr = metric tons of carbon dioxide equivalent emissions per year; MT/yr = metric tons per year; N/A = not applicable.

[1] Any project subject to CEQA would trigger this threshold.

Please refer to Appendix E for detailed calculations.

Source: Data modeled by ICF Jones & Stokes.

2.3.2.4 LAND USE PROJECTS EFFICIENCY-BASED THRESHOLD

GHG efficiency metrics can also be utilized as thresholds to assess the GHG efficiency of a project on a per capita basis (residential only projects) or on a "service population" basis (the sum of the number of jobs and the number of residents provided by a project) such that the project will allow for consistency with the goals of AB 32 (i.e., 1990 GHG emissions levels by 2020). GHG efficiency thresholds can be determined by dividing the GHG emissions inventory goal (allowable emissions), by the estimated 2020 population and employment. This method allows highly efficient projects with higher mass emissions to meet the overall reduction goals of AB 32. Staff believes it is more appropriate to base the land use efficiency threshold on the service population metric for the land use-driven emission inventory. This approach is appropriate because the threshold can be applied evenly to all project types (residential or commercial/retail only and mixed use) and uses only the land use emissions inventory that is comprised of all land use projects. Staff will provide the methodology to calculate a project's GHG emissions in the revised CEQA Guidelines, such as allowing infill projects up to a 50 percent or more reduction in daily vehicle trips if the reduction can be supported by close proximity to transit and support services, or a traffic study prepared for the project.

Table 6 – California 2020 GHG Emissions, Population Projections and GHG Efficiency Thresholds - Land Use Inventory Sectors

Land Use Sectors Greenhouse Gas Emissions Target	295,530,000
Population	44,135,923
Employment	20,194,661
California Service Population (Population + Employment)	64,330,584
AB 32 Goal GHG emissions (metric tons CO_2e)/SP[1]	**4.6**

Notes: AB = Assembly Bill; CO_2e = carbon dioxide equivalent; GHG = greenhouse gas; SP = service population.
[1] Greenhouse gas efficiency levels were calculated using only the "land use-related" sectors of ARB's emissions inventory.
Please refer to Appendix D for detailed calculations.
Sources: Data compiled by EDAW 2009, ARB 2009a, DOF 2009, EDD 2009, ICF Jones & Stokes 2009.

Staff proposes a project-level efficiency threshold of 4.6 MT CO_2e/SP, the derivation of which is shown Table 6. This efficiency-based threshold reflects very GHG-efficient projects. As stated previously and below, staff anticipates that significance thresholds (rebuttable presumptions of significance at the project level) will function on an interim basis only until adequate programmatic approaches are in place at the city, county, and regional level that will allow the CEQA streamlining of individual projects. (See State CEQA Guidelines §15183.5 ["Tiering and Streamlining the Analysis of Greenhouse Gas Emissions"]).

2.3.3 PLAN-LEVEL GHG THRESHOLDS

Staff proposes using a two step process for determining the significance of proposed plans and plan amendments for GHG. As a first step in assessing plan-level impacts, Staff

is proposing that agencies that have adopted a qualified Greenhouse Gas Reduction Strategy (or have incorporated similar criteria in their general plan) and the general plan is consistent with the Greenhouse Gas Reduction Strategy, the general plan would be considered less than significant. In addition, as discussed above for project-level GHG impacts, Staff is proposing an efficiency threshold to assess plan-level impacts. Staff believes a programmatic approach to limiting GHG emissions is appropriate at the plan-level. Thus, as projects consistent with the Greenhouse Gas Reduction Strategy are proposed, they may be able to tier off the plan and its environmental analysis.

2.3.3.1 GHG EFFICIENCY METRICS FOR PLANS

For local land use plans, a GHG-efficiency metric (e.g., GHG emissions per unit) would enable comparison of a proposed general plan to its alternatives and to determine if the proposed general plan meets AB 32 emission reduction goals.

AB 32 identifies local governments as essential partners in achieving California's goal to reduce GHG emissions. Local governments have primary authority to plan, zone, approve, and permit how and where land is developed to accommodate population growth and the changing needs of their jurisdiction. ARB has developed the Local Government Operations Protocol and is developing a protocol to estimate community-wide GHG emissions. ARB encourages local governments to use these protocols to track progress in reducing GHG emissions. ARB encourages local governments to institutionalize the community's strategy for reducing its carbon footprint in its general plan. SB 375 creates a process for regional integration of land development patterns and transportation infrastructure planning with the primary goal of reducing GHG emissions from the largest sector of the GHG emission inventory, light duty vehicles.

If the statewide AB 32 GHG emissions reduction context is established, GHG efficiency can be viewed independently from the jurisdiction in which the plan is located. Expressing projected 2020 mass of emissions from land use-related emissions sectors by comparison to a demographic unit (e.g., population and employment) provides evaluation of the GHG efficiency of a project in terms of what emissions are allowable while meeting AB 32 targets.

Two approaches were considered for efficiency metrics. The "service population" (SP) approach would consider efficiency in terms of the GHG emissions compared to the sum of the number of jobs and the number of residents at a point in time. The per capita option would consider efficiency in terms of GHG emissions per resident only. Staff recommends that the efficiency threshold for plans be based on all emission inventory sectors because, unlike land use projects, general plans comprise more than just land use related emissions (e.g. industrial). Further, Staff recommends that the plan threshold be based on the service population metric as general plans include a mix of residents and employees. The Service Population metric would allow decision makers to compare GHG efficiency of general plan alternatives that vary residential and non-residential development totals, encouraging GHG efficiency through improving jobs/housing balance. This approach would not give preference to communities that accommodate more residential (population-driven) land

uses than non-residential (employment driven) land uses which could occur with the per capita approach.

A SP-based GHG efficiency metric (see Table 7) was derived from the emission rates at the State level that would accommodate projected population and employment growth under trend forecast conditions, and the emission rates needed to accommodate growth while allowing for consistency with the goals of AB 32 (i.e., 1990 GHG emissions levels by 2020).

Table 7 – California 2020 GHG Emissions, Population Projections and GHG Efficiency Thresholds - All Inventory Sectors

All Inventory Sectors Greenhouse Gas Emissions Target	426,500,000
Population	44,135,923
Employment	20,194,661
California Service Population (Population + Employment)	64,330,584
AB 32 Goal GHG emissions (metric tons CO_2e)/SP[1]	**6.6**

Notes: AB = Assembly Bill; CO_2e = carbon dioxide equivalent; GHG = greenhouse gas; SP = service population.
[1] Greenhouse gas efficiency levels were calculated using only the "land use-related" sectors of ARB's emissions inventory.
Please refer to Appendix D for detailed calculations.
Sources: Data compiled by EDAW 2009, ARB 2009a, DOF 2009, EDD 2009, ICF Jones & Stokes 2009.

If a general plan demonstrates, through dividing the emissions inventory projections (MT CO_2e) by the amount of growth that would be accommodated in 2020, that it could meet the GHG efficiency metrics proposed in this section (6.6 MT CO_2e/SP from all emission sectors, as noted in Table 7), then the amount of GHG emissions associated with the general plan would be considered less than significant, regardless of its size (and magnitude of GHG emissions). In other words, the general plan would accommodate growth in a manner that would not hinder the State's ability to achieve AB 32 goals, and thus, would be less than significant for GHG emissions and their contribution to climate change. The efficiency metric would not penalize well-planned communities that propose a large amount of development. Instead, the SP-based GHG efficiency metric acts to encourage the types of development that BAAQMD and OPR support (i.e., infill and transit-oriented development) because it tends to reduce GHG and other air pollutant emissions overall, rather than discourage large developments for being accompanied by a large mass of GHG emissions. Plans that are more GHG efficient would have no or limited mitigation requirements to help them complete the CEQA process more readily than plans that promote GHG inefficiencies, which will require detailed design of mitigation during the CEQA process and could subject a plan to potential challenge as to whether all feasible mitigation was identified and adopted. This type of threshold can shed light on a well-planned general plan that accommodates a large amount of growth in a GHG-efficient way.

When analyzing long-range plans, such as general plans, it is important to note that the planning horizon will often surpass the 2020 timeframe for implementation of AB 32. Executive Order S-3-05 establishes a more aggressive emissions reduction goal for the year 2050 of 80 percent below 1990 emissions levels. The year 2020 should be viewed as a milestone year, and the general plan should not preclude the community from a trajectory toward the 2050 goal. However, the 2020 timeframe is examined in this threshold evaluation because doing so for the 2050 timeframe (with respect to population, employment, and GHG emissions projections) would be too speculative. Advances in technology and policy decisions at the state level will be needed to meet the aggressive 2050 goals. It is beyond the scope of the analysis tools available at this time to examine reasonable emissions reductions that can be achieved through CEQA analysis in the year 2050. As the 2020 timeframe draws nearer, BAAQMD will need to reevaluate the threshold to better represent progress toward 2050 goals.

2.3.4 GREENHOUSE GAS REDUCTION STRATEGIES

Finally, many local agencies have already undergone or plan to undergo efforts to create general or other plans that are consistent with AB 32 goals. The Air District encourages such planning efforts and recognizes that careful upfront planning by local agencies is invaluable to achieving the state's GHG reduction goals. If a project is consistent with an adopted Qualified Greenhouse Gas Reduction Strategy that addresses the project's GHG emissions, it can be presumed that the project will not have significant GHG emission impacts. This approach is consistent with CEQA Guidelines Sections 15064(h)(3) and 15183.5(b), which provides that a "lead agency may determine that a project's incremental contribution to a cumulative effect is not cumulatively considerable if the project will comply with the requirements in a previously approved plan or mitigation program which provides specific requirements that will avoid or substantially lessen the cumulative problem."

A qualified Greenhouse Gas Reduction Strategy (or similar adopted policies, ordinances and programs) is one that is consistent with all of the AB 32 Scoping Plan measures and goals. The Greenhouse Gas Reduction Strategy should identify a land use design, transportation network, goals, policies and implementation measures that would achieve AB 32 goals. Strategies with horizon years beyond 2020 should consider continuing the downward reduction path set by AB 32 and move toward climate stabilization goals established in Executive Order S-3-05.

Qualified Greenhouse Gas Reduction Strategy

A qualified Greenhouse Gas Reduction Strategy adopted by a local jurisdiction should include the following elements as described in the State CEQA Guidelines Section 15183.5. The District's revised CEQA Guidelines provides the methodology to determine if a Greenhouse Gas Reduction Strategy meets these requirements.

(A) Quantify greenhouse gas emissions, both existing and projected over a specified time period, resulting from activities within a defined geographic area;

(B) Establish a level, based on substantial evidence, below which the contribution to greenhouse gas emissions from activities covered by the plan would not be cumulatively considerable;

(C) Identify and analyze the greenhouse gas emissions resulting from specific actions or categories of actions anticipated within the geographic area;

(D) Specify measures or a group of measures, including performance standards, that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level;

(E) Establish a mechanism to monitor the plan's progress toward achieving the level and to require amendment if the plan is not achieving specified levels;

(F) Be adopted in a public process following environmental review.

Local Climate Action Policies, Ordinances and Programs

Air District staff recognizes that many communities in the Bay Area have been proactive in planning for climate change but have not yet developed a stand-alone Greenhouse Gas Reduction Strategy that meets the above criteria. Many cities and counties have adopted climate action policies, ordinances and program that may in fact achieve the goals of AB 32 and a qualified Greenhouse Gas Reduction Strategy. Staff recommends that if a local jurisdiction can demonstrate that its collective set of climate action policies, ordinances and other programs is consistent with AB 32 and State CEQA Guidelines Section 15183.5, includes requirements or feasible measures to reduce GHG emissions and achieves one of the following GHG emission reduction goals,[3] the AB 32 consistency demonstration should be considered equivalent to a qualified Greenhouse Gas Reduction Strategy:

- 1990 GHG emission levels,
- 15 percent below 2008 emission levels, or

Qualified Greenhouse Gas Reduction Strategies that are tied to the AB 32 reduction goals would promote reductions on a plan level without impeding the implementation of GHG-efficient development, and would recognize the initiative of many Bay Area communities who have already developed or are in the process of developing a GHG reduction plan. The details required above for a qualified Greenhouse Gas Reduction Strategy (or similar adopted policies, ordinances and programs) would provide the evidentiary basis for making CEQA findings that development consistent with the plan would result in feasible, measureable, and verifiable GHG reductions consistent with broad state goals

[3] Lead agencies using consistency with their jurisdiction's climate action policies, ordinances and programs as a measure of significance under CEQA Guidelines section 15064(h)(3) and 15183.5(b) should ensure that the policies, ordinances and programs satisfy all of the requirements of that subsection before relying on them in a CEQA analysis.

such that projects approved under qualified Greenhouse Gas Reduction Strategies or equivalent demonstrations would achieve their fair share of GHG emission reductions.

2.3.4.1 GHG THRESHOLDS FOR REGIONAL PLANS

Regional plans include the Regional Transportation Plan prepared by the Metropolitan Transportation Commission (MTC) and air quality plans prepared by the Air District.

The Regional Transportation Plan (RTP), also called a Metropolitan Transportation Plan (MTP) or Long-Range Transportation Plan is the mechanism used in California by both Metropolitan Planning Organizations (MPOs) and Regional Transportation Planning Agencies (RTPAs) to conduct long-range (minimum of 20 years) planning in their regions. MTC functions as both the regional transportation planning agency, a state designation, and, for federal purposes, as the region's metropolitan planning organization (MPO). As such, it is responsible for regularly updating the Regional Transportation Plan, a comprehensive blueprint for the development of the Bay Area's transportation system that includes mass transit, highway, airport, seaport, railroad, bicycle and pedestrian facilities. The performance of this system affects such public policy concerns as air quality, environmental resource consumption, social equity, "smart growth," economic development, safety, and security. Transportation planning recognizes the critical links between transportation and other societal goals. The planning process requires developing strategies for operating, managing, maintaining, and financing the area's transportation system in such a way as to advance the area's long-term goals.

The Air District periodically prepares and updates plans to achieve the goal of healthy air. Typically, a plan will analyze emissions inventories (estimates of current and future emissions from industry, motor vehicles, and other sources) and combine that information with air monitoring data (used to assess progress in improving air quality) and computer modeling simulations to test future strategies to reduce emissions in order to achieve air quality standards. Air quality plans usually include measures to reduce air pollutant emissions from industrial facilities, commercial processes, motor vehicles, and other sources. Bay Area air quality plans are prepared with the cooperation of MTC, the Association of Bay Area Governments (ABAG) and the Bay Conservation and Development Commission (BCDC).

The proposed threshold of significance for regional plans is no net increase in emissions including greenhouse gas emissions. This threshold serves to answer the State CEQA Guidelines Appendix G sample question: "Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?"

2.3.5 STATIONARY SOURCE GHG THRESHOLD

Staff's recommended threshold for stationary source GHG emissions is based on estimating the GHG emissions from combustion sources for all permit applications submitted to the Air District in 2005, 2006 and 2007. The analysis is based only on CO_2

emissions from stationary sources, as that would cover the vast majority of the GHG emissions due to stationary combustion sources in the SFBAAB. The estimated CO_2 emissions were calculated for the maximum permitted amount, i.e. emissions that would be emitted if the sources applying for a permit application operate at maximum permitted load and for the total permitted hours. All fuel types are included in the estimates. For boilers burning natural gas, diesel fuel is excluded since it is backup fuel and is used only if natural gas is not available. Emission values are estimated before any offsets (i.e., Emission Reduction Credits) are applied. GHG emissions from mobile sources, electricity use and water delivery associated with the operation of the permitted sources are not included in the estimates.

It is projected that a threshold level of 10,000 metric tons of CO_2e per year would capture approximately 95 percent of all GHG emissions from new permit applications from stationary sources in the SFBAAB. That threshold level was calculated as an average of the combined CO_2 emissions from all stationary source permit applications submitted to the Air District during the three year analysis period.

Staff recommends this 10,000 MT of CO_2/yr as it would address a broad range of combustion sources and thus provide for a greater amount of GHG reductions to be captured and mitigated through the CEQA process. As documented in the Scoping Plan, in order to achieve statewide reduction targets, emissions reductions need to be obtained through a broad range of sources throughout the California economy and this threshold would achieve this purpose. While this threshold would capture 95 percent of the GHG emissions from new permit applications, the threshold would do so by capturing only the large, significant projects. Permit applications with emissions above the 10,000 MT of CO_2/yr threshold account for less than 10 percent of stationary source permit applications which represent 95 percent of GHG emissions from new permits analyzed during the three year analysis period.

This threshold would be considered an interim threshold and Air District staff will reevaluate the threshold as AB 32 Scoping Plan measures such as cap and trade are more fully developed and implemented at the state level.

2.3.6 SUMMARY OF JUSTIFICATION FOR GHG THRESHOLDS

The bright-line numeric threshold of 1,100 MT CO_2e/yr is a numeric emissions level below which a project's contribution to global climate change would be less than "cumulatively considerable." This emissions rate is equivalent to a project size of approximately 60 single-family dwelling units, and approximately 59 percent of all future projects and 92 percent of all emissions from future projects would exceed this level. For projects that are above this bright-line cutoff level, emissions from these projects would still be less than cumulatively significant if the project as a whole would result in an efficiency of 4.6 MT CO_2e per service population or better for mixed-use projects. Projects with emissions above 1,100 MT CO_2e/yr would therefore still be less than significant if they achieved project efficiencies below these levels. If projects as proposed exceed these levels, they would be required to implement mitigation measures to bring

them back below the 1,100 MT CO_2e/yr bright-line cutoff or within the 4.6 MT CO_2e Service Population efficiency threshold. If mitigation did not bring a project back within the threshold requirements, the project would be cumulatively significant and could be approved only with a Statement of Overriding Considerations and a showing that all feasible mitigation measures have been implemented. Projects' GHG emissions would also be less than significant if they comply with a Qualified Greenhouse Gas Reduction Strategy.

As explained in the preceding analyses of these thresholds, the greenhouse gas emissions from land use projects expected between now and 2020 built in compliance with these thresholds would be approximately 26 percent below BAU 2020 conditions and thus would be consistent with achieving an AB 32 equivalent reduction. The 26 percent reduction from BAU 2020 from new projects built in conformance with these proposed thresholds would achieve an aggregate reduction of approximately 1.6 MMT CO_2e/yr, which is the level of emission reductions from new Bay Area land use sources needed to meet the AB 32 goals, per ARB's Scoping Plan as discussed above.

Projects with greenhouse gas emissions in conformance with these proposed thresholds would therefore not be considered significant for purposes of CEQA. Although the emissions from such projects would add an incremental amount to the overall greenhouse gas emissions that cause global climate change impacts, emissions from projects consistent with these thresholds would not be a "cumulatively considerable" contribution under CEQA. Such projects would not be "cumulatively considerable" because they would be helping to solve the cumulative problem as a part of the AB 32 process.

California's response to the problem of global climate change is to reduce greenhouse gas emissions to 1990 levels by 2020 under AB 32 as a near-term measure and ultimately to 80 percent below 1990 levels by 2050 as the long-term solution to stabilizing greenhouse gas concentrations in the atmosphere at a level that will not cause unacceptable climate change impacts. To implement this solution, the Air Resources Board has adopted a Scoping Plan and budgeted emissions reductions that will be needed from all sectors of society in order to reach the interim 2020 target.

The land-use sector in the Bay Area needs to achieve aggregate emission reductions of approximately 1.6 MMT CO_2e/yr from new projects between now and 2020 to achieve this goal, as noted above, and each individual new project will need to achieve its own respective portion of this amount in order for the Bay Area land use sector as a whole to achieve its allocated emissions target. Building all of the new projects expected in the Bay Area between now and 2020 in accordance with the thresholds that District staff are proposing will achieve the overall appropriate share for the land use sector, and building each individual project in accordance with the proposed thresholds will achieve that individual project's respective portion of the emission reductions needed to implement the AB 32 solution. For these reasons, projects built in conformance with the proposed thresholds will be part of the solution to the cumulative problem, and not part of the continuing problem. They will allow the Bay Area's land use sector to achieve the emission reductions necessary from that sector for California to implement its solution to the cumulative problem of global climate change. As such, even though such projects

will add an incremental amount of greenhouse gas emissions, their incremental contribution will be less than "cumulatively considerable" because they are helping to achieve the cumulative solution, not hindering it. Such projects will therefore not be "significant" for purposes of CEQA. (*See* CEQA Guidelines §15064(h)(1).)

The conclusion that land use projects that comply with these proposed thresholds is also supported by CEQA Guidelines Section 15030(a)(3), which provides that a project's contribution to a cumulative problem can be less that cumulatively considerable "if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact." In the case of greenhouse gas emissions associated with land use projects, achieving the amount of emission reductions below BAU that will be required to achieve the AB 32 goals is the project's "fair share" of the overall emission reductions needed under ARB's scoping plan to reach the overall statewide AB 32 emissions levels for 2020. If a project is designed to implement greenhouse gas mitigation measures that achieve a level of reductions consistent with what is required from all new land use projects to achieve the land use sector "budget" – *i.e.*, keeping overall project emissions below 1,100 MT CO_2e/yr or ensuring that project efficiency is better than 4.6 MT CO_2e/service population – then it will be implementing its share of the mitigation measures necessary to alleviate the cumulative impact, as shown in the analyses set forth above.

It is also worth noting that this "fair share" approach is flexible and will allow a project's significance to be determined by how well it is designed from a greenhouse gas efficiency standpoint, and not just by the project's size. For example, a large high-density infill project located in an urban core nearby to public transit and other alternative transportation options, and built using state-of-the-art energy efficiency methods and improvements such as solar panels, as well as all other feasible mitigation measures, would not become significant for greenhouse gas purposes (and thus require a Statement of Overriding Considerations in order to be approved) simply because it happened to be a large project. Projects such as this hypothetical development with low greenhouse gas emissions per service population are what California will need in the future in order to do its part in achieving a solution to the problem of global climate change. The determination of significance under CEQA should therefore take these factors into account, and staff's proposed significance thresholds would achieve this important policy goal. In all, land use sector projects that comply with the GHG thresholds would not be "cumulatively considerable" because they would be helping to solve the cumulative problem as a part of the AB 32 process.

Likewise, new Air District permit applications for stationary sources that comply with the quantitative threshold of 10,000 MT CO_2e/yr would not be "cumulatively considerable" because they also would not hinder the state's ability to solve the cumulative greenhouse gas emissions problem pursuant to AB 32. Unlike the land use sector, the AB 32 Scoping Plan measures, including the cap-and-trade program, provide for necessary emissions reductions from the stationary source sector to achieve AB 32 2020 goals.

While stationary source projects will need to comply with the cap-and-trade program once it is enacted and reduce their emissions accordingly, the program will be phased in over time starting in 2012 and at first will only apply to the very largest sources of GHG emissions. In the mean time, certain stationary source projects, particularly those with large GHG emissions, still will have a cumulatively considerable impact on climate change. The 10,000 MT CO_2e/yr threshold will capture 95 percent of the stationary source sector GHG emissions in the Bay Area. The five percent of emissions that are from stationary source projects below the 10,000 MT CO_2e/yr threshold account for a small portion of the Bay Area's total GHG emissions from stationary sources and these emissions come from very small projects. Such small stationary source projects will not significantly add to the global problem of climate change, and they will not hinder the Bay Area's ability to reach the AB 32 goal in any significant way, even when considered cumulatively. In Air District's staff's judgment, the potential environmental benefits from requiring EIRs and mitigation for these projects would be insignificant. In all, based on staff's expertise, stationary source projects with emissions below 10,000 MT CO_2e/yr will not provide a cumulatively considerable contribution to the cumulative impact of climate change.

3 COMMUNITY RISK AND HAZARD THRESHOLDS

To address community risk from air toxics, the Air District initiated the Community Air Risk Evaluation (CARE) program in 2004 to identify locations with high levels of risk from ambient toxic air contaminants (TAC) co-located with sensitive populations and use the information to help focus mitigation measures. Through the CARE program, the Air District developed an inventory of TAC emissions for 2005 and compiled demographic and heath indicator data. According to the findings of the CARE Program, diesel PM—mostly from on and off-road mobile sources—accounts for over 80 percent of the inhalation cancer risk from TACs in the Bay Area (BAAQMD 2006).

The Air District applied a regional air quality model using the 2005 emission inventory data to estimate excess cancer risk from ambient concentrations of important TAC species, including diesel PM, 1,3-butadiene, benzene, formaldehyde and acetaldehyde. The highest cancer risk levels from ambient TAC in the Bay Area tend to occur in the core urban areas, along major roadways and adjacent to freeways and port activity. Cancer risks in areas along these major freeways are estimated to range from 200 to over 500 excess cases in a million for a lifetime of exposure. Priority communities within the Bay Area – defined as having higher emitting sources, highest air concentrations, and nearby low income and sensitive populations – include the urban core areas of Concord, eastern San Francisco, western Alameda County, Redwood City/East Palo Alto, Richmond/San Pablo, and San Jose.

Fifty percent of BAAQMD's population was estimated to have an ambient background inhalation cancer risk of less than 500 cases in one million, based on emission levels in 2005. Table 8 presents a summary of percentages of the population exposed to varying levels of cancer risk from ambient TACs. Approximately two percent of the SFBAAB

population is exposed to background risk levels of less than 200 excess cases in one million. This is in contrast to the upper percentile ranges where eight percent of the SFBAAB population is exposed to background risk levels of greater than 1,000 excess cases per one million. To identify and reduce risks from TAC, this chapter presents thresholds of significance for both cancer risk and non-cancer health hazards.

Table 8 – Statistical Summary of Estimated Population-Weighted Ambient Cancer Risk in 2005

Percentage of Population (Percent below level of ambient risk)	Ambient Cancer Risk (inhalation cancer cases in one million)
92	1,000
90	900
83	800
77	700
63	600
50	500
32	400
13	300
2	200
<1	100

Source: Data compiled by EDAW 2009.

Many scientific studies have linked fine particulate matter and traffic-related air pollution to respiratory illness (Hiltermann et al. 1997, Schikowski et al 2005, Vineis et al. 2007) and premature mortality (Dockery 1993, Pope et al. 1995, Jerrett et al. 2005). Traffic-related air pollution is a complex mix of chemical compounds (Schauer et al. 2006), often spatially correlated with other stressors, such as noise and poverty (Wheeler and Ben-Shlomo 2005). While such correlations can be difficult to disentangle, strong evidence for adverse health effects of fine particulate matter ($PM_{2.5}$) has been developed for regulatory applications in a study by the U.S, EPA. This study found that a 10 percent increase in $PM_{2.5}$ concentrations increased the non-injury death rate by 10 percent (U.S. EPA 2006).

Public Health Officers for four counties in the San Francisco Bay Area in 2009 provided testimony to the Air District's Advisory Council (February 11, 2009, Advisory Council Meeting on Air Quality and Public Health). Among the recommendations made, was that $PM_{2.5}$, in addition to TACs, be considered in assessments of community-scale impacts of air pollution. In consideration of the scientific studies and recommendations by the Bay Area Health Directors, it is apparent that, in addition to the significance thresholds for local-scale TAC, thresholds of significance are required for near-source, local-scale concentrations of $PM_{2.5}$.

3.2 PROPOSED THRESHOLDS OF SIGNIFICANCE

Proposed thresholds of significance and Board-requested options are presented in this section:

- The **Staff Proposal** includes thresholds for cancer risk, non-cancer health hazards, and fine particulate matter.
- **Tiered Thresholds Option** includes tiered thresholds for new sources in impacted communities. Thresholds for receptors and cumulative impacts are the same as the Staff Proposal.

Proposal/Option	Construction-Related	Operational-Related
Project-Level – Individual Project		
Risks and Hazards – New Source (All Areas) (Individual Project) **Staff Proposal**	Same as Operational Thresholds*	Compliance with Qualified Community Risk Reduction Plan OR Increased cancer risk of >10.0 in a million Increased non-cancer risk of > 1.0 Hazard Index (Chronic or Acute) Ambient $PM_{2.5}$ increase: > 0.3 µg/m^3 annual average Zone of Influence: 1,000-foot radius from fence line of source or receptor
Risks and Hazards – New Receptor (All Areas) (Individual Project) **Staff Proposal**	Same as Operational Thresholds*	Compliance with Qualified Community Risk Reduction Plan OR Increased cancer risk of >10.0 in a million Increased non-cancer risk of > 1.0 Hazard Index (Chronic or Acute) Ambient $PM_{2.5}$ increase: > 0.3 µg/m^3 annual average Zone of Influence: 1,000-foot radius from fence line of source or receptor

Proposal/Option	Construction-Related	Operational-Related
Risks and Hazards (Individual Project) **Tiered Thresholds Option**	Same as Operational Thresholds*	**Impacted Communities:** Siting a New Source Compliance with Qualified Community Risk Reduction Plan OR Increased cancer risk of >5.0 in a million Increased non-cancer risk of > 1.0 Hazard Index (Chronic or Acute) Ambient $PM_{2.5}$ increase: > 0.2 µg/m^3 annual average Zone of Influence: 1,000-foot radius from fence line of source or receptor
	Same as Operational Thresholds*	**Impacted Communities:** Siting a New Receptor **All Other Areas:** Siting a New Source or Receptor Compliance with Qualified Community Risk Reduction Plan OR Increased cancer risk of >10.0 in a million Increased non-cancer risk of > 1.0 Hazard Index (Chronic or Acute) Ambient $PM_{2.5}$ increase: > 0.3 µg/m^3 annual average Zone of Influence: 1,000-foot radius from fence line of source or receptor
Accidental Release of Acutely Hazardous Air Pollutants	None	Storage or use of acutely hazardous materials locating near receptors or receptors locating near stored or used acutely hazardous materials considered significant
Project-Level – Cumulative		
Risks and Hazards – New Source (All Areas) (Cumulative Thresholds)	Same as Operational Thresholds*	Compliance with Qualified Community Risk Reduction Plan OR Cancer: > 100 in a million (from all local sources) Non-cancer: > 10.0 Hazard Index (from all local sources) (Chronic) $PM_{2.5}$: > 0.8 µg/m^3 annual average (from all local sources) Zone of Influence: 1,000-foot radius from fence line of source or receptor

Proposal/Option	Construction-Related	Operational-Related
Risks and Hazards – New Receptor (All Areas) (Cumulative Thresholds)	Same as Operational Thresholds*	Compliance with Qualified Community Risk Reduction Plan OR Cancer: > 100 in a million (from all local sources) Non-cancer: > 10.0 Hazard Index (from all local sources) (Chronic) $PM_{2.5}$: > 0.8 $\mu g/m^3$ annual average (from all local sources) Zone of Influence: 1,000-foot radius from fence line of source or receptor
Plan-Level		
Risks and Hazards	None	1. Overlay zones around existing and planned sources of TACs (including adopted Risk Reduction Plan areas). 2. Overlay zones of at least 500 feet (or Air District-approved modeled distance) from all freeways and high volume roadways.
Accidental Release of Acutely Hazardous Air Pollutants	None	None
Regional Plans (Transportation and Air Quality Plans)		
Risks and Hazards	None	No net increase in toxic air contaminants

* Note: The Air District recommends that for construction projects that are less than one year duration, Lead Agencies should annualize impacts over the scope of actual days that peak impacts are to occur, rather than the full year.

3.3 JUSTIFICATION AND SUBSTANTIAL EVIDENCE SUPPORTING THRESHOLDS

The goal of the proposed thresholds is to ensure that no source creates, or receptor endures, a significant adverse impact from any individual project, and that the total of all nearby directly emitted risk and hazard emissions is also not significantly adverse. The thresholds for local risks and hazards from TAC and $PM_{2.5}$ are intended to apply to all sources of emissions, including both permitted stationary sources and on- and off-road mobile sources, such as sources related to construction, busy roadways, or freight movement.

Thresholds for an individual new source are designed to ensure that the source does not contribute to a cumulatively significant impact. Cumulative thresholds for sources recognize that some areas are already near or at levels of significant impact. If within such an area there are receptors, or it can reasonably be foreseen that there will be

receptors, then a cumulative significance threshold sets a level beyond which any additional risk is significant.

For new receptors – sensitive populations or the general public – thresholds of significance are designed to identify levels of contributed risk or hazards from existing local sources that pose a significant risk to the receptors. Single-source thresholds for receptors are provided to recognize that within the area defined there can be variations in risk levels that may be significant. Single-source thresholds assist in the identification of significant risks, hazards, or concentrations in a subarea, within the area defined by the selected radius. Cumulative thresholds for receptors are designed to account for the effects of all sources within the defined area.

Cumulative thresholds, for both sources and receptors, must consider the size of the source area, defined by a radius from the proposed project. To determine cumulative impacts from a prescribed zone of influence requires the use of modeling. The larger the radius, the greater the number of sources considered that may contribute to the modeled risk and, until the radius approaches a regional length scale, the greater the expected modeled risk increment. If the area of impact considered were grown to the scale of a city, the modeled risk increment would approach the risk level present in the ambient air.

3.3.1 SCIENTIFIC AND REGULATORY JUSTIFICATION

Regulatory Framework for TACs

Prior to 1990, the Clean Air Act required EPA to list air toxics it deemed hazardous and to establish control standards which would restrict concentrations of hazardous air pollutants (HAP) to a level that would prevent any adverse effects "with an ample margin of safety." By 1990, EPA had regulated only seven such pollutants and it was widely acknowledged by that time that the original Clean Air Act had failed to address toxic air emissions in any meaningful way. As a result, Congress changed the focus of regulation in 1990 from a risk-based approach to technology-based standards. Title III, Section 112(b) of the 1990 Clean Air Act Amendment established this new regulatory approach. Under this framework, prescribed pollution control technologies based upon maximum achievable control technology (MACT) were installed without the a priori estimation of the health or environmental risk associated with each individual source. The law listed 188 HAPs that would be subject to the MACT standards. EPA issued 53 standards for 89 different types of major industrial sources of air toxics and eight categories of smaller sources such as dry cleaners. These requirements took effect between 1996 and 2002. Under the federal Title V Air Operating Permit Program, a facility with the potential to emit 10 tons of any toxic air pollutant, or 25 tons per year of any combination of toxic air pollutants, is defined as a major source HAPs. Title V permits include requirements for these facilities to limit toxic air pollutant emissions.

Several state and local agencies adopted programs to address gaps in EPA's program prior to the overhaul of the national program in 1990. California's program to reduce exposure to air toxics was established in 1983 by the Toxic Air Contaminant Identification and Control Act (AB 1807, Tanner 1983) and the Air Toxics "Hot Spots"

Information and Assessment Act (AB 2588, Connelly 1987). Under AB 1807, ARB and the Office of Environmental Health Hazard Assessment (OEHHA) determines if a substance should be formally identified as a toxic air contaminant (TAC) in California. OEHHA also establishes associated risk factors and safe concentrations of exposure.

AB 1807 was amended in 1993 by AB 2728, which required ARB to identify the 189 federal hazardous air pollutants as TACs. AB 2588 (Connelly, 1987) supplements the AB 1807 program, by requiring a statewide air toxics inventory, notification of people exposed to a significant health risk, and facility plans to reduce these risks. In September 1992, the "Hot Spots" Act was amended by Senate Bill 1731 which required facilities that pose a significant health risk to the community to reduce their risk through a risk management plan.

Cancer Risk

Cancer risk from TACs is typically expressed in numbers of excess cancer cases per million persons exposed over a defined period of exposure, for example, over an assumed 70 year lifetime. The Air District is not aware of any agency that has established an acceptable level of cancer risk for TACs. However, a range of what constitutes a significant increment of cancer risk from any compound has been established by the U.S. EPA. EPA's guidance for conducting air toxics analyses and making risk management decisions at the facility- and community-scale level considers a range of acceptable cancer risks from one in a million to one in ten thousand (100 in a million). The guidance considers an acceptable range of cancer risk increments to be from one in a million to one in ten thousand. In protecting public health with an ample margin of safety, EPA strives to provide maximum feasible protection against risks to health from HAPs by limiting additional risk to a level no higher than the one in ten thousand estimated risk that a person living near a source would be exposed to at the maximum pollutant concentrations for 70 years. This goal is described in the preamble to the benzene National Emissions Standards for Hazardous Air Pollutants (NESHAP) rulemaking (54 Federal Register 38044, September 14, 1989) and is incorporated by Congress for EPA's residual risk program under Clean Air Act section 112(f).

Regulation 2, Rule 5 of the Air District specifies permit requirements for new and modified stationary sources of TAC. The Project Risk Requirement (2-5-302.1) states that the Air Pollution Control Officer shall deny an Authority to Construct or Permit to Operate for any new or modified source of TACs if the project cancer risk exceeds 10.0 in one million.

Hazard Index for Non-cancer Health Effects

Non-cancer health hazards for chronic and acute diseases are expressed in terms of a hazard index (HI), a ratio of TAC concentration to a reference exposure level (REL), below which no adverse health effects are expected, even for sensitive individuals. As such, OEHHA has defined acceptable concentration levels, and also significant concentration increments, for compounds that pose non-cancer health hazards. If the HI for a compound is less than one, non-cancer chronic and acute health impacts have been determined to be less than significant.

State and Federal Ambient Air Quality Standards for $PM_{2.5}$

The Children's Environmental Health Protection Act (Senate Bill 25), passed by the California state legislature in 1999, requires ARB, in consultation with OEHHA, to "review all existing health-based ambient air quality standards to determine whether, based on public health, scientific literature and exposure pattern data, these standards adequately protect the public, including infants and children, with an adequate margin of safety." As a result of the review requirement, in 2002 ARB adopted an annual average California Ambient Air Quality Standard (CAAQS) for $PM_{2.5}$ of 12 ug/m^3 that is not to be exceeded (California Code of Regulations, Title 17 § 70200, Table of Standards.) The National Ambient Air Quality Standard (NAAQS) established an annual standard for $PM_{2.5}$ (15 ug/m^3) that is less stringent that the CAAQS, but also set a 24-hour average standard (35 ug/m^3), which is not included in the CAAQS (Code of Federal Regulations, Title 40, Part 50.7).

Significant Impact Levels for $PM_{2.5}$

EPA recently proposed and documented alternative options for $PM_{2.5}$ Significant Impact Levels (SILs) (Federal Register 40 CFR Parts 51 and 52, September 21, 2007). The EPA is proposing to facilitate implementation of a $PM_{2.5}$ Prevention of Significant Deterioration (PSD) program in areas attaining the $PM_{2.5}$ NAAQS by developing $PM_{2.5}$ increments, or SILs. These "increments" are maximum increases in ambient $PM_{2.5}$ concentrations ($PM_{2.5}$ increments) allowed in an area above the baseline concentration.

The SIL is a threshold that would be applied to individual facilities that apply for a permit to emit a regulated pollutant in an area that meets the NAAQS. The State and EPA must determine if emissions from that facility will cause the air quality to worsen. If an individual facility projects an increase in emissions that result in ambient impacts greater than the established SIL, the permit applicant would be required to perform additional analyses to determine if those impacts will be more than the amount of the PSD increment. This analysis would combine the impact of the proposed facility when added to all other sources in the area.

The EPA is proposing such values for $PM_{2.5}$ that will be used as screening tools by a major source subject to PSD to determine the subsequent level of analysis and data gathering required for a PSD permit application for emissions of $PM_{2.5}$. The SIL is one element of the EPA program to prevent deterioration in regional air quality and is utilized in the new source review (NSR) process. New source review is required under Section 165 of the Clean Air Act, whereby a permit applicant must demonstrate that emissions from the proposed construction and operation of a facility "will not cause, or contribute to, air pollution in excess of any maximum allowable increase or maximum allowable concentration for any pollutant." The purpose of the SIL is to provide a screening level that triggers further analysis in the permit application process.

For the purpose of NSR, SILs are set for three types of areas: Class I areas where especially clean air is most desirable, including national parks and wilderness areas; Class II areas where there is not expected to be substantial industrial growth; and Class III areas where the highest relative level of industrial development is expected. In Class II

and Class III areas, a $PM_{2.5}$ concentration of 0.3, 0.8, and 1 $\mu g/m^3$ has been proposed as a SIL. To arrive at the SIL $PM_{2.5}$ option of 0.8 $\mu g/m^3$, EPA scaled an established PM_{10} SILs of 1.0 $\mu g/m^3$ by the ratio of emissions of $PM_{2.5}$ to PM_{10} using the EPA's 1999 National Emissions Inventory. To arrive at the SIL option of 0.3 $\mu g/m^3$, EPA scaled the PM_{10} SIL of 1.0 $\mu g/m^3$ by the ratio of the current Federal ambient air quality standards for $PM_{2.5}$ and PM_{10} (15/50). These options represent what EPA currently considers as a range of appropriate SIL values.

EPA interprets the SIL to be the level of $PM_{2.5}$ increment that represents a "significant contribution" to regional non-attainment. While SIL options were not designed to be thresholds for assessing community risk and hazards, they are being considered to protect public health at a regional level by helping an area maintain the NAAQS. Furthermore, since it is the goal of the Air District to achieve and maintain the NAAQS and CAAQS at both regional and local scales, the SILs may be reasonably be considered as thresholds of significance under CEQA for local-scale increments of $PM_{2.5}$.

Roadway Proximity Health Studies

Several medical research studies have linked near-road pollution exposure to a variety of adverse health outcomes impacting children and adults. Kleinman et al. (2007) studied the potential of roadway particles to aggravate allergic and immune responses in mice. Using mice that were not inherently susceptible, the researchers placed these mice at various distances downwind of State Road 60 and Interstate 5 freeways in Los Angeles to test the effect these roadway particles have on their immune system. They found that within five meters of the roadway, there was a significant allergic response and elevated production of specific antibodies. At 150 meters (492 feet) and 500 meters (1,640 feet) downwind of the roadway, these effects were not statistically significant.

Another significant study (Ven Hee et al. 2009) conducted a survey involving 3,827 participants that aimed to determine the effect of residential traffic exposure on two preclinical indicators of heart failure; left ventricular mass index (LVMI), measured by the cardiac magnetic resonance imaging (MRI), and ejection fraction. The studies classified participants based on the distance between their residence and the nearest interstate highway, state or local highway, or major arterial road. Four distance groups were defined: less than 50 meters (165 feet), 50-100 meters, 101-150 meters, and greater than 150 meters. After adjusting for demographics, behavioral, and clinical covariates, the study found that living within 50 meters of a major roadway was associated with a 1.4 g/m^2 higher LVMI than living more than 150 meters from one. This suggests an association between traffic-related air pollution and increased prevalence of a preclinical predictor of heart failure among people living near roadways.

To quantify the roadway concentrations of $PM_{2.5}$ that contributed to the health impacts reported by Kleinman et al (2007), the Air District modeled the emissions and associated particulate matter concentrations for the roadways studied. To perform the modeling, emissions were estimated for Los Angeles using the EMFAC model and annual average vehicle traffic data taken from Caltrans was used in the roadway model (CAL3QHCR) to estimate the downwind $PM_{2.5}$ concentrations at 50 meters and 150 meters. Additionally,

emissions were assumed to occur from 10:00 a.m. to 2:00 p.m. corresponding to the time in which the mice were exposed during the study. The results of the modeling indicate that at 150 meters, where no significant health effects were found, the downwind concentration of $PM_{2.5}$ was 0.78 $\mu g/m^3$, consistent with the proposed EPA SIL option of 0.8 $\mu g/m^3$.

Concentration-Response Function for $PM_{2.5}$

The U.S. EPA reevaluated the relative risk of premature death associated with $PM_{2.5}$ exposure and developed a new relative risk factor (U.S. EPA 2006). This expert elicitation was prepared in support of the characterization of uncertainty in EPA's benefits analyses associated with reductions in exposure to particulate matter pollution. As recommended by the National Academy of Sciences, EPA used expert judgment to better describe the uncertainties inherent in their benefits analysis. . Twelve experts participated in the study and provided not just a point estimate of the health effects of PM2.5, but a probability distribution representing the range where they expected the true effect would be. Among the experts who directly incorporated their views on the likelihood of a causal relationship into their distributions, the central (median) estimates of the percent change in all-cause mortality in the adult U.S. population that would result from a permanent 1 µg/m3 drop in annual average PM2.5 concentrations ranged from 0.7 to 1.6 percent. The median of their estimates was 1.0 (% increase per 1 µg/m3 increase in PM2.5), with a 90% confidence interval of 0.3 to 2.0 (medians of their 5th and 95th percentiles, respectively) (BAAQMD 2010).Subsequent to the EPA elicitation, Schwartz et al. (2008) examined the linearity of the concentration-response function of $PM_{2.5}$-mortality and showed that the response function was linear, with health effects clearly continuing below the current U.S. standard of 15 $\mu g/m^3$, and that the effects of changes in exposure on mortality were seen within two years.

San Francisco Ordinance on Roadway Proximity Health Effects

In 2008, the City and County of San Francisco adopted an ordinance (San Francisco Health Code, Article 38 - Air Quality Assessment and Ventilation Requirement for Urban Infill Residential Development, Ord. 281-08, File No. 080934, December 5, 2008) requiring that public agencies in San Francisco take regulatory action to prevent future air quality health impacts from new sensitive uses proposed near busy roadways (SFDPH 2008). The regulation requires that developers screen sensitive use projects for proximity to traffic and calculate the concentration of $PM_{2.5}$ from traffic sources where traffic volumes suggest a potential hazard. If modeled levels of traffic-attributable $PM_{2.5}$ at a project site exceed an action level (currently set at 0.2 $\mu g/m^3$) developers would be required to incorporate ventilation systems to remove 80 percent of $PM_{2.5}$ from outdoor air. The regulation does not place any requirements on proposed sensitive uses if modeled air pollutant levels fall below the action threshold. This ordinance only considers impacts from on-road motor vehicles, not impacts related to construction equipment or stationary sources.

A report with supporting documentation for the ordinance (SFPHD 2008) provided a threshold to trigger action or mitigation of 0.2 $\mu g/m^3$ of $PM_{2.5}$ annual average exposure from roadway vehicles within a 150 meter (492 feet) maximum radius of a sensitive

receptor. The report applied the concentration-response function from Jerrett et al. (2005) that attributed 14 percent increase in mortality to a 10 $\mu g/m^3$ increase in $PM_{2.5}$ to estimate an increase in non-injury mortality in San Francisco of about 21 excess deaths per million population per year from a 0.2 $\mu g/m^3$ increment of annual average $PM_{2.5}$.

Distance for Significant Impact

The distance used for the radius around the project boundary should reflect the zone or area over which sources may have a significant influence. For cumulative thresholds, for both sources and receptors, this distance also determines the size of the source area, defined. To determine cumulative impacts from a prescribed zone of influence requires the use of modeling. The larger the radius, the greater the number of sources considered that may contribute to the risk and the greater the expected modeled risk increment. If the area of impact considered were grown to approach the scale of a city, the modeled risk increment would approach the risk level present in the ambient air.

A summary of research findings in ARB's Land Use Compatibility Handbook (ARB 2005) indicates that traffic-related pollutants were higher than regional levels within approximately 1,000 feet downwind and that differences in health-related effects (such as asthma, bronchitis, reduced lung function, and increased medical visits) could be attributed in part to the proximity to heavy vehicle and truck traffic within 300 to 1,000 feet of receptors. In the same summary report, ARB recommended avoiding siting sensitive land uses within 1,000 feet of a distribution center and major rail yard, which supports the use of a 1,000 feet evaluation distance in case such sources may be relevant to a particular project setting. A 1,000 foot zone of influence is also supported by Health & Safety Code §42301.6 (Notice for Possible Source Near School).

Some studies have shown that the concentrations of particulate matter tend to be reduced substantially or can even be indistinguishable from upwind background concentrations at a distance 1,000 feet downwind from sources such as freeways or large distribution centers. Zhu et al. (2002) conducted a systematic ultrafine particle study near Interstate 710, one of the busiest freeways in the Los Angeles Basin. Particle number concentration and size distribution were measured as a function of distances upwind and downwind of the I-710 freeway. Approximately 25 percent of the 12,180 vehicles per hour are heavy duty diesel trucks based on video counts conducted as part of the research. Measurements were taken at 13 feet, 23 feet, 55 feet, 252 feet, 449 feet, and 941 feet downwind and 613 feet upwind from the edge of the freeway. The particle number and supporting measurements of carbon monoxide and black carbon decreased exponentially and all constituents simultaneously tracked with each other as one moves away from the freeway. Ultrafine particle size distribution changed markedly and its number concentrations dropped dramatically with increasing distance. The study found that ultrafine particle concentrations measured 941 feet downwind of I-710 were indistinguishable from the upwind background concentration.

Impacted Communities

Starting in 2006, the Air District's CARE program developed gridded TAC emissions inventories and compiled demographic information that were used to identify

communities that were particularly impacted by toxic air pollution for the purposes of distributing grant and incentive funding. In 2009, the District completed regional modeling of TAC on a one kilometer by one kilometer grid system. This modeling was used to estimate cancer risk and TAC population exposures for the entire District. The information derived from the modeling was then used to update and refine the identification of impacted communities. One kilometer modeling yielded estimates of annual concentrations of five key compounds – diesel particulate matter, benzene, 1,3-butadiene, formaldehyde, and acetaldehyde – for year 2005. These concentrations were multiplied by their respective unit cancer risk factors, as established by OEHHA, to estimate the expected excess cancer risk per million people from these compounds.

Sensitive populations from the 2000 U.S. Census database were identified as youth (under 18) and seniors (over 64) and mapped to the same one kilometer grid used for the toxics modeling. Excess cancers from TAC exposure were determined by multiplying these sensitive populations by the model-estimated excess risk to establish a data set representing sensitive populations with high TAC exposures. TAC emissions (year 2005) were mapped to the one kilometer grid and also scaled by their unit cancer risk factor to provide a data set representing source regions for TAC emissions. Block-group level household income data from the U.S. Census database were used to identify block groups with family incomes where more than 40 percent of the population was below 185 percent of the federal poverty level (FPL). Poverty-level polygons that intersect high (top 50 percent) exposure cells and are within one grid cell of a high emissions cell (top 25 percent) were used to identify impacted areas. Boundaries were constructed along major roads or highways that encompass nearby high emission cells and low income areas. This method identified the following six areas as priority communities: (1) portions of the City of Concord; (2) Western Contra Costa County (including portions of the Cities of Richmond and San Pablo); (3) Western Alameda County along the Interstate-880 corridor (including portions of the Cities of Berkeley, Oakland, San Leandro, San Lorenzo, Hayward; (4) Portions of the City of San Jose. (5) Eastern San Mateo County (including portions of the Cities of Redwood City and East Palo Alto); and (6) Eastern portions of the City of San Francisco.

3.3.2 CONSTRUCTION, LAND USE AND STATIONARY SOURCE RISK AND HAZARD THRESHOLDS

The proposed options for local risk and hazards thresholds of significance are based on U.S. EPA guidance for conducting air toxics analyses and making risk management decisions at the facility and community-scale level. The thresholds consider reviews of recent health effects studies that link increased concentrations of fine particulate matter to increased mortality. The proposed thresholds would apply to both siting new sources and siting new receptors.

For new sources of TACs, thresholds of significance for a single source are designed to ensure that emissions do not raise the risk of cancer or non-cancer health impacts to cumulatively significant levels. For new sources of $PM_{2.5}$, thresholds are designed to ensure that $PM_{2.5}$ concentrations are maintained below state and federal standards in all

areas where sensitive receptors or members of the general public live or may foreseeably live, even if at the local- or community-scale where sources of TACs and PM may be nearby.

Project Radius for Assessing Impacts

For a project proposing a new source or receptor it is recommended to assess impacts within 1,000 feet, taking into account both its individual and nearby cumulative sources (i.e. proposed project plus existing and foreseeable future projects). Cumulative sources are the combined total risk values of each individual source within the 1,000-foot evaluation zone. A lead agency should enlarge the 1,000-foot radius on a case-by-case basis if an unusually large source or sources of risk or hazard emissions that may affect a proposed project is beyond the recommended radius.

The 1,000 foot radius is consistent with findings in ARB's Land Use Compatibility Handbook (ARB 2005), the Health & Safety Code §42301.6 (Notice for Possible Source Near School), and studies such as that of Zhu et al (2002) which found that concentrations of particulate matter tend to be reduced substantially at a distance 1,000 feet downwind from sources such as freeways or large distribution centers.

Qualified Community Risk Reduction Plan

Within the framework of these thresholds, proposed projects would be considered to be less than significant if they are consistent with a qualified Community Risk Reduction Plan (CRRP) adopted by the local jurisdiction with enforceable measures to reduce the community risk.

Project proposed in areas where a CRRP has been adopted that are not consistent with the CRRP would be considered to have a significant impact.

Projects proposed in areas where a CRRP has not been adopted and that have the potential to expose sensitive receptors or the general public to emissions-related risk in excess of the thresholds below from any source would be considered to have a significant air quality impact.

The conclusion that land use projects that comply with qualified Community Risk Reduction Plans are less than significant is supported by CEQA Guidelines Sections 15030(a)(3) and 15064(h)(3), which provides that a project's contribution to a cumulative problem can be less that cumulatively considerable if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact.

Increased Cancer Risk to Maximally Exposed Individual (MEI)

Emissions from a new source or emissions affecting a new receptor would be considered significant where ground-level concentrations of carcinogenic TACs from any source result in an increased cancer risk greater than 10.0 in one million, assuming a 70 year lifetime exposure. Under Board Option 1, within Impacted Communities as defined

through the CARE program, the significance level for cancer would be reduced to 5.0 in one million for new sources.

The 10.0 in one million cancer risk threshold for a single source is supported by EPA's guidance for conducting air toxics analyses and making risk management decisions at the facility and community-scale level. It is also the level set by the Project Risk Requirement in the Air District's Regulation 2, Rule 5 new and modified stationary sources of TAC, which states that the Air Pollution Control Officer shall deny an Authority to Construct or Permit to Operate for any new or modified source of TACs if the project risk exceeds a cancer risk of 10.0 in one million.

This threshold for an individual new source is designed to ensure that the source does not contribute a cumulatively significant impact. The justification for the Tiered Thresholds Option threshold of 5.0 in one million for new sources in an impacted community is that in these areas the cancer risk burden is higher than in other parts of the Bay Area; the threshold at which an individual source becomes significant is lower for an area that is already at or near unhealthy levels. However, even without a tiered approach, the recommended thresholds already address the burden of impacted communities via the cumulative thresholds: specifically, if an area has many existing TAC sources near receptors, then the cumulative threshold will be reached sooner than it would in another area with fewer TAC sources.

The single-source threshold for receptors is provided to address the possibility that within the area defined by the 1,000 foot radius there can be variations in risk levels that may be significant, below the corresponding cumulative threshold. Single-source thresholds assist in the identification of significant risks, hazards, or concentrations in a subarea, within the 1,000 foot radius.

Increased Non-Cancer Risk to MEI

Emissions from a new source or emissions affecting a new receptor would be considered significant where ground-level concentrations of non-carcinogenic TACs result in an increased chronic or acute Hazard Index (HI) from any source greater than 1.0. This threshold is unchanged under Tiered Thresholds Option.

A HI less than 1.0 represents a TAC concentration, as determined by OEHHA that is at a health protective level. While some TACs pose non-carcinogenic, chronic and acute health hazards, if the TAC concentrations result in a HI less than one, those concentrations have been determined to be less than significant.

Increased Ambient Concentration of $PM_{2.5}$

Emissions from a new source or emissions affecting a new receptor would be considered significant where ground-level concentrations of $PM_{2.5}$ from any source would result in an average annual increase greater than 0.3 $\mu g/m^3$. Under Tiered Thresholds Option, within Impacted Communities as defined through the CARE program, the significance level for a $PM_{2.5}$ increment is 0.2 $\mu g/m^3$.

If one applies the concentration-response of the median of the EPA consensus review (EPA 2005, BAAQMD 2010) and attributes a 1 percent increase in mortality to a 1 $\mu g/m^3$ increase in $PM_{2.5}$, one finds an increase in non-injury mortality in the Bay Area of about 20 excess deaths per million per year from a 0.3 $\mu g/m^3$ increment of $PM_{2.5}$. This is consistent with the impacts reported and considered significant by SFDPH (2008) using an earlier study (Jerrett et al. 2005) to estimate the increase in mortality from a 0.2 $\mu g/m^3$ $PM_{2.5}$ increment.

The SFDPH recommended a lower threshold of significance for multiple sources but only considered roadway emissions within a 492 foot radius. This recommendation applies to a single source but considers all types of emissions within 1,000 feet. On balance, the Air District estimates that the SFDPH threshold and this proposed one, in combination with the cumulative threshold for $PM_{2.5}$, will afford similar levels of health protection.

The proposed $PM_{2.5}$ threshold represents the lower range of an EPA proposed Significant Impact Level (SIL). EPA interprets the SIL to be the level of ambient impact that is considered to represent a "significant contribution" to regional non-attainment. While this threshold was not designed to be a threshold for assessing community risk and hazards, it was designed to protect public health at a regional level by helping an area maintain the NAAQS. Since achieving and maintaining state and federal AAQS is a reasonable goal at the local scale, the SIL provides a useful reference for comparison.

This threshold for an individual new source is designed to ensure that the source does not contribute a cumulatively significant impact. The justification for the Tiered Thresholds Option threshold of 0.2 $\mu g/m^3$ for new sources in an impacted community is that these areas have higher levels of diesel particulate matter than do other parts of the Bay Area; the threshold at which an individual source becomes significant is lower for an area that is already at or near unhealthy levels. However, even without a tiered approach, the recommended thresholds already address the burden of impacted communities via the cumulative thresholds: specifically, if an area has many existing $PM_{2.5}$ sources near receptors, then the cumulative threshold will be reached sooner than it would in another area with fewer $PM_{2.5}$ sources.

The single-source threshold for receptors is provided to address the possibility that within the area defined by the 1,000 foot radius there can be variations in risk levels that may be significant, below the corresponding cumulative threshold. Single-source thresholds assist in the identification of significant risks, hazards, or concentrations in a subarea, within the 1,000 foot radius.

3.3.2.1 ACCIDENTAL RELEASE OF ACUTELY HAZARDOUS AIR EMISSIONS

The BAAQMD currently recommends, at a minimum, that the lead agency, in consultation with the administering agency of the Risk Management Prevention Program (RMPP), find that any project resulting in receptors being within the Emergency Response Planning Guidelines (ERPG) exposure level 2 for a facility has a significant air quality impact. ERPG exposure level 2 is defined as "the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for

up to one hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action."

Staff proposes continuing with the current threshold for the accidental release of hazardous air pollutants. Staff recommends that agencies consult with the California Emergency Management Agency for the most recent guidelines and regulations for the storage of hazardous materials. Staff proposes that projects using or storing acutely hazardous materials locating near existing receptors, and projects resulting in receptors locating near facilities using or storing acutely hazardous materials be considered significant.

The current Accidental Release/Hazardous Air Emissions threshold of significance could affect all projects, regardless of size, and require mitigation for Accidental Release/Hazardous Air Emissions impacts.

3.3.3 CUMULATIVE RISK AND HAZARD THRESHOLDS

Qualified Community Risk Reduction Plan

Proposed projects would be considered to be less than significant if they are consistent with a qualified Community Risk Reduction Plan (CRRP) adopted by the local jurisdiction with enforceable measures to reduce the community risk.

Project proposed in areas where a CRRP has been adopted that are not consistent with the CRRP would be considered to have a significant impact.

Projects proposed in areas where a CRRP has not been adopted and that have the potential to expose sensitive receptors or the general public to emissions-related risk in excess of the following thresholds from the aggregate of cumulative sources would be considered to have a significant air quality impact.

The conclusion that land use projects that comply with qualified Community Risk Reduction Plans are less than significant is supported by CEQA Guidelines Sections 15030(a)(3) and 15064(h)(3), which provides that a project's contribution to a cumulative problem can be less that cumulatively considerable if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact.

Increased Cancer Risk to Maximally Exposed Individual (MEI)

Emissions from a new source or emissions affecting a new receptor would be considered significant where ground-level concentrations of carcinogenic TACs from any source result in an increased cancer risk greater than 100.0 in one million.

The significance threshold of 100 in a million increased excess cancer risk would be applied to the cumulative emissions. The 100 in a million threshold is based on EPA guidance for conducting air toxics analyses and making risk management decisions at the facility and community-scale level. In protecting public health with an ample margin of

safety, EPA strives to provide maximum feasible protection against risks to health from hazardous air pollutants (HAPs) by limiting risk to a level no higher than the one in ten thousand (100 in a million) estimated risk that a person living near a source would be exposed to at the maximum pollutant concentrations for 70 years (NESHAP 54 Federal Register 38044, September 14, 1989; CAA section 112(f)). One hundred in a million excess cancer cases is also consistent with the ambient cancer risk in the most pristine portions of the Bay Area based on the District's recent regional modeling analysis.

Increased Non-Cancer Risk to MEI

Emissions from a new source or emissions affecting a new receptor would be considered significant where ground-level concentrations of non-carcinogenic TACs result in an increased chronic Hazard Index from any source greater than 10.0.

The Air District has developed an Air Toxics Hot Spots (ATHS) program that provides guidance for implementing the Air Toxics "Hot Spots" Information and Assessment Act (AB 2588, Connelly, 1987: chaptered in the California Health and Safety Code § 44300, et. al.). The ATHS provides that if the health risks resulting from the facility's emissions exceed significance levels established by the air district, the facility is required to conduct an airborne toxic risk reduction audit and develop a plan to implement measures that will reduce emissions from the facility to a level below the significance level. The Air District has established a non-cancer Hazard Index of ten (10.0) as ATHS mandatory risk reduction levels. The proposed cumulative chronic non-cancer Hazard Index threshold is consistent with the Air District's ATHS program.

Increased Ambient Concentration of $PM_{2.5}$

Emissions from a new source or emissions affecting a new receptor would be considered significant where ground-level concentrations of $PM_{2.5}$ from any source would result in an average annual increase greater than 0.8 $\mu g/m^3$.

If one applies the concentration-response function from the U.S, EPA assessment (U.S. EPA 2006) and attributes a 10 percent increase in mortality to a 10 $\mu g/m^3$ increase in $PM_{2.5}$, one finds an increase in non-injury mortality in the Bay Area of about 50 excess deaths per year from a 0.8 $\mu g/m^3$ increment of $PM_{2.5}$. This is greater the impacts reported and considered significant by SFDPH (2008) using an earlier study (Jerrett et al. 2005) to estimate the increase in mortality from a 0.2 $\mu g/m^3$ $PM_{2.5}$ increment (SFDPH reported 21 excess deaths per year). However, SFDPH only considered roadway emissions within a 492 foot radius. This proposed threshold applies to all types of emissions within 1,000 feet. In modeling applications for proposed projects, a larger radius results in a greater number of sources considered and higher modeled concentrations. On balance, the Air District estimates that the SFDPH threshold and this proposed one, in combination with the individual source threshold for $PM_{2.5}$, will afford similar levels of health protection.

The proposed cumulative $PM_{2.5}$ threshold represents the middle range of an EPA proposed Significant Impact Level (SIL). EPA interprets the SIL to be the level of ambient impact that is considered to represent a "significant contribution" to regional non-attainment. While this threshold was not designed to be a threshold for assessing

community risk and hazards, it was designed to protect public health at a regional level by helping an area maintain the NAAQS. Since achieving and maintaining state and federal AAQS is a reasonable goal at the local scale, the SIL provides a useful reference for comparison. Furthermore, the 0.8 $\mu g/m^3$ threshold is consistent with studies (Kleinman et al 2007) that examined the potential health impacts of roadway particles.

3.3.4 PLAN-LEVEL RISK AND HAZARD THRESHOLDS

Staff proposes plan-level thresholds that will encourage a programmatic approach to addressing the overall adverse conditions resulting from risks and hazards that many Bay Area communities experience. By designating overlay zones in land use plans, local land use jurisdictions can take preemptive action before project-level review to reduce the potential for significant exposures to risk and hazard emissions. While this will require more up-front work at the general plan level, in the long-run this approach is a more feasible approach consistent with Air District and CARB guidance about siting sources and sensitive receptors that is more effective than project by project consideration of effects that often has more limited mitigation opportunities. This approach would also promote more robust cumulative consideration of effects of both existing and future development for the plan-level CEQA analysis as well as subsequent project-level analysis.

For local plans to have a less-than-significant impact with respect to potential risks and hazards, overlay zones would have to be established around existing and proposed land uses that would emit these air pollutants. Overlay zones to avoid risk impacts should be reflected in local plan policies, land use map(s), and implementing ordinances (e.g., zoning ordinance). The overlay zones around existing and future risk sources would be delineated using the quantitative approaches described above for project-level review and the resultant risk buffers would be included in the General Plan (or the EIR for the General Plan) to assist in site planning. BAAQMD will provide guidance as to the methods used to establish the TAC buffers and what standards to be applied for acceptable exposure level in the updated CEQA Guidelines document. Special overlay zones of at least 500 feet (or an appropriate distance determined by modeling and approved by the Air District) on each side of all freeways and high volume roadways would be included in this proposed threshold.

The threshold of significance for plan impacts could affect all plan adoptions and amendments and require mitigation for a plan's air quality impacts. Where sensitive receptors would be exposed above the acceptable exposure level, the plan impacts would be considered significant and mitigation would be required to be imposed either at the plan level (through policy) or at the project level (through project level requirements).

3.3.5 COMMUNITY RISK REDUCTION PLANS

The goal of a Community Risk Reduction Plan would be to bring TAC and $PM_{2.5}$ concentrations for the entire community covered by the Plan down to acceptable levels as identified by the local jurisdiction and approved by the Air District. This approach

provides local agencies a proactive alternative to addressing communities with high levels of risk on a project-by-project approach. This approach is supported by CEQA Guidelines Section 15030(a)(3), which provides that a project's contribution to a cumulative problem can be less than cumulatively considerable "if the project is required to implement or fund its fair share of a mitigation measure or measures designed to alleviate the cumulative impact." This approach is also further supported by CEQA Guidelines Section 15064(h)(3), which provides that a project's contribution to a cumulative effect is not considerable "if the project will comply with the requirements in a previously approved plan or mitigation program which provides specific requirements that will avoid or substantially lessen the cumulative problem."

Qualified Community Risk Reduction Plans

(A) A qualified Community Risk Reduction Plan adopted by a local jurisdiction should include, at a minimum, the following elements. The District's revised CEQA Guidelines provides the methodology to determine if a Community Risk Reduction Plan meets these requirements. Define a planning area;

(B) Include base year and future year emissions inventories of TACs and PM2.5;

(C) Include Air District–approved risk modeling of current and future risks;

(D) Establish risk and exposure reduction goals and targets for the community in consultation with Air District staff;

(E) Identify feasible, quantifiable, and verifiable measures to reduce emissions and exposures;

(F) Include procedures for monitoring and updating the inventory, modeling and reduction measures in coordination with Air District staff;

(G) Be adopted in a public process following environmental review.

4 CRITERIA POLLUTANT THRESHOLDS

4.2 PROPOSED THRESHOLDS OF SIGNIFICANCE

Project Construction	
Pollutant	**Average Daily (pounds/day)**
ROG (reactive organic gases)	54
NO_X (nitrogen oxides)	54
PM_{10} (exhaust) (particulate matter-10 microns)	82
$PM_{2.5}$ (exhaust) (particulate matter-2.5 microns)	54
$PM_{10}/PM_{2.5}$ (fugitive dust)	Best Management Practices
Local CO (carbon monoxide)	None

Project Operations		
Pollutant	**Average Daily (pounds/day)**	**Maximum Annual (tons/year)**
ROG	54	10
NO_X	54	10
PM_{10}	82	15
$PM_{2.5}$	54	10
Local CO	9.0 ppm (8-hour average), 20.0 ppm (1-hour average)	

Plans
1. Consistency with Current Air Quality Plan control measures 2. Projected VMT or vehicle trip increase is less than or equal to projected population increase

Regional Plans (Transportation and Air Quality Plans)
No net increase in emissions of criteria air pollutants and precursors

4.3 JUSTIFICATION AND SUBSTANTIAL EVIDENCE SUPPORTING THRESHOLDS

4.3.1 PROJECT CONSTRUCTION CRITERIA POLLUTANT THRESHOLDS

Staff proposes criteria pollutant construction thresholds that add significance criteria for exhaust emissions to the existing fugitive dust criteria employed by the Air District. While our current Guidelines considered construction exhaust emissions controlled by the overall air quality plan, the implementation of new and more stringent state and federal standards over the past ten years now warrants additional control of this source of emissions.

The average daily criteria air pollutant and precursor emission levels shown above are recommended as the thresholds of significance for construction activity for exhaust emissions. These thresholds represent the levels above which a project's individual emissions would result in a considerable contribution (i.e., significant) to the SFBAAB's existing non-attainment air quality conditions and thus establish a nexus to regional air quality impacts that satisfies CEQA requirements for evidence-based determinations of significant impacts.

For fugitive dust emissions, staff recommends following the current best management practices approach which has been a pragmatic and effective approach to the control of fugitive dust emissions. Studies have demonstrated (Western Regional Air Partnership, U.S.EPA) that the application of best management practices at construction sites have significantly controlled fugitive dust emissions. Individual measures have been shown to reduce fugitive dust by anywhere from 30 percent to more than 90 percent. In the aggregate best management practices will substantially reduce fugitive dust emissions from construction sites. These studies support staff's recommendation that projects implementing construction best management practices will reduce fugitive dust emissions to a less than significant level.

4.3.2 PROJECT OPERATION CRITERIA POLLUTANT THRESHOLDS

The proposed thresholds for project operations are the average daily and maximum annual criteria air pollutant and precursor levels shown above. These thresholds are based on the federal BAAQMD Offset Requirements to ozone precursors for which the SFBAAB is designated as a non-attainment area which is an appropriate approach to prevent further deterioration of ambient air quality and thus has nexus and proportionality to prevention of a regionally cumulative significant impact (e.g. worsened status of non-attainment). Despite non-attainment area for state PM_{10} and pending nonattainment for federal $PM_{2.5}$, the federal NSR Significant Emission Rate annual limits of 15 and 10 tons per year, respectively, are proposed thresholds as BAAQMD has not established an Offset Requirement limit for $PM_{2.5}$ and the existing limit of 100 tons per year is much less stringent and would not be appropriate in light of our pending nonattainment designation for the federal 24-hour $PM_{2.5}$ standard. These thresholds represent the emission levels above which a project's individual emissions would result in a cumulatively considerable contribution to the SFBAAB's existing air quality conditions. The thresholds would be an evaluation of the incremental contribution of a project to a significant cumulative impact. These threshold levels are well-established in terms of existing regulations as promoting review of emissions sources to prevent cumulative deterioration of air quality. Using existing environmental standards in this way to establish CEQA thresholds of significance under Guidelines section 15067.4 is an appropriate and effective means of promoting consistency in significance determinations and integrating CEQA environmental review activities with other areas of environmental

regulation. (*See Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal. App. 4th 98, 111.[4])

4.3.3 LOCAL CARBON MONOXIDE THRESHOLDS

The proposed carbon monoxide thresholds are based solely on ambient concentration limits set by the California Clean Air Act for Carbon Monoxide and Appendix G of the State of California CEQA Guidelines.

Since the ambient air quality standards are health-based (i.e., protective of public health), there is substantial evidence (i.e., health studies that the standards are based on) in support of their use as CEQA significance thresholds. The use of the ambient standard would relate directly to the CEQA checklist question. By not using a proxy standard, there would be a definitive bright line about what is or is not a significant impact and that line would be set using a health-based level.

The CAAQS of 20.0 ppm and 9 ppm for 1-hour and 8-hour CO, respectively, would be used as the thresholds of significance for localized concentrations of CO. Carbon monoxide is a directly emitted pollutant with primarily localized adverse effects when concentrations exceed the health based standards established by the California Air Resources Board (ARB).

In addition, Appendix G of the State of California CEQA Guidelines includes the checklist question: Would the project violate any air quality standard or contribute substantially to an existing or projected air quality violation? Answering yes to this question would indicate that the project would result in a significant impact under CEQA. The use of the ambient standard would relate directly to this checklist question.

4.3.4 PLAN-LEVEL CRITERIA POLLUTANT THRESHOLDS

This proposed threshold achieves the same goals as the Air District's current approach while alleviating the existing analytical difficulties and the inconsistency of comparing a plan update with AQP growth projections that may be up to several years old. Eliminating the analytical inconsistency provides better nexus and proportionality for evaluating air quality impacts for plans.

Over the years staff has received comments on the difficulties inherent in the current approach regarding the consistency tests for population and VMT growth. First, the population growth estimates used in the most recent AQP can be up to several years older than growth estimates used in a recent plan update, creating an inconsistency in this analysis. Staff recommends that this test of consistency be eliminated because the Air

[4] The Court of Appeal in the *Communities for a Better Environment* case held that existing regulatory standards could not be used as a definitive determination of whether a project would be significant under CEQA where there is substantial evidence to the contrary. Staff's proposed thresholds would not do that. The thresholds are levels at which a project's emissions would normally be significant, but would not be binding on a lead agency if there is contrary evidence in the record.

District and local jurisdictions all use regional population growth estimates that are disaggregated to local cities and counties. In addition, the impact to air quality is not necessarily growth but where that growth is located. The second test, rate of increase in vehicle use compared to growth rate, will determine if planned growth will impact air quality. Compact infill development inherently has less vehicle travel and more transit opportunities than suburban sprawl.

Second, the consistency test of comparing the rate of increase in VMT to the rate of increase in population has been problematic at times for practitioners because VMT is not always available with the project analysis. Staff recommends that either the rate of increase in VMT or vehicle trips be compared to the rate of increase in population. Staff also recommends that the growth estimates used in this analysis be for the years covered by the plan. Staff also recommends that the growth estimates be obtained from the Association of Bay Area Governments since the Air District uses ABAG growth estimates for air quality planning purposes.

4.3.5 CRITERIA POLLUTANT THRESHOLDS FOR REGIONAL PLANS

Regional plans include the Regional Transportation Plan prepared by the Metropolitan Transportation Commission (MTC) and air quality plans prepared by the Air District.

The Regional Transportation Plan (RTP), also called a Metropolitan Transportation Plan (MTP) or Long-Range Transportation Plan is the mechanism used in California by both Metropolitan Planning Organizations (MPOs) and Regional Transportation Planning Agencies (RTPAs) to conduct long-range (minimum of 20 years) planning in their regions. MTC functions as both the regional transportation planning agency, a state designation, and, for federal purposes, as the region's metropolitan planning organization (MPO). As such, it is responsible for regularly updating the Regional Transportation Plan, a comprehensive blueprint for the development of comprehensive transportation system that includes mass transit, highway, airport, seaport, railroad, bicycle and pedestrian facilities. The performance of this system affects such public policy concerns as air quality, environmental resource consumption, social equity, “smart growth,” economic development, safety, and security. Transportation planning recognizes the critical links between transportation and other societal goals. The planning process requires developing strategies for operating, managing, maintaining, and financing the area’s transportation system in such a way as to advance the area’s long-term goals.

The Air District periodically prepares and updates plans to achieve the goal of healthy air. Typically, a plan will analyze emissions inventories (estimates of current and future emissions from industry, motor vehicles, and other sources) and combine that information with air monitoring data (used to assess progress in improving air quality) and computer modeling simulations to test future strategies to reduce emissions in order to achieve air quality standards. Air quality plans usually include measures to reduce air pollutant emissions from industrial facilities, commercial processes, motor vehicles, and other sources. Bay Area air quality plans are prepared with the cooperation of MTC and the Association of Bay Area Governments (ABAG).

The proposed threshold of significance for regional plans is no net increase in emissions including criteria pollutant emissions. This threshold serves to answer the State CEQA Guidelines Appendix G sample question: "Would the project Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?"

5 ODOR THRESHOLDS

5.2 PROPOSED THRESHOLDS OF SIGNIFICANCE

Project Operations – Source or Receptor	Plans
Five confirmed complaints per year averaged over three years	Identify the location, and include policies to reduce the impacts, of existing or planned sources of odors

5.3 JUSTIFICATION AND SUBSTANTIAL EVIDENCE SUPPORTING THRESHOLDS

Staff proposes revising the current CEQA significance threshold for odors to be consistent with the Air District's regulation governing odor nuisances (Regulation 7—Odorous Substances). The current approach includes assessing the number of unconfirmed complaints which are not considered indicative of actual odor impacts. Basing the threshold on an average of five confirmed complaints per year over a three year period reflects the most stringent standards derived from the Air District rule and is therefore considered an appropriate approach to a CEQA evaluation of odor impacts.

Odors are generally considered a nuisance, but can result in a public health concern. Some land uses that are needed to provide services to the population of an area can result in offensive odors, such as filling portable propane tanks or recycling center operations. When a proposed project includes the siting of sensitive receptors in proximity to an existing odor source, or when siting a new source of potential odors, the following qualitative evaluation should be performed.

When determining whether potential for odor impacts exists, it is recommended that Lead Agencies consider the following factors and make a determination based on evidence in each qualitative analysis category:

- **Distance**: Use the screening-level distances in Table 9.
- **Wind Direction:** Consider whether sensitive receptors are located upwind or downwind from the source for the most of the year. If odor occurrences associated

with the source are seasonal in nature, consider whether sensitive receptors are located downwind during the season in which odor emissions occur.

- **Complaint History:** Consider whether there is a history of complaints associated with the source. If there is no complaint history associated with a particular source (perhaps because sensitive receptors do not already exist in proximity to the source), consider complaint-history associated with other similar sources in BAAQMD's jurisdiction with potential to emit the same or similar types of odorous chemicals or compounds, or that accommodate similar types of processes.

- **Character of Source:** Consider the character of the odor source, for example, the type of odor events according to duration of exposure or averaging time (e.g., continuous release, frequent release events, or infrequent events).

- **Exposure:** Consider whether the project would result in the exposure of a substantial number of people to odorous emissions.

Table 9 – Screening Distances for Potential Odor Sources

Type of Operation Project Screening	Distance
Wastewater Treatment Plant	2 miles
Wastewater Pumping Facilities	1 mile
Sanitary Landfill	2 miles
Transfer Station	1 mile
Composting Facility	1 mile
Petroleum Refinery	2 miles
Asphalt Batch Plant	2 miles
Chemical Manufacturing	2 miles
Fiberglass Manufacturing	1 mile
Painting/Coating Operations	1 mile
Rendering Plant	2 miles
Food Processing Facility	1 mile
Confined Animal Facility/Feed Lot/Dairy	1 mile
Green Waste and Recycling Operations	1 mile
Coffee Roaster	1 mile

California Integrated Waste Management Board (CIWMB). Facilities that are regulated by the CIWMB (e.g. landfill, composting, etc.) are required to have Odor Impact Minimization Plans (OIMP) in place and have procedures that establish fence line odor detection thresholds. The Air District recognizes a Lead Agency's discretion under CEQA to use established odor detection thresholds as thresholds of significance for CEQA review for CIWMB regulated facilities with an adopted OIMP.

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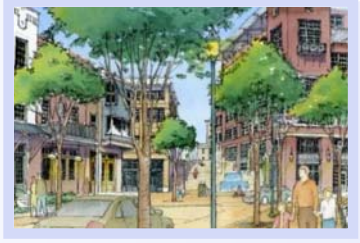
BAY AREA AIR QUALITY MANAGEMENT DISTRICT

California Environmental Quality Act

Air Quality Guidelines



May 2010

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

California Environmental Quality Act

Air Quality Guidelines

Bay Area Air Quality Management District
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BAY AREA AIR QUALITY MANAGEMENT DISTRICT

ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	micrograms per cubic meter
AB	Assembly Bill
AB 1807	Tanner Air Toxics Act
AB 2588	Air Toxics Hot Spots Information and Assessment Act of 1987
ABAG	Association of Bay Area Governments
AMS	American Meteorological Society
APS	Alternative Planning Strategy
AQP	Air Quality Plan
ARB	California Air Resources Board
ATCM	air toxics control measures
BAAQMD	Bay Area Quality Management District
BACT	Best Available Control Technology
BMPs	Best Management Practices
CCA	Community Choice Aggregation
CAAQS	California Ambient Air Quality Standards
CALINE4	California Line Source Dispersion Model
CAP	criteria air pollutants
CARE	Community Air Risk Evaluation
CAPCOA	California Air Pollution Control Officers Association
CCAA	California Clean Air Act
CCAR	California Climate Action Registry
CCR	California Code of Regulations
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CalRecycle	The California Department of Resources Recycling and Recovery (formally the California Integrated Waste Management Board)
CFC	Chlorofluorocarbon
CH_4	methane
CHAPIS	Community Health Air Pollution Information System
CO	carbon monoxide
CO Protocol	Carbon Monoxide Protocol
CO_2	Carbon dioxide
CO_2e	carbon dioxide equivalent
CRA	California Resources Agency

DOE	Department of Energy
du	dwelling units
EIR	Environmental Impact Report
EMFAC	On-Road Mobile-Source Emission Factors
EPA	U.S. Environmental Protection Agency
FAR	Floor Area Ratio
FCAA	Federal Clean Air Act
FCAAA	Federal Clean Air Act Amendments of 1990
GHG	greenhouse gas(es)
GRP	General Reporting Protocol
GVW	gross vehicle weight
GWP	global warming potential
H_2S	hydrogen sulfide
HEPA	High Efficiency Particulate Arresting (filter)
HI	Hazard Index
HRA	health risk assessment
HVAC	Heating, Ventilation, and Air Conditioning System
IPCC	Intergovernmental Panel on Climate Change
ISR	Indirect Source Review
ksf	thousand square feet
kwh	Kilowatt hour
lb/acre-day	pound per disturbed acre per day
lb/day	pounds per day
lb/kwh	pounds per kilowatt hour
LCFS	Low-Carbon Fuel Standard
LVW	loaded vehicle weight
MACT	maximum available control technology
mg	million gallons
MMT	million metric tons
mph	miles per hour
MPO	Metropolitan Planning Organizations
MT	metric tons
MTC	Metropolitan Transportation Commission
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards

NESHAP	national emissions standards for hazardous air pollutants
NH_3	mercaptan, ammonia
NOA	Naturally Occurring Asbestos
NOP	Notice of Preparation
NO_X	oxides of nitrogen
OEHHA	Office of Environmental Health Hazard Assessment
OPR	Governor's Office of Planning and Research
PM	particulate matter
PM_{10}	respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less
$PM_{2.5}$	fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less
ppm	parts per million
PUC	Public Utilities Commission
RoadMod	Roadway Construction Emissions Model
ROG	reactive organic gases
RTP	Regional Transportation Plan
SB	Senate Bill
SCS	Sustainable Communities Strategy
SF_6	sulfur hexafluoride
SFBAAB	San Francisco Bay Area Air Basin
SIP	State Implementation Plan
SMAQMD	Sacramento Metropolitan Air Quality Management District
SO_2	sulfur dioxide
SP	Service Population
SSIM	Sustainable Systems Integration Model
TAC	toxic air contaminant
T-BACT	Toxic Best Available Control Technology
TBPs	Toxic Best Practices
tpy	tons per year
UC	University of California
URBEMIS	Urban Land Use Emissions Model
VMT	vehicle miles traveled
VT	vehicle trips
yd^3	cubic yards
yr	year

1. INTRODUCTION

1.1. PURPOSE OF GUIDELINES

The purpose of the Bay Area Air Quality Management District (BAAQMD or District) California Environmental Quality Act (CEQA) Guidelines is to assist lead agencies in evaluating air quality impacts of projects and plans proposed in the San Francisco Bay Area Air Basin (SFBAAB). The Guidelines provides BAAQMD-recommended procedures for evaluating potential air quality impacts during the environmental review process consistent with CEQA requirements. These revised Guidelines supersede the BAAQMD's previous CEQA guidance titled *BAAQMD CEQA Guidelines: Assessing the Air Quality Impacts of Projects and Plans* (BAAQMD 1999).

Land development plans and projects have the potential to generate harmful air pollutants that degrade air quality and increase local exposure. The Guidelines contain instructions on how to evaluate, measure, and mitigate air quality impacts generated from land development construction and operation activities. The Guidelines focus on criteria air pollutant, greenhouse gas (GHG), toxic air contaminant, and odor emissions generated from plans or projects.

The Guidelines are intended to help lead agencies navigate through the CEQA process. The Guidelines offer step-by-step procedures for a thorough environmental impact analysis of adverse air emissions due to land development in the Bay Area.

1.1.1. BAAQMD's Role in Air Quality

BAAQMD is the primary agency responsible for assuring that the National and California Ambient Air Quality Standards (NAAQS and CAAQS, respectively) are attained and maintained in the Bay Area. BAAQMD's jurisdiction includes all of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo and Santa Clara counties, and the southern portions of Solano and Sonoma counties, as shown in Figure 1-1. The Air District's responsibilities in improving air quality in the region include: preparing plans for attaining and maintaining air quality standards; adopting and enforcing rules and regulations; issuing permits for stationary sources of air pollutants; inspecting stationary sources and responding to citizen complaints; monitoring air quality and meteorological conditions; awarding grants to reduce mobile emissions; implementing public outreach campaigns; and assisting local governments in addressing climate change.

BAAQMD takes on various roles in the CEQA process, depending on the nature of the proposed project, including:

Lead Agency – BAAQMD acts as a Lead Agency when it has the primary authority to implement or approve a project, such as when it adopts air quality plans for the region, issues stationary source permits, or adopts rules and regulations.

Responsible Agency – BAAQMD acts as a Responsible Agency when it has limited discretionary authority over a portion of a project, but does not have the primary discretionary authority of a Lead Agency. As a Responsible Agency, BAAQMD may coordinate the environmental review process with the lead agency regarding BAAQMD's permitting process, provide comments to the Lead Agency regarding potential impacts, and recommend mitigation measures.

Source: ESRI Satellite 2009

Bay Area Air Quality Management District Jurisdictional Boundaries **Figure 1-1**

Commenting Agency – BAAQMD may act as a Commenting Agency when it is not a Lead or Responsible Agency (i.e., it does not have discretionary authority over a project), but when it may have concerns about the air quality impacts of a proposed project or plan. As a Commenting Agency, BAAQMD may review environmental documents prepared for development proposals and plans in the region, such as local general plans, and provide comments to the Lead Agency regarding the adequacy of the air quality impact analysis, determination of significance, and mitigation measures proposed.

BAAQMD prepared the CEQA Guidelines to assist lead agencies in air quality analysis, as well as to promote sustainable development in the region. The CEQA Guidelines support lead agencies in analyzing air quality impacts and offers numerous mitigation measures and general plan policies to implement smart growth and transit oriented development, minimize construction emissions, and reduce population exposure to air pollution risks.

1.2. GUIDELINE COMPONENTS

The recommendations in the CEQA Guidelines should be viewed as minimum considerations for analyzing air quality impacts. Lead agencies are encouraged to tailor the air quality impact analysis to meet the needs of the local community and may conduct refined analysis that utilize more sophisticated models, more precise input data, innovative mitigation measures, and/or other features. The Guidelines contain the following sections:

Introduction – Chapter 1 provides a summary of the purpose of the Guide, and an overview of BAAQMD responsibilities.

Thresholds of Significance – Chapter 2 outlines the current thresholds or significance for determining the significance of air quality impacts.

Screening Criteria – Chapter 3 provides easy reference tables to determine if your project may have potentially significant impacts requiring a detailed analysis.

Assessing and Mitigating Impacts – Chapters 4 through 9 describe assessment methods and mitigation measures for operational-related, local community risk and hazards, local carbon monoxide (CO), odors, construction-related, and plan-level impacts.

Appendix A – Provides construction assessment tools.

Appendix B – Provides detailed air quality modeling instructions.

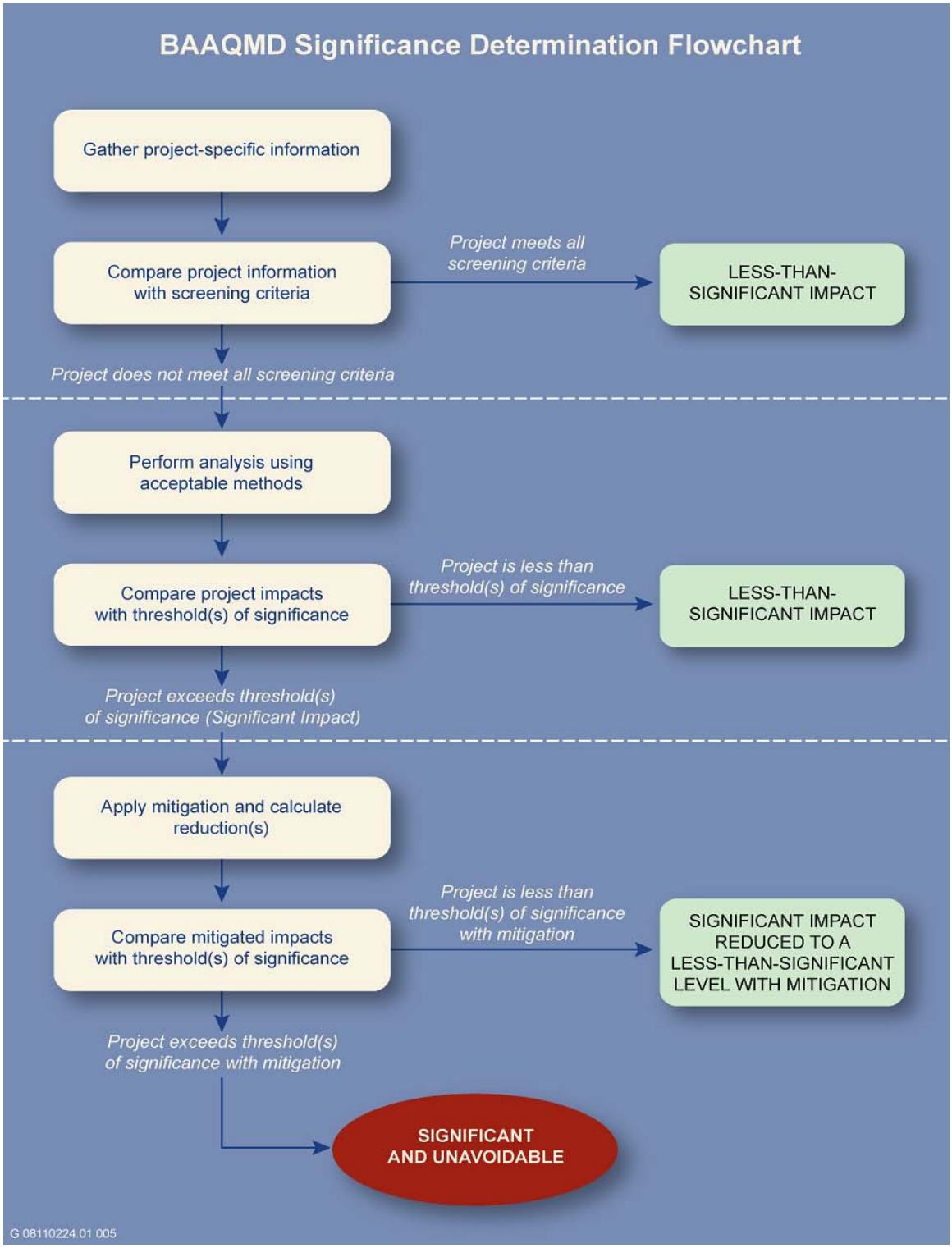
Appendix C – Outlines sample environmental setting information.

Appendix D – Contains justification statements for BAAQMD-adopted thresholds of significance.

Appendix E – Provides a glossary of terms used throughout this guide.

1.2.1. How To Use The Guidelines

Figure 2-1 illustrates general steps for evaluating a project or plan's air quality impacts. The first step is to determine whether the air quality evaluation is for a project or plan. Once identified, the project should be compared with the appropriate construction and operational screening criteria listed in Chapter 2. There are no screening criteria for plans.



General Steps for Determining Significance of Air Quality Impacts **Figure 1-2**

If the project meets the screening criteria and is consistent with the methodology used to develop the screening criteria, then its air quality impacts may be considered less than significant. Otherwise, lead agencies should evaluate potential air quality impacts of projects (and plans) as explained in Chapters 4 through 9. These Chapters describe how to analyze air quality impacts from criteria air pollutants, GHGs, local community risk and hazards, and odors associated with construction activity and operations of a project or plan.

If, after proper analysis, the project or plan's air quality impacts are found to be below the significance thresholds, then the air quality impacts may be considered less than significant. If not, the Lead Agency should implement appropriate mitigation measures to reduce associated air quality impacts. Lead agencies are responsible for evaluating and implementing all feasible mitigation measures in their CEQA document.

The mitigated project or plan's impacts are then compared again to the significance thresholds. If a project succeeded in mitigating its adverse air quality impacts below the corresponding thresholds, air quality impacts may be considered less than significant. If a project still exceeds the thresholds, the Air District strongly encourages the lead agency to consider project alternatives that could lessen any identified significant impact, including a no project alternative in accordance with CEQA Guidelines section 15126.6(e).

1.2.2. Early Consultation

The District encourages local jurisdictions and project applicants to address air quality issues as early as possible in the project planning stage. Addressing land use and site design issues while a proposed project is still in the conceptual stage increases opportunities to incorporate project design features to minimize land use compatibility issues and air quality impacts. By the time a project enters the CEQA process, it is usually more costly and time-consuming to redesign the project to incorporate mitigation measures. Early consultation may be achieved by including a formal step in the jurisdiction's development review procedures or simply by discussing air quality concerns at the planning counter when a project proponent makes an initial contact regarding a proposed development. Regardless of the specific procedures a local jurisdiction employs, the objective should be to incorporate features into a project that minimize air quality impacts before significant resources (public and private) have been devoted to the project.

The following air quality considerations warrant particular attention during early consultation between Lead Agencies and project proponents:

1. land use and design measures to encourage alternatives to the automobile, conserve energy and reduce project emissions;
2. land use conflicts and exposure of sensitive receptors to odors, toxics and criteria pollutants; and,
3. applicable District rules, regulations and permit requirements.

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PART I: THRESHOLDS OF SIGNIFICANCE & PROJECT SCREENING

2. THRESHOLDS OF SIGNIFICANCE

The SFBAAB is currently designated as a nonattainment area for state and national ozone standards and national particulate matter ambient air quality standards. SFBAAB's nonattainment status is attributed to the region's development history. Past, present and future development projects contribute to the region's adverse air quality impacts on a cumulative basis. By its very nature, air pollution is largely a cumulative impact. No single project is sufficient in size to, by itself, result in nonattainment of ambient air quality standards. Instead, a project's individual emissions contribute to existing cumulatively significant adverse air quality impacts. If a project's contribution to the cumulative impact is considerable, then the project's impact on air quality would be considered significant.

In developing thresholds of significance for air pollutants, BAAQMD considered the emission levels for which a project's individual emissions would be cumulatively considerable. If a project exceeds the identified significance thresholds, its emissions would be cumulatively considerable, resulting in significant adverse air quality impacts to the region's existing air quality conditions. Therefore, additional analysis to assess cumulative impacts is unnecessary. The analysis to assess project-level air quality impacts should be as comprehensive and rigorous as possible.

Similar to regulated air pollutants, GHG emissions and global climate change also represent cumulative impacts. GHG emissions contribute, on a cumulative basis, to the significant adverse environmental impacts of global climate change. Climate change impacts may include an increase in extreme heat days, higher concentrations of air pollutants, sea level rise, impacts to water supply and water quality, public health impacts, impacts to ecosystems, impacts to agriculture, and other environmental impacts. No single project could generate enough GHG emissions to noticeably change the global average temperature. The combination of GHG emissions from past, present, and future projects contribute substantially to the phenomenon of global climate change and its associated environmental impacts.

BAAQMD's approach to developing a *Threshold of Significance* for GHG emissions is to identify the emissions level for which a project would not be expected to substantially conflict with existing California legislation adopted to reduce statewide GHG emissions needed to move us towards climate stabilization. If a project would generate GHG emissions above the threshold level, it would be considered to contribute substantially to a cumulative impact, and would be considered significant. Refer to Table 2-1 for a summary of Air Quality CEQA Thresholds and to Appendix D for *Thresholds of Significance* documentation.

Table 2-1 Proposed Air Quality CEQA Thresholds of Significance			
Pollutant	**Construction-Related**	**Operational-Related**	
Project-Level			
Criteria Air Pollutants and Precursors (Regional)	**Average Daily Emissions (lb/day)**	**Average Daily Emissions (lb/day)**	**Maximum Annual Emissions (tpy)**
ROG	54	54	10
NO_X	54	54	10
PM_{10} (exhaust)	82	82	15
$PM_{2.5}$ (exhaust)	54	54	10
$PM_{10}/PM_{2.5}$ (fugitive dust)	Best Management Practices	None	
Local CO	None	9.0 ppm (8-hour average), 20.0 ppm (1-hour average)	
GHGs – Projects other than Stationary Sources	None	Compliance with Qualified GHG Reduction Strategy OR 1,100 MT of CO_2e/yr OR 4.6 MT CO_2e/SP/yr (residents+employees)	
GHGs –Stationary Sources	None	10,000 MT/yr	
Risks and Hazards (Individual Project)	Same as Operational Thresholds*	Compliance with Qualified Community Risk Reduction Plan OR Increased cancer risk of >10.0 in a million Increased non-cancer risk of > 1.0 Hazard Index (Chronic or Acute) Ambient $PM_{2.5}$ increase: > 0.3 µg/m^3 annual average Zone of Influence: 1,000-foot radius from property line of source or receptor	
Risks and Hazards (Cumulative Threshold)	Same as Operational Thresholds*	Compliance with Qualified Community Risk Reduction Plan OR Cancer: > 100 in a million (from all local sources) Non-cancer: > 10.0 Hazard Index (from all local sources) (Chronic) $PM_{2.5}$: > 0.8 µg/m^3 annual average (from all local sources) Zone of Influence: 1,000-foot radius from property line of source or receptor	
Accidental Release of Acutely Hazardous Air Pollutants	None	Storage or use of acutely hazardous materials locating near receptors or new receptors locating near stored or used acutely hazardous materials considered significant	
Odors	None	5 confirmed complaints per year averaged over three years	
Plan-Level			
Criteria Air Pollutants and Precursors	None	1. Consistency with Current Air Quality Plan control measures, and 2. Projected VMT or vehicle trip increase is less than or equal to projected population increase	
GHGs	None	Compliance with Qualified GHG Reduction Strategy OR 6.6 MT CO_2e/SP/yr (residents + employees)	

Table 2-1
Proposed Air Quality CEQA Thresholds of Significance

Pollutant	Construction-Related	Operational-Related
Risks and Hazards	None	1. Overlay zones around existing and planned sources of TACs (including adopted Risk Reduction Plan areas) and 2. Overlay zones of at least 500 feet from all freeways and high volume roadways
Accidental Release of Acutely Hazardous Air Pollutants	None	None
Odors	None	Identify the location, and include policies to reduce the impacts, of existing or planned sources of odors
Regional Plans (Transportation and Air Quality Plans)		
GHGs, Criteria Air Pollutants and Precursors, and Toxic Air Contaminants	None	No net increase in emissions

Notes: CEQA = California Environmental Quality Act; CO = carbon monoxide; CO_2e = carbon dioxide equivalent; GHGs = greenhouse gases; lb/day = pounds per day; MT = metric tons; NO_X = oxides of nitrogen; $PM_{2.5}$= fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; ppm = parts per million; ROG = reactive organic gases; SO_2 = sulfur dioxide; SP = service population; TACs = toxic air contaminants; TBP = toxic best practices; tons/day = tons per day; tpy = tons per year; yr= year; TBD: to be determined.
*Note: The Air District recommends that for construction projects that are less than one year duration, Lead Agencies should annualize impacts over the scope of actual days that peak impacts are to occur, rather than the full year.

2.1. CRITERIA AIR POLLUTANTS AND PRECURSORS – PROJECT LEVEL

Table 2-2 presents the *Thresholds of Significance* for operational-related criteria air pollutant and precursor emissions. These represent the levels at which a project's individual emissions of criteria air pollutants or precursors would result in a cumulatively considerable contribution to the SFBAAB's existing air quality conditions. If daily average or annual emissions of operational-related criteria air pollutants or precursors would exceed any applicable *Threshold of Significance* listed in Table 2-2, the proposed project would result in a cumulatively significant impact.

Table 2-2 Thresholds of Significance for Operational-Related Criteria Air Pollutants and Precursors		
Pollutant/Precursor	**Maximum Annual Emissions (tpy)**	**Average Daily Emissions (lb/day)**
ROG	10	54
NO_X	10	54
PM_{10}	15	82
$PM_{2.5}$	10	54
Notes: tpy = tons per year; lb/day = pounds per day; NO_X = oxides of nitrogen; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or lCOess; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; ROG = reactive organic gases; tpy = tons per year. Refer to Appendix D for support documentation.		

2.2. GREENHOUSE GASES – PROJECT LEVEL

The *Thresholds of Significance* for operational-related GHG emissions are:

- For land use development projects, the threshold is compliance with a qualified GHG Reduction Strategy; or annual emissions less than 1,100 metric tons per year (MT/yr) of CO_2e; or 4.6 MT CO_2e/SP/yr (residents + employees). Land use development projects include residential, commercial, industrial, and public land uses and facilities.

- For stationary-source projects, the threshold is 10,000 metric tons per year (MT/yr) of CO_2e. Stationary-source projects include land uses that would accommodate processes and equipment that emit GHG emissions and would require an Air District permit to operate.

If annual emissions of operational-related GHGs exceed these levels, the proposed project would result in a cumulatively considerable contribution of GHG emissions and a cumulatively significant impact to global climate change.

2.3. LOCAL COMMUNITY RISK AND HAZARD IMPACTS – PROJECT LEVEL

The *Thresholds of Significance* for local community risk and hazard impacts are identified below, which apply to both the siting of a new source and to the siting of a new receptor. Local community risk and hazard impacts are associated with TACs and $PM_{2.5}$ because emissions of these pollutants can have significant health impacts at the local level. If emissions of TACs or fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less ($PM_{2.5}$) exceed any of the *Thresholds of Significance* listed below, the proposed project would result in a significant impact.

- Non-compliance with a qualified risk reduction plan; or,
- An excess cancer risk level of more than 10 in one million, or a non-cancer (i.e., chronic or acute) hazard index greater than 1.0 would be a cumulatively considerable contribution;
- An incremental increase of greater than 0.3 micrograms per cubic meter ($\mu g/m^3$) annual average $PM_{2.5}$ would be a cumulatively considerable contribution.

Cumulative Impacts

A project would have a cumulative considerable impact if the aggregate total of all past, present, and foreseeable future sources within a 1,000 foot radius from the fence line of a source, or from the location of a receptor, plus the contribution from the project, exceeds the following:

- Non-compliance with a qualified risk reduction plan; or,
- An excess cancer risk levels of more than 100 in one million or a chronic non-cancer hazard index (from all local sources) greater than 10.0; or
- 0.8 $\mu g/m^3$ annual average $PM_{2.5}$.

A lead agency should enlarge the 1,000-foot radius on a case-by-case basis if an unusually large source or sources of risk or hazard emissions that may affect a proposed project is beyond the recommended radius.

2.4. LOCAL CARBON MONOXIDE IMPACTS – PROJECT LEVEL

Table 2-3 presents the *Thresholds of Significance* for local CO emissions, the 1- and 8-hour California Ambient Air Quality Standards (CAAQS) of 20.0 parts per million (ppm) and 9.0 ppm, respectively. By definition, these represent levels that are protective of public health. If a project would cause local emissions of CO to exceed any of the *Thresholds of Significance* listed below, the proposed project would result in a significant impact to air quality.

Table 2-3
Thresholds of Significance for Local Carbon Monoxide Emissions

CAAQS Averaging Time	Concentration (ppm)
1-Hour	20.0
8-Hour	9.0
Refer to Appendix D for support documentation.	

2.5. ODOR IMPACTS – PROJECT LEVEL

The *Thresholds of Significance* for odor impacts are qualitative in nature. A project that would result in the siting of a new source or the exposure of a new receptor to existing or planned odor sources should consider the screening level distances and the complaint history of the odor sources:

- Projects that would site a new odor source or a new receptor farther than the applicable screening distance shown in Table 3-3 from an existing receptor or odor source, respectively, would not likely result in a significant odor impact.

- An odor source with five (5) or more confirmed complaints per year averaged over three years is considered to have a significant impact on receptors within the screening distance shown in Table 3-3.

Facilities that are regulated by the CalRecycle agency (e.g. landfill, composting, etc) are required to have Odor Impact Minimization Plans (OIMP) in place and have procedures that establish fence line odor detection thresholds. The Air District recognizes a Lead Agency's discretion under CEQA to use established odor detection thresholds as thresholds of significance for CEQA review for CalRecycle regulated facilities with an adopted OIMP. Refer to *Chapter 7 Assessing and Mitigating Odor Impacts* for further discussion of odor analysis.

2.6. CONSTRUCTION-RELATED IMPACTS – PROJECT LEVEL

2.6.1. Criteria Air Pollutants and Precursors

Table 2-4 presents the *Thresholds of Significance* for construction-related criteria air pollutant and precursor emissions. If daily average emissions of construction-related criteria air pollutants or precursors would exceed any applicable *Threshold of Significance* listed in Table 2-4, the project would result in a significant cumulative impact.

Table 2-4
Thresholds of Significance for Construction-Related Criteria Air Pollutants and Precursors

Pollutant/Precursor	Daily Average Emissions (lb/day)
ROG	54
NO_X	54
PM_{10}	82*
$PM_{2.5}$	54*

* Applies to construction exhaust emissions only.

Notes: CO = carbon monoxide; lb/day = pounds per day; NO_X = oxides of nitrogen; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; ROG = reactive organic gases; SO_2 = sulfur dioxide. Refer to Appendix D for support documentation.

2.6.2. Greenhouse Gases

The District does not have an adopted *Threshold of Significance* for construction-related GHG emissions. However, the Lead Agency should quantify and disclose GHG emissions that would occur during construction, and make a determination on the significance of these construction-generated GHG emission impacts in relation to meeting AB 32 GHG reduction goals, as required by the Public Resources Code, Section 21082.2. The Lead Agency is encouraged to incorporate best management practices to reduce GHG emissions during construction, as feasible and applicable.

2.6.3. Local Community Risk and Hazards

The *Threshold of Significance* for construction-related local community risk and hazard impacts is the same as that for project operations. Construction-related TAC and PM impacts should be addressed on a case-by-case basis, taking into consideration the specific construction-related characteristics of each project and proximity to off-site receptors, as applicable. The Air District recommends that for construction projects that are less than one year duration, Lead Agencies should annualize impacts over the scope of actual days that peak impacts are to occur, rather than the full year.

2.7. THRESHOLDS OF SIGNIFICANCE FOR PLAN-LEVEL IMPACTS

The *Thresholds of Significance* for plans (e.g., general plans, community plans, specific plans, regional plans, congestion management plans, etc.) within the SFBAAB are summarized in Table 2-5 and discussed separately below.

Table 2-5
Thresholds of Significance for Plans

Criteria Air Pollutants and Precursors	Construction: none Operational: Consistency with Current AQP and projected VMT or vehicle trip increase is less than or equal to projected population increase.
GHGs	Construction: none Operational: 6.6 MT CO_2e/SP/yr (residents & employees) or a Qualified GHG Reduction Strategy. The efficiency threshold should only be applied to general plans. Other plans, e.g. specific plans, congestion management plans, etc., should use the project-level threshold of 4.6 CO_2e/SP/yr.
Local Community Risk and Hazards	Land use diagram identifies special overlay zones around existing and planned sources of TACs and $PM_{2.5}$, including special overlay zones of at least 500 feet (or Air District-approved modeled distance) on each side of all freeways and high-volume roadways, and plan identifies goals, policies, and objectives to minimize potentially adverse impacts.
Odors	Identify locations of odor sources in plan; identify goals, policies, and objectives to minimize potentially adverse impacts.
Regional Plans (transportation and air quality plans)	No net increase in emissions of GHGs, Criteria Air Pollutants and Precursors, and Toxic Air Contaminants. Threshold only applies to regional transportation and air quality plans.
Notes: AQP = Air Quality Plan; CO_2e = carbon dioxide equivalent; GHGs = greenhouse gases; MT = metric tons; SP = service population; TACs = toxic air contaminants; yr = year; $PM_{2.5}$= fine particulate matter Refer to Appendix D for support documentation.	

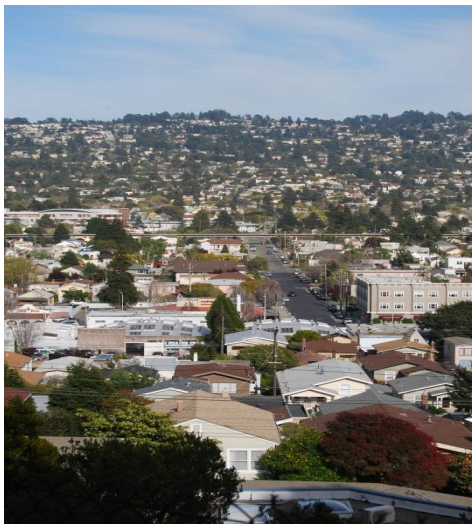
2.7.1. Criteria Air Pollutants and Precursor Emissions

Proposed plans (except regional plans) must show the following over the planning period of the plan to result in a less than significant impact:

- Consistency with current air quality plan control measures.
- A proposed plan's projected VMT or vehicle trips (VT) (either measure may be used) increase is less than or equal to its projected population increase.

2.7.2. Greenhouse Gases

The *Threshold of Significance* for operational-related GHG impacts of plans employs either a GHG efficiency-based metric (per Service Population [SP]), or a GHG Reduction Strategy option, described in Section 4.3.



The *Thresholds of Significance* options for plan level GHG emissions are:

- A GHG efficiency metric of 6.6 MT per SP per year of carbon dioxide equivalent (CO_2e). If annual maximum emissions of operational-related GHGs exceed this level, the proposed plan would result in a significant impact to global climate change.
- Consistency with an adopted GHG Reduction Strategy. If a proposed plan is consistent with an adopted GHG Reduction Strategy that meets the standards described in Section 4.3, the plan would be considered to have a less than significant impact. This approach is consistent with the plan elements described in the State CEQA Guidelines, Section 15183.5.

2.7.3. Local Community Risk and Hazards

The *Thresholds of Significance* for plans with regard to community risk and hazard impacts are:

1. The land use diagram must identify:
    a. Special overlay zones around existing and planned sources of TACs and PM (including adopted risk reduction plan areas); and
    b. Special overlay zones of at least 500 feet (or Air District-approved modeled distance) on each side of all freeways and high-volume roadways.
2. The plan must also identify goals, policies, and objectives to minimize potential impacts and create overlay zones around sources of TACs, PM, and hazards.

2.7.4. Odors

The *Thresholds of Significance* for plans with regard to odor impacts are to identify locations of odor sources in a plan and the plan must also identify goals, policies, and objectives to minimize potentially adverse impacts.

2.7.5. Regional Plans

The *Thresholds of Significance* for regional plans is to achieve a no net increase in emissions of criteria pollutants and precursors, GHG, and toxic air contaminants. This threshold applies only to regional transportation and air quality plans.

3. SCREENING CRITERIA

The screening criteria identified in this section are **not thresholds of significance**. The Air District developed screening criteria to provide lead agencies and project applicants with a conservative indication of whether the proposed project could result in potentially significant air quality impacts. If all of the screening criteria are met by a proposed project, then the lead agency or applicant would not need to perform a detailed air quality assessment of their project's air pollutant emissions. These screening levels are generally representative of new development on greenfield sites without any form of mitigation measures taken into consideration. In addition, the screening criteria in this section do not account for project design features, attributes, or local development requirements that could also result in lower emissions. For projects that are mixed-use, infill, and/or proximate to transit service and local services, emissions would be less than the greenfield type project that these screening criteria are based on.

If a project includes emissions from stationary source engines (e.g., back-up generators) and industrial sources subject to Air District Rules and Regulations, the screening criteria should not be used. The project's stationary source emissions should be analyzed separately from the land use-related indirect mobile- and area-source emissions. Stationary-source emissions are not included in the screening estimates given below and, for criteria pollutants, must be added to the indirect mobile- and area-source emissions generated by the land use development and compared to the appropriate Thresholds of Significance. Greenhouse gas emissions from permitted stationary sources should not be combined with operational emissions, but compared to a separate stationary source greenhouse gas threshold.

3.1. OPERATIONAL-RELATED IMPACTS

3.1.1. Criteria Air Pollutants and Precursors

The screening criteria developed for criteria pollutants and precursors were derived using the default assumptions used by the Urban Land Use Emissions Model (URBEMIS). If the project has sources of emissions not evaluated in the URBEMIS program the screening criteria should not be used. If the project meets the screening criteria in Table 3-1, the project would not result in the generation of operational-related criteria air pollutants and/or precursors that exceed the *Thresholds of Significance* shown in Table 2-2. Operation of the proposed project would therefore result in a less-than-significant cumulative impact to air quality from criteria air pollutant and precursor emissions.

3.1.2. Greenhouse Gases

The screening criteria developed for greenhouse gases were derived using the default emission assumptions in URBEMIS and using off-model GHG estimates for indirect emissions from electrical generation, solid waste and water conveyance. If the project has other significant sources of GHG emissions not accounted for in the methodology described above, then the screening criteria should not be used. Projects below the applicable screening criteria shown in Table 3-1 would not exceed the 1,100 MT of CO_2e/yr GHG threshold of significance for projects other than permitted stationary sources.

If a project, including stationary sources, is located in a community with an adopted qualified GHG Reduction Strategy, the project may be considered less than significant if it is consistent with the GHG Reduction Strategy. A project must demonstrate its consistency by identifying and implementing all applicable feasible measures and policies from the GHG Reduction Strategy into the project.

Table 3-1
Operational-Related Criteria Air Pollutant and Precursor Screening Level Sizes

Land Use Type	Operational Criteria Pollutant Screening Size	Operational GHG Screening Size	Construction-Related Screening Size
Single-family	325 du (NOX)	56 du	114 du (ROG)
Apartment, low-rise	451 du (ROG)	78 du	240 du (ROG)
Apartment, mid-rise	494 du (ROG)	87 du	240 du (ROG)
Apartment, high-rise	510 du (ROG)	91 du	249 du (ROG)
Condo/townhouse, general	451 du (ROG)	78 du	240 du (ROG)
Condo/townhouse, high-rise	511 du (ROG)	92 du	252 du (ROG)
Mobile home park	450 du (ROG)	82 du	114 du (ROG)
Retirement community	487 du (ROG)	94 du	114 du (ROG)
Congregate care facility	657 du (ROG)	143 du	240 du (ROG)
Day-care center	53 ksf (NOX)	11 ksf	277 ksf (ROG)
Elementary school	271 ksf (NOX)	44 ksf	277 ksf (ROG)
Elementary school	2747 students (ROG)	-	3904 students (ROG)
Junior high school	285 ksf (NOX)	-	277 ksf (ROG)
Junior high school	2460 students (NOX)	46 ksf	3261 students (ROG)
High school	311 ksf (NOX)	49 ksf	277 ksf (ROG)
High school	2390 students (NOX)	-	3012 students (ROG)
Junior college (2 years)	152 ksf (NOX)	28 ksf	277 ksf (ROG)
Junior college (2 years)	2865 students (ROG)	-	3012 students (ROG)
University/college (4 years)	1760 students (NOX)	320 students	3012 students (ROG)
Library	78 ksf (NOX)	15 ksf	277 ksf (ROG)
Place of worship	439 ksf (NOX)	61 ksf	277 ksf (ROG)
City park	2613 acres (ROG)	600 acres	67 acres (PM10)
Racquet club	291 ksf (NOX)	46 ksf	277 ksf (ROG)
Racquetball/health	128 ksf (NOX)	24 ksf	277 ksf (ROG)
Quality restaurant	47 ksf (NOX)	9 ksf	277 ksf (ROG)
High turnover restaurant	33 ksf (NOX)	7 ksf	277 ksf (ROG)
Fast food rest. w/ drive thru	6 ksf (NOX)	1 ksf	277 ksf (ROG)
Fast food rest. w/o drive thru	8 ksf (NOX)	1 ksf	277 ksf (ROG)
Hotel	489 rooms (NOX)	83 rooms	554 rooms (ROG)
Motel	688 rooms (NOX)	106 rooms	554 rooms (ROG)
Free-standing discount store	76 ksf (NOX)	15 ksf	277 ksf (ROG)
Free-standing discount superstore	87 ksf (NOX)	17 ksf	277 ksf (ROG)
Discount club	102 ksf (NOX)	20 ksf	277 ksf (ROG)
Regional shopping center	99 ksf (NOX)	19 ksf	277 ksf (ROG)
Electronic Superstore	95 ksf (NOX)	18 ksf	277 ksf (ROG)
Home improvement superstore	142 ksf (NOX)	26 ksf	277 ksf (ROG)
Strip mall	99 ksf (NOX)	19 ksf	277 ksf (ROG)
Hardware/paint store	83 ksf (NOX)	16 ksf	277 ksf (ROG)
Supermarket	42 ksf (NOX)	8 ksf	277 ksf (ROG)
Convenience market (24 hour)	5 ksf (NOX)	1 ksf	277 ksf (ROG)
Convenience market with gas pumps	4 ksf (NOX)	1 ksf	277 ksf (ROG)
Bank (with drive-through)	17 ksf (NOX)	3 ksf	277 ksf (ROG)

Table 3-1
Operational-Related Criteria Air Pollutant and Precursor Screening Level Sizes

Land Use Type	Operational Criteria Pollutant Screening Size	Operational GHG Screening Size	Construction-Related Screening Size
General office building	346 ksf (NOX)	53 ksf	277 ksf (ROG)
Office park	323 ksf (NOX)	50 ksf	277 ksf (ROG)
Government office building	61 ksf (NOX)	12 ksf	277 ksf (ROG)
Government (civic center)	149 ksf (NOX)	27 ksf	277 ksf (ROG)
Pharmacy/drugstore w/ drive through	49 ksf (NOX)	10 ksf	277 ksf (ROG)
Pharmacy/drugstore w/o drive through	48 ksf (NOX)	10 ksf	277 ksf (ROG)
Medical office building	117 ksf (NOX)	22 ksf	277 ksf (ROG)
Hospital	226 ksf (NOX)	39 ksf	277 ksf (ROG)
Hospital	334 beds (NOX)	84 ksf	337 beds (ROG)
Warehouse	864 ksf (NOX)	64 ksf	259 ksf (NOX)
General light industry	541 ksf (NOX)	121 ksf	259 ksf (NOX)
General light industry	72 acres (NOX)	-	11 acres (NOX)
General light industry	1249 employees (NOX)	-	540 employees (NOX)
General heavy industry	1899 ksf (ROG)	-	259 ksf (NOX)
General heavy industry	281 acres (ROG)	-	11 acres (NOX)
Industrial park	553 ksf (NOX)	65 ksf	259 ksf (NOX)
Industrial park	61 acres (NOX)	-	11 acres (NOX)
Industrial park	1154 employees (NOX)	-	577 employees (NOX)
Manufacturing	992 ksf (NOX)	89 ksf	259 ksf (NOX)

Notes: du = dwelling units; ksf = thousand square feet; NO_X = oxides of nitrogen; ROG = reactive organic gases.
Screening levels include indirect and area source emissions. Emissions from engines (e.g., back-up generators) and industrial sources subject to Air District Rules and Regulations embedded in the land uses are not included in the screening estimates and must be added to the above land uses.
Refer to Appendix D for support documentation.
Source: Modeled by EDAW 2009.

3.2. COMMUNITY RISK AND HAZARD IMPACTS

Please refer to Chapter 5 for discussion of screening criteria for local community risk and hazard impacts.

3.3. CARBON MONOXIDE IMPACTS

This preliminary screening methodology provides the Lead Agency with a conservative indication of whether the implementation of the proposed project would result in CO emissions that exceed the *Thresholds of Significance* shown in Table 2-3.

The proposed project would result in a less-than-significant impact to localized CO concentrations if the following screening criteria is met:

1. Project is consistent with an applicable congestion management program established by the county congestion management agency for designated roads or highways, regional transportation plan, and local congestion management agency plans.
2. The project traffic would not increase traffic volumes at affected intersections to more than 44,000 vehicles per hour.
3. The project traffic would not increase traffic volumes at affected intersections to more than 24,000 vehicles per hour where vertical and/or horizontal mixing is substantially limited (e.g., tunnel, parking garage, bridge underpass, natural or urban street canyon, below-grade roadway).

3.4. ODOR IMPACTS

Table 3-3 presents odor screening distances recommended by BAAQMD for a variety of land uses. Projects that would site a new odor source or a new receptor farther than the applicable screening distance shown in Table 3-3 from an existing receptor or odor source, respectively, would not likely result in a significant odor impact. The odor screening distances in Table 3-3 should not be used as absolute screening criteria, rather as information to consider along with the odor parameters and complaint history. Refer to *Chapter 7 Assessing and Mitigating Odor Impacts* for comprehensive guidance on significance determination.

Table 3-3
Odor Screening Distances

Land Use/Type of Operation	Project Screening Distance
Wastewater Treatment Plant	2 miles
Wastewater Pumping Facilities	1 mile
Sanitary Landfill	2 miles
Transfer Station	1 mile
Composting Facility	1 mile
Petroleum Refinery	2 miles
Asphalt Batch Plant	2 miles
Chemical Manufacturing	2 miles
Fiberglass Manufacturing	1 mile
Painting/Coating Operations	1 mile
Rendering Plant	2 miles
Coffee Roaster	1 mile
Food Processing Facility	1 mile
Confined Animal Facility/Feed Lot/Dairy	1 mile
Green Waste and Recycling Operations	1 mile
Metal Smelting Plants	2 miles
Refer to Appendix D for support documentation.	

Facilities that are regulated by CalRecycle (e.g. landfill, composting, etc.) are required to have Odor Impact Minimization Plans (OIMP) in place and have procedures that establish fence line odor detection thresholds. The Air District recognizes a Lead Agency's discretion under CEQA to

use established odor detection thresholds as thresholds of significance for CEQA review for CalRecycle regulated facilities with an adopted OIMP.

3.5. CONSTRUCTION-RELATED IMPACTS

3.5.1. Criteria Air Pollutants and Precursors

This preliminary screening provides the Lead Agency with a conservative indication of whether the proposed project would result in the generation of construction-related criteria air pollutants and/or precursors that exceed the *Thresholds of Significance* shown in Table 2-4.

If all of the following *Screening Criteria* are met, the construction of the proposed project would result in a less-than-significant impact from criteria air pollutant and precursor emissions.

1. The project is below the applicable screening level size shown in Table 3-1; and
2. All *Basic Construction Mitigation Measures* would be included in the project design and implemented during construction; and
3. Construction-related activities would not include any of the following:
    a. Demolition;
    b. Simultaneous occurrence of more than two construction phases (e.g., paving and building construction would occur simultaneously);
    c. Simultaneous construction of more than one land use type (e.g., project would develop residential and commercial uses on the same site) (not applicable to high density infill development);
    d. Extensive site preparation (i.e., greater than default assumptions used by the Urban Land Use Emissions Model [URBEMIS] for grading, cut/fill, or earth movement); or
    e. Extensive material transport (e.g., greater than 10,000 cubic yards of soil import/export) requiring a considerable amount of haul truck activity.

3.5.2. Community Risk and Hazards

Chapter 5, *Assessing and Mitigating Local Community Risk and Hazard Impacts*, contains information on screening criteria for local risk and hazards.

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PART II: ASSESSING & MITIGATING PROJECT LEVEL IMPACTS

4. OPERATIONAL-RELATED IMPACTS

Operational emissions typically represent the majority of a project's air quality impacts. After a project is built, operational emissions, including mobile and area sources, are anticipated to occur continuously throughout the project's lifetime. Operational-related activities, such as driving, use of landscape equipment, and wood burning, could generate emissions of criteria air pollutants and their precursors, GHG, TACs, and PM. Area sources generally include fuel combustion from space and water heating, landscape maintenance equipment, and fireplaces/stoves, evaporative emissions from architectural coatings and consumer products and unpermitted emissions from stationary sources. This chapter provides recommendations for assessing and mitigating operational-related impacts for individual projects. Recommendations for assessing and mitigating operational-related impacts at the plan-level are discussed in Chapter 9. Chapter 9 also contains guidance for assessing a project's consistency with applicable air quality plans.

When calculating project criteria pollutant and GHG emissions to compare to the thresholds of significance, the lead agency should ensure that project design features, attributes, or local development requirements are taken into consideration as part of the project as proposed and not viewed as mitigation measures. For example, projects that are mixed-use, infill, and/or proximate to transit service and local services, or that provide neighborhood serving commercial and retail services would have substantially lower vehicle trip rates and associated criteria pollutant and GHG emissions than what would be reflected in standard, basin-wide average URBEMIS default trip rates and emission estimates. A project specific transportation study should identify the reductions that can be claimed by projects with the above described attributes. However, the Air District, in association with the California Air Pollution Control Officers Association (CAPCOA), is currently developing guidance for estimating reductions in standard vehicle trip rates and vehicle miles traveled (VMT) that can be claimed for these land use types that do not develop project specific transportation studies. This additional guidance will be posted to the District website in June 2010.

To estimate a project's carbon dioxide equivalent emissions from direct and indirect emission sources, BAAQMD recommends using the BAAQMD GHG Model (BGM). The Air District developed this model to calculate GHG emissions not included in URBEMIS such as indirect emissions from electricity use and waste and direct fugitive emissions of refrigerants. The BGM is discussed in more detail in Section 4.2 below.

4.1. CRITERIA AIR POLLUTANT AND PRECURSOR EMISSIONS

4.1.1. Significance Determination

Step 1: Comparison of Project Attributes with Screening Criteria

The first step in determining the significance of operational-related criteria air pollutants and precursors is to compare the attributes of the proposed project with the applicable S*creening Criteria* listed in Chapter 3. This preliminary screening provides a conservative indication of whether operation of the proposed project would result in the generation of criteria air pollutants and/or precursors that exceed the *Thresholds of Significance* listed in Chapter 2. If all of the *Screening Criteria* are met, the operation of the proposed project would result in a less than significant impact to air quality. If the proposed project does not meet all the *Screening Criteria*, then project emissions need to be quantified.

Step 2: Emissions Quantification

If a proposed project involves the removal of existing emission sources, BAAQMD recommends subtracting the existing emissions levels from the emissions levels estimated for the new proposed land use. This net calculation is permissible only if the existing emission sources were operational at the time that the Notice of Preparation (NOP) for the CEQA project was circulated or in the absence of an NOP when environmental analysis begins, and would continue if the proposed redevelopment project is not approved. This net calculation is not permitted for emission sources that ceased to operate, or the land uses were vacated and/or demolished, prior to circulation of the NOP or the commencement of environmental analysis. This approach is consistent with the definition of baseline conditions pursuant to CEQA.

Land Use Development Projects

For proposed land use development projects, BAAQMD recommends using the most current version of URBEMIS (which to date is version 9.2.4) to quantify operational-related criteria air pollutants and precursors. URBEMIS is a modeling tool initially developed by the California Air Resources Board for calculating air pollutant emissions from land use development projects. URBEMIS uses EMFAC emission factors and ITE trip generation rates to calculate ROG, NO_X, carbon monoxide, particulate matter, carbon dioxide, and total vehicle trips. URBEMIS is not equipped for calculating air quality impacts from stationary sources or plans. For land use projects, URBEMIS quantifies emissions from area sources (e.g., natural gas fuel combustion for space and water heating, wood stoves and fireplace combustion, landscape maintenance equipment, consumer products, and architectural coating) and operational-related emissions (mobile sources).

Appendix B contains more detailed instructions for using URBEMIS to model operational emissions.

Stationary-Source Facilities

A stationary source consists of a single emission source with an identified emission point, such as a stack at a facility. Facilities can have multiple emission point sources located on-site and sometimes the facility as a whole is referred to as a stationary source. Major stationary sources are typically associated with industrial processes, such as refineries or power plants. Minor stationary sources are typically land uses that may require air district permits, such as gasoline dispensing stations, and dry cleaning establishments. Examples of other District-permitted stationary sources include back-up diesel generators, boilers, heaters, flares, cement kilns, and other types of combustion equipment, as well as non-combustion sources such as coating or printing operations. BAAQMD is responsible for issuing permits for the construction and operation of stationary sources in order to reduce air pollution, and to attain and maintain the national and California ambient air quality standards in the SFBAAB. Newly modified or constructed stationary sources subject to Air District permitting may be required to implement Best Available Control Technology (BACT), which may include the installation of emissions control equipment or the implementation of administrative practices that would result in the lowest achievable emission rate. Stationary sources may also be required to offset their emissions of criteria air pollutants and precursors to be permitted. This may entail shutting down or augmenting another stationary source at the same facility. Facilities also may purchase an emissions reduction credit to offset their emissions. Any stationary source emissions remaining after the application of BACT and

offsets should be added to the indirect and area source emissions estimated above to arrive at total project emissions.

URBEMIS is not equipped to estimate emissions generated by stationary sources. Instead emissions from stationary sources should be estimated using manual calculation methods in consultation with BAAQMD. When stationary sources will be subject to BAAQMD regulations, the regulation emission limits should be used as emission factors. If BAAQMD emission limits are not applicable, alternative sources of emission factors include: EPA AP-42 emission factors for particular industrial processes, manufacturer specifications for specific equipment, throughput data (e.g., fuel consumption, rate of material feedstock input) and other specifications provided by the project engineer. To the extent possible, BAAQMD recommends that the methodology used to estimate stationary-source emissions be consistent with calculations that would need to be performed to fulfill requirements of the permitting process and provided in the CEQA document.

Step 3: Comparison of Unmitigated Emissions with Thresholds of Significance
Sum the estimated emissions for area, mobile, and stationary sources (if any) for each pollutant as explained above and compare the total average daily and annual emissions of each criteria pollutant and their precursors with the applicable *Thresholds of Significance* (refer to Table 2-2). If daily average or annual emissions of operational-related criteria air pollutants or precursors do not exceed any of the *Thresholds of Significance*, the project would result in a less than significant impact to air quality. If the quantified emissions of operational-related criteria air pollutants or precursors do exceed any applicable *Threshold of Significance,* the proposed project would result in a significant impact to air quality and CEQA requires implementation of all feasible mitigation measures.

Step 4: Mitigation Measures and Emission Reductions
Where operational-related emissions exceed applicable *Thresholds of Significance*, lead agencies are responsible for implementing all feasible mitigation measures to reduce the project's air quality impacts. Section 4.2 contains numerous examples of mitigation measures and associated emission reductions that may be applied to projects. The project's mitigated emission estimates from mitigation measures included in the proposed project or recommended by the lead agency should be quantified and disclosed in the CEQA document.

Step 5: Comparison of Mitigated Emissions with Thresholds of Significance
Compare the total average daily and annual amounts of mitigated criteria air pollutants and precursors with the applicable *Thresholds of Significance* (refer to Table 4-1). If the implementation of mitigation measures, including off-site mitigation, would reduce all operational-related criteria air pollutants and precursors to levels below the applicable *Thresholds of Significance*, the impact to air quality would be reduced to a less than significant level. Implementation of mitigation measures means that they are made conditions of project approval and included in a Mitigation Monitoring and Reporting Plan (MMRP). If mitigated levels of any criteria air pollutant or precursor would still exceed the applicable *Threshold of Significance*, the impact to air quality would remain significant and unavoidable.

Table 4-1
Example Operational Criteria Air Pollutant and Precursor Emissions Analysis

Step	Emissions Source	Emissions (lb/day or tpy)*			
		ROG	NO_X	PM_{10}	$PM_{2.5}$
2	Area Sources	A	A	A	A
	Mobile Sources	B	B	B	B
	Stationary Sources	C	C	C	C
	Total Unmitigated Emissions	A + B + C = D	A + B + C = D	A + B + C = D	A + B + C = D
	BAAQMD Threshold	54 lb/day or 10 tpy	54 lb/day or 10 tpy	82 lb/day or 15 tpy	54 lb/day or 10 tpy
3	Unmitigated Emissions Exceed BAAQMD Threshold?	Is D > Threshold? (If Yes, significant. Go to step 4. If No, less than significant)			
4	Mitigated Emissions	E	E	E	E
5	Mitigated Emissions Exceed BAAQMD Threshold?	Is E > Threshold? (If Yes, significant and unavoidable. If No, less than significant with mitigation incorporated)			

* Letters "A", "B", and "C" are used to represent numeric values that would be obtained through modeling for area and mobile sources, and by manual calculations for stationary source-emissions. "D" represents the sum of "A", "B", and "C" (i.e., unmitigated emissions). "E" represents mitigated emissions.
Notes: lb/day = pounds per day; NO_X = oxides of nitrogen; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; ROG = reactive organic gases; tpy = tons per year.
Refer to Appendix D for support documentation.

4.2. GREENHOUSE GAS IMPACTS

4.2.1. Significance Determination

Step 1: Comparison of Project Attributes with Screening Criteria
The first step in determining the significance of operational-related GHG emissions is to compare the attributes of the proposed project with the applicable S*creening Criteria* (Refer to Chapter 3). If all of the *Screening Criteria* are met, the operation of the proposed project would result in a less than significant impact to global climate change. If the proposed project does not meet all the *Screening Criteria*, then project emissions need to be quantified.

If a project is located in a community with an adopted qualified GHG Reduction Strategy (described in section 4.3), the project may be considered less than significant if it is consistent with the GHG Reduction Strategy. A project must demonstrate its consistency by identifying and implementing all applicable feasible measures and policies from the GHG Reduction Strategy into the project.

Step 2: Emissions Quantification

For quantifying a project's GHG emissions, BAAQMD recommends that all GHG emissions from a project be estimated, including a project's direct and indirect GHG emissions from operations. Direct emissions refer to emissions produced from onsite combustion of energy, such as natural gas used in furnaces and boilers, emissions from industrial processes, and fuel combustion from mobile sources. Indirect emissions are emissions produced offsite from energy production and water conveyance due to a project's energy use and water consumption. See Table 4-2 for a list of GHG emission sources and types that should be estimated for projects.

Please note that when estimating a project's emissions, no additional reductions associated with implementation of AB 32 Scoping Plan measures should be taken because development of the threshold assumed reductions from adopted regulations would occur (see Appendix D). In addition, the BAAQMD Greenhouse Gas Model discussed below will make appropriate adjustments to a project's emission totals to reflect reductions from adopted state regulations such as Pavley and the low carbon fuel standard.

Biogenic emissions should not be included in the quantification of GHG emissions for a project. Biogenic CO_2 emissions result from materials that are derived from living cells, as opposed to CO_2 emissions derived from fossil fuels, limestone and other materials that have been transformed by geological processes. Biogenic CO_2 contains carbon that is present in organic materials that include, but are not limited to, wood, paper, vegetable oils, animal fat, and food, animal and yard waste.

The GHG emissions from permitted stationary sources should be calculated separately from a project's operational emissions. Permitted stationary sources are subject to a different threshold than land use developments. For example, if a proposed project anticipates having a permitted stationary source on site, such as a back-up generator, the GHG emissions from the generator should not be added to the project's total emissions. The generator's GHG emissions should be calculated separately and compared to the GHG threshold for stationary sources to determine its impact level.

If a proposed project involves the removal of existing emission sources, BAAQMD recommends subtracting the existing emissions levels from the emissions levels estimated for the new proposed land use. This net calculation is permissible only if the existing emission sources were operational at the time that the Notice of Preparation (NOP) for the CEQA project was circulated (or in the absence of an NOP when environmental analysis begins), and would continue if the proposed redevelopment project is not approved. This net calculation is not permitted for emission sources that ceased to operate, or the land uses were vacated and/or demolished, prior to circulation of the NOP or the commencement of environmental analysis. This approach is consistent with the definition of baseline conditions pursuant to CEQA.

BAAQMD Greenhouse Gas Model

BAAQMD recommends using URBEMIS to estimate direct CO_2 emissions from area and mobile sources. The same detailed guidance described for criteria air pollutants and precursors (Section 4.1 above) could be followed for quantifying GHG emissions as appropriate. URBEMIS estimates

the modeled emissions output in units of short tons; the URBEMIS output may be converted to metric tons by multiplying the amount of short tons by 0.91.

To estimate a project's carbon dioxide equivalent emissions from direct and indirect emission sources, BAAQMD recommends using the BAAQMD GHG Model (BGM). The Air District developed this model to calculate GHG emissions not included in URBEMIS such as indirect emissions from electricity use and waste and direct fugitive emissions of refrigerants. The BGM also adjusts for state regulations not included in URBEMIS, specifically California's low carbon fuel rules and Pavley regulations.

The BGM imports project inputs and emission results from URBEMIS to quantify carbon dioxide equivalent emissions from additional direct and indirect sources not included in URBEMIS, such as water supply, waste disposal, electricity generation and refrigerants. The BGM also contains a range of GHG reduction strategies/mitigation measures that may be applied to projects. The BGM also adjusts emission totals to reflect reductions from adopted state regulations such as Pavley and the low carbon fuel standard. This model is available without cost and may be downloaded at: http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES.aspx. The BGM is run using Microsoft Excel. Refer to the BGM user's manual for detailed instructions on using the model.

Table 4-2 outlines the recommended methodologies for estimating a project's GHG emissions.

Table 4-2
Guidance for Estimating a Project's Operations GHG Emissions

Emission Source	Emission Type	GHG	Methodology
Area Sources (natural gas, hearth, landscape fuel, etc.)	Direct, natural gas and fuel combustion	CO_2, CH_4, N_20	URBEMIS and BGM
Transportation	Direct, fuel combustion	CO_2, CH_4, N_20	URBEMIS and BGM
Electricity consumption	Indirect, electricity	CO_2, CH_4, N_20	BGM
Solid waste	Indirect, landfill; direct, fuel combustion	CO_2, CH_4, N_20	BGM
Water consumption	Indirect, electricity	CO_2, CH_4, N_20	BGM
Wastewater (non-biogenic emissions)	Indirect	CO_2, CH_4, N_20	BGM
Industrial process emissions	Direct	CO_2, CH_4, N_20, and refrigerants	BGM and BAAQMD permits*
Fugitive emissions	Direct	CO_2, CH_4, N_20, and refrigerants	BGM

* Industrial processes permitted by the Air District must use the methodology provided in BAAQMD rules and regulations. Other industrial process emissions, such as commercial refrigerants, should use the BGM.
CO_2 (carbon dioxide), CH_4 (methane), N_20 (nitrous oxides), and refrigerants (HFCs and PFCs).

In cases where users may need to estimate a project's GHG emissions manually, BAAQMD recommends using ARB's most current Local Government Operations Protocol (LGOP) as appropriate for guidance. The most current LGOP may be downloaded from ARB's website.

Step 3: Comparison of Unmitigated Emissions with Thresholds of Significance

Sum the estimated GHG emissions from area and mobile sources and compare the total annual GHG emissions with the applicable *Threshold of Significance*. If annual emissions of operational-related GHGs do not exceed the *Threshold of Significance*, the project would result in a less than significant impact to global climate change. If annual emissions do exceed the *Threshold of*

Significance, the proposed project would result in a significant impact to global climate change and will require mitigation measures for emission reductions.

Step 4: Mitigation Measures and Emission Reductions

Where operational-related emissions exceed applicable *Thresholds of Significance*, lead agencies are responsible for implementing all feasible mitigation measures to reduce the project's GHG emissions. Section 4.2 contains recommended mitigation measures and associated emission reductions. The Air District recommends using the BGM if additional reductions are needed. The air quality analysis should quantify the reduction of emissions associated with any proposed mitigation measures and include this information in the CEQA document.

Step 5: Comparison of Mitigated Emissions with Thresholds of Significance

Compare the total annual amount of mitigated GHGs with the applicable *Threshold of Significance,* as demonstrated in Table 4-3. If the implementation of project proposed or required mitigation measures would reduce operational-related GHGs to a level below either the 1,100 MT CO_2e/yr or 4.6 MT CO_2e/SP/yr *Threshold of Significance*, the impact would be reduced to a less than significant level. If mitigated levels still exceed the applicable *Threshold of Significance*, the impact to global climate change would remain significant and unavoidable.

Table 4-3
Example of Operational Greenhouse Gas Emissions Analysis

Step	Emissions Source	Emissions (MT CO_2e/yr)*
2	Area Sources	A
	Mobile Sources	B
	Indirect Sources	C
	Total Unmitigated Emissions	A + B + C = D
	BAAQMD Threshold	1,100 or 4.6 MT CO_2e/yr/SP
3	Unmitigated Emissions Exceed BAAQMD Threshold?	Is D > 1,100/4.6? (If Yes, significant. Go to step 4. If No, less than significant)
4	Mitigated Emissions	E
5	Mitigated Emissions Exceed BAAQMD Threshold?	Is E > 1,100/4.6? (If Yes, significant and unavoidable. If No, less than significant with mitigation incorporated)

* Letters "A", "B", and "C" are used to represent numeric values that would be obtained through modeling for area and mobile sources, and by manual calculations for indirect source-emissions. "D" represents the sum of "A", "B", and "C" (i.e., unmitigated emissions). "E" represents mitigated emissions.

Notes: CO_2e = carbon dioxide equivalent; MT = metric tons; yr = year.
Refer to Appendix D for support documentation.

4.3. GREENHOUSE GAS REDUCTION STRATEGIES

The Air District encourages local governments to adopt a qualified GHG Reduction Strategy that is consistent with AB 32 goals. If a project is consistent with an adopted qualified GHG Reduction Strategy that meets the standards laid out below, it can be presumed that the project will not have significant GHG emission impacts. This approach is consistent with the State CEQA Guidelines, Section 15183.5 (see text in box below).

§15183.5. Tiering and Streamlining the Analysis of Greenhouse Gas Emissions.

(a) Lead agencies may analyze and mitigate the significant effects of greenhouse gas emissions at a programmatic level, such as in a general plan, a long range development plan, or a separate plan to reduce greenhouse gas emissions. Later project-specific environmental documents may tier from and/or incorporate by reference that existing programmatic review. Project-specific environmental documents may rely on an EIR containing a programmatic analysis of greenhouse gas emissions as provided in section 15152 (tiering), 15167 (staged EIRs) 15168 (program EIRs), 15175-15179.5 (Master EIRs), 15182 (EIRs Prepared for Specific Plans), and 15183 (EIRs Prepared for General Plans, Community Plans, or Zoning).

(b) Plans for the Reduction of Greenhouse Gas Emissions. Public agencies may choose to analyze and mitigate significant greenhouse gas emissions in a plan for the reduction of greenhouse gas emissions or similar document. A plan to reduce greenhouse gas emissions may be used in a cumulative impacts analysis as set forth below. Pursuant to sections 15064(h)(3) and 15130(d), a lead agency may determine that a project's incremental contribution to a cumulative effect is not cumulatively considerable if the project complies with the requirements in a previously adopted plan or mitigation program under specified circumstances.

(1) Plan Elements. A plan for the reduction of greenhouse gas emissions should:

(A) Quantify greenhouse gas emissions, both existing and projected over a specified time period, resulting from activities within a defined geographic area;

(B) Establish a level, based on substantial evidence, below which the contribution to greenhouse gas emissions from activities covered by the plan would not be cumulatively considerable;

(C) Identify and analyze the greenhouse gas emissions resulting from specific actions or categories of actions anticipated within the geographic area;

(D) Specify measures or a group of measures, including performance standards, that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level;

(E) Establish a mechanism to monitor the plan's progress toward achieving the level and to require amendment if the plan is not achieving specified levels;

(F) Be adopted in a public process following environmental review

(2) Use with Later Activities. A plan for the reduction of greenhouse gas emissions, once adopted following certification of an EIR or adoption of an environmental document, may be used in the cumulative impacts analysis of later projects. An environmental document that relies on a greenhouse gas reduction plan for a cumulative impacts analysis must identify those requirements specified in the plan that apply to the project, and, if those requirements are not otherwise binding and enforceable, incorporate those requirements as mitigation measures applicable to the project. If there is substantial evidence that the effects of a particular project may be cumulatively considerable notwithstanding the project's compliance with the specified requirements in the plan for the reduction of greenhouse gas emissions, an EIR must be prepared for the project.

Standard Elements of a GHG Reduction Strategy

The Air District recommends the Plan Elements in the state CEQA Guidelines as the minimum standard to meet the GHG Reduction Strategy Thresholds of Significance option. A GHG Reduction Strategy may be one single plan, such as a general plan or climate action plan, or could be comprised of a collection of climate action policies, ordinances and programs that have been legislatively adopted by a local jurisdiction. The GHG Reduction Strategy should identify goals, policies and implementation measures that would achieve AB 32 goals for the entire community. Plans with horizon years beyond 2020 should consider continuing the downward reduction path set by AB 32 and move toward climate stabilization goals established in Executive Order S-3-05.

To meet this threshold of significance, a GHG Reduction Strategy must include the following elements (corresponding to the State CEQA Guidelines Plan Elements):

(A) Quantify greenhouse gas emissions, both existing and projected over a specified time period, resulting from activities within a defined geographic area.

A GHG Reduction Strategy must include an emissions inventory that quantifies an existing baseline level of emissions and projected GHG emissions from a business-as-usual, no-plan, forecast scenario of the horizon year. The baseline year is based on the existing growth pattern defined by an existing general plan. The projected GHG emissions are based on the emissions from the existing growth pattern or general plan through to 2020, and if different, the year used for the forecast. If the forecast year is beyond 2020, BAAQMD recommends doing a forecast for 2020 to establish a trend. The forecast does not include new growth estimates based on a new or draft general plan.

When conducting the baseline emissions inventory and forecast, ARB's business-as-usual 2020 forecasting methodology should be followed to the extent possible, including the following recommended methodology and assumptions:

- The baseline inventory should include one complete calendar year of data for 2008 or earlier. CO_2 must be inventoried across all sectors (residential, commercial, industrial, transportation and waste); accounting of CH_4, N_20, SF6, HFC and PFC emission sources can also be included where reliable estimation methodologies and data are available.

- Business-as-usual emissions are projected in the absence of any policies or actions that would reduce emissions. The forecast should include only adopted and funded projects.

- The business-as-usual forecast should project emissions from the baseline year using growth factors specific to each of the different economic sectors: Recommendations for growth factors are included in the Air District's GHG Quantification Guidance document (explained below and available on the District's website).

The Air District's *GHG Plan Level Reduction Strategy Guidance* contains detailed recommendations for developing GHG emission inventories and projections and for quantifying emission reductions from policies and mitigation measures. This document is available at the Air District's website, http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES.aspx.

(B) Establish a level, based on substantial evidence, below which the contribution to GHG emissions from activities covered by the plan would not be cumulatively considerable.

A GHG Reduction Strategy must establish a target that is adopted by legislation that meets or exceeds one of the following options, all based on AB 32 goals:

- Reduce emissions to 1990 level by 2020[1]
- Reduce emissions 15 percent below baseline (2008 or earlier) emission level by 2020[2]
- Meet the plan efficiency threshold of 6.6 MT CO_2e/service population/year

If the target year for a GHG reduction goal exceeds 2020, then the GHG emission reduction target should be in line with the goals outlined in Executive Order S-3-05.

(C) Identify and analyze the GHG emissions resulting from specific actions or categories of actions anticipated within the geographic area.

A Strategy should identify and analyze GHG reductions from anticipated actions in order to understand the amount of reductions needed to meet its target. Anticipated actions refer to local and state policies and regulations that may be planned or adopted but not implemented. For example, ARB's Scoping Plan contains a number of measures that are planned but not yet implemented. BAAQMD recommends for the Strategy to include an additional forecast analyzing anticipated actions. Element (C), together with (A), is meant to identify the scope of GHG emissions to be reduced through Element (D).

(D) Specify measures or a group of measures, including performance standards that substantial evidence demonstrates, if implemented on a project-by-project basis, would collectively achieve the specified emissions level.

The GHG Reduction Strategy should include mandatory and enforceable measures that impact new development projects, such as mandatory energy efficiency standards, density requirements, etc. These measures may exist in codes or other policies and may be included in the Strategy by reference.

The GHG Reduction Strategy should include quantification of expected GHG reductions from each identified measure or categories of measures (such as residential energy efficiency measures, bike/pedestrian measures, recycling measures, etc.), including disclosure of calculation methods and assumptions. Quantification should reflect annual GHG reductions and demonstrate how the GHG reduction target will be met. The Strategy should specify which measures apply to new development projects.

(E) Monitor the plan's progress

To ensure that all new development projects are incorporating all applicable measures contained within the GHG Reduction Strategy, the Strategy should include an Implementation Plan containing the following:

- Identification of which measures apply to different types of new development projects, discerning between voluntary and mandatory measures.

[1] Specified target in AB 32 legislation

[2] From "Climate Change Scoping Plan", Executive Summary page 5

- Mechanism for reviewing and determining if all applicable mandatory measures are being adequately applied to new development projects.

- Identification of implementation steps and parties responsible for ensuring implementation of each action.

- Schedule of implementation identifying near-term and longer-term implementation steps.

- Procedures for monitoring and updating the GHG inventory and reduction measures every 3-5 years before 2020 and submitting annual implementation updates to the jurisdiction's governing body.

- Annual review and reporting on the progress of implementation of individual measures, including assessment of how new development projects have been incorporating Strategy measures. Review should also include an assessment of the implementation of Scoping Plan measures in order to determine if adjustments to local Strategy must be made to account for any shortfalls in Scoping Plan implementation.

(F) Adopt the GHG Reduction Strategy in a public process following environmental review

A GHG Reduction Strategy should undergo an environmental review which may include a negative declaration or EIR.

If the GHG Reduction Strategy consists of a number of different elements, such as a general plan, a climate action plan and/or separate codes, ordinances and policies, each element that is applicable to new development projects would have to complete an environmental review in order to allow tiering for new development projects.

Sustainable Communities Strategy (SCS) or Alternative Planning Strategy

If a project is located within an adopted Sustainable Communities Strategy or Alternative Planning Strategy, the GHG emissions from cars and light duty trucks do not need to be analyzed in the environmental analysis. This approach is consistent with the State CEQA Guidelines, Section 15183.5(c). This approach only applies to certain residential and mixed use projects and transit priority projects as defined in Section 21155 of the State CEQA Guidelines.

Section 15183.5(c): Special Situations. As provided in Public Resources Code sections 21155.2 and 21159.28, environmental documents for certain residential and mixed us projects, and transit priority projects, as defined in section 21155, that are consistent with the general use designation, density, building intensity, and applicable policies specified for the project area in an applicable sustainable communities strategy or alternative planning strategy need not analyze global warming impacts resulting from cars and light duty trucks. A lead agency should consider whether such projects may result in GHG emissions resulting from other source, however, consistent with these Guidelines.

Section 21155: A transit priority project shall (1) contain at least 50 percent residential use, based on total building square footage and, if the project contains between 26 percent and 50 percent nonresidential uses, a floor area ratio of not less than 0.75; (2) provide a minimum net density of at least 20 dwelling units per acre; and (3) be within one-half mile of a major transit stop or high-quality transit corridor included in a regional transportation plan. A major transit stop is as defined in Section 21064.3, except that, for purposes of this section, it also includes major transit stops that are included in the applicable regional transportation plan. For purposes of this section, a high quality transit corridor means a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute hours. A project shall be considered to be within on-half mile of a major transit stop or high-quality transit corridor if all parcels within the project have not more than 25 percent of their area farther than one-half mile from the stop or corridor and if not more than 10 percent of the residential units or 100 units, whichever is less, in the project are farther than one-half mile from the stop or corridor.

4.4. MITIGATING OPERATIONAL-RELATED IMPACTS

The following mitigation measures would reduce operational-related emissions of criteria air pollutants, precursors, and GHGs from mobile, area, and stationary sources. Additional mitigation measures may be used, including off-site measures, provided their mitigation efficiency is justified. Where a range of emission reduction potential is given for a measure, the Lead Agency should provide justification for the mitigation reduction efficiency assumed for the project. If mitigation does not bring a project back within the threshold requirements, the project could be cumulatively significant and could be approved only with a Statement of Overriding Considerations and a showing that all feasible mitigation measures have been implemented.

Reductions from mitigation measures should be scaled proportionally to their sector of project-generated emissions. For example, if a measure would result in a 50 percent reduction in residential natural gas consumption, but only 20 percent of a project's emissions are associated with natural gas consumption, and only 10 percent of a project's emissions are from residential land uses, then the scaled reduction would equal one percent (50% * 20% * 10% = 1%).

Once all emission reductions are scaled by their applicable sector and land use, they should be added together for the total sum of emission reductions. Once all emission reductions are scaled by their applicable sector and land use, they should be added together for the total sum of emission reductions.

The Air District prefers for project emissions to be reduced to their extent possible onsite. For projects that are not able to mitigate onsite to a level below significance, offsite mitigation measures serve as a feasible alternative. Recent State's CEQA Guidelines amendments allow for offsite measures to mitigate a project's emissions, (Section 15126.4(c)(4))

In implementing offsite mitigation measures, the lead agency must ensure that emission reductions from identified projects are real, permanent through the duration of the project,

enforceable, and are equal to the pollutant type and amount of the project impact being offset. BAAQMD recommends that offsite mitigation projects occur within the nine-county Bay Area in order to reduce localized impacts and capture potential co-benefits. Offsite mitigation for PM and toxics emission reductions should occur within a five mile radius to the project site.

Another feasible mitigation measure the Air District is exploring establishing is an offsite mitigation program to assist lead agencies and project applicants in achieving emission reductions. A project applicant would enter into an agreement with the Air District and pay into an Air District fund. The Air District would commit to reducing the type and amount of emission indentified in the agreement. The Air District would identify, implement, and manage offsite mitigation projects.

The following tables list feasible mitigation measures for consideration in projects. The estimated emission reductions are a work in progress and the Air District will continue to improve guidance on quantifying the mitigation measures.

URBEMIS Mitigation Measures for Operational Mobile Source Emissions

Measure	Sector Reductions	Applicable Pollutants	Sector	Notes	Additional comments
Mix of Uses	-3% to 9%	CAPs, GHGs	Mobile sources	-3 when no housing or employment centers within 1/2 mile	Residential: % reduction is taken from base trips (9.57) and subtracted from ITE trip generation; Nonresidential: % reduction from ITE trip generation
Local serving retail within 1/2 mile of project	2%	CAPs, GHGs	Mobile sources	Uses lower end of reported research to avoid double counting with mix of uses measure	
Transit Service	0% to 15%	CAPs, GHGs	Mobile sources		
Bike & Pedestrian	0%–9%	CAPs, GHGs	Mobile sources	Credit is given based on intersection density, sidewalk completeness, and bike network completeness; No reduction if entire area within 1/2 mile is single use	
Affordable Housing	0%–4%	CAPs, GHGs	Mobile sources		
Transportation Demand Management Parking, Transit Passes					
Daily Parking Charge	0%–25%	CAPs, GHGs	Only resident/ employee trips, no visitor/ shopper trips		
Parking Cash-Out	0%–12.5%	CAPs, GHGs		Shoup, Donald. 2005. Parking Cash Out. American Planning Association. Chicago, IL.	
Free Transit Passes	25% of Transit Service Reduction	CAPs, GHGs			

URBEMIS Mitigation Measures for Operational Mobile Source Emissions

Measure	Sector Reductions	Applicable Pollutants	Sector	Notes	Additional comments
Telecommuting					
Employee Telecommuting Program	1%–100%	CAPs, GHGs	Mobile sources, Worker Trips only		
Compressed Work Schedule 3/36	1%–40%	CAPs, GHGs			
Compressed Work Schedule 4/40	1%–20%	CAPs, GHGs			
Compressed Work Schedule 9/80	1%–10%	CAPs, GHGs			
Other Transportation Demand Measures					
Secure Bike Parking (at least 1 space per 20 vehicle spaces)	At least 3 elements: 1% reduction, plus 5% of the reduction for transit and pedestrian/bike friendliness; At least 5 elements: 2% reduction, plus 10% of the reduction for transit and pedestrian/bike friendliness	CAPs, GHGs	Mobile sources, Worker Trips only		
Showers/Changing Facilities Provided					
Guaranteed Ride Home Program Provided					
Car-Sharing Services Provided					
Information Provided on Transportation Alternatives (Bike Schedules, Maps)					
Dedicated Employee Transportation Coordinator					
Carpool Matching Program					
Preferential Carpool/Vanpool Parking					
Parking Supply	0%–50%	CAPs, GHGs	Mobile sources		
On Road Trucks	As input by user in URBEMIS	CAPs, GHGs	Mobile sources		

URBEMIS Mitigation Measures for Operational Area-Source Emissions

Measure	Sector Reductions	Applicable Pollutants	Sector	Notes
Increase Energy Efficiency Beyond Title 24	Same as % improvement over Title 24	CAPs, GHGs	Natural gas sector in URBEMIS for applicable land use only	User should specify baseline year for the Title 24 standards
Electrically powered landscape equipment and outdoor electrical outlets	Same as % of landscape equipment emissions	CAPs, GHGs	Landscape emissions: residential only	
Low VOC architectural coatings	Same as % VOC reduction in applicable coatings (Interior/Exterior)	ROG only	Architectural coating	

NON-URBEMIS Energy Efficiency Mitigation Measures

Measure	Sector Reductions	Applicable Pollutants	Sector	Notes	Additional comments
Plant shade trees within 40 feet of the south side or within 60 feet of the west sides of properties.	30%	GHGs	R,C A/C Electricity	USDA Forest Service, Pacific Northwest Research Station. "California Study Shows Shade Trees Reduce Summertime Electricity Use." Science Daily 7 January 2009. 20 February 2009 <http://www.sciencedaily.com/releases/2009/01/090105150831.htm>.	Electricity-related measures reduce CAPs off-site, but they are not typically quantified as part of a CEQA analysis.
Require cool roof materials (albedo >= 30)	34%	GHGs	C A/C Electricity	U.S. EPA Cool Roof Product Information, Available: <http://www.epa.gov/heatisland/resources/pdf/CoolRoofsCompendium.pdf>	
	69%	GHGs	R A/C Electricity		
Install green roofs	1%	GHGs	R,C A/C Electricity	Reductions are based on the Energy & Atmosphere credits (EA Credit 2) documented in the Leadership in Energy & Environmental Design (LEED), Green Building Rating System for New Constructions and Major Renovations, Version 2.2, October 2005. The reduction assumes that a vegetated roof is installed on a least 50% of the roof	

NON-URBEMIS Energy Efficiency Mitigation Measures

Measure	Sector Reductions	Applicable Pollutants	Sector	Notes	Additional comments
				area or that a combination high albedo and vegetated roof surface is installed that meets the following standard: (Area of SRI Roof/0.75)+(Area of vegetated roof/0.5) >= Total Roof Area.	
Require smart meters and programmable thermostats	10%	CAPs, GHGs	R, C electricity and natural gas space heating	U. S. Environmental Protection Agency. 2009. Programmable Thermostat. http://www.energystar.gov/ia/new_homes/features/ProgThermostats1-17-01.pdf	
Meet GBC standards in all New construction	17%	GHGs	R electricity	California Energy Commission [CEC] 2007. Impact Analysis 2008 Update to the California Energy Efficiency Standards for Residential and Nonresidential Buildings	
	7%	GHGs	C electricity		
	9%	CAPs, GHGs	R natural gas		
	3%	CAPs, GHGs	C natural gas		
Retrofit existing buildings to meet CA GBC standards	38%	GHGs	R electricity	California Energy Commission [CEC] 2003. Impact Analysis 2005 Update to the California Energy Efficiency Standards for Residential and Nonresidential Buildings; California Energy Commission [CEC] 2007. Impact Analysis 2008 Update to the California Energy Efficiency Standards for Residential and Nonresidential Buildings	
	12%	GHGs	C electricity		
	18%	CAPs, GHGs	R natural gas		
	12%	CAPs, GHGs	C natural gas		
Install solar water heaters	70%	CAPs, GHGs	R natural gas water heating	Energy Star. 2009. Solar Water Heater. http://www.energystar.gov/ia/new_homes/features/WaterHtrs_062906.pdf; Department of Energy. California Energy Commission [CEC] 2007. Impact Analysis 2008 Update to the California Energy Efficiency Standards for Residential and Nonresidential Buildings	Cannot take credit for both solar and tank-less water heater measures
	70%	CAPs, GHGs	C natural gas water heating		

NON-URBEMIS Energy Efficiency Mitigation Measures

Measure	Sector Reductions	Applicable Pollutants	Sector	Notes	Additional comments
Install tank-less water heaters	35%	CAPs, GHGs	R natural gas water heating	Tankless Water Heater. 2008. Available: <http://www.eere.energy.gov/consumer/your_home/water_heating/index.cfm/mytopic=12820>	
	35%	CAPs, GHGs	C natural gas water heating		
Install solar panels on residential and commercial buildings	100%	GHGs	R, C electricity		
100% increase in diversity of land use mix	5%	CAPs, GHGs	Mobile sources	Ewing, Reid, et al. 2001. *Travel and the Built Environment: A Synthesis.* Transportation Research Record 1780. Paper No. 01-3515 as cited in Urban Land Institute. 2008. *Growing Cooler.* ISBN: 978-0-87420-082-2. Washington, DC	
Jobs housing balance	Trip reduction = (1 – (ABS (1.5 * HH – E)/(1.5 * HH + E)) – 0.25) / 0.25 * 0.03; where ABS = absolute value; HH = study area households ; E = study area employment	CAPs, GHGs	Mobile sources	*Nelson/Nygaard Consultants. 2005. Crediting Low-Traffic Developments: Adjusting Site-Level Vehicle Trip Generation Using URBEMIS. Pg 12, (adapted from Criterion and Fehr & Peers, 2001)*	
100% increase in design (i.e., presence of design guidelines for transit oriented development, complete streets standards)	3%	CAPs, GHGs	Mobile sources	Ewing, Reid, et al. 2001. *Travel and the Built Environment: A Synthesis.* Transportation Research Record 1780. Paper No. 01-3515 as cited in Urban Land Institute. 2008. *Growing Cooler.* ISBN: 978-0-87420-082-2. Washington, DC	

NON-URBEMIS Energy Efficiency Mitigation Measures

Measure	Sector Reductions	Applicable Pollutants	Sector	Notes	Additional comments
100% increase in density	5%	CAPs, GHGs	Mobile sources	Ewing, Reid, et al. 2001. *Travel and the Built Environment: A Synthesis.* Transportation Research Record 1780. Paper No. 01-3515 as cited in Urban Land Institute. 2008. *Growing Cooler.* ISBN: 978-0-87420-082-2. Washington, DC	
HVAC duct sealing	30%	GHGs	R,C A/C electricity	Sacramento Metropolitan Utilities District. 2008. Duct Sealing. Available: <http://www.pge.com/myhome/saveenergymoney/rebates/coolheat/duct/index.shtml>.	
Provide necessary infrastructure and treatment to allow use of 50% greywater/ recycled water in residential and commercial uses for outdoor irrigation	SFR: 74%*50% = 37.5% MFR: 58% * 50% = 29% Commercial: 12% * 50% = 6%	GHGs	R electricity (water consumption) C electricity (water consumption)	Department of Water Resources. 2001. Statewide Indoor/Outdoor Split. Accessed December 2, 2008. Available at: <http://www.landwateruse.water.ca.gov/annualdata/urbanwateruse/2001/landuselevels.cfm?use=8>.	
Complete streets (i.e., bike lanes and pedestrian sidewalks on both sides of streets, traffic calming features such as pedestrian bulb-outs, cross-walks, traffic circles, and elimination of physical and psychological barriers (e.g., sound walls and large arterial roadways, respectively).)	1-5%	CAPs, GHGs	Mobile sources	Dierkers, G., E. Silsbe, S. Stott, S. Winkelman, an M. Wubben. 2007. *CCAP Transportation Emissions Guidebook*. Center for Clean Air Policy. Washington, D.C. Available: <http://www.ccap.org/safe/guidebook.php>. as cited in California Air Pollution Control Officers Association (CAPCOA) 2008. *CEQA and Climate Change.*	

NON-URBEMIS Energy Efficiency Mitigation Measures					
Measure	**Sector Reductions**	**Applicable Pollutants**	**Sector**	**Notes**	**Additional comments**
Maximize interior day light		GHGs	R, C, M		
Increase roof/ceiling insulation		CAPs, GHGs	R, C, M		
Create program to encourage efficiency improvements in rental units		CAPs, GHGs	R		
Install rainwater collection systems in residential and Commercial Buildings		GHGs	R,C,M		
Install low-water use appliances and fixtures		GHGs	R,C,M	California Air Pollution Control Officers Association (CAPCOA) 2008. CEQA and Climate Change.	
Restrict the use of water for cleaning outdoor surfaces/Prohibit systems that apply water to non-vegetated surfaces		GHGs	R,C,M	California Attorney General's Office GHG Reduction Measures	
Implement water-sensitive urban design practices in new construction		GHGs	R,C,M		
NON-URBEMIS Waste Reduction Mitigation Measures					
Provide composting facilities at residential uses		GHGs	R		
Create food waste and green waste curb-side pickup service		GHGs	R,C,M		
Require the provision of storage areas for recyclables and green waste in new construction		GHGs	R,C,M		

Notes: CAPs = Criteria Air Pollutants; GHGs = Greenhouse Gases; ROG = Reactive Organic Gases; R = Residential Development; C = Commercial Development; M = Mixed Use Development; A/C = Air Conditioning; and VOC = Volatile Organic Compounds.

Source: Information compiled by EDAW 2009.

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5. LOCAL COMMUNITY RISK AND HAZARD IMPACTS

The purpose of this Chapter is (1) to recommend methods whereby local community risk and hazard impacts from projects for both new sources and new receptors can be determined based on comparison with applicable thresholds of significance and screening criteria and (2) to recommend mitigation measures for these impacts. This chapter contains the following sections:

Section 5.2 – Presents methods for assessing single-source impacts from either an individual new source or impacts on new receptors from existing individual sources.

Section 5.3 – Discusses methods for assessing cumulative impacts from multiple sources.

Section 5.4 – Discusses methods for mitigating local community risk and hazard impacts.

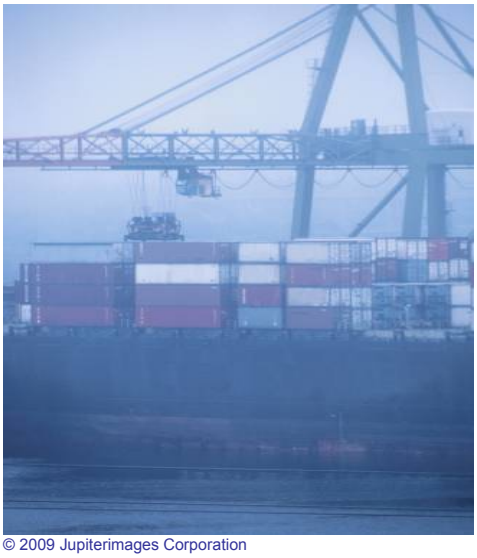
The recommendations provided in this chapter apply to assessing and mitigating impacts for project-level impacts and related cumulative impacts. Refer to Chapter 9 for recommendations for assessing and mitigating local community risk and hazard impacts at the plan-level.

To assist the Lead Agency in evaluating air quality impacts at the neighborhood scale, *Thresholds of Significance* have been established for local community risks and hazards associated with TACs and $PM_{2.5}$ with respect to siting a new source and/or receptor; as well as for assessing both individual source and cumulative multiple source impacts. These *Thresholds of Significance* focus on $PM_{2.5}$ and TACs because these more so than other emission types pose significant health impacts at the local level as discussed separately below.

5.1. TOXIC AIR CONTAMINANTS

TACs are a defined set of airborne pollutants that may pose a present or potential hazard to human health. A wide range of sources, from industrial plants to motor vehicles, emit TACs. Like $PM_{2.5}$, TAC can be emitted directly and can also be formed in the atmosphere through reactions among different pollutants. The methods presented in this Chapter for assessing local community risk and hazard impacts only include direct TAC emissions, not those formed in the atmosphere.

The health effects associated with TACs are quite diverse and generally are assessed locally, rather than regionally. TACs can cause long-term health effects such as cancer, birth defects, neurological damage, asthma, bronchitis or genetic damage; or short-term acute affects such as eye watering, respiratory irritation (a cough), running nose, throat pain, and headaches. For evaluation purposes, TACs are separated into carcinogens and non-carcinogens based on the nature of the physiological effects associated with exposure to the pollutant. Carcinogens are assumed to have no safe threshold below which health impacts would not occur, and cancer risk is expressed as excess cancer cases per one million exposed individuals, typically over a lifetime of exposure. Non-carcinogenic substances differ in that there is generally assumed to be a safe level of exposure below which no negative health impact is believed to occur. These levels are



determined on a pollutant-by-pollutant basis. Acute and chronic exposure to non-carcinogens is expressed as a hazard index (HI), which is the ratio of expected exposure levels to an acceptable reference exposure levels.

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. 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 the current scientific knowledge that includes consideration of possible differential effects on the health of infants, children and other sensitive subpopulations, in accordance with the mandate of the Children's Environmental Health Protection Act (Senate Bill 25, Escutia, Chapter 731, Statutes of 1999, Health and Safety Code Sections 39669.5 et seq.). The methodology in this Chapter reflects the approach adopted by OEHHA in May 2009, which considers age sensitivity factors to account for early life stage exposures. 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.

5.1.1. Fine Particulate Matter

$PM_{2.5}$ is a complex mixture of substances that includes elements such as carbon and metals; compounds such as nitrates, organics, and sulfates; and complex mixtures such as diesel exhaust and wood smoke. $PM_{2.5}$ can be emitted directly and can also be formed in the atmosphere through reactions among different pollutants. The methods presented in this Chapter for assessing local community risk and hazard impacts only include direct $PM_{2.5}$ emissions, not those formed in the atmosphere.

Compelling evidence suggests that $PM_{2.5}$ is by far the most harmful air pollutant in the SFBAAB in terms of the associated impact on public health. A large body of scientific evidence indicates that both long-term and short-term exposure to $PM_{2.5}$ can cause a wide range of health effects (e.g., aggravating asthma and bronchitis, causing visits to the hospital for respiratory and cardio-vascular symptoms, and contributing to heart attacks and deaths). BAAQMD recommends characterizing potential health effects from exposure to directly $PM_{2.5}$ emissions through comparison to the applicable *Thresholds of Significance*.

5.1.2. Common Source Types

Common stationary source types of TAC and $PM_{2.5}$ emissions include gasoline stations, dry cleaners, and diesel backup generators, which are subject to BAAQMD permit requirements. The other, often more significant, common source type is on-road motor vehicles on freeways and roads such as trucks and cars, and off-road sources such as construction equipment, ships and trains. Because these common sources are prevalent in many communities, this Chapter focuses on screening tools for the evaluation of associated cumulative community risk and hazard impacts. However, it is important to note that other influential source types do exist (e.g., ports, railyards, and truck distribution centers), but these are often more complex and require more advanced modeling techniques beyond those discussed herein.

5.1.3. Area of Influence

For assessing community risks and hazards, a 1,000 foot radius is recommended around the project property boundary. BAAQMD recommends that any proposed project that includes the siting of a new source or receptor assess associated impacts within 1,000 feet, taking into account both individual and nearby cumulative sources (i.e., proposed project plus existing and foreseeable future projects). Cumulative sources represent the combined total risk values of each individual source within the 1,000-foot evaluation zone. A lead agency should enlarge the 1,000-

foot radius on a case-by-case basis if an unusually large source or sources of risk or hazard emissions that may affect a proposed project is beyond the recommended radius.

The recommended methodology for assessing community risks and hazards from $PM_{2.5}$ and TACs follows a phased approach. Within this approach, more advanced techniques, for both new sources and receptors, which require additional site specific information are presented for each progressive phase to assess risks and hazards. Each phase provides concentrations and risks that are directly comparable to the applicable *Thresholds of Significance*, although it is important to note that the use of more site specific modeling input data produces more accurate results. Also, progression from one phase to the next in a sequential fashion is not necessary and a refined modeling analysis can be conducted at any time.

5.1.4. Impacted Communities

In the Bay Area, there are a number of urban or industrialized communities where the exposure to TACs is relatively high in comparison to others. These same communities are often faced with other environmental and socio-economic hardships that further stress their residents and result in poor health outcomes. To address community risk from air toxics, the Air District initiated the Community Air Risk Evaluation (CARE) program in 2004 to identify locations with high levels of risk from TACs co-located with sensitive populations and use the information to help focus mitigation measures. Through the CARE program, the Air District developed an inventory of TAC emissions for 2005 and compiled demographic and heath indicator data. According to the findings of the CARE Program, diesel PM, mostly from on and off-road mobile sources, accounts for over 80 percent of the inhalation cancer risk from TACs in the Bay Area. Figure 5-1 shows the impacted communities as of November 2009, including: the urban core areas of Concord, eastern San Francisco, western Alameda County, Redwood City/East Palo Alto, Richmond/San Pablo, and San Jose. For more information on, and possible revisions to, impacted communities, go to the CARE Program website.

In many cases, air quality conditions in impacted communities result in part from land use and transportation decisions made over many years. BAAQMD believes comprehensive, community-wide strategies will achieve the greatest reductions in emissions of and exposure to TAC and $PM_{2.5}$. BAAQMD strongly recommends that within these impacted areas local jurisdictions develop and adopt Community Risk Reduction Plans, described in Section 5.4. The goal of the Community Risk Reduction Plan is to encourage local jurisdictions to take a proactive approach to reduce the overall exposure to TAC and $PM_{2.5}$ emissions and concentrations from new and existing sources. Local plans may also be developed in other areas to address air quality impacts related to land use decisions and ensure sufficient health protection in the community.

5.2. SINGLE SOURCE IMPACTS

5.2.1. Significance Determination

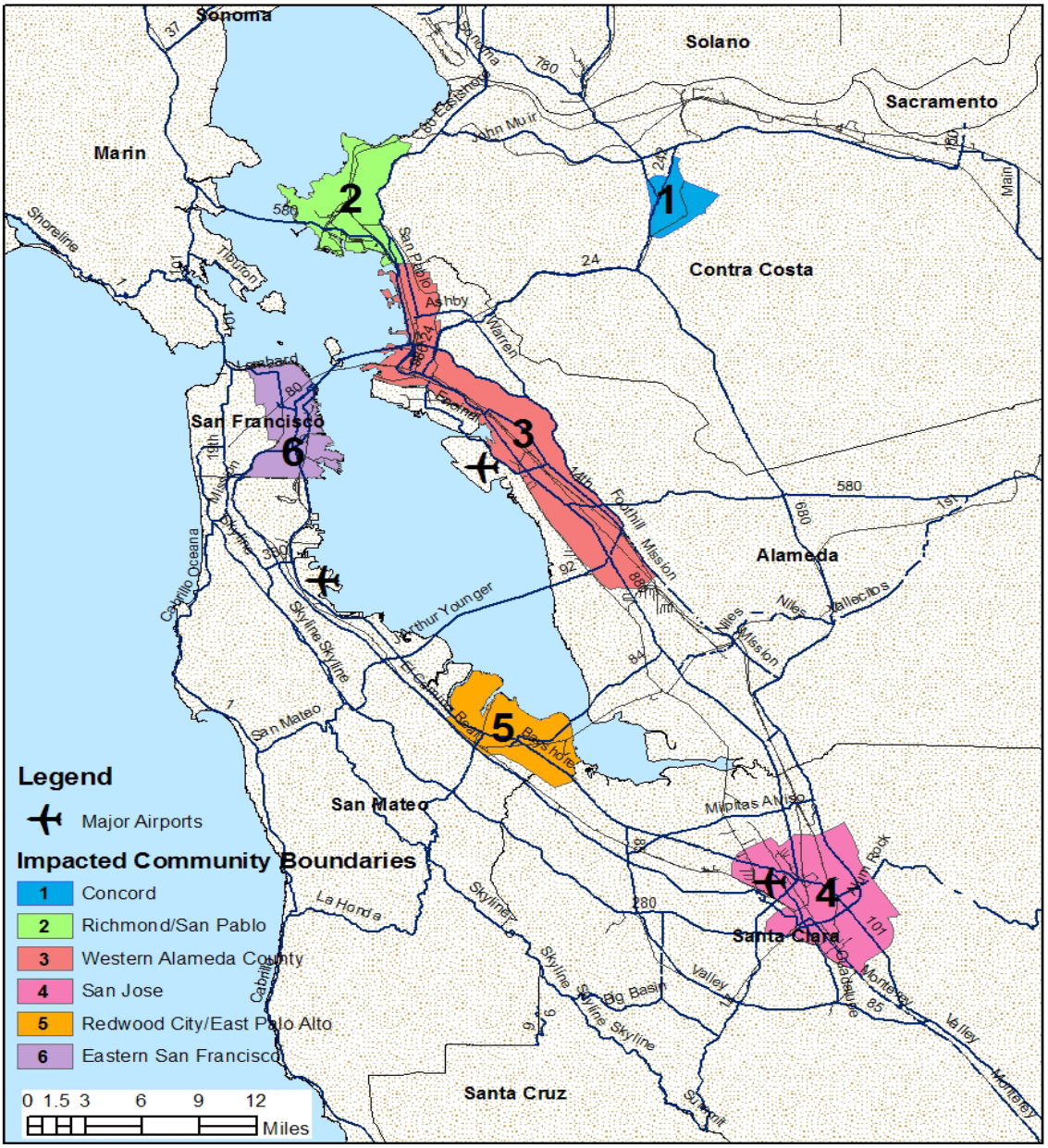
The Lead Agency shall determine whether operational-related TAC and $PM_{2.5}$ emissions generated as part of a proposed project siting a new source or receptor would expose existing or new receptors to levels that exceed BAAQMD's applicable *Thresholds of Significance* stated below:

- Compliance with a qualified Community Risk Reduction Plan;
- An excess cancer risk level of more than 10 in one million, or a non-cancer (i.e., chronic or acute) risk greater than 1.0 HI from a single source would be a significant cumulatively considerable contribution;

- An incremental increase of greater than 0.3 µg/m^3 annual average $PM_{2.5}$ from a single source would be a significant cumulatively considerable contribution.

In all areas, but especially within impacted communities identified under BAAQMD's CARE program, the Lead Agency is encouraged to develop and adopt a Community Risk Reduction Plan. To determine whether an impacted community is located in a jurisdiction, the Lead Agency should refer to Figure 5-1 and the BAAQMD CARE web page at http://www.baaqmd.gov/CARE/. Please consult with BAAQMD if a more precise map is needed.

Impacted Communities **Figure 5-1**



Source: BAAQMD 2009

Exposure of receptors to substantial concentrations of TACs and $PM_{2.5}$ could occur from the following situations:

1. Siting a new TAC and/or $PM_{2.5}$ source (e.g., diesel generator, truck distribution center, freeway) near existing or planned receptors; and
2. Siting a new receptor near an existing source of TAC and/or $PM_{2.5}$ emissions.

BAAQMD recommendations for evaluating and making a significance determination for each of these situations are discussed separately below.

5.2.2. Siting a New Source

When evaluating whether a new source of TAC and/or $PM_{2.5}$ emissions would adversely affect existing or future proposed receptors, a Lead Agency shall examine:

- the extent to which the new source would increase risk levels, hazard index, and/or $PM_{2.5}$ concentrations at nearby receptors,
- whether the source would be permitted or non-permitted by the BAAQMD, and
- whether the project would implement Best Available Control Technology for Toxics (T-BACT), as determined by BAAQMD.

The incremental increase in cancer and non-cancer (chronic and acute) risk from TACs and $PM_{2.5}$ concentrations at the affected receptors shall be assessed. As described above, the recommended methodology for assessing community risks and hazards from $PM_{2.5}$ and TACs follows a phased approach, within which progressively more advanced techniques are presented for each phase (Figure 5-2). Each phase provides concentrations and risks that are directly comparable to the applicable *Thresholds of Significance*, although it is important to note that the use of more site specific modeling input data produces more accurate results. Also, progression from one phase to the next in a sequential fashion is not necessary and a refined modeling analysis can be conducted at any time.

For siting a new source, the first step is to determine the associated emission levels.

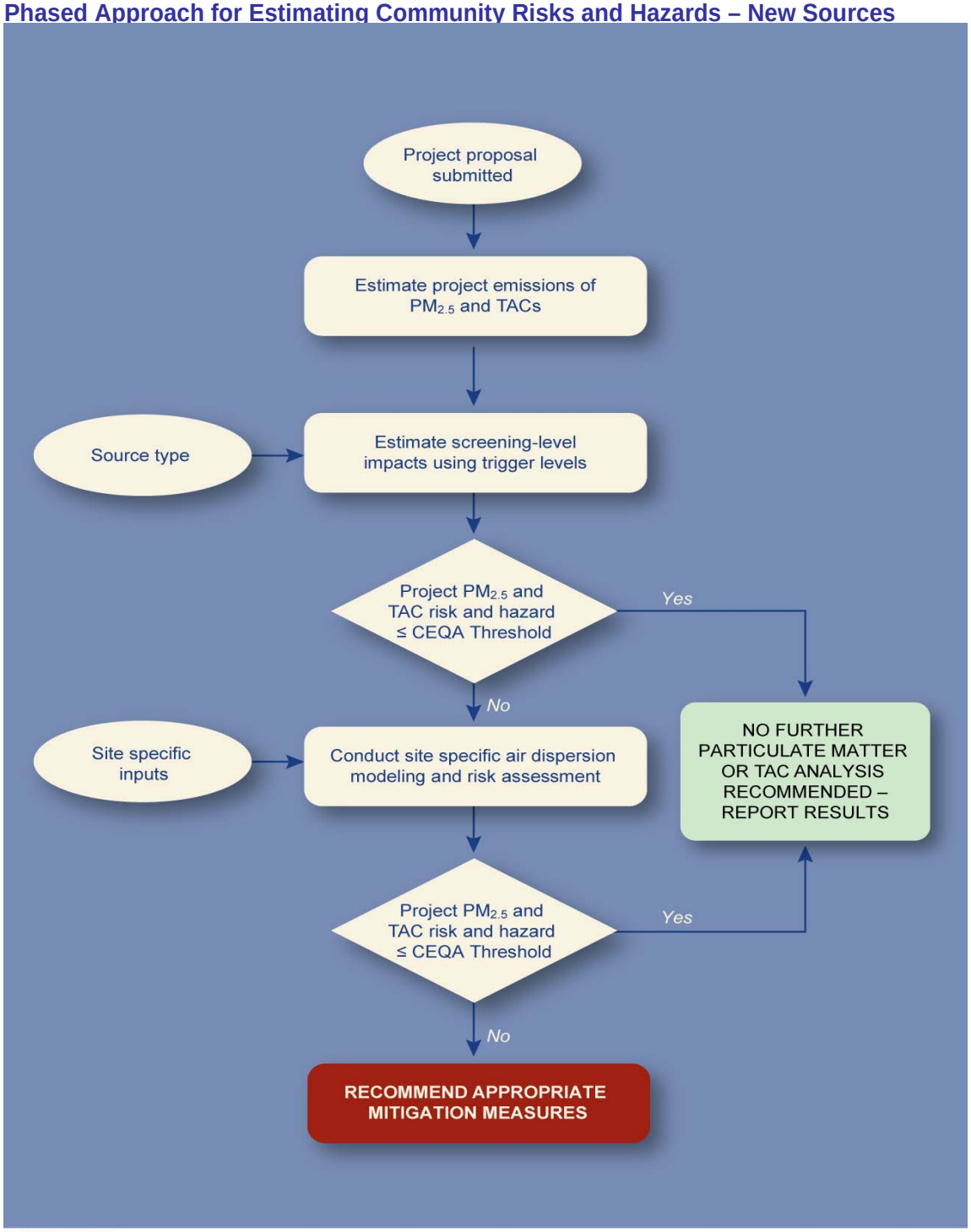
5.2.3. Sources Permitted by BAAQMD

For sources that would be permitted by BAAQMD (e.g., gas stations and back-up diesel generators) the project's type, size, or planned level of use can be used to help estimate $PM_{2.5}$ and TAC emissions. Screening or modeling conducted as part of the permit application can be used to determine cancer and non-cancer risk and $PM_{2.5}$ concentrations for comparing to the applicable *Thresholds of Significance*. BAAQMD can assist in determining the level of emissions associated with the new source. A Lead Agency should identify the maximally exposed existing or reasonably foreseeable future receptor.

Requirements of Toxics New Source Review (Regulation 2, Rule 5) will determine whether the project would implement T-BACT.

Figure 5-2

Phased Approach for Estimating Community Risks and Hazards – New Sources



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Concentration estimates of $PM_{2.5}$ from screening or modeling should be compared with the *Threshold of Significance* for $PM_{2.5}$. If screening estimates determine $PM_{2.5}$ concentrations from the project would not exceed the *Threshold of Significance*, no further analysis is recommended (See Figure 5-2). If emissions would exceed the *Threshold of Significance*, more refined modeling or mitigation measures to offset emission can be considered.

5.2.4. Sources Not Requiring a BAAQMD Permit

Some proposed projects would include the operation of non-permitted sources of TAC and/or $PM_{2.5}$ emissions. For instance, projects that would attract high numbers of diesel-powered on-road trucks or use off-road diesel equipment on site, such as a distribution center, a quarry, or a manufacturing facility, would potentially expose existing or future planned receptors to substantial risk levels and/or health hazards.

For sources that would not require permits from BAAQMD (e.g., distribution centers and large retail centers) where emissions are primarily from mobile sources—the number and activity of vehicles and fleet information would be required. The latest version of the State of California's EMFAC model is recommended for estimating emissions from on-road vehicles; the OFFROAD model is recommended for estimating emissions from off-road vehicles. For these types of new sources (not permitted by BAAQMD) screening methods are not currently available and a more refined analysis is necessary.

If modeling estimates for community risks and hazards determine that local levels associated with the proposed project meet the applicable *Thresholds of Significance*, no further analysis is recommended. More details on project screening and recommended protocols for modeling stationary and mobile sources are presented in *Recommended Methods for Screening and Modeling Local Risks and Hazards*. This online companion document provides screening tables for emissions from on-road cars and trucks on major roadways and many existing permitted sources in the SFBAAB. It describes how to use screening tables to determine whether a site specific modeling analysis and risk assessment is required. The document also addresses sources that BAAQMD has determined to have negligible impact on health outcomes. It describes the recommended methodology for performing dispersion modeling and estimating emission factors if the project exceeds the thresholds based on the screening analysis; it describes how to calculate the potential cancer risk using age-sensitivity toxicity factors from the concentrations produced from the air modeling analysis; and it provides a sample calculation and the methodology for estimating short term, acute exposures and long term, chronic health impacts. The recommended protocols are consistent with the most current risk assessment methodology used for the BAAQMD's *New Source Review for Toxic Air Contaminants Regulation 2, Rule 5: Toxics New Source Review* and, with few exceptions, follows the California Air Pollution Control Officers Association's (CAPCOA) *Health Risk Assessments for Proposed Land Use Projects* (July 2009).

BAAQMD recommends that all receptors located within a 1,000 foot radius of the project's fence line be assessed for potentially significant impacts from the incremental increase in risks or hazards from the proposed new source. A lead agency should enlarge the 1,000-foot radius on a case-by-case basis if an unusually large source or sources of risk or hazard emissions that may affect a proposed project is beyond the recommended radius.

For new land uses that would host a high number of non-permitted TAC sources, such as a distribution center, the incremental increase in cancer risk shall be determined by an HRA using an acceptable air dispersion model in accordance with BAAQMD's *Recommended Methods for Screening and Modeling Local Risks and Hazards* and/or. A Lead Agency may consult HRAs that have previously been conducted for similar land uses to determine whether it assesses the incremental increase in cancer risk qualitatively or by performing an HRA. This analysis shall account for all TAC and PM emissions generated on the project site, as well as any TAC emissions that would occur near the site as a result of the implementation of the project (e.g., diesel trucks queuing outside an entrance, a high volume of trucks using a road to access a quarry or landfill).

Some proposed projects would include both permitted and non-permitted TAC sources. For instance, a manufacturing facility may include some permitted stationary sources and also attract a high volume of diesel trucks and/or include a rail yard. All sources should be accounted for in the analysis.

5.2.5. Siting a New Receptor

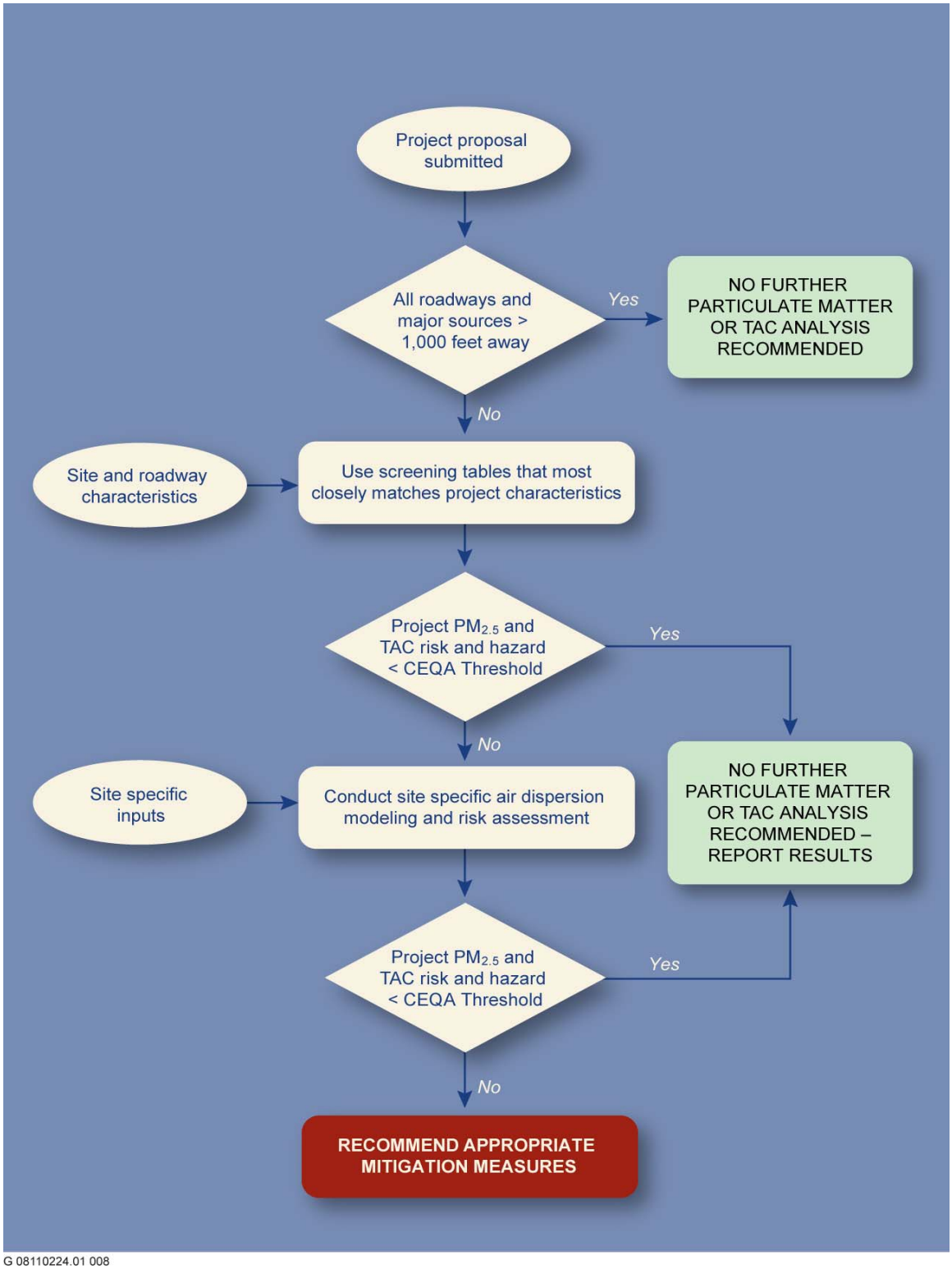
If a project is likely to be a place where people live, play, or convalesce, it should be considered a receptor. It should also be considered a receptor if sensitive individuals are likely to spend a significant amount of time there. Sensitive individuals refer to those segments of the population most susceptible to poor air quality: children, the elderly, and those with pre-existing serious health problems affected by air quality (ARB 2005). Examples of receptors include residences, schools and school yards, parks and play grounds, daycare centers, nursing homes, and medical facilities. Residences can include houses, apartments, and senior living complexes. Medical facilities can include hospitals, convalescent homes, and health clinics. Playgrounds could be play areas associated with parks or community centers.

When siting a new receptor, a Lead Agency shall examine existing or future proposed sources of TAC and/or $PM_{2.5}$ emissions that would adversely affect individuals within the planned project. A Lead Agency shall examine:

- the extent to which existing sources would increase risk levels, hazard index, and/or $PM_{2.5}$ concentrations near the planned receptor,
- whether the existing sources are permitted or non-permitted by the BAAQMD, and
- whether there are freeways or major roadways near the planned receptor.

BAAQMD recommends that a Lead Agency identify all TAC and $PM_{2.5}$ sources located within a 1,000 foot radius of the proposed project site. A lead agency should enlarge the 1,000-foot radius on a case-by-case basis if an unusually large source or sources of risk or hazard emissions that may affect a proposed project is beyond the recommended radius. Permitted sources of TAC and $PM_{2.5}$ should be identified and located as should freeways and major roadways, and other potential sources. To conduct a thorough search, a Lead Agency shall gather all facility data within 1,000 feet of the project site (and beyond where appropriate).

The phased approach for evaluating impacts to new receptors is shown in Figure 5-3.



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Phased Approach for Estimating Community Risks and Hazards – Receptors
Figure 5-3

5.2.6. Screening Table for Stationary Sources

BAAQMD will make available data for certain existing permitted, stationary sources of TAC and $PM_{2.5}$ with site locations, coordinates, source type, and screening-level estimates of excess cancer risk, chronic, and acute HI, and $PM_{2.5}$ concentrations. An example of the entries to be provided in this table is shown in Table 5-1.

Table 5-1
Screening Table for Existing Permitted Stationary Sources*
(within 1,000 feet of the Proposed Project)

EXAMPLE
Proposed Project Location Details:
Address-19th Avenue and Judah Street, San Francisco, CA
Centroid UTMs-E 546090, N 4179460

Site #	Facility Name	Street Address	City	UTM E	UTM N	Cancer Risk in a million	Chronic Hazard Index	Acute Hazard Index	$PM_{2.5}$ ug/m^3
462	20th Avenue Cleaner	1845 Irving Street	San Francisco	546113	4179490	7.5	0.02	0.00	
4672	Sundown Cleaners	1952 Irving Street	San Francisco	546016	4179510	7.5	0.02	0.00	
13519	Pacific Bell	1515 19th Avenue	San Francisco	546086	4179240	58.4	0.10	0.04	0.10
2155	Chevron Station #91000	1288 19th Avenue	San Francisco	546052	4179720	5.8	0.03	0.00	
8756	ConocoPhillips #251075	1400 19th Avenue	San Francisco	546064	4179490	2.7	0.01	0.00	
9266	ConocoPhillips #2611185	1401 19th Avenue	San Francisco	546058	4179500	2.2	0.01	0.00	
					Cumulative:	84	0.19	0.04	0.10

Source: BAAQMD 2009

*This example provides conservative screening level estimates and does not represent actual risk levels, HI or PM concentrations for the facilities listed.

Table 5-1 selects a hypothetical location at 19th Avenue and Judah Street in San Francisco, as shown at the top of the table along with the Universal Transverse Mercator (UTM) coordinates of the location. Below this location are listed permitted facilities within 1,000 feet of the example location. Each row contains entries for a specific existing permitted source and conservative estimates of maximum risk, hazard index, and $PM_{2.5}$ concentration within the 1,000 foot radius. Within a row, each risk, HI, or $PM_{2.5}$ concentration for a source can be compared to the significance threshold: cancer risk is compared to 10 in a million; chronic and acute hazard index are compared to 1.0; and $PM_{2.5}$ concentration is compared to 0.3 $\mu g/m^3$. In Table 5-1 all entries are below the target threshold except for the source at 1515 19th Avenue, which has a cancer risk, conservatively estimated at about 58 in a million.

It is important to note that the listing of existing sources provided by the BAAQMD provides conservative screening-level estimates and does not represent the actual risk levels, HI, or PM concentrations for that facility. These estimates are assumed to be uniform within the 1,000 foot radius and independent of the distance between source and receptor.

To use the screening tables, a Lead Agency would identify sources in the tables within 1,000 feet (or beyond where appropriate) of the project site. Risks, hazards, and $PM_{2.5}$ concentrations for individual sources correspond to the table entries. These values are assumed to remain constant for all locations within the 1,000 foot radius. Table entries within a column can be summed to estimate the cumulative risks from all sources. The screening table for Air District permitted sources is also available as a compressed keyhole language (kmz) file for each of the nine Bay Area counties. The kmz file can be plotted using the Google Earth™ mapping tool, which is freely available as described in *Recommended Methodology for Screening and Modeling Local Risks and Hazards*.

5.2.7. Screening Tables for On-road Mobile Sources

For all State highways within the SFBAAB, BAAQMD will make available a set of maps and tables that provide screening-level risks and $PM_{2.5}$ concentrations. Screening tables are provided for each of the nine counties within BAAQMD's jurisdiction. To develop these tables, BAAQMD selected conservative assumptions and inputs following this general methodology:

- Hourly vehicle miles traveled (VMT) and emissions for 2012 were developed for each county using EMFAC based on default vehicle mix and full range of vehicle speeds.
- Highest vehicle traffic volumes for each roadway based on Caltrans's *2007 Traffic Volumes on California State Highways* were scaled based on VMT to develop hourly vehicle volumes.
- Hourly vehicle volume and emissions were input into a roadway model, CAL3QHCR, to estimate annual average concentrations using the most conservative meteorological data collected from monitoring locations within each county.

For the $PM_{2.5}$ screening tables, the peak one hour of traffic was used to develop hourly vehicle volumes that totaled to the annual average daily traffic while risk and hazard tables are based on annual average daily vehicle volumes.

The purpose of the screening tables is to provide an easy-to-use initial analysis to determine if nearby roadway impacts to a new receptor are below the thresholds of significance. The outcome of the screening may be used to make a determination of no further action or it may indicate that a more refined analysis is warranted. The recommended project screening approach is as follows:

1. Determine if the new receptor is at least 1,000 feet from the nearest significant traffic volume roadway defined as a freeway or arterial roadway with greater than 10,000 vehicles per day. For new residential developments, the receptor should be placed at the edge of the property boundary. If the receptor does not have any significant roadway sources within 1,000 foot radius, then the proposed project meets the distance requirements and no further single-source roadway-related air quality evaluation is recommended.

2. If the receptor is within the 1,000 feet radius of a nearby roadway that has greater than 20,000 vehicles per day, then use the county- and road-specific screening tables to determine the $PM_{2.5}$ concentrations, cancer risks, and hazards for the project. For non-California highways, default local roadway screening tables are provided in the online report *Recommended Methodology for Screening and Modeling Local Risks and*

Hazards. If any of the thresholds for $PM_{2.5}$ concentration, risks, and hazards are exceeded based on the comparisons, then more refined modeling analysis is recommended or the project sponsor may choose to implement mitigation measures.

3. For developments that exceed the screening analysis, site specific modeling analysis is recommended following BAAQMD's *Recommended Methodology for Screening and Modeling Local Risks and Hazards*.

For completion of Step 2 as described above, the methodology requires the use of appropriate screening tables to determine if the distance from the development to the nearby significant roadway will expose new receptors to concentrations exceeding the thresholds. The first step is to ensure that the latest screening tables have been downloaded from BAAQMD's website. An example (Table 5-2) is included in this section for San Francisco County for demonstration purposes only and should not be relied upon for use in a CEQA analysis. The Lead Agency or project sponsor must first gather project information including the county for which the development is proposed and the distance of the project to the nearest state highway or local roadway to determine which screening tables are appropriate. For each county, two tables are provided for $PM_{2.5}$ concentrations, cancer risks, chronic non-cancer hazards, and acute non-cancer hazards based on whether the project is located north or south of the roadway or east or west of the roadway. The direction tables correspond to whether the projects are located generally upwind or downwind of the roadway with respect to the prevailing wind direction. Appropriate values are then posted in each table based on the project being located 100 feet, 200 feet, 500 feet, 700 feet, and 1,000 feet from the edge of the nearest travel lane to the project.

For proposed projects, the appropriate cell should be determined by referencing the corresponding county, roadway, and project distance in the tables that most closely matches the project conditions. If the project is predominantly north or south of the roadway, choose the north or south tables. Likewise, if the project is predominantly east or west, choose the east or west tables. If the project is evenly located for example, northeast or southwest of the roadway, select the higher value between either screening tables based on the project distance to the roadway. For distances not listed in the tables, BAAQMD recommends that the values between the two closest distances be linearly interpolated to estimate the value that best reflects the actual project distance.

The results of the screening analysis indicate whether new receptors will be exposed to roadway TAC emissions at concentrations exceeding the threshold of significance and therefore, a more refined modeling analysis and quantitative HRA may be required. If the concentration is less than the thresholds, then no further analysis is required for the single source comparison for roadways. The results of the analysis should be reported in the environmental documentation or staff report that includes a reference to the screening tables used. If the concentrations exceed the thresholds, then the project sponsor has the option to conduct a more refined modeling analysis or implement appropriate mitigation measures.

An example of how to use the screening tables is provided as follows. A new residential development is hypothetically proposed at the intersection of 23rd Street and Minnesota Street in San Francisco. It is located approximately 440 feet to the east of midpoint of northbound Highway 280. Based on Table 5-2, the $PM_{2.5}$ concentrations from Highway 280 is 0.60 $\mu g/m^3$ at 200 feet away and 0.28 $\mu g/m^3$ 500 feet away from the project.

Table 5-2 East or West of San Francisco County Highway					
Highway	**Distance East or West of Freeway – $PM_{2.5}$ Concentrations (ug/m^3)**				
	100 Feet	**200 Feet**	**500 Feet**	**700 Feet**	**1,000 Feet**
1	0.50	0.28	0.12	0.096	0.060
35	0.14	0.11	0.032	0.020	0.016
80	1.0	0.64	0.30	0.20	0.15
101	1.1	0.72	0.34	0.26	0.17
280	0.80	**0.60**	**0.28**	0.19	0.13
Source: BAAQMD 2009; table above for demonstration purposes and should not be used in CEQA analysis.					

To linearly interpolate the $PM_{2.5}$ concentration for the project distance of 440 feet, the following equation was used:

(200 ft – 500 ft) x (0.60 ug/m^3 – $PM_{2.5\ 440\ feet}$) = (200 ft – 440 ft) x (0.6 ug/m^3 – 0.28 ug/m^3)

Solving for $PM_{2.5}$ at 440 feet, the $PM_{2.5}$ concentration is estimated as 0.34 ug/m^3.

A similar example methodology was applied to the cancer risk, chronic non-cancer hazard and acute hazard. The resulting values based on a distance of 440 feet are shown in Table 5-3.

Table 5-3 Cancer and Non-Cancer (Chronic and Acute) Hazard Indices at 440 feet			
Description	**Screening Value**	**Thresholds**	**Exceeds Threshold?**
$PM_{2.5}$ Concentration	0.34 ug/m^3	0.3 ug/m^3	Yes
Cancer Risk	1.1 in a million	10 in a million	No
Chronic Non-cancer Hazard Index	0.028	1	No
Acute Non-cancer Hazard Index	0.028	1	No
Source: BAAQMD 2009; table above for demonstration purposes and should not be used in CEQA analysis.			

In this example, the proposed project would exceed the $PM_{2.5}$ threshold, but not the risk or hazard-based thresholds. At this point, the project sponsor can ratio the PM concentration further based on the actual AADT at the closest milepost to the project. If the concentrations continue to be exceed the threshold, the project sponsor can determine whether additional modeling is warranted or implementation of mitigation measures is appropriate. Possible options include moving the residential portion of the development to a distance at which the roadway impacts would be negligible or installing high efficiency filtration in the development.

If the project sponsors choose to conduct a more refined modeling analysis, BAAQMD recommends the following general procedures. More detailed methodology is provided on the online resources located at BAAQMD's CEQA webpage. To evaluate $PM_{2.5}$ concentrations, BAAQMD recommends using CAL3QHC, which was designed to model roadside CO and PM concentrations. The CAL3QHCR model can estimate $PM_{2.5}$ concentrations at defined receptor locations by processing hourly meteorological data over a year, hourly emissions, and traffic volume. The latest version of the model is available at: http://www.epa.gov/scram001/dispersion_prefrec.htm.

To run CAL3QHCR, meteorological, traffic, and vehicle emissions data at specified intervals over time are required. BAAQMD recommends the use of the meteorological data that most closely representatives conditions at the site. BAAQMD offers readily compatible meteorological data for each county within the SFBAAB that can be run by CAL3QHCR at http://hank.baaqmd.gov/tec/data/. For the screening analysis, BAAQMD relied on the most conservative meteorological data collected from any stations within the county; however, in this site-specific analysis, the user should select the data that is nearest the project and reflects actual meteorological conditions.

Emissions data must also be input into the CAL3QHCR model. Year 2012 average hourly emissions (e.g., grams/vehicle mile) were used in developing the screening tables. The emissions data can be produced using the EMFAC2007 model, but should be reflective of the base year in which residents will be residing in the new development. The model should also be run assuming the full range of vehicle fleet and if available, the average vehicle speeds along the specific stretch of road. However, if average speeds are not available, the user should select the full range of variable speeds to ensure that the analysis is health protective.

Table 5-4
San Francisco County State Highway Traffic Volumes

Highway Number	Average Daily 2-way Traffic Volumes (Vehicles/day)	Start Location	End Location
1	122,000	Alemany Boulevard	Presidio, South Highway 2, onto Golden Gate Bridge
35	31,000	John Muir Drive	Highway 1, Sloat Boulevard at 19th Avenue
80	254,000	Highway 101 at Division Street	Bay Bridge at Treasure Island, Yerba Buena Island
101	245,000	Third Street	Van Ness Avenue to Highway 1 at Golden Gate Bridge
280	195,000	Alemany Boulevard, San Jose Avenue	Mariposa Street to 4th Street and Brannan Street

Source: BAAQMD 2009

How to use the screening tables:

- Distance is from the center of the highway to the facility or development
- When two or more highways are within the influence area, sum the contribution from each freeway

The CAL3QHCR model also relies on hourly traffic volumes (e.g., vehicles per hour) as determined by the relative VMT. BAAQMD recommends developing a weighed VMT by using the ratio of VMT per hour to the peak VMT over the 24 hour day (as produced by the EMFAC model). This weighed VMT represents the percentage of traffic volume on an hourly basis over a 24 hour period. The hourly traffic volumes for the CAL3QHCR model are then the product of the weighed VMT by the peak traffic volumes for that roadway. The peak one-hour vehicle traffic for the applicable milepost of any California highway can be determined through the Caltrans web site at http://traffic-counts.dot.ca.gov/. Develop hourly emissions rates for input into the air model. The model provides annual average $PM_{2.5}$ concentrations that can be compared directly against the thresholds.

A more detailed analysis is required for estimating the risk and hazard evaluation. TAC emissions were evaluated for only those toxic compounds found in diesel or gasoline fuel including diesel PM, benzene, ethylbenzene, acrolein, etc. The District recommends using the CAL3QHCR model. The model must be run separately to estimate emissions from diesel PM and emission of other TAC. In each analysis, the District recommends developing diesel specific emission factors from EMFAC. Because risk and hazard are expressed as lifetime exposure, the emissions were averaged from 2012 to 2040 that accounts for more efficient vehicle emissions and increased VMT. Beyond 2040, the EMFAC model does not have emissions and consequently, the 2040 emissions were applied from 2040 to 2082, to complete a 70-year lifetime exposure.

Annual average traffic volumes were used in the model. As specified in Regulation 2, Rule 5, BAAQMD recommends that age sensitivity factors be applied to the emissions per year to account for early life-stage exposures. The cancer risk and hazard levels are calculated using the predicted annual average concentrations multiplied by the cancer slope factor for cancer risk or divided by the relative exposure levels for hazard.

The risk and hazard levels are then compared against the applicable thresholds. Further assessment may be warranted if the thresholds are exceeded, but the project sponsor may consider design changes and other mitigation measures as a means of reducing potential risks (see Section 5.4). For detailed discussion on this methodology, the project sponsor should download the online report *Recommended Methodology for Screening and Modeling Local Risks and Hazards*.

5.3. CUMULATIVE IMPACTS

5.3.1. Significance Determination

A Lead Agency shall examine TAC and/or $PM_{2.5}$ sources that are located within 1,000 feet of a proposed project site. Sources of TACs include, but are not limited to, land uses such as freeways and high volume roadways, truck distribution centers, ports, rail yards, refineries, chrome plating facilities, dry cleaners using perchloroethylene, and gasoline dispensing facilities. Land uses that contain permitted sources, such as a landfill or manufacturing plant, may also contain non-permitted TAC and/or $PM_{2.5}$ sources, particularly if they host a high volume of diesel truck activity. A Lead Agency should determine what the combined risk levels are from all nearby TAC sources in the vicinity of sensitive receptors. Lead agencies should use their judgment to decide if there are significant sources outside 1,000 feet that should be included.

A Lead Agency's analysis shall determine whether TAC and/or $PM_{2.5}$ emissions generated as part of a proposed project would expose off-site receptors to risk levels that exceed BAAQMD's applicable *Thresholds of Significance* for determining cumulative impacts.

A project would have a cumulative significant impact if the aggregate total of all past, present, and foreseeable future sources within a 1,000 foot radius (or beyond where appropriate) from the fence line of a source, or from the location of a receptor, plus the contribution from the project, exceeds the following:

- An excess cancer risk levels of more than 100 in one million or a chronic hazard index greater than 10 for TACs; or
- 0.8 µg/m^3 annual average $PM_{2.5}$.

Within impacted communities identified under BAAQMD's CARE program, the Lead Agency is encouraged to develop and adopt a Community Risk Reduction Plan. To determine whether a new source is located in an impacted community, the Lead Agency should refer to Figure 5-1 and the CARE webpage. Please consult with BAAQMD if a more precise map is needed.

BAAQMD recommends that cumulative impacts of new sources and new receptors be evaluated as described in Section 5.2, and include the impacts of all individual sources (stationary and roadways) within the 1,000 foot radius.

Community risk and hazards analyses should follow guidance developed by BAAQMD for risk screening described in *Recommended Methodology for Screening and Modeling Local Risks and Hazards*, which generally follows CAPCOA's guidance document titled *Health Risk Assessments for Proposed Land Use Projects*. $PM_{2.5}$ concentrations and risk levels estimated for the locations where receptors may be located should be compared to BAAQMD's applicable *Threshold of Significance* for siting a new receptor near existing sources of TAC emissions.

A Lead Agency shall compare the analysis results from TAC and $PM_{2.5}$ emissions with the applicable *Threshold of Significance*. *Thresholds of Significance* apply for projects that would site new permitted or non-permitted sources in close proximity to receptors and for projects that would site new sensitive receptors in close proximity to permitted or non-permitted sources of TAC emissions. If a proposed project would not exceed BAAQMD's applicable *Threshold of Significance* for TACs or $PM_{2.5}$, then the project would result in a less-than-significant air quality impact. If a project would exceed the applicable *Threshold of Significance,* the proposed project would result in a significant air quality impact and the Lead Agency should implement all feasible mitigation to reduce the impact (Refer to Section 5.4).

If implementation of BAAQMD-recommended mitigation measures for reducing TAC and $PM_{2.5}$ emissions and resultant exposure to health risks would reduce all TAC impacts to levels below the applicable *Threshold of Significance*, TAC impacts would be reduced to a less-than-significant level. If resultant health risk exposure would still exceed the applicable *Threshold of Significance*, the impacts would remain significant and unavoidable.

5.4. COMMUNITY RISK REDUCTION PLANS

The goal of a Community Risk Reduction Plan would be to bring TAC and $PM_{2.5}$ concentrations for the entire community covered by the Plan down to acceptable levels as identified by the local jurisdiction and approved by the Air District. This approach provides local agencies a proactive alternative to addressing communities with high levels of risk on a project-by-project approach. The Air District has developed detailed guidelines for preparing Community Risk Reduction Plans which can be found on the Air District web site at: http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES.aspx.

Qualified Community Risk Reduction Plans

A qualified Community Risk Reduction Plan adopted by a local jurisdiction should include, at a minimum, the following elements:(A) Define a planning area;

(B) Include base year and future year emissions inventories of TACs and PM2.5;

(C) Include Air District–approved risk modeling of current and future risks;

(D) Establish risk and exposure reduction goals and targets for the community in consultation with Air District staff;

(E) Identify feasible, quantifiable, and verifiable measures to reduce emissions and exposures;

(F) Include procedures for monitoring and updating the inventory, modeling and reduction measures in coordination with Air District staff;

(G) Be adopted in a public process following environmental review.

5.5. MITIGATING LOCAL COMMUNITY RISK AND HAZARD IMPACTS

- For stationary sources, please refer to BAAQMD's permit handbook and BACT/T-BACT workbook. BAAQMD-recommended mitigation measures for reducing the exposure of sensitive receptors to TACs and hazards include the following:

  1. Increase project distance from freeways and/or major roadways.

  2. Redesign the site layout to locate sensitive receptors as far as possible from any freeways, major roadways, or other non-permitted TAC sources (e.g., loading docks, parking lots).

  3. In some cases, BAAQMD may recommend site redesign. BAAQMD will work closely with the local jurisdiction and project consultant in developing a design that is more appropriate for the site.

  4. Large projects may consider phased development where commercial/retail portions of the project are developed first. This would allow time for CARB's diesel regulations to effectively reduce diesel emissions along major highways and arterial roadways. Ultimately lower concentrations would be predicted along the roads in the near future such that residential development would be impacted by less risk in later phases of development.

  5. Projects that propose sensitive receptors adjacent to sources of diesel PM (e.g., freeways, major roadways, rail lines, and rail yards) shall consider tiered plantings of trees such as redwood, deodar cedar, live oak and oleander to reduce TAC and PM exposure. This recommendation is based on a laboratory study that measured the removal rates of PM passing through leaves and needles of vegetation. Particles were generated in a wind tunnel and a static chamber and passed through vegetative layers at low wind velocities. Redwood, deodar cedar, live oak, and oleander were tested. The results indicate that all forms of vegetation were able to remove 65–85 percent of very fine particles at wind velocities below 1.5 meters per second (approximately 3 miles per hour [mph]) with redwood and deodar cedar being the most effective. Even greater

removal rates were predicted for ultra-fine PM (i.e., aerodynamic resistance diameter of 0.1 micrometer or less).

6. Install and maintain air filtration systems of fresh air supply either on an individual unit-by-unit basis, with individual air intake and exhaust ducts ventilating each unit separately, or through a centralized building ventilation system. The ventilation system should be certified to achieve a certain effectiveness, for example, to remove at least 80% of ambient $PM_{2.5}$ concentrations from indoor areas. The air intake for these units should be located away from areas producing the air pollution (i.e., away from major roadways and highways).

7. Where appropriate, install passive (drop-in) electrostatic filtering systems, especially those with low air velocities (i.e., 1 mph).

8. Locate air intakes and design windows to reduce PM exposure (e.g., windows nearest to the freeway do not open).

9. Install indoor air quality monitoring units in buildings.

10. Require rerouting of nearby heavy-duty truck routes.

11. Enforce illegal parking and/or idling of heavy-duty trucks in vicinity

6. LOCAL CARBON MONOXIDE IMPACTS

Emissions and ambient concentrations of CO have decreased dramatically in the SFBAAB with the introduction of the catalytic converter in 1975. No exceedances of the CAAQS or NAAQS for CO have been recorded at nearby monitoring stations since 1991. SFBAAB is currently designated as an attainment area for the CAAQS and NAAQS for CO; however, elevated localized concentrations of CO still warrant consideration in the environmental review process. Occurrences of localized CO concentrations, known as hotspots, are often associated with heavy traffic congestion, which most frequently occur at signalized intersections of high-volume roadways.

6.1. SIGNIFICANCE DETERMINATION

Step 1: Comparison of Project Attributes with Screening Criteria

The first step in determining the significance of CO emissions is to compare the attributes of the proposed project to the applicable S*creening Criteria* (refer to Chapter 3).

This preliminary screening procedure provides a conservative indication of whether the proposed project would result in the generation of CO concentrations that would substantially contribute to an exceedance of the *Thresholds of Significance*. If all of the *Screening Criteria* are met, the proposed project would result in a less-than-significant impact to air quality with respect to concentrations of local CO. If the proposed project does not meet all the screening criteria, then CO emissions should be quantified.

Step 2: Emissions Quantification

This section describes recommended methodologies for quantifying concentrations of local CO for proposed projects that do not meet all of the *Screening Criteria*. The recommended methodology is to use both the On-Road Mobile-Source Emission Factors (EMFAC) and the California Line Source Dispersion Model (CALINE4) models in accordance with recommendations in the University of California, Davis, Transportation Project-Level Carbon Monoxide Protocol (*CO Protocol*) (Garza, et al. 1997).

Air Quality Models

BAAQMD recommends using the most current version of the EMFAC model to obtain mobile-source emission factors for CO associated with operating conditions that would be representative of the roadway or facility subject to analysis.

Users should input the emission factors and other input parameters into the CALINE4 model to quantify CO concentrations near roadways or facilities.

The *CO Protocol* contains detailed methodology for modeling CO impacts.

Input Parameters

The CALINE4 model contains five screens for input data. CALINE4 input parameters are summarized below. For more detailed descriptions see the CALINE4 Users Guide.

Job Parameters

File Name – Name the file (e.g., data file extension) to create the CALINE4 Input file.

Job Title – Provide a name for the modeling scenario (e.g., existing no project, existing plus project).

Run Type – Select the worst-case wind angle.

Aerodynamic Roughness Coefficient – Choose the characteristic (i.e., rural, suburban, central business district, other) that is most representative of the project site.

Model Information – Indicate the unit of measurement (i.e., meters or feet) and inputs the vertical dimension of the project (i.e., altitude above sea level).

Run – Once data input is completed, return to this screen to run the model. Upon running the model, the output will appear as a text file called C4$.out. Save the output file under an appropriate filename for future reference.

Link Geometry

On this screen, input the dimensions (i.e., coordinates) for the roadway intersection that is the subject of the analysis.

Link Name – Input names for each roadway segment

Link Type – Indicate the character of the roadway segment (i.e., at-grade, depressed, fill, bridge, parking lot).

Endpoint Coordinates (X_1, X_2, Y_1, Y_2) – Input the dimensions (i.e., coordinates) of the roadway segments as though the intersection were oriented at point of origin X = 0, Y = 0 on a Cartesian coordinate system. Roadway segments approaching the intersection from the west side of the screen (if north is treated as “up”, or the top of the screen) would have negative X coordinate endpoints. Similarly, roadway segments approaching the intersection from the south would have negative Y coordinate endpoints.

Link Height – Indicate the vertical dimension of the roadway segment. If the roadway segment is at-grade, should set this parameter to zero. If the roadway segment is depressed, enter a negative value for this parameter.

Mixing Zone Width – The Mixing Zone is defined as the width of the roadway, plus three meters on either side. The minimum allowable value is 10 meters, or 32.81 feet.

Canyon/Bluff (Mix Left/Right) – Set these features to zero.

Link Activity

Traffic Volume – Input hourly traffic volumes applicable to each roadway segment.

Emission Factor – Input the CO emission factor (in units of grams/mile) obtained from EMFAC for the applicable vehicle speed class reflecting operating conditions for the affected intersection.

Run Conditions

Wind Speed – Input 0.5 meters per second to represent worst-case conditions.

Wind Direction – Set parameter to zero. Select "Worst-Case Wind Angle" as the "Run Type" on the "Job Parameters" screen, so this field will be overridden by the model.

Wind Direction Standard Deviation – Use a wind direction standard deviation of 5 degrees to represent worst-case conditions.

Atmospheric Stability Class – Use Stability Class 4 (i.e., class D) to represent average conditions in the SFBAAB.

Mixing Height – Indicate the vertical dimension over which vertical mixing may occur. In most situations, input 300 meters, approximately the height of the atmospheric boundary layer. If the roadway subject to analysis is a bridge underpass, tunnel, or other situation where vertical mixing would be limited, indicates the height of the structure that would hamper vertical mixing (in units of meters).

Ambient Temperature – Indicate the average temperature of the project site during the time of day at which maximum daily traffic volume would occur (in degrees Celsius). A temperature of 7.2 degrees Celsius is recommended.

Ambient Pollutant Concentration – Enter 0 in this field to determine the contribution of CO from the roadway subject to analysis. Add the roadway-related CO concentration to ambient CO levels outside of the CALINE4 model, as discussed later in this section.

Receptor Positions

Receptor Name – Input names for each receptor.

Receptor Coordinates (X, Y, Z) – Input receptor coordinates in a manner similar to the "Link Coordinates" on the "Link Geometry" screen. Locate receptors at three and seven meters from the intersection in all directions from the intersection, in accordance with the recommendations of the *CO Protocol*. The Receptor Coordinates are oriented in the same Cartesian coordinate system as the roadway segment "Link Coordinates". Receptors located to the southwest of the intersection would have negative X and Y coordinates. The Z dimension should be assigned the coordinate of 1.8 meters (5.9 feet); the approximate breathing height of a receptor located adjacent to the roadway.

This screen also contains a window that shows a map of the link and receptor coordinates in the X, Y plane.

Model Output

CALINE4 output includes estimated 1-hour CO concentrations in units of ppm at the receptor locations input into the model. Note the highest concentrations at each of the three meter and seven meter receptor distances from the roadway.

Background Concentrations

Ambient 1-hour CO concentrations can be obtained from ARB air quality monitoring station data and 8-hour concentrations from EPA. Users should obtain the CO monitoring data recorded at the monitoring station nearest the project site. According to the *CO Protocol*, select the second highest concentration recorded during the last two years to represent the ambient CO concentration in the project area.

Estimated Localized CO Concentrations

Users should sum the highest modeled 1-hour CO concentration in units of ppm obtained from CALINE4 to ambient (background) 1-hour CO concentrations in ppm obtained from ARB. This represents the modeled worst-case 1-hour CO concentration near the affected roadway.

Persistence Factor – multiply the highest 1-hour CO concentration estimated by CALINE4 by a persistence factor of 0.7, as recommended in the CO Protocol, to obtain the estimated 8-hour CO concentration.

Add the estimated 8-hour CO concentration (ppm) obtained in the previous step to the ambient 8-hour CO concentration obtained from EPA (ppm). This represents the modeled worst-case 8-hour CO concentration near the affected roadway.

Step 3: Comparison of Unmitigated Emissions with Thresholds of Significance
Following quantification of local CO emissions in accordance with the recommended methods, compare the total modeled worst-case 1-hour and 8-hour CO concentrations with the applicable *Threshold of Significance*. If the modeled concentrations do not exceed any of the *Thresholds of Significance*, the project would result in a less-than-significant impact to air quality. If modeled concentrations do exceed any applicable *Threshold of Significance,* the proposed project would result in a significant impact to air quality with respect to local CO impacts.

Step 4: Mitigation Measures and Emission Reductions
Where local CO emissions exceed applicable *Thresholds of Significance*, refer to Section 6.2 for recommended mitigation measures and associated emission reductions. Only reduction measures included in the proposed project or recommended as mitigation in a CEQA-compliant document can be included when quantifying mitigated emission levels.

Step 5: Comparison of Mitigated Emissions with Thresholds of Significance
Following quantification of local CO emissions in accordance with the recommended methods, compare the total modeled worst-case 1-hour and 8-hour CO concentrations with the applicable *Thresholds of Significance*. If the implementation of recommended mitigation measures reduces all local CO emissions to levels below the applicable *Thresholds of Significance*, the impact to air quality would be reduced to a less-than-significant level. If mitigated levels of local CO emissions still exceed the applicable *Threshold of Significance*, the impact to air quality would remain significant and unavoidable.

6.2. MITIGATING LOCAL CARBON MONOXIDE IMPACTS

The following section describes recommended mitigation measures for reducing local CO impacts to air quality. Consider implementation of the following measures, as feasible, for reducing project-generated traffic volumes and associated CO emissions at affected intersections. Actual emission reductions should be quantified through project-specific transportation modeling.

1. Synchronize traffic signals to improve traffic flow and minimize traffic congestion.

2. Consider additional traffic signals, such as light metering, to relocate congested areas further away from receptors.

3. Improve public transit service to reduce vehicle traffic and increase public transit mode share during peak traffic congestion periods.

4. Improve bicycle and pedestrian infrastructure to reduce vehicle traffic and increase bicycle and pedestrian mode share during peak traffic congestion periods. Improvements may include installing class I or II bike lanes, sidewalks, and traffic calming features.

5. Adjust pedestrian crosswalk signal timing to minimize waiting time for vehicles turning right or otherwise sharing green time with pedestrians. Give pedestrians a head start before traffic signal changes to green.

6. Where pedestrian traffic is high, implement pedestrian crosswalks with multi-directional crossings allowing pedestrians to cross intersections diagonally.
7. Limit heavy-duty truck traffic during peak hours. Designate truck routes that divert truck traffic away from congested intersections.
8. Limit left turns or other maneuvers during peak hours that add to congestion.
9. Limit on-street parking during peak hours to allow for added vehicle capacity.
10. Implement traffic congestion-alleviating mitigation measures as identified by a traffic engineer.

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7. ODOR IMPACTS

Odor impacts could result from siting a new odor source near existing sensitive receptors or siting a new sensitive receptor near an existing odor source. Examples of land uses that have the potential to generate considerable odors include, but are not limited to:

1. Wastewater treatment plants;
2. Landfills;
3. Confined animal facilities;
4. Composting stations;
5. Food manufacturing plants;
6. Refineries; and
7. Chemical plants.

Odors are generally regarded as an annoyance rather than a health hazard. Manifestations of a person's reaction to 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. People may have different reactions to the same odor. An odor that is offensive to one person may be perfectly acceptable to another (e.g., coffee roaster). An unfamiliar odor is more easily detected and is more likely to cause complaints than a familiar one. Known as odor fatigue, 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 concentration in the air. When an odor sample is progressively diluted, the odor 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 odor reaches a level that is no longer detectable.

The presence of an odor impact is dependent on a number of variables including:

1. Nature of the odor source (e.g., wastewater treatment plant, food processing plant);
2. Frequency of odor generation (e.g., daily, seasonal, activity-specific);
3. Intensity of odor (e.g., concentration);
4. Distance of odor source to sensitive receptors (e.g., miles);
5. Wind direction (e.g., upwind or downwind); and
6. Sensitivity of the receptor.

The recommendations provided in this chapter only apply to assessing and mitigating odor impacts for individual projects. Please refer to Chapter 9 for recommendations for assessing and mitigating odor impacts at the plan-level.

7.1. SIGNIFICANCE DETERMINATION

Odor impacts could occur from two different situations:

1. Siting a new odor source (e.g., the project includes a proposed odor source near existing sensitive receptors), or
2. Siting a new receptor (e.g., the project includes proposed sensitive receptors near an existing odor source).

Regardless of the situation, BAAQMD recommends completing the following steps to comprehensively analyze the potential for an odor impact.

Step 1: Disclosure of Odor Parameters

The first step in assessing potential odor impacts is to gather and disclose applicable information regarding the characteristics of the buffer zone between the sensitive receptor(s) and the odor source(s), local meteorological conditions, and the nature of the odor source. Consideration of such parameters assists in evaluating the potential for odor impacts as a result of the proposed project. Projects should clearly state the following information in odor analyses, which provide the minimum amount of information required to address potential odor impacts:

1. Type of odor source(s) the project is exposed to or the type of odor source(s) produced by the project (e.g., wastewater treatment plant, landfill, food manufacturing plant);
2. Frequency of odor events generated by odor source(s) (e.g., operating hours, seasonal);
3. Distance and landscape between the odor source(s) and the sensitive receptor(s) (e.g., topography, land features); and
4. Predominant wind direction and speed and whether the sensitive receptor(s) in question are upwind or downwind from the odor source(s).

Step 2: Odor Screening Distances

BAAQMD has developed a list of recommended odor screening distances for specific odor-generating facilities shown in Table 3-3. Projects that would locate sensitive receptor(s) to odor source(s) closer than the screening distances would be considered to result in a potential significant impact. If the proposed project would include the operation of an odor source, the screening distances should also be used to evaluate the potential impact to existing sensitive receptors. Projects that would locate sensitive receptor(s) near odor source(s) farther than the screening distances, or vice versa, would be considered to have a sufficient buffer to avoid significant impacts. The odor screening distances in Table 3-3 should not be used as absolute thresholds, rather an indicator to how much further analysis is required. The Lead Agency should also consider the other parameters listed above in Step 1 and information from Step 3 below to comprehensively evaluate potential odor impacts.

Step 3: Odor Complaint History

The impact of an existing odor source on surrounding sensitive receptors should also be evaluated by identifying the number of confirmed complaints received for that specific odor source.

Facilities that are regulated by CalRecycle (e.g. landfill, composting, etc.) are required to have Odor Impact Minimization Plans (OIMP) in place and have procedures that establish fence line odor detection thresholds. The Air District recognizes a Lead Agency's discretion under CEQA to use established odor detection thresholds as thresholds of significance for CEQA review for CalRecycle regulated facilities with an adopted OIMP.

If the proposed project would be located near an existing odor source, lead agencies should contact BAAQMD to obtain the odor complaints over the past 3 years for the source in question. Then calculate the annual average confirmed odor complaints filed for the source. BAAQMD considers a source to have a substantial number of odor complaints if the complaint history includes five or more confirmed complaints per year averaged over a 3-year period. Also, disclose the distance at which receptors were affected by the existing odor source. As discussed in Step 1, describe the topography and landscape between the receptors and the odor source. These distances and landscaping should then be compared with the distance and landscape that would separate the proposed project and the odor source.

If the proposed project would locate an odor source, first identify the location of potential sensitive receptors (i.e., distance, upwind/downwind) with respect to the project site. If the proposed odor source does not have any existing or planned sensitive receptors within the screening distances shown in Table 3-3, it may be considered less than significant for odor impacts. To evaluate how implementation of the proposed source project would affect identified sensitive receptors contact BAAQMD to obtain odor complaints in the region for facilities similar in size and type of odor produced in the past 3 years. These surrogate odor complaints should be evaluated for their distance from source to receptor, and then compared with the distance from the proposed project to receptors. Odor complaints from the surrogate odor source are considered substantial if the complaint history includes more than five confirmed complaints per year averaged over a 3-year period.

BAAQMD considers a substantial number of odor complaints, specifically, more than five confirmed complaints per year averaged over the past three years as the indication of an odor impact. As discussed above, the Lead Agency should compare the odor parameters (i.e., distance and wind direction) associated with the odor complaints that have been filed with those of the proposed project. Similar to the odor screening distances, odor complaints should not be used as an absolute threshold, but evidence to support a significance determination.

Step 4: Significance Determination

An odor source with five or more confirmed complaints per year averaged over three years is considered to have a significant impact. BAAQMD recognizes that there is not one piece of information that can solely be used to determine the significance of an odor impact. The factors (i.e., Step 1 through 3) discussed above could enhance the potential for a significant odor impact or help prevent the potential for a significant odor impact. For example, a project that would be located near an existing odor source may not discover any odor complaints for the existing odor source. It is possible that factors such as a small number of existing nearby receptors, predominate wind direction blowing away from the existing receptors, and/or seasonality of the odor source has prevented any odor complaints from being filed about the existing odor source. The results of each of the steps above should be clearly disclosed in the CEQA document. Projects should use the collective information from Steps 1 through 3 to qualitatively evaluate the potential for a significant odor impact. The Lead Agency should clearly state the reasoning for the significance determination using information from Steps 1 through 3 to support the determination.

7.2. MITIGATING ODOR IMPACTS

BAAQMD considers appropriate land use planning the primary method to mitigate odor impacts. Providing a sufficient buffer zone between sensitive receptors and odor sources should be considered prior to analyzing implementation of odor mitigation technology. Projects that would include potential sensitive receptors should consider the odor parameters, discussed in Step 1 above, during the planning process to avoid siting receptors near odor sources. Similarly, projects

that would include an odor source should consider the location of nearby existing sensitive receptors that could be affected by the project.

The source types for which mitigation has been provided below have been selected based on the nature of the odors produced as a result of their operational activities. These land use types are those most likely to result in odor impacts if sensitive receptors are located in close proximity. This should not be considered an exhaustive list and due to the subjective nature of odor impacts, there is no formulaic method to assess if odor mitigation is sufficient. In determining whether the implementation of mitigation would reduce the potential odor impact to a less-than-significant level, rely on the information obtained through the steps above.

7.2.1. Wastewater Treatment Plant

Main odor sources for wastewater treatment plants typically are the headworks area where the wastewater enters the facility and large solids and grit are removed, the primary clarifiers where suspended solids are removed, and the aeration basins when poor mixing characteristics lead to inadequate dissolved oxygen levels. Lead agencies should consider applying the following odor mitigation measures to wastewater treatment plants.

1. Activated Carbon Filter/Carbon adsorption
2. Biofiltration/Bio Trickling Filters
3. Fine Bubble Aerator
4. Hooded Enclosures
5. Wet and Dry Scrubbers
6. Caustic and Hypochlorite Chemical Scrubbers
7. Ammonia Scrubber
8. Energy Efficient Blower System
9. Thermal Oxidizer
10. Capping/Covering Storage Basins and Anaerobic Ponds
11. Mixed Flow Exhaust
12. Wastewater circulation technology
13. Exhaust stack and vent location with respect to receptors

7.2.2. Landfill/Recycling/Composting Facilities

Odors generated from landfills and composting facilities are typically associated with methane production from the anaerobic decomposition of waste. Lead agencies should consider applying the mitigation measures below to reduce and treat methane in facilities. Landfill projects should also implement best management practices to avoid and minimize the creation of anaerobic conditions.

1. Passive Gas Collection
2. Active Gas Collection
3. Flaring or energy production/utilization
4. Vegetation Growth on Landfill Cover
5. Cover/Cap Landfill
6. Odor Neutralizing Spray
7. Negative aeration for compost facilities
8. Turning and mixing of compost piles

Facilities that are regulated by CalRecycle (e.g. landfill, composting, etc.) are required to have Odor Impact Minimization Plans (OIMP) in place and have procedures that establish fence line odor detection thresholds. The Air District recognizes a Lead Agency's discretion under CEQA to use established odor detection thresholds as thresholds of significance for CEQA review for CalRecycle regulated facilities with an adopted OIMP.

7.2.3. Petroleum Refinery

Odors generated from materials and processes associated with petroleum refineries include, but are not limited to, H_2S, SO_2, mercaptan, ammonia (NH_3), and petroleum coke. Installing the following current and feasible odor mitigation measures for petroleum refineries should be considered.

1. Water Injections to Hydrocracking Process
2. Vapor recovery system
3. Injection of masking odorants into process streams
4. Flare meters and controls
5. Wastewater circulation technology for Aerated Ponds
6. Exhaust stack and vent location with respect to receptors
7. Thermal oxidizers
8. Carbon absorption
9. Biofiltration/Bio Trickling Filters

7.2.4. Chemical Plant

Chemical plants can generate a variety of different odors (e.g., acrylates, phenols, and styrene) as a result of process emissions. The range of odor mitigation measures required for chemical plants may vary substantially depending on the type of odors produced. The odor mitigation measures could be applied to chemical plants.

1. Wet scrubbers (50–90 percent efficiency)
2. Catalytic oxidation (99 percent efficiency)
3. Thermal oxidation (90–99 percent efficiency)
4. Carbon adsorption (95 percent efficiency)
5. Exhaust stack and vent location with respect to receptors

7.2.5. Food Services

Restaurants, especially fast food restaurants, can generate substantial sources of odors as a result of cooking processes and waste disposal. Char broilers, deep-fryers, and ovens tend to produce food odors that can be considered offensive to some people. The food waste produced by restaurants can putrefy if not properly managed, which can also produce objectionable odors. The follow mitigation measures are management practices and odor technology that can be used to reduce the amount odors generated by food services.

1. Integral grease filtration system or grease removal system
2. Baffle filters
3. Electrostatic precipitator
4. Water cooling/cleaning unit
5. Disposable pleated or bag filters

6. Activated carbon filters
7. Oxidizing pellet beds
8. Incineration
9. Catalytic conversion
10. Proper packaging and frequency of food waste disposal
11. Exhaust stack and vent location with respect to receptors

In conclusion, odor impacts can also be minimized, contained, or prevented by implementing technologies and design measures at the source, or through planning-based measures. Where odor sources and receptors cannot be physically separated to a degree where impacts would be minimized to less-than-significant level, disclosures of odor sources to prospective tenants of sensitive land uses should be used. Mitigation for odors that is both effective and feasible shall be selected on a case-by-case basis.

8. CONSTRUCTION-RELATED IMPACTS

Construction-related activities are those associated with the building of a project or plan components. Construction activities are typically short-term or temporary in duration; however, project-generated emissions could represent a significant impact with respect to air quality and/or global climate change. Construction-related activities will result in the generation of criteria air pollutants including carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter (PM_{10}, and $PM_{2.5}$); precursor emissions such as, reactive organic gases (ROG) and oxides of nitrogen (NO_X), and GHGs from exhaust, fugitive dust, and off-gas emissions. Sources of exhaust emissions could include on-road haul trucks, delivery trucks, worker commute motor vehicles, and off-road heavy-duty equipment. Sources of fugitive emissions (e.g., PM dust) could include construction-related activities such as soil disturbance, grading, and material hauling. Sources of off-gas emissions could include asphalt paving and the application of architectural coatings.

The recommendations provided in this chapter only apply to assessing and mitigating construction-related impacts for individual projects. Construction-related assumptions and project-specific information assumed in CEQA analyses should accompany the quantitative analysis described below. Refer to Chapter 9 for recommendations for assessing and mitigating construction-related impacts at the plan level.

8.1. CRITERIA AIR POLLUTANTS AND PRECURSORS

8.1.1. Significance Determination

Step 1: Comparison of Project Attributes with Screening Criteria

The first step in determining the significance of construction-related criteria air pollutants and precursors is to compare the attributes of the proposed project with the applicable *Screening Criteria* listed in Chapter 3. If all of the *Screening Criteria* are met, construction of the proposed project would result in a less-than-significant impact to air quality. If not, than construction emissions need to be quantified.

Step 2: Emissions Quantification

BAAQMD recommends using URBEMIS to quantify construction emissions for proposed land use development projects and the Roadway Construction Emissions Model (RoadMod) for proposed linear projects such as, new roadway, roadway widening, or pipeline installation). The most current URBEMIS (currently version 9.2.4) should be used for emission quantification. Table 8-5 outlines summary guidelines for using URBEMIS. Refer to Appendix B for detailed instructions for modeling construction-generated emissions using URBEMIS and RoadMod.

Step 3: Comparison of Unmitigated Emissions with Thresholds of Significance

Following quantification of project-generated construction-related emissions, the total average daily emissions of each criteria pollutant and precursor should be compared with the applicable *Threshold of Significance*. For instance, with respect PM_{10} and $PM_{2.5}$, compare the total amount of emissions from both exhaust and fugitive sources with the applicable *Threshold of Significance*. If construction-related emissions have been quantified using multiple models or

model runs, sum the criteria air pollutants and precursor levels from each where said activities would overlap. In cases where the exact timing of construction activities is not known, sum any phases that could overlap to be conservative.

If daily average emissions of construction-related criteria air pollutants or precursors would not exceed any of the *Thresholds of Significance*, the project would result in a less-than-significant impact to air quality. If daily average emissions of construction-related criteria air pollutants or precursors would exceed any applicable *Threshold of Significance,* the proposed project would result in a significant impact to air quality and would require mitigation measures for emission reductions.

Step 4: Mitigation and Emission Reductions

For all proposed projects, BAAQMD recommends the implementation of all *Basic Construction Mitigation Measures* (Table 8.2) whether or not construction-related emissions exceed applicable *Thresholds of Significance*. In addition, all projects must implement any applicable air toxics control measures (ATCM). For example, projects that have the potential to disturb asbestos (from soil or building material) must comply with all the requirements of ARB's ATCM for Construction, Grading, Quarrying, and Surface Mining Operations. Only reduction measures included in the proposed project's description or recommended as mitigation in a CEQA-compliant environmental document can be included when quantifying mitigated emission levels. Refer to Appendix B for detailed instructions on how to use URBEMIS to quantify the effects of construction emissions mitigation measures.

Step 5: Comparison of Mitigated (Basic Mitigation) Emissions with Thresholds of Significance

Following quantification of project-generated construction-related emissions, compare the total average daily amount of mitigated (with implementation of *Basic Construction Mitigation Measures)* criteria air pollutants and precursors with the applicable *Thresholds of Significance*. If the implementation of BAAQMD-recommended *Basic Construction Mitigation Measures* would reduce all construction-related criteria air pollutants and precursors to levels below the applicable *Thresholds of Significance*, the impact to air quality would be less than significant. If emissions of any criteria air pollutant or precursor would exceed the applicable *Threshold of Significance*, the impact to air quality would be significant. Table 8-1 provides an example of significance determination methodology.

Step 6: Implement Additional Construction Mitigation Measures

BAAQMD recommends that all proposed projects, where construction-related emissions would exceed the applicable *Thresholds of Significance*, implement the *Additional Construction Mitigation Measures* (Table 8-3). The methodology for quantifying reductions of fugitive PM dust, exhaust, and off gas emissions associated with the implementation of these mitigation measures are discussed separately below (Table 8-3). Keep all of the changes recommended above with regards to the *Basic Construction Mitigation Measures*, as the emission reductions associated with these *Additional Construction Mitigation Measures* are considered additive. Please note that in RoadMod all of these associated reductions should be taken outside of the model, described in further detail in Appendix B.

Step 7: Comparison of Mitigated Emissions with Thresholds of Significance

Following quantification of project-generated construction-related emissions in accordance with the above BAAQMD-recommended methods, compare the total average daily amount of mitigated (with *Additional Construction Mitigation Measures* implemented) criteria air pollutants and precursors with the applicable *Thresholds of Significance*. If the implementation of additional mitigation measures would reduce all construction-related criteria air pollutants and precursors to levels below the applicable *Thresholds of Significance*, the impact to air quality would be reduced

to a less-than-significant level. If mitigated levels of any criteria air pollutant or precursor still exceed the applicable *Threshold of Significance*, the impact to air quality would remain significant and unavoidable.

Table 8-1
Example Construction Criteria Air Pollutant and Precursor Significance Determination

Step	Emissions Source	Emissions (lb/day or tpy)			
		ROG	NO_X	PM_{10}	$PM_{2.5}$
2	Fugitive Dust Emissions	-	-	A	A
	Mobile Sources	B	B	B	B
	Off-gassing	C	-	-	-
3	Total Unmitigated Emissions	B + C = D	B = D	A + B = D	A + B = D
4	Total Basic Mitigated Emissions	E	E	E	E
	BAAQMD Threshold	54 lb/day	54 lb/day	82 lb/day*	54 lb/day*
5	Basic Mitigated Emissions Exceed BAAQMD Threshold?	Is E > 54 lb/day? (If Yes, significant. Go to step 6. If No, less than significant)	Is E > 54 lb/day? (If Yes, significant. Go to step 6. If No, less than significant)	Is B* > 82 lb/day? (If Yes, significant. Go to step 6. If No, less than significant)	Is B* > 54 lb/day? (If Yes, significant. Go to step 6. If No, less than significant)
6	Total Additional Mitigated Emissions	F	F	F	F
7	Additional Mitigated Emissions Exceed BAAQMD Threshold?	Is F > 54 lb/day? (If Yes, significant and unavoidable. If No, less than significant with mitigation incorporated)	Is F > 54 lb/day? (If Yes, significant and unavoidable. If No, less than significant with mitigation incorporated)	Is F* > 82 lb/day? (If Yes, significant and unavoidable. If No, less than significant with mitigation incorporated)	Is F* > 54 lb/day? (If Yes, significant and unavoidable. If No, less than significant with mitigation incorporated)

* Applies to construction equipment exhaust only.

Notes: tpy = tons per year.; lb/day = pounds per day; NO_X = oxides of nitrogen; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less; ROG = reactive organic gases;
Refer to Appendix D for support documentation.

8.1.2. Mitigating Criteria Air Pollutants and Precursors

Basic Construction Mitigation Measures

For all proposed projects, BAAQMD recommends the implementation of all *Basic Construction Mitigation Measures,* listed in Table 8-2*,* whether or not construction-related emissions exceed applicable *Thresholds of Significance*. Appendix B provides guidance on quantifying mitigated emission reductions using URBEMIS and RoadMod.

Table 8-2
Basic Construction Mitigation Measures Recommended for ALL Proposed Projects

1. All exposed surfaces (e.g., parking areas, staging areas, soil piles, graded areas, and unpaved access roads) shall be watered two times per day.
2. All haul trucks transporting soil, sand, or other loose material off-site shall be covered.
3. All visible mud or dirt track-out onto adjacent public roads shall be removed using wet power vacuum street sweepers at least once per day. The use of dry power sweeping is prohibited.
4. All vehicle speeds on unpaved roads shall be limited to 15 mph.
5. All roadways, driveways, and sidewalks to be paved shall be completed as soon as possible. Building pads shall be laid as soon as possible after grading unless seeding or soil binders are used.
6. Idling times shall be minimized either by shutting equipment off when not in use or reducing the maximum idling time to 5 minutes (as required by the California airborne toxics control measure Title 13, Section 2485 of California Code of Regulations [CCR]). Clear signage shall be provided for construction workers at all access points.
7. All construction equipment shall be maintained and properly tuned in accordance with manufacturer's specifications. All equipment shall be checked by a certified mechanic and determined to be running in proper condition prior to operation.
8. Post a publicly visible sign with the telephone number and person to contact at the Lead Agency regarding dust complaints. This person shall respond and take corrective action within 48 hours. The Air District's phone number shall also be visible to ensure compliance with applicable regulations.

Additional Construction Mitigation Measures

BAAQMD recommends that all proposed projects, where construction-related emissions would exceed the applicable *Thresholds of Significance*, implement the *Additional Construction Mitigation Measures*. Table 8-3 lists the *Additional Construction Mitigation Measures*. Appendix B contains more detailed guidance on emission reductions by source type (i.e., fugitive dust and exhaust) for quantification in URBEMIS and RoadMod.

Table 8-3
Additional Construction Mitigation Measures Recommended for Projects with Construction Emissions Above the Threshold

1. All exposed surfaces shall be watered at a frequency adequate to maintain minimum soil moisture of 12 percent. Moisture content can be verified by lab samples or moisture probe.
2. All excavation, grading, and/or demolition activities shall be suspended when average wind speeds exceed 20 mph.
3. Wind breaks (e.g., trees, fences) shall be installed on the windward side(s) of actively disturbed areas of construction. Wind breaks should have at maximum 50 percent air porosity.
4. Vegetative ground cover (e.g., fast-germinating native grass seed) shall be planted in disturbed areas as soon as possible and watered appropriately until vegetation is established.
5. The simultaneous occurrence of excavation, grading, and ground-disturbing construction activities on the same area at any one time shall be limited. Activities shall be phased to reduce the amount of disturbed surfaces at any one time.
6. All trucks and equipment, including their tires, shall be washed off prior to leaving the site.
7. Site accesses to a distance of 100 feet from the paved road shall be treated with a 6 to 12 inch compacted layer of wood chips, mulch, or gravel.
8. Sandbags or other erosion control measures shall be installed to prevent silt runoff to public roadways from sites with a slope greater than one percent.
9. Minimizing the idling time of diesel powered construction equipment to two minutes.
10. The project shall develop a plan demonstrating that the off-road equipment (more than 50 horsepower) to be used in the construction project (i.e., owned, leased, and subcontractor vehicles) would achieve a project wide fleet-average 20 percent NO_X reduction and 45 percent PM reduction compared to the most recent ARB fleet average. Acceptable options for reducing emissions include the use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, add-on devices such as particulate filters, and/or other options as such become available.
11. Use low VOC (i.e., ROG) coatings beyond the local requirements (i.e., Regulation 8, Rule 3: Architectural Coatings).
12. Requiring that all construction equipment, diesel trucks, and generators be equipped with Best Available Control Technology for emission reductions of NOx and PM.
13. Requiring all contractors use equipment that meets CARB's most recent certification standard for off-road heavy duty diesel engines.

Assessing Mitigation Measures

Table 8-4 provides a summary of BAAQMD recommendations for assessing construction-related impacts and mitigation measures using URBEMIS. Detailed guidance is provided in Appendix B.

Table 8-4
URBEMIS Guidance for Assessing Construction-Related Impacts

URBEMIS Construction Input Parameter	Guidance Principle
Land Use Type and Size	• Select most applicable land use type. • Use the appropriate land use units.
Construction Schedule	• Use the earliest possible commencement date(s) if project-specific information is unknown. • Overlap phases that will or have the potential to occur simultaneously. • Check the selected number of work days per week to ensure an accurate number of construction work days for each phase.
Demolition Phase	• Use a separate demolition URBEMIS run if the land use size to be developed differs from the land use size to be demolished. • Demolition fugitive dust is based on maximum daily volume of building to be demolished. • Demolition construction equipment is based on acres of land use to be demolished (in *Enter Land Use Data* module).
Site Grading Phase	• Site grading construction equipment is based on maximum daily acres disturbed. • Enter project-specific maximum daily acres disturbed if known, otherwise URBEMIS assumes the maximum daily amount of acres disturbed is 25 percent of total acres disturbed.
Site Grading Fugitive Dust	• Select the appropriate fugitive dust quantification methodology based on the amount and type of project-specific information available. • The more specific grading information available will result in more accurate quantification of PM emissions.
Asphalt Paving Phase	• Acres to be asphalt paved are based on land use type and size (in *Enter Land Use Data* module). • Asphalt paving construction equipment is based on total acres to be paved. • Assumes asphalt paving occurs at equal rate throughout phase. • Account for excess asphalt paving requirements of project beyond default assumptions by adjusting the acres to be paved.
Architectural Coatings	• Assumes architectural coating operations occur at equal rate throughout phase.
Basic Construction Mitigation Measures	• All projects must implement Basic Construction Mitigation Measures, including those below the construction screening levels. • Use surrogate URBEMIS mitigation to account for Basic Construction Mitigation Measures' emission reductions.
Additional Construction Mitigation Measures	• Projects with construction emissions that exceed the thresholds are required to implement Additional Construction Mitigation Measures. • Use surrogate URBEMIS mitigation to account for Additional Construction Mitigation Measures' emission reductions.
Other	• For all construction phases, the more specific information available will result in more accurate emissions quantification. • When a specific construction schedule is unknown, all phases that could potentially overlap should be added to calculate maximum daily emissions.

8.2. GREENHOUSE GASES

The District does not have an adopted *Threshold of Significance* for construction-related GHG emissions. However, the Lead Agency should quantify and disclose GHG emissions that would occur during construction, and make a determination on the significance of these construction-generated GHG emission impacts in relation to meeting AB 32 GHG reduction goals. BAAQMD recommends using URBEMIS for proposed land use development projects and RoadMod for proposed projects that are linear in nature. Sources of construction-related GHGs only include exhaust, for which the same detailed guidance as described for criteria air pollutants and precursors should be followed.

The Lead Agency is encouraged to incorporate best management practices to reduce GHG emissions during construction, as applicable. Best management practices may include, but are not limited to: using alternative fueled (e.g., biodiesel, electric) construction vehicles/equipment of at least 15 percent of the fleet; using local building materials of at least 10 percent; and recycling or reusing at least 50 percent of construction waste or demolition materials.

8.3. TOXIC AIR CONTAMINANTS

BAAQMD recommends that the same community risk and hazard *Threshold of Significance* for project operations be applied to construction. However, BAAQMD suggests associated impacts should be addressed on a case-by-case basis, taking into consideration the specific construction-related characteristics of each project and proximity to off-site receptors, as applicable. The Air District recommends that for construction projects that are less than one year duration, Lead Agencies should annualize impacts over the scope of actual days that peak impacts are to occur, rather than the full year.

BAAQMD has developed guidance for estimating risk and hazards impacts entitled *Recommended Methods for Screening and Modeling Local Risks and Hazards* (May 2010) which also includes recommendations for mitigation of significant risk and hazards impacts. The Air District has also developed a Construction Risk Calculator model that provides distances from a construction site, based on user-provided project date, where the risk impacts are estimated to be less than significant; sensitive receptors located within these distances would be considered to have potentially significant risk and hazards impacts from construction. The Construction Risk Calculator can be downloaded from the Air District web site at: http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES.aspx.

8.3.1. Diesel Particulate Matter

Construction-related activities could result in the generation of TACs, specifically diesel PM, from on-road haul trucks and off-road equipment exhaust emissions. Due to the variable nature of construction activity, the generation of TAC emissions in most cases would be temporary, especially considering the short amount of time such equipment is typically within an influential distance that would result in the exposure of sensitive receptors to substantial concentrations. Concentrations of mobile-source diesel PM emissions are typically reduced by 70 percent at a distance of approximately 500 feet (ARB 2005). In addition, current models and methodologies for conducting health risk assessments are associated with longer-term exposure periods of 9, 40, and 70 years, which do not correlate well with the temporary and highly variable nature of construction activities. This results in difficulties with producing accurate estimates of health risk. Additionally, the implementation of the *Basic Construction Mitigation Measures* (table 8-2), which is recommended for all proposed projects, would also reduce diesel PM exhaust emissions.

However, these variability issues associated with construction do not necessarily minimize the significance of possible impacts.

The analysis shall disclose the following about construction-related activities:

1. Types of off-site receptors and their proximity to construction activity within approximately 1,000 feet;
2. Duration of construction period;
3. Quantity and types of diesel-powered equipment;
4. Number of hours equipment would be operated each day;
5. Location(s) of equipment use, distance to nearest off-site sensitive receptors, and orientation with respect to the predominant wind direction;
6. Location of equipment staging area; and
7. Amount of on-site diesel-generated $PM_{2.5}$ exhaust (assuming that all on-site diesel $PM_{2.5}$ exhaust is diesel PM) if mass emission levels from construction activity are estimated.

In cases where construction-generated emissions of diesel PM are anticipated to occur in close proximity to sensitive receptors for extended periods of time, lead agencies are encouraged to consult with BAAQMD.

8.3.2. Demolition and Renovation of Asbestos-Containing Materials

Demolition of existing buildings and structures would be subject to BAAQMD Regulation 11, Rule 2 (Asbestos Demolition, Renovation, and Manufacturing). BAAQMD Regulation 11, Rule 2 is intended to limit asbestos emissions from demolition or renovation of structures and the associated disturbance of asbestos-containing waste material generated or handled during these activities. The rule addresses the national emissions standards for asbestos along with some additional requirements. The rule requires the Lead Agency and its contractors to notify BAAQMD of any regulated renovation or demolition activity. This notification includes a description of structures and methods utilized to determine whether asbestos-containing materials are potentially present. All asbestos-containing material found on the site must be removed prior to demolition or renovation activity in accordance with BAAQMD Regulation 11, Rule 2, including specific requirements for surveying, notification, removal, and disposal of material containing asbestos. Therefore, projects that comply with Regulation 11, Rule 2 would ensure that asbestos-containing materials would be disposed of appropriately and safely. By complying with BAAQMD Regulation 11, Rule 2, thereby minimizing the release of airborne asbestos emissions, demolition activity would not result in a significant impact to air quality.

Because BAAQMD Regulation 11, Rule 2 is in place, no further analysis about the demolition of asbestos-containing materials is needed in a CEQA document. BAAQMD does recommend that CEQA documents acknowledge and discuss BAAQMD Regulation 11, Rule 2 to support the public's understanding of this issue.

8.3.3. Naturally Occurring Asbestos

Naturally occurring asbestos (NOA) was identified as a TAC in 1986 by ARB. NOA is located in many parts of California and is commonly associated with ultramafic rocks, according to the California Department of Geology's special publication titled Guidelines for Geologic Investigations of Naturally Occurring Asbestos in California. Asbestos is the common name for a group of naturally occurring fibrous silicate minerals that can separate into thin but strong and durable fibers. Ultramafic rocks form in high-temperature environments well below the surface of the earth. By the time they are exposed at the surface by geologic uplift and erosion, ultramafic rocks may be partially to completely altered into a type of metamorphic rock called serpentinite.

Sometimes the metamorphic conditions are right for the formation of chrysotile asbestos or tremolite-actinolite asbestos in the bodies of these rocks, along their boundaries, or in the soil.

For individuals living in areas of NOA, there are many potential pathways for airborne exposure. Exposures to soil dust containing asbestos can occur under a variety of scenarios, including children playing in the dirt; dust raised from unpaved roads and driveways covered with crushed serpentine; grading and earth disturbance associated with construction activity; quarrying; gardening; and other human activities. For homes built on asbestos outcroppings, asbestos can be tracked into the home and can also enter as fibers suspended in the air. Once such fibers are indoors, they can be entrained into the air by normal household activities, such as vacuuming (as many respirable fibers will simply pass through vacuum cleaner bags).

People exposed to low levels of asbestos may be at elevated risk (e.g., above background rates) of lung cancer and mesothelioma. The risk is proportional to the cumulative inhaled dose (quantity of fibers), and also increases with the time since first exposure. Although there are a number of factors that influence the disease-causing potency of any given asbestos (such as fiber length and width, fiber type, and fiber chemistry), all forms are carcinogens.

8.3.4. Mitigating Naturally Occurring Asbestos

BAAQMD enforces CARB's ATCM which regulates NOA emissions from grading, quarrying, and surface mining operations at sites which contain ultramafic rock. The provisions that cover these operations are found specifically in the California Code of Regulations, Section 93105. The ATCM for Construction, Grading, Quarrying and Surface Mining Operations was signed into State law on July 22, 2002, and became effective in the SFBAAB on November 19, 2002. The purpose of this regulation is to reduce public exposure to NOA from construction and mining activities that emit or re-suspend dust which may contain NOA.

The ATCM requires regulated operations engaged in road construction and maintenance activities, construction and grading operations, and quarrying and surface mining operations in areas where NOA is likely to be found, to employ the best available dust mitigation measures to reduce and control dust emissions. Tables 8-2 and 8-3 list a number of dust mitigation measures for construction.

BAAQMD's NOA program requires that the applicable notification forms from the Air District's website be submitted by qualifying operations in accordance with the procedures detailed in the ATCM Inspection Guidelines Policies and Procedures. The Lead Agency shall reference BAAQMD's ATCM Policies and Procedures to determine which NOA Notification Form is applicable to the proposed project (NOA Notification Forms).

Using the geologic map of the SFBAAB (Geologic Map), the Lead Agency shall discuss whether a proposed project would be located in "areas moderately likely to contain NOA." If a project would not involve earth-disturbing construction activity in one of these areas or would not locate receptors in one of these areas then it can be assumed that the project would not have the potential to expose people to airborne asbestos particles.

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PART III: ASSESSING & MITIGATING PLAN LEVEL IMPACTS

9. PLAN-LEVEL IMPACTS

Long range plans (e.g., general plan, redevelopment plans, specific plans, area plans, community plans, regional plans, congestion management plans, etc.) present unique challenges for assessing impacts. These plans often contain development strategies for 20-year, or longer, time horizons. They can also provide for a wide range of potential land uses and densities that accommodate all types of development. General plan updates and large specific plans nearly always require the Lead Agency to prepare an Environmental Impact Report (EIR). Due to the SFBAAB's nonattainment status for ozone and PM, and the cumulative impacts of growth on air quality, these plans almost always have significant, unavoidable adverse air quality impacts. CEQA requires the Lead Agency to evaluate individual as well as cumulative impacts of general plans, and all feasible mitigation measures must be incorporated within the proposed plan to reduce significant air quality impacts.

This chapter provides guidance on methods to evaluate air quality and climate change impacts of long-range plans prepared within the SFBAAB pursuant to CEQA. The term *general and area plan* refers broadly to discretionary planning activities which may include, but are not limited to the following: general plans, redevelopment plans, specific plans, area plans, community plans, congestion management plans, and annexations of lands and service areas. General and area plans are often subject to program-level analysis under CEQA, as opposed to project-level analysis. As a general principle, the guidance offered within this chapter should be applied to discretionary, program-level planning activities; whereas the project-level guidance offered in other chapters should be applied to individual project-specific approvals, such as a proposed development project.

Air quality impacts from future development pursuant to general or area plans can be divided into construction-related impacts and operational-related impacts. Construction-related impacts are associated with construction activities likely to occur in conjunction with future development allocated by the plan. Operational-related impacts are associated with continued and future operation of developed land uses, including increased vehicle trips and energy use.

Please note that the plan-level approach described here differs for greenhouse gas (GHG) impact assessments. The Air District recommends that when assessing GHG impacts for plans other than regional plans (transportation and air quality plans) and general plans, such as specific plans and area plans, the appropriate thresholds and methodology is the same as project-level GHG impact assessments described in Chapter 4.

Regional plan (transportation and air quality plans) impacts also are assessed differently because of their unique characteristics (regional plans do not establish land use designations) and are subject to a threshold of "no net increase in emissions."

9.1. CRITERIA AIR POLLUTANTS AND PRECURSOR EMISSIONS

To meet the *Threshold of Significance* for operational-related criteria air pollutant and precursor impacts for plans (other than regional plans), a proposed plan must satisfy the following criteria:

- Consistency with current air quality plan (AQP) control measures. (This requirement applies to project-level as well as plan-level analyses.)
- A proposed plan's projected VMT or vehicle trips (VT) (either measure may be used) increase is less than or equal to its projected population increase.

Air Quality Plan Control Measures

For this threshold, an air quality plan refers to clean air plans, state implementation plans (SIPS), ozone plans, and other potential air quality plans developed by BAAQMD. To date, the Air District's most current plan is the 2010 Clean Air Plan.

The following approach for incorporating current AQP control measures into a plan is also applicable for determining a project's consistency with an air quality plan. CEQA requires lead agencies to determine whether a project is consistent with all applicable air quality plans. In addition, the State CEQA Guidelines sample Environmental Checklist Form (Appendix G), poses the question: "Would the project conflict with or obstruct implementation of the applicable air quality plan?"

BAAQMD recommends that the agency approving a project where an air quality plan consistency determination is required analyze the project with respect to the following questions. If all the questions are concluded in the affirmative, and those conclusions are supported by substantial evidence, the Air District considers the project consistent with air quality plans prepared for the Bay Area.

1. Does the project support the primary goals of the AQP?

The primary goals of the 2010 Bay Area Clean Air Plan (CAP), the current AQP to date, are to:

- Attain air quality standards;
- Reduce population exposure and protecting public health in the Bay Area; and
- Reduce greenhouse gas emissions and protect the climate.

Any project (i.e. project or plan) that would not support these goals would not be considered consistent with the 2010 CAP. The recommended measure for determining project support of these goals is consistency with District-approved CEQA thresholds of significance. Therefore, if approval of a project would not result in significant and unavoidable air quality impacts, after the application of all feasible mitigation, the project would be considered consistent with the 2010 CAP.

2. Does the project include applicable control measures from the AQP?

Agencies approving projects should require that they include all air quality plan control measures that can feasibly be incorporated into the project design or applied as mitigation, or justify the reasons, supported by substantial evidence, why a measure or measures are not incorporated into the project. Projects that incorporate all feasible air quality plan control measures are considered consistent with the 2010 CAP.

The 2010 CAP contains 55 control measures aimed at reducing air pollution in the Bay Area. Along with the traditional stationary, area, mobile source and transportation control measures, the 2010 CAP contains a number of new control measures designed to protect the climate and promote mixed use, compact development to reduce vehicle emissions and exposure to pollutants from stationary and mobile sources. BAAQMD encourages project developers and lead agencies to incorporate these Land Use and Local Impact (LUM) measures and Energy and Climate measures (ECM) into proposed project designs and plan elements.

Refer to Volume II of the 2010 CAP Control Measure for a list of all the control measures and implementation guidance.

3. Does the project disrupt or hinder implementation of any AQP control measures?

If approval of a project would not cause the disruption, delay or otherwise hinder the implementation of any air quality plan control measure, it would be considered consistent with the 2010 CAP. Examples of how a project may cause the disruption or delay of control measures include a project that precludes an extension of a transit line or bike path, or proposes excessive parking beyond parking requirements.

Projected VMT and Population Growth

A proposed plan must demonstrate that its projected VMT or vehicle trips (VT) (either measure may be used) is less than or equal to its projected population increase to be considered to have a less than significant impact on criteria air pollutants and precursor emissions.

9.2. GREENHOUSE GASES

California's legislative mandate (AB 32) is to reduce total projected 2020 GHG emissions to 1990 levels, a reduction of approximately 30 percent. To achieve this target, future development must be planned and implemented in the most GHG-efficient manner possible. GHG-efficient development reduces vehicle miles traveled by supporting compact, dense, mixed-use, pedestrian- and bicycle-friendly, transit oriented development. State, regional and local agencies are strongly encouraged to address GHG emissions when updating and/or adopting long-range plans. For local jurisdictions, the general plan is perhaps the best venue for addressing GHG emissions in making meaningful progress toward attaining AB 32 goals while addressing CEQA requirements.

If a long-range plan includes goals, policies, performance standards, and implementation measures achieving GHG emission reductions that can be shown to meet and/or exceed AB 32 mandates, as outlined in Section 4.3, subsequent projects consistent with the plan could be relieved of performing GHG analysis as part of their CEQA compliance.

The *Threshold of Significance* for operational-related GHG impacts of plans employs either a GHG efficiency-based metric of 6.6 MT per SP per year of carbon dioxide equivalent (CO_2e), or a GHG Reduction Strategy option. Unlike the other plan-level thresholds that apply to the different

plans mentioned in Section 9 above, the GHG efficiency threshold may only be applied to general plans. A Lead Agency may also determine that this threshold is appropriate for a GHG Reduction Strategy's 2020 milestone target. GHG Reduction Strategies using this threshold with horizon years beyond 2020 should consider horizon-year goals consistent with climate stabilization predictions identified in the Governor's Executive Order S-03-05.

Step 1. GHG Reduction Strategy Approach

A long-range plan would be assumed to have a less than significant impact related to GHG emissions if the Lead Agency has a qualified GHG Reduction Strategy that is referenced and or integrated within the long-range plan. See Chapter 4 for qualifying criteria for a qualified GHG Reduction Strategy.

If the Lead Agency does not have a qualified GHG Reduction Strategy meeting established criteria, refer to Step 2.

Step 2. GHG Efficiency Approach – Emissions Quantification

BAAQMD recommends quantifying community-wide GHG emissions from a general or area plan through development of a GHG emissions inventory and projections report. The emissions inventory should be conducted for a base year at or before the current year of the plan; and should follow published ARB protocols for municipal and community-wide inventories (when available). The base year inventory should be expressed in terms of metric tons CO_2e emissions and account for municipal and community-wide emission sectors applicable in the jurisdiction such as, transportation, commercial, residential, water use and treatment, solid waste, and agriculture.

Section 4.3 contains additional guidance on preparing a GHG emissions inventory and projections report for a qualified GHG Reduction Strategy that should be applied to general plans as well. A range of tools and resources are available to assist lead agencies in completing inventories, including the Air District's *GHG Plan Level Reduction Strategy Guidance*, Intergovernmental Panel on Climate Change (IPCC) Emissions Inventory Guidelines, CCAR GRP, and ICLEI's Clean Air and Climate Protection (CACP) model. In all instances where regional, statewide or national data sources are available, the Air District recommends that local data be used if available and more accurate.

Step 3. Prepare Greenhouse Gas Emissions Projections

BAAQMD recommends preparing a community-wide GHG emission projection to identify the expected levels of GHG emissions for: 1) 2020 (i.e., the AB 32 benchmark year), and 2) the projected year of the plan build out. Two projections should be prepared for each year:

- A projection reflecting existing conditions (e.g., business-as-usual), and
- A projection that accounts for proposed policies, programs, and plans included within the general or area plan that would reduce GHG emissions from build-out of the plan.

The first projection should be used as the basis for evaluation of the no project alternative in the plan's EIR. The second projection should be used as the basis for evaluation of the proposed

project. Additional projections corresponding to plan alternatives considered within the EIR should also be prepared and included within the EIR's alternatives analysis. Examples of policies, performance standards and implementation measures are included in Section 9.5.

Where possible, emission projections should account for inherent improvements in energy and fuel efficiency, population and employment growth rates published by ABAG, VMT growth rates available from MTC, energy consumption growth rates available from California Energy Commission (CEC) planned expansions of municipal infrastructure or services, and anticipated statewide legislative requirements or mandates (e.g., Renewable Energy Portfolio, Green Building Code Standards, on-road vehicle emission regulations).

A range of GIS-based planning models are available that can assist lead agencies in completing projections, including Index, PLACE3S, UPlan, and the Sustainable Systems Integration Model (SSIM). The projection should be expressed in metric tons CO_2e emissions, and include the expected municipal and community-wide emissions across all sectors evaluated in the base year inventory.

BAAQMD encourages lead agencies to prepare similar projections for 2050 (the Executive Order S-03-05 benchmark year). As we approach the 2020 timeframe, BAAQMD will reevaluate this significance threshold to better represent progress toward 2050 goals. The Lead Agency should use the projected build-out emissions profile of the general or area plan as a benchmark to ensure that adoption of the plan would not preclude attainment of 2050 goals.

Step 4. Determine Planned Population and Employment Levels and Service Population

State law requires that general and area plans identify the planned density and intensity of land uses for all lands within the planning area established by the Lead Agency. These measures of density (typically dwelling units/acre) and intensity (typically floor-area ratios) are often translated into expected population and employment levels for estimating traffic impacts associated with the proposed plan. Most demand-based transportation models use population and employment to determine trip generation. Measures of population and employment are typically available for general and area plans. In evaluating GHG impacts, estimates of the number of residents and jobs anticipated in the general or area plan are required for 2020, the build-out year of the proposed plan, the no project alternative, and additional alternatives the Lead Agency is evaluating in the environmental review.

Service population (SP) is an efficiency-based measure used by BAAQMD to estimate the development potential of a general or area plan. SP is determined by adding the number of residents to the number of jobs estimated for a given point in time. For purposes of evaluating GHG impacts, SP estimates are required for 2020 and for the build-out year of the proposed plan.

Step 5. Compare Service Population to 2020 GHG Projections and Thresholds of Significance

The Lead Agency should divide the 2020 GHG emissions inventory by 2020 SP estimates to determine the per-SP emissions associated with the proposed general or area plan, the no project alternative, and additional alternatives the Lead Agency is evaluating. The Lead Agency should then compare these per-SP emissions to the significance thresholds identified in Chapter 2 (refer to Table 9-1).

Table 9-1 Example Plan-level Greenhouse Gas Emissions Analysis			
Step	**Emissions Source**	**Year**	**Emissions (MT CO2e/yr)***
2	GHG Emissions Inventory (Community-wide and municipal)	Base year (e.g., 2007)	A
3	GHG Emissions Projections	2020	B
		GP Buildout (e.g., 2030)	C
4	Projected Service Population (population + employment)	SP	
	GHG/SP (2020)	B/SP (MT CO_2e/SP/yr)	
5	BAAQMD GHG/SP Threshold	6.6 (MT CO_2e/SP/yr)	
	Is B/SP > 6.6? (If Yes, Significant. Proceed to Step 6. If No, less than significant).		
*Letters "A", "B", and "C" are used to represent numeric values that would be obtained through conducting a community-wide emissions inventory and projections. Notes: CO_2e = carbon dioxide equivalent; MT = metric tons; yr = year, P = population, SP = service population. Refer to Appendix D for support documentation.			

If the estimated per-SP emissions exceed identified thresholds, the general or area plan would be considered to have a significant impact with respect to GHG emissions, and mitigation would be required.

Step 6. Mitigation Measures

General or area plans found to have a significant impact should implement all feasible mitigation measures to reduce impacts. Refer to Section 9.5 for examples of appropriate mitigation measures for operational impacts relative to GHG emissions. Mitigation measures identified through the environmental review process must be made into binding and enforceable policies and implementation programs within the long range plan.

9.3. LOCAL COMMUNITY RISK AND HAZARD IMPACTS

For general and area plans to have a less-than-significant impact with respect to potential toxic air contaminants (TACs), special overlay zones need to be established around existing and proposed land uses that emit TACs. Special overlay zones should be included in proposed plan policies, land use maps, and implementing ordinances.

The *Thresholds of Significance* for plans with regard to community risk and hazard impacts are:

1. The land use diagram must identify:

    a. Special overlay zones around existing and planned sources of TACs;

b. Special overlay zones of at least 500 feet (or Air District-approved modeled distance) on each side of all freeways and high-volume roadways.

2. The plan must also identify goals, policies, and objectives to minimize potential impacts and create overlay zones for sources of TACs and receptors.

ARB's Land Use Handbook offers advisory recommendations for locating sensitive receptors near uses associated with TACs, such as freeways and high-traffic roads, commercial distribution centers, rail yards, ports, refineries, chrome platers, dry cleaners, gasoline stations, and other industrial facilities, to reduce exposure of sensitive populations. The Lead Agency should refer to this handbook when evaluating whether the proposed general or area plan includes adequate buffer distances between TAC sources and sensitive receptors.

9.3.1. Community Risk Reduction Plans

The goal of a Community Risk Reduction Plan (CRRP) would be to bring TAC and $PM_{2.5}$ concentrations for the entire community covered by the Plan down to acceptable levels as identified by the local jurisdiction and approved by the Air District. This approach provides local agencies a proactive alternative to addressing communities with high levels of risk on a project-by-project approach.

A qualified Community Risk Reduction Plan adopted by a local jurisdiction should include, at a minimum, the following elements:(A) Define a planning area;

(B) Include base year and future year emissions inventories of TACs and PM2.5;

(C) Include Air District–approved risk modeling of current and future risks;

(D) Establish risk and exposure reduction goals and targets for the community in consultation with Air District staff;

(E) Identify feasible, quantifiable, and verifiable measures to reduce emissions and exposures;

(F) Include procedures for monitoring and updating the inventory, modeling and reduction measures in coordination with Air District staff;

(G) Be adopted in a public process following environmental review.

Refer to Chapter 5 for additional guidance on preparing a CRRP. The Air District has also developed the *Community Risk Reduction Plan Methodology* guidance document, which can found at http://www.baaqmd.gov/Divisions/Planning-and-Research/CEQA-GUIDELINES.aspx.

9.4. ODOR IMPACTS

- For plans to have a less-than-significant impact, a plan must identify the location of existing and planned odor sources in the plan area. The plan must also include policies to reduce potential odor impacts in the plan area.

9.5. REGIONAL PLANS

Regional plans must demonstrate a no net increase in emissions to satisfy the *Threshold of Significance* for operational-related criteria air pollutant and precursor impacts, GHGs, and toxic air contaminants.

Regional plans include the Regional Transportation Plan prepared by the Metropolitan Transportation Commission (MTC) and air quality plans prepared by the Air District. In order to meet this threshold, these agencies must compare the regional plan's baseline emissions with its projected future emissions. This approach requires two comparative analyses:

a. Compare existing (base year) emissions with projected future year plus project emissions (base year/project comparison);

b. Compare projected future year emissions without the project with projected future year emissions plus the project (no project/project comparison).

A regional plan is considered less than significant if each scenario demonstrates that no net increase in emissions of criteria air pollutants and precursors, GHGs, and toxic air contaminants will occur.

9.6. MITIGATING PLAN-LEVEL IMPACTS

Plans often have significant, unavoidable adverse air quality impacts due to the SFBAAB's nonattainment status and the cumulative impacts of growth on air quality. In addition, plans generally have long-term planning horizons of twenty years or more. For these reasons, it is essential for plans to incorporate all feasible strategies and measures to reduce air quality impacts. Mitigation measures for plans are often broad in scope due to the long timeframe and comprehensive nature of general and area plan policies and programs.

This section contains mitigation measures recommended for plans prepared within the SFBAAB. Measures are identified by state-required general plan element, planning issue, development phase, and type of air quality impact. Proposed plans should incorporate mitigation measures applicable to their elements and planning issues.

Plans are the appropriate place to establish community-wide air quality policies that reinforce regional air quality plans. Plans present opportunities to establish requirements for new construction, future development, and redevelopment projects within a community that will ensure new or revised plans do not inhibit attainment of state and national air quality standards and actually assist in improving local and regional air quality. Binding, enforceable mitigation measures identified through the environmental review process should be incorporated as policies and implementation programs within the plan to the

greatest extent feasible. Ideally, air quality related goals, policies, performance measures and standards should be incorporated within the context of the proposed project itself, rather than introduced as corrective actions within the proposed project's EIR. The list below is not intended to serve as an exhaustive list. The Air District also recommends that Lead Agencies refer to CAPCOA's *Model Policies for Greenhouse Gases in General Plans* (June 2009) for additional guidance (http://www.capcoa.org/modelpolicies/CAPCOA-ModelPolicies-6-12-09-915am.pdf).

9.6.1. Qualified Greenhouse Gas Reduction Strategy

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Develop and adopt a comprehensive Qualified GHG Reduction Strategy that includes: baseline inventory of greenhouse gas emissions from all sources, greenhouse gas emissions reduction targets that are consistent with the goals of AB 32, and enforceable GHG emission reduction strategies and performance measures.		X				X		
Qualified GHG Reduction Strategy to include enforcement and monitoring tools to ensure regular review of progress toward the emission reduction targets, report progress to the public and responsible agencies, and revise the plan as appropriate.		X				X		

9.6.2. Land Use Element

Urban Form

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Create and enhance landscaped greenway, trail, and sidewalk connections between neighborhoods, commercial areas, activity centers, and parks.					X	X		
Adopt policies supporting infill development					X	X		
Ensure that proposed land uses are supported by a multi-modal transportation system and that the land uses themselves support the development of the transportation system.					X	X		
Designate a central city core for high-density and mixed-use development.					X	X		
Discourage high intensity office and commercial uses from locating outside of designated centers or downtowns, or far from residential areas and transit stations.					X	X		
Provide financial incentives and density bonuses to entice development within the designated central city.					X	X		
Provide public education about benefits of well-designed, higher-density housing and relationships between land use and transportation.					X	X		

Compact Development

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Achieve a jobs/housing balance or improve the jobs/housing ratio within the plan area.					X	X		
Create incentives to attract mixed-use projects to older commercial and industrial areas.					X	X		
Adopt incentives for the concurrent development of retail, office, and residential land uses within mixed-use projects or areas. Require mixed-use development to include ground-floor retail.					X	X		
Provide adaptive re-use alternatives to demolition of historic buildings. Provide incentives to prevent demolition of historic buildings.	X	X			X	X		
Facilitate lot consolidation that promotes integrated development with improved pedestrian and vehicular access.					X	X		
Reinvest in existing neighborhoods and promote infill development as a preference over new, greenfield development.					X	X		
Ensure that new development finances the full cost of expanding public infrastructure and services to provide an economic incentive for incremental expansion.					X	X		
Require new developments to extend sewer and water lines from existing systems or to be in conformance with a master sewer and water plan.	X	X			X	X		

Transit-oriented Design

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Require all development projects proposed within 2,000 feet of an existing or planned light rail transit, commuter rail, express bus, or transit corridor stop, to incorporate site design measures that enhance the efficiency of the transit system.					X	X		
Develop transit/pedestrian-oriented design guidelines. Identify and designate appropriate sites during general plan updates and amendments.					X	X		
Plan areas within ¼-mile of locations identified as transit hubs and commercial centers for higher density development.					X	X		

Sustainable Development

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Ensure new construction complies with California Green Building Code Standards and local green building ordinances.					X	X		
Promote re-use of previously developed property, construction materials, and/or vacant sites within a built-up area.					X	X		
Avoid development of isolated residential areas near hillsides or other areas where such development would require significant infrastructure investment or adversely impact biological resources.						X		
Require orientation of buildings to maximize passive solar heating during cool seasons, avoid solar heat gain during hot periods, enhance natural ventilation, and promote effective use of daylight. Orientation should optimize opportunities for on-site solar generation.					X	X		
Provide land area zoned for commercial and industrial uses to support a mix of retail, office, professional, service, and manufacturing businesses.					X	X		
Provide permitting incentives for energy efficient and solar building projects.					X	X		
Develop a joint powers agreement or other legal instrument that provides incentive for counties to discourage urban commercial development in unincorporated areas and promote urban infill and redevelopment projects.					X	X		

Activity Centers

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Provide pedestrian amenities, traffic-calming features, plazas and public areas, attractive streetscapes, shade trees, lighting, and retail stores at activity centers.					X	X		
Provide for a mix of complementary retail uses to be located together to create activity centers and commercial districts serving adjacent neighborhoods.					X	X		
Permit upper-story residential and office uses in neighborhood shopping areas.					X	X		
Provide pedestrian links between commercial districts and neighborhoods.					X	X		
Provide benches, streetlights, public art, and other amenities in activity centers to attract pedestrians.					X	X		

Green Economy and Businesses

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Work with businesses to encourage employee transit subsidies and shuttles from transit stations.					X	X		
Encourage businesses to participate in local green business programs.					X	X		
Offer incentives to attract businesses to city core and infill areas.					X	X		
Work to attract green businesses and promote local green job training programs.					X	X		
Support regional collaboration to strengthen the green economy.					X	X		
Provide outreach and education to local businesses on energy, waste, and water conservation benefits and cost savings.					X	X		
Support innovative energy technology companies.					X	X		

9.6.3. Circulation Element

Local Circulation

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Create or reinforce a grid street pattern with small block sizes and maintain high connectivity within the roadway network.					X	X		
Implement circulation improvements that reduce vehicle idling, such as signal timing systems and controlled intersections.					X	X	X	
Consider alternatives such as increasing public transit or improving bicycle or pedestrian travel routes before funding transportation improvements that increase VMT.					X	X		
Require payment of transportation impact fees and/or roadway and transit improvements as a condition upon new development.					X	X		
Minimize use of cul-de-sacs and incomplete roadway segments.					X	X		
Actively promote walking as a safe mode of local travel, particularly for children attending local schools.					X	X		
Consult with school districts, private schools, and other operators to coordinate local busing, to expand ride-sharing programs, and to replace older diesel buses with low or zero emission vehicles.					X	X	X	
Evaluate all busing options as a preferential strategy to roadway improvements in the vicinity of schools to ease congestion.					X	X		
Establish public/private partnerships to develop satellite and neighborhood work centers for telecommuting.					X	X		
Employ traffic calming methods such as median landscaping and provision of bike or transit lanes to slow traffic, improve roadway capacity, and address safety issues.					X	X		
Support the use of electric vehicles where appropriate. Provide electric recharge facilities.					X	X		

Regional Transportation

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Ensure that submittals of transportation improvement projects to be included in regional transportation plans (RTP, RTIP, CMP, etc.) are consistent with the air quality goals and policies of the general plan.					X	X		
Consult with adjacent jurisdictions to address the impacts of regional development patterns on the circulation system.					X	X		
Adopt a (or implement the existing) Transportation Demand Management Ordinance.					X	X		
Create financing programs for the purchase or lease of vehicles used in employer ride sharing programs.					X	X		
Consult with adjacent jurisdictions to maintain adequate service levels at shared intersections and to provide adequate capacity on regional routes for through traffic.					X	X		
Work to provide a strong paratransit system that promotes the mobility of all residents and educate residents about local mobility choices.					X	X		
Designate sites for park-and-ride lots. Consider funding of the park and ride lots as mitigation during CEQA review of residential development projects.					X	X		
Consult with appropriate transportation agencies and major employers to establish express buses and vanpools to increase the patronage of park and ride lots.					X	X		
Allow developers to reach agreements with auto-oriented shopping center owners to use commercial parking lots as park-and-ride lots and multimodal transfer sites.					X	X		

Parking

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Reduce parking for private vehicles while increasing options for alternative transportation.					X	X		
Eliminate minimum parking requirements for new development.					X	X		
Establish commercial district parking fees.					X	X		
Require that parking is paid for separately and is not included in rent for residential or commercial space.					X	X		
Encourage parking sharing between different land uses.					X	X		
Encourage businesses to offer parking cash-outs to employees.					X	X		
Encourage parking assessment districts.					X	X		
Encourage car-share and bike-share programs and dedicated parking spaces in new development.					X	X		
Support preferential parking for low emission and carpool vehicles					X	X		

Bicycles and Pedestrians

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Provide safe and convenient pedestrian and bicycle connections to and from activity centers, commercial districts, offices, neighborhoods, schools, other major activity centers.					X	X		
Ensure that non-motorized transportation systems are connected and not interrupted by impassable barriers, such as freeways.					X	X		
Provide pedestrian pathways that are well-shaded and pleasantly landscaped to encourage use.					X	X		
Consult with transit providers to increase the number of bicycles that can be accommodated on buses.					X	X		
Provide crosswalks and sidewalks along streets that are accessible for people with disabilities and people who are physically challenged.					X	X		
Prohibit on-street parking to reduce bicycle/automobile conflicts in appropriate target areas.					X	X		
Prohibit projects that impede bicycle and walking access.					X	X		
Retrofit abandoned rail corridors as segments of a bikeway and pedestrian trail system.					X	X		
Require commercial developments and business centers to include bicycle amenities in building such as bicycle racks, showers, and lockers.					X	X		

Regional Rail Transit

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Support regional rail service and consult with rail operators to expand services.					X	X		
Create activity centers and transit-oriented development projects near transit stations.					X	X		

Local and Regional Bus Transit

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Give funding preference to investment in public transit over investment in infrastructure for private automobile traffic.					X	X		
Establish a local shuttle service to connect neighborhoods, commercial centers, and public facilities to rail transit.					X	X		
Empower seniors and those with physical disabilities who desire maximum personal freedom and independence of lifestyle with unimpeded access to public transportation.					X	X		
Provide transit shelters that are comfortable, attractive, and accommodate transit riders. Ensure that shelters provide shade, route information, benches and lighting.					X	X		
Design all arterial and collector streets planned as transit routes to allow for the efficient operation of public transit.					X	X		
Require transit providers to coordinate intermodal time schedules					X	X		

9.6.4. Conservation Element

Municipal Operations

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Replace existing City vehicles with ultra-low or zero emission vehicles and purchase new low emission vehicles.					X	X		
Require that all new government buildings, and all major renovations and additions, meet identified green building standards.					X	X		
Install cost-effective renewable energy systems on all city buildings and purchase remaining electricity from renewable sources.					X	X		
Support the use of teleconferencing in lieu of city/county employee travel to conferences and meetings when feasible.					X	X		
Require city/county departments to set up telecommuting programs as part of their trip reduction strategies.					X	X		
Require environmentally responsible government purchasing. Require or give preference to products that reduce or eliminate indirect GHG emissions.						X		
Investigate the feasibility of using solar (photovoltaic) street lights instead of conventional street lights to conserve energy.					X	X		
Support investment in cost-effective land use and transportation modeling and geographic information system technology.					X	X	X	X
Install LED lighting for all traffic light systems.						X		
Implement a timed traffic light system to reduce idling.					X	X		

Air Quality – Sensitive Receptors

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Develop and adopt a comprehensive Community Risk Reduction Plan that includes: baseline inventory of TAC and $PM_{2.5}$ emissions from all sources, emissions reduction targets, and enforceable emission reduction strategies and performance measures. Community Risk Reduction Plan to include enforcement and monitoring tools to ensure regular review of progress toward the emission reduction targets, report progress to the public and responsible agencies, and revise the plan as appropriate.			X				X	
Require residential development projects and projects categorized as sensitive receptors to be located an adequate distance from existing and potential sources of TACs and odors.				X			X	X
Require new air pollution point sources such as, but not limited to, industrial, manufacturing, and processing facilities to be located an adequate distance from residential areas and other sensitive receptors.	X		X	X	X		X	X
Consult with BAAQMD to identify TAC sources and determine the need for and requirements of a health risk assessment for proposed developments.			X	X			X	X
Consult with project proponents during the pre-application review process to avoid inappropriate uses at affected sites and during the environmental review process for general plan amendments and general plan updates.					X		X	X
Require project proponents to prepare health risk assessments in accordance with BAAQMD-recommended procedures as part of environmental review when the proposed project has associated air-toxic emissions.			X				X	
Designate adequate industrial land in areas downwind and well-separated from sensitive uses.							X	X
Designate non-sensitive land uses for areas surrounding industrial sites.					X		X	X
Protect vacant industrial sites from encroachment by residential or other sensitive uses through appropriate zoning.					X		X	X
Require indoor air quality equipment, such as enhanced air filters, to be installed at schools, residences, and other sensitive receptor uses located near pollution sources.							X	X
Quantify the existing and added health risks to new sensitive receptors or for new sources.							X	
Utilize pollution absorbing trees and vegetation in buffer areas.					X	X	X	

Air Quality – PM_{10} and Dust Control

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Include PM_{10} control measures as conditions of approval for subdivision maps, site plans, and grading permits.	X				X			
Minimize vegetation removal required for fire prevention.	X				X			
Require alternatives to discing, such as mowing, to the extent feasible. Where vegetation removal is required for aesthetic or property maintenance purposes, encourage or require alternatives to discing.	X	X			X	X		
Require subdivision designs and site planning to minimize grading and use landform grading in hillside areas.	X							
Condition grading permits to require that graded areas be stabilized from the completion of grading to commencement of construction.	X							
Require all access roads, driveways, and parking areas serving new commercial and industrial development to be constructed with materials that minimize particulate emissions and are appropriate to the scale and intensity of use.	X							
Develop a street cleaning program aimed at removing heavy silt loadings from roadways that result from sources such as storm water runoff and construction sites.	X				X			
Pave shoulders and pave or landscape medians. Curb and gutter installation may provide additional benefits where paving is contiguous to the curb.	X	X			X	X		

Water Conservation

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Require residential remodels and renovations to improve plumbing fixture and fixture-fitting water efficiency by an established amount above the California Building Standards Code water efficiency standards.		X						
Provide water use audits to identify conservation opportunities and financial incentives for adopting identified efficiency measures.		X						
Require use of native and drought-tolerant plants, proper soil preparation, and efficient irrigation systems for landscaping.		X				X		
Maximize use of native, low-water plants for landscaping of areas adjacent to sidewalks or other impermeable surfaces.		X				X		
Increase use of recycled and reclaimed water for landscaping projects.		X				X		
Adopt a water-efficient landscaping ordinance and implement the Bay-Friendly Landscaping Guidelines established by StopWaste.org.						X		
Provide public water conservation education.						X		
Reduce pollutant runoff from new development through use of Best Management Practices.	X	X	X		X	X	X	
Minimize impervious surfaces and associated urban runoff pollutants in new development and reuse projects.	X	X	X		X	X	X	
Utilize permeable surfaces and green roof technologies where appropriate.					X	X	X	

Energy Conservation

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Conduct energy efficiency audits of existing buildings by checking, repairing, and readjusting heating, ventilation, air conditioning, and lighting, water heating equipment, insulation and weatherization. Offer financial incentives for adoption of identified efficiency measures.		X				X		
Require implementation of energy-efficient design features in new development, including appropriate site orientation, exceedance of Title 24, use of light color roofing and building materials, and use of evergreen and wind-break trees to reduce heating and cooling fuel consumption.		X				X		
Adopt residential and commercial energy efficiency retrofit ordinances that require upgrades as a condition of issuing permits for renovations or additions, and on the sale of residences and buildings.		X				X		
Facilitate cooperation between neighboring development projects to use on-site renewable energy supplies or combined heat and power co-generation facilities.		X				X		
Develop a comprehensive renewable energy financing and informational program for residential and commercial uses.		X				X		
Partner with community services agencies to fund energy efficiency projects for low income residents.		X				X		
Encourage the installation of energy efficient fireplaces in lieu of normal open-hearth fireplaces. Prohibit installation of wood burning devices.	X	X			X	X		
Provide natural gas lines or electrical outlets to backyards to encourage the use of natural gas or electric barbecues, and electric gardening equipment.	X				X			
Implement Community Choice Aggregation (CCA) for renewable electricity generation.		X				X		

Solid Waste

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Achieve established local and regional waste-reduction and diversion goals. Adopt more stringent waste reduction goals.		X				X		
Establish programs that enable residents to donate or recycle surplus furniture, old electronics, clothing, and other household items.		X				X		
Establish methane recovery in local landfills and wastewater treatment plants to generate electricity.		X				X		
Participate or initiate a composting program for restaurants and residences.						X		
Implement recycling programs for businesses and construction waste.	X	X			X	X		
Prohibit styrofoam containers and plastic bag use by businesses.					X	X		

9.6.5. Open Space Element

Community Forestry

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Require inclusion of low VOC-emitting street trees and landscaping for all development projects.		X				X		
Require that trees larger than a specified diameter that are removed to accommodate development must be replaced at a set ratio.		X				X		
Provide adequate funding to manage and maintain the existing community forest, including sufficient funds for tree planting, pest control, scheduled pruning, and removal and replacement of dead trees.		X				X		
Provide public education regarding the benefits of street trees and the community forest.		X				X		

Sustainable Agriculture

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Require agricultural practices be conducted in a manner that minimizes harmful effects on soils, air and water quality, and marsh and wildlife habitat. Sustainable agricultural practices should be addressed in the Qualified GHG Reduction Strategy to address climate change effects if relevant.	X	X			X	X		
Preserve forested areas, agricultural lands, wildlife habitat and corridors, wetlands, watersheds, groundwater recharge areas and other open spaces that provide carbon sequestration benefits.	X	X			X	X		
Establish a mitigation program for establishing conservation areas. Impose mitigation fees on development of such lands and use funds generated to protect existing, or create replacement, conservation areas.	X	X			X	X		
Require no-till farming, crop rotation, cover cropping, and residue farming.	X	X			X	X		
Require the use of appropriate vegetation within urban-agricultural buffer areas.		X				X		
Protect grasslands from conversion to non-agricultural uses.	X	X			X	X		
Support energy production activities that are compatible with agriculture, including biogas, wind and solar.		X				X		
Allow alternative energy projects in areas zoned for agriculture or open space where consistent with primary uses.		X				X		
Provide spaces within the community suitable for farmers markets.						X		
Promote local produce and garden programs at schools.						X		

Parks and Recreation

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Expand and improve community recreation amenities including parks, pedestrian trails and connections to regional trail facilities.						X		
Require payment of park fees and/or dedication and provision of parkland, recreation facilities and/or multi-use trails as a condition upon new development.		X				X		
Encourage development of pocket parks in neighborhoods. Improve equal accessibility to park space across communities.		X				X		
Encourage joint use of parks with schools and community centers and facilities.		X				X		

9.6.6. Housing Element

Affordable Housing

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Ensure a portion of future residential development is affordable to low and very low income households.		X				X		
Target local funds, including redevelopment and Community Development or Energy Efficiency Block Grant resources, to assist affordable housing developers in incorporating energy efficient designs and features.						X		
Adopt minimum residential densities in areas designated for transit-oriented, mixed use development to ensure higher density in these areas.					X	X		
Consult with the Housing Authority, transit providers, and developers to facilitate construction of low-income housing developments that employ transit-oriented and pedestrian-oriented design principles.					X	X		
Offer density-bonus incentives for projects that provide for infill, mixed use, and higher density residential development.					X	X		

9.6.7. Safety Element

Traffic Safety

Mitigation Measure or General/Area Plan Policy	Construction				Operational			
	CAPs	GHGs	TACs	Odors	CAPs	GHGs	TACs	Odors
Facilitate traffic safety for motorists and pedestrians through proper street design and traffic monitoring.					X	X		
Require traffic control devices, crosswalks, and pedestrian-oriented lighting within design of streets, sidewalks, trails, and school routes.					X	X		

A. CONSTRUCTION ASSESSMENT TOOLS

High Level Haulage Input Worksheet
High Level of Detail Fugitive Dust Quantification Method

Instructions: When using the *High Level of Detail* quantificaiton method to calculate fugitive dust emissions from cut/fill activities, BAAQMD recommends using this worksheet to calculate the on- and off-site haulage inputs for URBEMIS. If a project would involve both on-site and off-site cut/fill operations, the user should create two separate High Level Haulage Input Worksheets (i.e., one worksheet calculation for on-site and one for off-site).

Project Name:

Grading Activity/Phase:

User inputs
Input to use in URBEMIS
Calculation (do not change)

Cut/Fill Operations

Description	Amount	Units	Notes
Total Cut/Fill Volume	1,800	cubic yards	Enter information
Months of Activity	2	months	Enter information
Days of Activity	44	days	
Daily Cut/Fill Volume	40.91	cubic yards/day	

Soil Density by Soil Type and Condition

Soil Type	Bulk Density (grams/cubic centimeter)	Density (pounds/cubic yard)	Density (tons/cubic yard)
Sandy	1.69	2,849	1.42
Loamy Coarse-Loamy	1.63	2,747	1.37
Loamy Fine-Loamy	1.60	2,697	1.35
Loamy Coarse-Silty	1.60	2,697	1.35
Loamy Fine-Silty	1.54	2,596	1.30
Clayey 25-25% clay	1.49	2,511	1.26
Clayey >45% clay	1.39	2,343	1.17

Source: U.S. Department of Agriculture, Natural Resources Conservation Service, 2007. National Soil Survey Handbook, title 430-VI. [Online] Available at <http://soils.usda.gov/technical/handbook/>.

URBEMIS 2007 Ton-Mile Calculation

Description	Amount	Units	Notes
Soil Type	Loamy Coarse-Loamy		Use drop-down menu to select soil type. Assume Sandy unless project-specific soil type is known.
Soil Density	1.37	tons/cubic yard	Enter project specific soil density if known
Haul Distance (Round Trip On-Site)	0.04	miles	Enter distance
Ton-Mile per Day	2.25	ton-miles/day	

Notes:
On-site ton-mile assumes cut/fill volume is moved by scrapers.
Off-site ton-mile assumes cut/fill volume is moved by haul trucks.

URBEMIS Construction Modeling Data Needs/Requests

1) Construction Schedule

Land use type and size to be developed
Commencement and buildout date
Duration and start date for each construction phase (e.g., demolition, grading, building construction)
Identify any potential or planned overlap in phases

Note: If project will be built out in multiple phases, provide information above for each phase.

2) Demolition

Commencement date and duration of activities
Total volume to be demolished
Maximum daily volume to be demolished
Haul truck capacity and distance to disposal site (URBEMIS defaults provided)
Demolition equipment required (URBEMIS defaults provided)

Note: URBEMIS estimates demolition construction equipment based on the land use being developed.

3) Grading (Mass and Fine)

Commencement date and duration of activities
Maximum daily acres disturbed (URBEMIS defaults provided)
Volume of material to be cut and/or filled (cubic yards)
Volume of material to be exported and/or exported (cubic yards)
Construction equipment required

Note: URBEMIS estimates grading construction equipment based on maximum daily acres disturbed.

4) Fugitive Dust

A) Method 1 (Default)
Maximum daily acres disturbed (URBEMIS defaults provided)

B) Method 2 (Low Level of Detail)
Duration of cut/fill operations
Volume of material to be cut and/or filled (cubic yards)
Origin of soil material (i.e., on-site or off-site)

C) Method 3 (Medium Level of Detail)
Duration of cut/fill operations
Number of scrapers or haul trucks operating per day
Hours of operation for each scraper or haul truck (scraper hours and haul truck hours)

D) Method 4 (High Level of Detail)
Duration of cut/fill operations
Volume of material to be cut and/or filled (cubic yards)
Bulk density of material (i.e., tons per cubic yard)
Round trip distance required to move materials on-site (on-site miles only)

5) Asphalt Paving

Commencement date and duration of activities
Total acres to be paved
Construction equipment required

Note: URBEMIS estimates asphalt paving construction equipment based on total acres to be paved.

6) Architectural Coatings

Commencement date and duration of activities

B. AIR QUALITY MODELING INSTRUCTIONS (URBEMIS)

This section provides detailed instructions for and examples of air quality modeling of operational and construction-related emissions pursuant to the methodological recommendations in this guide.

OPERATIONAL-RELATED EMISSIONS

URBEMIS Input Parameters

URBEMIS provides default values for Bay Area specific modeling parameters. Users may use the default values or provide project specific information when possible for more accurate emission quantification. BAAQMD-recommended input parameters and data requirements along with general URBEMIS user information for each operational-related activity are described below. Refer to the URBEMIS User's Guide and the BAAQMD Greenhouse Gas Model User's Manual (referred to collectively as the "User's Guide" below) for more detailed information.

Table B-1
URBEMIS Input Parameters for Operation Emissions

Operational Input Parameters	Guidance Principle
Air District	Bay Area Air District
Analysis Year	Earliest possible year when project would be operational
Land Use Type and Units	Based on project description
Trip Rate	From project traffic study, local trip rates, or ITE Trip Generation Manual
Project Location	Urban
Road Dust	Category should not be turned off but can be modified if project information is known
Pass-by Trips	See User's Guide for further instructions
Double Counting Correction	See User's Guide for further instructions
Percentage of Land Uses using Natural Gas	100 percent for both residential and nonresidential development
Persons per Residential Unit (Consumer Products)	Based on estimated number of residents
All Other URBEMIS Inputs	Use default values, unless project-specific data is available. See User's Guide for further instructions[1]

[1] The rationale for changing default values should be disclosed in the CEQA document

Land Use Type and Size

Choose each individual land use type (e.g., single family housing, apartment high rise, regional shopping center, or office park) that is most applicable to the proposed development project in the *Enter Land Use Data* module and enter the size of the project (e.g., acres, thousand square feet [ksf], students, dwelling units [du], rooms, pumps, rooms, or employees). Ensure that the unit type for the project-specific data is consistent with the unit type selected in URBEMIS. By default, URBEMIS estimates the trip generation rates for each land use type based on equations included in the ITE Trip Generation Manual. The trip rate represents the number of daily trips generated by a particular land use type by size. Override the default trip rate if project-specific data is available from the transportation analysis.

URBEMIS estimates the trip rate differently for residential land use types than for non-residential land use types. For residential land use types, URBEMIS adjusts the default trip rate based on residential density (i.e., dwelling units/residential acre). Overriding the default value for the number of acres for a residential land use type would automatically result in a change in the trip rate value. If both the number of acres and the trip rates for a residential development are known, enter the unit amount for the land use first, then adjust the acreage second, and then adjust the trip rate last. Select the *Submit* button after completing the *Enter Land Use Data* module.

For nonresidential land use types, URBEMIS uses a default trip rate value that is directly based on the unit amount entered into the *Enter Land Use Data* module. URBEMIS also assumes a Floor Area Ratio (FAR) of 0.5 for all nonresidential uses. The FAR is the ratio of the total floor area of a building to the size of the parcel on which it is located. Override the value in the acres data field based on the FAR for the proposed nonresidential land uses. URBEMIS does not adjust the default trip rate if the acre value is adjusted.

The *Enter Land Use Data* module includes a default worker commute trip percentage for all nonresidential land use types, which is used to estimate percentages of other commercial trip types in the *Enter Operational Data* module. The *Enter Land Use Data* module also contains default percentages of primary, diverted, and pass-by trips for all land use types, residential and non-residential. Primary trips are trips made for the specific purpose of visiting the generator and URBEMIS assumes that primary trips travel a full trip length; pass-by trips are trips made as intermediate stops on the way from an origin to another trip destination; and diverted-linked trips are trips attracted from the traffic volume on roadways in the vicinity of the generator but which require a diversion from that roadway to another roadway to gain access to the site. Pass-by and diverted-linked trips are assigned a shorter trip distance than primary trips. URBEMIS assumes that pass-by trips result in virtually no extra travel, with an assumed trip length of 0.1 mile. Diverted-linked trip lengths are assumed to equal 25 percent of the primary trip length. URBEMIS allows users to edit these data fields. URBEMIS incorporates this information for estimation of mobile-source emissions only if the check box for the Pass-by Trips category in the *Enter Operational Data* module is selected. When not selected, URBEMIS assumes all trips are primary trips. BAAQMD recommends reviewing the User's Guide for more information about when to use this feature. Additional discussion about pass-by trips is provided under the *Enter Operational Data* module guidance below.

When estimating emissions for a type of land use that is not listed in URBEMIS, select a similar land use type or add a new land use type on the Blank tab of the *Enter Land Use Data* module. When selecting a similar nonresidential land use type as a proxy, consider the worker commute trip percentage and the primary, diverted, and pass-by trip values. The name of the land use type is unimportant and can be overridden with new text if desired. BAAQMD recommends using one of the types of residential land uses listed in URBEMIS as a proxy when analyzing any type of unique residential project.

For unique nonresidential types of land uses, BAAQMD recommends either using another nonresidential land use type as a proxy or using a Blank land use type. If a new land use type is analyzed using a row on the Blank tab of the *Enter Land Use Data* module, enter a trip rate as URBEMIS does not provide default trip rate on the Blank tab. BAAQMD recommends using a trip rate from the ITE Trip Generation Manual, if an appropriate trip rate is available. If an applicable trip generation rate is not available, the Lead Agency should make a good faith effort to derive a trip generation rate for the proposed project.

Operational Data

The *Enter Operational Data* module allows users to estimate vehicle exhaust emissions from trips (and associated VMT) generated by a project. The module consists of seven operational

parameter categories including *Year & Vehicle Fleet*, *Trip Characteristics*, *Temperature Data*, *Variable Starts*, *Road Dust*, *Pass-by Trips*, and *Double-Counting Correction*. The first five operational categories are all needed to calculate vehicle exhaust emissions and; therefore, cannot be turned off. Three of the seven operational categories can be turned off: *Road Dust*, *Pass-by Trips*, and *Double-Counting Correction*.

Guidance regarding each of the operational categories is provided below. In general, most of the default values for these seven source categories do not need to be changed, except where otherwise noted.

Year & Vehicle Fleet

The *Year & Vehicle Fleet* category allows users to specify the operational year for the project. Use the earliest possible year when the project would be operational to estimate worst-case operational emissions. Be aware that changing the project start year also changes the vehicle fleet mix. The default fleet mix values (i.e., *Fleet %, Vehicle Type*, *Non-Catalyst*, *Catalyst*, *Diesel*) are based on values from EMFAC using the year and the location of the project that is specified when users creates a new project in URBEMIS. The fleet mix should be modified only if it is known that the fleet mix for a project would be different from the average vehicle fleet mix in the project area. In that situation, select *Keep Current Fleet Mix When Changing Years*. Changes to the fleet mix data should be based on information provided by the transportation analysis and/or assumptions that are disclosed in the CEQA document. For instance, the fleet mix of motor vehicle trips generated by a school project would likely consist of a higher percentage of school buses and a lower percentage of motor homes and motorcycles than the URBEMIS average.

Trip Characteristics

The *Trip Characteristics* category includes trip data such as average speed, trip percentages, urban and rural trip lengths for different trip types. The trip percentages for home-based trips can be modified; however, it is not possible to modify the same for commercial-based trips, which URBEMIS calculates using the worker commute trip percentage entered in the *Enter Land Use Data* module. URBEMIS uses either the urban or rural trip length values depending on whether *Urban Project* or *Rural Project* is selected on the same screen. In general, the *Urban Project* option should be selected for most land use development projects under BAAQMD's jurisdiction. The trip length values can be changed if supported by information produced in a transportation analysis and/or reasonable assumptions about the project. For instance, the trip length for a proposed school might be adjusted according to the spatial distribution of the households that would be served by that school, particularly if the majority of trip generation would consist of parents driving their children to the school.

In addition to trip rate adjustments based on residential density, URBEMIS allows for modifications to vehicle trips based on other project characteristics. If specific project information is available for any land use type it should be reflected in the URBEMIS inputs. The table "URBEMIS Measures – Operational (Mobile-source) Measures" in Section 4.2 lists available measures to alter the trip rate to better reflect specific conditions. For example, if a project includes access to transit, URBEMIS trip rates can be adjusted between 0% and 15%. A 15% reduction in vehicle trips due to transit access would only be appropriate for a project that offers access to exceptional transit service. See the User's Guide for further instructions on all adjustments. Lead agencies must discuss and justify their reductions with substantial evidence.

Temperature Data

The *Temperature Data* category contains default ambient winter and summer temperature values which are used to estimate winter and summer emissions, respectively. The default temperature values in these data fields are specific to SFBAAB and should only be modified in consultation with BAAQMD.

Variable Starts
The *Variable Starts* parameter category shows the percentage of vehicles in several time classes (minutes since the vehicle engine was turned off) for the six trip types defined in the *Trip Characteristics* parameter category. This information is derived from the applicable EMFAC file and should only be modified in consultation BAAQMD.

Road Dust
The *Road Dust* parameter category allows users to specify the distribution of vehicle travel between paved and unpaved roads. This category is used to calculate entrained road dust emissions due to vehicle travel on paved and unpaved surfaces. Do not turn this category off, and users can adjust the percentage of travel on paved and unpaved roads if detailed project information is known.

Pass-by Trips
The *Pass-by Trips* parameter category can only be turned on or off. When selected, this category divides all the project-generated trips into primary, pass-by, and diverted-linked trips (entered as percentages in *Enter Land Use Data* module). When this category is not selected, URBEMIS assumes 100 percent of the project-generated trips are primary trips. Pass-by trips are trips made as intermediate stops on the way from an origin to a primary trip destination. URBEMIS accounts for these trips by setting the trip length to 0.1 miles for each pass-by trip. These trips are most important for retail and commercial land uses, such as gas stations and fast food restaurants. This option is not applicable to all land use types. For example, most of the trips to and from a *Warehouse* are typically expected to be primary trips and the *Pass-by Trips* option should not be used. This category check box should not be selected unless the percentage of pass-by trips is supported by a transportation analysis or a set of reasonable assumptions discussed in the CEQA document. If the trip length values in the *Trip Characteristics* category or the trip rate values in the Enter Land Use Data module are overwritten using information provided by a transportation analysis, be aware of whether the traffic data incorporated the occurrence of pass-by trips. If the *Pass-By Trips* checkbox is selected then the Lead Agency should discuss its reasoning for assuming that some of the project-generated vehicle trips would be considered pass-by trips.

Double-Counting Correction
The *Double-Counting Correction* parameter category is designed to account for internal trips between residential and nonresidential land uses. The *Double-Counting Correction* is applicable to mixed-use projects that include both residential and nonresidential land use types in the *Enter Land Use Data* module. For example, a residential trip and a retail trip generated by a mixed-use project may be the same trip. Users have the option of entering the number of internal trips between residential and nonresidential land uses in the *Enter the gross internal trip* as desired. The value entered represents the number of internal trips that would not be included in the emissions estimate. This category should not be used unless the transportation analysis or local transportation studies contain data to support the correction factor. In some cases, the transportation analysis may report project-specific trip generation that is already corrected for internal trips. Consult with a traffic engineer to determine the appropriate method to account for internal trips. The *Double-Counting Correction* checkbox should not be selected if detailed project information is unknown.

Area Source
The *Enter Area Source Data* module allows users to adjust the five area-source emission categories including, natural gas fuel combustion, hearth fuel combustion, landscape fuel combustion, consumer products, and architectural coatings. The natural gas, hearth, and landscape maintenance categories relate to on-site fuel combustion and the consumer products and architectural coatings categories address on-site evaporative emissions.

Guidance regarding each of the area-source categories is provided below. In general, most of the default values for these five source categories do not need to be changed except where otherwise noted in this guide.

Natural Gas Fuel Combustion
Parameters in the *Natural Gas Fuel Combustion* category are used to estimate the natural gas combustion emissions from space and water heating. On the *Natural Gas* tab the default percentage for land uses using natural gas should be changed to 100 percent for both residential and nonresidential land use types, as is representative of most development projects in the SFBAAB, unless project-specific data is available. Similarly, do not override the default natural gas usage values unless project-specific data is available.

Hearth Fuel Combustion
The *Hearth Fuel Combustion* category consists of separate tabs for *Hearth Percentages*, *Wood Stoves*, *Wood Fireplaces*, *Natural Gas Fireplaces*, and *Natural Gas Emission Factors*. Each of the tabs is discussed separately below.

- *Hearth Percentages*
  The parameters on the *Hearth Percentages* tab are applicable only to projects that include residential units. The default percentages should be used for the wood stoves, wood fireplaces, and wood stoves unless project-specific information is available. URBEMIS does not estimate emissions from any hearth types for nonresidential land use types.

- *Wood Stoves*
  On the *Wood Stoves* tab, the default percent values for the types of wood stoves (i.e., *Noncatalytic*, *Catalytic*, *Conventional*, and *Pellet*) should be changed in accordance with District Regulation 6, Rule 3, which allows only EPA-certified wood burning fireplaces and pellet stoves in new construction projects. The values for *Wood Burned*, *Wood Stove Usage*, and *Pounds in a Cord of Wood* should not be changed unless project-specific information is available.

- *Wood Fireplaces*
  The *Wood Fireplaces* tab is similar to the *Wood Stoves* tab. The emission factors on this tab cannot be modified. The values for *Wood Burned*, *Wood Stove Usage*, and *Pounds in a Cord of Wood* should not be changed unless project-specific information is available. District Regulation 6, Rule 3 allows only EPA-certified wood burning fireplaces in new construction projects.

- *Natural Gas Fireplaces*
  The values in the data fields on the *Natural Gas Fireplaces* tab should only be modified in the case that project-specific information is available that supports overriding default values.

- *Natural Gas Emission Factors*
  The emission factors contained in the *Natural Gas Emission Factors* tab cannot be modified. These values are used to estimate emissions from natural gas combustion in fireplaces/stoves and, according to the URBEMIS User's Guide, are based on U.S. Environmental Protection Agency Air Pollutant (AP-42) emission factors.

Landscape Fuel Combustion
The *Landscape Fuel Combustion* source category calculates on-site emissions from landscaping equipment such as lawn mowers, leaf blowers, chain saws, and hedge trimmers that are powered by internal combustion engines. On this tab, only adjust the value for the year being analyzed. The year entered into this field should be the earliest year when the project could become fully

operational. Landscaping emissions are estimated for the summer period only. URBEMIS uses emission rates from ARB's OFFROAD model to estimate of landscape maintenance equipment emissions.

Consumer Products
The *Consumer Products* source category is only relevant to projects that include residential land use types. The *Pounds of ROG (per person)* value should not be adjusted in this category. The persons per residential unit data field should be adjusted based on the estimated number of residents that would be supported by the proposed project, if available. The value should be consistent with the number of residents divided by the number of residential units.

Architectural Coating
Do not make changes to the values in the *Architectural Coating* source category without consulting BAAQMD.

EXAMPLE PROJECT OPERATIONAL-RELATED EMISSIONS CALCULATION

Description
The Example Project would develop a multi-story, mixed-use building that includes 40 units of residential condominium apartments, 50,000 square feet (or "50 thousand square feet" [ksf]) of offices and 35 ksf of retail land uses on an undeveloped 4.0-acre site. All of the residential condominium apartments would have natural gas lines for space heating but half of the units would be referred to as "suites" and include natural gas fireplaces. The regular apartments would not have natural gas fireplaces. Project construction would last two years beginning in 2010 and the project would be fully operational by 2013.

Screening Analysis
In the Land Use Module of URBEMIS (*Enter Land Use Data*) the corresponding Land Use Types of the proposed development would be Apartment High Rise units, General Office Building, and Strip Mall.

When each of the Land Use Types (i.e. Apartment High Rise units, General Office Building, and Strip Mall) is considered individually, their respective sizes would not exceed any of the District's Operational Screening Criteria (Table 3-1). However, because the project would contain more than one land use type, the operational screening levels cannot be used to assess the project's operational emissions, as explained in the discussion about the screening levels earlier in this guidance. The lead agency would be required to perform a detailed estimation of operational emissions using URBEMIS.

Emissions Quantification
When entering the proposed land uses into the Land Use Module, URBEMIS estimates the number of Acres for each Land Use Type assuming that each land use type would be constructed on separate lots. Using default values URBEMIS would assume this Example Project is 4.56 total acres (i.e. 0.65 acres for Apartment High Rise, 2.30 acres for General Office Building, and 1.61 acres for Strip Mall). For mixed-use and/or multi-level developments, the user should adjust the Acres for each of the proposed land uses such that the combined total acreage of all land use types is equal to the actual combined total size of the proposed project site (i.e., 4.0 acres, in this example) prior to running the model.

URBEMIS estimates the Trip Rate differently for residential land use types than for non-residential land use types. For residential land use types, URBEMIS adjusts the default Trip Rate based on residential density (i.e., dwelling units/residential acre). Therefore, overriding the default

value for the number of Acres assumed by URBEMIS for a residential land use type would automatically result in a change to the value assumed in the Trip Rate data field. If both the number of Acres and the Trip Rate for a residential development are known, the user should adjust the Acres field first, then adjust the Trip Rate field, and then click the Submit button. For nonresidential Land Use Types, URBEMIS uses a default value for in the Trip Rate data field that is directly based on the Unit Amt entered into the Land Use Module. The trip rates used by URBEMIS are based on standard rates from the ITE Trip Generation Manual. URBEMIS also assumes a Floor Area Ratio (FAR) of 0.5 for all nonresidential land use types. The FAR is the ratio of the total floor area of a building to the size of the parcel on which it is located. The user should override the value in the Acres data field based on the actual FAR for the development, as appropriate.

In the Area Source Module, Hearth Fuel Combustion category, the user should change the data fields for Wood Stoves, Wood Fireplaces, Natural Gas Fireplaces, and None (% w/o any hearth option) on the Hearth Percentages tab to 0, 0, 50, and 50, respectively to match the project description. In the Landscape Fuel Combustion source category the Year being Analyzed data field should be changed to 2013.

In the Operational Module the year data field in the Year & Vehicle Fleet category page should also be changed to 2013.

Lastly, the estimated daily and annual emissions of criteria air pollutants and precursors should be compared to the District's thresholds of significance (Table 2-2). If the daily or annual emissions would exceed the thresholds of significance, operational emissions would be considered significant and all feasible mitigation measures should be implemented to reduce these emissions.

CONSTRUCTION-RELATED EMISSIONS

Land Use Development Projects

URBEMIS includes a module (*Enter Construction Data*) that quantifies emissions from the following construction-related activity phases: demolition, mass and fine grading ("grading"), trenching, asphalt paving, building construction, and the application of architectural coatings.

URBEMIS Input Parameters

BAAQMD recommends input parameters and data requirements along with general URBEMIS user information for each construction-related activity phase below. Refer to the URBEMIS User's Manual for more detailed information. Appendix A contains a *Construction Data Needs Form* template that can be used to assist with requesting and gathering project-specific information.

Land Use Type and Size

Choose each individual land use type (e.g., single family housing, apartment high rise, regional shopping center, or office park) that is most applicable to the proposed development project in the *Enter Land Use Data* module and enter the size of the project (e.g., acres, thousand square feet [ksf], students, dwelling units [du], rooms, pumps, rooms, or employees). For several of the land use types, various size units are available (e.g., ksf and acres); ensure that the unit type for the project-specific data is consistent with the unit type selected in URBEMIS.

Schedule

The project schedule typically provides the number of months or days required for the completion of each construction-related activity phase (e.g., grading, building construction, asphalt paving), as well as the total duration of project construction. Where project-specific information is

available, modify URBEMIS default assumptions in *Click to Add, Delete, or Modify Phases* under the *Enter Construction Data* module. In this module, add or delete construction activities, add multiple similar construction activities (e.g., three grading phases), as well as overlap any construction activities as necessary. The URBEMIS default assumption for the number of work days per week is five, which inherently assumes that construction-related activities would only occur during weekdays, not on weekends. This can be altered if project-specific data is available in *Click to Add, Delete, or Modify Phases* under the construction phase setting *Work Days/Week.* For projects with specific phasing information (i.e., duration of each construction phase), but no definite construction commencement date, the earliest feasible start date should be used to be conservative. In addition, when project-specific information is not known, assume some overlap of construction phases (e.g., overlap of grading and asphalt paving activities or asphalt paving and building construction activities) to also be conservative. Please note that URBEMIS quantifies annual emissions on a calendar year basis (i.e., January to December) rather than the year-long period (running yearly average from the start date of construction) with the maximum amount of emissions.

Demolition

URBEMIS quantifies exhaust and fugitive PM dust emissions from demolition activities in the *Demolition Phase* within the *Enter Construction Data* module. Information to quantify emissions from this activity phase includes:

1. Duration of demolition (work days/week, phase start and end dates);
2. Total volume of building to be demolished (width, length, and height);
3. Maximum daily volume of building to be demolished (width, length, and height);
4. Haul truck capacity (cubic yards [yd^3]);
5. Haul truck trip length to disposal site (round trip miles); and
6. Off-road equipment requirements (number and type of equipment).

URBEMIS contains default assumptions for haul truck capacity (yd^3 per truck) and round trip distance (miles), if project-specific information is not available. URBEMIS also contains default assumptions for off-road equipment requirements. URBEMIS bases these on the size(s) of the proposed land use type(s) in the *Enter Land Use Data* module to estimate the off-road equipment requirements. In other words, URBEMIS assumes the size of the land use to be demolished is equal to the land use that would be developed. If the size(s) and/or type(s) of the land use(s) to be demolished are different from the land use(s) to be developed, create a separate URBEMIS run to quantify demolition emissions. Input the size and type of land use(s) for the different demolition building space versus the proposed building space in the *Enter Land Use Data* module for the separate URBEMIS run and only include the *Demolition* phase within the *Enter Construction Data* module.

Site Grading (Mass and Fine)

URBEMIS quantifies exhaust and fugitive PM dust emissions from grading activities in the *Site Grading* phase within the *Enter Construction Data* module. Information to quantify emissions from this activity phase includes, where applicable:

1. Duration of grading (work days/week, phase start and end dates);
2. Total acreage to be graded (acres);
3. Maximum daily acreage disturbed (acres per day);
4. Type and amount of cut/fill activities (yd^3 per day on- or off-site);
5. Description of soil hauling (amount of soil import/export [yd^3], haul truck capacity [yd^3 per truck], round trips per day, round trip distance [miles]); and

6. Off-road grading equipment requirements (number and type of equipment).

URBEMIS default assumptions for the total acreage to be graded and the maximum daily acreage disturbed are shown in the *Daily Acreage* tab within the *Site Grading* phase. Under the default settings, URBEMIS assumes that the maximum daily acreage disturbed is equivalent to 25 percent of the total acreage to be graded. Override this default assumption if more specific project information is available. The *Site Grading* phase consists of separate tabs for *Daily Acreage*, as mentioned above, *Fugitive Dust*, *Soil Hauling*, and *Site Grading Equipment*. Due to the differences in methodology and level of information required, each is discussed separately below.

Fugitive Dust

URBEMIS quantifies fugitive PM dust emissions in the *Site Grading* phase under the *Fugitive Dust* tab. URBEMIS provides four different levels of detail from which to select (i.e., default, low, medium, and high), described below.

Default: This method involves the use of the *Default Emission Rate* quantification methodology in the *Fugitive Dust* tab for which fugitive PM dust emissions are based on an emission rate (pound per disturbed acre per day [lb/acre-day]). This method should only be used when no project-specific information is known, or when no cut/fill activities would occur. BAAQMD recommends the selection of the worst-case emission rate (i.e., 38.2 lb/acre-day) for extensive site preparation activities (e.g., cut/fill) where the exact type and amount (e.g., yd^3 per day on- or off-site) are not known, and selection of the average emission rate (i.e., 10 lb/acre-day) otherwise. The average emission rate would be used for projects that involve typical site grading activities, but no cut/fill or earthmoving activities.

Low: The *Low Level of Detail* quantification method should be used when cut/fill activities would occur and the amount of on-site and off-site cut/fill is known. Input the type and amount of cut/fill activities (yd^3 per day on- or off-site). On-site cut/fill activities involve soil movement within the boundaries of the project site via scrapers or graders, while off-site cut/fill activities involve soil movement outside of the boundaries of the project site via haul trucks. Projects that require off-site cut/fill should also enter the appropriate amount of soil import/export in the *Soil Hauling* tab, as discussed in more detail below.

Medium: The *Medium Level of Detail* quantification method should be used when cut/fill activities would occur and the required number of activity hours per day for on-site scrapers and off-site haul trucks is known. Input the number of hours per day for on-site scraper and off-site haul trucks conducting cut/fill activities. Input the total number of scraper-hours and/or haul truck-hours that are anticipated to occur per day. For example, if two scrapers would operate for eight hours per day each and three haul trucks would operate for four hours per day each, enter 16 for the *Onsite Scraper* parameter (i.e., 2 scrapers × 8 hours) and 12 for the *Offsite Haul* parameter (i.e., 3 haul trucks × 4 hours). Similar to the *Low Level of Detail* quantification method, on-site cut/fill activities involve soil movement within the boundaries of the project site via scrapers or graders, while off-site cut/fill activities involve soil movement outside of the boundaries of the project site via haul trucks. Projects that require off-site cut/fill should also enter the appropriate amount of soil import/export in the *Soil Hauling* tab, as discussed in more detail below.

High: The *High Level of Detail* quantification method should be used when cut/fill activities would occur and details about soil haulage is known. Input data on the amount of on- and off-site haulage (ton-miles per day) based on the total volume of cut/fill (yd^3), duration of the cut/fill activities (work days), density of soil being moved (tons per yd^3), and the scraper or haul truck round-trip distance (miles). A *High Level Haulage Input* worksheet that can be used to assist with

determining the amount of on- and off-site haulage (ton-miles per day) required for this method is contained in Appendix A.

Soil Hauling
URBEMIS quantifies entrained PM road dust and exhaust emissions from soil hauling in the *Soil Hauling* tab within the *Site Grading* phase. Information requirements include the amount of soil import/export (yd^3), round trips per day, round trip distance (miles), and haul truck capacity (yd^3 per truck). For round trip distance and haul truck capacity, URBEMIS provides default assumptions of 20 yd^3 per truck and 20 miles, respectively. Override the default assumptions if the project specific values are known.

Grading Equipment
URBEMIS quantifies exhaust emissions from on-site heavy-duty equipment in the *Site Grading Equipment* tab within the *Site Grading* phase. Information requirements include the type of equipment and quantity or amount, along with horsepower, load factor, and hours of operation per work day. URBEMIS provides default assumptions for all of these, primarily based on the amount of maximum daily acreage disturbed shown in the *Daily Acreage* tab. If project-specific grading equipment is known, click on the *All Checks Off* button and input the number for each type of equipment to be used for the project. Note that although the *All Checks Off* button will allow users to override the URBEMIS default equipment assumptions in the *Amount Model Uses* column, make sure to delete the previous URBEMIS default equipment selections prior to entering the project-specific equipment information.

Asphalt Paving
URBEMIS quantifies off-gas and exhaust emissions from asphalt paving activities in the *Paving* tab within the *Enter Construction Data* module. Information to quantify emissions from this activity phase includes the duration of asphalt paving (work days/week, phase start and end dates), total acreage to be paved, and off-road equipment requirements. URBEMIS includes default assumptions for the amount of asphalt to be paved based on the size of the proposed land use type(s) in the *Enter Land Use Data* module. Account for the size of project features (e.g., parking structure, roadways, and large hardtop fields) that would require asphalt paving in excess of default assumptions (i.e., standard site access and parking spaces) within the *Total Acreage to be Paved with Asphalt* parameter.

Architectural Coating
URBEMIS quantifies off-gas emissions from the application of architectural coatings in the *Arch Coating* tab within the *Enter Construction Data* module. Information to quantify emissions from this phase include the duration of activities (i.e., work days/week, phase start and end dates). URBEMIS includes default parameters for the volatile organic compound content per liter of coating based on BAAQMD's Regulation 8, Rule 3: Architectural Coating.

Basic Construction Mitigation Measures
BAAQMD recommends that all proposed projects implement the *Basic Construction Mitigation Measures* regardless of the significance determination. The methodology for quantifying criteria air pollutant and precursor emission reductions from both fugitive PM dust and exhaust emissions by implementing the *Basic Construction Mitigation Measures* discussed below.

Fugitive Particulate Matter Dust Emissions
For quantification of fugitive PM dust-related *Basic Construction Mitigation Measures* in URBEMIS, BAAQMD first recommends selecting the *Mitigation* option in the *Enter Construction Data* module for the *Site Grading* phase. For *Site Grading Soil Disturbance Mitigation*, select (turn on) the soil stabilizing measure titled *Water exposed surfaces* along with the two times daily option without altering the default percent reduction. For *Unpaved Roads Mitigation*, select the

measure titled *Reduce speed on unpaved roads to less than 15 mph* without altering the default percent reduction. URBEMIS assumes that fugitive PM dust emissions from soil disturbance activities and travel on unpaved roads account for approximately 79 percent and 21 percent of total the fugitive PM dust emissions, respectively. URBEMIS will apply an approximate 53 percent reduction to total fugitive PM dust emissions as a result of implementation of the *Basic Construction Mitigation Measures* 1 through 5 in Table 8-2.

BAAQMD considers this as a surrogate for the implementation of the *Basic Construction Mitigation Measures* listed in Section 8.2. RoadMod assumes an inherent 50 percent reduction in fugitive PM dust emissions when water trucks are selected. BAAQMD recommends selecting water trucks to account for the implementation of the *Basic Construction Mitigation Measures*.

Exhaust Emissions

For quantification of the exhaust-related *Basic Construction Mitigation Measures* in URBEMIS, select the *Mitigation* option in the *Enter Construction Data* module for the *Site Grading*, *Building Construction,* and *Asphalt Paving* phases, as applicable to the proposed project. BAAQMD then recommends that for the *Off-Road Equipment Mitigation*, select (turn on) the measure titled *Use aqueous diesel fuel* and alter the default percent reduction for each to match those recommended by BAAQMD in Section 8.2. BAAQMD considers this as a surrogate for the implementation of the *Basic Construction Mitigation Measures* listed in Section 8.2.

RoadMod

RoadMod does not calculate emission reductions associated with the implementation of the exhaust-related *Basic Construction Mitigation Measures*. To quantify the exhaust-related emission reductions associated with the implementation of the *Basic Construction Mitigation Measures*, rely on the information and data contained in the *Data Entry* and *Emission Estimates* tabs in RoadMod. Reductions in exhaust emissions should be quantified separately for each phase (i.e., Grubbing/Land Clearing, Grading/Excavation, Drainage/Utilities/ Sub-Grade, and Paving). First isolate the exhaust emissions from off-road (e.g., heavy-duty) equipment for each phase. Table 8-4 below provides a cell reference for the *Data Entry* tab of RoadMod to assist with the identification and isolation of such emissions.

Once isolated, apply the specified percent reductions listed in Section 8.2 to each compound emission to determine the resultant amount of mitigated emissions from construction of the proposed project for each phase. A 5 percent reduction could be applied for NO_X, PM_{10}, and $PM_{2.5}$ to account for implementation of the appropriate *Basic Construction Mitigation Measures*.

Emission reductions should be estimated by multiplying the total emissions for each compound by the anticipated emission reduction applicable for that compound to estimate the mitigated amount of emissions reductions.

Linear Projects

For proposed projects that are linear in nature (e.g., road or levee construction, pipeline installation, transmission lines), BAAQMD recommends using the most current version of Sacramento Metropolitan Air Quality Management District's (SMAQMD) Road Construction Emissions Model (RoadMod) to quantify construction-related criteria air pollutants and precursors. Similar to URBEMIS, RoadMod quantifies fugitive PM dust, exhaust, and off-gas emissions from the following construction-related activity phases: grubbing/land clearing, grading/excavation, drainage/utilities/sub-grade, and paving. BAAQMD recommends using RoadMod in accordance with the user instructions and default assumptions unless project-specific information is available. The default assumptions are applicable to projects located within the SFBAAB. Also, URBEMIS inherently accounts for the on-site construction of roadways and the installation of project infrastructure. If the proposed project involves off-site improvements that

are linear in nature (e.g., roadway widening), use RoadMod in addition to URBEMIS to determine total emissions.

Table B-1
Roadway Construction Emissions Model
Cell Reference for Unmitigated Off-Road Equipment Emissions

Linear Construction Phase	NO_X	PM_{10}	$PM_{2.5}$
Grubbing/Land Clearing	G155	H155	I155
Grading/Excavation	G195	H195	I195
Drainage/Utilities/Sub-Grade	G235	H235	I235
Paving	G275	H275	I275

Notes: NO_X = oxides of nitrogen; $PM_{2.5}$ = fine particulate matter with an aerodynamic resistance diameter of 2.5 micrometers or less; PM_{10} = respirable particulate matter with an aerodynamic resistance diameter of 10 micrometers or less.
Cell references refer to the *Data Entry* tab from the SMAQMD Road Construction Emissions Model.
Source: SMAQMD 2009.

NO_X Emission Reduction
Emissions of NO_X (lb/day) × (1 – [NO_X percent reduction])

PM_{10} Emission Reduction
Emissions of PM_{10} (lb/day) × (1 – [PM_{10} percent reduction])

$PM_{2.5}$ Emission Reduction
Emissions of $PM_{2.5}$ (lb/day) × ([1 – [$PM_{2.5}$ percent reduction])

Users should use the *Emission Estimates* tab to calculate the total mitigated amount of emissions for each phase of construction. The total NO_X, PM_{10}, and $PM_{2.5}$ exhaust emissions for each phase are contained in cells E6 to E9, H6 to H9, and K6 to K9, respectively. To calculate the total amount of mitigated emissions, first subtract the unmitigated off-road equipment exhaust emissions (Please refer to Table 8-2) from the total exhaust emissions to calculate total emissions without inclusion of off-road equipment exhaust emissions. Then, add the mitigated off-road exhaust emissions (calculated with the method described above) to the remaining emissions to calculate the total emissions with mitigated off-road construction equipment exhaust emissions. For PM_{10} and $PM_{2.5}$, add the mitigated exhaust emissions with the mitigated fugitive PM dust emissions (calculated by RoadMod) to calculate the total amount of mitigated PM_{10} and $PM_{2.5}$ emissions.

Fugitive Particulate Matter Dust
BAAQMD recommends that for *Site Grading Soil Disturbance Mitigation* select (turn on) the soil stabilizing measure titled *Equipment loading/unloading*. To account for the implementation of the *Additional Construction Mitigation Measures* 1 through 8, alter the default percent reduction to 63 percent, which would result in a total reduction of 75 percent in fugitive PM dust emissions.

To quantify emission reductions associated with the implementation of the fugitive PM dust-related *Additional Construction Mitigation Measures* in RoadMod, rely on the *Emission Estimates* tab. RoadMod assumes a 50 percent reduction in fugitive PM dust emissions. Apply an additional 50 percent reduction to the fugitive PM dust emissions contained in the *Emission Estimates* tab of RoadMod to account for the implementation of the *Additional Construction Mitigation Measures* 1

through 8. The resulting total percent reduction from fugitive PM dust emissions would be 75 percent (i.e., 1 – (0.5 × 0.5)). The resultant amount of fugitive PM dust emissions should be added to the average daily mitigated exhaust PM emissions (methodology described below) to calculate the total amount of mitigated PM_{10} and $PM_{2.5}$ emissions.

Exhaust Emissions

BAAQMD recommends that for the *Off-Road Equipment Mitigation* select (turn on) the measure titled *Diesel particulate filter* and alter the default percent reduction for each to match those recommended by BAAQMD in Section 8.2. BAAQMD considers this as a surrogate for the implementation of the *Additional Construction Mitigation Measures*. BAAQMD recommends that, if implementing Measure 9, turn on the measure titled *Use aqueous diesel fuel* and alter the default percent reduction values to 20 percent for NO_X and 45 percent for PM_{10}, and $PM_{2.5}$.

For RoadMod, apply a 20 percent reduction for NO_X and a 45 percent reduction for PM_{10} and $PM_{2.5}$ to account for implementation of Measure 9 in the *Additional Construction Mitigation Measure* .To quantify the other exhaust-related emission reductions associated with the implementation of the *Additional Construction Mitigation Measures*, follow the same methodology described above for applying the reductions associated with the implementation of the *Basic Construction Mitigation Measures*.

Off-Gas Emissions

For quantification of off-gas-related *Additional Construction Mitigation Measures*, first select the *Mitigation* option in the *Enter Construction Data* module for the *Architectural Coating* phase. Then select (turn on) the measures applicable to the proposed project and alter the default percent reduction for each to match those recommended by BAAQMD in Section 8.2. BAAQMD considers this as a surrogate for the implementation of the *Additional Construction Mitigation Measures* listed in Section 8.2.

EXAMPLE PROJECT CONSTRUCTION-RELATED EMISSIONS CALCULATION

Description

This Example Project proposes development of 100 single-family residential units over a 2-year period. The project site would be approximately 33 acres (URBEMIS default assumption) and require an undetermined volume of fill materials to be imported to the site. In addition, the project would involve construction of a new access road to serve the development.

Screening Analysis

The project size is less than the construction screening level for single-family residential uses listed in Table 3-4. However, because the project includes the import of fill to the site, the construction screening levels cannot be used to address construction emissions. Therefore, a detailed quantitative analysis of construction-generated NO_X emissions should be performed using URBEMIS to estimate NO_X generated by construction of the residential units and using the RoadMod to estimate NO_X emissions from construction of the new access road.

Emissions Quantification

The size and type of land use proposed (i.e., single family housing) should be entered into the Land Use Module in URBEMIS. In this case, the project's total acres are equal to the default URBEMIS assumption; therefore, no override is necessary in the Acres data field. Modeling the construction emissions associated with single-family residential units in URBEMIS requires detailed information about the construction schedule (e.g., commencement date, types of construction activities required, and length of construction activities).

The fugitive PM dust emissions associated with fill activities should be estimated using the Fugitive Dust tab of the Mass Site Grading phase. For use of the Low Level of Detail quantification method, the volume of fill activities should be divided by the number of days that fill activities would occur. For example, if the project would require up to 20,000 yd^3 of fill materials to be imported over a minimum of 40 work days, the user should enter 500 (i.e., 20,000 yd^3 ÷ 40 days) into the Amount of Offsite Cut/Fill (cubic yards/day) data field. In addition, users should also input the total volume of fill materials to be imported into the Total Amount of Soil to Import (cubic yards) data field in the Soil Hauling tab. Off-road construction equipment for grading activities is estimated by URBEMIS based on the Maximum Daily Acreage Disturbed data field.

URBEMIS estimates the types and quantities of construction equipment in the Building Construction phase to develop the proposed project. For the Asphalt Paving phase, URBEMIS assumes the project requires asphalt paving for 25% of the total site. If more specific information can be provided, then user should turn off the Reset acreage with land use changes button in the Off Gas Emissions tab and override the Total Acreage to be Paved with Asphalt data field.

Due to the linear nature of the new access road to the project, daily mass emissions associated with its construction should be quantified using RoadMod. Users should obtain basic project information for the new access road and enter the information into the Data Entry tab of RoadMod. If project-specific information is not available RoadMod estimates the construction schedule for the road and the equipment used in each construction phase.

For analysis of the project's total average daily emissions, users should add emissions of each respective pollutant associated with development of the single-family residential units with the respective emissions associated with construction of the access road where construction activities are anticipated to overlap in the construction schedule. The average daily emissions of each pollutant that would occur throughout the entire construction period should be identified and compared with the District's threshold of significance. If the emissions would exceed the threshold of significance, construction emissions would be considered significant and all feasible mitigation measures to reduce emissions shall be implemented.

The user should keep in mind that the District's numeric thresholds for construction emissions apply to exhaust emissions only. The District recommends implementation of Basic Control Measures to reduce fugitive dust emissions for all projects, and Additional Control Measures to reduce fugitive dust emissions for significant projects.

C. SAMPLE AIR QUALITY SETTING

The Bay Area Air Quality Management District (BAAQMD) is the regional air quality agency for 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, the southern portion of Sonoma, and the southwestern portion of Solano County. Air quality in this area is determined by such natural factors as topography, meteorology, and climate, in addition to the presence of existing air pollution sources and ambient conditions. These factors along with applicable regulations are discussed below.

C.1.1. Climate, Topography, Air Pollution Potential

The SFBAAB is characterized by complex terrain, consisting of coastal mountain ranges, inland valleys, and bays, which distort normal wind flow patterns. The Coast Range splits resulting in a western coast gap, Golden Gate, and an eastern coast gap, Carquinez Strait, which allow air to flow in and out of the SFBAAB and the Central Valley.

The climate is dominated by the strength and location of a semi-permanent, subtropical high-pressure cell. During the summer, the Pacific high pressure cell is centered over the northeastern Pacific Ocean resulting in stable meteorological conditions and a steady northwesterly wind flow. Upwelling of cold ocean water from below to the surface because of the northwesterly flow produces a band of cold water off the California coast. The cool and moisture-laden air approaching the coast from the Pacific Ocean is further cooled by the presence of the cold water band resulting in condensation and the presence of fog and stratus clouds along the Northern California coast.

In the winter, the Pacific high-pressure cell weakens and shifts southward resulting in wind flow offshore, the absence of upwelling, and the occurrence of storms. Weak inversions coupled with moderate winds result in a low air pollution potential.

High Pressure Cell

During the summer, the large-scale meteorological condition that dominates the West Coast is a semi-permanent high pressure cell centered over the northeastern Pacific Ocean. This high pressure cell keeps storms from affecting the California coast. Hence, the SFBAAB experiences little precipitation in the summer months. Winds tend to blow on shore out of the north/northwest.

The steady northwesterly flow induces upwelling of cold water from below. This upwelling produces a band of cold water off the California coast. When air approaches the California coast, already cool and moisture-laden from its long journey over the Pacific, it is further cooled as it crosses this bank of cold water. This cooling often produces condensation resulting in a high incidence of fog and stratus clouds along the Northern California coast in the summer.

Generally in the winter, the Pacific high weakens and shifts southward, winds tend to flow offshore, upwelling ceases and storms occur. During the winter rainy periods, inversions (layers of warmer air over colder air; see below) are weak or nonexistent, winds are usually moderate and air pollution potential is low. The Pacific high does periodically become dominant, bringing strong inversions, light winds and high pollution potential.

Topography

The topography of the SFBAAB is characterized by complex terrain, consisting of coastal mountain ranges, inland valleys and bays. This complex terrain, especially the higher elevations, distorts the normal wind flow patterns in the SFBAAB. The greatest distortion occur when low-level inversions are present and the air beneath the inversion flows independently of air above the inversion, a condition that is common in the summer time.

The only major break in California's Coast Range occurs in the SFBAAB. Here the Coast Range splits into western and eastern ranges. Between the two ranges lies San Francisco Bay. The gap in the western coast range is known as the Golden Gate, and the gap in the eastern coast range is the Carquinez Strait. These gaps allow air to pass into and out of the SFBAAB and the Central Valley.

Wind Patterns

During the summer, winds flowing from the northwest are drawn inland through the Golden Gate and over the lower portions of the San Francisco Peninsula. Immediately south of Mount Tamalpais, the northwesterly winds accelerate considerably and come more directly from the west as they stream through the Golden Gate. This channeling of wind through the Golden Gate produces a jet that sweeps eastward and splits off to the northwest toward Richmond and to the southwest toward San Jose when it meets the East Bay hills.

Wind speeds may be strong locally in areas where air is channeled through a narrow opening, such as the Carquinez Strait, the Golden Gate or the San Bruno gap. For example, the average wind speed at San Francisco International Airport in July is about 17 knots (from 3 p.m. to 4 p.m.), compared with only 7 knots at San Jose and less than 6 knots at the Farallon Islands.

The air flowing in from the coast to the Central Valley, called the sea breeze, begins developing at or near ground level along the coast in late morning or early afternoon. As the day progresses, the sea breeze layer deepens and increases in velocity while spreading inland. The depth of the sea breeze depends in large part upon the height and strength of the inversion. If the inversion is low and strong, and hence stable, the flow of the sea breeze will be inhibited and stagnant conditions are likely to result.

In the winter, the SFBAAB frequently experiences stormy conditions with moderate to strong winds, as well as periods of stagnation with very light winds. Winter stagnation episodes are characterized by nighttime drainage flows in coastal valleys. Drainage is a reversal of the usual daytime air-flow patterns; air moves from the Central Valley toward the coast and back down toward the Bay from the smaller valleys within the SFBAAB.

Temperature

Summertime temperatures in the SFBAAB are determined in large part by the effect of differential heating between land and water surfaces. Because land tends to heat up and cool off more quickly than water, a large-scale gradient (differential) in temperature is often created between the coast and the Central Valley, and small-scale local gradients are often produced along the shorelines of the ocean and bays. The temperature gradient near the ocean is also exaggerated, especially in summer, because of the upwelling of cold ocean bottom water along the coast. On summer afternoons the temperatures at the coast can be 35^{o}F cooler than temperatures 15 to 20 miles inland. At night this contrast usually decreases to less than 10^{o}.

In the winter, the relationship of minimum and maximum temperatures is reversed. During the daytime the temperature contrast between the coast and inland areas is small, whereas at night the variation in temperature is large.

Precipitation

The SFBAAB is characterized by moderately wet winters and dry summers. Winter rains account for about 75 percent of the average annual rainfall. The amount of annual precipitation can vary greatly from one part of the SFBAAB to another even within short distances. In general, total annual rainfall can reach 40 inches in the mountains, but it is often less than 16 inches in sheltered valleys.

During rainy periods, ventilation (rapid horizontal movement of air and injection of cleaner air) and vertical mixing are usually high, and thus pollution levels tend to be low. However, frequent dry periods do occur during the winter where mixing and ventilation are low and pollutant levels build up.

Air Pollution Potential

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

Wind Circulation

Low wind speed contributes to the buildup of air pollution because it allows more pollutants to be emitted into the air mass per unit of time. Light winds occur most frequently during periods of low sun (fall and winter, and early morning) and at night. These are also periods when air pollutant emissions from some sources are at their peak, namely, commute traffic (early morning) and wood burning appliances (nighttime). The problem can be compounded in valleys, when weak flows carry the pollutants upvalley during the day, and cold air drainage flows move the air mass downvalley at night. Such restricted movement of trapped air provides little opportunity for ventilation and leads to buildup of pollutants to potentially unhealthful levels.

Wind-roses provide useful information for communities that contain industry, landfills or other potentially odorous or noxious land uses. Each wind-rose diagram provides a general indication of the proportion of time that winds blow from each compass direction. The longer the vector length, the greater the frequency of wind occurring from that direction. Such information may be particularly useful in planning buffer zones. For example, sensitive receptors such as residential developments, schools or hospitals are inappropriate uses immediately downwind from facilities that emit toxic or odorous pollutants, unless adequate separation is provided by a buffer zone. Caution should be taken in using wind-roses in planning and environmental review processes. A site on the opposite side of a hill or tall building, even a short distance from a meteorological monitoring station, may experience a significant difference in wind pattern. Consult BAAQMD meteorologists if more detailed wind circulation information is needed.

Inversions

An inversion is a layer of warmer air over a layer of cooler air. Inversions affect air quality conditions significantly because they influence the mixing depth, i.e., the vertical depth in the atmosphere available for diluting air contaminants near the ground. The highest air pollutant concentrations in the SFBAAB generally occur during inversions.

There are two types of inversions that occur regularly in the SFBAAB. One is more common in the summer and fall, while the other is most common during the winter. The frequent occurrence of elevated temperature inversions in summer and fall months acts to cap the mixing depth, limiting the depth of air available for dilution. Elevated inversions are caused by subsiding air from the subtropical high pressure zone, and from the cool marine air layer that is drawn into the SFBAAB by the heated low pressure region in the Central Valley.

The inversions typical of winter, called radiation inversions, are formed as heat quickly radiates from the earth's surface after sunset, causing the air in contact with it to rapidly cool. Radiation inversions are strongest on clear, low-wind, cold winter nights, allowing the build-up of such pollutants as carbon monoxide and particulate matter. When wind speeds are low, there is little mechanical turbulence to mix the air, resulting in a layer of warm air over a layer of cooler air next

to the ground. Mixing depths under these conditions can be as shallow as 50 to 100 meters, particularly in rural areas. Urban areas usually have deeper minimum mixing layers because of heat island effects and increased surface roughness. During radiation inversions downwind transport is slow, the mixing depths are shallow, and turbulence is minimal. All of these factors contribute

Although each type of inversion is most common during a specific season, either inversion mechanism can occur at any time of the year. Sometimes both occur simultaneously. Moreover, the characteristics of an inversion often change throughout the course of a day. The terrain of the SFBAAB also induces significant variations among subregions.

Solar Radiation

The frequency of hot, sunny days during the summer months in the SFBAAB is another important factor that affects air pollution potential. It is at the higher temperatures that ozone is formed. In the presence of ultraviolet sunlight and warm temperatures, reactive organic gases and oxides of nitrogen react to form secondary photochemical pollutants, including ozone.

Because temperatures in many of the SFBAAB inland valleys are so much higher than near the coast, the inland areas are especially prone to photochemical air pollution.

In late fall and winter, solar angles are low, resulting in insufficient ultraviolet light and warming of the atmosphere to drive the photochemical reactions. Ozone concentrations do not reach significant levels in the SFBAAB during these seasons.

Sheltered Terrain

The hills and mountains in the SFBAAB contribute to the high pollution potential of some areas. During the day, or at night during windy conditions, areas in the lee sides of mountains are sheltered from the prevailing winds, thereby reducing turbulence and downwind transport. At night, when wind speeds are low, the upper atmospheric layers are often decoupled from the surface layers during radiation conditions. If elevated terrain is present, it will tend to block pollutant transport in that direction. Elevated terrain also can create a recirculation pattern by inducing upvalley air flows during the day and reverse downvalley flows during the night, allowing little inflow of fresh air.

The areas having the highest air pollution potential tend to be those that experience the highest temperatures in the summer and the lowest temperatures in the winter. The coastal areas are exposed to the prevailing marine air , creating cooler temperatures in the summer, warmer temperatures in winter, and stratus clouds all year. The inland valleys are sheltered from the marine air and experience hotter summers and colder winters. Thus, the topography of the inland valleys creates conditions conducive to high air pollution potential.

Pollution Potential Related to Emissions

Although air pollution potential is strongly influenced by climate and topography, the air pollution that occurs in a location also depends upon the amount of air pollutant emissions in the surrounding area or transported from more distant places. Air pollutant emissions generally are highest in areas that have high population densities, high motor vehicle use and/or industrialization. These contaminants created by photochemical processes in the atmosphere, such as ozone, may result in high concentrations many miles downwind from the sources of their precursor chemicals.

Climatological Subregions

This section discusses the varying climatological and topographic conditions, and the resulting variations in air pollution potential, within inhabited subregions of the SFBAAB. All urbanized areas of the SFBAAB are included in one of 11 climatological subregions. Sparsely inhabited

areas are excluded from the subregional designations. Some of the climatological subregions discussed in this appendix overlap county boundaries. The Lead Agencies analyzing projects located close to the boundary between subregions may need to examine the characteristics of the neighboring subregions to adequately evaluate potential air quality impacts.

The information about each subregion includes location, topography and climatological factors relevant to air quality. Where relevant to air quality concerns, more localized subareas within a subregion are discussed. Each subregional section concludes with a discussion of pollution potential resulting from climatological and topographic variables and the major types of air pollutant sources in the subregion.

Carquinez Strait Region

The Carquinez Strait runs from Rodeo to Martinez. It is the only sea-level gap between the Bay and the Central Valley. The subregion includes the lowlands bordering the strait to the north and south, and includes the area adjoining Suisun Bay and the western part of the Sacramento-San Joaquin Delta as far east as Bethel Island. The subregion extends from Rodeo in the southwest and Vallejo in the northwest to Fairfield on the northeast and Brentwood on the southeast.

Prevailing winds are from the west in the Carquinez Strait. During the summer and fall months, high pressure offshore coupled with low pressure in the Central Valley causes marine air to flow eastward through the Carquinez Strait. The wind is strongest in the afternoon. Afternoon wind speeds of 15 to 20 mph are common throughout the strait region. Annual average wind speeds are 8 mph in Martinez, and 9 to 10 mph further east. Sometimes atmospheric conditions cause air to flow from the east. East winds usually contain more pollutants than the cleaner marine air from the west. In the summer and fall months, this can cause elevated pollutant levels to move into the central SFBAAB through the strait. These high pressure periods are usually accompanied by low wind speeds, shallow mixing depths, higher temperatures and little or no rainfall.

Summer mean maximum temperatures reach about 90° F. in the subregion. Mean minimum temperatures in the winter are in the high 30's. Temperature extremes are especially pronounced in sheltered areas farther from the moderating effects of the strait itself, e.g. at Fairfield.

Many industrial facilities with significant air pollutant emissions — e.g., chemical plants and refineries — are located within the Carquinez Strait Region. The pollution potential of this area is often moderated by high wind speeds. However, upsets at industrial facilities can lead to short-term pollution episodes, and emissions of unpleasant odors may occur at anytime. Receptors downwind of these facilities could suffer more long-term exposure to air contaminants than individuals elsewhere., It is important that local governments and other Lead Agencies maintain buffers zones around sources of air pollution sufficient to avoid adverse health and nuisance impacts on nearby receptors. Areas of the subregion that are traversed by major roadways, e.g. Interstate 80, may also be subject to higher local concentrations of carbon monoxide and particulate matter, as well as certain toxic air contaminants such as benzene.

Cotati and Petaluma Valleys

The subregion that stretches from Santa Rosa to the San Pablo Bay is often considered as two different valleys: the Cotati Valley in the north and the Petaluma Valley in the south. To the east, the valley is bordered by the Sonoma Mountains, while to the west is a series of low hills, followed by the Estero Lowlands, which open to the Pacific Ocean. The region from the Estero Lowlands to the San Pablo Bay is known as the Petaluma Gap. This low-terrain area allows marine air to travel into the SFBAAB.

Wind patterns in the Petaluma and Cotati Valleys are strongly influenced by the Petaluma Gap, with winds flowing predominantly from the west. As marine air travels through the Petaluma Gap, it splits into northward and southward paths moving into the Cotati and Petaluma valleys. The

southward path crosses San Pablo Bay and moves eastward through the Carquinez Strait. The northward path contributes to Santa Rosa's prevailing winds from the south and southeast. Petaluma's prevailing winds are from the northwest.

When the ocean breeze is weak, strong winds from the east can predominate, carrying pollutants from the Central Valley and the Carquinez Strait. During these periods, upvalley flows can carry the polluted air as far north as Santa Rosa.

Winds are usually stronger in the Petaluma Valley than the Cotati Valley because the former is directly in line with the Petaluma Gap. Petaluma's climate is similar to areas closer to the coast even though Petaluma is 28 miles from the ocean. Average annual wind speed at the Petaluma Airport is seven mph. The Cotati Valley, being slightly north of the Petaluma Gap, experiences lower wind speeds. The annual average wind speed in Santa Rosa is five mph.

Air temperatures are very similar in the two valleys. Summer maximum temperatures for this subregion are in the low-to-mid-80's, while winter maximum temperatures are in the high-50's to low-60's. Summer minimum temperatures are around 50 degrees, and winter minimum temperatures are in the high 30's.

Generally, air pollution potential is low in the Petaluma Valley because of its link to the Petaluma Gap and because of its low population density. There are two scenarios that could produce elevated pollutant levels: 1) stagnant conditions in the morning hours created when a weak ocean breeze meets a weak bay breeze, and 2) an eastern or southeastern wind pattern in the afternoon brings in pollution from the Carquinez Strait Region and the Central Valley.

The Cotati Valley has a higher pollution potential than does the Petaluma Valley. The Cotati Valley lacks a gap to the sea, contains a larger population and has natural barriers at its northern and eastern ends. There are also industrial facilities in and around Santa Rosa. Both valleys of this subregion are also threatened by increased motor vehicle traffic and the associated air contaminants. Population and motor vehicle use are increasing significantly, and housing costs and the suburbanization of employment are leading to more and longer commutes traversing the subregion.

Diablo and San Ramon Valleys

East of the Coast Range lay the Diablo and San Ramon Valleys. The valleys have a northwest to southeast orientation, with the northern portion known as Diablo Valley and the southern portion as San Ramon Valley. The Diablo Valley is bordered in the north by the Carquinez Strait and in the south by the San Ramon Valley. The San Ramon Valley is long and narrow and extends south from Walnut Creek to Dublin. At its southern end it opens onto the Amador Valley.

The mountains on the west side of these valleys block much of the marine air from reaching the valleys. During the daytime, there are two predominant flow patterns: an upvalley flow from the north and a westerly flow (wind from the west) across the lower elevations of the Coast Range. On clear nights, surface inversions separate the flow of air into two layers: the surface flow and the upper layer flow. When this happens, there are often drainage surface winds which flow downvalley toward the Carquinez Strait.

Wind speeds in these valleys generally are low. Monitoring stations in Concord and Danville report annual average wind speeds of 5 mph. Winds can increase in the afternoon near San Ramon because it is located at the eastern edge of the Crow Canyon gap. Through this gap, polluted air from cities near the Bay travels to the valley in the summer months.

Air temperatures in these valleys are cooler in the winter and warmer in the summer than are temperatures further west, as these valleys are far from the moderating effect of the Bay and

ocean. Mean summer maximum temperatures are in the low- to mid-80's. Mean winter minimum temperatures are in the high-30's to low-40's.

Pollution potential is relatively high in these valleys. On winter evenings, light winds combined with surface-based inversions and terrain that restricts air flow can cause pollutant levels to build up. San Ramon Valley can experience high pollution concentrations due to motor vehicle emissions and emissions from fireplaces and wood stoves. In the summer months, ozone and ozone precursors are often transported into the valleys from both the central SFBAAB and the Central Valley.

Livermore Valley

The Livermore Valley is a sheltered inland valley near the eastern border of SFBAAB. The western side of the valley is bordered by 1,000 to 1,500 foot hills with two gaps connecting the valley to the central SFBAAB, the Hayward Pass and Niles Canyon. The eastern side of the valley also is bordered by 1,000 to 1,500 foot hills with one major passage to the San Joaquin Valley called the Altamont Pass and several secondary passages. To the north lie the Black Hills and Mount Diablo. A northwest to southeast channel connects the Diablo Valley to the Livermore Valley. The south side of the Livermore Valley is bordered by mountains approximately 3,000 to 3,500 feet high.

During the summer months, when there is a strong inversion with a low ceiling, air movement is weak and pollutants become trapped and concentrated. Maximum summer temperatures in the Livermore Valley range from the high-80's to the low-90's, with extremes in the 100's. At other times in the summer, a strong Pacific high pressure cell from the west, coupled with hot inland temperatures causes a strong onshore pressure gradient which produces a strong, afternoon wind. With a weak temperature inversion, air moves over the hills with ease, dispersing pollutants.

In the winter, with the exception of an occasional storm moving through the area, air movement is often dictated by local conditions. At night and early morning, especially under clear, calm and cold conditions, gravity drives cold air downward. The cold air drains off the hills and moves into the gaps and passes. On the eastern side of the valley the prevailing winds blow from north, northeast and east out of the Altamont Pass. Winds are light during the late night and early morning hours. Winter daytime winds sometimes flow from the south through the Altamont Pass to the San Joaquin Valley. Average winter maximum temperatures range from the high-50's to the low-60's, while minimum temperatures are from the mid-to-high-30's, with extremes in the high teens and low-20's.

Air pollution potential is high in the Livermore Valley, especially for photochemical pollutants in the summer and fall. High temperatures increase the potential for ozone to build up. The valley not only traps locally generated pollutants but can be the receptor of ozone and ozone precursors from San Francisco, Alameda, Contra Costa and Santa Clara counties. On northeasterly wind flow days, most common in the early fall, ozone may be carried west from the San Joaquin Valley to the Livermore Valley.

During the winter, the sheltering effect of the valley, its distance from moderating water bodies, and the presence of a strong high pressure system contribute to the development of strong, surface-based temperature inversions. Pollutants such as carbon monoxide and particulate matter, generated by motor vehicles, fireplaces and agricultural burning, can become concentrated. Air pollution problems could intensify because of population growth and increased commuting to and through the subregion.

Marin County Basins

Marin County is bounded on the west by the Pacific Ocean, on the east by San Pablo Bay, on the south by the Golden Gate and on the north by the Petaluma Gap. Most of Marin's population lives in the eastern part of the county, in small, sheltered valleys. These valleys act like a series of miniature air basins.

Although there are a few mountains above 1500 feet, most of the terrain is only 800 to 1000 feet high, which usually is not high enough to block the marine layer. Because of the wedge shape of the county, northeast Marin County is further from the ocean than is the southeastern section. This extra distance from the ocean allows the marine air to be moderated by bayside conditions as it travels to northeastern Marin County. In southern Marin the distance from the ocean is short and elevations are lower, resulting in higher incidence of maritime air in that area.

Wind speeds are highest along the west coast of Marin, averaging about 8 to 10 miles per hour. The complex terrain in central Marin creates sufficient friction to slow the air flow. At Hamilton Air Force Base, in Novato, the annual average wind speeds are only 5 mph. The prevailing wind directions throughout Marin County are generally from the northwest.

In the summer months, areas along the coast are usually subject to onshore movement of cool marine air. In the winter, proximity to the ocean keeps the coastal regions relatively warm, with temperatures varying little throughout the year. Coastal temperatures are usually in the high-50's in the winter and the low-60's in the summer. The warmest months are September and October.

The eastern side of Marin County has warmer weather than the western side because of its distance from the ocean and because the hills that separate eastern Marin from western Marin occasionally block the flow of the marine air. The temperatures of cities next to the Bay are moderated by the cooling effect of the Bay in the summer and the warming effect of the Bay in the winter. For example, San Rafael experiences average maximum summer temperatures in the low-80's and average minimum winter temperatures in the low-40’s. Inland towns such as Kentfield experience average maximum temperatures that are two degrees cooler in the winter and two degrees warmer in the summer.

Air pollution potential is highest in eastern Marin County, where most of population is located in semi-sheltered valleys. In the southeast, the influence of marine air keeps pollution levels low. As development moves further north, there is greater potential for air pollution to build up because the valleys are more sheltered from the sea breeze. While Marin County does not have many polluting industries, the air quality on its eastern side — especially along the U.S. 101 corridor — may be affected by emissions from increasing motor vehicle use within and through the county.

Napa Valley

The Napa Valley is bordered by relatively high mountains. With an average ridge line height of about 2000 feet, with some peaks approaching 3000 to 4000 feet, these mountains are effective barriers to the prevailing northwesterly winds. The Napa Valley is widest at its southern end and narrows in the north.

During the day, the prevailing winds flow upvalley from the south about half of the time. A strong upvalley wind frequently develops during warm summer afternoons, drawing air in from the San Pablo Bay. Daytime winds sometimes flow downvalley from the north. During the evening, especially in the winter, downvalley drainage often occurs. Wind speeds are generally low, with almost 50 percent of the winds less than 4 mph. Only 5 percent of the winds are between 16 and 18 mph, representing strong summertime upvalley winds and winter storms.

Summer average maximum temperatures are in the low 80's at the southern end of the valley and in the low 90's at the northern end. Winter average maximum temperatures are in the high-

50's and low-60's, and minimum temperatures are in the high to mid 30's with the slightly cooler temperatures in the northern end.

The air pollution potential in the Napa Valley could be high if there were sufficient sources of air contaminants nearby. Summer and fall prevailing winds can transport ozone precursors northward from the Carquinez Strait Region to the Napa Valley, effectively trapping and concentrating the pollutants when stable conditions are present. The local upslope and downslope flows created by the surrounding mountains may also recirculate pollutants already present, contributing to buildup of air pollution. High ozone concentrations are a potential problem to sensitive crops such as wine grapes, as well as to human health. The high frequency of light winds and stable conditions during the late fall and winter contribute to the buildup of particulate matter from motor vehicles, agriculture and woodburning in fireplaces and stoves.

Northern Alameda and Western Contra Costa Counties

This climatological subregion stretches from Richmond to San Leandro. Its western boundary is defined by the Bay and its eastern boundary by the Oakland-Berkeley Hills. The Oakland-Berkeley Hills have a ridge line height of approximately 1500 feet, a significant barrier to air flow. The most densely populated area of the subregion lies in a strip of land between the Bay and the lower hills.

In this area, marine air traveling through the Golden Gate, as well as across San Francisco and through the San Bruno Gap, is a dominant weather factor. The Oakland-Berkeley Hills cause the westerly flow of air to split off to the north and south of Oakland, which causes diminished wind speeds. The prevailing winds for most of this subregion are from the west. At the northern end, near Richmond, prevailing winds are from the south-southwest.

Temperatures in this subregion have a narrow range due to the proximity of the moderating marine air. Maximum temperatures during summer average in the mid-70's, with minimums in the mid-50's. Winter highs are in the mid- to high-50's, with lows in the low- to mid-40's.

The air pollution potential is lowest for the parts of the subregion that are closest to the bay, due largely to good ventilation and less influx of pollutants from upwind sources. The occurrence of light winds in the evenings and early mornings occasionally causes elevated pollutant levels.

The air pollution potential at the northern (Richmond) and southern (Oakland, San Leandro) parts of this subregion is marginally higher than communities directly east of the Golden Gate, because of the lower frequency of strong winds.

This subregion contains a variety of industrial air pollution sources. Some industries are quite close to residential areas. The subregion is also traversed by frequently congested major freeways. Traffic and congestion, and the motor vehicle emissions they generate, are increasing.

Peninsula

The peninsula region extends from northwest of San Jose to the Golden Gate. The Santa Cruz Mountains run up the center of the peninsula, with elevations exceeding 2000 feet at the southern end, decreasing to 500 feet in South San Francisco. Coastal towns experience a high incidence of cool, foggy weather in the summer. Cities in the southeastern peninsula experience warmer temperatures and fewer foggy days because the marine layer is blocked by the ridgeline to the west. San Francisco lies at the northern end of the peninsula. Because most of San Francisco's topography is below 200 feet, marine air is able to flow easily across most of the city, making its climate cool and windy.

The blocking effect of the Santa Cruz Mountains results in variations in summertime maximum temperatures in different parts of the peninsula. For example, in coastal areas and San Francisco

the mean maximum summer temperatures are in the mid-60's, while in Redwood City the mean maximum summer temperatures are in the low-80's. Mean minimum temperatures during the winter months are in the high-30's to low-40's on the eastern side of the Peninsula and in the low 40's on the coast.

Two important gaps in the Santa Cruz Mountains occur on the peninsula. The larger of the two is the San Bruno Gap, extending from Fort Funston on the ocean to the San Francisco Airport. Because the gap is oriented in the same northwest to southeast direction as the prevailing winds, and because the elevations along the gap are less than 200 feet, marine air is easily able to penetrate into the bay. The other gap is the Crystal Springs Gap, between Half Moon Bay and San Carlos. As the sea breeze strengthens on summer afternoons, the gap permits maritime air to pass across the mountains, and its cooling effect is commonly seen from San Mateo to Redwood City.

Annual average wind speeds range from 5 to 10 mph throughout the peninsula, with higher wind speeds usually found along the coast. Winds on the eastern side of the peninsula are often high in certain areas, such as near the San Bruno Gap and the Crystal Springs Gap.

The prevailing winds along the peninsula's coast are from the west, although individual sites can show significant differences. For example, Fort Funston in western San Francisco shows a southwest wind pattern while Pillar Point in San Mateo County shows a northwest wind pattern. On the east side of the mountains winds are generally from the west, although wind patterns in this area are often influenced greatly by local topographic features.

Air pollution potential is highest along the southeastern portion of the peninsula. This is the area most protected from the high winds and fog of the marine layer. Pollutant transport from upwind sites is common. In the southeastern portion of the peninsula, air pollutant emissions are relatively high due to motor vehicle traffic as well as stationary sources. At the northern end of the peninsula in San Francisco, pollutant emissions are high, especially from motor vehicle congestion. Localized pollutants, such as carbon monoxide, can build up in "urban canyons". Winds are generally fast enough to carry the pollutants away before they can accumulate.

Santa Clara Valley

The Santa Clara Valley is bounded by the Bay to the north and by mountains to the east, south and west. Temperatures are warm on summer days and cool on summer nights, and winter temperatures are fairly mild. At the northern end of the valley, mean maximum temperatures are in the low-80's during the summer and the high-50's during the winter, and mean minimum temperatures range from the high-50's in the summer to the low-40's in the winter. Further inland, where the moderating effect of the Bay is not as strong, temperature extremes are greater. For example, in San Martin, located 27 miles south of the San Jose Airport, temperatures can be more than 10 degrees warmer on summer afternoons and more than 10 degrees cooler on winter nights.

Winds in the valley are greatly influenced by the terrain, resulting in a prevailing flow that roughly parallels the valley's northwest-southeast axis. A north-northwesterly sea breeze flows through the valley during the afternoon and early evening, and a light south-southeasterly drainage flow occurs during the late evening and early morning. In the summer the southern end of the valley sometimes becomes a "convergence zone," when air flowing from the Monterey Bay gets channeled northward into the southern end of the valley and meets with the prevailing north-northwesterly winds.

Wind speeds are greatest in the spring and summer and weakest in the fall and winter. Nighttime and early morning hours frequently have calm winds in all seasons, while summer afternoons and

evenings are quite breezy. Strong winds are rare, associated mostly with the occasional winter storm.

The air pollution potential of the Santa Clara Valley is high. High summer temperatures, stable air and mountains surrounding the valley combine to promote ozone formation. In addition to the many local sources of pollution, ozone precursors from San Francisco, San Mateo and Alameda Counties are carried by prevailing winds to the Santa Clara Valley. The valley tends to channel pollutants to the southeast. In addition, on summer days with low level inversions, ozone can be recirculated by southerly drainage flows in the late evening and early morning and by the prevailing northwesterlies in the afternoon. A similar recirculation pattern occurs in the winter, affecting levels of carbon monoxide and particulate matter. This movement of the air up and down the valley increases the impact of the pollutants significantly.

Pollution sources are plentiful and complex in this subregion. The Santa Clara Valley has a high concentration of industry at the northern end, in the Silicon Valley. Some of these industries are sources of air toxics as well as criteria air pollutants. In addition, Santa Clara Valley's large population and many work-site destinations generate the highest mobile source emissions of any subregion in the SFBAAB.

Sonoma Valley

The Sonoma Valley is west of the Napa Valley. It is separated from the Napa Valley and from the Cotati and Petaluma Valleys by mountains. The Sonoma Valley is long and narrow, approximately 5 miles wide at its southern end and less than a mile wide at the northern end.

The climate is similar to that of the Napa Valley, with the same basic wind characteristics. The strongest upvalley winds occur in the afternoon during the summer and the strongest downvalley winds occur during clear, calm winter nights. Prevailing winds follow the axis of the valley, northwest/southeast, while some upslope flow during the day and downslope flow during the night occurs near the base of the mountains. Summer average maximum temperatures are usually in the high-80's, and summer minimums are around 50 degrees. Winter maximums are in the high-50's to the mid-60's, with minimums ranging from the mid-30's to low-40's.

As in the Napa Valley, the air pollution potential of the Sonoma Valley could be high if there were significant sources of pollution nearby. Prevailing winds can transport local and nonlocally generated pollutants northward into the narrow valley, which often traps and concentrates the pollutants under stable conditions. The local upslope and downslope flows set up by the surrounding mountains may also recirculate pollutants.

However, local sources of air pollution are minor. With the exception of some processing of agricultural goods, such as wine and cheese manufacturing, there is little industry in this valley. Increases in motor vehicle emissions and woodsmoke emissions from stoves and fireplaces may increase pollution as the valley grows in population and as a tourist attraction.

Southwestern Alameda County

This subregion encompasses the southeast side of San Francisco Bay, from Dublin Canyon to north of Milpitas. The subregion is bordered on the east by the East Bay hills and on the west by the bay. Most of the area is flat.

This subregion is indirectly affected by marine air flow. Marine air entering through the Golden Gate is blocked by the East Bay hills, forcing the air to diverge into northerly and southerly paths. The southern flow is directed down the bay, parallel to the hills, where it eventually passes over southwestern Alameda County. These sea breezes are strongest in the afternoon. The further from the ocean the marine air travels, the more the ocean’s effect is diminished. Although the

climate in this region is affected by sea breezes, it is affected less so than the regions closer to the Golden Gate.

The climate of southwestern Alameda County is also affected by its close proximity to San Francisco Bay. The Bay cools the air with which it comes in contact during warm weather, while during cold weather the Bay warms the air. The normal northwest wind pattern carries this air onshore. Bay breezes push cool air onshore during the daytime and draw air from the land offshore at night.

Winds are predominantly out of the northwest during the summer months. In the winter, winds are equally likely to be from the east. Easterly-southeasterly surface flow into southern Alameda County passes through three major gaps: Hayward/Dublin Canyon, Niles Canyon and Mission Pass. Areas north of the gaps experience winds from the southeast, while areas south of the gaps experience winds from the northeast. Wind speeds are moderate in this subregion, with annual average wind speeds close to the Bay at about 7 mph, while further inland they average 6 mph.

Air temperatures are moderated by the subregion's proximity to the Bay and to the sea breeze. Temperatures are slightly cooler in the winter and slightly warmer in the summer than East Bay cities to the north. During the summer months, average maximum temperatures are in the mid-70's. Average maximum winter temperatures are in the high-50's to low-60's. Average minimum temperatures are in the low 40's in winter and mid-50's in the summer.

Pollution potential is relatively high in this subregion during the summer and fall. When high pressure dominates, low mixing depths and Bay and ocean wind patterns can concentrate and carry pollutants from other cities to this area, adding to the locally emitted pollutant mix. The polluted air is then pushed up against the East Bay hills. In the wintertime, the air pollution potential in southwestern Alameda County is moderate. Air pollution sources include light and heavy industry, and motor vehicles. Increasing motor vehicle traffic and congestion in the subregion may increase Southwest Alameda County pollution as well as that of its neighboring subregions.

C.1.2. Existing Ambient Air Quality: Criteria Air Pollutants

The California Air Resources Board (ARB) and the U.S. Environmental Protection Agency (EPA) currently focus on the following air pollutants as indicators of ambient air quality: ozone, particulate matter (PM), nitrogen dioxide (NO_2), CO, sulfur dioxide (SO_2), 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, they are commonly referred to as "criteria air pollutants." Sources and health effects of the criteria air pollutants are summarized in Table C.2. Current state and federal air quality standards are available at http://www.arb.ca.gov/research/aaqs/aaqs2.pdf and designations are available at http://www.arb.ca.gov/desig/desig.htm. See Table C.1 for current attainment status.

Table C.1
Ambient Air Quality Standards and Designations

Pollutant	Averaging Time	California		National Standards[a]		
		Standards[b, c]	Attainment Status[d]	Primary[c,e]	Secondary[c,f]	Attainment Status[g]
Ozone	1-hour	0.09 ppm (180 µg/m^3)	N (Serious)	–[h]	Same as Primary Standard	–[h]
	8-hour	0.070 ppm (137 µg/m^3)	–	0.075 ppm (147 µg/m^3)		N
Carbon Monoxide (CO)	1-hour	20 ppm (23 mg/m^3)	A	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)	Annual Arithmetic Mean	0.030 ppm (57 µg/m^3)	–	0.053 ppm (100 µg/m^3)	Same as Primary Standard	U/A
	1-hour	0.18 ppm (339 µg/m^3)	A	–		–
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	–	–	0.030 ppm (80 µg/m^3)	–	A
	24-hour	0.04 ppm (105 µg/m^3)	A	0.14 ppm (365 µg/m^3)	–	
	3-hour	–	–	–	0.5 ppm (1300 µg/m^3)	
	1-hour	0.25 ppm (655 µg/m^3)	A	–	–	–
Respirable Particulate Matter (PM_{10})	Annual Arithmetic Mean	20 µg/m^3	N	–[h]	Same as Primary Standard	U
	24-hour	50 µg/m^3		150 µg/m^3		
Fine Particulate Matter ($PM_{2.5}$)	Annual Arithmetic Mean	12 µg/m^3	N	15 µg/m^3	Same as Primary Standard	N[j]
	24-hour	–	–	35 µg/m^3		
Lead[i]	30-day Average	1.5 µg/m^3	A	–	–	–
	Calendar Quarter	–	–	1.5 µg/m^3	Same as Primary Standard	–

BAY AREA AIR QUALITY MANAGEMENT DISTRICT

Table C.1
Ambient Air Quality Standards and Designations

Pollutant	Averaging Time	California		National Standards[a]		
		Standards[b, c]	Attainment Status[d]	Primary[c,e]	Secondary[c,f]	Attainment Status[g]
Sulfates	24-hour	25 µg/m^3	A	**No National Standards**		
Hydrogen Sulfide	1-hour	0.03 ppm (42 µg/m^3)	U			
Vinyl Chloride[i]	24-hour	0.01 ppm (26 µg/m^3)	–			
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			

[a] National standards (other than ozone, 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 the EPA for further clarification and current federal policies.

[b] 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. CAAQS are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

[c] Concentration expressed first in units in which it was promulgated [i.e., parts per million (ppm) or micrograms per cubic meter (µg/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.

[d] 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): is 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.

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

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

[g] 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.

[h] The 1-hour ozone NAAQS was revoked on June 15, 2005 and the annual PM_{10} NAAQS was revoked in 2006.

[i] 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 this pollutant.

[j] U.S EPA lowered the 24-hour $PM_{2.5}$ standard from 65 µg/m^3 to 35 µg/m^3 in 2006. EPA issued attainment status designations for the 35 µg/m^{3}standard on December 22, 2008. EPA has designated the Bay Area as nonattainment for the 35 µg/m^3 $PM_{2.5}$ standard. The EPA designation will be effective 90 days after publication of the regulation in the Federal Register.

Table C.2
Common Sources of Health Effects for Criteria Air Pollutants

Pollutants	Sources	Health Effects
Ozone	Atmospheric reaction of organic gases with nitrogen oxides in sunlight	Aggravation of respiratory and cardiovascular diseases; reduced lung function; increased cough and chest discomfort
Fine Particulate Matter (PM_{10} and $PM_{2.5}$)	Stationary combustion of solid fuels; construction activities; industrial processes; atmospheric chemical reactions	Reduced lung function; aggravation of respiratory and cardiovascular diseases; increases in mortality rate; reduced lung function growth in children
Nitrogen Dioxide (NO_2)	Motor vehicle exhaust; high temperature stationary combustion; atmospheric reactions	Aggravation of respiratory illness
Carbon Monoxide (CO)	Incomplete combustion of fuels and other carbon-containing substances, such as motor vehicle exhaust; natural events, such as decomposition of organic matter	Aggravation of some heart diseases; reduced tolerance for exercise; impairment of mental function; birth defects; death at high levels of exposure
Sulfur Dioxide (SO_2)	Combination of sulfur-containing fossil fuels; smelting of sulfur-bearing metal ore; industrial processes	Aggravation of respiratory diseases; reduced lung function
Lead	Contaminated soil	Behavioral and hearing disabilities in children; nervous system impairment

Source: South Coast Air Quality Management District 2005; EPA 2009; EDAW 2009

Ozone, or smog, is not emitted directly into the environment, but is formed in the atmosphere by complex chemical reactions between ROG and NO_X in the presence of sunlight. Ozone formation is greatest on warm, windless, sunny days. The main sources of NO_X and ROG, often referred to as ozone precursors, are combustion processes (including motor vehicle engines) the evaporation of solvents, paints, and fuels, and biogenic sources. Automobiles are the single largest source of ozone precursors in the SFBAAB. Tailpipe emissions of ROG are highest during cold starts, hard acceleration, stop-and-go conditions, and slow speeds. They decline as speeds increase up to about 50 mph, then increase again at high speeds and high engine loads. ROG emissions associated with evaporation of unburned fuel depend on vehicle and ambient temperature cycles. Nitrogen oxide emissions exhibit a different curve; emissions decrease as the vehicle approaches 30 mph and then begin to increase with increasing speeds.

Ozone levels usually build up during the day and peak in the afternoon hours. Short-term exposure can irritate the eyes and cause constriction of the airways. Besides causing shortness of breath, it can aggravate existing respiratory diseases such as asthma, bronchitis and emphysema. Chronic exposure to high ozone levels can permanently damage lung tissue. Ozone can also damage plants and trees, and materials such as rubber and fabrics.

Particulate Matter refers to a wide range of solid or liquid particles in the atmosphere, including smoke, dust, aerosols, and metallic oxides. Respirable particulate matter with an aerodynamic diameter of 10 micrometers or less is referred to as PM_{10}. $PM_{2.5}$ includes a subgroup of finer particles that have an aerodynamic diameter of 2.5 micrometers or less. Some particulate matter,

such as pollen, is naturally occurring. In the SFBAAB most particulate matter is caused by combustion, factories, construction, grading, demolition, agricultural activities, and motor vehicles. Extended exposure to particulate matter can increase the risk of chronic respiratory disease. PM_{10} is of concern because it bypasses the body's natural filtration system more easily than larger particles, and can lodge deep in the lungs. The EPA and the state of California revised their PM standards several years ago to apply only to these fine particles. $PM_{2.5}$ poses an increased health risk because the particles can deposit deep in the lungs and contain substances that are particularly harmful to human health. Motor vehicles are currently responsible for about half of particulates in the SFBAAB. Wood burning in fireplaces and stoves is another large source of fine particulates.

Nitrogen Dioxide (NO_2) is a reddish-brown gas that is a by-product of combustion processes. Automobiles and industrial operations are the main sources of NO_2. Aside from its contribution to ozone formation, nitrogen dioxide can increase the risk of acute and chronic respiratory disease and reduce visibility. NO_2 may be visible as a coloring component of a brown cloud on high pollution days, especially in conjunction with high ozone levels.

Carbon Monoxide (CO) is an odorless, colorless gas. It is formed by the incomplete combustion of fuels. The single largest source of CO in the SFBAAB is motor vehicles. Emissions are highest during cold starts, hard acceleration, stop-and-go driving, and when a vehicle is moving at low speeds. New findings indicate that CO emissions per mile are lowest at about 45 mph for the average light-duty motor vehicle and begin to increase again at higher speeds. When inhaled at high concentrations, CO combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease or anemia, as well as fetuses. Even healthy people exposed to high CO concentrations can experience headaches, dizziness, fatigue, unconsciousness, and even death.

Sulfur Dioxide (SO_2) is a colorless acid gas with a pungent odor. It has potential to damage materials and it can have health effects at high concentrations. It is produced by the combustion of sulfur-containing fuels, such as oil, coal and diesel. SO_2 can irritate lung tissue and increase the risk of acute and chronic respiratory disease.

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, 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 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. The EPA banned the use of leaded gasoline in highway vehicles in December 1995. As a result of the EPA's regulatory efforts to remove lead from gasoline, emissions of lead from the transportation sector and levels of lead in the air decreased dramatically.

Monitoring Data

The BAAQMD operates a regional air quality monitoring network that regularly measures the concentrations of the five major criteria air pollutants. Air pollutant monitoring data is available at http://www.arb.ca.gov/adam/welcome.html. Air quality conditions in the SFBAAB have improved significantly since the BAAQMD was created in 1955. Ambient concentrations and the number of days on which the region exceeds standards have declined dramatically. Neither State nor

national ambient air quality standards of these chemicals have been violated in recent decades for nitrogen dioxide, sulfur dioxide, sulfates, lead, hydrogen sulfide, and vinyl chloride.

Emissions Inventory

The BAAQMD estimates emissions of criteria air pollutants from approximately nine hundred source categories. The estimates are based on BAAQMD permit information for stationary sources (e.g., manufacturing industries, refineries, dry-cleaning operations), plus more generalized estimates for area sources (e.g., space heating, landscaping activities, use of consumer products) and mobile sources (e.g., trains, ships and planes, as well as on-road and off-road motor vehicles). BAAQMD emissions inventory data is available at http://www.arb.ca.gov/ei/maps/statemap/dismap.htm.

C.1.2. Existing Ambient Air Quality: Toxic Air Contaminants

In addition to the criteria air pollutants listed above, another group of pollutants, commonly referred to as toxic air contaminants (TACs) or hazardous air pollutants can result in health effects that can be quite severe. Many TACs are confirmed or suspected carcinogens, or are known or suspected to cause birth defects or neurological damage. Secondly, many TACs can be toxic at very low concentrations. For some chemicals, such as carcinogens, there are no thresholds below which exposure can be considered risk-free.

Industrial facilities and mobile sources are significant sources of TACs. The electronics industry, including semiconductor manufacturing, has the potential to contaminate both air and water due to the highly toxic chlorinated solvents commonly used in semiconductor production processes. Sources of TACs go beyond industry. Various common urban facilities also produce TAC emissions, such as gasoline stations (benzene), hospitals (ethylene oxide), and dry cleaners (perchloroethylene). Automobile exhaust also contains TACs such as benzene and 1,3-butadiene. Most recently, diesel particulate matter was identified as a TAC by the ARB. Diesel PM differs from other TACs in that it is not a single substance but rather a complex mixture of hundreds of substances. BAAQMD research indicates that mobile-source emissions of diesel PM, benzene, and 1,3-butadiene represent a substantial portion of the ambient background risk from TACs in the SFBAAB.

C.1.3. Greenhouse Gases and Global Climate Change

Unlike emissions of criteria and toxic air pollutants, which have local or regional impacts, emissions of greenhouse gases (GHGs) that contribute to global warming or global climate change have a broader, global impact. Global warming is a process whereby GHGs accumulating in the atmosphere contribute to an increase in the temperature of the earth's atmosphere. The principal GHGs contributing to global warming are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated compounds. The primary GHGs of concern are summarized in Table C.3. These gases allow visible and ultraviolet light from the sun to pass through the atmosphere, but they prevent heat from escaping back out into space. Among the potential implications of global warming are rising sea levels, and adverse impacts to water supply, water quality, agriculture, forestry, and habitats. In addition, global warming may increase electricity demand for cooling, decrease the availability of hydroelectric power, and affect regional air quality and public health. Like most criteria and toxic air pollutants, much of the GHG production comes from motor vehicles. GHG emissions can be reduced to some degree by improved coordination of land use and transportation planning on the city, county, and subregional level, and other measures to reduce automobile use. Energy conservation measures also can contribute to reductions in GHG emissions.

Table C.3 Examples of Greenhouse Gases	
Gas	**Sources**
Carbon dioxide (CO_2)	Fossil fuel combustion in stationary and point sources; emission sources includes burning of oil, coal, gas.
Methane (CH_4)	Incomplete combustion in forest fires, landfills, and leaks in natural gas and petroleum systems, agricultural activities, coal mining, wastewater treatment, and certain industrial processes.
Nitrous oxide (N_2O)	Fossil fuel combustion in stationary and point sources; other emission sources include agricultural soil management, animal manure management, sewage treatment, adipic acid production, and nitric acid production.
Chlorofluorocarbon (CFC), and Hydro-chlorofluorocarbon (HCFC)	Agents used in production of foam insulation; other sources include air conditioners, refrigerators, and solvents in cleaners.
Sulfur hexafluoride (SF_6)	Electric insulation in high voltage equipment that transmits and distributes electricity, including circuit breakers, gas-insulated substations, and other switchgear used in the transmission system to manage the high voltages carried between generating stations and customer load centers.
Perfluorocarbons (PFC's)	Primary aluminum production and semiconductor manufacturing.
Source: EPA 2009	

California Greenhouse Gas Emissions Inventory

Emissions of GHGs contributing to global climate change are attributable in large part to human activities associated with the transportation, industrial/manufacturing, utility, residential, commercial and agricultural sectors. In California, the transportation sector is the largest emitter of GHGs, followed by electricity generation. Emissions of CO_2 are byproducts of fossil fuel combustion. CH_4, a highly potent GHG, results from off-gassing (the release of chemicals from nonmetallic substances under ambient or greater pressure conditions) is largely associated with agricultural practices and landfills. N_2O is also largely attributable to agricultural practices and soil management. CO_2 sinks, or reservoirs, include vegetation and the ocean, which absorb CO_2 through sequestration and dissolution, respectively, two of the most common processes of CO_2 sequestration.

California produced 474 million gross metric tons (MMT) of CO_2 equivalent (CO_2e) averaged over the period from 2002-2004. CO_2e 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 (GWP) of a GHG, is dependent on the lifetime, or persistence, of the gas molecule in the atmosphere. For example, one ton of CH_4 has the same contribution to the greenhouse effect as approximately 23 tons of CO_2. Therefore, CH_4 is a much more potent GHG than CO_2. Expressing emissions in CO_2e 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 2002-2004, accounting for 38 percent of total GHG emissions in the state. This sector was followed by the electric power sector (including both in-state and out-of-state sources) (18 percent) and the industrial sector (21 percent).

California Greenhouse Gas Emissions Projections

The 1990 GHG emissions limit is approximately 430 MMT CO_2e, which must be met in California by 2020 per the requirements of AB 32 (discussed below in the Regulatory Setting). ARB's GHG inventory for all emissions sectors would require an approximate 28 percent reduction in GHG emissions from projected 2020 forecasts to meet the target emissions limit (equivalent to levels in 1990) established in AB 32. The AB 32 Scoping Plan, discussed further below, is ARB's plan for meeting this mandate.

C.1.4. Existing Ambient Air Quality: Odors and Dust

Other air quality issues of concern in the SFBAAB include nuisance impacts of odors and dust. Objectionable odors may be associated with a variety of pollutants. Common sources of odors include wastewater treatment plants, landfills, composting facilities, refineries and chemical plants. Similarly, nuisance dust may be generated by a variety of sources including quarries, agriculture, grading and construction. Odors rarely have direct health impacts, but they can be very unpleasant and can lead to anger and concern over possible health effects among the public. Each year the BAAQMD receives thousands of citizen complaints about objectionable odors. Dust emissions can contribute to increased ambient concentrations of PM_{10}, and can also contribute to reduced visibility and soiling of exposed surfaces.

REGULATORY SETTING

Air quality with respect to criteria air pollutants and TACs within the SFBAAB is regulated by such agencies as the BAAQMD, ARB, and EPA. Each of these agencies develops rules, regulations, policies, and/or goals to attain the goals or directives imposed through legislation. Although the EPA regulations may not be superseded, both state and local regulations may be more stringent.

C.1.5. Criteria Air Pollutants

Federal Air Quality Regulations

U.S. Environmental Protection Agency

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 (FCAA), which was enacted in 1963. The FCAA was amended in 1970, 1977, and 1990.

The FCAA required EPA to establish primary and secondary NAAQS, which are available at http://www.arb.ca.gov/research/aaqs/aaqs2.pdf. The FCAA 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 (FCAAA) added requirements for states with nonattainment areas to revise their SIPs to incorporate additional control measures to reduce air pollution. The SIP is periodically modified to reflect the latest emissions inventories, planning documents, and rules and regulations of the air basins as reported by their jurisdictional agencies. EPA has responsibility to review all state SIPs to determine conformation to the mandates of the FCAAA and determine if implementation will achieve air quality goals. If the EPA determines a SIP to be inadequate, a Federal Implementation Plan (FIP) may be prepared for the nonattainment area that imposes additional control measures. Failure to submit an approvable SIP or to implement the plan within the mandated timeframe may result in sanctions being applied to transportation funding and stationary air pollution sources in the air basin.

State Air Quality Regulations

In 1992 and 1993, the California Air Resources Board (CARB) requested delegation of authority for the implementation and enforcement of specified New Source Performance Standards

(NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAPS) to the following local agencies: Bay Area and South Coast Air Quality Management Districts (AQMDs). EPA's review of the State of California's laws, rules, and regulations showed them to be adequate for the implementation and enforcement of these federal standards, and EPA granted the delegations as requested.

California Air Resources Board

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), which was adopted in 1988. The CCAA requires that all air districts in the state endeavor to achieve and maintain the CAAQS by the earliest practical date. The act specifies that districts should focus particular attention on reducing the emissions from transportation and area-wide emission sources, and provides districts with the authority to regulate indirect sources.

ARB is primarily responsible for developing and implementing air pollution control plans to achieve and maintain the NAAQS. The ARB is primarily responsibility for statewide pollution sources and produces a major part of the SIP. Local air districts are still relied upon to provide additional strategies for sources under their jurisdiction. The ARB combines this data and submits the completed SIP to EPA.

Other ARB duties include monitoring air quality (in conjunction with air monitoring networks maintained by air pollution control and air quality management districts), establishing CAAQS (which in many cases are more stringent than the NAAQS), determining and updating area designations and maps, and setting emissions standards for new mobile sources, consumer products, small utility engines, and off-road vehicles.

Transport of Pollutants

The California Clean Air Act, Section 39610 (a), directs the ARB to “identify each district in which transported air pollutants from upwind areas outside the district cause or contribute to a violation of the ozone standard and to identify the district of origin of transported pollutants.” The information regarding the transport of air pollutants from one basin to another was to be quantified to assist interrelated basins in the preparation of plans for the attainment of State ambient air quality standards. Numerous studies conducted by the ARB have identified air basins that are impacted by pollutants transported from other air basins (as of 1993). Among the air basins affected by air pollution transport from the SFBAAB are the North Central Coast Air Basin, the Mountain Counties Air Basin, the San Joaquin Valley Air Basin, and the Sacramento Valley Air Basin. The SFBAAB was also identified as an area impacted by the transport of air pollutants from the Sacramento region.

Local Air Quality Regulations

Bay Area Air Quality Management District

The BAAQMD attains and maintains air quality conditions in the SFBAAB through a comprehensive program of planning, regulation, enforcement, technical innovation, and promotion of the understanding of air quality issues. The clean air strategy of the BAAQMD includes the preparation of plans for the attainment of ambient air quality standards, adoption and enforcement of rules and regulations concerning sources of air pollution, and issuance of permits for stationary sources of air pollution. The BAAQMD also inspects stationary sources of air pollution and responds to citizen complaints, monitors ambient air quality and meteorological conditions, and implements programs and regulations required by the FCAA, FCAAA, and the CCAA.

In 2009, the BAAQMD released the update to its CEQA Guidelines. This is an advisory document that provides the Lead Agency, consultants, and project applicants with uniform procedures for

addressing air quality in environmental documents. The handbook contains the following applicable components:

1. Criteria and thresholds for determining whether a project may have a significant adverse air quality impact;
2. Specific procedures and modeling protocols for quantifying and analyzing air quality impacts;
3. Methods available to mitigate air quality impacts;
4. Information for use in air quality assessments and environmental documents that will be updated more frequently such as air quality data, regulatory setting, climate, topography.

Air Quality Plans

As stated above, the BAAQMD prepares plans to attain ambient air quality standards in the SFBAAB. The BAAQMD prepares ozone attainment plans (OAP) for the national ozone standard and clean air plans (CAP) for the California standard both in coordination with the Metropolitan Transportation Commission and the Association of Bay Area Governments (ABAG).

With respect to applicable air quality plans, the BAAQMD prepared the *2009 Clean Air Plan* to address nonattainment of the national 1-hour ozone standard in the SFBAAB. The purpose of the 2009 Clean Air Plan is to:

1. Update the Bay Area 2005 Ozone Strategy in accordance with the requirements of the California Clean Air Act to implement "all feasible measures" to reduce ozone;
2. Consider the impacts of ozone control measures on particulate matter (PM), air toxics, and greenhouse gases in a single, integrated plan;
3. Review progress in improving air quality in recent years;
4. Establish emission control measures to be adopted or implemented in the 2009-2012 timeframe.

Similarly, the BAAQMD prepared the 2009 Clean Air Plan to address nonattainment of the CAAQS.

C.1.6. Toxic Air Contaminants

TACs, or in federal parlance under the FCAA, HAPs, are pollutants that result in an increase in mortality, a serious illness, or pose a present or potential hazard to human health. Health effects of TACs may include cancer, birth defects, and immune system and neurological damage.

TACs can be separated into carcinogens and noncarcinogens based on the nature of the physiological degradation associated with exposure to the pollutant. For regulatory purposes, carcinogens are assumed to have no safe threshold below which heath impacts will not occur. Noncarcinogenic TACs differ in that there is a safe level in which it is generally assumed that no negative health impacts would occur. These levels are determined on a pollutant-by-pollutant basis.

It is important to understand that TACs are not considered criteria air pollutants and thus are not specifically addressed through the setting of ambient air quality standards. Instead, the 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 (MACT and BACT) to limit emissions. These in conjunction with additional rules set forth by the BAAQMD establish the regulatory framework for TACs.

Federal Hazardous Air Pollutant Program

Title III of the FCAAA requires the EPA to promulgate national emissions standards for hazardous air pollutants (NESHAPs). 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 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. These federal rules are also commonly referred to as MACT standards, because they reflect the Maximum Achievable Control Technology. For area sources, the standards may be different, based on generally available control technology. In the second phase (2001–2008), the 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 FCAAA 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, §219 required the use of reformulated gasoline in selected U.S. cities (those with the most severe ozone nonattainment conditions) to further reduce mobile-source emissions.

State Toxic Air Contaminant Programs

California regulates TACs primarily through the Tanner Air Toxics Act (AB 1807) and the Air Toxics Hot Spots Information and Assessment Act of 1987 (AB 2588). The Tanner Act sets forth a formal procedure for ARB to designate substances as TACs. This includes research, public participation, and scientific peer review before ARB can designate a substance as a TAC. To date, ARB has identified over 21 TACs, and adopted the EPA's list of HAPs as TACs. Most recently, diesel exhaust particulate was added to the ARB list of TACs. Once a TAC is identified, ARB's then adopts an Airborne Toxics Control Measure 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 TBACT to minimize emissions. None of the TACs identified by ARB have a safe threshold.

The Hot Spots Act requires that existing facilities that emit toxic substances above specified level:

1. Prepare a toxic emission inventory;
2. Prepare a risk assessment if emissions are significant;
3. Notify the public of significant risk levels;
4. Prepare and implement risk reduction measure.

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 1) more stringent emission standards for some new urban bus engines beginning with 2002 model year engines, 2) zero-emission bus demonstration and purchase requirements applicable to transit agencies, and 3) reporting requirements with which transit agencies must demonstrate compliance with the urban 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 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/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.

Local Air Quality Regulations

Bay Area Air Quality Management District

The BAAQMD has regulated TACs since the 1980s. At the local level, air pollution control or management districts may adopt and enforce ARB's control measures. Under BAAQMD Regulation 2-1 (General Permit Requirements), Regulation 2-2 (New Source Review), and Regulation 2-5 (New Source Review), all nonexempt sources that possess the potential to emit TACs are required to obtain permits from BAAQMD. 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. The BAAQMD limits emissions and public exposure to TACs through a number of programs. The BAAQMD prioritizes TAC-emitting stationary sources based on the quantity and toxicity of the TAC emissions and the proximity of the facilities to sensitive receptors. In addition, the BAAQMD has adopted Regulation 11 Rules 2 and 14, which address asbestos demolition renovation, manufacturing, and standards for asbestos containing serpentine.

C.1.7. Greenhouse Gases and Global Climate Change

Federal Greenhouse Gas Regulations

Supreme Court Ruling

The U.S. Environmental Protection Agency (EPA) is the Federal agency responsible for implementing the Clean Air Act (CAA). The U.S. Supreme Court ruled in its decision in *Massachusetts et al. v. Environmental Protection Agency* et al. ([2007] 549 U.S. 05-1120), issued on April 2, 2007, that carbon dioxide (CO_2) is an air pollutant as defined under the CAA, and that EPA has the authority to regulate emissions of GHGs.

EPA Actions

In response to the mounting issue of climate change, EPA has taken actions to regulate, monitor, and potentially reduce GHG emissions.

Mandatory Greenhouse Gas Reporting Rule

On September 22, 2009, EPA issued a final rule for mandatory reporting of GHGs from large GHG emissions sources in the United States. In general, this national reporting requirement will provide EPA with accurate and timely GHG emissions data from facilities that emit 25,000 metric tons or more of CO2 per year. This publically available data will allow the reporters to track their own emissions, compare them to similar facilities, and aid in identifying cost effective opportunities to reduce emissions in the future. Reporting is at the facility level, except that certain suppliers of fossil fuels and industrial greenhouse gases along with vehicle and engine manufacturers will report at the corporate level. An estimated 85% of the total U.S. GHG emissions, from approximately 10,000 facilities, are covered by this final rule.

Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Clean Air Act

On April 23, 2009, EPA published their Proposed Endangerment and Cause or Contribute Findings for Greenhouse Gases under the CCA (Endangerment Finding) in the Federal Register. The Endangerment Finding is based on Section 202(a) of the CAA, which states that the Administrator (of EPA) should regulate and develop standards for "emission[s] of air pollution from any class of classes of new motor vehicles or new motor vehicle engines, which in [its] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." The proposed rule addresses Section 202(a) in two distinct findings. The first addresses whether or not the concentrations of the six key GHGs (i.e., carbon dioxide [CO_2], methane [CH_4], nitrous oxide [N_2O], hydrofluorocarbons [HFCs], perflurorocarbons [PFCs], and sulfur hexafluoride [SF_6]) in the atmosphere threaten the public health and welfare of current and future generations. The second addresses whether or not the combined emissions of GHGs from new motor vehicles and motor vehicle engines contribute to atmospheric concentrations of GHGs and therefore the threat of climate change.

The Administrator proposed the finding that atmospheric concentrations of GHGs endanger the public health and welfare within the meaning of Section 202(a) of the CCA. The evidence supporting this finding consists of human activity resulting in "high atmospheric levels" of GHG emissions, which are very likely responsible for increases in average temperatures and other climatic changes. Furthermore, the observed and projected results of climate change (e.g., higher likelihood of heat waves, wild fires, droughts, sea level rise, higher intensity storms) are a threat to the public health and welfare. Therefore, GHGs were found to endanger the public health and welfare of current and future generations.

The Administrator also proposed the finding that GHG emissions from new motor vehicles and motor vehicle engines are contributing to air pollution, which is endangering public health and welfare. The proposed finding cites that in 2006, motor vehicles were the second largest contributor to domestic GHG emissions (24 percent of total) behind electricity generation. Furthermore, in 2005, the U.S. was responsible for 18 percent of global GHG emissions. Therefore, GHG emissions from motor vehicles and motor vehicle engines were found to contribute to air pollution that endangers public health and welfare.

State Greenhouse Gas Regulations

Assembly Bill 1493 (2002)

In 2002, then-Governor Gray Davis signed Assembly Bill (AB) 1493. AB 1493 requires that ARB develop and adopt, by January 1, 2005, regulations that achieve "the maximum feasible reduction of greenhouse gases emitted by passenger vehicles and light-duty trucks and other vehicles determined by ARB to be vehicles whose primary use is noncommercial personal transportation in the state."

To meet the requirements of AB 1493, in 2004 ARB approved amendments to the California Code of Regulations (CCR) adding GHG emissions standards to California's existing standards for motor vehicle emissions. Amendments to CCR Title 13, Sections 1900 and 1961 (13 CCR 1900, 1961), and adoption of Section 1961.1 (13 CCR 1961.1) require automobile manufacturers to meet fleet-average GHG emissions limits for all passenger cars, light-duty trucks within various weight criteria, and medium-duty passenger vehicle weight classes (i.e., any medium-duty vehicle with a gross vehicle weight rating less than 10,000 pounds that is designed primarily for the transportation of persons), beginning with the 2009 model year. For passenger cars and light-duty trucks with a loaded vehicle weight (LVW) of 3,750 pounds or less, the GHG emission limits for the 2016 model year are approximately 37percent lower than the limits for the first year of the regulations, the 2009 model year. For light-duty trucks with LVW of 3,751 pounds to gross vehicle

weight (GVW) of 8,500 pounds, as well as medium-duty passenger vehicles, GHG emissions would be reduced approximately 24 percent between 2009 and 2016.

In December 2004, a group of car dealerships, automobile manufacturers, and trade groups representing automobile manufacturers filed suit against ARB to prevent enforcement of 13 CCR Sections 1900 and 1961 as amended by AB 1493 and 13 CCR 1961.1 (*Central Valley Chrysler-Jeep et al. v. Catherine E. Witherspoon, in Her Official Capacity as Executive Director of the California Air Resources Board, et al.*). The auto-makers' suit in the U.S. District Court for the Eastern District of California, contended California's implementation of regulations that, in effect, regulate vehicle fuel economy violates various federal laws, regulations, and policies.

On December 12, 2007, the Court found that if California receives appropriate authorization from EPA (the last remaining factor in enforcing the standard), these regulations would be consistent with and have the force of federal law, thus, rejecting the automakers' claim. This authorization to implement more stringent standards in California was requested in the form of a CAA Section 209, subsection (b) waiver in 2005. Since that time, EPA failed to act on granting California authorization to implement the standards. Governor Schwarzenegger and Attorney General Edmund G. Brown filed suit against EPA for the delay. In December 2007, EPA Administrator Stephen Johnson denied California's request for the waiver to implement AB 1493. Johnson cited the need for a national approach to reducing GHG emissions, the lack of a "need to meet compelling and extraordinary conditions", and the emissions reductions that would be achieved through the Energy Independence and Security Act of 2007 as the reasoning for the denial.

The state of California filed suit against EPA for its decision to deny the CAA waiver. The recent change in presidential administration directed EPA to reexamine its position for denial of California's CAA waiver and for its past opposition to GHG emissions regulation. California received the waiver, notwithstanding the previous denial by EPA, on June 30, 2009.

Assembly Bill 32 (2006), California Global Warming Solutions Act

In September 2006, the governor of California signed AB 32 (Chapter 488, Statutes of 2006), the California Global Warming Solutions Act of 2006, which enacted Sections 38500–38599 of the California Health and Safety Code. AB 32 requires the reduction of statewide GHG emissions to 1990 levels by 2020. This equates to an approximate 15 percent reduction compared to existing statewide GHG emission levels or a 30 percent reduction from projected 2020 "business as usual" emission levels. The required reduction will be accomplished through an enforceable statewide cap on GHG emissions beginning in 2012.

To effectively implement the statewide cap on GHG emissions, AB 32 directs ARB to develop and implement regulations that reduce statewide GHG emissions generated by stationary sources. Specific actions required of ARB under AB 32 include adoption of a quantified cap on GHG emissions that represent 1990 emissions levels along with disclosing how the cap was quantified, institution of a schedule to meet the emissions cap, and development of tracking, reporting, and enforcement mechanisms to ensure that the state achieves the reductions in GHG emissions needed to meet the cap.

In addition, AB 32 states that if any regulations established under AB 1493 (2002) cannot be implemented then ARB is required to develop additional, new regulations to control GHG emissions from vehicles as part of AB 32.

AB 32 Climate Change Scoping Plan

In December 2008, ARB adopted its *Climate Change Scoping Plan*, which contains the main strategies California will implement to achieve reduction of approximately 169 million metric tons (MMT) of CO_2e, or approximately 30% from the state's projected 2020 emission level of 596 MMT of CO_2e under a business-as-usual scenario (this is a reduction of 42 MMT CO_2e, or almost 10%,

from 2002-2004 average emissions). The *Scoping Plan* also includes ARB-recommended GHG reductions for each emissions sector of the state's GHG inventory. The Scoping Plan calls for the largest reductions in GHG emissions to be achieved by implementing the following measures and standards:

- improved emissions standards for light-duty vehicles (estimated reductions of 31.7 MMT CO_2e),
- the Low-Carbon Fuel Standard (15.0 MMT CO_2e),
- energy efficiency measures in buildings and appliances and the widespread development of combined heat and power systems (26.3 MMT CO_2e), and
- a renewable portfolio standard for electricity production (21.3 MMT CO_2e).

ARB has not yet determined what amount of GHG reductions it recommends from local government operations; however, the *Scoping Plan* does state that land use planning and urban growth decisions will play an important role in the state's GHG reductions because local governments have primary authority to plan, zone, approve, and permit how land is developed to accommodate population growth and the changing needs of their jurisdictions. (Meanwhile, ARB is also developing an additional protocol for community emissions.) ARB further acknowledges that decisions on how land is used will have large impacts on the GHG emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas emission sectors. The *Scoping Plan* states that the ultimate GHG reduction assignment to local government operations is to be determined (ARB 2008). With regard to land use planning, the *Scoping Plan* expects approximately 5.0 MMT CO_2e will be achieved associated with implementation of SB 375, which is discussed further below.

Senate Bills 1078 and 107 and Executive Order S-14-08

SB 1078 (Chapter 516, Statutes of 2002) requires retail sellers of electricity, including investor-owned utilities and community choice aggregators, to provide at least 20 percent of their supply from renewable sources by 2017. SB 107 (Chapter 464, Statutes of 2006) changed the target date to 2010. In November 2008 Governor Schwarzenegger signed Executive Order S-14-08, which expands the state's Renewable Energy Standard to 33 percent renewable power by 2020. Governor Schwarzenegger plans to propose legislative language that will codify the new higher standard.

Senate Bill 1368 (2006)

SB 1368 is the companion bill of AB 32 and was signed by Governor Schwarzenegger in September 2006. SB 1368 requires the California Public Utilities Commission (PUC) to establish a greenhouse gas emission performance standard for baseload generation from investor owned utilities by February 1, 2007. The California Energy Commission (CEC) must establish a similar standard for local publicly owned utilities by June 30, 2007. These standards cannot exceed the greenhouse gas emission rate from a baseload combined-cycle natural gas fired plant. The legislation further requires that all electricity provided to California, including imported electricity, must be generated from plants that meet the standards set by the PUC and CEC.

Senate Bill 97 (2007)

SB 97, signed by governor of California in August 2007 (Chapter 185, Statutes of 2007; Public Resources Code, Sections 21083.05 and 21097), acknowledges climate change is a prominent environmental issue that requires analysis under CEQA. This bill directed the Governor's Office of Planning and Research (OPR) to prepare, develop, and transmit to the California Resources Agency by July 1, 2009 guidelines for mitigating GHG emissions or the effects of GHG emissions,

as required by CEQA. The California Resources Agency is required to certify and adopt these guidelines by January 1, 2010.

This bill also removes, both retroactively and prospectively, as legitimate causes of action in litigation any claim of inadequate CEQA analysis of effects of GHG emissions associated with environmental review for projects funded by the Highway Safety, Traffic Reduction, Air Quality and Port Security Bond Act of 2006 (Proposition 1B) or the Disaster Preparedness and Flood Protection Bond Act of 2006 (Proposition 1E). This provision will be repealed by provision of law on January 1, 2010 at that time such projects, if any remain unapproved, will no longer enjoy protection against litigation claims based on failure to adequately address issues related to GHG emissions.

Senate Bill 375 (2008)

SB 375, signed in September 2008, aligns regional transportation planning efforts, regional GHG reduction targets, and land use and housing allocation. As part of the alignment, SB 375 requires Metropolitan Planning Organizations (MPOs) to adopt a Sustainable Communities Strategy (SCS) or Alternative Planning Strategy (APS) which prescribes land use allocation in that MPO's Regional Transportation Plan (RTP). The ARB, in consultation with MPOs, is required to provide each affected region with reduction targets for GHGs emitted by passenger cars and light trucks in the region for the years 2020 and 2035. These reduction targets will be updated every 8 years but can be updated every 4 years if advancements in emissions technologies affect the reduction strategies to achieve the targets. The ARB is also charged with reviewing each MPO's SCS or APS for consistency with its assigned GHG emission reduction targets. If MPOs do not meet the GHG reduction targets, transportation projects located in the MPO boundaries would not be eligible for funding programmed after January 1, 2012.

This bill also extends the minimum time period for the Regional Housing Needs Allocation (RNHA) cycle from 5 years to 8 years for local governments located in an MPO that meets certain requirements. City or County land use policies (e.g., General Plans) are not required to be consistent with the RTP including associated SCSs or APSs. Qualified projects consistent with an approved SCS or APS and categorized as "transit priority projects" would receive incentives under new provisions of CEQA.

Executive Order S-3-05 (2005)

Governor Schwarzenegger signed Executive Order S-3-05 on June 1, 2005 which proclaimed California is vulnerable to the impacts of climate change. The executive order declared increased temperatures could reduce snowpack in the Sierra Nevada Mountains, further exacerbate California's air quality problems, and potentially cause a rise in sea levels. To combat those concerns, the executive order established targets for total GHG emissions which include reducing GHG emissions to the 2000 level by 2010, to the 1990 level by 2020, and to 80 percent below the 1990 level by 2050.

The executive order also directed the secretary of the California Environmental Protection Agency to coordinate a multiagency effort to reduce GHG emissions to the target levels. The secretary will submit biannual reports to the governor and legislature describing progress made toward reaching the emission targets; impacts of global warming on California's resources; and mitigation and adaptation plans to combat impacts of global warming.

To comply with the executive order, the Secretary of the California Environmental Protection Agency created the California Climate Action Team which is made up of members from various state agencies and commissions. The California Climate Action Team released its first report in March 2006 of which proposed achieving the GHG emissions targets by building on voluntary

actions of California businesses and actions by local governments and communities along with continued implementation of state incentive and regulatory programs.

Executive Order S-13-08

Governor Schwarzenegger signed Executive Order S-13-08 on November 14, 2008 which directs California to develop methods for adapting to climate change through preparation of a statewide plan. The executive order directs OPR, in cooperation with the California Resources Agency (CRA), to provide land use planning guidance related to sea level rise and other climate change impacts by May 30, 2009. The order also directs the CRA to develop a state Climate Adaptation Strategy by June 30, 2009 and to convene an independent panel to complete the first California Sea Level Rise Assessment Report. The assessment report is required to be completed by December 1, 2010 and required to include the following four items:

1. Project the relative sea level rise specific to California by taking into account issues such as coastal erosion rates, tidal impacts, El Niño and La Niña events, storm surge, and land subsidence rates;
2. Identify the range of uncertainty in selected sea level rise projections;
3. Synthesize existing information on projected sea level rise impacts to state infrastructure (e.g., roads, public facilities, beaches), natural areas, and coastal and marine ecosystems; and
4. Discuss future research needs relating to sea level rise in California.

Executive Order S-1-07

Governor Schwarzenegger signed Executive Order S-1-07 in 2007 which proclaimed the transportation sector as the main source of GHG emissions in California. The executive order proclaims the transportation sector accounts for over 40 percent of statewide GHG emissions. The executive order also establishes a goal to reduce the carbon intensity of transportation fuels sold in California by a minimum of 10 percent by 2020.

In particular, the executive order established a Low-Carbon Fuel Standard (LCFS) and directed the Secretary for Environmental Protection to coordinate the actions of the CEC, the ARB, the University of California, and other agencies to develop and propose protocols for measuring the "life-cycle carbon intensity" of transportation fuels. This analysis supporting development of the protocols was included in the State Implementation Plan for alternative fuels (*State Alternative Fuels Plan* adopted by CEC on December 24, 2007) and was submitted to ARB for consideration as an "early action" item under AB 32. The ARB adopted the LCFS on April 23, 2009.

Local Greenhouse Gas Regulations

Bay Area Air Quality Management District Climate Protection Program

The BAAQMD established a climate protection program to reduce pollutants that contribute to global climate change and affect air quality in the SFBAAB. The climate protection program includes measures that promote energy efficiency, reduce vehicle miles traveled, and develop alternative sources of energy all of which assist in reducing emissions of GHG and in reducing air pollutants that affect the health of residents. BAAQMD also seeks to support current climate protection programs in the region and to stimulate additional efforts through public education and outreach, technical assistance to local governments and other interested parties, and promotion of collaborative efforts among stakeholders.

D. THRESHOLD OF SIGNIFICANCE JUSTIFICATION

[TO BE ADDED AFTER BAAQMD BOARD OF DIRECTORS TAKE ACTION]

E. GLOSSARY

Aerosol -- Particle of solid or liquid matter that can remain suspended in the air because of its small size (generally under one micrometer in diameter).

Air Quality Management District (AQMD) -- Local agency charged with controlling air pollution and attaining air quality standards. The Bay Area Air Quality Management District is the regional AQMD that includes Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo and Santa Clara Counties and the southern halves of Solano and Sonoma Counties.

Air Resources Board (ARB) -- The State of California agency responsible for air pollution control. Responsibilities include: establishing State ambient air quality standards, setting allowable emission levels for motor vehicles in California and oversight of local air quality management districts.

Area Sources -- Sources of air pollutants that individually emit relatively small quantities of air pollutants, but that may emit considerable quantities of emissions when aggregated over a large area. Examples include water heaters, lawn maintenance equipment, and consumer products.

Best Available Control Technology (BACT) -- The most stringent emissions control that has been achieved in practice, identified in a state implementation plan, or found by the District to be technologically feasible and cost-effective for a given class of sources.

California Clean Air Act (CCAA) -- Legislation enacted in 1988 mandating a planning process to attain state ambient air quality standards.

CALINE -- A model developed by the Air Resources Board that calculates carbon monoxide concentrations resulting from motor vehicle use.

Carbon Monoxide (CO) -- A colorless, odorless, toxic gas produced by the incomplete combustion of carbon-containing substances. It is emitted in large quantities by exhaust of gasoline-powered vehicles.

Carbon Dioxide (CO_2) -- A colorless, odorless gas that is an important contributor to Earth's greenhouse effect.

Carbon Dioxide Equivalent (CO_2E) -- A metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential.

Chlorofluorocarbons (CFCs) -- A family of inert, nontoxic, and easily liquefied chemicals used in refrigeration, air conditioning, packaging, insulation, or as solvents and aerosol propellants. CFCs drift into the upper atmosphere where their chlorine components destroy stratospheric ozone.

Clean Air Act (CAA) -- Long-standing federal legislation, last amended in 1990, that is the legal basis for the national clean air programs.

Conformity -- A requirement in federal law and administrative practice that requires that projects will not be approved if they do not conform with the State Implementation Plan by: causing or contributing to an increase in air pollutant emissions, violating an air pollutant standard, or increasing the frequency of violations of an air pollutant standard.

Criteria Air Pollutants -- Air pollutants for which the federal or State government has established ambient air quality standards, or criteria, for outdoor concentration in order to protect public health. Criteria pollutants include: ozone, carbon monoxide, sulfur dioxide PM10 (previously total suspended particulate), nitrogen oxide, and lead.

EMFAC -- The computer model developed by the California Air Resources Board to estimate composite on-road motor vehicle emission factors by vehicle class.

Emission Factor -- The amount of a specific pollutant emitted from a specified polluting source per unit quantity of material handled, processed, or burned.

Emission Inventory -- A list of air pollutants emitted over a determined area by type of source. Typically expressed in mass per unit time.

Environmental Protection Agency (EPA) -- The federal agency responsible for control of air and water pollution, toxic substances, solid waste, and cleanup of contaminated sites.

Exceedance -- A monitored level of concentration of any air contaminant higher than national or state ambient air quality standards.

Global Warming Potential (GWP) -- The index used to translate the level of emissions of various gases into a common measure in order to compare the relative radiative forcing of different gases without directly calculating the changes in atmospheric concentrations. GWPs are calculated as the ratio of the radiative forcing that would result from the emissions of one kilogram of a greenhouse gas to that from emission of one kilogram of carbon dioxide over a period of time (usually 100 years).

Greenhouse Gas (GHG) -- Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), halogenated fluorocarbons (HCFCs), ozone (O_3), perfluorocarbons (PFCs), sulfur hexafluoride (SF_6) and hydrofluorocarbons (HFCs).

Hazardous Air Pollutants – Federal terminology for air pollutants which are not covered by ambient air quality standards but may reasonably be expected to cause or contribute to serious illness or death (see NESHAPs).

Health Risk Assessment -- An analysis where human exposure to toxic substances is estimated, and considered together with information regarding the toxic potency of the substances, to provide quantitative estimates of health risk.

Hot Spot -- A location where emissions from specific sources may expose individuals and population groups to elevated risks of adverse health effects and contribute to the cumulative health risks of emissions from other sources in the area.

Hydrogen Sulfide (H_2S) -- A gas characterized by "rotten egg" smell, found in the vicinity of oil refineries, chemical plants and sewage treatment plants.

Impacted Communities – Also known as priority communities, the Air District defines impacted communities within the Bay Area as having higher emitting sources, highest air concentrations, and nearby low income and sensitive populations. The Air District identified the following impacted communities: the urban core areas of Concord, eastern San Francisco, western Alameda County, Redwood City/East Palo Alto, Richmond/San Pablo, and San Jose.

Indirect Sources – Land uses and facilities that attract or generate motor vehicle trips and thus result in air pollutant emissions, e.g., shopping centers, office buildings, and airports.

Inversion -- The phenomenon of a layer of warm air over cooler air below. This atmospheric condition resists the natural dispersion and dilution of air pollutants.

Level of Service (LOS) -- A transportation planning term for a method of measurement of traffic congestion. The LOS compares actual or projected traffic volume to the maximum capacity of the road under study. LOS ranges from A through F. LOS A describes free flow conditions, while LOS F describes the most congested conditions, up to or over the maximum capacity for which the road was designed.

Mobile Source -- Any motor vehicle that produces air pollution, e.g., cars, trucks, motorcycles (on-road mobile sources) or airplanes, trains and construction equipment (off-road mobile sources).

National Ambient Air Quality Standards (NAAQS) -- Health-based pollutant concentration limits established by EPA that apply to outdoor air (see Criteria Air Pollutants).

National Emissions Standards for Hazardous Air Pollutants (NESHAPs) – Emissions standards set by EPA for air pollutants not covered by NAAQS that may cause an increase in deaths or in serious, irreversible, or incapacitating illness.

Nitrogen Oxides (NO_X) -- Gases formed in great part from atmospheric nitrogen and oxygen when combustion takes place under conditions of high temperature and high pressure; NOX is a precursor to the criteria air pollutant ozone.

Nonattainment Area -- Defined geographic area that does not meet one or more of the

Ambient Air Quality Standards for the criteria pollutants designated in the federal Clean Air Act and/or California Clean Air Act.

Ozone (O_3) -- A pungent, colorless, toxic gas. A product of complex photochemical processes, usually in the presence of sunlight. Tropospheric (lower atmosphere) ozone is a criteria air pollutant.

Particulate -- A particle of solid or liquid matter; soot, dust, aerosols, fumes and mists.

Photochemical Process -- The chemical changes brought about by the radiant energy of the sun acting upon various polluting substances. The products are known as photochemical smog.

$PM_{2.5}$ -- Fine particulate matter (solid or liquid) with an aerodynamic diameter equal to or less than 2.5 micrometers. Individual particles of this size are small enough to be inhaled deeply into the lungs..

PM_{10} -- Fine particulate matter (solid or liquid) with an aerodynamic diameter equal to or less than 10 micrometers. Individual particles of this size are small enough to be inhaled into human lungs; they are not visible to the human eye.

Precursor -- Compounds that change chemically or physically after being emitted into the air and eventually produce air pollutants. For example, organic compounds are precursors to ozone.

Prevention of Significant Deterioration (PSD) -- EPA program in which State and/or federal permits are required that are intended to restrict emissions for new or modified sources in places where air quality is already better than required to meet primary and secondary ambient air quality standards.

Reactive Organic Gases (ROG) -- Classes of organic compounds, especially olefins, substituted aromatics and aldehydes, that react rapidly in the atmosphere to form photochemical smog or ozone.

Sensitive Receptors -- Facilities or land uses that include members of the population that are particularly sensitive to the effects of air pollutants, such as children, the elderly, and people with illnesses. Examples include schools, hospitals and residential areas.

State Implementation Plan (SIP) -- EPA-approved state plans for attaining and maintaining federal air quality standards.

Stationary Source -- A fixed, non-mobile source of air pollution, usually found at industrial or commercial facilities.

Sulfur Oxides (SO_X) -- Pungent, colorless gases formed primarily by the combustion of sulfur-containing fossil fuels, especially coal and oil. Considered a criteria air pollutant, sulfur oxides may damage the respiratory tract as well as vegetation.

Toxic Air Contaminants -- Air pollutants which cause illness or death in relatively small quantities. Non-criteria air contaminants that, upon exposure, ingestion, inhalation, or assimilation into organisms either directly from the environment or indirectly by ingestion through food chains, may cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, or physical deformations in such organisms or their offspring.

Transportation Control Measures (TCMs) -- Measures to reduce traffic congestion and decrease emissions from motor vehicles by reducing vehicle use.

URBEMIS -- A computer model developed by the California Air Resources Board to estimate air pollutant emissions from motor vehicle trips associated with land use development.

GHG PLAN LEVEL QUANTIFICATION GUIDANCE

April 15, 2010

This guidance is intended to assist local governments in developing GHG emission inventories and projections, and in quantifying emission reductions from various policies and mitigation measures. In drafting this guidance, the Air District has drawn from established methodologies and practices, rather than creating new protocols or quantification methods. This guidance should be interpreted as recommended approaches rather than a protocol. This guidance will be continually updated as new tools, methodologies and protocols are developed.

The contact for all Air District data referenced below is Abby Young (ayoung@baaqmd.gov). All questions or comments related to this guidance should be directed to Abby Young.

1. GHG Inventories

1.1 Basic parameters

1.1.1 Emissions to include

Carbon dioxide (CO_2) must be inventoried across all sectors. It is also highly recommended that methane (CH_4) from landfills be included in GHG inventories (see more detail in section 1.5 below). Accounting of N_20, SF6, HFC and PFC emission sources can also be included where reliable estimation methodologies and data are available.

1.1.2 Sectors to include

The inventory should reflect the legal geographic boundary of the jurisdiction. The table below lists the sectors that should be included in GHG inventories, as well as the emission sources within each sector and recommended energy types to include.

Sector	Emission sources	Energy types
Residential	Energy and water use in residential buildings	Electricity Natural gas
Commercial	Energy and water use in commercial, government and institutional buildings	Electricity Natural gas
Industrial	Energy and water use in industrial buildings, facilities and processes	Electricity Natural gas

Sector	Emission sources	Energy types
Transportation	All road vehicles Public transportation Light rail Off-road vehicles/equipment	Gasoline Diesel CNG LNG Bio-diesel
Waste	Landfills Waste stream	Landfill gas

It is the local government's discretion to determine which, if any, additional energy types to include in its inventory. It is highly recommended that any energy type contributing a measurable amount to the overall GHG picture in any sector should be included.

Local governments may want to add additional sectors to their inventories, such as agriculture. If this is done, the assumptions, methodologies and data sources should be clearly identified.

1.1.3 Emission sources to include/exclude

All greenhouse gas emission sources within the geographic scope of the inventory should be accounted for.

If an emissions reduction is to be claimed through a mitigation measure, the correlating emission source must be included in the inventory. For example, a jurisdiction cannot take credit for installing an emissions capture facility at a closed landfill site unless the baseline emissions inventory includes that site as an emissions source.

If any specific exclusion is made, it should be disclosed, along with a justification of the exclusion.

1.1.4 Biogenic carbon emissions

Biogenic CO_2 emissions result from materials that are derived from living cells, as opposed to CO_2 emissions derived from fossil fuels, limestone and other materials that have been transformed by geological processes. Biogenic CO_2 contains carbon that is present in organic materials that include, but are not limited to, wood, paper, vegetable oils, animal fat, and food, animal and yard waste. Biogenic CO_2 emissions should be excluded from the GHG inventory because these emissions are the result of materials in the biological/physical carbon cycle, rather than the geological carbon cycle.

1.1.5 Units to report in

All GHG emissions should be reported in metric tons of CO_2 equivalent (CO_2e), per the international convention of using "global warming potentials." To convert emissions into CO_2e, use the guidance provided in Equation 6.5 of ARB's Local Government Operations Protocol, version 1.0 (page 34).

A list of standard conversion factors for units of measurement is included in the Local Government Operations Protocol, Appendix F.

1.1.6 Base year to choose

The baseline inventory should include one complete calendar year of data for 2008 or earlier, depending on the jurisdiction's GHG emission reduction target (see Section 2.7.2 of the CEQA Guidelines, under Standard Elements of a GHG Reduction Strategy for further guidance).

Discussion note: ARB recommends that GHG inventories use a three-year baseline. A three-year average baseline tends to dampen unusual aspects in any given year that would not be representative of a good baseline. For example, in years of severe drought, CO_2 electricity coefficients may be more carbon intensive than in other years due to the need to supplant diminished hydroelectric power capacity with fossil fuels to produce electricity. Taking a three year average can smooth over some of these anomalies. However, it is recognized that this approach requires an additional level of effort, and so is considered optional rather than recommended.

1.1.7 Emission coefficients to use

Jurisdictions should use electricity coefficients listed in the Local Government Operations Protocol, Appendix G. The Protocol contains utility-specific coefficients, or emission factors, for carbon dioxide (CO_2) (table G.5) and region specific emission factors for methane (CH_4), and nitrous oxide (N_2O) emissions for electricity consumption. GHG emission inventories should use the CO_2 emission factors for the jurisdiction's specific utility, and use the sub-region designation CAMX, WECC California, for calculating CH_4, and N_2O emissions (table G.7), if those emissions are being included in the inventory. Refer to the Local Government Operations Protocol for more detailed guidance and emission factors.

For non-electricity energy, jurisdictions should also use coefficients listed in the Local Government Operations Protocol, Appendix G.

1.2 Residential and Commercial Sectors

1.2.1 Emission sources to include

The types of buildings comprising the residential and commercial sectors include single and multi-family housing, commercial buildings, governmental buildings and facilities, and institutional buildings and facilities (hospitals, colleges, etc.).

The GHG inventory should include direct and indirect emissions produced by the operation of residential and commercial buildings. Direct emissions refer to emissions produced due to the onsite combustion of energy, such as natural gas used in furnaces, boilers and hot water heaters. Indirect emissions refer to the emissions produced offsite as a result of energy used in the buildings, such as those emitted by power plants due to electricity use.

There may be a small amount of additional types of energy utilized by buildings that result in GHG emissions, such as propane, heating oil, diesel used by generators, etc. It is recommended that local governments include this data in their GHG inventories if the data is available and reliable. Because this energy use is dispersed and difficult to identify/track, at this time the Air District does not suggest requiring its inclusion in GHG inventories. This recommendation may change in the future as better information becomes available.

1.2.2 Data sources to use

Local power utilities (PG&E, municipal utilities) are the best source of data for electricity and natural gas use by residential and commercial buildings. To access this data from PG&E, the local government must contact PG&E directly and make an information request. All data requests should be sent to GHGDataRequests@pge.com.

1.3 Industrial Sectors

1.3.1 Emission sources to include

The industrial sector is comprised of industrial buildings and facilities. Emission sources from this sector include energy directly used onsite, such as natural gas, combined heat and power, diesel fuel, etc., and also electricity used in buildings and facilities even if it is generated outside the jurisdiction.

Emissions from very large energy intensive industrial facilities (paper and steel mills, industrial chemical plants, petrochemical plants and refineries, metal smelters, large cement making operations) should be represented within the context of the community-scale emissions inventory results in an appropriate fashion, as (1) their emissions may be well documented in other inventory programs, (2) the purpose of a local government analysis is to account for the emissions the jurisdiction has the ability to influence, and (3) their inclusion could skew the results to the point of prohibiting the facilitation of intercity comparisons. Two sets of emission inventory results should be presented – one including the large emission source and one excluding it. By doing this, all emissions in the jurisdiction are accounted for, and at the same time policy relevance is maintained by seeing an inventory that is not highly skewed toward one dominating emission source.

1.3.2 Data sources to use

Consumption data on electricity and natural gas supplied directly from utilities (PG&E or municipal utilities) can be supplied by those utilities directly. To access this data from PG&E, the local government must contact PG&E directly and make an information request. All data requests should be sent to GHGDataRequests@pge.com.

1.3.3 Direct access

In some cases, large industrial facilities may combust and consume energy directly onsite. Because local utilities do not supply this energy, they can not be used as a data source. The Air District can assist local governments in developing and providing non-proprietary GHG emissions data for industrial facilities that are permitted by the Air District.

1.3.4 Transportation Sector

1.3.5 Emission sources to include/exclude

Gasoline and diesel fuel used by on-road and off-road vehicles should be included in the GHG inventory.

1.3.6 Recommended metric: VMT

Vehicle miles traveled (VMT) is the preferred metric for determining GHG emissions from the transportation sector. Fuel sales and vehicle trips have also been

suggested as appropriate metrics, however at this time the Air District recommends using VMT.

GHG emissions can be determined through fuel sales within a jurisdiction. However, it is difficult to develop an accurate number for fuel sales that would be appropriate for a community-wide inventory. In addition, fuel sales may not be as valuable a piece of information as VMT or vehicle trips in terms of policy relevance, as it does not provide any information on driving patterns. Given this, fuel sales is not the preferred metric for determining GHG emissions from the transportation sector.

Vehicle trips can be used as a metric in GHG inventories as long as meaningful VMT and emission factors can be generated. In order to adequately determine GHG emissions from vehicle trips a variety of inputs need to be known: VMT per trip, trip speed, vehicle type, etc. Because of the complexity involved in this exercise, there are currently no protocols or agreed upon methodologies for using vehicle trips to determine GHG emissions in a community inventory. If vehicle trips are used in place of VMT to determine GHG emissions, all assumptions, methodologies and data sources must be clearly identified.

The Air District will continue to research and explore new methods and the possibility of using additional metrics to determine GHG emissions from transportation.

1.3.7 Highway VMT

The percentage that a city contributes to overall county-wide VMT is also the percentage that the city should use to apportion its share of highway VMT occurring in the county. For example, if the City of Oakland contributes 30% to all VMT in Alameda County, then the City should apportion 30% of all highway VMT in Alameda County to its own community inventory.

1.3.8 Data sources to use

The recommended data source for city and county VMT data is "2008 (or most recent) California Public Road Data" (http://www.dot.ca.gov/hq/tsip/hpms/datalibrary.php), a publication of CalTrans' Highway Performance Monitoring System. This provides daily VMT (DVMT) numbers, which account for decreased traffic volumes on the weekends.

The Air District can provide assistance to agencies to determine localized emission factors, vehicle mix, fuel usage and fuel efficiency for each county. The Air District generates CO_2, and CH_4 emission factors using the EMFAC model. The Air District compiles data on N_2O emissions. The basis for the estimates are CO_2 emission rates (grams/mile), which are based on engine testing at different speeds, and county-wide vehicle registration data obtained from DMV. Estimates are available for years 1970-2040. The model also provides estimates of criteria air pollutants, as well as methane emissions (CH_4). In addition, it produces an estimate of fuel usage, and fuel economy. County variations in emission factors are due to the use of county-specific vehicle usage, vehicle mix, vehicle speed and ambient temperatures. For more information on EMFAC, please refer to the California Air Resources Board website: http://www.arb.ca.gov/msei/onroad/latest_version.htm.

Discussion note: ARB has developed a post-processing tool for EMFAC2007

that incorporates the emissions impacts of Pavley I and II into the tool. In addition, ARB will be releasing EMFAC2010 by the end of the year, with Pavley I and II fully integrated.

1.3.9 Off-road emissions

The Air District can work with local governments to provide emissions data for off-road sources, which include lawn and garden equipment, construction equipment, industrial equipment and light commercial equipment. Emissions for off-road sources is estimated using ARB's OFFROAD2007 (or most recent year) emissions model.

1.4 Waste Sector

1.4.1 Emission sources to include/exclude

There are two sources of emissions associated with the landfilled waste that should be included in the GHG inventory. The first is methane being produced at landfills located within the jurisdiction's boundary, and the second is the estimated future generation of methane associated with waste being produced by entities residing in the jurisdiction during the base year (community generated waste).

1) Direct landfill emissions
   This includes methane emissions released from any landfills located within the jurisdiction in the baseline year, whether closed or open. It also includes any methane emissions from the alternative daily cover (ADC) used in the landfills where the waste generated within the jurisdiction is disposed.

2) Future emissions from waste generated in the base year
   Waste breaks down and releases emissions over time. In order to fully account for emissions due to lifetime decomposition, future emissions are estimated and attributed up front to waste going to landfill in any given year. This should include methane emissions from all solid waste generated within the jurisdiction in the base year that was sent to landfills regardless of whether the landfills are located within or outside of the jurisdiction's community boundary.

Emissions from stationary combustion of fossil fuels at the site of the landfill should be included in your GHG inventory but this consumption will be catalogued in the commercial and industrial sectors. Composting and the burning of biofuels (the biogenic portion of biodiesel, for example) are typically not included in GHG inventories. Some communities have opted to note these biogenic emissions as information items, without bundling them into any emission total.

At the community level, electricity use associated with the operation of landfills within the jurisdiction should be included in data for the industrial or commercial sectors. You will not need to duplicate the reporting of emissions from electricity consumption in the community Waste Sector.

1.4.2 Methane Recovery Factors

Emissions from landfills must be multiplied by a methane recovery factor, which is based on the amount of landfill gas that is retained (not emitted) due to the facility's landfill gas capture system. Even if a landfill has determined its specific methane recovery factor, all landfills should use the recommended recovery factor of 75%.

The 75% recovery factor is the default value recommended in the Local Government Operations Protocol which has been adopted by ARB, The Climate Registry and ICLEI.

For landfills with no gas capture systems, a first order decay (FOD) method should be used to determine onsite emissions. In the Bay Area, it is most likely that the only landfills without gas collection systems are older, closed facilities. Local governments with such landfills should use ARB's Landfill Emissions Tool to model landfill gas emissions (http://www.arb.ca.gov/cc/protocols/localgov/pubs/pubs.htm).

1.4.3 Sewage and wastewater treatment

Carbon dioxide, nitrous oxide and methane emissions are created through sewage and wastewater treatment processes. Carbon dioxide emissions associated with these processes are considered biogenic in nature and should only be included as information items. Methane and nitrous oxide emissions, however, should be included. The methodology included in the Local Government Operations Protocol (Chapter 10) for determining methane and nitrous oxide emissions from sewage and wastewater treatment should be followed.

1.4.4 Data sources

The methane emission factors for lifetime decomposition associated with waste generation should be taken from the EPA WARM model. For quantification of emissions only methane generation is taken into account. More information on the WARM Model is available at:
http://epa.gov/climatechange/wycd/waste/calculators/Warm_home.html

The Air District can provide information on emissions produced directly from landfills that are permitted by the Air District.

Waste disposal and alternative daily cover tonnage is reported by permitted facility operators and compiled by county/regional agency disposal reporting coordinators and published in the Disposal Reporting System (DRS) for every county/jurisdiction from 1995 to 2006. This data can be accessed through the Department of Resources Recycling and Recovery – CalRecycle – formerly the California Integrated Waste Management Board.
(http://www.calrecycle.ca.gov/LGCentral/Reports/DRS/)

Discussion note: Determining lifecycle emissions from consumption and waste is a developing area of research. Some local governments are currently considering altering their GHG inventories to account for lifecycle emission impacts of consumption from their communities. Because this is a very new area of research without generally accepted methodologies, the Air District is not recommending this approach at this time. However, this emerging trend provides added reason to include emissions from the waste stream in GHG inventories.

1.5 Regional emissions sources

1.5.1 Water utilities

Electricity use associated with processing and pumping water by water utilities is embedded in data provided to each jurisdiction by PG&E or municipal utilities.

1.5.2 Transit (BART, CalTrain, AC Transit, etc.)

Emissions from energy used for transportation by transit systems within a community should be included in the inventory. In many cases local transit systems will be operated as part of a larger regional transit system. In these cases, the local government must count the emissions that result from the movement of the transit system within the geographic boundaries of the community apportioned on a distance traveled basis.

Emissions from electric transit vehicles, such as BART, will appear as part of the commercial sector, as this electricity consumption will be embedded in the community electricity data.

1.5.3 Airports and sea ports

Emissions from the operations of sea ports and airports (building energy use, ground fleet vehicles, etc.) should be included in the inventory. In addition, fuel used by vehicles (planes, ships) in dock should also be included in the inventory. Emissions from providing electricity to ships and planes in port should be counted in the community inventory as utility provided electricity.

1.5.4 Non-road vehicle use (planes, trains, ships)

Rail: These systems are generally operated as part of a larger regional system. At this time the Air District does not recommend that emissions from heavy duty rail be included in community GHG inventories.

Air travel: Methods to apportion emissions from air travel to community inventories are currently inconsistent and highly speculative. At this time the Air District does not recommend that emissions from air travel be included in community GHG inventories. Ground emissions from an airport would still be included in the inventory, however.

Water travel: Emissions from water travel occurring entirely within the local government's geographic boundary should be included in the inventory. Emissions from water travel largely occurring outside the geographic boundaries of the community (such as with sea travel) should not be included.

1.5.5 Pass-through highway traffic or inter-regional travel

Vehicle travel on highways or other forms of inter-regional travel should be included in the GHG inventory to the extent that VMT occurs within the geographic boundary of the jurisdiction. The Air District can assist local governments in developing and providing VMT data for highway travel with their jurisdictions' geographic boundaries.

1.5.6 Large industrial facilities

See discussion of large industrial facilities in section 1.3 above.

1.6 Recommended Tools

The following tools can help local governments assess baseline inventory GHG emissions, and/or GHG reductions from project characteristics and mitigation measures. While many tools exist that can assist with GHG quantification, the Air District recommends these particular tools due to their long-term use as industry standards and well-vetted methodologies. Many other quantification tools draw from the methodologies and assumptions embedded in these tools.

1.6.1 ICLEI Clean Air – Climate Protection Software

The Clean Air and Climate Protection Software (CACP 2009) created by ICLEI is a one-stop emissions management tool to calculate and track emissions of GHG and criteria pollutants associated with electricity, fuel use, and waste disposal. This climate protection software was created to support local governments in developing emission inventories and climate action planning. This software is free for use and may be downloaded at http://www.icleiusa.org/action-center/tools/cacp-software

1.6.2 EMFAC

ARB developed the EMFAC (EMission FACtors) model to calculate emission rates from motor vehicles operating in California. The EMFAC model considers all motor vehicles, from passenger cars to heavy-duty trucks, operating on highways, freeways, and local roads in California. EMFAC and OFFROAD, the ARB model that calculates emissions from off-road vehicles, contain emission estimates for carbon dioxide and methane transportation emissions. EMFAC2007 and OFFROAD2007 represent the most current model versions and may be downloaded at, http://www.arb.ca.gov/msei/onroad/latest_version.htm

1.6.3 WARM

EPA created the WAste Reduction Model (WARM) to help calculate GHG emissions reductions from different waste management practices. WARM calculates and totals GHG emissions of baseline and alternative waste management practices such as, source reduction, recycling, combustion, composting, and landfilling. The model calculates emissions in metric tons of carbon equivalent (MTCE), metric tons of carbon dioxide equivalent (MTCO2E), and energy units (million BTU) across a wide range of material types commonly found in municipal solid waste. WARM, last updated in November 2009, is free for use and may be applied as web-based calculator or Excel spreadsheet at, http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html)

1.6.4 Local Government Operations Protocol[1]

The Local Government Operations Protocol is designed to provide standard guidelines to assist local governments in quantifying and reporting GHG emissions associated with their government operations. The Protocol was developed in partnership by ARB, California Climate Action Registry (CCAR), and ICLEI, in collaboration with The Climate Registry and dozens of stakeholders. The Protocol provides the principles, approach, methodology, and procedures needed to develop a local government operations GHG emissions inventory. It is designed to support the complete, transparent, and accurate reporting of a local government's GHG emissions. The Protocol is free and may be downloaded at http://www.arb.ca.gov/cc/protocols/localgov/pubs/pubs.htm

1.6.5 Use of local models and methodologies

The Air District encourages local governments to apply local models and methodologies to quantify GHG emissions where appropriate. For example, using

[1] This guidance includes multiple references to the Local Government Operations Protocol (LGOP), version 1.0. It should be noted that the California Climate Action Reserve is scheduled to release version 1.1 of the LGOP in Spring of 2010. Upon release of version 1.1, all relevant references in this guidance will be revised.

local travel demand model data to inform GHG inventories may be appropriate, depending on the reliability of the data.

2. Projection (Forecast)

GHG emission projections, or forecasts, for communities should reflect a business-as-usual (BAU) approach, in which emissions are projected in the absence of any policies or actions that would occur beyond the base year that would reduce emissions.

2.1 Choosing a future/target year

The projection should include one complete calendar year of data for a future year. The future year should coincide with the year chosen for the jurisdiction's GHG emission reduction target. According to Section 2.7.2 of these Guidelines, the future year will most likely be 2020, but could also be a year farther in the future (see Section 2.7.2 of the CEQA Guidelines, under Standard Elements of a GHG Reduction Strategy for further guidance).

2.2 Growth projections

The Air District recommends consistency with ARB's Business-as-usual Forecasting Method where possible, except as noted below. ARB's 2020 BAU emissions estimate was derived by projecting emissions from a past baseline year using growth factors specific to each of the different economic sectors. For the purposes of the Scoping Plan, ARB used three-year average emissions, by sector, for 2002-2004 to forecast emissions to 2020. At the time the Scoping Plan process was initiated, 2004 was the most recent year for which actual data were available.

Growth factors are sector-specific and are derived from several sources, including the energy demand models generated by California Energy Commission (CEC) for their 2007 Integrated Energy Policy Report (IEPR), business economic growth data developed for ARB's criteria pollutant forecast system (CEFS), population growth data from the California Department of Finance, and projections of vehicle miles traveled from ARB's on-road mobile source emissions model, EMFAC2007. For the electricity and other energy sectors, ARB consulted with CEC to select the most appropriate growth factor.

ARB's forecasting method is similar to other GHG forecasting approaches, including the method used in the Climate Action Team 2006 Report. Where appropriate, ARB used updated and improved growth factors for estimating 2020 emissions sector-by-sector. These future emissions are projected in the absence of any policies or actions that would reduce emissions.

Deviations from ARB's approach:

- Estimating population growth – future growth projections may be based on ABAG's most recent Projections report. ABAG derives its projections based on data from the Department of Finance, but adapts them with local information.
- Estimating VMT growth – ARB uses fuel sales data to develop projections of VMT. As discussed above, fuel sales are not a preferred method for determining GHG emissions locally. The Air District recommends using MTC's county-specific growth estimates to estimate future VMT.

2.3 Future electricity coefficients

The most recently certified electricity coefficient for the jurisdiction's local utility should be used as the projected electricity coefficient for the future/projection year. Jurisdictions should use electricity coefficients listed in the Local Government Operations Protocol, Appendix G (table G.5). Refer to section 1.7 above for more detailed guidance.

2.4 Accounting for state-level actions

Several measures included in the AB 32 Scoping Plan will impact local GHG emissions and may be taken into account in the GHG emission projection. Of particular importance are the Renewable Portfolio Standard and the Pavley I and II regulations. While other Scoping Plan measures are also relevant, such as the Low Carbon Fuel Standard, because the details of the regulation have not yet been developed, assessing GHG impacts at the local level from these measures is fairly speculative at this time.

2.4.1 Renewable Portfolio Standard

The State of California Renewable Portfolio Standard (RPS) requires electricity providers to increase the portion of electricity they deliver that comes from renewable energy sources to 20% by 2010 and by 33% by 2020. Local governments can develop assumptions on the impact of the RPS on their communities based on information from their local utilities. Most utilities in California (including PG&E) have reported their GHG emissions data to the California Climate Action Reserve (CCAR). The 2006 Power/Utility Reporting Protocol, version 1.0 (PUP) provides information for each utility, including the amount of power produced by renewable energy for any given year. Guidance on how to use this information to estimate the impact of the RPS on a community's future GHG emissions is in development by the Air District and will be forthcoming.

2.4.2 Pavely I and II

Assembly Bill 1493 (Pavley), signed into law in 2002, will require automakers to reduce greenhouse gas emissions from new passenger cars and light trucks beginning in 2011. ARB will implement the law in two phases of increasingly stringent standards. ARB has developed a post-processing tool for EMFAC2007 that incorporates the emissions impacts of Pavley I and II into the tool. In addition, ARB will be releasing EMFAC2010 by the end of the year, with Pavley I and II fully integrated.

2.4.3 SB 375

Although SB 375 is expected to reduce vehicle trips and transportation-related emissions, it should not be included as an emission reduction measure in GHG Reduction Strategies for two reasons: 1) the intent and implementation of SB 375 is likely to overlap with mixed use and transit-oriented development measures included in the Strategy (thus to avoid double-counting), and 2) a technical, defensible analysis of the bill's projected impact on the state or the Bay Area is not available at this time.

3. GHG Mitigation Measures

This guidance applies to addressing project characteristics, as well as mitigation measures. It is recommended that GHG reductions from appropriate policies and measures be applied to projects before entering the mitigation phase.

3.1 Residential and commercial buildings

3.1.1 Green building codes

3.1.1.1 Exceeding Title 24

New California buildings must be designed to meet the building energy efficiency standards of Title 24, also known as the California Building Standards Code. Title 24 Part 6 regulates energy uses including space heating and cooling, hot water heating, ventilation, and hard-wired lighting. By committing to a percent improvement over Title 24, a development reduces its energy use and resulting GHG emissions.

GHG reductions from a percent improvement over Title 24 can be quantified by calculating baseline energy consumption using methodologies based on the California Energy Commission's (CEC) Residential Appliance Saturation Survey (RASS) and Commercial End-Use Survey (CEUS). The CEUS is based on a survey conducted in 2002 for existing commercial buildings in various climate zones. Electricity and natural gas use per square foot for each end use in each building type and climate zone is extracted from the CEUS data. Since the data is provided by end use, it is straightforward to calculate the Title 24 and non-Title 24 regulated energy intensity for each building type.

Data from RASS is used to calculate the total electricity and natural gas use for residential buildings on a per dwelling unit. The RASS study estimates the unit energy consumption (UEC) values for individual households surveyed and also provides the saturation number for each type of end use. The saturation number indicates the proportion of households that have a demand for each type of end-use category. As the data is provided by end use, it is straightforward to calculate the Title 24 and non-Title 24 electricity and natural gas intensity for each building type.

RASS and CEUS data are based on CEC Forecasting Climate Zones (FCZs); therefore, differences in project energy usage due to different climates are accounted for. The percent improvement is applied to Title 24 built environment energy uses, and overall GHG emissions are calculated using local utility emission factors. This methodology allows project applicants flexibility in choosing which specific measures they will pursue to achieve the percent reductions (for example, installing higher quality building insulation, or installing a more efficient water heating system), while still making the mitigation commitment at the time of CEQA analysis.

3.1.1.2 LEED and GreenPoint Rated

Local building codes that use requirements referencing LEED building standards and/or GreenPoint Rated may look to those two programs for direction on how to quantify GHG emissions impacts of their respective standards.

With support from the Air District, Build It Green has developed a Climate Calculator (http://www.stopwaste.org/docs/calculator_report-spring_09_update.pdf) to generate data on GHG emissions avoided and other savings. The Climate Calculator produces four sets of data:

1) CO_2e data derived from the building's green design features;
2) CO_2e data related to the recycling of construction and demolition waste;
3) CO_2e data related to the project's location, which quantifies the potential reduction in miles driven by residents who live in more compact, transit-oriented, mixed-use developments; and
4) Non-CO_2 savings, including gallons of water, tons of waste, kilowatt-hours of electricity, and therms of natural gas.

The US Green Building Council (USGBC) provides information on how to equate points on the LEED scale to percentage points exceeding energy efficiency standards in Title 24. For a comparison between LEED-NC and LEED-CS and Title 24's 2005 standard, see the USGBC Information Guidelines at http://www.usgbc.org/ShowFile.aspx?DocumentID=2255. LEED has not yet updated this comparison to the new 2008 Title 24 energy efficiency standards.

3.2 Transportation

Local governments should use URBEMIS to calculate potential GHG emission reductions from different transportation mitigation measures. In order to use URBEMIS effectively, accurate estimations of trip rates and length (VMT per trip) must be made.

3.3.1 Estimating Trip Rates

The majority of transportation impact analysis conducted for CEQA documents in California apply trip generation rates provided by the Institute of Transportation Engineers (ITE) in their regularly updated report *Trip Generation*. This data is typically based on single-use developments, in suburban locations with ample free parking and with minimal transit service and demand management strategies in place. As a result, the ITE trip generation rates represent upper bound trip generation rates for an individual land use type. Local governments can use local models to fine tune the trip rates beyond what ITE provides.

For some large development projects or general plans, the local or regional travel demand model is used to estimate the number of trips generated as well as trip lengths and vehicle speeds at which the individual trips occur. These models account for whether the trip segment occurs on a freeway or local streets as well as the degree of congestion. The values for trip generation rates and trip lengths using ITE and average trip lengths can be used to assess the model estimates of vehicle trip generation and VMT. These comparisons should recognize that the travel demand models explicitly account for various factors that reduce trip-making and VMT, including the demographic characteristics of the site occupants, location and accessibility of the development site relative to other destinations in the region, the mix of land uses within the site and its surrounding area, and possibly the availability of effective transit service. When performing a comparison using the ITE trip rates and average trip lengths, the reviewer should take into consideration that these factors have already been accounted for in the modeling.

3.3.2 Impacts of Transit-oriented development on trip rates

The Santa Clara County Congestion Management agency has produced guidelines suggesting a 9 percent trip reduction for housing within 2,000 feet of a light-rail commuter-rail station.

The results of a literature review of studies documenting the effectiveness of Transit Oriented Development (TOD) in the reduction of vehicle trips show residents living near transit stations are around 5 times more likely to commute by transit as the average resident worker in the same city.

The Robert Cervero study, *Impacts of Transit Oriented Housing*, includes a survey of 17 transit–oriented developments in five U.S. metropolitan areas that show vehicle trips per dwelling unit substantially below ITE manual estimates. According to the study, over a typical weekday, the surveyed TOD housing projects averaged 47 percent fewer vehicle trips than that estimated by the manual (3.55 versus 6.67). The San Francisco Bay area also averaged vehicle trip generation rates substantially below those estimated by the ITE manual.

3.3.3 Estimating VMT

Baseline VMT for projects should be calculated by multiplying ITE trip rates by the typical trip length. MTC is the best source for local trip length data in the Bay Area.

Discussion note: Some mechanisms that reduce trip generation rates and trip lengths below the standard ITE trip rates and current average trip lengths might be considered to be intrinsic parts of the development proposal rather than mitigation measures, such as project location (e.g., infill or transit oriented development), density, mix of uses, and urban design. These intrinsic attributes of a project should be considered part of the baseline condition and quantified as project design features rather than mitigation. This approach highlights all elements of a project that affect trip generation rates and vehicle miles traveled.

3.3.4 Density impacts on VMT

The report “Transportation Research Board Special Report 298: Driving and the Build Environment Effects of Compact Development on Motorized Travel, Energy Use and CO2 Emissions” examines the relationship between land development patterns and vehicle miles travelled. The report suggest that doubling residential density across a metropolitan area might lower household VMT by 5 to 12 percent, and as much as 25 percent if coupled with higher employment concentrations, significant public transit improvements, mixed uses and other supportive demand management measures.

3.3 Waste

The Air District has created a tool to assist local governments in estimating GHG impacts of project-level measures in the waste sector. This tool, the BAAQMD GHG Model Calculator (see description in 6.2 below), draws coefficients for different waste types from the EPA WARM tool and local waste disposal rates from CalRecycle (formerly the California Integrated Waste Management Board).

3.4 Impacts of multiple policies

Some GHG reduction policies/measures, whether applied in project planning or as mitigation measures, are more effective when used in concert with other measures.

Quantifying the impacts of multiple strategies applied together is a new area of research, without established methodologies. In July of 2010, the California Air Pollution Control Officers Association (CAPCOA) will release a report on GHG mitigation measures quantification that will include a discussion and general approaches for quantifying the "layering" of multiple policies.

3.5 Recommended Tools

3.5.1 URBEMIS

URBEMIS is an emissions model that quantifies construction and operation emissions from land use projects. The Air District recommends URBEMIS as the standard tool for quantifying project related emissions of criteria pollutants and carbon dioxide in proposed land use developments. URBEMIS uses the California Air Resource Board's EMFAC2007 model for on-road vehicle emissions and OFFROAD2007 for off-road vehicle emissions. URBEMIS provides daily and annual emission reports for NOX, ROG, PM2.5, CO, and CO_2. URBEMIS also quantifies a range of construction, transportation, and area source mitigation measures. The model is free and may be downloaded at http://www.urbemis.com/.

3.5.2 GHG Model Calculator

The Air District is developing a model to calculate GHG emissions from land use development projects. Users will be able to import emission results from URBEMIS, an emissions model for land use projects, to quantify GHG emissions not included in URBEMIS such as GHG emissions from electricity use and waste. Users will also be able to apply a range of GHG mitigation measures in the model. The Air District intends for this model to complement URBEMIS in quantifying project related GHG emissions in proposed land use developments. The model will be based as an Excel spreadsheet and will be ready for use in June 2010.

3.5.3 CAPCOA GHG Mitigation Study Report (Environ)

CAPCOA, through a contract with Environ, is producing a technical analysis of GHG reduction estimates for a wide range of mitigation strategies. The final report will contain quantification methodologies, recommended assumptions, GHG reduction estimates, and methodology references for individual measures. The report will provide guidance on how to interpret reduction ranges and assign percentage reductions to characterize land use projects and GHG mitigation measures. The Air District recommends applying any identified emission reductions for a project in URBEMIS and the GHG Model Calculator. Both these models have customizable inputs and a wide range of mitigation measures that may be utilized for GHG reductions. The final report will be for release in June 2010.

3.5.4 Use of local models and methodologies

The Air District encourages local governments to apply local models and methodologies to quantify GHG emissions where appropriate. For example, the URBEMIS model contains a number of customizable inputs for users to apply local conditions and characteristics.

4. Implementation and Monitoring

4.1 Implementation plan

The implementation plan is a critical component of the GHG Reduction Strategy. GHG Reduction Strategies should include two-tiered implementation approaches – one approach for overall implementation of the Strategy, and implementation plans for each individual measure (or groups of measures).

4.1.1 Overall implementation plan

The overall implementation plan should include as much detail as possible on the following:

- identification of the department with oversight of coordination of Strategy implementation;
- identification of lead staff charged with coordination of Strategy implementation;
- integrated timeline of implementation of all measures – timeline should take into consideration economic requirements for measures (fiscal year budget allocations, energy savings from specific measures used to fund other measures, etc.); and
- monitoring and reporting approach (see Items 2 and 3 below) that outlines when update reports on the status of implementation of individual measures will occur, as well as the occurrence of updated GHG inventories.

4.1.2 Implementation of individual measures

Implementation strategies for each individual measure (or groups of measures) should include as much of the following detail as possible:

- estimation of staff requirements, including designation of lead staff (or department);
- capital requirements and payback period;
- budget requirements and fiscal year(s) for which budget requests will need to be made;
- potential financing mechanisms if other than municipal budget;
- legislative actions required for implementation (adoption of ordinances, etc.);
- implementation steps and timeline for implementation; and
- all policies and measures in the Strategy that apply to new development projects should be identified so that it is clear whether or not a new project is consistent with the Strategy.

4.2 Re-inventory every 5 years

The Strategy should specify that the GHG emission inventory will be updated at a minimum every 5 years in order to track overall progress toward meeting the GHG emission reduction target. This process helps to establish the community's emission trends, assess and reprioritize the performance of emission reduction measures currently implemented and better inform the emission forecast. The emission inventory update should consist of a full review of emissions from all sectors included in the original inventory and an assessment of progress toward the target.

4.3 Annual report on implementation of strategy

Apart from the periodic emission inventory, the Strategy should include a schedule for annual reporting on the implementation of individual measures. Annual reporting on measures will assist in determining if new developments are in fact being impacted by the Strategy.

4.4 Review of new project consistency with strategy

The Strategy should include a mechanism for identifying and reporting on how consistently the relevant policies and measures in the Strategy have been applied to new development.







Climate Change Scoping Plan

a framework for change

DECEMBER 2008

Pursuant to AB 32
The California Global Warming Solutions Act of 2006

Prepared by
the California Air Resources Board
for the State of California

Arnold Schwarzenegger
Governor

Linda S. Adams
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APPENDICES

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EXECUTIVE SUMMARY

On September 27, 2006, Governor Schwarzenegger signed Assembly Bill 32, the Global Warming Solutions Act of 2006 (Núñez, Chapter 488, Statutes of 2006). The event marked a watershed moment in California's history. By requiring in law a reduction of greenhouse gas (GHG) emissions to 1990 levels by 2020, California set the stage for its transition to a sustainable, clean energy future. This historic step also helped put climate change on the national agenda, and has spurred action by many other states.

The California Air Resources Board (ARB or Board) is the lead agency for implementing AB 32, which set the major milestones for establishing the program. ARB met the first milestones in 2007: developing a list of discrete early actions to begin reducing greenhouse gas emissions, assembling an inventory of historic emissions, establishing greenhouse gas emission reporting requirements, and setting the 2020 emissions limit.

ARB must develop a Scoping Plan outlining the State's strategy to achieve the 2020 greenhouse gas emissions limit. This Scoping Plan, developed by ARB in coordination with the Climate Action Team (CAT), proposes a comprehensive set of actions designed to reduce overall greenhouse gas emissions in California, improve our environment, reduce our dependence on oil, diversify our energy sources, save energy, create new jobs, and enhance public health.

This "Approved Scoping Plan" was adopted by the Board at its December 11, 2008 meeting. The measures in this Scoping Plan will be developed over the next two years and be in place by 2012.

Reduction Goals

This plan calls for an ambitious but achievable reduction in California's carbon footprint. Reducing greenhouse gas emissions to 1990 levels means cutting approximately 30 percent from business-as-usual emission levels projected for 2020, or about 15 percent from today's levels. On a per-capita basis, that means reducing our annual emissions of 14 tons of carbon dioxide equivalent for every man, woman and child in California down to about 10 tons per person by 2020. This challenge also presents a magnificent opportunity to transform California's economy into one that runs on clean and sustainable technologies, so that all Californians are able to enjoy their rights in the future to clean air, clean water, and a healthy and safe environment.

Significant progress can be made toward the 2020 goal relying on existing technologies and improving the efficiency of energy use. A number of solutions are "off the shelf," and many – especially investments in energy conservation and efficiency – have proven economic benefits. Other solutions involve improving our state's infrastructure, transitioning

to cleaner and more secure sources of energy, and adopting 21st century land use planning and development practices.

A Clean Energy Future

Getting to the 2020 goal is not the end of the State's effort. According to climate scientists, California and the rest of the developed world will have to cut emissions by 80 percent from today's levels to stabilize the amount of carbon dioxide in the atmosphere and prevent the most severe effects of global climate change. This long range goal is reflected in California Executive Order S-3-05 that requires an 80 percent reduction of greenhouse gases from 1990 levels by 2050.

Reducing our greenhouse gas emissions by 80 percent will require California to develop new technologies that dramatically reduce dependence on fossil fuels, and shift into a landscape of new ideas, clean energy, and green technology. The measures and approaches in this plan are designed to accelerate this necessary transition, promote the rapid development of a cleaner, low carbon economy, create vibrant livable communities, and improve the ways we travel and move goods throughout the state. This transition will require close coordination of California's climate change and energy policies, and represents a concerted and deliberate shift away from fossil fuels toward a more secure and sustainable future. This is the firm commitment that California is making to the world, to its children and to future generations.

Making the transition to a clean energy future brings with it great opportunities. With these opportunities, however, also come challenges. As the State moves ahead with the development and implementation of policies to spur this transition, it will be necessary to ensure that they are crafted to not just cut greenhouse gas emissions and move toward cleaner energy sources, but also to ensure that the economic and employment benefits that will accompany the transition are realized in California. This means that particular attention must be paid to fostering an economic environment that promotes and rewards California-based investment and development of new technologies and that adequate resources are devoted to building and maintaining a California-based workforce equipped to help make the transition.

A Public Process

Addressing climate change presents California with a challenge of unprecedented scale and scope. Success will require the support of Californians up and down the state. At every step of the way, we have endeavored to engage the public in the development of this plan and our efforts to turn the tide in the fight against global warming.

In preparing the Draft Scoping Plan, ARB and CAT subgroups held dozens of workshops, workgroups, and meetings on specific technical issues and policy measures. Since the release of the draft plan in late June, we have continued our extensive outreach with workshops and webcasts throughout the state. Hundreds of Californians showed up to share their thoughts about the draft plan, and gave us their suggestions for improving it. We've received thousands of postcards, form letters, emails, and over 1,000 unique comments

posted to our website or sent by mail. All told, more than 42,000 people commented on the draft Plan.

ARB catalogued and publicly posted all the comments we received. In many instances, we engaged experts and staff at our partner agencies for additional evaluation of comments and suggestions.

This plan reflects the input of Californians at every level. Our partners at other State agencies, in the legislature, and at the local government level have provided key input. We've met with members of community groups to address environmental justice issues, with representatives of California's labor force to ensure that good jobs accompany our transition to a clean energy future, and with representatives of California's small businesses to ensure that this vital part of our state's economic engine flourishes under this plan. We've heeded the advice of public health and environmental experts throughout the state to design the plan so that it provides valuable co-benefits in addition to cutting greenhouse gases. We've also worked with representatives from many of California's leading businesses and industries to craft a plan that works in tandem with the State's efforts to continue strong economic growth.

In short, we've heard from virtually every sector of California's society and economy, reflecting the fact that the plan will touch the life of almost every Californian in some way.

Scoping Plan Recommendations

The recommendations in this plan were shaped by input and advice from ARB's partners on the Climate Action Team, as well as the Environmental Justice Advisory Committee (EJAC), the Economic and Technology Advancement Advisory Committee (ETAAC), and the Market Advisory Committee (MAC). Like the Draft Scoping Plan, the strength of this plan lies in the comprehensive array of emission reduction approaches and tools that it recommends.

Key elements of California's recommendations for reducing its greenhouse gas emissions to 1990 levels by 2020 include:

- **Expanding and strengthening existing energy efficiency programs as well as building and appliance standards;**
- **Achieving a statewide renewables energy mix of 33 percent;**
- **Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system;**
- **Establishing targets for transportation-related greenhouse gas emissions for regions throughout California, and pursuing policies and incentives to achieve those targets;**

- **Adopting and implementing measures pursuant to existing State laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard; and**
- **Creating targeted fees, including a public goods charge on water use, fees on high global warming potential gases, and a fee to fund the administrative costs of the State's long term commitment to AB 32 implementation.**

After Board approval of this plan, the measures in it will be developed and adopted through the normal rulemaking process, with public input.

Key Changes

This plan is built upon the same comprehensive approach to achieving reductions as the draft plan. However, as a result of the extensive public comment we received, this plan includes a number of general and measure-specific changes. The key changes and additions follow.

Additional Reports and Supplements

1. Economic and Public Health Evaluations: This plan incorporates an evaluation of the economic and public health benefits of the recommended measures. These analyses follow the same methodology used to evaluate the Draft Scoping Plan.[1]

2. CEQA Evaluation: This plan includes an evaluation of the potential environmental impacts of the Scoping Plan under the California Environmental Quality Act (CEQA).[2]

Programmatic Changes

1. Margin of Safety for Uncapped Sectors: The plan provides a 'margin of safety,' that is, additional reductions beyond those in the draft plan to account for measures in uncapped sectors that do not, or may not, achieve the estimated reduction of greenhouse gas emissions in this plan. Along with the certainty provided by the cap, this will ensure that the 2020 target is met.

2. Focus on Labor: The plan includes a discussion of issues directly related to California's labor interests and working families, including workforce development and career technical education. This additional element reflects ARB's existing activities and expanded efforts by State agencies, such as the Employment Development Department, to ensure that California will have a green technology workforce to address the challenges and opportunities presented by the transition to a clean energy future.

[1] Staff will provide an update to the Board to respond to comments received on these analyses.

[2] This evaluation is contained in Appendix J.

3. Long Term Trajectory: The plan includes an assessment of how well the recommended measures put California on the long-term reduction trajectory needed to do our part to stabilize the global climate.

4. Carbon Sequestration: The plan describes California's role in the West Coast Regional Carbon Sequestration Partnership (WESTCARB), a public-private collaboration to characterize regional carbon capture and sequestration opportunities. In addition, the plan expresses support for near-term development of sequestration technology. This plan also acknowledges the important role of terrestrial sequestration in our forests, rangelands, wetlands, and other land resources.

5. Cap-and-Trade Program: The plan provides additional detail on the proposed cap-and-trade program including a discussion regarding auction of allowances, a discussion of the proposed role for offsets, the role of voluntary renewable power purchases, and additional detail on the mechanisms to be developed to encourage voluntary early action.

6. Implementation: The plan provides additional detail on implementation, tracking and enforcement of the recommended actions, including the important role of local air districts.

Changes to Specific Measures and Programs

1. Regional Targets: ARB re-evaluated the potential benefits from regional targets for transportation-related greenhouse gases in consultation with regional planning organizations and researchers at U.C. Berkeley. Based on this information, ARB increased the anticipated reduction of greenhouse gas emissions for Regional Transportation-Related Greenhouse Gas Targets from 2 to 5 million metric tons of CO_2 equivalent ($MMTCO_2E$).

2. Local Government Targets: In recognition of the critical role local governments will play in the successful implementation of AB 32, ARB added a section describing this role. In addition, ARB recommended a greenhouse gas reduction goal for local governments of 15 percent below today's levels by 2020 to ensure that their municipal and community-wide emissions match the State's reduction target.

3. Additional Industrial Source Measures: ARB added four additional measures to address emissions from industrial sources. These proposed measures would regulate fugitive emissions from oil and gas recovery and transmission activities, reduce refinery flaring, and require control of methane leaks at refineries. We

anticipate that these measures will provide 1.5 $MMTCO_2E$ of greenhouse gas reductions.

4. Recycling and Waste Re-Assessment: In consultation with the California Integrated Waste Management Board, ARB re-assessed potential measures in the Recycling and Waste sector. As a result of this review, ARB increased the anticipated reduction of greenhouse gas emissions from the Recycling and Waste Sector from 1 to 10 $MMTCO_2E$, incorporating measures to move toward high recycling and zero-waste.[3]

5. Green Building Sector: This plan includes additional technical evaluations demonstrating that green building systems have the potential to reduce approximately 26 $MMTCO_2E$ of greenhouse gases. These tools will be helpful in reducing the carbon footprint for new and existing buildings. However, most of these greenhouse gas emissions reductions will already be counted in the Electricity, Commercial/Residential Energy, Water or Waste sectors and are not separately counted toward the AB 32 goal in this plan.

6. High Global Warming Potential (GWP) Mitigation Fee: Currently many of the chemicals with very high Global Warming Potential (GWP)—typically older refrigerants and constituents of some foam insulation products—are relatively inexpensive to purchase. ARB includes in this plan a Mitigation Fee measure to better reflect their impact on the climate. The fee is anticipated to promote the development of alternatives to these chemicals, and improve recycling and removal of these substances when older units containing them are dismantled.

7. Modified Vehicle Reductions: Based on current regulatory development, ARB modified the expected emissions reduction of greenhouse gases from the Heavy-Duty Vehicle Greenhouse Gas Emission Reduction (Aerodynamic Efficiency) measure and the Tire Inflation measure. The former measure is now expected to achieve 0.9 $MMTCO_2E$ while the latter is now expected to achieve 0.4 $MMTCO_2E$.

8. Discounting Low Carbon Fuel Standard Reductions: ARB modified the expected emission reductions from the Low Carbon Fuel Standard to reflect overlap in claimed benefits with California's clean car law (the Pavley greenhouse gas vehicle standards). This has the result of discounting expected reduction of greenhouse gas emissions from the Low Carbon Fuel Standard by approximately 10 percent.

[3] Research to help quantify these greenhouse gas emissions reductions is continuing, so only 1 $MMTCO_2E$ of these reductions are currently counted toward the AB 32 goal in this plan. Additional tons will be considered part of the safety margin.

A Balanced and Comprehensive Approach

Meeting the goals of AB 32 will require a coordinated set of strategies to reduce emissions throughout the economy. These strategies will fit within the comprehensive tracking, reporting, and enforcement framework that is already being developed and implemented. By 2020, a hard and declining cap will cover 85 percent of California's greenhouse gas emissions, helping to ensure that we meet our reduction targets on time.

AB 32 lays out a number of important factors that have helped to guide the development of this plan and will continue to be considered as regulations are developed over the next few years. Some of the key criteria that have and will be further considered are: cost-effectiveness; overall societal benefits like energy diversification and public health improvements; minimization of leakage; and impacts on specific sectors like small business and disproportionately impacted communities. The comprehensive approach in the plan reflects a balance among these and other important factors and will help to ensure that California meets its greenhouse gas reduction targets in a way that promotes and rewards innovation, is consistent with and helps to foster economic growth, and delivers improvements to the environment and public health.

Many of the measures in this plan complement and reinforce one another. For instance, the Low Carbon Fuel Standard, which reduces the carbon intensity of transportation fuels sold in California, will work in tandem with technology-forcing regulations designed to reduce greenhouse gas emissions from cars and trucks. Improvements in land use and the ways we grow and build our communities will further reduce emissions from the transportation sector.

Many of the measures also build on highly successful long-standing practices in California—such as energy efficiency and the use of renewable energy resources—that can be accelerated and expanded. Increasing the amount of energy we get from renewable energy sources, including placing solar arrays and solar water heaters on houses throughout California, will be supported by an increase in building standards for energy efficiency. Other measures address the transport and treatment of water throughout the state, reduce greenhouse gas emissions that come from ships in California's ports, and promote changes to agricultural and forestry practices. There are also measures designed to safely reduce or recover a range of very potent greenhouse gases – refrigerants and other industrial gases – that contribute to global warming at a level many times greater per ton emitted than carbon dioxide.

Many of the measures in this plan are designed to take advantage of the economic and innovation-related benefits that market-based compliance strategies can provide. Particularly in light of current economic uncertainty, it is important to ensure that California's climate policies be designed to promote and take advantage of economic opportunities while also cutting greenhouse gas emissions. For instance, the cap-and-trade program creates an opportunity for firms to seek out cost-effective emission reduction strategies and provides an incentive for technological innovation. California's clean car standards, which require manufacturers to meet annual average levels of greenhouse gas emissions for all cars they sell in California, also offer flexibility to help ensure compliance. Under California's clean

car standards, manufacturers who exceed compliance standards are permitted to bank credits for future use or sell them to other manufacturers. These types of compliance options will be key in ensuring that we are able to meet our reduction targets in a cost-effective manner.

Working with the Western Climate Initiative

California is working closely with six other states and four Canadian provinces in the Western Climate Initiative (WCI) to design a regional greenhouse gas emissions reduction program that includes a cap-and-trade approach. California's participation in WCI creates an opportunity to provide substantially greater reductions in greenhouse gas emissions from throughout the region than could be achieved by California alone. The larger scope of the program also expands the market for clean technologies and helps avoid leakage, that is, the shifting of emissions from sources within California to sources outside the state.

The WCI partners released the recommended design for a regional cap-and-trade program in September 2008.[4] ARB embraces the WCI effort, and will continue to work with WCI partners. The creation of a robust regional trading system can complement the other policies and measures included in this plan, and provide the means to achieve the reduction of greenhouse gas emissions needed from a wide range of sectors as cost-effectively as possible.

California's Economy, Environment, and Public Health

The approaches in this plan are designed to maximize the benefits that can accompany the transition to a clean energy economy. California has a long and successful track record of implementing environmental policies that also deliver economic benefits. This plan continues in that tradition.

AB 32: Evaluating the Economic Effects

The economic analysis of this plan indicates that implementation of the recommended strategies to address global warming will create jobs and save individual households money.[5] The analysis also indicates that measures in the plan will position California to move toward a more secure, sustainable future where we invest heavily in energy efficiency and clean technologies. The economic analysis indicates that implementation of that forward-looking approach also creates more jobs and saves individual households more money than if California stood by and pursued an unacceptable course of doing nothing at all to address our unbridled reliance on fossil fuels.

Specifically, analysis of the Scoping Plan indicates that projected economic benefits in 2020 compared to the business-as-usual scenario include:

- Increased economic production of $33 billion

[4] Details of the WCI recommendation are provided in Appendix D.

[5] See Appendix G.

- Increased overall gross state product of $7 billion
- Increased overall personal income by $16 billion
- Increased per capita income of $200
- Increased jobs by more than 100,000

Furthermore, the results of the economic analysis may underestimate the economic benefits of the plan since the models that were used do not account for savings that result from the flexibility provided under market-based programs.

AB 32: The Environmental and Public Health Costs of Inaction

A key factor that was not weighed in the overall economic analysis is the potential cost of doing nothing. When these costs are taken into account, the benefits associated with implementing a comprehensive plan to cut greenhouse gas emissions become even clearer. As a state, California is particularly vulnerable to the costs associated with unmitigated climate change.

A summary report from the California Climate Change Center notes that a warming California climate would generate more smoggy days by contributing to ozone formation while also fostering more large brush and forest fires. Continuing increases in global greenhouse gas emissions at business-as-usual rates would result, by late in the century, in California losing 90 percent of the Sierra snow pack, sea level rising by more than 20 inches, and a three to four times increase in heat wave days. These impacts will translate into real costs for California, including flood damage and flood control costs that could amount to several billion dollars in many regions such as the Central Valley, where urbanization and limited river channel capacity already exacerbate existing flood risks.[6] Water supply costs due to scarcity and increased operating costs would increase as much as $689 million per year by 2050.[7] ARB analysis shows that due to snow pack loss, California's snow sports sector would be reduced by $1.4 billion (2006 dollars) annually by 2050 and shed 14,500 jobs; many other sectors of California's economy would suffer as well.

Failing to address climate change also carries with it the risk of substantial public health costs, primarily as a result of rising temperatures. Sustained triple-digit heat waves increase the health risk for several segments of the population, especially the elderly. But higher average temperatures will also increase the interactions of smog-causing chemicals with sunlight and the atmosphere to produce higher volumes of toxic byproducts than would otherwise occur. In the 2006 report to the Governor

[6] A Summary Report from: California Climate Change Center. *Our Changing Climate: Assessing the Risks to California*. Document No. CEC-500-2006-077. July 2006. http://www.energy.ca.gov/2006publications/CEC-500-2006-077/CEC-500-2006-077.PDF (accessed October 12, 2008)

[7] A Report from: California Climate Change Center. *Climate Warming and Water Supply Management in California*. Document No. CEC-500-2005-195-SF. March 2006. pp.13-14 http://www.energy.ca.gov/2005publications/CEC-500-2005-195/CEC-500-2005-195-SF.PDF (accessed October 12, 2008).

from the California Climate Center, it was reported that global increases in temperature will lead to increased concentrations and emissions of harmful pollutants in California.[8] Some cities in California are disproportionately susceptible to temperature increases since they already have elevated pollution levels and are subject to the heat-island effect that reduces nighttime cooling, allowing heat to build up and magnify the creation of additional harmful pollution. Low-income communities are disproportionately impacted by climate change, lacking the resources to avoid or adapt to these impacts. For example, low-income residents are less likely to have access to air conditioning to prevent heat stroke and death in heat waves. For California, then, taking action with other regions and nations to help mitigate the impacts of climate change will help slow temperature rise. This in turn will likely result in fewer premature deaths from respiratory and heat-related causes, and many thousands fewer hospital visits and days of illness.

California cannot avert the impacts of global climate change by acting alone. We can, however, take a national and international leadership role in this effort by demonstrating that taking firm and reasoned steps to address global warming can actually help spur economic growth.

AB 32: Providing Savings for Households and Businesses

This plan builds upon California's thirty-year track record of pioneering energy efficiency programs. Many of the measures in the plan will deliver significant gains in energy efficiency throughout the economy. These gains, even after increases in per unit energy costs are taken into account, will help deliver annual savings of between $400 and $500 on average by 2020 for households, including low-income households.

Businesses, both large and small, will benefit too. By 2020, the efficiency measures in the plan will decrease overall energy expenditures for businesses even after taking into account projected rises in per unit energy costs. Since small businesses spend a greater proportional share of revenue on energy-related costs, they are likely to benefit the most. Furthermore, businesses throughout the state will benefit from the overall economic growth that is projected to accompany implementation of AB 32 between now and 2020.

Similar savings are projected in the transportation sector. By reducing greenhouse gas pollution from more efficient and alternatively-fueled cars and trucks under California's Clean Car law (the Pavley greenhouse gas standards), consumers save on operating costs through reduced fuel use. Although cars will be marginally more expensive, owners will be paid back with savings over the lifetime of the car, and the average new car buyer will have an extra $30 each month for other expenditures. Current estimates indicate that consumer savings in 2020 for California's existing

[8] A Report from: California Climate Change Center. *Scenarios of Climate Change in California: An Overview*. Document No. CEC-500-2005-186-SF. February 2006. http://www.energy.ca.gov/2005publications/CEC-500-2005-186/CEC-500-2005-186-SF.PDF (accessed October 12, 2008)

clean car standards will be over $12 billion. These savings give Californians the ability to invest their dollars in other sectors of the state's economy.

AB 32: Driving Investment and Job Growth

Addressing climate change also provides a strong incentive for investment in California. Our leadership in environmental and energy efficiency policy has already helped attract a large and growing share of the nation's venture capital investment in green technologies. Since AB 32 was signed into law, venture capital investment in California has skyrocketed. In the second quarter of 2008 alone, California dominated world investment in clean technology venture capital, receiving $800 million of the global total of $2 billion.[9]

These investments in building a new clean tech sector also translate directly into job growth. A study by U.C. Berkeley's Energy and Resources Group and Goldman School of Public Policy found that investments in green technologies produce jobs at a higher rate than investments in comparable conventional technologies.[10] And the National Venture Capital Association estimates that each $100 million in venture capital funding helps create 2,700 jobs, $500 million in annual revenues for two decades and many indirect jobs.[11]

AB 32: Improving Public Health

The public health analysis conducted for this Plan indicates that cutting greenhouse gases will also provide a wide range of additional public health and environmental benefits. By 2020, the economic value alone of the additional air-quality related benefits is projected to be on the order of $4.4 billion. Our analysis indicates that implementing the Scoping Plan will result in a reduction of 15 tons per day of combustion-generated soot (PM 2.5) and 61 tons per day of oxides of nitrogen (precursors to smog). These reductions in harmful air pollution would provide the following estimated health benefits in 2020, above and beyond those projected to be achieved as a result of California's other existing public health protection and improvement efforts:

- An estimated 780 premature deaths statewide will be avoided
- Almost 12,000 incidences of asthma and lower respiratory symptoms will be avoided

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[9] Press Release from Cleantech Network LLC, *Cleantech Venture Investment Reaches Record of $2 Billion in 2008*. July 08, 2008. http://cleantech.com/about/pressreleases/011008.cfm (accessed October 12, 2008)

[10] Report of the Renewable and Appropriate Energy Laboratory. *Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?* Energy and Resources Group/Goldman School of Public Policy at University of California, Berkeley. April 13, 2004. http://rael.berkeley.edu/old-site/renewables.jobs.2006.pdf (accessed October 12, 2008)

[11] Report prepared for the National Venture Capital Association. *Venture Impact 2004: Venture Capital Benefits to the U.S. Economy*. Prepared by: Global Insight. June 2004. http://www.globalinsight.com/publicDownload/genericContent/07-20-04_fullstudy.pdf (accessed October 12, 2008)

- 77,000 work loss days will be avoided

In addition to the quantified health benefits, our analysis also indicates that implementation of the measures in the plan will deliver a range of other public health benefits. These include health benefits associated with local and regional transportation-related greenhouse gas targets that will facilitate greater use of alternative modes of transportation such as walking and bicycling. These types of moderate physical activities reduce many serious health risks including coronary heart disease, diabetes, hypertension and obesity.[12] Furthermore, as specific measures are developed, ARB and public health experts will work together to ensure that they are designed with an eye toward capturing a broad range of public health co-benefits.

The results of both the economic and public health analyses are clear: guiding California toward a clean energy future with reduced dependence on fossil fuels will grow our economy, improve public health, protect the environment and create a more secure future built on clean and sustainable technologies.

State Leadership

California is committed to once again lead and support a pioneering effort to protect the environment and improve public health while maintaining a vibrant economy. Every agency, department and division will bring climate change considerations into its policies, planning and analysis, building and expanding current efforts to green its fleet and buildings, and managing its water, natural resources, and infrastructure to reduce greenhouse gas emissions.

In all these efforts, California is exercising a leadership role in global action to address climate change. It is also exemplifying the essential role states play as the laboratories of innovation for the nation. As California has done in the past in addressing emissions that caused smog, the State will continue to develop innovative programs that benefit public health and improve our environment and quality of life.

Moving Beyond 2020

AB 32 requires a return to 1990 emission levels by 2020. The Scoping Plan is designed to achieve that goal. However, 2020 is by no means the end of California's journey to a clean energy future. In fact, that is when many of the strategies laid out in this plan will just be kicking into high gear.

Take, for example, the regional transportation-related greenhouse gas emissions targets. In order to achieve the deep cuts in greenhouse gas emissions we will need beyond 2020 it will be necessary to significantly change California's current land use and transportation planning policies. Although these changes will take time, getting started now will help put California

[12] Appendix H contains a reference list of studies documenting the public health benefits of alternative transportation.

on course to cut statewide greenhouse gas emissions by 80 percent in 2050 as called for by Governor Schwarzenegger.

Similarly, measures like the cap-and-trade program, energy efficiency programs, the California clean car standards, and the renewables portfolio standard will all play central roles in helping California meet its 2020 reduction requirements. Yet, these strategies will also figure prominently in California's efforts beyond 2020. Some of these measures, like energy efficiency programs and the renewables portfolio standard, have already delivered greenhouse gas emissions reduction benefits that will expand over time. Others, like the cap-and-trade program, will put in place a foundation on which to build well into the future. All of these measures, and many others in the plan, will ensure that California meets its 2020 target and is positioned to continue its international role as leader in the fight against global warming to 2050 and beyond.

A Shared Challenge

Californians are already responding to the challenge of reducing greenhouse gas emissions. Over 120 California cities and counties have signed on to the U.S. Conference of Mayors Climate Protection Agreement[13] and many have established offices of climate change and are developing comprehensive plans to reduce their carbon footprint. Well over 300 companies, municipalities, organizations and corporations are members of the California Climate Action Registry, reporting their greenhouse gas emissions on an annual basis. Many other businesses and corporations are making climate change part of their fiscal and strategic planning. ARB encourages these initial efforts and has set in place a policy to support and encourage other voluntary early reductions.

Successful implementation of AB 32 will depend on a growing commitment by a majority of companies to include climate change as an integral part of their planning and operations. Individuals and households throughout the state will also have to take steps to consider climate change at home, at work and in their recreational activities. To support this effort, this plan includes a comprehensive statewide outreach program to provide businesses and individuals with the widest range of information so they can make informed decisions about reducing their carbon footprints.

Californians will not have to wait for decades to see the benefits of a low carbon economy. New homes can achieve a near zero-carbon footprint with better building techniques and existing technologies, such as solar arrays and solar water heaters. Many older homes can be retrofitted to use far less energy than at present. A new generation of vehicles, including plug-in hybrids, is poised to appear in dealers' showrooms, and the development of the infrastructure to support hydrogen fuel cell cars continues. Cities and new developments will be more walkable, public transport will improve, and high-speed rail will give travelers a new clean transportation option.

[13] Mayors Climate Protection Center. *List of Participating Mayors.* http://www.usmayors.org/climateprotection/list.asp (accessed October 12, 2008)

That world is just around the corner. What lies beyond is even more exciting. Where will California be in 2050? By harnessing the ingenuity and creativity of our society and sparking the imagination of the next generation of Californians, California will make the transition to a clean-energy, low-carbon society and become a healthier, cleaner and more sustainable place to live. This plan charts a course toward that future.

ARB invites comment and input from the broadest array of the public and stakeholders as we move forward over the next two years to develop the individual measures, and develop the policies that will move us toward sustainable clean energy and away from fossil fuels. Your participation will help craft the mechanisms and measures to make this plan a reality. This is California's plan and together, we need to make the necessary changes to address the greatest environmental challenge we face. As Governor Schwarzenegger stated when he signed AB 32 into law two years ago, "We owe our children and we owe our grandchildren. We simply must do everything in our power to fight global warming before it is too late."

I. INTRODUCTION: A Framework for Change

California strengthened its commitment to address climate change when Governor Schwarzenegger signed Assembly Bill 32 (AB 32), the Global Warming Solutions Act of 2006 (Núñez, Chapter 488, Statutes of 2006). This groundbreaking legislation represents a turning point for California and makes it clear that a business-as-usual approach toward greenhouse gas emissions is no longer acceptable. In light of the need for strong and immediate action to counter the growing threat of global warming, AB 32 sets forth an aggressive timetable for achieving results.

AB 32 embodies the idea that California can continue to grow and flourish while reducing its greenhouse gas emissions and continuing its long-standing efforts to achieve healthy air, and protect and enhance public health. Achieving these goals will involve every sector of the state's $1.7 trillion economy and touch the life of every Californian.

As the lead agency for implementing AB 32, the California Air Resources Board (ARB or the Board) released a Draft Scoping Plan on June 26, 2008, which laid out a comprehensive statewide plan to reduce California's greenhouse gas emissions to 1990 levels by 2020. This draft plan set forth a comprehensive reduction strategy that combines market-based regulatory approaches, other regulations, voluntary measures, fees, policies, and programs that will significantly reduce emissions of greenhouse gases and help make our state cleaner, more efficient and more secure.

Based upon the numerous comments received on the draft, as well as additional staff analysis, ARB released a *Proposed* Scoping Plan on October 15, 2008. At its November 20 and 21, 2008 meeting, the Board heard staff presentations on the Proposed Scoping Plan and directed staff to make a number of modifications. This *Approved* Scoping Plan incorporates these modifications, as well as corrections from the November 14, 2008 errata sheet, but otherwise reflects the same measures of the Proposed Scoping Plan.

The Board approved this Scoping Plan at its December 11, 2008 meeting, providing specific direction for the State's greenhouse gas emissions reduction program. The recommended measures will be developed into regulations over the next two years, to go into effect by January 1, 2012. As specific measures in the plan are developed, we will update and adjust our regulatory proposals as necessary to ensure that they reflect any new information, additional analyses, new technologies or other factors that emerge during the process.

ARB has conducted a transparent, wide-ranging public process to develop the Scoping Plan, including numerous meetings, workshops, and seminars with stakeholders. Substantial input on the development of the Scoping Plan came from formal advisory committees, meetings with industrial and business groups, non-profit organizations and members of the public, as

well as written comments on the Draft Scoping Plan. ARB will continue its outreach activities to seek ongoing public input and will encourage early and continued involvement in the implementation of the plan from all Californians.

A. Summary of Changes from the Draft Scoping Plan

ARB released the June Draft Scoping Plan and requested public comment and input, while continuing to analyze the measures and their impact on California. Since the Draft Scoping Plan release, ARB received almost 1,000 unique written comments as well as hundreds of verbal comments at workshops and in meetings. Taking into account that some written comments were submitted by multiple individuals, all told more than 42,000 people have commented on the draft plan. ARB has also completed detailed economic and public health evaluations of its recommendations.

The key changes between the Draft Scoping Plan and the Scoping Plan are summarized below. The Scoping Plan includes the following modifications:

1. General

- Incorporates economic and public health analyses of the Scoping Plan. These analyses show that the recommendations in the Scoping Plan will have a net positive impact on both the economy and public health. These analyses follow the same methodology used to evaluate the Draft Scoping Plan.
- Provides a "margin of safety" by recommending additional greenhouse gas emissions reduction strategies to account for measures in uncapped sectors that do not achieve the greenhouse gas emissions reductions estimated in the Scoping Plan. Along with the certainty provided by the cap, this will ensure that the 2020 target is met.
- Expands the discussion of workforce development, education, and labor to more fully reflect existing activities and the role of other state agencies in ensuring an adequate green technology workforce.
- Assesses how well the recommended measures put California on the long-term reduction trajectory needed to do our part to stabilize the global climate.
- Describes California's role in the West Coast Regional Carbon Sequestration Partnership (WESTCARB), a public-private collaboration to characterize regional carbon capture and sequestration opportunities, and expresses support for near-term advancement of the technology and monitoring of its development. Acknowledges the important role of terrestrial sequestration.
- Provides greater detail on the mechanisms to be developed to encourage voluntary early action.
- Provides additional detail on implementation, tracking and enforcement of the recommended actions, including the important role of local air districts.

- Evaluates the potential environmental impacts of the Scoping Plan under the California Environmental Quality Act (CEQA). This evaluation is contained in Appendix J.

2. Proposed Measures

- Provides greater detail on the proposed cap-and-trade program including more detail on the allocation and auction of allowances, and clarification of the proposed role of offsets.
- Re-evaluates the potential benefits from regional targets for transportation-related greenhouse gases in consultation with regional planning organizations and researchers at U.C. Berkeley. Based on this information, ARB increased the anticipated greenhouse gas emissions reductions for Regional Transportation-Related Greenhouse Gas Targets from 2 to 5 million metric tons of CO_2 equivalent ($MMTCO_2E$).
- In recognition of the importance of local governments in the successful implementation of AB 32, adds a section describing this role and recommends a greenhouse gas emissions reduction target for local government municipal and community-wide emissions of a 15 percent reduction from current levels by 2020 to parallel the State's target.
- Adds four measures to address emissions from industrial sources. These proposed measures would regulate fugitive emissions from oil and gas recovery and gas transmission activities, reduce refinery flaring, and remove the methane exemption for refineries. These proposed measures are anticipated to provide 1.5 $MMTCO_2E$ of greenhouse gas reductions in 2020.
- In consultation with the California Integrated Waste Management Board, re-assesses potential measures in the Recycling and Waste sector. As a result of this assessment, ARB increased the reduction of greenhouse gas emissions that can ultimately be anticipated from the Recycling and Waste Sector from 1 to 10 $MMTCO_2E$, recommending measures to move toward high recycling and zero-waste. Research to help quantify these greenhouse gas emissions is continuing, so only 1 $MMTCO_2E$ of these reductions is currently counted towards the AB 32 goal in this plan.
- Estimates the potential reduction of greenhouse gas emissions from the Green Building sector. Green building systems have the potential to reduce approximately 26 $MMTCO_2E$ of greenhouse gas emissions. Since most of these emissions reductions are counted in the Electricity, Commercial/Residential Energy, Water or Waste sectors, emission reductions in the Green Building sector are not separately counted toward the AB 32 goal.
- Adds a High Global Warming Potential (GWP) Mitigation Fee measure to ensure that the climate impact of these gases is reflected in their price to encourage reduced use and end-of-life losses, as well as the development of alternatives.
- Reduces the expected greenhouse gas emissions reduction from the Heavy-Duty Vehicle Greenhouse Gas Emissions Reduction (Aerodynamic Efficiency) measure and the Tire Inflation measure based on ongoing regulatory

development. The Heavy-Duty Vehicle Greenhouse Gas Emissions Reduction (Aerodynamic Efficiency) measure is now expected to achieve 0.9 $MMTCO_2E$ and the Tire Inflation measure is now expected to achieve 0.4 $MMTCO_2E$.

- Modifies the expected reduction of greenhouse gas emissions from the Low Carbon Fuel Standard to account for potential overlap of benefits with the Pavley greenhouse gas vehicle standards. ARB discounted the expected emission reductions from the Low Carbon Fuel Standard by 10 percent.
- After further evaluation, moves the Heavy-Duty Truck Efficiency measure to the Goods Movement measure. ARB expects that market dynamics will provide an inducement to improve heavy-duty truck efficiency, and reductions in greenhouse gases in the future. ARB would consider pursuing direct requirements to reduce greenhouse gases if truck efficiency does not improve in the future.

B. Background

1. Climate Change Policy in California

California first addressed climate change in 1988 with the passage of AB 4420 (Sher, Chapter 1506, Statutes of 1988). This bill directed the California Energy Commission (CEC) to study global warming impacts to the state and develop an inventory of greenhouse gas emissions sources. In 2000, SB 1771 (Sher, Chapter 1018, Statutes of 2000) established the California Climate Action Registry to allow companies, cities and government agencies to voluntarily record their greenhouse gas emissions in anticipation of a possible program that would allow them to be credited for early reductions.

In 2001, the United Nations' Intergovernmental Panel on Climate Change (IPCC) reported that "there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities." The following year, AB 1493 (Pavley, Chapter 200, Statutes of 2002) was signed into law, requiring ARB to develop regulations to reduce greenhouse gas emissions from passenger vehicles, light-duty trucks and non-commercial vehicles sold in California.

Recognizing the value of regional partners in addressing climate change, the governors of California, Washington, and Oregon created the West Coast Global Warming Initiative in 2003 with provisions for the states to work together on climate change-related programs.

Two years later Governor Schwarzenegger signed Executive Order S-3-05, calling for the State to reduce greenhouse gas emissions to 1990 levels by 2020 and to reduce greenhouse gas emissions to 80 percent below 1990 levels by 2050. The 2020 goal was established to be an aggressive, but achievable, mid-term target, and the 2050 greenhouse gas emissions reduction goal represents the level scientists believe is necessary to reach levels that will stabilize climate.

In 2006, SB 1368 (Perata, Chapter 598, Statutes of 2006) created greenhouse gas performance standards for new long-term financial investments in base-load electricity generation serving California customers. This law is designed to help spur the transition toward cleaner energy in California by placing restrictions on the ability of utilities to build new carbon-intensive plants or enter into new contracts with high carbon sources of electricity. Expiration of existing utility long-term contracts with coal plants will reduce greenhouse gas emissions when such generation is replaced by lower greenhouse gas-emitting resources. These reductions will reduce the need for utilities to submit allowances to comply with the cap-and-trade program.

2. Assembly Bill 32: The Global Warming Solutions Act

In 2006, the Legislature passed and Governor Schwarzenegger signed AB 32, the Global Warming Solutions Act of 2006, which set the 2020 greenhouse gas emissions reduction goal into law. It directed ARB to begin developing discrete early actions to reduce greenhouse gases while also preparing a Scoping Plan to identify how best to reach the 2020 limit. The reduction measures to meet the 2020 target are to become operative by 2012.

AB 32 includes a number of specific requirements for ARB:

- *Identify the statewide level of greenhouse gas emissions in 1990 to serve as the emissions limit to be achieved by 2020 (Health and Safety Code (HSC) §38550).* In December 2007, the Board approved the 2020 emission limit of 427 million metric tons of carbon dioxide equivalent ($MMTCO_2E$) of greenhouse gases.
- *Adopt a regulation requiring the mandatory reporting of greenhouse gas emissions (HSC §38530).* In December 2007, the Board adopted a regulation requiring the largest industrial sources to report and verify their greenhouse gas emissions. The reporting regulation serves as a solid foundation to determine greenhouse gas emissions and track future changes in emission levels.
- *Identify and adopt regulations for Discrete Early Actions that could be enforceable on or before January 1, 2010 (HSC §38560.5).* The Board identified nine Discrete Early Action measures including potential regulations affecting landfills, motor vehicle fuels, refrigerants in cars, port operations and other sources in 2007. The Board has already approved two Discrete Early Action measures (ship electrification at ports and reduction of high GWP gases in consumer products). Regulatory development for the remaining measures is ongoing.
- *Ensure early voluntary reductions receive appropriate credit in the implementation of AB 32 (HSC §38562(b)(3)).* In February 2008, the Board approved a policy statement encouraging voluntary early actions and establishing a procedure for project proponents to submit quantification methods to be evaluated by ARB. ARB, along with California's local air districts and the California Climate Action Registry, is working to implement this program. Voluntary programs are discussed further in Chapter II and in Chapter IV.

- *Convene an Environmental Justice Advisory Committee (EJAC) to advise the Board in developing the Scoping Plan and any other pertinent matter in implementing AB 32 (HSC §38591).* The EJAC has met 12 times since early 2007, providing comments on the proposed Early Action measures and the development of the Scoping Plan, and submitted its comments and recommendations on the draft Scoping Plan in October 2008. ARB will continue to work with The EJAC as AB 32 is implemented.
- *Appoint an Economic and Technology Advancement Advisory Committee (ETAAC) to provide recommendations for technologies, research and greenhouse gas emission reduction measures (HSC §38591).* After a year-long public process, The ETAAC submitted a report of their recommendations to the Board in February 2008. The ETAAC also reviewed and provided comments on the Draft Scoping Plan.

3. Climate Action Team

In addition to establishing greenhouse gas emissions reduction targets for California, Executive Order S-3-05 established the Climate Action Team (CAT) for State agencies in 2005. Chaired by the Secretary of the California Environmental Protection Agency (CalEPA), the CAT has helped to direct State efforts on the reduction of greenhouse gas emissions and engage key State agencies including ARB. The Health and Human Services Agency, represented by the Department of Public Health, is the newest member of the CAT. Based on numerous public meetings and the review of thousands of submitted comments, the CAT released its first report in March 2006, identifying key carbon reduction recommendations for the Governor and Legislature.

Climate Action Team

California Environmental Protection Agency
Business, Transportation, and Housing Agency
Health and Human Services Agency
Resources Agency
State and Consumer Services Agency
Governor's Office of Planning and Research
Air Resources Board
California Energy Commission
California Public Utilities Commission
Department of Food and Agriculture
Department of Forestry and Fire Protection
Department of General Services
Department of Parks and Recreation
Department of Transportation
Department of Water Resources
Integrated Waste Management Board
State Water Resources Control Board

In April 2007, the CAT released a second report, "Proposed Early Actions to Mitigate Climate Change in California," which details numerous strategies that should be initiated prior to the 2012 deadline for other climate action regulations and efforts.

AB 32 recognizes the essential role of the CAT in coordinating overall climate policy. AB 32 does not affect the existing authority of other state agencies, and in addition to

ARB, many state agencies will be responsible for implementing the measures and strategies in this plan. The CAT is central to the success of AB 32, which requires an unprecedented level of cooperation and coordination across State government. The CAT provides the leadership for these efforts and helps ARB work closely with our state partners on the development and implementation of the strategies in the Scoping Plan.

There are currently 12 subgroups within the CAT – nine that address specific economic sectors, and three that were formed to analyze broad issues related to implementing a multi-sector approach to greenhouse gas emissions reduction efforts. The CAT sector-based subgroups include: Agriculture, Cement, Energy, Forest, Green Buildings, Land Use, Recycling and Waste Management, State Fleet, and Water-Energy. The members of these subgroups are drawn from departments that work with or regulate industries in the sector. ARB participated in each of the subgroups. All of the subgroups held public meetings and solicited public input, and many had multiple public workshops.

In March 2008, the subgroups collectively submitted more than 100 greenhouse gas emissions reduction measures to ARB for consideration in the Draft Scoping Plan. Many of those recommendations are reflected in this plan, and a number of them focus on reducing greenhouse gas emissions from energy production and use.

Through the Energy Subgroup the California Energy Commission (CEC) and the California Public Utilities Commission (CPUC) are conducting a joint proceeding to provide recommendations on how best to address electricity and natural gas in the implementation of AB 32, including evaluation of how the Electricity sector might best participate in a cap-and-trade program. The two Commissions forwarded interim recommendations to ARB in March 2008 that supported inclusion of the Electricity sector in a multi-sector cap-and-trade program, and measures to increase the penetration of energy efficiency programs in both buildings and appliances and to increase renewable energy sources. The two Commissions have developed a second proposed decision that was released in September 2008. This proposed decision provides more detailed recommendations that relate to the electricity and natural gas sectors. Because implementation of the Scoping Plan will require careful coordination with the State's energy policy, ARB will continue working closely with the two Commissions on this important area during the implementation of the recommendations in the Scoping Plan.

There are also three subgroups which are not sector-specific. The Economic Subgroup reviewed cost information associated with potential measures that were included in the 2006 CAT report with updates reflected in the report, "Updated Macroeconomic Analysis of Climate Strategies," in October 2007. This report provided an update of the macroeconomic analysis presented in the March 2006 CAT report to Governor Schwarzenegger and the Legislature. The Research Subgroup coordinates climate change research and identifies opportunities for collaboration, and is presently working on a report to the Governor. The State Operations Subgroup

has been created to work with State agencies to create a statewide plan to reduce State government's greenhouse gas emissions by a minimum of 30 percent by 2020.

In the first quarter of 2009, the Climate Action Team will release a report on its activities outside of its involvement in the development of the Scoping Plan. The CAT report will focus on several cross-cutting topics with which members of the CAT have been involved since the publication of the 2006 CAT report. The topics to be covered include research on the physical and consequent economic impacts of climate change as well as climate change research coordination efforts among the CAT members. There will also be an update on the important climate change adaptation efforts led by the Resources Agency and a discussion of cross-cutting issues related to environmental justice concerns. The CAT report will be released in draft form and will be available for public review in December 2008.

4. Development of the Greenhouse Gas Emission Reduction Strategy

In developing the Scoping Plan, ARB considered the State's existing climate change policy initiatives and the Early Action measures identified by the Board. Several advisory groups were formed to assist ARB in developing the Scoping Plan, including the Environmental Justice Advisory Committee (EJAC), the Economic and Technology Advancement Committee (ETAAC), and the Market Advisory Committee (MAC).

The Environmental Justice Advisory Committee (HSC §38591(a) et seq) advises ARB on development of the Scoping Plan and any other pertinent matter in implementing AB 32. The Board appoints its members, based on nominations received from environmental justice organizations and community groups.

The Economic and Technology Advancement Advisory Committee (HSC §38591(d)) includes members who are appointed by the Board based on expertise in fields of business, technology research and development, climate change, and economics. The ETAAC advises ARB on activities that will facilitate investment in, and implementation of, technological research and development opportunities, funding opportunities, partnership development, technology transfer opportunities, and related areas that lead to reductions of greenhouse gas emissions.

Members of the Market Advisory Committee (created under Executive Order S-20-06) were appointed by the Secretary of CalEPA based on their expertise in economics and climate change. The MAC advised ARB on the design of a cap-and-trade program for reducing greenhouse gas emissions.

Along with input from the advisory groups, ARB received submittals to a public solicitation for ideas, and numerous comments during public workshops, workgroup meetings, community meetings, and meetings with stakeholder groups. ARB held numerous workshops on the Draft Scoping Plan and convened workgroup meetings focused on program design and economic analysis. ARB and other involved State

agencies also held sector-specific technical workshops to look in greater detail at potential emissions reduction measures.

ARB also looked outward to examine programs at the regional, national and international levels. ARB met with and learned from experts from the European Union, the United Kingdom, Japan, Australia, the United Nations, the Regional Greenhouse Gas Initiative, the RECLAIM program, and the U.S. Environmental Protection Agency (U.S. EPA).

After the release of the Draft Scoping Plan, ARB conducted workshops and community meetings around the state to solicit public input. The Environmental Justice Advisory Committee and the Economic and Technology Advancement Advisory Committee held meetings to review and provide additional comments on the Draft Scoping Plan. In addition, ARB held meetings with numerous stakeholder groups to discuss specific greenhouse gas emissions reduction measures.

As described before, ARB has reviewed and considered both the written comments and the verbal comments received at the public workshops and meetings with stakeholders. This input, along with additional analysis, has ultimately shaped this Scoping Plan.

5. Implementation of the Scoping Plan

The foundation of the Scoping Plan's strategy is a set of measures that will cut greenhouse gas emissions by nearly 30 percent by the year 2020 as compared to business as usual and put California on a course for much deeper reductions in the long term. In addition to pursuing the reduction of greenhouse gas emissions, other strategies to mitigate climate change, such as carbon capture and storage (underground geologic storage of carbon dioxide), should also be further explored. And, as greenhouse gas reduction measures are implemented, we will continually evaluate how these measures can be optimized to also help deliver a broad range of public health benefits.

Most of the measures in this Scoping Plan will be implemented through the full rulemaking processes at ARB or other agencies. These processes will provide opportunity for public input as the measures are developed and analyzed in more detail. This additional analysis and public input will likely provide greater certainty about the estimates of costs and expected greenhouse gas emission reductions, as well as the design details that are described in this Scoping Plan. With the exception of Discrete Early Actions, which will be in place by January 1, 2010, other regulations are expected to be adopted by January 1, 2011 and take effect at the beginning of 2012.

Some of the measures in the plan may deliver more emission reductions than we expect; others less. It is also very likely that we will figure out new and better ways to cut greenhouse gas emissions as we move forward. New technologies will no doubt be developed, and new ideas and strategies will emerge. The Scoping Plan puts

California squarely on the path to a clean energy future but it also recognizes that adjustments will probably need to occur along the way and that as additional tools become available they will augment, and in some cases perhaps even replace, existing approaches.

California will not be implementing the measures in this Plan in a vacuum. Significant new action on climate policy is likely at the federal level and California and its partners in the Western Climate Initiative are working together to create a regional effort for achieving significant reductions of greenhouse gas emissions throughout the western United States and Canada. California is also developing a state Climate Adaptation Strategy to reduce California's vulnerability to known and projected climate change impacts.

ARB and other State agencies will continue to monitor, lead and participate in these broader activities. ARB will adjust the measures described here as necessary to ensure that California's program is designed to facilitate the development of integrated and cost-effective regional, national, and international greenhouse gas emissions reduction programs. (HSC §38564)

6. Climate Change in California

The impacts of climate change on California and its residents are occurring now. Of greater concern are the expected future impacts to the state's environment, public health and economy, justifying the need to sharply cut greenhouse gas emissions.

In the Findings and Declarations for AB 32, the Legislature found that:

> "The potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to the marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other health-related problems."

The Legislature further found that global warming would cause detrimental effects to some of the state's largest industries, including agriculture, winemaking, tourism, skiing, commercial and recreational fishing, forestry, and the adequacy of electrical power.

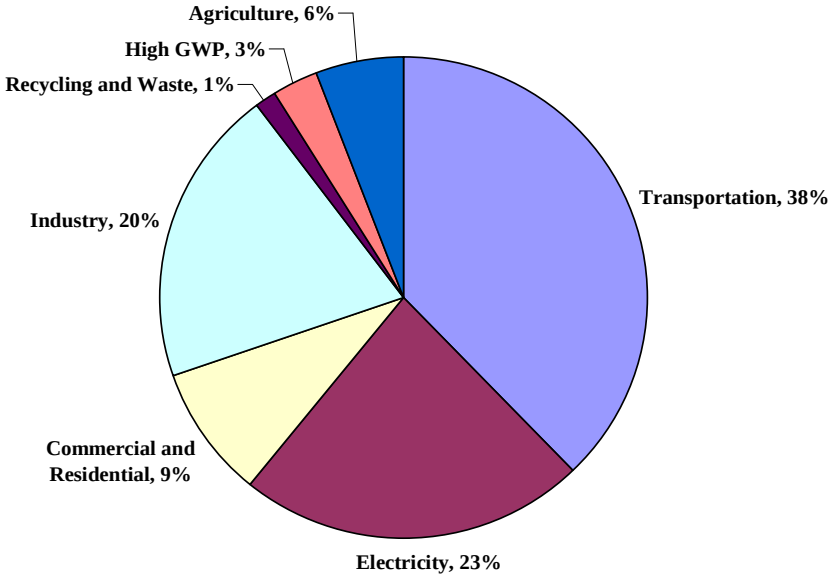
The impacts of global warming are already being felt in California. The Sierra snowpack, an important source of water supply for the state, has shrunk 10 percent in the last 100 years. It is expected to continue to decrease by as much as 25 percent by 2050. World-wide changes are causing sea levels to rise – about 8 inches of increase has been recorded at the Golden Gate Bridge over the past 100 years – threatening low coastal areas with inundation and serious damage from storms.

C. California's Greenhouse Gas Emissions and the 2020 Target

California is the fifteenth largest emitter of greenhouse gases on the planet, representing about two percent of the worldwide emissions. Although carbon dioxide is the largest contributor to climate change, AB 32 also references five other greenhouse gases: methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). Many other gases contribute to climate change and would also be addressed by measures in this Scoping Plan.

Figure 1 and Table 1 show 2002 to 2004 average emissions and estimates for projected emissions in 2020 without any greenhouse gas reduction measures (business-as-usual case). The 2020 business-as-usual forecast does not take any credit for reductions from measures included in this Plan, including the Pavley greenhouse gas emissions standards for vehicles, full implementation of the Renewables Portfolio Standard beyond current levels of renewable energy, or the solar measures. Additional information about the assumptions in the 2020 forecast is provided in Appendix F.

Figure 1: California's Greenhouse Gas Emissions (2002-2004 Average)[14]



As seen in Figure 1, the Transportation sector – largely the cars and trucks that move goods and people – is the largest contributor with 38 percent of the state's total greenhouse gas emissions. Table 1 shows that if we take no action, greenhouse gas emissions in the

[14] Air Resources Board. Greenhouse Gas Inventory. http://www.arb.ca.gov/cc/inventory/inventory.htm (accessed October 12, 2008)

Transportation sector are expected to grow by approximately 25 percent by 2020 (an increase of 46 $MMTCO_2E$).

The Electricity and Commercial/Residential Energy sector is the next largest contributor with over 30 percent of the statewide greenhouse gas emissions. Although electricity imported into California accounts for only about a quarter of our electricity, imports contribute more than half of the greenhouse gas emissions from electricity because much of the imported electricity is generated at coal-fired power plants. AB 32 specifically requires ARB to address emissions from electricity sources both inside and outside of the state.

California's Industrial sector includes refineries, cement plants, oil and gas production, food processors, and other large industrial sources. This sector contributes almost 20 percent of California's greenhouse gas emissions, but the sector's emissions are not projected to grow significantly in the future. The sector termed recycling and waste management is a unique system, encompassing not just emissions from waste facilities but also the emissions associated with the production, distribution and disposal of products throughout the economy.

Although high global warming potential (GWP) gases are a small contributor to historic greenhouse gas emissions, levels of these gases are projected to increase sharply over the next several decades, making them a significant source by 2020.

The Forest sector is unique in that forests both emit greenhouse gases and uptake carbon dioxide (CO_2). While the current inventory shows forests as a sink of 4.7 $MMTCO_2E$, carbon sequestration has declined since 1990. For this reason, the 2020 projection assumes no net emissions from forests.

The agricultural greenhouse gas emissions shown are largely methane emissions from livestock, both from the animals and their waste. Emissions of greenhouse gases from fertilizer application are also important contributors from the Agricultural sector. ARB has begun a research program to better understand the variables affecting these emissions. Opportunities to sequester CO_2 in the Agricultural sector may also exist; however, additional research is needed to identify and quantify potential sequestration benefits.

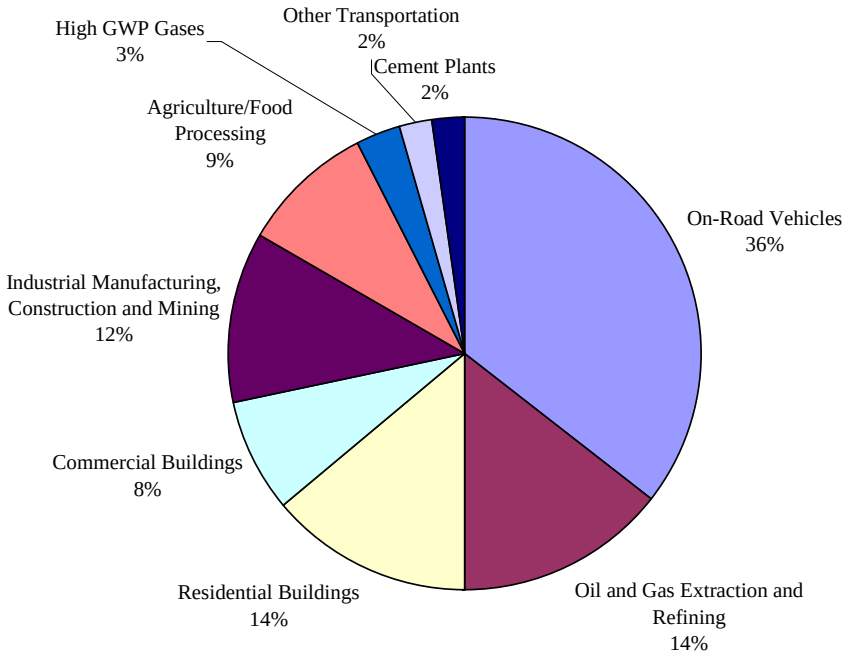
In December 2007, ARB approved a greenhouse gas emissions target for 2020 equivalent to the state's calculated greenhouse gas emissions level in 1990. ARB developed the 2020 target after extensive technical work and a series of stakeholder meetings. The 2020 target of 427 $MMTCO_2E$ requires the reduction of 169 $MMTCO_2E$, or approximately 30 percent, from the state's projected 2020 emissions of 596 $MMTCO_2E$ (business-as-usual) and the reduction of 42 $MMTCO_2E$, or almost 10 percent, from 2002-2004 average emissions.

Table 1: 2002-2004 Average Emissions and 2020 Projected Emissions (Business-as-Usual)[15]
($MMTCO_2E$)

Sector	2002-2004 Average Emissions	Projected 2020 Emissions [BAU]
Transportation	179.3	225.4
Electricity	109.0	139.2
Commercial and Residential	41.0	46.7
Industry	95.9	100.5
Recycling and Waste	5.6	7.7
High GWP	14.8	46.9
Agriculture	27.7	29.8
Forest Net Emissions	-4.7	0.0
Emissions Total	**469**	**596**

Figure 2 presents California's historic greenhouse gas emissions in a different way – based not on the source of the emissions, but on the end use. This chart highlights the importance of addressing on-road transportation sources of greenhouse gas emissions, as well as the significant contribution from the heating, cooling, and lighting of buildings.

Figure 2: California's Greenhouse Gas Emissions – A Demand-Side View –



[15] Ibid.

The data shown in this section provide two ways to look at California's greenhouse gas profile – emissions-based and end use (demand side)-based. While it is possible to illustrate the inventory many different ways, no chart or graph can fully display how diverse economic sectors fit together. California's economy is a web of activity where seemingly independent sectors and subsectors operate interdependently and often synergistically. For example, reductions in water use reduce the need to pump water, directly lowering electricity use and associated greenhouse gas emissions. Similarly, reducing the generation of waste reduces the need to transport the waste to landfills – lowering transportation emissions and, possibly, landfill methane emissions. Increased recycling or re-use reduces the carbon emissions embedded in products – it takes less energy to make a soda can made from recycled aluminum than from virgin feedstock.

The measures included in this Scoping Plan are identified discretely, but many impact each other, and changes in one measure can directly overlap and have a ripple effect on the efficacy and success of other measures. The measures and policies outlined in this Plan reflect these interconnections, and highlight the need for all agencies to work collaboratively to implement the Scoping Plan.

II. RECOMMENDED ACTIONS

Achieving the goals of AB 32 in a cost-effective manner will require a wide range of approaches. Every part of California's economy needs to play a role in reducing greenhouse gas emissions. ARB's comprehensive greenhouse gas emissions inventory lists emission sources ranging from the largest refineries and power plants to small industrial processes and farm livestock. The recommended measures were developed to reduce greenhouse gas emissions from key sources and activities while improving public health, promoting a cleaner environment, preserving our natural resources, and ensuring that the impacts of the reductions are equitable and do not disproportionately impact low-income and minority communities. These measures also put the state on a path to meet the long-term 2050 goal of reducing California's greenhouse gas emissions to 80 percent below 1990 levels. This trajectory is consistent with the reductions that are needed globally to help stabilize the climate. While the scale of this effort is considerable, our experience with cultural and technological changes makes California well-equipped to handle this challenge.

ARB evaluated a comprehensive array of approaches and tools to achieve these emission reductions. Reducing greenhouse gas emissions from the wide variety of sources can best be accomplished though a cap-and-trade program along with a mix of complementary strategies that combine market-based regulatory approaches, other regulations, voluntary measures, fees, policies, and programs. ARB will monitor implementation of these measures to ensure that the State meets the 2020 limit on greenhouse gas emissions.

An overall limit on greenhouse gas emissions from most of the California economy – the "capped sectors" – will be established by the cap-and-trade program. (The basic elements of the cap-and-trade program are described later in this chapter.) Within the capped sectors, some of the reductions will be accomplished through direct regulations such as improved building efficiency standards and vehicle efficiency measures. Whatever additional reductions are needed to bring emissions within the cap are accomplished through price incentives posed by emissions allowance prices. Together, direct regulation and price incentives assure that emissions are brought down cost-effectively to the level of the overall cap. ARB also recommends specific measures for the remainder of the economy – the "uncapped sectors."

Key elements of California's recommendations for reducing its greenhouse gas emissions to 1990 levels by 2020 include:

- **Expanding and strengthening existing energy efficiency programs as well as building and appliance standards;**
- **Achieving a statewide renewables energy mix of 33 percent;**
- **Developing a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system;**
- **Establishing targets for transportation-related greenhouse gas emissions for regions throughout California and pursuing policies and incentives to achieve those targets;**
- **Adopting and implementing measures pursuant to existing State laws and policies, including California's clean car standards, goods movement measures, and the Low Carbon Fuel Standard; and**
- **Creating targeted fees, including a public goods charge on water use, fees on high global warming potential gases, and a fee to fund the administrative costs of the State's long-term commitment to AB 32 implementation.**

The recommended greenhouse gas emissions reduction measures are listed in Table 2 and are summarized in Section C below. The total reduction for the recommended measures slightly exceeds the 169 $MMTCO_2E$ of reductions estimated in the Draft Scoping Plan. This is the net effect of adding several measures and adjusting the emission reduction estimates for some other measures. The 2020 emissions cap in the cap-and-trade program is preserved at the same level as in the Draft Scoping Plan (365 $MMTCO_2E$).

The measures listed in Table 2 lead to emissions reductions from sources within the capped sectors (146.7 $MMTOCO_2E$) and from sources or sectors not covered by cap-and-trade (27.3 $MMTCO_2E$). As mentioned, within the capped sectors the reductions derive both from direct regulation and from the incentives posed by allowance prices. Further discussion of how the cap-and-trade program and the complementary measures work together to achieve the overall target is provided below.

Table 2 also lists several other recommended measures which will contribute toward achieving the 2020 statewide goal, but whose reductions are not (for various reasons including the potential for double counting) additive with the other measures. Those measures and the basis for not including their reductions are further discussed in Section C.

Table 2: Recommended Greenhouse Gas Reduction Measures

Recommended Reduction Measures	Reductions Counted Towards 2020 Target ($MMTCO_2E$)	
ESTIMATED REDUCTIONS RESULTING FROM THE COMBINATION OF CAP-AND-TRADE PROGRAM AND COMPLEMENTARY MEASURES		**146.7**
California Light-Duty Vehicle Greenhouse Gas Standards • Implement Pavley standards • Develop Pavley II light-duty vehicle standards	31.7	
Energy Efficiency • Building/appliance efficiency, new programs, etc. • Increase CHP generation by 30,000 GWh • Solar Water Heating (AB 1470 goal)	26.3	
Renewables Portfolio Standard (33% by 2020)	21.3	
Low Carbon Fuel Standard	15	
Regional Transportation-Related GHG Targets[16]	5	
Vehicle Efficiency Measures	4.5	
Goods Movement • Ship Electrification at Ports • System-Wide Efficiency Improvements	3.7	
Million Solar Roofs	2.1	
Medium/Heavy Duty Vehicles • Heavy-Duty Vehicle Greenhouse Gas Emission Reduction (Aerodynamic Efficiency) • Medium- and Heavy-Duty Vehicle Hybridization	1.4	
High Speed Rail	1.0	
Industrial Measures (for sources covered under cap-and-trade program) • Refinery Measures • Energy Efficiency & Co-Benefits Audits	0.3	
Additional Reductions Necessary to Achieve the Cap	34.4	
ESTIMATED REDUCTIONS FROM UNCAPPED SOURCES/SECTORS		**27.3**
High Global Warming Potential Gas Measures	20.2	
Sustainable Forests	5.0	
Industrial Measures (for sources not covered under cap and trade program) • Oil and Gas Extraction and Transmission	1.1	
Recycling and Waste (landfill methane capture)	1.0	
TOTAL REDUCTIONS COUNTED TOWARDS 2020 TARGET		**174**

Other Recommended Measures	Estimated 2020 Reductions ($MMTCO_2E$)
State Government Operations	1-2
Local Government Operations	TBD
Green Buildings	26
Recycling and Waste • Mandatory Commercial Recycling • Other measures	9
Water Sector Measures	4.8
Methane Capture at Large Dairies	1.0

[16] This number represents an estimate of what may be achieved from local land use changes. It is not the SB 375 regional target. ARB will establish regional targets for each Metropolitan Planning Organization (MPO) region following the input of the Regional Targets Advisory Committee and a public consultation process with MPOs and other stakeholders per SB 375.

The development of a California cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system is a central feature of the overall recommendation. This program will lead to prices on greenhouse gas emissions, prices that will spur reductions in greenhouse gas emissions throughout the California economy, through application of existing technologies and through the creation of new technological and organizational options. The rationale for combining a cap-and-trade program with complementary measures was outlined by the Market Advisory Committee, which noted the following in its recommendations to the ARB:

> Before setting out the key design elements of a cap-and-trade program it is important to explain how the proposed emissions trading approach relates to other policy measures. The following considerations seem especially relevant:
>
> - The emissions trading program puts a cap on the total emissions generated by facilities covered under the system. Because a certain number of emissions allowances are put in circulation in each compliance period, this approach provides a measure of certainty about the total quantity of emissions that will be released from entities covered under the program.
> - The market price of emissions allowances yields an enduring price signal for GHG emissions across the economy. This price signal provides incentives for the market to find new ways to reduce emissions.
> - By itself, a cap-and-trade program alone will not deliver the most efficient mitigation outcome for the state. There is a strong economic and public policy basis for other policies that can accompany an emissions trading system. [17]

The Economic and Technology Advancement Advisory Committee (ETAAC) also addressed the benefits associated with a combined policy of cap and trade and complementary measures.

> A declining cap can send the right price signals to shape the behavior of consumers when purchasing products and services. It would also shape business decisions on what products to manufacture and how to manufacture them. Establishing a price for carbon and other GHG emissions can efficiently tilt decision-making toward cleaner alternatives. This cap and trade approach (complemented by technology-forcing performance standards) avoids the danger of having government or other centralized decision-makers choose specific technologies, thereby limiting the flexibility to allow other options to emerge on a level playing field.

[17] Recommendations of the Market Advisory Committee to the California Air Resources Board. *Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California*. June 30, 2007. p. 19. http://www.climatechange.ca.gov/publications/market_advisory_committee/2007-06-29_MAC_FINAL_REPORT.PDF (accessed October 12, 2008)

> If markets were perfect, such a cap and trade system would bring enough new technologies into the market and stimulate the necessary industrial RD&D to solve the climate change challenge in a cost effective manner. As the Market Advisory Committee notes, however, placing a price on GHG emissions addresses only one of many market failures that impede solutions to climate change. Additional market barriers and co-benefits would not be addressed if a cap and trade system were the only state policy employed to implement AB 32. Complementary policies will be needed to spur innovation, overcome traditional market barriers (e.g., lack of information available to energy consumers, different incentives for landlords and tenants to conserve energy, different costs of investment financing between individuals, corporations and the state government, etc.) and address distributional impacts from possible higher prices for goods and services in a carbon-constrained world.[18]

The Environmental Justice Advisory Committee (EJAC) also supports an approach that includes a price on carbon along with complementary measures. Although the EJAC recommends that the carbon price be established through a carbon fee rather than through a cap-and-trade program, they recognize the importance of mutually supportive policies:

> California should establish a three-pronged approach for addressing greenhouse gases: (1) adopting standards and regulations; (2) providing incentives; and (3) putting a price on carbon via a carbon fee. The three pieces support one another and no single prong can work without equally robust support from the others.[19]

In keeping with the rationale outlined above, ARB finds that it is critically important to include complementary measures directed at emission sources that are included in the cap-and-trade program. These measures are designed to achieve cost-effective emissions reductions while accelerating the necessary transition to the low-carbon economy required to meet the 2050 target:

- The already adopted Light-Duty Vehicle Greenhouse Gas Standards are designed to accelerate the introduction of low-greenhouse gas emitting vehicles, reduce emissions and save consumers money at the pump.
- The Low Carbon Fuel Standard (LCFS) is a flexible performance standard designed to accelerate the availability and diversity of low-carbon fuels by taking into consideration the full life-cycle of greenhouse gas emissions. The LCFS will reduce emissions and make our economy more resilient to future petroleum price volatility.
- The Regional Transportation-Related Greenhouse Gas Targets provide incentives for channeling investment into integrated development patterns and transportation

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[18] Recommendations of the Economic and Technical Advancement Advisory Committee (ETAAC), Final Report. *Technologies and Policies to Consider for Reducing Greenhouse Gas Emissions in California*. February 14, 2008. pp. 1-4 http://www.arb.ca.gov/cc/etaac/ETAACFinalReport2-11-08.pdf (accessed October 12, 2008)

[19] Recommendations and Comments of the Environmental Justice Advisory Committee on the Implementation of the Global Warming Solutions Act of 2006 (AB32) on the Draft Scoping Plan. October 2008. p. 10. http://www.arb.ca.gov/cc/ejac/ejac_comments_final.pdf (accessed October 12, 2008)

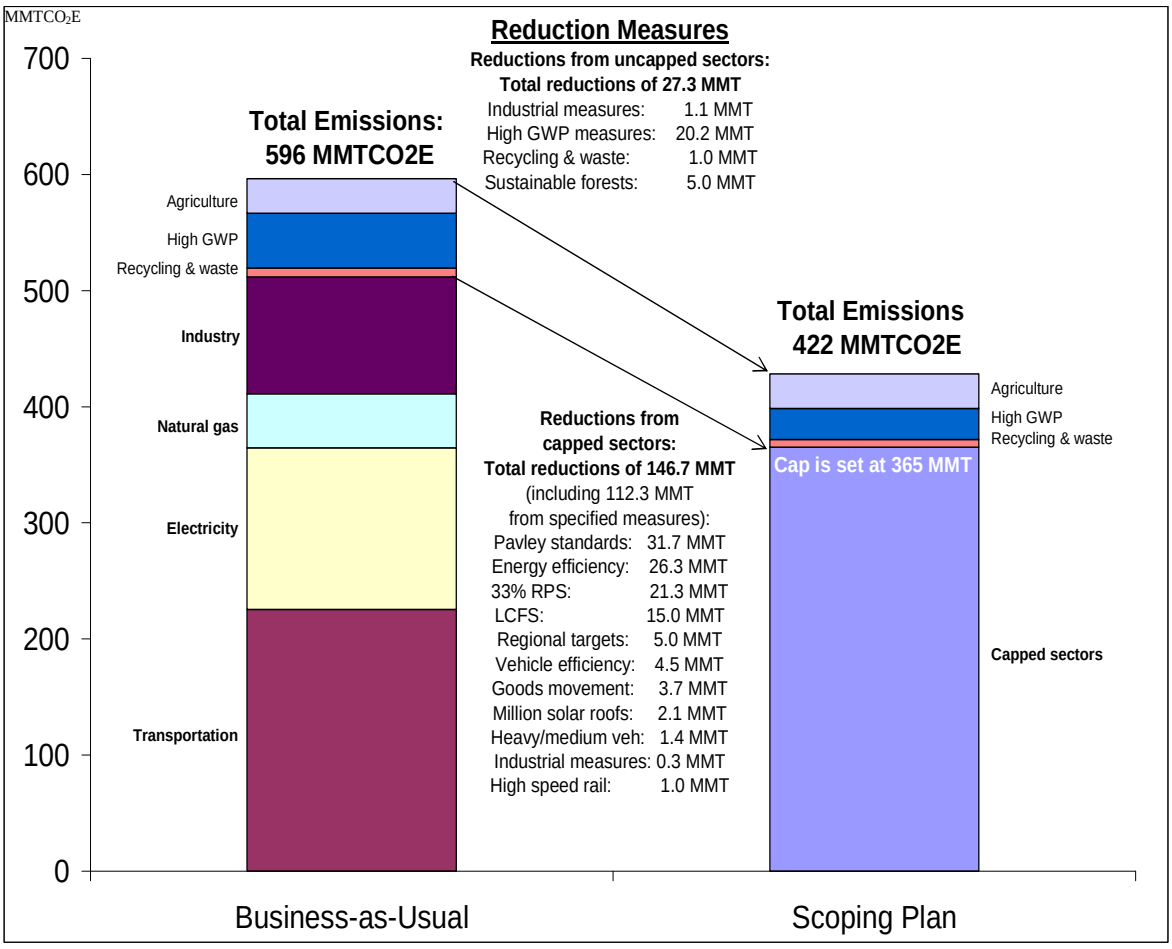
infrastructure, through improved planning. Improved planning and the resulting development are essential for meeting the 2050 emissions target.

- In the Energy sector, measures will provide better information and overcome institutional barriers that slow the adoption of cost-effective energy efficiency technologies. Enhanced energy efficiency programs will provide incentives for customers to purchase and install more efficient products and processes, and building and appliance standards will ensure that manufacturers and builders bring improved products to market.
- The Renewables Portfolio Standard (RPS) promotes multiple objectives, including diversifying the electricity supply. Increasing the RPS to 33 percent is designed to accelerate the transformation of the Electricity sector, including investment in the transmission infrastructure and system changes to allow integration of large quantities of intermittent wind and solar generation.
- The Million Solar Roofs Initiative uses incentives to transform the rooftop solar market by driving down costs over time.
- The Goods Movement program is primarily intended to achieve criteria and toxic air pollutant reductions but will provide important greenhouse gas benefits as well.
- Similar to the light duty vehicle greenhouse gas standards, the heavy duty and medium duty vehicle measures and the additional light duty vehicle efficiency measures aim to achieve cost-effective reductions of GHG emissions and save fuel.

Each of these complementary measures helps to position the California economy for the future by reducing the greenhouse gas intensity of products, processes, and activities. When combined with the absolute and declining emissions limit of the cap-and-trade program, these policies ensure that we cost-effectively achieve our greenhouse gas emissions goals and set ourselves on a path towards a clean low carbon future.

Figure 3 illustrates how the recommended emission reduction measures together put California on a path toward achieving the 2020 goal. The left hand column in Figure 3 shows total projected business as usual emissions in 2020, by sector (596 $MMTCO_2E$). The right hand column shows 2020 emissions after applying the Scoping Plan recommended reduction measures (422 $MMTCO_2E$). The measures that accomplish the needed reductions are listed in between the columns. As Figure 3 shows, there are a total of 27.3 $MMTCO_2E$ in reductions from uncapped sectors, and 146.7 $MMTCO_2E$ in reductions from capped sectors.

Figure 3: California Greenhouse Gas Emissions in 2020 and Recommended Reduction Measures



The recommended cap-and-trade program provides covered sources with the flexibility to pursue low cost reductions. It is important to recognize, however, that other recommended measures also provide compliance flexibility. As is often the case with ARB regulations, many of the measures establish performance standards and allow regulated entities to determine how best to achieve the required emission level. This approach rewards innovation and allows facilities to take advantage of the best way to meet the overarching environmental objective.

Table 3 lists the proposed measures that include compliance flexibility or market mechanisms. This flexibility ranges from the potential for tradable renewable energy credits in the Renewables Portfolio Standard to the incentives to encourage emission reductions in electricity and natural gas efficiency programs to the averaging, banking and trading mechanisms in the Pavley and Low Carbon Fuel Standard programs to a multi-sector cap-and-trade program.

Table 3: Measures With Flexible Market Compliance Features

Measure	Estimated Reductions
Additional Reductions from Capped Sectors	34.4
California Light-Duty Vehicle Greenhouse Gas Standards (Pavley I & II)	31.7
Renewables Portfolio Standard	21.3
Electricity Efficiency	15.2
Low Carbon Fuel Standard	15.0
Mitigation Fee on High GWP Gases	5.0
Natural Gas Efficiency	4.3
Goods Movement Systemwide Efficiency	3.5
Medium/Heavy Duty Vehicle Hybridization	0.5
Total	**130.9**

The recommended mix of measures builds on a strong foundation of previous action in California to address climate change and broader environmental issues. The program recommended here relies on implementing existing laws and regulations that were adopted to reduce greenhouse gas emissions and other policy goals; strengthening and expanding existing programs; implementing the discrete early actions adopted by the Board in 2007; and new measures developed during the Scoping Plan process itself.

The mix of measures recommended in this Plan provides a comprehensive approach to reduce emissions to achieve the 2020 target, and to initiate the transformations required to achieve the 2050 target. The cap-and-trade program and complementary measures will cover about 85 percent of greenhouse gas emissions throughout California's economy. ARB recognizes that due to several factors, including information discovered during regulatory development, technology maturity, and implementation challenges, actual reductions from individual measures aimed at achieving the 2020 target may be higher or lower than current estimates. The inclusion of many of these emissions within the cap-and-trade program, along with a margin of safety in the uncapped sectors, will help ensure that the 2020 target is met. The combination of approaches provides certainty that the overall program will meet the target despite some degree of uncertainty in the estimates for any individual measure. Additionally, by internalizing the cost of CO_2E emissions throughout the economy, the cap-and-trade program supports the complementary measures and provides further incentives for innovation and continuing emissions reductions from energy producers and consumers setting us on a path toward our 2050 goals.

Some emissions sources are not currently suitable for inclusion in the cap-and-trade program due to challenges associated with precise measurement, tracking or sector structure. For these emissions sources, ARB is including measures designed to focus on waste management, agriculture, forestry, and certain emissions of high GWP gases, a rapidly growing component of California's greenhouse gas emissions inventory.

California's economy is expected to continue to experience robust growth through 2020. Economic modeling, including evaluation of the effects on low-income Californians, shows that the measures included within this Scoping Plan can be implemented with a net positive effect on California's long-term economic growth. The evaluation of related public health and environmental benefits of the various measures also shows that implementation will result in not only reduced greenhouse gas emissions and improved public health, but also in a beneficial effect on California's environment. The results of these evaluations are presented in Chapter III.

AB 32 includes specific criteria that ARB must consider before adopting regulations for market-based compliance mechanisms to implement a greenhouse gas reduction program, and directs the Board, to the extent feasible, to design market-based compliance mechanisms to prevent any increase in the emissions of toxic air contaminants or criteria air pollutants. In the development of regulations that contain market mechanisms, ARB will consider the economic, environmental and public health effects, and the evaluation of potential localized impacts. These results will be used to institute appropriate economic, environmental and public health safeguards.

ARB has also designed the recommendation to ensure that reductions will come from throughout the California economy. Transportation accounts for the largest share of California's greenhouse gas emissions. Accordingly, a large share of the reduction of greenhouse gas emissions from the recommended measures comes from this sector. Measures include the inclusion of transportation fuels in the cap-and-trade program, the Low Carbon Fuel Standard to reduce the carbon intensity of transportation fuels, enforcement of regulations that reduce greenhouse gas emissions from vehicles, and policies to reduce transportation emissions by changes in future land use patterns and community design as well as improvements in public transportation.

In the Energy sector, the recommended measures increase the amount of electricity from renewable energy sources, and improve the energy efficiency of industries, homes and buildings. The inclusion of these sectors and the Industrial sector in the cap-and-trade program provides further assurance that significant cost-effective reductions will be achieved from the sectors that contribute the greatest emissions. Additional energy production from renewable resources may also rely on measures suggested in the Agriculture, Water, and the Recycling and Waste Management Sectors.

Other sectors are also called upon to cut emissions. The cap-and-trade program covers industrial sources and natural gas use. The recommended measures would require industrial processes to examine how to lower their greenhouse gas emissions and be more energy efficient, and would require goods movement operations through California's ports to be more energy efficient. Other measures address waste management, agricultural and forestry practices, as well as the transport and treatment of water throughout the state. Finally, the recommended measures address ways to reduce or eliminate the emissions of high global warming potential gases that, on a per-ton basis, contribute to global warming at a level many times greater than carbon dioxide.

As the Scoping Plan is implemented, ARB and other agencies will coordinate with the Green Chemistry Initiative, particularly in the Green Building and Recycling/Waste sectors. Green Chemistry is a fundamentally new approach to environmental protection that emphasizes environmental protection at the design stage of product and manufacturing processes, rather than focusing on end-of-pipe or end-of-life activities, or a single environmental medium, such as air, water or soil. This new approach will reduce the use of harmful chemicals, generate less waste, use less energy, and, accordingly, will contribute toward California's greenhouse gas reduction goals.

A. The Role of State Government: Setting an Example

For many years California State government has successfully incorporated environmental principles in managing its resources and running its business. The Governor has directed State agencies to sharply reduce their building-related energy use and encouraged our State-run pensions to invest in energy efficient and clean technologies.[20] The State also has been active in procuring low-emission, alternative fuel vehicles in its large fleet.

While State government has already accomplished much to reduce its greenhouse gas emissions, it can and must do more. State agencies must lead by example by continuing to reduce their greenhouse gas emissions. Therefore, California State government has established a target of reducing its greenhouse gas emissions by a *minimum* of 30 percent below its estimated business-as-usual emissions by 2020 – approximately a 15 percent reduction from current levels.

As an owner-operator of key infrastructure, State government has the ability to ensure that the most advanced, cost-effective environmental performance requirements are used in the design, construction, and operation of State facilities. As a purchaser with significant market power, State government has the ability to demand that the products and services it procures contribute positively toward California's targets to reduce greenhouse gas emissions, such as through the efforts of Environmentally Preferable Purchasing. As an investor of more than $400 billion,[21] State government has the ability to prioritize low-carbon investments. With more than 350,000 employees, State government is uniquely situated to adopt and implement policies that give State workers the ability to decrease their individual carbon impact, including encouraging siting facilities within communities to enhance balance in jobs and housing, encouraging carpooling, biking, walking, telecommuting, the use of public transit, and the use of alternative work schedules.

[20]Governor Schwarzenegger signed Executive Order Executive Order S-20-04 on December 14, 2004. This Order contains a number of directives, including a set of aggressive goals for reducing state building energy use and requested the California Public Employees Retirement System (CalPERS) and the California State Teachers Retirement System (CalSTRS) to target resource-efficient buildings for real estate investments and commit funds toward clean, efficient and sustainable technologies.

[21] CalPERS and CalSTRS are the two largest pension systems in the nation with investments in excess of $400 billion as of August 2008.

Myriad opportunities exist for California State government to operate more efficiently. These opportunities will not only reduce greenhouse gas emissions but also will produce savings for California taxpayers. Initiatives now underway that will contribute to the State government reduction target include the Governor's Green Building Initiative and the Department of General Services' efforts to increase the number of fuel-efficient vehicles in the State fleet.

Major efforts to expand renewable energy use and divest from coal-fired power plants are currently underway. Together with energy conservation and efficiency strategies on water projects, roadways, parks, and bridges, these efforts all play major roles in reducing the State's greenhouse gas emissions. State agencies should review their travel practices and make greater use of teleconferencing and videoconferencing to reduce the need for business travel, particularly air travel.

State agencies are now examining their policies and operations to determine how they can reduce their greenhouse gas emissions. These findings will be instrumental as each cabinet-level agency registers with the California Climate Action Registry (CCAR) to record and report their individual carbon footprints. The Climate Action Team has created a new State Government Operations sub-group that will work closely with the agencies to review the results of their evaluations and the CCAR reports to determine how best to achieve the maximum reductions possible.

State agencies must take the lead in driving this low-carbon economy by reducing their own emissions, and also by serving as a catalyst for local government and private sector activity. New "Best Practices" implemented by State agencies can be transferred to other entities within California, the nation, and internationally. By increasing cooperation and coordination across organizational boundaries, State government will maximize the experience and contributions of each agency involved to achieve the 30 percent reduction of greenhouse gas emissions while growing the economy and protecting the environment.

State government's impact on emissions goes far beyond its own buildings, vehicles, projects, and employees. State government casts a sizable "carbon shadow"– that is, the climate change impact of legislative, executive, and financial actions of State agencies that affect Californians now and in the future. For example, the California Energy Commission (CEC) recently initiated a proceeding to consider how to align its permitting process with the State's greenhouse gas and renewable energy policy goals. ARB intends to work closely with the CEC during this proceeding. New power plants, both fossil-fuel fired and renewable generation, will be a critical part of the state's electricity mix in coming decades. The investments that are made in this new infrastructure in the next several years will become part of the backbone of the state's electricity supply for decades to come. This timely investigation will be a critical element of California's ability to meet the AB 32 emissions reduction target for 2020, the ambitious target set by the Governor for 2050, and also the specific goal of achieving 33 percent renewables in the state's electricity mix. The Governor's Office of Planning and Research and the Resources Agency are developing proposed amendments to the California Environmental Quality Act (CEQA) Guidelines to

provide guidance on how to address greenhouse gases in CEQA documents. As required by SB 97 (Chapter 185, Statutes of 2007), the amended CEQA guidelines will be adopted by January 1, 2010.

In addition, agencies such as the California Labor and Workforce Development Agency, the Business, Transportation and Housing Agency and the newly created Green Collar Jobs Council (AB 3018, Chapter 312, Statutes of 2008) are dedicated to economic development, training, safety, labor relations, and employment development throughout the State. ARB will coordinate with the Council and also with other State agencies to address workforce needs and facilitate a smooth transition to California's emerging low-carbon economy that maximizes economic development and employment opportunities in California.

The State expends funds to provide services to California residents – from preserving our natural resources to building and maintaining infrastructure like roads, bridges and dams. California residents should reap all of the benefits of these projects, including any associated quantifiable and marketable reductions in greenhouse gas emissions. Because of this, California should retain ownership of these greenhouse gas emissions reductions and use them to promote the goals of AB 32 and other goals of the state.

California State government can also lead through example by aligning its efforts to reduce greenhouse gas emissions with efforts to protect and improve public health. As a new member of the Climate Action Team, the Department of Public Health will help ensure that measures to combat global warming also incorporate public health protection and improvement strategies. As discussed below, these and many other State leadership efforts can be built upon at the local level as well.

B. The Role of Local Government: Essential Partners

Local governments are essential partners in achieving California's goals to reduce greenhouse gas emissions. They have broad influence and, in some cases, exclusive authority over activities that contribute to significant direct and indirect greenhouse gas emissions through their planning and permitting processes, local ordinances, outreach and education efforts, and municipal operations. Many of the proposed measures to reduce greenhouse gas emissions rely on local government actions.

Over 120 California cities have already signed on to the U.S. Conference of Mayors Climate Protection Agreement. In addition, over 30 California cities and counties have committed to developing and implementing Climate Action Plans. Many local governments and related organizations have already begun educating Californians on the benefits of energy efficiency measures, public transportation, solar homes, and recycling. These communities have not only demonstrated courageous leadership in taking initiative to reduce greenhouse gas emissions, they are also reaping important co-benefits, including local economic benefits, more sustainable communities, and improved quality of life.

Land use planning and urban growth decisions are also areas where successful implementation of the Scoping Plan relies on local government. Local governments have primary authority to plan, zone, approve, and permit how and where land is developed to accommodate population growth and the changing needs of their jurisdictions. Decisions on how land is used will have large impacts on the greenhouse gas emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas sectors.

To provide local governments guidance on how to inventory and report greenhouse gas emissions from government buildings, facilities, vehicles, wastewater and potable water treatment facilities, landfill and composting facilities, and other government operations, ARB recently adopted the Local Government Operations Protocol. ARB encourages local governments to use this protocol to track their progress in achieving reductions from municipal operations. ARB is also developing an additional protocol for community emissions. This protocol will go beyond just municipal operations and include emissions from the community as a whole, including residential and commercial activity. These local protocols will play a key role in ensuring that strategies that are developed and implemented at the local level, like urban forestry and greening projects, water and energy efficiency projects, and others, can be appropriately quantified and credited toward California's efforts to reduce greenhouse gas emissions.

In addition to tracking emissions using these protocols, ARB encourages local governments to adopt a reduction goal for municipal operations emissions and move toward establishing similar goals for community emissions that parallel the State commitment to reduce greenhouse gas emissions by approximately 15 percent from current levels by 2020. To consolidate climate action resources and aid local governments in their emission reduction efforts, the ARB is developing various tools and guidance for use by local governments, including the next generation of best practices, case studies, a calculator to help calculate local greenhouse gas emissions, and other decision support tools.

The recent passage of SB 375 (Steinberg, Chapter 728, Statutes of 2008) creates a process whereby local governments and other stakeholders work together within their region to achieve reduction of greenhouse gas emissions through integrated development patterns, improved transportation planning, and other transportation measures and policies. The implementation of regional transportation-related greenhouse gas emissions targets and SB 375 are discussed in more detail in Section C.

C. Emissions Reduction Measures

The Scoping Plan will build on California's successful history of balancing effective regulations with economic progress. Several types of measures have been recommended. The plan includes a California cap-and-trade program that will be integrated with a broader regional market to maximize cost-effective opportunities to achieve GHG emissions reductions. The plan also includes transformational measures that are designed to help pave the path toward California's clean energy future. For example, the Low Carbon Fuel

Standard (LCFS) is a performance standard with flexible compliance mechanisms that will incent the development of a diverse set of clean, low-carbon transportation fuel options. Similarly, the plan recognizes the importance of local and regional government leadership in ensuring that California's land use and transportation planning processes are designed to be consistent with efforts to achieve a clean energy future and to protect and enhance public health and safety.

The Scoping Plan also contains a number of targeted measures that are designed to overcome existing barriers to action such as lack of information, lack of coordination, or other regulatory and institutional factors. Energy efficiency is a classic example where cost-effective action often is not taken due to lack of complete information, relatively high initial costs, and mismatches between who pays for and who benefits from efficiency investments. These problems often mean that efficiency measures are not taken that would save money in the long term for small businesses, home owners and renters. While California has a long history of success in implementing regulations and programs to encourage energy efficiency, innovative methods to overcome these economic and information barriers are needed to provide the benefits of increased efficiency to more Californians and to meet our greenhouse gas emissions reduction goals.

Several of the recommended measures complement each other. For example, the LCFS will provide clean transportation fuel options. The Pavley performance standards help deploy vehicles that can use many of the low-carbon fuels, including advanced biofuels, electricity and hydrogen. The combined operation of both programs will make it more likely that more efficient, less polluting vehicles will use the cleanest possible fuels. In addition, both of these programs will benefit from ARB's zero-emission vehicle program, which focuses on deployment of plug-in battery-electric and fuel cell vehicles. All of these strategies are expandable beyond 2020, and are needed as vital components to reach the State's 2050 goal.

The cap-and-trade program creates an emissions limit or "cap" on the sectors responsible for the vast majority of California's greenhouse gas emissions and provides capped sources significant flexibility in how they collectively achieve the reductions necessary to meet the cap. The other measures in these capped sectors provide a clear path toward achieving reductions required by the cap, while simultaneously addressing market barriers and creating the low-carbon energy options needed to achieve our long term climate goals. In the design of the cap-and-trade program, ARB will also evaluate possible ways to include features that complement the other measures, such as consideration of allowance set-asides that could be used to help achieve or exceed the aggressive energy efficiency goals included in this Plan.

Both required measures and other cost-effective actions by capped sectors will contribute toward achievement of the cap. For example, increasing energy efficiency will reduce electricity demand, thereby reducing the need for utilities to submit allowances to comply with the cap-and-trade program. In this way, energy efficiency contributes to real reductions toward the cap. Expiration of existing utility long-term contracts with coal plants will reduce GHG emissions when such generation is replaced by renewable generation, coal with carbon sequestration, or natural gas generation, which emits less CO_2 per megawatt-hour.

Additionally, measures and other actions that result in reductions in energy demand 'downstream' of capped sectors will help achieve the cap. For example, the Pavley vehicle standards, building efficiency standards, and land use planning that contributes to reduced transportation fuel demand will all reduce emissions by reducing the demand for upstream energy production. These downstream entities will further benefit from these reductions by avoiding any costs that would be passed through from a cap-and-trade system.

Discrete Early Actions

In September 2007, ARB approved a list of nine Discrete Early Actions to reduce greenhouse gas emissions and is currently in the process of developing regulations and programs based on these measures. Regulations implementing the Discrete Early Action measures must be adopted and in effect by January 1, 2010 (HSC §38560.5 (b)). All the Discrete Early Actions are included in the recommended measures and are shown below in Table 4.

Table 4: Anticipated Board Consideration Dates for Discrete Early Actions

Discrete Early Action	Anticipated Board Consideration
Green Ports – Ship Electrification at Ports	December 2007 – Adopted
Reduction of High GWP Gases in Consumer Products	June 2008 – Adopted
SmartWay – Heavy-Duty Vehicle Greenhouse Gas Emission Reduction (Aerodynamic Efficiency)	December 2008
Reduction of Perfluorocarbons from Semiconductor Manufacturing	February 2009
Improved Landfill Gas Capture	January 2009
Reduction of HFC-134a from Do-It-Yourself Motor Vehicle Servicing	January 2009
SF_6 Reductions from the Non-Electric Sector	January 2009
Tire Inflation Program	March 2009
Low Carbon Fuel Standard	March 2009

The following sections describe the recommended measures in this Scoping Plan. Additional information about these measures is provided in Appendix C.

1. California Cap-and-Trade Program Linked to Western Climate Initiative Partner Jurisdictions

Implement a broad-based California cap-and-trade program to provide a firm limit on emissions. Link the California cap–and-trade program with other Western Climate Initiative Partner programs to create a regional market system to achieve greater environmental and economic benefits for California. Ensure California's program meets all applicable AB 32 requirements for market-based mechanisms.

California is working closely with other states and provinces in the Western Climate Initiative (WCI) to design a regional cap-and-trade program that can deliver reductions of greenhouse gas emissions throughout the region. ARB will develop a cap-and-trade program for California that will link with the programs in the other WCI Partner jurisdictions to create a regional cap-and-trade program. The WCI Partner jurisdictions released the program design document on September 23, 2008 (see Appendix D). ARB will continue to work with the WCI Partner jurisdictions to develop and implement the cap-and-trade program. ARB will also design the California program to meet the requirements of AB 32, including the need to consider any potential localized impacts and ensure that reductions are enforceable by the Board.

Based on the requirements of AB 32, regulations to implement the cap-and-trade program need to be developed by January 1, 2011, with the program beginning in 2012. This rule development schedule will be coordinated with the WCI timeline for developing a regional cap-and-trade program. Preliminary plans for this rulemaking are described later in this section.

A cap-and-trade program sets the total amount of greenhouse gas emissions allowable for facilities under the cap and allows covered sources, including producers and consumers of energy, to determine the least expensive strategies to comply. The emissions allowed under the cap will be denominated in metric tons of CO_2E. The currency will be in the form of allowances which the State will issue based upon the total emissions allowed under the cap during any specific compliance period. Emission allowances can be banked for future use, encouraging early reductions and reducing market volatility. The ability to trade allows facilities to adjust to changing conditions and take advantage of reduction opportunities when those opportunities are less expensive than buying additional emissions allowances.

Provisions could be made to allow a limited use of surplus reductions of greenhouse gas emissions that occur outside of the cap. These additional reductions are known as offsets and are discussed further below. In order to be used to meet a source's compliance obligation, offsets will be subject to stringent criteria and verification procedures to ensure their enforceability and consistency with AB 32 requirements.

Appendix C describes the fundamentals of a cap-and-trade program and program design elements. Appendix D contains the WCI Design Recommendations and related background documents.

California Cap-and-Trade Program

By providing a firm cap on 85 percent of the state's greenhouse gas emissions, the cap-and-trade regulatory program is an essential component of the overall plan to meet the 2020 target and provides a robust mechanism to achieve the additional reductions needed by 2050. To meet the emissions reduction target under AB 32, the limit on emissions allowed under the cap, plus emissions from uncapped sources, must be no greater than the 2020 emissions goal.

By setting a limit on the quantity of greenhouse gases emitted, a well-designed cap-and-trade program will complement other measures for entities within covered sectors. Additionally, starting a cap-and-trade program now will set us on a course to achieve further emissions cuts well beyond 2020 and ensure that California is primed to take advantage of opportunities for linking with other programs, including future federal and international efforts.

The proposed cap-and-trade measure phases in the following sectors:

Starting in the first compliance period (2012):

- In-state electrical generating facilities that emit over 25,000 metric tons CO_2E per year,[22] including imports not covered by a WCI Partner jurisdiction.
- Large industrial facilities that emit over 25,000 metric tons CO_2E per year, including high global warming potential gases.

Starting in the second compliance period (2015):

- Upstream treatment of industrial fuel combustion at facilities with emissions at or below 25,000 metric tons CO_2E per year, and all commercial and residential fuel combustion regulated where the fuel enters into commerce
- Transportation fuel combustion regulated where the fuel enters into commerce.

For some energy-intensive industrial sources such as cement, stringent requirements in California, either through inclusion in a cap-and-trade program or through source-specific regulation, have the potential to create a disadvantage for California facilities relative to out-of-state competitors unless those locations have similar requirements (e.g., through the WCI). If production shifts outside of California in order to operate without being subject to these requirements, emissions could remain unchanged or even increase. This is referred to as "leakage." AB 32 requires ARB to design measures to minimize leakage. Minimizing leakage will be a key consideration when developing the cap-and-trade regulation and the other AB 32 program measures.[23]

[22] Allowances will not be required for combustion emissions from carbon-neutral projects.

[23] The cement industry is an example of a sector that may be susceptible to this type of leakage, and the Draft Scoping Plan included consideration of a measure to institute an intensity standard at concrete batch plants that would consider this type of life-cycle emissions. ARB will evaluate whether this type of intensity standard could be incorporated into the cap-and-trade program or instituted as a complementary measure during the cap-and-trade rulemaking.

As shown in Table 5, the preliminary estimate of the cap on greenhouse gas emissions for sectors covered by the cap-and-trade program is 365 $MMTCO_2E$ in 2020, which covers about 85 percent of California's total greenhouse gas emissions.[24] Greenhouse gas emissions from most of the sectors covered by a cap-and-trade program will also be governed by other measures, including performance standards, efficiency programs, and direct regulations. These other measures will provide real reductions which will contribute reductions toward the cap.

In addition, ARB will work closely with the CPUC, CEC, and The California Independent System Operator to ensure that the cap-and-trade program works within the context of the State's energy policy and enables the reliable provision of electricity.

Table 5: Sector Responsibilities Under Cap-and-Trade Program
($MMTCO_2E$ in 2020)

Sector	Projected 2020 Business-as-Usual Emissions		Preliminary 2020 Emissions Limit under Cap-and-Trade Program
	By Sector	Total	
Transportation	225	512	365
Electricity	139		
Commercial and Residential	47		
Industry	101		

Linkage with the Western Climate Initiative Partner Jurisdictions

The WCI was formed in 2007. Members are California, Arizona, New Mexico, Oregon, Washington, Utah, and Montana, and the Canadian provinces of British Columbia, Manitoba, Ontario, and Quebec. The WCI Partner jurisdictions, including California, have adopted goals to reduce greenhouse gas emissions that, in total, reduce regional emissions to 15 percent below 2005 levels by 2020. This regional goal is approximately equal to California's goal of returning to 1990 levels by 2020. A cap-and-trade program is one element of the effort by the WCI Partner jurisdictions to identify, evaluate, and implement ways to reduce greenhouse gas emissions and achieve related co-benefits.

[24] The actual cap for the program will be established as part of the rulemaking process. The preliminary cap of 365 $MMTCO_2E$ in 2020 assumes that all of California's electricity imports would be covered under a California cap. Because a significant portion of California's imported electricity is from power plants located in other WCI Partner Jurisdictions, emissions from those sources could be included in the cap of the states within which the power plants are located. In establishing the California cap, ARB will need to consider the degree to which emissions from these sources are addressed as part of the WCI regional market.

The WCI Partner jurisdictions released their recommendation for the design of a regional cap-and-trade program in September 2008. This design document and the background paper that accompanied it are presented in Appendix D. These recommendations were developed collaboratively by the WCI Partner jurisdictions, including California, with a goal of achieving regional targets to reduce greenhouse gas emissions equitably and effectively. The WCI Partner jurisdictions' recommendations are generally consistent with the recommendations provided in June 2007 by the California Market Advisory Committee,[25] the recommendations provided to ARB by the California Public Utilities Commission and the California Energy Commission in March 2008,[26] and the proposed opinion released by the two Commissions in September 2008.[27]

Participating in a regional system has several advantages for California. The reduction of greenhouse gas emissions that can be achieved collectively by the WCI Partner jurisdictions are approximately double what can be achieved through a California-only program. The broad scope of a WCI-wide market will provide additional opportunities for reduction of emissions, therefore providing greater market liquidity and more stable carbon prices within the program. The regional system also significantly reduces the potential for leakage, which is a shift in economic and emissions activity out of California that could hurt the state's economy without reducing global greenhouse gas emissions. Harmonizing the approach and timing of California's requirements for reducing greenhouse gas emissions with other states and provinces in the region can encourage retention of local businesses in the state. Further, by creating a cost-effective regional market system, California and the other WCI Partner jurisdictions will continue to demonstrate leadership in preparation for future federal and international climate action.

To achieve the individual WCI Partner jurisdiction goals and the regional goal, each WCI Partner jurisdiction will have an allowance budget based on its goal that declines to 2020. For example, California's allowance budget will be based on the level of emissions needed to achieve the AB 32 target for 2020, as described above. Once California links with the other WCI Partner jurisdictions, allowances could be

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[25] Recommendations of the Market Advisory Committee to the California Air Resources Board. *Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California*. June 30, 2007. p. 19. http://www.climatechange.ca.gov/publications/market_advisory_committee/2007-06-29_MAC_FINAL_REPORT.PDF (accessed October 12, 2008) Cal/EPA The Market Advisory Committee (MAC) consisted of a consortium of economists, policy makers, academics, government representatives, and environmental advocates who came together through the auspices of CalEPA, pursuant to Executive Order S-20-06 from Governor Schwarzenegger.

[26] Joint Agency Decision of the CEC and the CPUC. *Final Adopted Interim Decision on Basic Greenhouse Gas Regulatory Framework for Electricity and Natural Gas Sectors*, March 13, 2008. Document number CEC-100-2008-002-F. http://www.energy.ca.gov/2008publications/CEC-100-2008-002/CEC-100-2008-002-F.PDF (accessed October 12, 2008)

[27] Joint Agency proposed final opinion of the CEC and the CPUC. *Proposed Final Opinion on Greenhouse Gas Regulatory Strategies*. Published September 12, 2008 and to be considered for adoption on October 16, 2008 by the CEC and the CPUC. Document Number CEC-100-2008-007-D http://www.energy.ca.gov/ghg_emissions/index.html (accessed October 12, 2008)

traded across state and provincial boundaries. As a result of trading, emissions in a state may vary from its allowance budget, although total regional emissions will not exceed the regional cap.

The overall number of allowances issued in a given year by the WCI Partner jurisdictions will set a limit on emissions from sectors covered by the program for the region. Details of distribution of allowances will be established by each partner within the general guidelines set forth in the WCI program design framework. The WCI Partner jurisdictions have agreed to consider standardizing allowance distribution across specific sectors if necessary to address competitiveness issues. In addition, the WCI Partner jurisdictions have agreed to phase in regionally coordinated auctions of allowances, with a minimum percentage of allowances auctioned in each period starting with 10 percent in the first compliance period and increasing to 25 percent in 2020. WCI partners aspire to reach higher auction percentages over time, possibly to 100 percent. Under the program design, each WCI Partner jurisdiction, including California, can auction a greater portion of its allowance budget in any compliance period. The distribution of California's allowances will be determined during the cap-and-trade rulemaking process, as discussed below.

The WCI Partner jurisdictions are also proposing the use of an allowance reserve price for the first 5 percent of the auctioned allowances in the regional cap. A reserve price will help to ensure that the cap is set at a level that will motivate real emissions reductions and may provide an opportunity for the regional cap-and-trade program to provide reductions that exceed the regional target.

A regional coordinated cap-and-trade program with strong reporting and enforcement rules will provide a high degree of certainty that emissions will not exceed targeted levels and that leakage will not occur.

Federal Action

A cap-and-trade program is expected to be a significant element in any future federal action taken to reduce greenhouse gas emissions. ARB's efforts to design a broad cap-and-trade system that works in concert with sector- or source-related measures and meets the requirements of AB 32 can serve as a model for a federal program. An effective, enforceable regional cap-and-trade program can promote the type of federal legislation needed to meet the pressing challenge of climate change. In the event that California businesses, organizations, or individuals hold regional allowances when a federal system is implemented, California will work to ensure that those allowances continue to have value, either in a continuing regional program or within the federal program.

Cap-and-Trade Rulemaking

To implement the cap-and-trade program, ARB will embark on regulatory development that includes extensive and broad-based public participation. Major program design elements will include setting an emissions cap in conjunction with the

WCI Partner jurisdictions, determining the method of distributing both allowances and revenues raised through auctions, and establishing the rules for the use of offsets. ARB will continue to work with all affected stakeholders, State and local agencies, and our WCI partners to create a robust regional market system.

After adoption of the Scoping Plan, ARB will establish a formal structure to elicit ongoing participation in the rulemaking process from a wide range of affected stakeholders. While the process will be open to involvement by all interested parties, ARB anticipates creation of a series of focused working groups that include participation by representatives of the regulated community, environmental and community advocates and other public interest groups, prominent academics with expertise in cap-and-trade issues and new technology development, local air pollution control districts, stakeholders in the WCI, and other State agencies with existing authority for regulating capped sectors.

This process will integrate economic and administrative design considerations and include consideration of environmental and public health issues. ARB will convene a series of technical workshops to examine mechanisms to address the concerns related to the cap-and-trade program raised by the Environmental Justice Advisory Committee and other stakeholders. The first workshop will explore cap-and-trade program design options that could provide incentives to maximize additional environmental and economic benefits, and to analyze the proposed program to prevent increases in emissions of toxic air contaminants or criteria pollutants through the design and architecture of the program itself. Similar technical workshops will focus on issues related to offsets and the WCI proposal.

Allowances and Revenues

Emission allowances represent a significant economic value whether they are freely allocated or sold through auction. Section E includes a preliminary discussion of some of the options that have been suggested for use of allowance value or revenues. ARB will evaluate the possible uses of allowances or revenues as part of the rulemaking process. One approach would be to dedicate a portion of the allowances for such purposes as rewarding early actions to reduce emissions, providing incentives for local governments and others to promote energy efficiency, better land use planning, and other reduction strategies, and targeting projects to reduce emissions in low-income or disadvantaged communities. This type of dedicated use of allowances is typically referred to as an allowance 'set-aside.'

The California Public Utilities Commission and the California Energy Commission addressed the question of allocation and auction of allowances in their joint proceeding on implementation of AB 32 for the Electricity and Natural Gas sectors. They have recently released a proposed opinion that recommends to ARB a transition

to 100 percent auction for the Electricity sector by 2016.[28] The CPUC and CEC included in their draft opinion the recommendation that all auction revenues be used for purposes related to AB 32, and all revenue from allowances allocated to the Electricity sector and received by retail providers would be used for the benefit of the Electricity sector to support investments in renewable energy, efficiency, new energy technology, infrastructure, customer bill relief, and other similar programs.

The Market Advisory Committee also recommended the eventual transition to full auction within the cap-and-trade program, noting that a system in which California ultimately auctions all of its emission allowances is consistent with fundamental objectives of cost-effectiveness, fairness and simplicity.[29] ARB agrees that the transition to a 100 percent auction, with auction revenue going to further the policy objectives of California's climate change program, is a worthwhile goal. ARB expects that California will auction significantly more than the WCI minimum levels and will transition to 100 percent auction. However a broad set of factors must be considered in evaluating the potential timing of a transition to a full auction including competiveness, potential for emissions leakage, the effect on regulated vs. unregulated industrial sectors, the overall impact on consumers, and the strategic use of auction revenues.

Allowance allocation and revenue use decisions can greatly affect the equity of a cap-and-trade system. Addressing both these issues will be a major part of the rulemaking process. ARB will seek input from a broad range of experts in an open public process regarding the options for allocation and revenue use under consideration by ARB and the WCI Partner jurisdictions. This process will evaluate various mechanisms ARB is considering for allowance distribution and potential uses of allowance value, including the recommendations offered by CPUC and CEC. Issues to be considered will include the appropriate timing and structure of a transition to full auction of allowances, the potential need to harmonize the allocation process regionally for certain sectors subject to inter-state competition, and equity across the various sectors here in California.

Offsets

Individual projects can be developed to achieve the reduction of emissions from activities not otherwise regulated, covered under an emissions cap, or resulting from government incentives. These projects can generate "offsets," i.e., verifiable reductions of emissions whose ownership can be transferred to others. The cap-and-trade rulemaking will establish appropriate rules for use of offsets. As required by

[28] Op. Cit. The proposed opinion has not yet been voted on by either the CPUC or the CEC. The Commissions are expected to vote on this proposed opinion before the December Board meeting when the Proposed Scoping Plan will be considered for approval.

[29] Recommendations of the Market Advisory Committee to the California Air Resources Board. *Recommendations for Designing a Greenhouse Gas Cap-and-Trade System for California*. June 30, 2007. p. 55. http://www.climatechange.ca.gov/publications/market_advisory_committee/2007-06-29_MAC_FINAL_REPORT.PDF (accessed October 12, 2008)

AB 32, any reduction of greenhouse gas emissions used for compliance purposes must be real, permanent, quantifiable, verifiable, enforceable, and additional (HSC §38562(d)(1) and (2)). Offsets used to meet regulatory requirements must be quantified according to Board-adopted methodologies, and ARB must adopt a regulation to verify and enforce the reductions (HSC §38571). The criteria developed will ensure that the reductions are quantified accurately and are not double-counted within the system.

Offsets can provide regulated entities a source of low-cost emissions reductions. Reductions from compliance offset projects must be quantified using rigorous measurement and enforcement protocols that provide a basis to determine whether the reductions are also additional, i.e., beyond what would have happened in the absence of the offset project. Establishing that reductions are additional is one of the major challenges in establishing the validity of particular offset projects. Once a project can quantify emissions using an approved methodology, the reductions of emissions must be verified to ensure that reductions actually occurred.

While some offsets provide benefits, allowing unlimited offsets would reduce the amount of reductions of greenhouse gas emissions occurring within the sectors covered by the cap-and-trade program. This could reduce the local economic, environmental and public health co-benefits and delay the transition to low-carbon energy systems within the capped sectors that will be necessary to meet our long term climate goals. The limit on the use of offsets and allowances from other systems within the WCI Partner jurisdiction program design assures that a majority of the emissions reductions required from 2012 to 2020 occur at entities and facilities covered by the cap and trade program. Consequently, the use of offsets and allowances from other systems are limited to no more than 49 percent of the required reduction of emissions. This quantitative limit will help provide balance between the need to achieve meaningful emissions reductions from capped sources with the need to provide sources within capped sectors the opportunity for low-cost reduction opportunities that offsets can provide. The WCI offset program may incorporate flexibility to use offsets and non-WCI allowances across the three compliance periods, which each WCI Partner jurisdiction could use at its discretion. ARB will apply the limit on offsets that is within its jurisdiction, such that the allowable offsets in each compliance period is less than half of the emissions reductions expected from capped sectors in that compliance period. Each WCI Partner jurisdiction may choose to adopt a more stringent limit on the use of offsets and non-WCI allowances.

Offsets can also encourage the spread of clean, low carbon technologies outside California. High quality offset projects located outside the state can help lower the compliance costs for regulated entities in California, while reducing greenhouse gas emissions in areas that would otherwise lack the resources needed to do so. International projects may also have significant environmental, economic and social benefits. Projects in the Mexican border region may be of particular interest, considering the opportunity to realize considerable co-benefits on both sides of the border. The Governor has recently signed a Memorandum of Understanding with the

six Mexican border states that calls for cooperation on the development of project protocols for Mexican greenhouse gas emissions reduction projects.[30] Additionally, defining project types related to imported commodities (such as cement) would enable California to provide incentives to reduce emissions associated with products that are imported into the state for our consumption.

California is committed to working at the international level to reduce greenhouse gas emissions globally and finding ways to support the adoption of low-carbon technologies and sustainable development in the developing world. ARB will work with WCI Partner jurisdictions and within the rulemaking process to establish an offsets program without geographic restrictions that includes sufficiently stringent criteria for creating offset credits to ensure the overall environmental integrity of the program.

One concept being evaluated for accepting offsets from the developing world is to limit offsets to those jurisdictions that demonstrate performance in reducing emissions and/or achieving greenhouse gas intensity targets in certain carbon intensive sectors (e.g., cement), or in reducing emissions or enhancing sequestration through eligible forest carbon activities in accordance with appropriate national or sub-national accounting frameworks. This could be achieved through an agreement to work jointly to develop minimum performance standards or sectoral benchmarks, backed by appropriate monitoring and accounting frameworks. Such agreements would encourage early action in developing countries toward binding commitments, and could also reduce concerns about competitiveness and risks associated with carbon leakage.

2. California Light-Duty Vehicle Greenhouse Gas Standards

Implement adopted Pavley standards and planned second phase of the program. Align zero-emission vehicle, alternative and renewable fuel and vehicle technology programs with long-term climate change goals.

Passenger vehicles are responsible for almost 30 percent of California's greenhouse gas emissions. To address these emissions, ARB is proposing a comprehensive three-prong strategy – reducing greenhouse gas emissions from vehicles, reducing the carbon content of the fuel these vehicles burn, and reducing the miles these vehicles travel. Transportation fuels and regional transportation-related greenhouse gas targets are discussed later in the recommendations.

There are a number of efforts intended to reduce greenhouse gas emissions from California's passenger vehicles, including the Pavley greenhouse gas vehicle

[30] Memorandum of Understanding on Environmental Cooperation between the California Environmental Protection Agency, the California Department of Food and Agriculture and the California Resources Agency of the State of California, United States of America and the Ministry of Environment and Natural Resources of the United Mexican States. February 13, 2008. http://gov.ca.gov/pdf/press/021308_MOU_English.pdf (accessed October 12, 2008)

standards to achieve near-term emission reductions, the zero-emission vehicle (ZEV) program to transform the future vehicle fleet, and the Alternative and Renewable Fuel and Vehicle Technology Program created by AB 118 (Núñez, Chapter 750, Statutes of 2007).

Pavley Greenhouse Gas Vehicle Standards

AB 1493 (Pavley, Chapter 200, Statutes of 2002) directed ARB to adopt vehicle standards that lowered greenhouse gas emissions to the maximum extent technologically feasible, beginning with the 2009 model year. ARB adopted regulations in 2004 and applied to the U.S. Environmental Protection Agency (U.S. EPA) for a waiver under the federal Clean Air Act to implement the regulation. The Pavley regulations incorporate both performance standards and market-based compliance mechanisms. To obtain additional reductions from the light duty fleet, ARB plans to adopt a second, more stringent, phase of the Pavley regulations. Table 6 summarizes the estimated reduction of emissions for the Pavley regulations. In addition to delivering greenhouse gas emissions reductions, the standards will save money for Californians who purchase vehicles that comply with the Pavley standards – an estimated average of $30 each month in avoided fuel costs.

To date, 13 other states have adopted California's existing greenhouse gas standards for vehicles. Under federal law, California is the only state allowed to adopt its own vehicle standards (though other states are permitted to adopt California's more rigorous standards), but California cannot implement the regulations until U.S. EPA grants an administrative waiver. In December 2007, U.S. EPA denied California's waiver request to implement the Pavley regulations. California and others are challenging that denial in Federal court. The regulations have also been challenged by the automakers in federal courts, although to date, those challenges have been unsuccessful.

ARB is evaluating the use of feebates as a measure to achieve additional reductions from the mobile source sector, either as a backstop to the Pavley regulation if the regulation cannot be implemented, or as a supplement to Pavley if the waiver is approved and the regulation takes effect. AB 32 specifically states that if the Pavley regulations do not remain in effect, ARB shall implement alternative regulations to control mobile sources to achieve equivalent or greater reductions of greenhouse gas emissions (HSC §38590). ARB is currently evaluating the use of a feebate program as the mechanism to secure these reductions. A feebate regulation would combine a rebate program for low-emitting vehicles with a fee program for high-emitting vehicles. This program would be designed in a way to generate equivalent or greater cumulative reductions of greenhouse gas emissions compared to what would have been achieved under the Pavley regulations. ARB would also evaluate the potential to expand the program to include additional vehicle classes not currently included in the Pavley program for further greenhouse gas benefits.

If the U.S. EPA grants California's request for a waiver to proceed with implementation of the Pavley regulations, we will analyze the potential for pursuing a

feebate program that could complement the Pavley regulations and achieve additional reductions of greenhouse gas emissions.

Zero-Emission Vehicle Program

The Zero Emission Vehicle (ZEV) program will play an important role in helping California meet its 2020 and 2050 greenhouse gas emissions reduction requirements. Through 2012, the program requires placement of hundreds of ZEVs (including hydrogen fuel cell and battery electric vehicles) and thousands of near-zero emission vehicles (plug-in hybrids, conventional hybrids, compressed natural gas vehicles). In the mid-term (2012-2015), the program will require placement of increasing numbers of ZEVs and near-zero emission vehicles in California. In 2009, the Board will consider a proposal that is currently being developed to ensure that the ZEV program is optimally designed to help the State meet its 2020 target and put us on the path to meeting our 2050 target of an 80 percent reduction in greenhouse gas emissions.

It is important to note that while the use of both battery-powered electric vehicles and plug-in hybrids (which can be plugged in to recharge batteries) is not expected to increase electricity demand in the near term, over the longer term these technologies could result in meaningful new electricity demand. However, the expected increased electricity demand is likely to be met by off peak vehicle battery charging (i.e., overnight) to provide a means of load leveling and other possible benefits.[31]

Air Quality Improvement Program/Alternative and Renewable Fuel and Vehicle Technology Program

Under AB 118 (Núñez, Chapter 750, Statutes of 2007), ARB is administering the Air Quality Improvement Program, which provides approximately $50 million per year for grants to fund clean vehicle/equipment projects and research on the air quality impacts of alternative fuels and advanced technology vehicles.

AB 118 also created the Alternative and Renewable Fuel and Vehicle Technology Program and authorized CEC to spend up to $120 million per year for over seven years (from 2008-2015) to develop, demonstrate, and deploy innovative technologies to transform California's fuel and vehicle types. This program creates the opportunities for investment in technologies and fuels that will help meet the Low Carbon Fuel Standard, the AB 1007 (Pavley, Chapter 371, Statutes of 2005) goal of increasing alternative fuels, the AB 32 goal of reducing greenhouse gas emissions to 1990 levels by 2020, and the State's overall goal of reducing greenhouse gas emissions 80 percent below 1990 levels by 2050. CEC and ARB are coordinating closely in the implementation of AB 118. In the long-term, programs to reduce greenhouse gas emissions from cars would reduce highway funds because less fuel would be sold, reducing tax revenue. In coordination with other State agencies, ARB

[31] There is also a potential for battery-electric and hybrid vehicles (both plug-in and traditional hybrid-electric) to be used in the future to provide electricity back into the electricity grid during times of especially high demand (peak periods).

will continue to evaluate the potential impacts of these shifts and identify potential solutions.

Table 6: California Light-Duty Vehicle Greenhouse Gas Standards Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
T-1	Pavley I and II – Light-Duty Vehicle Greenhouse Gas Standards	31.7
	Total	**31.7**

3. Energy Efficiency

Maximize energy efficiency building and appliance standards, and pursue additional efficiency efforts including new technologies, and new policy and implementation mechanisms. Pursue comparable investment in energy efficiency from all retail providers of electricity in California (including both investor-owned and publicly-owned utilities).

Energy-efficiency measures for both electricity and natural gas can reduce greenhouse gas emissions significantly. In 2003, the CPUC and CEC adopted an Energy Action Plan that prioritized resources for meeting California's future energy needs, with energy efficiency being first in the "loading order," or highest priority. Since then, this policy goal has been codified into statute through legislation that requires electric utilities to meet their resource needs first with energy efficiency.[32]

This measure would set new targets for statewide annual energy demand reductions of 32,000 gigawatt hours and 800 million therms from business as usual[33] – enough to power more than 5 million homes, or replace the need to build about ten new large power plants (500 megawatts each). These targets represent a higher goal than existing efficiency targets established by CPUC for the investor-owned utilities due to the inclusion of innovative strategies above traditional utility programs. Achieving the State's energy efficiency targets will require coordinated efforts from the State, the federal government, energy companies and customers. ARB will work with CEC and CPUC to facilitate these partnerships. A number of these measures also have the potential to deliver significant economic benefits to California consumers, including low-income households and small businesses. California's energy efficiency programs for buildings and appliances have generated more than $50 billion in

[32] SB 1037 (Kehoe, Chapter 366, Statutes of 2005) and AB 2021 (Levine, Chapter 734, Statutes of 2006) directed electricity corporations subject to CPUC's authority and publicly-owned electricity utilities to first meet their unmet resource needs through all available energy efficiency and demand response resources that are cost effective, reliable and feasible.

[33] The savings targeted here are additional to savings currently assumed to be incorporated in CEC's 2007 demand forecasts. However, CEC has initiated a public process to better determine the quantity of energy savings from standards, utility programs, and market effects that are embedded in the baseline demand forecast.

savings over the past three decades. Tables 7 and 8 summarize the reduction of greenhouse gas emissions.

Efficiency

Achieving the energy efficiency target will require redoubled efforts to target industrial, agricultural, commercial, and residential end-use sectors, comprised of both innovative new initiatives that have been embraced by CEC's energy policy reports and CPUC's long-term strategic plan, and improvements to California's traditional approaches of improved building standards and utility programs.

High-efficiency distributed generation applications like fuel cell technologies can also play an important role in helping the State meet its requirements for reduction of greenhouse gas emissions. Key energy efficiency strategies, grouped by type, include:

Cross-cutting Strategy for Buildings

- "Zero Net Energy" buildings[34]

Codes and Standards Strategies

- More stringent building codes and appliance efficiency standards
- Broader standards for new types of appliances and for water efficiency
- Improved compliance and enforcement of existing standards
- Voluntary efficiency and green building targets beyond mandatory codes

Strategies for Existing Buildings

- Voluntary and mandatory whole-building retrofits for existing buildings
- Innovative financing to overcome first-cost and split incentives for energy efficiency, on-site, renewables, and high efficiency distributed generation

Existing and Improved Utility Programs

- More aggressive utility programs to achieve long-term savings

Other Needed Strategies

- Water system and water use efficiency and conservation measures
- Local government programs that lead by example and tap into local authority over planning, development, and code compliance
- Additional industrial and agricultural efficiency initiatives
- Providing real time energy information technologies to help consumers conserve and optimize energy performance

With the support of key State agencies, utilities, local governments and others, the CPUC has recently adopted the *California Long Term Energy Efficiency Strategic*

[34] Zero net energy refers to building energy use over the course of a typical year. When the building is producing more electricity than it needs, it exports its surplus to the grid. When the building requires more electricity than is being produced on-site, it draws from the grid. Generally, when constructing a ZNE building, energy efficiency measures can result in up to 70% savings relative to existing building practices, which then allows for renewables to meet the remaining load.

Plan.[35] Released September 2008, this Plan sets forth a set of strategies toward maximizing the achievement of cost-effective energy efficiency in California's Electricity and Natural Gas sectors between 2009 and 2020, and beyond. Its recommendations are the result of a year-long collaboration by energy experts, utilities, businesses, consumer groups, and governmental organizations in California, throughout the west, nationally and internationally.

For many of the above goals and others, the Strategic Plan discusses practical implementation strategies, detailing necessary partnerships among the state, its utilities, the private sector, and other market players and timelines for near-term, mid-term and long-term success. While the Strategic Plan is the most current and innovative summary of energy efficiency strategies needed to meet State goals, additional planning and new strategies will likely be needed, both to achieve the 2020 emissions reduction goals and to set the State on a trajectory toward 2050.

Other innovative approaches could also be used to motivate private investment in efficiency improvements. One example that will be evaluated during the development of the cap-and-trade program is the creation of a mechanism to make allowances available within the program to provide incentives for local governments, third party providers, or others to pursue projects to reduce greenhouse gas emissions, including the bundling of energy efficiency improvements for small businesses or in targeted communities.

Solar Water Heating

Solar water heating systems offer a potential for natural gas savings in California. A solar water heating system offsets the use of natural gas by using the sun to heat water, typically reducing the need for conventional water heating by about two-thirds. Successful implementation of the zero net energy target for new buildings will require significant growth in California's solar water heating system manufacturing and installation industry. The State has initiated a program to move toward a self sustaining solar water heater industry. The Solar Hot Water and Efficiency Act of 2007 (SHWEA) authorized a ten year, $250-million incentive program for solar water heaters with a goal of promoting the installation of 200,000 systems in California by 2017.[36]

Combined Heat and Power

Combined heat and power (CHP), also referred to as cogeneration, produces electricity and useful thermal energy in an integrated system. The widespread development of efficient CHP systems would help displace the need to develop new, or expand existing, power plants. This measure sets a target of an additional

[35] California Public Utilities Commission. *California Long Term Energy Efficiency Strategic Plan*. September 2008. http://www.californiaenergyefficiency.com/docs/EEStrategicPlan.pdf (accessed October 12, 2008).

[36] Established under Assembly Bill 1470 (Huffman, Chapter 536, Statues of 2007).

4,000 MW of installed CHP capacity by 2020, enough to displace approximately 30,000 GWh of demand from other power generation sources.[37]

California has supported CHP for many years, but market and other barriers continue to keep CHP from reaching its full market potential. Increasing the deployment of efficient CHP will require a multi-pronged approach that includes addressing significant barriers and instituting incentives or mandates where appropriate. These approaches could include such options as utility-provided incentive payments, the creation of a CHP portfolio standard, transmission and distribution support payments, or the use of feed-in tariffs.

Table 7: Energy Efficiency Recommendation - Electricity
($MMTCO_2E$ in 2020)

Measure No.	Measure Description	Reductions
E-1	Energy Efficiency (32,000 GWh of Reduced Demand) • Increased Utility Energy Efficiency Programs • More Stringent Building & Appliance Standards • Additional Efficiency and Conservation Programs	15.2
E-2	Increase Combined Heat and Power Use by 30,000 GWh	6.7
	Total	**21.9**

Table 8: Energy Efficiency Recommendation - Commercial and Residential
($MMTCO_2E$ in 2020)

Measure No.	Measure Description	Reductions
CR-1	Energy Efficiency (800 Million Therms Reduced Consumption) • Utility Energy Efficiency Programs • Building and Appliance Standards • Additional Efficiency and Conservation Programs	4.3
CR-2	Solar Water Heating (AB 1470 goal)	0.1
	Total	**4.4**

4. Renewables Portfolio Standard

Achieve 33 percent renewable energy mix statewide.

CEC estimates that about 12 percent of California's retail electric load is currently met with renewable resources. Renewable energy includes (but is not limited to) wind, solar, geothermal, small hydroelectric, biomass, anaerobic digestion, and landfill gas. California's current Renewables Portfolio Standard (RPS) is intended to

[37] Accounting for avoided transmission line losses of seven percent, this amount of CHP would actually displace 32,000 GWh from the grid.

increase that share to 20 percent by 2010. Increased use of renewables will decrease California's reliance on fossil fuels, thus reducing emissions of greenhouse gases from the Electricity sector. Based on Governor Schwarzenegger's call for a statewide 33 percent RPS, the Plan anticipates that California will have 33 percent of its electricity provided by renewable resources by 2020, and includes the reduction of greenhouse gas emissions based on this level.

Senate Bill 107 (Simitian, Chapter 464, Statutes of 2006) obligates the investor-owned utilities (IOUs) to increase the share of renewables in their electricity portfolios to 20 percent by 2010. Meanwhile, the publicly-owned utilities (POUs) are encouraged but not required to meet the same RPS. The governing boards of the state's three largest POUs, the Los Angeles Department of Water and Power (LADWP), the Sacramento Municipal Utility District (SMUD), and the Imperial Irrigation District (IID), have adopted policies to achieve 20 percent renewables by 2010 or 2011. LADWP and IID have established targets of 35 and 30 percent, respectively, by 2020.

In 2005, CEC and CPUC committed in the Energy Action Plan II to "evaluate and develop implementation paths for achieving renewable resource goals beyond 2010, including 33 percent renewables by 2020, in light of cost-benefit and risk analysis, for all load serving entities." The proposed opinion in the CPUC/CEC joint proceeding lends strong support for obtaining 33 percent of California's electricity from renewables, and states the two Commissions' belief that this target is achievable if the State commits to significant investments in transmission infrastructure and key program augmentation. As with the energy efficiency target, achieving the 33 percent goal will require broad-based participation from many parties and the removal of barriers. CEC, CPUC, California Independent System Operator (CAISO), and ARB are working with California utilities and other stakeholders to formally establish and meet this goal.

A key prerequisite to reaching a target of 33 percent renewables will be to provide sufficient electric transmission lines to renewable resource zones and system changes to allow integration of large quantities of intermittent wind and solar generation. The Renewable Energy Transmission Initiative (RETI) is a broad collaborative of State agencies, utilities, the environmental community, and renewable generation developers that are working cooperatively to identify and prioritize renewable generation zones and associated transmission projects. Although biomass, geothermal, and small-scale hydroelectric generation can provide steady baseload power, other renewable generation is intermittent (wind) or varies over time (solar). Therefore, integration of intermittent generation into the electricity system will require grid improvements so that fluctuations in power availability can be accommodated. Improved communications technology, automated demand response, electric sub-station improvements and other modern technologies must be implemented both to facilitate intermittent renewables, and to improve grid reliability.

Another key action that may help to achieve the renewable energy goals is to reduce the complexity and cost faced by small renewable developers in contracting with utilities to supply renewable generation. This is particularly important for projects offering below 20 megawatts of generation capacity. One such option may be a feed-in tariff for all RPS-eligible renewable energy facilities up to 20 megawatts in size. This mechanism was recommended in CEC's 2007 Integrated Energy Policy Report. Such a tariff, set at an appropriate level, could benefit small-scale facilities by allowing them to be brought into the electricity grid more rapidly.

For the purposes of calculating the reduction of greenhouse gas emissions in this Scoping Plan, ARB is counting emissions avoided by increasing the percentage of renewables in California's electricity mix from the current level of 12 percent to the 33 percent goal, as shown in Table 9.

Table 9: Renewables Portfolio Standard Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
E-3	Achieve a 33% renewables mix by 2020	21.3
	Total	**21.3**

5. Low Carbon Fuel Standard

Develop and adopt the Low Carbon Fuel Standard.

Because transportation is the largest single source of greenhouse gas emissions in California, the State is taking an integrated approach to reducing emissions from this sector. Beyond including vehicle efficiency improvements and lowering vehicle miles traveled, the State is proposing to reduce the carbon intensity of transportation fuels consumed in California.

To reduce the carbon intensity of transportation fuels, ARB is developing a Low Carbon Fuel Standard (LCFS), which would reduce the carbon intensity of California's transportation fuels by at least ten percent by 2020 as called for by Governor Schwarzenegger in Executive Order S-01-07.

LCFS will incorporate compliance mechanisms that provide flexibility to fuel providers in how they meet the requirements to reduce greenhouse gas emissions. The LCFS will examine the full fuel cycle impacts of transportation fuels and ARB will work to design the regulation in a way that most effectively addresses the issues raised by the Environmental Justice Advisory Committee and other stakeholders. ARB identified the LCFS as a Discrete Early Action item, and is developing a regulation for Board consideration in March 2009. A 10 percent reduction in the intensity of transportation fuels is expected to equate to a reduction of 16.5 MMTCO$_2$E in 2020. However, in order to account for possible overlap of

benefits between LCFS and the Pavley greenhouse gas standards, ARB has discounted the contribution of LCFS to 15 $MMTCO_2E$.

Table 10: Low Carbon Fuel Standard Recommendation
($MMTCO_2E$ in 2020)

Measure No.	Measure Description	Reductions
T-2	Low Carbon Fuel Standard (Discrete Early Action)	15
	Total	**15**

6. Regional Transportation-Related Greenhouse Gas Targets

Develop regional greenhouse gas emissions reduction targets for passenger vehicles.

Establishment of Regional Targets

On September 30, 2008, Governor Arnold Schwarzenegger signed Senate Bill 375 (Steinberg) which establishes mechanisms for the development of regional targets for reducing passenger vehicle greenhouse gas emissions. Through the SB 375 process, regions will work to integrate development patterns and the transportation network in a way that achieves the reduction of greenhouse gas emissions while meeting housing needs and other regional planning objectives. This new law reflects the importance of achieving significant additional reductions of greenhouse gas emissions from changed land use patterns and improved transportation to help achieve the goals of AB 32.

SB 375 requires ARB to develop, in consultation with metropolitan planning organizations (MPOs), passenger vehicle greenhouse gas emissions reduction targets for 2020 and 2035 by September 30, 2010. It sets forth a collaborative process to establish these targets, including the appointment by ARB of a Regional Targets Advisory Committee to recommend factors to be considered and methodologies for setting greenhouse gas emissions reduction targets. SB 375 also provides incentives – relief from certain California Environmental Quality Act (CEQA) requirements for development projects that are consistent with regional plans that achieve the targets.

Reaching the Targets

Transportation planning is done on a regional level in major urban areas, through the Metropolitan Planning Organizations. These MPOs are required by the federal government to prepare regional transportation plans (RTPs) in order to receive federal transportation dollars. These plans must reflect the land uses called out in city and county general plans. Regional planning efforts provide an opportunity for community residents to help select future growth scenarios that lead to more sustainable and energy efficient communities. Such plans should be developed through an extensive public process to provide for local accountability.

SB 375 requires MPOs to prepare a sustainable communities strategy to reach the regional target provided by ARB. MPOs would use the sustainable communities strategy for the land use pattern underlying the region's transportation plan. If the strategy does not meet the target, the MPO must document the impediments and show how the target could be met with an alternative planning strategy. The CEQA relief would be provided to those projects that are consistent with either the sustainable communities strategy or alternative planning strategy, whichever meets the target.

Many regions in California have conducted comprehensive scenario planning, called Blueprint planning, that engages a broad set of stakeholders at the local level on the impacts of land use and transportation choices. The State has allocated resources to initiate or augment existing Blueprint efforts of MPOs. These efforts focus on fostering efficient land use patterns that not only reduce vehicle travel but also accommodate an adequate supply of housing, reduce impacts on valuable habitat and productive farmland, increase resource use efficiency, and promote a prosperous regional economy. Blueprint planning can play an important role in the SB 375 process by helping inform target-setting efforts and building strong sustainable communities strategies.

Local governments will play a significant role in the regional planning process to reach passenger vehicle greenhouse gas emissions reduction targets. Local governments have the ability to directly influence both the siting and design of new residential and commercial developments in a way that reduces greenhouse gases associated with vehicle travel, as well as energy, water, and waste. A partnership of local and regional agencies is needed to create a sustainable vision for the future that accommodates population growth in a carbon efficient way while meeting housing needs and other planning goals. Integration of the sustainable communities strategies or alternative planning strategies with local general plans will be key to the achievement of these goals. State, regional, and local agencies must work together to prioritize and create the supporting policies, programs, incentives, guidance, and funding to assist local actions to help ensure regional targets are met.

Enhanced public transit service combined with incentives for land use development that provides a better market for public transit will play an important role in helping to reach regional targets.

SB 375 maintains regions' flexibility in the development of sustainable communities strategies. There are many different ways regions can plan and work toward reducing the growth in vehicle travel. Increasing low-carbon travel choices (public transit, carpooling, walking and biking) combined with land use patterns and infrastructure that support these low-carbon modes of travel, can decrease average vehicle trip lengths by bringing more people closer to more destinations. The need for integrated strategies is supported by the current transportation and land use modeling literature.

Supporting measures that should be considered in both the regional target-setting and sustainable communities strategy processes include the following:

- Congestion pricing strategies can provide a method of efficiently managing traffic demand while raising funds for needed transit, biking and pedestrian infrastructure investment. Regional and local agencies, however, do not have the authority to pursue these strategies on their own, as federal approval and State authorization must be provided for regional implementation of most pricing measures.

- Indirect source rules for new development have already been implemented by some local air districts and proposed by others for purposes of criteria pollution reduction. Regions should evaluate the need for measures that would ensure the mitigation of high carbon footprint development outside of the sustainable communities strategies or alternative planning strategies that meet the targets established under SB 375.

- Programs to reduce vehicle trips while preserving personal mobility, such as employee transit incentives, telework programs, car sharing, parking policies, public education programs and other strategies that enhance and complement land use and transit strategies can be implemented and coordinated by regional and local agencies and stakeholder groups.

Another way to encourage greenhouse gas reductions from vehicle travel is through pay as you drive insurance (PAYD), a structure in which drivers realize a direct financial benefit from driving less. The California Insurance Commissioner recently announced support for PAYD and has proposed regulations to permit PAYD on a voluntary basis.

Separate emissions reduction estimates for these strategies are not quantified here. As regional targets are developed in the SB 375 process, ARB will work with regions to quantify the benefits in the context of the targets.

Estimating the Benefits of Regional Targets

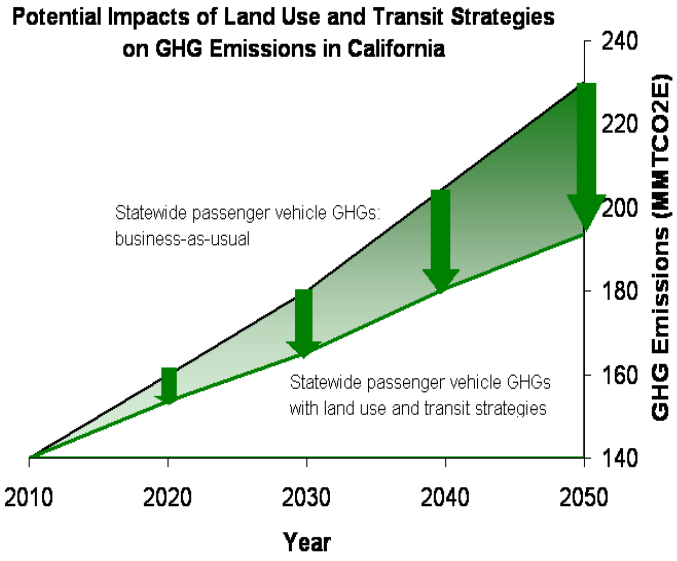
The ARB estimate of the statewide benefit of regional transportation-related greenhouse gas emissions reduction targets is based on analysis of research results quantifying the effects of land use and transportation strategies. The emissions reduction number in Table 11 is not the statewide metric for regional targets that must be developed as SB 375 is implemented. The emissions target will ultimately be determined during the SB 375 process.

The possible impacts of land use and transportation policies have been well documented. Most recently, a 2008 U.C. Berkeley study[38] reviewed over 20

[38]Rodier, Caroline. U.C. Berkeley, Transportation Sustainability Research Center, "A Review of the International Modeling Literature: Transit, Land Use, and Auto Pricing Strategies to Reduce Vehicle Miles Traveled and Greenhouse Gas Emissions," August 2008. http://www.arb.ca.gov/planning/tsaq/docs/rodier_8-1-08_trb_paper.pdf (accessed October 12, 2008)

modeling studies from California (including the State's four largest MPOs), other states and Europe. The study found a range of 0.4 to 7.7 percent reduction in vehicle miles traveled (VMT) resulting from a combination of land use and enhanced transit policies compared to a business-as-usual case over a 10-year horizon, with benefits doubling by 2030, as shown in Figure 4. With the inclusion of additional measures such as pricing policies, the reduction of greenhouse gas emissions can be greater. These strategies will be considered during the target-setting process. Sophisticated land use and transportation models can best assess these effects. As part of the development of regional targets, technical tools will need to be refined to ensure sound quantification techniques are available.

Figure 4



The potential benefits of this measure that can be realized by 2020 (as shown in Table 11) were estimated after first accounting for the benefits of the vehicle technology and efficiency measures in the plan. It was calculated based on the U.C. Berkeley study's median value of 4 percent per capita VMT reduction over a 10-year time horizon. This value should not be interpreted as the final estimate of the benefits of this measure. The current academic literature supports this realistic statewide estimate of potential benefits, but the ultimate benefit will be determined as an outcome of SB 375 implementation on a regional level. The incentives for sustainable planning in SB 375 can set California on a new path. ARB's establishment of regional targets in 2010, combined with the Regional Targets Advisory Committee process, required by the legislation, provides a clear mechanism for maximizing the benefits of this measure.

Additional Benefits of Regional Targets and Land Use Strategies

Land use and transportation measures that help reduce vehicle travel will also provide multiple benefits beyond greenhouse gas reductions. Quality of life will be improved

by increasing access to a variety of mobility options such as transit, biking, and walking, and will provide a diversity of housing options focused on proximity to jobs, recreation, and services. Other important state and community goals that could be met through better integrated land use and transportation planning include agricultural, open space and habitat preservation, improved water quality, positive health effects, and the reduction of smog forming pollutants.

Growing more sustainably has the potential to provide additional greenhouse gas and energy savings by encouraging more compact, mixed-use developments resulting in reduced demand for electricity and heating and cooling energy. These land use-related energy savings will contribute toward the Plan's energy efficiency measures to achieve the goal of reducing electricity and natural gas usage. ARB is continuing to evaluate the greenhouse gas emissions reductions that may be additional to the proposed measures in this plan.

Table 11: Regional Transportation-Related Greenhouse Gas Targets Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
T-3	Regional Transportation-Related Greenhouse Gas Targets[39]	5
	Total	**5**

7. Vehicle Efficiency Measures

Implement light-duty vehicle efficiency measures.

Several additional measures could reduce light-duty vehicle greenhouse gas emissions. The California Integrated Waste Management Board (CIWMB) with various partners continues to conduct a public awareness campaign to promote sustainable tire practices. ARB is pursuing a regulation to ensure that tires are properly inflated when vehicles are serviced. In addition, CEC in consultation with CIWMB is developing an efficient tire program focusing first on data gathering and outreach, then on potential adoption of minimum fuel-efficient tire standards, and lastly on the development of consumer information requirements for replacing tires. ARB is also pursuing ways to reduce engine load via lower friction oil and reducing the need for air conditioner use. ARB is actively engaged in the regulatory development process for the tire inflation component of this measure. Current information indicates the reduction of greenhouse gas emissions is likely to be less than estimated in the Draft Scoping Plan. ARB has adjusted the estimated reductions shown in Table 12 to reflect this.

[39] This number represents an estimate of what may be achieved from local land use changes. It is not the SB 375 regional target. ARB will establish regional targets for each MPO region following the input of the Regional Targets Advisory Committee and a public consultation process with MPOs and other stakeholders per SB 375.

Table 12: Vehicle Efficiency Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
T-4	Vehicle Efficiency Measures	4.5
	Total	**4.5**

8. Goods Movement

Implement adopted regulations for the use of shore power for ships at berth. Improve efficiency in goods movement activities.

A significant portion of greenhouse gas emissions from transportation activities comes from the movement of freight or goods throughout the state. Activity at California ports is forecast to increase by 250 percent between now and 2020. Both the Goods Movement Emission Reduction Plan (GMERP) and the 2007 State Implementation Plan (SIP) contain numerous measures designed to reduce the public health impact of goods movement activities in California. ARB has already adopted a regulation to require ship electrification at ports. Proposition 1B funds, as well as clean air plans being implemented by California's ports, will also help reduce greenhouse gas emissions while cutting criteria pollutant and toxic diesel emissions. ARB is proposing to develop and implement additional measures to reduce greenhouse gas emissions due to goods movement from trucks, ports and other related facilities. The anticipated reductions would be above and beyond what is already expected in the GMERP and the SIP. This effort should provide accompanying reductions in air toxics and smog forming emissions. The estimated reduction of greenhouse gas emissions is shown in Table 13.

After further evaluation, ARB incorporated the Draft Scoping Plan's Heavy-Duty Vehicle-Efficiency measure into the Goods Movement measure. A Heavy-Duty Engine Efficiency measure could reduce emissions associated with goods movement through improvements which could involve advanced combustion strategies, friction reduction, waste heat recovery, and electrification of accessories. ARB will consider setting requirements and standards for heavy-duty engine efficiency in the future if higher levels of efficiency are not being produced either in response to market forces (fuel costs) or federal standards.

Table 13: Goods Movement Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
T-5	Ship Electrification at Ports (Discrete Early Action)	0.2
T-6	Goods Movement Efficiency Measures • System-Wide Efficiency Improvements	3.5
	Total	**3.7**

9. Million Solar Roofs Program

Install 3,000 MW of solar-electric capacity under California's existing solar programs.

As part of Governor Schwarzenegger's Million Solar Roofs Program, California has set a goal to install 3,000 megawatts (MW) of new solar capacity by 2017 – moving the state toward a cleaner energy future and helping lower the cost of solar systems for consumers. The Million Solar Roofs Initiative is a ratepayer-financed incentive program aimed at transforming the market for rooftop solar systems by driving down costs over time. Created under Senate Bill 1 (Murray, Chapter 132, Statutes of 2006), the Million Solar Roofs Program includes CPUC's California Solar Initiative and CEC's New Solar Homes Partnership, and requires publicly-owned utilities (POUs) to adopt, implement and finance a solar incentive program. This measure would offset electricity from the grid, thereby reducing greenhouse gas emissions. The estimated emissions reductions are shown in Table 14.

Obtaining the incentives requires the building owners or developers to meet certain efficiency requirements: specifically, that new construction projects meet energy efficiency levels that exceed the State's Title 24 Building Energy Efficiency Standards, and that existing commercial buildings undergo an energy audit. Thus, the program is also a mechanism for achieving the efficiency targets for the Energy sector. By requiring greater energy efficiency for projects that seek solar incentives, the State would be able to reduce both electricity and natural gas needs and their associated greenhouse gas emissions.

Table 14: Million Solar Roofs Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
E-4	Million Solar Roofs (including California Solar Initiative, New Solar Homes Partnership and solar programs of publicly owned utilities) • Target of 3000 MW Total Installation by 2020	2.1
	Total	**2.1**

10. Medium/Heavy-Duty Vehicles

Adopt medium and heavy-duty vehicle efficiency measures.

Medium- and heavy-duty vehicles account for approximately 20 percent of the transportation greenhouse gas inventory. Requiring retrofits to improve the fuel efficiency of heavy-duty trucks could include a requirement for devices that reduce aerodynamic drag and rolling resistance. In addition, hybridization of medium- and

heavy-duty vehicles would also reduce greenhouse gas emissions through increased fuel efficiency. Hybrid trucks would likely achieve the greatest benefits in urban, stop-and-go applications, such as parcel delivery, utility services, transit, and other vocational work trucks. The recommendation for this sector is summarized in Table 15.

Table 15: Medium/Heavy-Duty Vehicle Recommendation
($MMTCO_2E$ in 2020)

Measure No.	Measure Description	Reductions
T-7	Heavy-Duty Vehicle Greenhouse Gas Emissions Reduction Measure - Aerodynamic Efficiency (Discrete Early Action)	0.9
T-8	Medium/Heavy-Duty Vehicle Hybridization	0.5
	Total	**1.4**

11. Industrial Emissions

Require assessment of large industrial sources to determine whether individual sources within a facility can cost-effectively reduce greenhouse gas emissions and provide other pollution reduction co-benefits. Reduce greenhouse gas emissions from fugitive emissions from oil and gas extraction and gas transmission. Adopt and implement regulations to control fugitive methane emissions and reduce flaring at refineries.

Energy Efficiency and Co-Benefits Audits for Large Industrial Sources

This measure would apply to the direct greenhouse gas emissions at major industrial facilities emitting more than 0.5 $MMTCO_2E$ per year. In general, these facilities also have significant emissions of criteria air pollutants, toxic air pollutants, or both. Major industrial facilities include power plants, refineries, cement plants, and miscellaneous other sources. ARB would implement this measure through a regulation, requiring each facility to conduct an energy efficiency audit of individual combustion and other direct sources of greenhouse gases within the facility to determine the potential reduction opportunities, including criteria air pollutants and toxic air contaminants. The audit would include an assessment of the impacts of replacing or upgrading older, less efficient units such as boilers and heaters, or replacing the units with combined heat and power (CHP) units. The measure is summarized in Table 16.

The audit would help ARB to identify potential reductions of greenhouse gas emissions reductions, the associated costs and cost-effectiveness, their technical feasibility, and the potential to reduce air pollution impacts at the local or regional level. ARB will use the results to determine if certain emissions sources within a facility can make cost-effective reductions of greenhouse gas emissions that also provide reductions in other criteria or toxic pollutants. Where this is the case, rule provisions or permit conditions would be considered to ensure the best combination

of pollution reductions. Nothing in this measure would delay known cost-effective strategies that otherwise would be required.

The California Long Term Energy Efficiency Strategic Plan (CPUC) discusses a number of strategies associated with improving industrial sector efficiency and greenhouse gas emissions reductions, including the development of certification protocols for industrial efficiency improvements to develop market recognition for efficiency gains.

Oil and Gas Recovery Operations and Transmission/Refineries

California is a major oil and gas producer. Crude oil, both from in-state and imported sources, is processed at 21 oil refineries in the state. In addition to conforming to the requirements of the cap-and-trade program and the audit measure, ARB has identified four specific measures for development and implementation, two for oil and gas recovery operations and gas transmission, and two for refineries. Other industrial measures that were under consideration affect greenhouse gas emissions sources that are fully regulated under cap and trade, which ARB concluded would provide cost-effective reductions of greenhouse gas emissions. All measures would be designed to secure a combination of cost-effective reductions in greenhouse gas emissions, criteria air pollutants and air toxics. Two measures would be developed to reduce methane emissions in the oil and gas production and gas transmission processes from leaks and incomplete combustion of methane (used as fuel). These measures would include improved leak detection, process modifications, equipment retrofits, installation of new equipment, and best management practices. The first measure would affect oil and gas producers. The second would impact operators of natural gas pipeline systems. These fugitive emissions are not proposed to be covered by a cap and trade program, although combustion-related emissions from these operations are proposed to be covered. The WCI partner jurisdictions are currently evaluating the inclusion of fugitive methane emissions to the extent that adequate quantification methods exist. During implementation of this measure, ARB will determine whether these emissions will also be covered in California's cap-and-trade program. If the emissions are covered under the cap, ARB will evaluate the need for the measures described here.

Two measures would be developed for oil refineries. The first would limit the greenhouse gas emissions from refinery flares while preserving flaring as needed for safety reasons. The second would remove the current fugitive methane exemption in most refinery Volatile Organic Compounds (VOC) regulations. This exemption was established because methane does not appreciably contribute to urban smog, but is inappropriate given the role that methane plays in global warming. ARB believes these measures would provide cost-effective greenhouse gas, criteria pollutants and air toxics emissions reductions. Most combustion and other process emissions at refineries would be governed by the cap-and-trade program. As with the oil and gas production measures above, the need for these measures would be evaluated if fugitive methane is included in the WCI cap-and-trade program.

Table 16: Industrial Emissions Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
I-1	Energy Efficiency and Co-Benefits Audits for Large Industrial Sources	TBD
I-2	Oil and Gas Extraction GHG Emissions Reduction	0.2
I-3	GHG Leak Reduction from Oil and Gas Transmission	0.9
I-4	Refinery Flare Recovery Process Improvements	0.33
I-5	Removal of Methane Exemption from Existing Refinery Regulations	0.01
	Total	**1.4**

12. High Speed Rail

Support implementation of a high speed rail system.

A high speed rail (HSR) system is part of the statewide strategy to provide more mobility choice and reduce greenhouse gas emissions. This measure supports implementation of plans to construct and operate a HSR system between northern and southern California. As planned, the HSR is a 700-mile-long rail system capable of speeds in excess of 200 miles per hour on dedicated, fully-grade separated tracks with state-of-the-art safety, signaling and automated rail control systems. The system would serve the major metropolitan centers of California in 2030 and is projected to displace between 86 and 117 million riders from other travel modes in 2030.

For Phase 1 of the HSR, between San Francisco and Anaheim, 2020 is projected to be the first year of service, with 26 percent of the projected 2030 full system ridership levels. The anticipated reduction of greenhouse gas emissions are shown in Table 17. HSR system ridership and the benefits associated with it are anticipated to increase over time as additional portions of the planned system are completed. Over the long term, the system also has the potential to support the reduction of greenhouse gas emissions in the transportation sector from land use strategies, by providing opportunities for and encouraging low-impact transit-oriented development.

HSR implementation was initiated recently when California voters approved Proposition 1A, the "Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century," as it appeared on the November 2008 ballot. HSR is anticipated to begin in 2010, with full implementation anticipated in 2030.

Table 17: High Speed Rail Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
T-9	High Speed Rail	1.0
	Total	**1.0**

13. Green Building Strategy

Expand the use of green building practices to reduce the carbon footprint of California's new and existing inventory of buildings.

Collectively, energy use and related activities by buildings are the second largest contributor to California's greenhouse gas emissions. Almost one-quarter of California's greenhouse gas emissions can be attributed to buildings.[40] As the Governor recognized in his Green Building Initiative (Executive Order S-20-04), significant reductions in greenhouse gas emissions can be achieved through the design and construction of new green buildings as well as the sustainable operation, retrofitting, and renovation of existing buildings.

A Green Building strategy offers a comprehensive approach to reducing direct and upstream greenhouse gas emissions that cross-cuts multiple sectors including Electricity/Natural Gas, Water, Recycling/Waste, and Transportation. Green buildings are designed, constructed, renovated, operated, and maintained using an integrated approach that reduces greenhouse gas emissions by maximizing energy and resource efficiency. Employing a whole-building design approach can create tremendous synergies that result in multiple benefits at little or no net cost, allowing for efficiencies that would never be possible on an incremental basis.

A Green Building strategy will produce greenhouse gas saving through buildings that exceed minimum energy efficiency standards, decrease consumption of potable water, reduce solid waste during construction and operation, and incorporate sustainable materials. Combined these measures can also contribute to healthy indoor air quality, protect human health and minimize impacts to the environment. A Green Building strategy also includes siting considerations. Buildings that are sited close to public transportation or near mixed-use areas can work in tandem with transportation-related strategies to decrease greenhouse gas emissions that result from that sector.

In July 2008, the California Building Standards Commission (CBSC) adopted the Green Building Standards Code (GBSC) for all new construction in the state. While the current version of the commercial green building code is voluntary, CBSC anticipates adopting a mandatory code in 2011 which will institute minimum environmental performance standards for all occupancies. The Green Building Strategy includes Zero Net Energy (ZNE) goals for new and existing homes and commercial buildings consistent with the recently-adopted California Long Term Energy Efficiency Strategic Plan. ARB encourages local governments to raise the bar by adopting "beyond-code" green building requirements. To assist this effort, State government would develop and regularly tighten voluntary standards, written in GBSC language for easy adoption by local jurisdictions.

[40] Greenhouse gas emission estimates from electricity, natural gas, and water use in homes and commercial buildings.

As we approach the 2020 and 2030 targets for zero energy buildings, these "percent above code" targets must shift to "percent of ZNE" targets. Zero energy new and existing buildings can be an overarching and unifying concept for energy efficiency in buildings, as discussed above (building energy efficiency measures E-1 and CR-1). In order to achieve statewide GHG emission reductions, these targets should be expanded to address other aspects of environmental performance. For example, these targets could be re-framed as a carbon footprint reduction goal for a 35 percent reduction in both energy and water consumption. For commercial buildings, a 2011 target should be established such that a quarter of all new buildings reduce energy and water consumption by at least 25 percent beyond code.

Furthermore, retrofitting existing residential and commercial buildings would achieve substantial greenhouse gas emissions reduction benefits. This Scoping Plan recommends the establishment of an environmental performance rating system for homes and commercial buildings and further recommends that California adopt mechanisms to encourage and require retrofits for buildings that do not meet minimum standards of performance.

An effective green building framework can operate to deliver reductions of greenhouse gas emissions in multiple sectors. The green building strategies provide a vehicle to achieve the statewide electricity and natural gas efficiency targets and lower greenhouse gas emissions from the waste and water transport sectors. Achieving these green building emissions reductions will require coordinated efforts from a broad range of stakeholders, and new financing mechanisms to motivate investment in green building strategies.

Achieving significant greenhouse gas emissions reductions from new and existing buildings will require a combination of green building measures for new construction and retrofits to existing buildings. The State of California will set an example by requiring all new State buildings to exceed existing Green Building Initiative energy goals and achieve nationally-recognized building sustainability standards such as Leadership in Energy and Environmental Design - New Construction (LEED-NC) "Gold" certification. Existing State buildings would also be retrofitted to achieve higher standards equivalent to LEED-EB for existing buildings (EB) "Silver." All new schools should be required to meet the Collaborative for High Performance Schools (CHPS) 2009 criteria. Existing schools applying for modernization funds should also be required to meet CHPS 2009 criteria.

ARB estimates that the greenhouse gas savings from green building measures as approximately 26 $MMTCO_2E$, as shown in Table 18 below. Most of these reductions are accounted for in the Electricity, Waste and Water sectors. Because of this, ARB has assigned all emissions reductions that occur as a result of green building strategies to other sectors for purposes of meeting AB 32 requirements, but will continue to evaluate and refine the emissions from this sector. As such, this strategy will require implementation from various entities within California, including CEC,

PUC, State Architect, and others, each taking the lead in their area of authority and expertise.

Table 18: Green Buildings Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
GB-1	Green Buildings[41]	26
	Total	**26**

14. High Global Warming Potential Gases

Adopt measures to reduce high global warming potential gases.

High global warming potential (GWP) gases pose a unique challenge. Just a few pounds of high GWP materials can have the equivalent effect on global warming as several *tons* of carbon dioxide. For example, the average refrigerator has about a half-pound of refrigerant and about one pound of "blowing agents" used to make the insulating foam. If these gases were released into the atmosphere, they would have a global warming impact equivalent to five metric tons of CO_2.

High GWP chemicals are very common and are used in many different applications such as refrigeration, air conditioning systems, fire suppression systems, and the production of insulating foam. Because these gases have been in use for years, old refrigerators, air conditioners and foam insulation represent a significant "bank" of these materials yet to be released. High GWP gases are released primarily in two ways. The first is through leaking systems, and the second is during the disposal process. Once high GWP materials are released, they persist in the atmosphere for tens or even hundreds of years. Recommended measures to address this growing problem take the form of direct regulations and use of mitigation fees.

ARB identified four Discrete Early Action measures to reduce greenhouse gas emissions from the refrigerants used in car air conditioners, semiconductor manufacturing, air quality tracer studies, and consumer products. ARB has identified additional potential reduction opportunities based on specifications for future commercial and industrial refrigeration, changing the refrigerants used in auto air conditioning systems, and ensuring that existing car air conditioning systems as well as stationary refrigeration equipment do not leak. Recovery and destruction of high GWP materials in the banks described above could also provide significant reductions.

[41] Although some of these emissions reductions may be additional, most of them are accounted for in the Energy, Waste, Water, and Transportation sectors. In addition, some of these reductions may occur out of state, making quantification more difficult. Because of this, these emissions reductions are not currently counted toward the AB 32 2020 goal.

ARB is also proposing to establish an upstream mitigation fee on the use of high GWP gases. Even with the reductions from the specific high GWP measures described above, this sector's emissions are still projected to more than double from current levels by 2020. This is because of the high growth in the sector due, in part, to the replacement of ozone-depleting substances being phased out of production. These emissions would be difficult to address via traditional approaches since the gases are used in small quantities in very diverse applications. Additionally, there are no proven substitutes or alternatives for some uses, and the relative low price of most high GWP compounds provides little incentive to develop alternatives, reduce leakage, or recover the gases at end-of-life.

An upstream fee would ensure that the climate impact of these substances is reflected in the total cost of the product, encouraging reduced use and end-of-life losses, as well as the development of alternatives. The fee would be variable and associated with the impact the product makes on public health and the environment. This could encourage product innovation because fees would correspondingly decrease as the manufacturer or producer redesigned their product or found lower-cost alternatives. This mitigation fee would complement many of the downstream high GWP regulations currently being developed.[42] Fees on high GWP gases would be set to be consistent with the cost of reducing greenhouse gas emissions and could be set to reduce multiple environmental impacts. Revenues could be used to mitigate greenhouse gas emissions either from other high GWP compounds or other greenhouse gases.

Table 19 summarizes the recommendations for measures in the High GWP sector. These measures address both high GWP gases identified in AB 32 and also other high GWP gases, such as ozone-depleting substances that are only partially covered by the Montreal Protocol. The emissions reductions shown are only for the six greenhouse gases explicitly identified in AB 32.

[42] Industrial process emissions of high GWP gases are also expected to be part of the cap-and-trade program. As ARB moves through the rulemaking for both the high GWP fee and the cap-and-trade program, staff will evaluate whether these are complementary approaches or if one or the other needs to be adjusted to prevent duplicative regulation of the industrial process emissions of these gases.

Table 19: High GWP Gases Sector Recommendation
($MMTCO_2E$ in 2020)

Measure No.	Measure Description	Reductions
H-1	Motor Vehicle Air Conditioning Systems: Reduction of Refrigerant Emissions from Non-Professional Servicing (Discrete Early Action)	0.26
H-2	SF_6 Limits in Non-Utility and Non-Semiconductor Applications (Discrete Early Action)	0.3
H-3	Reduction of Perfluorocarbons in Semiconductor Manufacturing (Discrete Early Action)	0.15
H-4	Limit High GWP Use in Consumer Products (Discrete Early Action) (Adopted June 2008)	0.25
H-5	High GWP Reductions from Mobile Sources • Low GWP Refrigerants for New Motor Vehicle Air Conditioning Systems • Air Conditioner Refrigerant Leak Test During Vehicle Smog Check • Refrigerant Recovery from Decommissioned Refrigerated Shipping Containers • Enforcement of Federal Ban on Refrigerant Release during Servicing or Dismantling of Motor Vehicle Air Conditioning Systems	3.3
H-6	High GWP Reductions from Stationary Sources • High GWP Stationary Equipment Refrigerant Management Program: o Refrigerant Tracking/Reporting/Repair Deposit Program o Specifications for Commercial and Industrial Refrigeration Systems • Foam Recovery and Destruction Program • SF_6 Leak Reduction and Recycling in Electrical Applications • Alternative Suppressants in Fire Protection Systems • Residential Refrigeration Early Retirement Program	10.9
H-7	Mitigation Fee on High GWP Gases[43]	5
	Total	**20.2**

[43] The 5 $MMTCO_2E$ reduction is an estimate of what might occur with a fee in place. Additional emissions reductions from a fee would be expected as resulting revenues are used in mitigation programs. Using the funds to mitigate greenhouse gas emissions could substantially increase the emissions reductions from this measure.

15. Recycling and Waste

Reduce methane emissions at landfills. Increase waste diversion, composting and other beneficial uses of organic materials, and mandate commercial recycling. Move toward zero-waste.

California has a long track record of reducing greenhouse gas emissions by turning waste into resources, exemplified by the waste diversion rate from landfills of 54 percent (which exceeds the current 50 percent mandate) resulting from recovery of recyclable materials. Re-introducing recyclables with intrinsic energy value back into the manufacturing process reduces greenhouse gas emissions from multiple phases of product production including extraction of raw materials, preprocessing and manufacturing. Additionally, by recovering organic materials from the waste stream, and having a vibrant composting and organic materials industry, there is an opportunity to further reduce greenhouse gas emissions through the indirect benefits associated with the reduced need for water and fertilizer for California's Agricultural sector. Incentives may also be an effective way to secure greenhouse gas emissions reductions in this sector. Table 20 summarizes the emissions reductions from Recycling and Waste sector.

Reduction in Landfill Methane

Methane emissions from landfills, generated when wastes decompose, account for one percent of California's greenhouse gas emissions. Greenhouse gas emissions can be substantially reduced by properly managing all materials to minimize the generation of waste, maximize the diversion from landfills, and manage them to their highest and best use. Capturing landfill methane results in greenhouse gas benefits, as well as reductions in other air pollutants such as volatile organic compounds. ARB is working closely with the California Integrated Waste Management Board (CIWMB) to develop a Discrete Early Action measure for landfill methane control that will be presented to ARB in January.

CIWMB is also pursuing efforts to reduce methane emissions by diverting organics from landfills, and to promote best management practices at smaller uncontrolled landfills. Landfill gas may also provide a viable source of liquefied natural gas (LNG) vehicle fuel. Reductions from these types of projects would be accounted for in the Transportation sector.

High Recycling / Zero Waste

This measure reduces greenhouse gas emissions primarily by reducing the substantial energy use associated with the acquisition of raw materials in the manufacturing stage of a product's life-cycle. As virgin raw materials are replaced with recyclables, a large reduction in energy consumption should be realized. Implementing programs with a systems approach that focus on consumer demand, manufacturing, and movement of products will result in the reduction of greenhouse gas emissions and other co-benefits. Reducing waste and materials at the source of generation,

increased use of organic materials to produce compost to benefit soils and to produce biofuels and energy, coupled with increased recycling – especially in the commercial sector – and Extended Producer Responsibility (EPR) plus Environmentally Preferable Purchasing (EPP) also have the potential to reduce emissions, both in-state and within the connected global economy. This measure could also assist in meeting the 33 percent renewables energy goal through deployment of anaerobic digestion for production of fuels/energy.

As noted by ETAAC, recycling in the commercial sector could be substantially increased. This will be implemented through mandatory programs and enhanced partnerships with local governments. The provision of appropriate financial incentives will be critical. ARB will work with CIWMB to develop and implement these types of programs. ARB will also work with CIWMB, the California Department of Food and Agriculture, the Department of Transportation, and others to provide direct incentives for the use of compost in agriculture and landscaping. Further, CIWMB will explore the use of incentives for all Recycling and Waste Management measures, including for commercial recycling and for local jurisdictions to encourage the collection of residentially and commercially-generated food scraps for composting and in-vessel anaerobic digestion.

Table 20: Recycling and Waste Sector Recommendation - Landfill Methane Capture and High Recycling/Zero Waste

(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
RW-1	Landfill Methane Control (Discrete Early Action)	1
RW-2	Additional Reductions in Landfill Methane • Increase the Efficiency of Landfill Methane Capture	TBD
RW-3	High Recycling/Zero Waste • Mandatory Commercial Recycling • Increase Production and Markets for Organics Products • Anaerobic Digestion • Extended Producer Responsibility • Environmentally Preferable Purchasing	 5 2 2 TBD TBD
	Total	**10**[44]

[44] Reductions from RW-2 and RW-3 are not counted toward the AB 32 goal. ARB is continuing to work with CIWMB to quantify these emissions and determine what portion of the reductions can be credited to meeting the AB 32 2020 goal. These measures may provide greater emissions reductions than estimated.

16. Sustainable Forests

Preserve forest sequestration and encourage the use of forest biomass for sustainable energy generation.

The 2020 Scoping Plan target for California's forest sector is to maintain the current 5 $MMTCO_2E$ of sequestration through sustainable management practices, potentially including reducing the risk of catastrophic wildfire, and the avoidance or mitigation of land-use changes that reduce carbon storage. California's Board of Forestry and Fire Protection has the existing authority to provide for sustainable management practices, and will, at a minimum, work to maintain current carbon sequestration levels. The Resources Agency and its departments will also have an important role to play in implementing this measure.

In addition, the Resources Agency is supporting voluntary actions, including expenditure of public funds for projects focused largely on conserving biodiversity, providing recreation, promoting sustainable forest management and other projects that also provide carbon sequestration benefits. The federal government must also use its regulatory authority to, at a minimum, maintain current carbon sequestration levels for land under its jurisdiction in California.

Forests in California are now a carbon sink. This means that atmospheric removal of carbon through sequestration is greater than atmospheric emissions from processes like fire and decomposition of wood. However, several factors, such as wildfires and forest land conversion, may cause a decline in the carbon sink. The 2020 target would provide a mechanism to help ensure that current carbon stocks are, at a minimum, maintained and do not diminish over time. The 5 $MMTCO_2E$ emission reduction target is set equal to the magnitude of the current estimate of net emissions from California's forest sector. As technical data improve, the target can be recalibrated to reflect new information.

California's forests will play an even greater role in reducing carbon emissions for the 2050 greenhouse gas emissions reduction goals. Forests are unique in that planting trees today will maximize their sequestration capacity in 20 to 50 years. As a result, near-term investments in activities such as planting trees will help us reach our 2020 target, but will also play a greater role in reaching our 2050 goals.

Monitoring carbon sequestered on forest lands will be necessary to implement the target. The Board of Forestry and Fire Protection, working with the Resources Agency, the Department of Forestry and Fire Protection and ARB would be tasked with developing a monitoring program, improving greenhouse gas inventories, and determining what actions are needed to meet the 2020 target for the Forest sector. Future climate impacts will exacerbate existing wildfire and insect disturbances in the Forest sector. These disturbances will create new uncertainties in reducing emissions and maintaining sequestration levels over the long-term, requiring more creative strategies for adapting to these changes. In the short term, focusing on sustainable management practices and land-use issues is a practical approach for moving forward.

Future land use decisions will play a role in reaching our greenhouse gas emissions reduction goals for all sectors. Loss of forest land to development increases greenhouse gas emissions levels because less carbon is sequestered. Avoiding or mitigating such conversions will support efforts to meet the 2020 goal. When significant changes occur, the California Environmental Quality Act is a mechanism providing for assessment and mitigation of greenhouse gas emissions.

Going forward there are a number of forestry-related strategies that can play an important role in California's greenhouse gas emissions reduction efforts. Biomass resources from forest residue will factor into the expansion of renewable energy sources (this is currently accounted for in the Energy sector). Similarly, fuels management strategies have the potential to reduce the risk of catastrophic fires. However, fuels management needs to be evaluated to determine whether, and if so under what circumstances, quantifiable greenhouse gas emission reductions are achieved. Additionally, public investments to purchase and preserve forests and woodlands would also provide greenhouse gas emission reductions that will be accounted for as projects are funded. Urban forest projects can also provide the dual benefit of carbon sequestration and shading to reduce air conditioning load.

Furthermore, the Forest sector currently functions as a source of voluntary reductions that would not otherwise occur and this role could expand even further in the future. ARB has already adopted a methodology to quantify reductions from forest projects, and recently adopted additional quantification methodologies. Table 21 summarizes the emission reductions from the forest measure.

Table 21: Sustainable Forests Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
F-1	Sustainable Forest Target	5
	Total	**5**

17. Water

Continue efficiency programs and use cleaner energy sources to move and treat water.

Water use requires significant amounts of energy. Approximately one-fifth of the electricity and one-third of the non-power plant natural gas consumed in the state are associated with water delivery, treatment and use. Although State, federal, and local water projects have allowed the state to grow and meet its water demands, greenhouse gas emissions can be reduced if we can move, treat, and use water more efficiently. As is the case with energy efficiency, California has a long history of advancing water efficiency and conservation programs. Without this ongoing, critical work,

baseline or business-as-usual greenhouse gas emissions associated with water use would be much higher than is currently the case.

Six greenhouse gas emissions reduction strategies measures are proposed for the Water sector, and are shown in Table 22. Three of the measures target reducing energy requirements associated with providing reliable water supplies and two measures are aimed at reducing the amount of non-renewable electricity associated with conveying and treating water. The final measure focuses on providing sustainable funding for implementing these actions. The greenhouse gas emissions reductions from these measures are indirectly realized through reduced energy requirements and are accounted for in the Electricity and Natural Gas sector.

In addition, a mechanism to make allowances available in a cap-and-trade program could be used to provide additional incentives for local governments, water suppliers, and third party providers to bundle water and energy efficiency improvements. This type of allowance set-aside will be evaluated during the rulemaking for the cap-and-trade program.

ARB recommends a public goods charge for funding investments in water management actions that improve water and energy efficiency and reduce GHG emissions. As noted by the Economic and Technology Advancement Advisory Committee, a public goods charge on water can be collected on water bills and then used to fund end-use water efficiency improvements, system-wide efficiency projects, water recycling, and other actions that improve water and energy efficiency and reduce GHG emissions. Depending on how the fee schedule is developed in a subsequent rulemaking process, a public goods charge could generate $100 million to $500 million. These actions would also have the co-benefit of improving water quality and water supply reliability for customers.

Table 22: Water Recommendation
($MMTCO_2E$ in 2020)

Measure No.	Measure Description	Reductions
W-1	Water Use Efficiency	1.4
W-2	Water Recycling	0.3
W-3	Water System Energy Efficiency	2.0
W-4	Reuse Urban Runoff	0.2
W-5	Increase Renewable Energy Production	0.9
W-6	Public Goods Charge	TBD
	Total	**4.8**[45]

[45] Greenhouse gas emission reductions from the water sector are not currently counted toward the 2020 goal. ARB anticipates that a portion of these reductions will be additional to identified reductions in the Electricity sector and is working with the appropriate agencies to refine the electricity/water emissions inventory.

18. Agriculture

In the near-term, encourage investment in manure digesters and at the five-year Scoping Plan update determine if the program should be made mandatory by 2020.

Encouraging the capture of methane through use of manure digester systems at dairies can provide emission reductions on a voluntary basis. This measure is also a renewable energy strategy to promote the use of captured gas for fuels or power production. Initially, economic incentives such as marketable emission reduction credits, favorable utility contracts, or renewable energy incentives will be needed. Quantified reductions for this measure (shown in Table 23) are not included in the sum of statewide reductions shown in Table 2 since the initial approach is voluntary. ARB and the California Climate Action Registry worked together on a manure digester protocol to establish methods for quantifying greenhouse gas emissions reductions from individual projects; the Board adopted this protocol in September 2008. The voluntary approach will be re-assessed at the five-year update of the Scoping Plan to determine if the program should become mandatory for large dairies by 2020.

Nitrogen fertilizer, which produces N_2O emissions, is the other significant source of greenhouse gases in the Agricultural sector. ARB has begun a research program to better understand the variables affecting fertilizer N_2O emissions (Phase 1), and based on the findings, will explore opportunities for emission reductions (Phase 2).

There may be significant potential for additional voluntary reductions in the agricultural sector through strategies, such as those recommended by ETAAC. These opportunities include increases in fuel efficiency of on-farm equipment, water use efficiency, and biomass utilization for fuels and power production.

Increasing carbon sequestration, including on working rangelands, hardwood and riparian woodland reforestation, also hold potential as a greenhouse gas strategies. As we evaluate the role that this sector can play in California's emissions reduction efforts, we will explore the feasibility of developing sound quantification protocols so that these and other related strategies may be employed in the future.

Table 23: Agriculture Recommendation
(MMTCO$_2$E in 2020)

Measure No.	Measure Description	Reductions
A-1	Methane Capture at Large Dairies[46]	1.0
	Total	**1.0**

[46] Because the emission reductions from this measure are not required, they are not counted in the total.

D. Voluntary Early Actions and Reductions

Many individual activities that are not currently addressed under regulatory approaches can nevertheless result in cost-effective, real, additional, and verifiable greenhouse gas emissions reductions that will help California meet its 2020 target. Ensuring that appropriate credit is available to these types of emissions reduction projects will also help jump-start a new wave of technologies that will feature prominently in California and the world's long-term efforts to combat climate change. ARB will pursue several approaches that will recognize and reward these types of projects.

1. Voluntary Early Action

ARB is required to design regulations to encourage early action to reduce greenhouse gas emissions, and to provide appropriate recognition or credit for that action. (HSC §38562(b)(1) and (3)) Recognizing and rewarding greenhouse gas emissions reductions that occur prior to the full implementation of the AB 32 program can set the stage for innovation by incentivizing the development and employment of new clean technologies and by generating economic and environmental benefits for California.

In February 2008, ARB adopted a policy statement encouraging the early reductions of greenhouse gas emissions.[47] The policy statement describes a process for interested parties to submit proposed emission quantification methodologies for voluntary greenhouse gas emissions reductions to ARB for review. The intent is to provide a rapid assessment of methodologies for evaluating potential greenhouse gas emissions reduction projects to encourage early actions. Where appropriate, ARB will issue Executive Orders to confirm the technical soundness of the methodologies, and the methodology would be available for use by other parties to demonstrate the creation of voluntary early reductions. ARB is currently in the process of evaluating a number of submitted project methodologies.

ARB will provide appropriate credit for voluntary early reductions that can be adequately quantified and verified through three primary means. First, within the cap-and-trade program, ARB would set aside a certain number of allowances from the first compliance period to use to reward voluntary reductions that occur before 2012. In addition, ARB will assure that the allocation process in the first compliance period does not disadvantage facilities that have made reductions after AB 32 went into effect at the start of 2007 and before 2012.[48] The third approach will be to design

[47] Board Meeting Agenda. California Air Resources Board. February 28, 2008. http://www.arb.ca.gov/board/ma/2008/ma022808.htm (accessed October 12, 2008)

[48] ARB will evaluate whether some reductions that occurred prior to AB 32 going into effect on January 1, 2007, should also receive credit under these rules. For example, many facilities in California registered with the California Climate Action Registry after its creation in 2002 to document early actions to reduce emissions by having a record of entities profiles and baselines. ARB will evaluate what reductions made prior to 2007 should be eligible for credit from the allowance set-aside as part of the cap-and-trade program rulemaking.

other regulations, to the extent feasible, to recognize and reward early action. These approaches are discussed in more detail in Appendix C.

2. Voluntary Reductions

Emissions reduction projects that are not otherwise regulated, covered under an emissions cap, or undertaken as a result of government incentive programs can generate "offsets." These are verifiable reductions whose ownership can be transferred to others. Voluntary offset markets have recently flourished as a way for companies and individuals to offset their own emissions by purchasing reductions outside of their own operations. These sorts of voluntary efforts to reduce greenhouse gas emissions can play an important role in helping the State meet its overall greenhouse gas reduction goals.

ARB will adopt methodologies for quantifying voluntary reductions. (HSC §38571) The Board adopted a methodology for forest projects in October 2007 and for urban forestry and manure digesters in September 2008. The recognition of voluntary reduction or offset methodologies does not in any way guarantee that these offsets can be used for other compliance purposes. The Board would need to adopt regulations to verify and enforce reductions achieved under these or other approved methodologies before they could be used for compliance purposes. (HSC §38571)

Allowance set-asides, in addition to being used to potentially reward voluntary early actions by facilities that will be included in the cap-and-trade program, could also be used to reward voluntary early action at other facilities not covered by the cap and to ensure that voluntary actions, such as voluntary renewable power purchases by individuals, businesses, and others, serve to reduce greenhouse gas emissions under the cap. An early action allowance set-aside could be utilized both by entities that are covered by the cap, and by those who develop emissions reducing projects outside of the cap, or purchase the reductions associated with those projects, and have not sold or used them. Additional discussion of voluntary offsets is included in Appendix C.

E. Use of Allowances and Revenues

Revenues may be generated from the implementation of various proposed components of the Scoping Plan, including by the use of auctions within a cap-and-trade system or through the imposition of more targeted measures, such as a public goods charge on water. These revenues could be used to support AB 32 requirements for greenhouse gas emissions reductions and associated socio-economic considerations. This section summarizes some of the recommendations and ideas that ARB has received to date. As discussed in the description of the cap-and-trade measure above, ARB will seek input from a broad range of experts in an open public process regarding the options for allocation and revenue use under consideration.

The Economic and Technology Advancement Advisory Committee (ETAAC) recommended the creation of a California Carbon Trust as a possible mechanism for using revenues

generated by the program, leveraged with private funds, to further the overall program goals. ETAAC's recommendation is roughly based on the United Kingdom Carbon Trust. The United Kingdom program was established with public funds, but now functions as a stand-alone corporation, providing management and consulting services to corporations and small and medium businesses on reducing greenhouse gas emissions. It also funds innovations in carbon reduction technologies. ETAAC recommended the creation of a similar organization that would use revenue from the sale of carbon allowances or from carbon fees to:

- Fund research, development and demonstration projects,
- Help bring promising and high potential technologies through the often challenging early stages of development and get them to market,
- Manage the early carbon market and mitigate price volatility, purchasing credits and selling them or retiring them as needed,
- Dedicate resources to fund projects to achieve AB 32 Environmental Justice goals, or
- Support a green technology workforce training program.

The most appropriate use for some of the allowances and revenue generated under AB 32 may be to retain it within or return it to the sector from which it was generated. For example, CEC and CPUC specifically recommended that significant portions of the revenue generated from the electricity sector under a cap-and-trade program be used for the benefit of that sector to support investments in renewable energy, efficiency, new energy technology, infrastructure, customer utility bill relief, and other similar programs. In the case of more targeted revenues from a public goods charge, the intent would be to use the funds for program purposes within the sector in which it was raised, for example in the water sector. ARB will seek input from a broad range of experts in an open public process, and will work with other agencies, the WCI partner jurisdictions, and stakeholders to consider the options for use of revenues from the AB 32 program.

Possible uses of allowances and of the revenue generated under the program include:

- **Reducing costs of emissions reductions or achieving additional reductions –** Funding energy efficiency and renewable resource development could lower overall costs to consumers and companies, and provide the opportunity to achieve greater emissions reductions than would otherwise be possible. Program revenues could be used to fund programs directly, or create financial incentives for others. Allowance set-asides could also be used to provide incentives for voluntary renewable power purchases by individuals and businesses, and for increased energy efficiency.
- **Achieving environmental co-benefits –** Criteria and toxic air pollutants create health risks, and some communities bear a disproportionate burden from air pollution. Revenues could be used to enhance greenhouse gas emission reductions that also provide reductions in air and other pollutants that affect public health.

- **Incentives to local governments –** Funding or other incentives to local governments for well-designed land-use planning and infrastructure projects could lead to shorter commutes and encourage walking, bicycling and the use of public transit. Funding of other incentives for local governments could also be used to increase recycling, composting, and to generating renewable energy from anaerobic digestion.
- **Consumer rebates –** Utilities and other businesses could use revenues to support and increase rebate programs to customers to offset some of the cost associated with increased investments in renewable resources and to encourage increased energy efficiency.
- **Direct refund to consumers –** Revenue from the program could be recycled directly back to consumers in a variety of forms including per capita dividends, earned income tax credits, or other mechanisms.
- **Climate change adaptation programs –** Climate change will impact natural and human environments. Program revenues could be used to help the state adapt to the effects of climate change which will be detailed in the State's Climate Adaptation Strategy being prepared by the Resources Agency to be completed in early 2009.
- **Subsidies –** Revenues could be used to reduce immediate cost impacts to covered industries required to make substantial upfront capital investments to reduce greenhouse gas emissions.
- **RD&D funding –** Revenues could be used to support research, development, and deployment of green technologies.
- **Worker transition assistance –** Regulating greenhouse gas emissions will probably shift economic growth to some sectors and green technologies and away from higher carbon intensity industries. Worker training programs could help the California labor force be competitive in these new industries.
- **Administration of a greenhouse gas program –** A portion of revenues could be used to underwrite the State's AB 32 programs and operating costs.
- **Direct emission reductions –** Revenues could be used to purchase greenhouse gas reductions for the sole purpose of retirement, providing direct additional greenhouse gas emission reductions. Potential projects, such as afforestation and reforestation, would both sequester CO_2 and provide other environmental benefits.

Many of the potential uses of revenue would help ARB implement the community benefit section of the AB 32 (HSC §38565) which directs the Board, where applicable and to the extent feasible, to ensure that the greenhouse gas emissions reduction program directs public and private investment toward the most disadvantaged communities in California.

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III. EVALUATIONS

The primary purpose of the Scoping Plan is to develop a set of measures that will provide the maximum technologically feasible and cost-effective greenhouse gas emission reductions. In developing this Plan, ARB evaluated the effect of these measures on California's economy, environment, and public health. This Chapter outlines these analyses.

ARB conducted broad evaluations of the potential impacts of the Scoping Plan, and will conduct more specific evaluations during regulatory development (HSC §38561(d), and HSC §38562(b)). Prior to inclusion of market-based compliance mechanisms in a regulation, to the extent feasible, the Board will consider direct, indirect and cumulative emission impacts, and localized impacts in communities that are already adversely impacted by air pollution (HSC §38570(b)).

Based on the evaluation of the recommendations included in this Plan, implementing AB 32 is expected to have an overall positive effect on the economy. In addition, implementation of the measures in the Recommended Actions section (Chapter II) will reduce statewide oxides of nitrogen (NOx), volatile organic compounds (VOC) and atmospheric particulate matter (PM) emissions primarily due to reduced fuel consumption, with resulting public health benefits. ARB will also work at the measure-specific level to further maximize the public health benefits that can accompany implementation of greenhouse gas emissions reduction strategies. The following sections provide a summary of the ARB evaluations of the recommended measures included in this Scoping Plan. More detailed information on the evaluations and their results are provided in Appendices G and H.

A. Economic Modeling

To evaluate the economic impacts of the Scoping Plan, ARB compared estimated economic activity under a business-as usual (BAU) case to the results obtained when actions recommended in this Plan are implemented. The BAU case is briefly described below. The estimated costs and savings used as model inputs for individual measures are outlined in Appendix G, and additional documentation on the calculation of those costs and savings is provided in Appendix I. All dollar estimates are in 2007 dollars.

Under the BAU case, Gross State Product (GSP) in California is projected to increase from $1.8 trillion in 2007 to almost $2.6 trillion in 2020. The results of our economic analysis indicate that implementation of the Scoping Plan will have an overall positive net economic benefit for the state. Positive impacts are anticipated primarily because the investments motivated by several measures result in substantial energy savings that more than pay back the cost of the investments at expected future energy prices.

The business-as-usual case is a representation of what the State of the California economy will be in the year 2020 assuming that none of the measures recommended in the Scoping Plan are implemented. While a number of the measures in the plan will be implemented as the result of existing federal or State policies and do not require additional regulatory action resulting from the implementation of AB 32, they are not included in the BAU case to ensure that the economic impacts of all of the measures in the Scoping Plan are fully assessed.

The BAU case is constructed using forecasts from the California Department of Finance, the California Energy Commission, and other sources, and is described in more detail in Appendix G. ARB used a conservative estimate of future petroleum price in this analysis, $89 per barrel of oil in 2020. Aspects of the BAU case are subject to uncertainty, for example, the possibility that future energy prices could deviate from those that are included in the BAU case.

1. Macro-economic Modeling Results

Table 24 summarizes the key findings from the economic modeling. Gross State Product, personal income and employment are shown for 2007 and for two cases for 2020, the BAU case and for implementation of the Scoping Plan. For both the BAU case and the Scoping Plan case, Gross State Product increases by almost $800 billion between 2007 and 2020, personal income grows by 2.8 percent per year from $1.5 trillion in 2007 to $2.1 trillion in 2020, and employment grows by 0.9 percent per year from 16.4 million jobs in 2007 to 18.4 million (BAU) or 18.5 million (Scoping Plan) in 2020. The results consistently show that implementing the Scoping Plan will not only significantly reduce California's greenhouse gas emissions, but will also have a net positive effect on California's economic growth through 2020.

Table 24: Summary of Key Economic Findings from Modeling the Scoping Plan Using E-DRAM

Economic Indicator	2007	Business-as-Usual*		Scoping Plan		
		2020	Average Annual Growth	2020	Change from BAU	Average Annual Growth
Gross State Product ($Billion)	1,811	2,586	2.8%	2,593	0.3%	2.8%
Personal Income ($Billion)	1,464	2,093	2.8%	2,109	0.8%	2.8%
Employment (Million Jobs)	16.41	18.41	0.9%	18.53	0.7%	0.9%
Emissions ($MMTCO_2E$)	500**	596	1.4%**	422	-28%	-1.2%**
Carbon Prices (Dollars)	-	-	-	10.00	NA	-

* Business-as-usual is a forecast of the California economy in 2020 without implementation of any of the measures identified in the Scoping Plan.

** Approximate value. ARB is in currently estimating greenhouse gas emissions for 2007.

The macroeconomic modeling results presented here understate the benefits of market-based policies, including the cap-and-trade program. Consequently, our estimate of the economic impact of implementing the Scoping Plan understates the positive impact on the California economy. Nonetheless, using the current best estimates of the costs and savings of the measures, which are documented in Appendix I, the models demonstrate that implementing the Plan will have a positive effect on California's economy.

The modeling results reflect a carbon price for the cap-and-trade program of $10 per-ton. It is important to note that the $10 per-ton figure does not reflect the average cost of reductions; rather it is the *maximum* price at which reductions to achieve the cap are pursued based on the marketing program.

The positive impacts are largely attributable to savings that result from reductions in expenditures on energy. These savings translate into increased consumer spending on goods and services other than energy. Many of the measures entail more efficient use of energy in the economy, with savings that exceed their costs. In this way, investment in energy efficiency results in money pumped back into local economies. Table 25 summarizes the energy savings that are projected from implementation of the Scoping Plan. These savings are estimated to exceed $20 billion annually by 2020.

Table 25: Fuels and Electricity Saved in 2020 from Implementation of the Scoping Plan

	Gasoline	Diesel	Electricity	Natural Gas*
Use Avoided**	4,600 million gallons	670 million gallons	74,000 GWh	3,400 million therms
Value of Avoided Fuel Use (Million $2007)	$17,000	$2,500	$6,400***	$2,700
Percent Reduction from BAU	25%	17%	22%****	24%

* Not including natural gas for electric generation.

** These estimates are based on reduced use of these fuels due to increased efficiencies, reduced vehicle miles travelled, etc. Changes to the fuel mix, such as those called for under the RPS or the LCFS, are not included here. These estimates are not the same as the estimates of reduced fuel consumption used in the public health analysis.

*** Based on estimated avoided cost based on average base-load electricity, including generation, transmission and distribution.

**** This is as a percentage of BAU total California electricity consumption in 2020.

2. Impact on Specific Business Sectors

As indicated in Table 26 and Table 27, the effects of the Plan are not uniform across sectors. Implementation of the Scoping Plan would have the strongest positive impact on output and employment for the agriculture, forestry and fishing sector, the

finance, insurance and real estate sector, and the mining sector. Similar to the statewide economic impacts projected by the model, however, these results also indicate that relative to the business-as-usual case, the impacts due to implementation of the Plan change current growth projections for most sectors by only very small amounts.

Table 26 and Table 27 also show that a decrease in output is projected for the utility and retail trade sectors as compared to the business-as-usual case, and a decrease in employment is projected for the utility sector. In the utility sector, the modeling indicates that implementation of the Scoping Plan would significantly reduce the need for additional power generation and natural gas consumption, which subsequently reduces the growth in output for this sector. This results in a reduction from business-as-usual for economic output and employment of approximately 17 and 15 percent respectively in 2020. The primary reason for these projections is the implementation of efficiency measures and programs for both consumers and producers. While increasing spending on efficiency and renewable energy is expected to increase employment, many of the resulting jobs will not appear in the utility sector.

The retail trade sector, which is projected to grow by nearly 50 percent in both the business-as-usual and the Scoping Plan case, is also projected to experience a slight net decline in output relative to business-as-usual. Since gasoline is considered a consumer retail purchase under this model, the reduced growth is mostly due to the decrease of approximately $19 billion in retail transportation fuel purchases, which is largely offset by the positive $14 billion increase in spending at other retail enterprises.

Table 26: Summary of Economic Output by Sector from Modeling the Scoping Plan Using E-DRAM

Sector	Output ($Billions)			
	2007	Business-as-Usual	Scoping Plan	Percent Change from BAU
Agriculture, Forestry and Fishing	76	109	113	3.9%
Mining	27	29	31	7.2%
Utilities	51	72	60	-16.7%
Construction	114	164	166	1.7%
Manufacturing	673	943	948	0.5%
Wholesale Trade	120	171	173	1.0%
Retail Trade	207	296	291	-1.6%
Transportation and Warehousing	76	109	111	1.9%
Information	164	235	238	1.1%
Finance, Insurance and Real Estate	391	559	572	2.3%
Services	636	910	927	1.9%
Government	-	-	-	-
Total	**2,535**	**3,597**	**3,630**	**0.8%**

Table 27: Summary of Employment Changes by Sector from Modeling the Scoping Plan Using E-DRAM

Sector	Employment (thousands)			
	2007	Business-as-Usual	Scoping Plan	Percent Change from BAU
Agriculture, Forestry and Fishing	398	449	464	3.5%
Mining	26	26	26	1.3%
Utilities	60	67	57	-14.7%
Construction	825	929	934	0.5%
Manufacturing	1,821	2,046	2,057	0.5%
Wholesale Trade	703	791	793	0.1%
Retail Trade	1,688	1,901	1,916	0.8%
Transportation and Warehousing	447	503	510	1.2%
Information	398	448	450	0.4%
Finance, Insurance and Real Estate	911	1,026	1,046	2.0%
Services	5,975	6,729	6,773	0.7%
Government	3,100	3,491	3,502	0.3%
Total	**16,352**	**18,405**	**18,528**	**0.6%**

3. Household Impacts

Implementation of the Scoping Plan will provide low- and middle-income households savings on the order of a few hundred dollars per year in 2020 compared to the business-as-usual case, primarily as a result of increased energy efficiencies.

Low-Income Households: Based on current U.S. Department of Health and Human Services poverty guidelines, we evaluated the projected impacts of the plan on households with earnings at or below both 100 and 200 percent of the poverty guidelines. For all households, including those with incomes at 100 percent and 200 percent of the poverty level, implementation of the Scoping Plan produces a slight increase in per-capita income relative to the business-as-usual case.

At the same time, the analysis projects an increase of approximately 50,000 jobs available for lower-income workers[49] relative to business-as-usual as a result of implementing the Plan. The largest employment gains come in the retail, food service, agriculture, and health care fields. A decline in such jobs is projected in the retail gasoline sector due to the overall projected decrease in output from this sector. This decline, however, is more than offset by the increases experienced in other areas.

Another important factor to consider when analyzing the impact of the Scoping Plan on households is how it will affect household expenditures. As indicated in Table 28, analysis based on the modeling projections estimates a savings (i.e., reduced expenditures) of around $400 per household in 2020 for low-income households under both federal poverty guideline definitions. These savings are driven primarily by the implementation of the clean car standards and energy efficiency measures in the Scoping Plan that over time are projected to outweigh potential increases in electricity and natural gas prices that may occur. As the measures in the Scoping Plan are implemented, ARB will work to ensure that the program is structured so that low income households can fully participate in and benefit from the full range of energy efficiency measures. Many of California's energy efficiency efforts are targeted specifically at low income populations, and the CPUC's Long Term Strategic Plan for energy efficiency has redoubled its objective for the delivery of energy efficiency measures to low income populations. Additional information regarding the data in Table 28 can be found in Appendix G.

[49] Low-income jobs are defined as those with a median hourly wage below $15 per hour (2007 dollars) based on wage data and staffing pattern projections from the California Employment Development Department. The shares of low-wage occupations for each industry are then applied to the corresponding E-DRAM sector employment projections.

Table 28: Impact of Implementation of the Scoping Plan on Total Estimated Household Savings in 2020 (2007 $)

Income at 100% of Poverty Guideline	Income at 200% of Poverty Guideline	Middle Income*	High Income**	All Households***
$400	$400	$500	$500	$500

* All households between 200% and 400% of the poverty guidelines.

** All households above 400% of the poverty guidelines.

*** Average of households of all income levels.

The analysis indicates that implementation of the Scoping Plan is likely to result in small savings for most Californians, with little difference across income levels. Largely due to increased efficiencies, low-income households are projected to be slightly better off from an economic perspective in 2020 as a result of implementing AB 32.

Middle-Income Households: Implementation of the plan produces a small increase in household income across all income levels, including middle-income households, relative to the business-as-usual case.[50] In terms of how jobs for middle-income households[51] would be impacted, the modeling indicates a slight overall increase of almost 40,000 in 2020.

As shown in Table 28, the analysis projects a net-savings in annual household expenditures of about $500 in 2020 for middle-income households. These savings are driven by the emergence of greater energy efficiencies that will be implemented as a result of the plan.

4. WCI Economic Analysis

The Scoping Plan recommends that California develop a cap-and-trade program that links to the broader regional market being developed by the Western Climate Initiative (WCI). In order to examine the economic impacts of WCI program design options, WCI Partner jurisdictions contracted with ICF International and Systematic Solutions, Inc. (SSI) to perform economic analyses using ENERGY 2020, a multi-region, multi-sector energy model. The WCI economic modeling results are reported in full in Appendix D and are discussed in the Background Report on the Design Recommendations for the WCI Regional Cap-and-Trade Program, also included in Appendix D.

To help inform the program design process, the WCI analysis examined the implications of key design decisions, including: program scope, allowance banking,

[50] For purposes of our analysis we define "middle-income" households as those earning between 200% and 400% of the federal poverty guidelines.

[51] Hourly wage between $15 and $30 per hour.

and the use of offsets. Due to time and resource constraints, the modeling was limited to the eight WCI Partner jurisdictions in the Western Electric Coordinating Council (WECC) area, thereby excluding from the analysis three Canadian provinces, Manitoba, Quebec, and Ontario. Future analyses are planned that will integrate these provinces so that a full assessment of the WCI Partner jurisdictions can be performed.

The WCI modeling work is not directly comparable to the ARB results reported here. The WCI analysis relies on a more aggregated set of greenhouse gas emissions reduction measures rather than the specific individual policies recommended in the Scoping Plan; it uses somewhat different assumptions regarding what measures are included in the "business-as-usual" case, and it models the entire WECC rather than California. Nevertheless, the results of the WCI modeling provide useful insight into the economic impact of greenhouse gas emissions reduction policies.

Consistent with the conclusions of the ARB evaluation, overall the WCI analysis found that the WCI Partner jurisdictions can meet the regional goal of reducing emissions to 15 percent below 2005 levels by 2020 (equivalent to the AB 32 2020 target) with small overall savings due to reduced energy expenditures exceeding the direct costs of greenhouse gas emissions reductions. The savings are focused primarily in the residential and commercial sectors, where energy efficiency programs and vehicle standards are expected to have their most significant impacts. Energy-intensive industrial sectors are estimated to have small net costs overall (less than 0.5 percent of output).

The WCI analysis does not examine the potential macroeconomic impacts of the costs and savings estimated with ENERGY 2020. The WCI Partner jurisdictions are planning to continue the analysis so that macroeconomic impacts, such as income, employment, and output, can be assessed. Once completed, the macroeconomic impacts can be compared to previous studies of cap-and-trade programs considered in the United States and Canada.

B. Green Technology

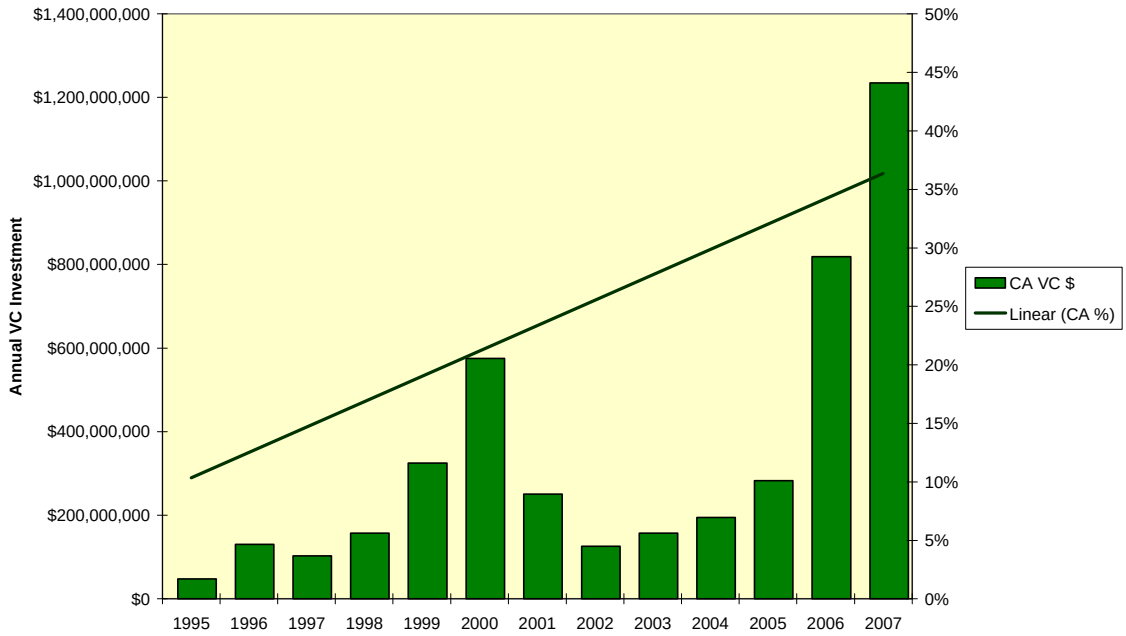
The development of green technologies and a trained workforce equipped to design, develop and deploy them will be key to the success of California's long-term efforts to combat global warming. Bold, long-range environmental policies help drive innovation and investment in emission-reducing products and services in part by attracting private capital. Typically, the private sector under invests in research and development for products that yield public benefits. However, when environmental policy is properly designed and sufficiently robust to support a market for such products, private capital is attracted to green technology development as it is to any strategic growth opportunity.

California's leadership in environmental and energy efficiency policy has helped attract an increasing share of venture capital investment in green technologies. According to statistics from PricewaterhouseCoopers and the National Venture Capital Association, California's share of U.S. venture capital investment in innovative energy technologies increased

dramatically from 1995 to 2007 (see Figure 5 below).[52] The same period saw a stream of pioneering environmental policy initiatives, including energy efficiency codes for buildings and appliances, a renewables portfolio standard for electricity generation, climate change emissions standards for light-duty automobiles and, most recently, AB 32. Flows of venture capital into California are escalating as a direct result of the focus on reductions of greenhouse gas emissions. As mentioned above, California captured the largest single portion of global venture capital investment ($800 million out a total of two billion dollars) during the second quarter of 2008.

Figure 5

California's Growing Share of Venture Capital Investment in Energy Innovation, 1995-2007 (current $, % share)



Source: PricewaterhouseCoopers MoneyTree Report, available at: [https://www.pwcmoneytree.com].

A survey of clean technology investors by Global Insight and the National Venture Capital Association found that public policy influences where venture capitalists invest.[53] Furthermore, investments in green technology solutions produce jobs at a higher rate than investments in comparable conventional technologies.[54] Venture capitalists estimate that

[52] Based on historical trend data for the 'Industrial/Energy' industry for California and the United States from the PricewaterhouseCoopers MoneyTree Report. https://www.pwcmoneytree.com/MTPublic/ns/nav.jsp?page=historical (accessed October 12, 2008)

[53] Clean Tech Entrepreneurs & Cleantech Venture Network LLC. *Creating Cleantech Clusters: 2006 Update*. May 2006. p.43 http://www.e2.org/ext/doc/2006%20National%20Cleantech%20FORMATTED%20FINAL.pdf (accessed October 12, 2008)

[54] Report of the Renewable and Appropriate Energy Laboratory. *Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?* Energy and Resources Group/Goldman School of Public Policy at

each $100 million in venture capital funding, over a period of two decades, helps create 2,700 jobs, $500 million in annual revenues, and many indirect jobs.[55]

Access to capital controlled by institutional investors is also enhanced by policies that encourage early adoption of green technologies. When California-based corporations use green technologies to reduce their exposure to climate change risk, institutional investors reward them by facilitating their access to capital. The Investor Network on Climate Risk – including institutional investors with more than $8 trillion of assets under management – endorsed an action plan in 2008 that calls for requiring asset managers to consider climate risks and opportunities when investing; investing in companies developing and deploying clean technologies; and expanding climate risk scrutiny by investors and analysts.[56]

Additional capital for green technologies helps drive increased employment, both indirectly, as energy savings are plowed back into other sectors of the economy, and directly, as new green products are successfully commercialized.

McKinsey & Company projects average annual returns of 17 percent on global investments in energy productivity, and estimates the global investment opportunity at $170 billion annually through 2020.[57] Meanwhile, global investment in energy efficiency and renewable energy has grown from $33 billion to more than $148 billion in the last four years. Beyond 2020, green technologies are expected to attract investment of more than $600 billion annually.[58] In short, green technology is now a *bona fide* global growth industry.

Today, green technology businesses directly employ at least 43,000 Californians, primarily in energy efficiency and energy generation, according to a 2008 study from the California Economic Strategy Panel. Green jobs are concentrated in manufacturing (41 percent), and professional, scientific and technical services (28 percent), with median annual earnings of

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University of California, Berkeley. April 13, 2004. http://rael.berkeley.edu/old-site/renewables.jobs.2006.pdf (accessed October 12, 2008)

[55] Report prepared for the National Venture Capital Association. *Venture Impact 2004: Venture Capital Benefits to the U.S. Economy*. Prepared by: Global Insight. June 2004. http://www.globalinsight.com/publicDownload/genericContent/07-20-04_fullstudy.pdf (accessed October 12, 2008)

[56] The Investor Network on Climate Risk. *Final Report, 2008 Investor Summit on Climate Risk*. February 14, 2008. http://www.ceres.org//Document.Doc?id=331 (accessed October 12, 2008)

[57] McKinsey Global Institute. *The Case for Investing in Energy Productivity*. McKinsey & Company. February, 2008. p.8 http://www.mckinsey.com/mgi/reports/pdfs/Investing_Energy_Productivity/Investing_Energy_Productivity.pdf (accessed October 12, 2008)

[58] United Nations Environment Programme-New Energy Finance Ltd. *Global Trends in Sustainable Energy Investment 2008: Analysis of Trends and Issues in the Financing of Renewable Energy and Energy Efficiency* 2008. p.12 ISBN: 978-92-807-2939-9 http://www.unep.fr/energy/act/fin/sefi/Global_Trends_2008.pdf (accessed October 12, 2008)

$35,725 and $56,754, respectively.[59] By 2030, under a moderate growth scenario, green businesses nationwide are expected to generate revenues of $2.4 trillion, (2006 dollars), and employ 21 million Americans.[60]

As a leader in green technology development and use, California has already realized substantial economic benefits from the adoption of energy efficiency policies. State energy efficiency measures have saved enough energy over the past 30 years to avoid construction of two dozen 500-megawatt power plants. Today, California's per capita electricity consumption is 40 percent below the national average, and the carbon intensity of California's economy is among the lowest in the nation.[61]

Renewable energy, such as solar, wind, biomass, geothermal, will also bring new employment opportunities to Californians while spurring economic growth. California enjoys significant comparative advantages for renewable energy: concentrated innovation resources, a large potential customer base, key natural resources such as reliable solar and wind, and supportive regulatory programs, including the California Renewables Portfolio Standard, the Million Solar Roofs Initiative, the California Global Warming Solutions Act of 2006, and the Solar Water Heating and Efficiency Act of 2007.

Other researchers have estimated that under a national scenario with 15 percent renewables penetration by 2020, California will experience a net gain in direct employment of 140,000 jobs.[62] Because investments in green technologies produce jobs at a higher rate than investments in conventional technologies, jobs losses that occur in traditional fossil fuel industries will be more than compensated for by gains in the clean energy sector.

Furthermore, if California's renewable energy suppliers field products that are sufficiently competitive to penetrate the export market, employment and earnings dividends for the state will also increase. California renewable energy industries servicing the export market can generate up to 16 times more employment than those that only manufacture for domestic

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[59] California Economic Strategy Panel with Collaborative Economics. *Clean Technology and the Green Economy*. March 2008. P.14-15 http://www.labor.ca.gov/panel/pdf/DRAFT_Green_Economy_031708.pdf (accessed October 12, 2008)

[60] The American Solar Energy Society. *Renewable Energy and Energy Efficiency: Economic Drivers for the 21st Century*. 2007. p.39 ISBN 978-0-89553-307-3 http://www.ases.org/images/stories/ASES-JobsReport-Final.pdf (accessed October 12, 2008)

[61] California Energy Commission. *2007 Integrated Energy Policy Report*. Document No. CEC-100-2007-008-CMF. 2007. p. 3 http://www.energy.ca.gov/2007publications/CEC-100-2007-008/CEC-100-2007-008-CMF.PDF (accessed October 12, 2008)

[62] Tellus Institute and MRG Associates. *Clean Energy: Jobs for America's Future.* As cited in: Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate? Energy and Resources Group/Goldman School of Public Policy at University of California, Berkeley. April 13, 2004. http://rael.berkeley.edu/old-site/renewables.jobs.2006.pdf (accessed October 12, 2008)

consumption, according to a study by the Research and Policy Center of Environment California.[63]

C. Cost-Effectiveness

As noted in several provisions of AB 32, cost-effectiveness is an important requirement to be considered in the design and implementation of emission reduction strategies. (See HSC §§38505, 38560, 38561, 38562.) AB 32 defines "cost-effective" or "cost-effectiveness" as "the cost per unit of reduced emissions of greenhouse gases adjusted for its global warming potential." (HSC §38505(d)) This definition specifies the metric (i.e., dollars per ton) by which the Board must express cost-effectiveness, but it does not provide criteria to assess if a regulation is or is not cost-effective. It also does not specify whether there should be a specific upper-bound dollar per ton cost that can be considered cost-effective, or how such a bound would be determined or adjusted over time. ARB has investigated different approaches that could be used to evaluate the cost-effectiveness of regulations and is recommending the following approach.

The estimated cost per ton of greenhouse gas emissions reduced by the measures recommended in this Plan ranges from $-408 (net savings) to $133, with all but one (the Renewables Portfolio Standard) costing less than $55 per ton. The RPS is being implemented for energy diversity purposes, not just greenhouse gas reductions, and the $133 per ton figure does not take these other benefits into account. Therefore, it should not be used as a reference to define the range of cost-effective greenhouse gas measures. These estimates are based on the best information available as ARB prepared this Plan. Updated estimates and greater certainty will be provided as the measures are further developed during the rulemaking process.

In the meantime, the current estimates provide a range illustrating the cost per ton of the mix of measures that collectively meet the 2020 target. This range will assist the Board in evaluating the cost-effectiveness of individual measures when considering adoption of regulations. The range of acceptable cost-effectiveness may change if effective lower-cost measures and options are identified. Because both the projections of "business-as-usual" 2020 emissions and the degree of reductions from any given measures may be greater or less than current estimates, the determination should remain flexible to accommodate a higher or lower estimate of cost-effectiveness. In addition, the approach must provide flexibility to pursue measures that simultaneously achieve policy objectives other than greenhouse gas emissions reduction (such as energy diversity).

The criteria for judging cost-effectiveness will be updated as additional technological data and strategies become available. As ARB moves from adoption of the Scoping Plan to

[63] Environment California Research and Policy Center. *Renewable Energy and Jobs. Employment Impacts of Developing Markets for Renewables in California*. July 2003. As cited in: Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate? Energy and Resources Group/Goldman School of Public Policy at University of California, Berkeley. April 13, 2004. http://rael.berkeley.edu/old-site/renewables.jobs.2006.pdf (accessed October 12, 2008)

developing specific regulations, and as regulations continue to be adopted, updated cost-effectiveness estimates will be established in a rigorous and transparent process with full stakeholder participation. As ARB progresses from proposed measures and estimated costs to actual regulations, the comparison of cost-effectiveness would move toward the well established practice of comparing the cost-effectiveness of new regulations to the cost-effectiveness of previously enacted and/or similar regulations. This approach is consistent with how cost-effectiveness is evaluated for strategies to reduce criteria and toxic pollutants.

D. Small Business Impact

Small businesses play an important role in California's economy. As required under AB 32, ARB analyzed the impact that implementation of the Scoping Plan would have on small businesses in the state. The analysis indicates that the primary impacts on small businesses as a result of AB 32 will come in the form of changes in the costs of goods and services that they procure, and in particular, changes in energy expenditures. Due to the number of measures in the plan that will deliver significantly greater energy efficiencies, our analysis projects that implementation of the plan will have a positive impact on small business in California even after taking into account the higher per-unit energy prices that are likely to occur between now and 2020. Small businesses also will benefit as a result of the robust economic growth and the increases in jobs, production, and personal income that are projected between now and 2020 as AB 32 is implemented. Additional information is provided in Appendix G.

Recent analysis from Energy and Environmental Economics, Inc. (E3) forecasts that a package of greenhouse gas emissions reduction measures similar to those recommended in this Plan would deliver a five percent decrease in electricity expenditures for the average California electricity customer relative to business-as-usual in 2020.[64] This projection is based on the assumption that increases in electricity prices will be more than offset by the continued expansion of energy efficiency measures and that more efficient technologies will be developed and implemented.[65] For purpose of this analysis, expenditures on natural gas are assumed to remain the same, balancing the projected 29 percent decrease in natural gas consumption in California with the model's projected natural gas price increase of almost 9 percent.

Based on this assessment, implementation of the Scoping Plan will likely have minor but positive impacts on small businesses in the state. These benefits are attributable primarily to the measures in the plan that will deliver significantly greater energy and fuel efficiencies. Even when higher per unit energy prices are taken into account, these efficiencies will decrease overall energy expenditures for small businesses. Additionally, as previously described, the California economy is projected to experience robust economic growth

[64] Based on their GHG Calculator, CPUC/CEC GHG Docket (CPUC Rulemaking.06.04.009, CEC Docket 07-OIIP-01), available at http://www.ethree.com/cpuc_ghg_model.html.

[65] The E3 analysis focuses on direct programmatic measures and does not include the incremental price impact of the cap-and-trade program, which will depend upon allowance price, allocation strategy, the capped sector industry response, and other program design decisions.

between now and 2020 as AB 32 is implemented. Small businesses will experience many of the benefits associated with this growth in the form of more jobs, greater production activity, and rising personal income.

The projected decrease in electricity expenditures is especially important for small businesses since they typically spend more on energy as a percentage of revenue compared to larger enterprises. For example, firms with a single employee spend approximately 3.3 percent of each sales dollar on electricity, while businesses with between ten and forty-nine employees spend around 1.2 percent. As a result, smaller businesses are likely to experience a greater relative benefit from decreased energy expenditures relative to their larger counterparts.

From the broader economic perspective, these changes will make California more competitive as a location for small business, moving it from 7th highest to 19th among all states in terms of the percentage of revenue that businesses expend on electricity.[66] As was noted above for low income households, care must be taken to ensure that the program is structured to allow small businesses to participate in and benefit from the energy efficiency measures.

While ARB's analysis indicates a positive impact on small businesses from AB 32 implementation, to ensure that these benefits are realized to the fullest potential it will take additional outreach and communication efforts on the part of ARB and many other state and local entities. There are a number of existing programs that are designed to help small businesses achieve greater efficiencies in energy use. These programs can be enhanced and expanded upon, and new programs and efforts can be developed to ensure that all small businesses in California are aware of and able to take cost-effective steps to reduce energy use and enjoy the associated economic savings. For example, as discussed more completely in Chapter IV, ARB and our partners in State government are working together to develop an on-line small business "toolkit" designed for small and medium-sized businesses to provide a one-stop shop of technical and financial information resources. As further development and implementation of the measures in the plan proceeds, we will work with other state and local partners to ensure that small businesses can both benefit from and play a role in helping to achieve our greenhouse gas emission reduction requirements.

E. Public Health/Environmental Benefits Analyses

AB 32 requires ARB to evaluate the environmental and public health impacts of the Scoping Plan. The analysis of this plan is focused primarily on the quantification of public health benefits from air quality improvements that would result from implementation. Unlike traditional pollutants and toxic emissions, global warming pollutants do not typically have localized impacts. At ambient levels, carbon dioxide, which makes up over 80 percent of global warming pollutants in California, has no direct environmental or public health consequences. Climate change caused by greenhouse gas pollutants emitted in another state

[66] Although the natural gas data is less specific, a similar scenario is expected where increased prices are typically offset by greater efficiencies for most small businesses.

or country has the same potential to damage our public health and the environment as does climate change due to pollutants emitted within California. Although this analysis does not consider the public health impacts of climate change, the potential public health impacts are great, and have been well documented elsewhere. However, many of the measures aimed at reducing global warming pollutants also provide co-benefits to public health and California's natural resources.

The environmental and cumulative impacts of the Plan are discussed in the California Environmental Quality Act (CEQA) document that is included in Appendix J. As the Scoping Plan is implemented, and specific measures are developed, ARB will conduct further CEQA analyses, including cumulative and multi-media impacts. As ARB further develops its approach for consideration of these issues in future rulemakings, and updates needed analytical tools and data sets, we will consult with outside experts and the EJAC. ARB recognizes that the adoption of the Scoping Plan will launch a variety of regulatory proceedings in many different venues. ARB will work closely with other California State agencies including: the Office of Planning and Research, Environmental Protection Agency, Resources Agency, Integrated Waste Management Board, Department of Public Health, Office of Environmental Health Hazard Assessment, State Water Resources Control Board, Department of Toxic Substances Control, Department of Water Resources, Board of Forestry, Department of Fish and Game, Public Utilities Commission, California Energy Commission, and others to identify and address potential multi-media environmental impacts early in the regulatory development process.

California's actions to reduce greenhouse gas emissions will help transition the State to new technologies, improved efficiencies, and land use patterns also necessary to meet air quality standards and other public health goals. California's challenging public health issues associated with air pollution are already the focus of comprehensive regulatory and incentive programs. These programs are reducing smog forming pollutants and toxic diesel particulate matter at a rapid pace. However, to meet increasingly stringent air quality standards and air toxics reduction goals, transformative changes are needed in the 2020 timeframe and beyond. Implementation of AB 32 will provide additional support to existing State efforts devoted to protecting and improving public health.

1. Key Air Quality-Related Public Health Benefits

The primary direct public health benefits of the Scoping Plan are reductions in smog forming emissions and toxic diesel particulate matter. The most significant reductions are of oxides of nitrogen (NOx), which forms both ozone and particulate pollution (PM2.5), and directly emitted PM2.5, which includes diesel particulate matter. The analysis focuses on PM2.5 impacts and quantifies 2020 public health benefits of this plan in terms of avoided premature deaths, hospitalizations, respiratory effects, and lost work days. Additional benefits associated with the reductions in ozone forming emissions were not quantified since statewide 2020 photochemical modeling is not available.

The estimated air quality-related public health benefits of the Scoping Plan are above and beyond the much greater benefits of California's existing programs, which are reducing air pollutant emissions every year. This continuing progress is the result of California's plans for meeting air quality standards ("State Implementation Plans" or SIPs), reducing emissions from goods movement activities, and addressing health risk from diesel particulate matter. These programs address both existing and new sources of air pollution, taking into account population and economic growth. The additional benefits of the Scoping Plan in 2020 are significant, and in the longer term, can be expected to increase with further reductions in fossil fuel combustion, the primary basis for the estimated public health benefits.

The recommended measures in the Scoping Plan that reduce smog forming ("criteria") pollutants are shown in Table 29 along with the estimated reductions. Statewide, these measures would reduce approximately 61 tons per day of NOx and 15 tons per day of PM2.5 in 2020. As shown in Table 30, this equates to an estimated air quality-related public health benefit of 780 avoided premature deaths statewide. In comparison, reductions in PM2.5 from California's existing programs and 2007 SIP measures are estimated to result in 12,000 avoided premature deaths statewide in the same timeframe.

Table 29: Statewide Criteria Pollutant Emission Reductions in 2020 from Proposed Scoping Plan Recommendation[67]

(tons per day)

Measure	NOx	PM2.5
Light-Duty Vehicle • Pavley I and Pavley II GHG Standards • Vehicle Efficiency Measures	1.6	1.4
Goods Movement Efficiency Measures	16.9	0.6
Medium and Heavy-Duty Vehicle GHG Emission Reduction • Aerodynamic Efficiency • Hybridization • Engine Efficiency	5.6	0.2
Local Government Actions and Regional Targets	8.7	1.4
Energy Efficiency and Conservation (Electricity)	7.0	4.0
Energy Efficiency and Conservation (Natural Gas)	10.4	0.8
Solar Water Heating	0.3	0.03
Million Solar Roofs	1.0	0.6
Renewables Portfolio Standard	9.8	5.6
Total	**61**	**15**

[67] Table 29 does not include the criteria pollutant co-benefits of additional greenhouse gas reductions that would be achieved from the proposed cap-and-trade regulation because we cannot predict in which sectors they would be achieved.

Table 30: Estimates of Statewide Air Quality-Related Health Benefits in 2020

Health Endpoint	Health Benefits of Existing Measures and 2007 SIP *mean*	Health Benefits of Recommendations in the Proposed Scoping Plan *mean*
Avoided Premature Death	12,000	780
Avoided Hospital Admissions for Respiratory Causes	1,300	87
Avoided Hospital Admissions for Cardiovascular Causes	2,600	170
Avoided Asthma and Lower Respiratory Symptoms	190,000	12,000
Avoided Acute Bronchitis	15,000	980
Avoided Work Loss Days	1,200,000	77,000
Avoided Minor Restricted Activity Days	7,000,000	450,000

In addition to the quantified air-quality-related health benefits, our analysis indicates that implementation of the Scoping Plan can deliver other public health benefits as well. These include potential health benefits associated with local and regional transportation-related greenhouse gas targets that can facilitate greater use of alternative modes of transportation, such as walking and bicycling. These types of moderate physical activities reduce many serious health risks including coronary heart disease, diabetes, hypertension and obesity.[68] Finally, it is important to note that the steps California is taking to address global warming, along with actions by other regions, states, and nations, will help mitigate the public health effects of heat waves, more widespread incidence of illness and disease, and other potentially severe impacts.

The measures in the Scoping Plan are designed primarily to help spur the transition to a lower carbon economy. However, in addition to improving air quality, these measures can also improve California's environmental resources, including land, water, and native species. Land resources will be affected by regional transportation-related targets leading to improved land use planning, and forest carbon sequestration targets which can result in better stewardship of California lands and reduced wildfire risk. A number of conservation measures will aid in effective management of the State's precious water resources. Demand for waste disposal and hazardous materials should decrease as measures to encourage recycling and reuse transform our wastes into fuel, energy, and other useful products are implemented. Additional analysis of the way that implementation of the Scoping Plan will impact these environmental resources will be conducted as we proceed. Many of these measures serve the dual purpose of mitigating greenhouse gas emissions and helping California adapt to the impacts of climate change.

[68] Appendix H contains a reference list of studies documenting the public health benefits of alternative transportation.

2. Approach

ARB quantified the potential reductions of NOx and PM2.5 from implementation of the Plan's recommendations, and the public health benefits associated with the resulting potential air quality improvement. These analyses compare NOx and PM2.5 emissions in 2020 with the implementation of the Scoping Plan with NOx and PM2.5 emissions in 2020 in the absence of the Scoping Plan – a "business-as-usual" scenario. The methodology used to evaluate the public health benefits of the emission reductions is similar to the methodology used in ARB's 2006 Goods Movement Emission Reduction Plan (GMERP), as updated in the recent staff report for estimating premature death from exposure to particulate matter.[69] This methodology is based on a peer-reviewed methodology developed by the U.S. Environmental Protection Agency (U.S. EPA). ARB augmented U.S. EPA's methodology by incorporating the result of new epidemiological studies relevant to California's population, including regionally specific studies, as they became available.

AB 32 directs ARB to conduct several levels of analysis as we proceed through the development and implementation of a comprehensive greenhouse gas emissions reduction strategy. As part of the Scoping Plan development, ARB is required to assess both the economic and non-economic impacts of the plan as noted above. Additionally, AB 32 requires ARB to undertake additional analysis at the time of adoption of regulations, including market-based compliance mechanisms.

Although not yet at the stage of regulatory development and adoption, in this analysis ARB conducted an evaluation of the air quality-related public health benefits associated with the Scoping Plan based on a community level emissions analysis example. As regulations that rely on market-based compliance mechanisms are further developed for consideration by the Board, more detail about the specific regulatory proposals will be developed, enabling ARB to more closely evaluate the potential for direct, indirect and cumulative impacts.

3. Existing Programs for Air Quality Improvement in California

The public health analysis of the Scoping Plan presents air-quality benefits that will occur in addition to the benefits of California's comprehensive air quality programs designed to meet health-based standards and reduce health risk from air toxics. It is also important to note that under both a "business-as-usual" scenario and under the implementation of the Scoping Plan, the population and economy of California are projected to continue to grow. New businesses and industries will continue to be sited in California, bringing both economic opportunity and potential environmental impacts. Federal, State, and local laws and regulations have established requirements to ensure that new and modified sources of pollution are carefully evaluated and that

[69] Air Resources Board. *Methodology for Estimating Premature Deaths Associated with Long-term Exposure to Fine Airborne Particulate Matter in California.* October 24, 2008. http://www.arb.ca.gov/research/health/pm-mort/pm-mort_final.pdf (accessed December 9, 2008)

significant impacts are mitigated. Emissions from existing businesses are also tightly controlled by local air pollution control districts. Statewide programs are in place to reduce emissions from cars, trucks, and off-road equipment, along with smog check, cleaner gasoline and diesel fuels, and regulations to reduce evaporative emissions from consumer products, paints, and refueling. Additional information about the existing regulatory framework for sources of air pollution is provided in Appendix H.

It is important to evaluate the air quality and public health benefits of the Scoping Plan in the context of the State's on-going air quality improvement efforts. California's long-standing air pollution control programs have substantially improved air quality in the state and will continue to do so in the future. By 2020, these programs will deliver reductions in statewide NOx emissions of 441 tons per day and direct fine particle emission reductions of 34 tons per day. Through 2020, three key ARB efforts will deliver deep reductions in air pollutant emissions despite continuing growth:

- Diesel Risk Reduction Plan
- Goods Movement Emission Reduction Plan
- 2007 State Implementation Plan

Measures in these plans will result in the accelerated phase-in of cleaner technology for virtually all of California's diesel engine fleets including trucks, buses, construction equipment, and cargo handling equipment at ports. Adoption and implementation of these and other measures are critical to achieving clean air and public health goals statewide.

The U.S. Environmental Protection Agency has set a new, more stringent, national ambient air quality standard for ozone that will have compliance deadlines well past 2020 for the most severely impacted areas like southern California.[70] The unmitigated impacts of climate change will make it harder to meet this standard and to provide healthful air to Californians.

4. Statewide Analysis

For this evaluation, ARB examined the recommended measures to determine the potential for impacts on air, land, water, native species and biological resources, and waste and hazardous materials. Local government, State government, and green building sectors were not included in this evaluation as they represent means of implementation of the greenhouse gas emission reduction measures. As noted, the main focus of this analysis is on air quality. To the extent feasible, ARB quantified estimated emissions reductions in criteria pollutants associated with each recommended measure except cap-and-trade. Reductions in NOx and PM2.5 were

[70] U.S. Environmental Protection Agency. *National Ambient Air Quality Standards for Ozone. Final Rule.* 73 Federal Register 16436. March 27, 2008. http://www.epa.gov/fedrgstr/EPA-AIR/2008/March/Day-27/a5645.pdf (accessed October 12, 2008)

used to estimate public health benefits. The estimated statewide reductions are 61 tons per day of NOx and 15 tons per day of PM2.5. Further analysis of the potential criteria pollutant benefits of a cap-and-trade program will be done as part of regulatory development.

5. Regional Assessment: South Coast Air Basin Example

In order to assess potential air quality benefits of the Scoping Plan on a regional level, ARB evaluated associated criteria pollutant reductions in the South Coast Air Basin as an example case. Existing programs will reduce current NOx emissions by almost 50 percent in 2020. With the new 2007 SIP measures, NOx emissions will be reduced almost 60 percent. Because of the large population and high pollutant concentrations in this region, greater benefits occur from each ton of pollution reduced. The estimated air quality-related public health benefits of the Scoping Plan for the South Coast region are shown in Table 31. The significant air quality-related public health benefits in this region are largely attributed to the additional reductions in PM2.5.

Table 31: Estimated Air Quality-Related Health Benefits of Existing Program, 2007 SIP, and Scoping Plan in the South Coast Air Basin, 2020

Health Impacts / Scenario	Benefits from Existing Program	Additional Benefits from 2007 SIP	Additional Co-Benefits from Scoping Plan
Premature Deaths Avoided	4,800	2,000	360
Hospitalizations Avoided – Respiratory	550	230	40
Hospitalizations Avoided – Cardiovascular	1,100	440	77
Asthma & Lower Respiratory Symptoms Avoided	80,000	35,000	6,200
Acute Bronchitis Avoided	6,400	2,800	500
Work Loss Days Avoided	510,000	220,000	38,000
Minor Restricted Activity Days Avoided	3,000,000	1,300,000	220,000

6. Community Level Assessment: Wilmington Example

ARB also conducted an evaluation of the potential air quality impacts of the Scoping Plan in the community of Wilmington as an illustration of the potential for localized impacts. Wilmington is in southern Los Angeles County and includes a diverse range of stationary and mobile emissions sources, including the ports of Los Angeles and Long Beach, railyards, major transportation corridors, refineries, power plants, and other industrial and commercial operations. Like the regional analysis, additional emission reductions from the 2007 SIP were estimated and show significant reductions in Wilmington by 2020 – approximately a 45 percent reduction in NOx and a 40 percent reduction in directly-emitted PM2.5. Mobile source emissions are projected to continue to be proportionately greater than stationary source emissions in 2020 even as mobile source emissions decline.

For this assessment, ARB evaluated criteria pollutant emission reductions in the Wilmington study area assuming that the source-specific quantified measures are implemented, including measures to reduce emissions from oil and gas extraction and refineries. It was further assumed that the non-source specific program elements, such as the proposed cap-and-trade program, result in a 10 percent reduction in fuel combustion by affected sources within the study area. For example, it is estimated that industrial sources would achieve greenhouse gas emission reductions through efficiency measures that reduce on site fuel use by 10 percent either in response to a cap-and-trade program, or due to the results of the facility energy efficiency audits. While it is likely that the actual onsite reductions will differ across individual facilities from the assumed uniform ten percent reduction,[71] the analysis identifies how reductions at these facilities affect the overall level of co-benefits.

The estimated NOx co-benefit of about 1.7 tons per day is small relative to the projected reductions of 24 tons per day that will occur as a result of the SIP and other measures. For example, an 8 ton per day NOx reduction is expected from cleaner port trucks. In comparison, the potential NOx benefit from a 10 percent efficiency improvement in major goods movement categories is estimated at about 1.5 tons per day. The estimated PM2.5 co-benefits, on the order of 0.12 tons per day, are also small relative to the projected reductions of 2.3 tons per day that will occur as a result of the SIP and other measures. Approximately 30 percent (0.04 ton per day) of the PM 2.5 co-benefit reduction is associated with assumed energy efficiency measures at the four large refineries in the study area, while another 30 percent would occur due to a 10 percent efficiency improvement by goods movement sources.

The co-benefit emissions reductions in the study area would produce regional air quality-related health benefits. A relatively small portion of these benefits would occur in the study area (approximately 300,000 area residents). Health benefits due to reductions in NOx are mostly at the regional levels, since NOx emissions have usually travelled some distance before they are transformed into PM via atmospheric reactions. Point source combustion PM emissions persist in the atmosphere and increase exposures both in the area where they are emitted and broadly throughout the region. Based on previous modeling studies of the impact of port and rail yard PM emissions in the South Coast Air Basin conducted by ARB, PM exposures will be reduced far beyond the study area, and a majority of the health benefits are expected to occur in areas outside of the Wilmington community.[72]

Using the previously described methodology that correlates emission reductions in the air basin with expected regional health benefits there would be an estimated

[71] The reductions at any one facility could be much greater or lesser than 10 percent For example, very small or no reductions might occur because available cost-effective industrial emission reductions have already been implemented at a particular site.

[72] ARB analysis indicates that about 20 percent of the health benefits would occur in the Wilmington area.

24 avoided premature deaths attributed to emission reductions that occur in Wilmington as a result of the Scoping Plan.[73]

F. Summary of Societal Benefits

AB 32 requires ARB to "consider the overall societal benefits, including reductions in other air pollutants, diversification of energy sources, and other benefits to the economy, environment, and public health" (HSC § 38562(b)(6)) when developing regulations to implement the Scoping Plan. ARB conducted an initial assessment of societal benefits associated with AB 32 implementation. This section summarizes those that have been identified during development of the Scoping Plan, including diversification of energy sources, mobility, regressivity, and job creation. More detailed economic and environment/public health analyses can be found in Appendix G and H, respectively. The impact of low income households (regressivity), impacts on small businesses, and impact on jobs are described in the Economic Analysis section and Appendix G.

1. Energy Diversification

Generally, energy-related measures in this Scoping Plan are expected to result in a transformation of the State's energy portfolio, driven primarily by the Low Carbon Fuel Standard (LCFS), which addresses transportation fuel, and the 33 percent RPS, which increases renewably-produced electricity production and distribution to households and businesses.

The LCFS aims to achieve at least a 10 percent reduction in the carbon intensity of California's transportation fuels by 2020. As the State moves toward less dependence upon one source of fuel for transportation, our economy will be less at risk from significant fluctuations in fuel prices. Measures within the Scoping Plan will force energy diversification in California toward low-carbon intensive energy sources and encourage significant growth in infrastructure, capital, and investment in biofuels.

The move toward 33 percent renewables will, by definition, increase the diversification of California's electrical supply. Increased use of wind, solar, geothermal and biomass (including from the organic fraction of municipal solid waste) generation will all add to ensuring the state has a broader portfolio of energy inputs.

Based on ARB's economic analysis, the combined energy diversification and increased energy efficiency expected from implementation of the Scoping Plan is predicted to result in: a 25 percent decrease in gasoline usage (4.6 billion gallons), a 17 percent decrease in diesel fuel use (670 million gallons), a 22 percent decrease in electricity (74,000 GWh reduction) and a 24 percent reduction in natural gas (3,400 therms).

[73] See Appendix H

The cap-and-trade program, offsets, and other measures that contain market-based features may also help diversify California's energy portfolio by incentivizing the development and deployment of clean and efficient energy generating technologies.

2. Mobility and Shifts in Land Use Patterns

Mobility is analyzed through multiple approaches in the Scoping Plan. Appendix C includes an analysis of a proposed measure for regional transportation-related greenhouse targets. Reductions in vehicle miles traveled (VMT) are expected to result from regional and local planning which target land use, building and zoning improvements.

As the Scoping Plan is implemented, measures that support shifts in land use patterns are expected to emphasize compact, low impact growth in urban areas over development in greenfields. Communities could realize benefits, such as improved access to transit, improved jobs-housing balance, preservation of open spaces and agricultural fields, and improved water quality due to decreased runoff. Local and regional strategies promoting appropriate land use patterns could encourage fewer miles traveled, lowering emissions of greenhouse gases, criteria pollutants and PM. More compact communities with improved transit service could increase mobility, allowing residents to easily access work, shopping, childcare, health care and recreational opportunities.

Furthermore, if open spaces and desirable locations become more accessible and communities are designed to encourage walkability between neighborhoods and shopping, entertainment, schools and other destinations, residents are likely to increase their levels of physical activity. Research shows that regular physical activity can reduce health risks, including coronary heart disease, diabetes, hypertension, anxiety and depression, and obesity. Measures in the Scoping Plan encourage Californians to use alternatives to personal vehicle travel that could result in increased personal exercise. To complement these changes, future community developments may evolve to include trails and pedestrian access to major centers. However, where compact development may increase proximity to large sources of pollution, such as high traffic arterials, distribution centers, and industrial facilities, it will be critical to analyze the anticipated and unanticipated impacts and benefits, to ensure that increases in exposure to vehicular air pollution and other toxics and particulates do not occur .

G. California Environmental Quality Act Functional Equivalent Document

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to determine the potential adverse environmental impacts of proposed projects. ARB's analysis of the potential adverse environmental impacts of the Scoping Plan is presented in Appendix J. The analysis summarizes and discusses the specific strategies in the Scoping Plan that, if adopted and implemented, will reduce greenhouse gas emissions throughout the state. The

evaluation is programmatic by necessity; it allows consideration of broad policy alternatives and program-wide mitigation measures at a time when an agency has greater flexibility to deal with basic problems of cumulative impacts. A programmatic document also plays an important role in establishing a structure within which future reviews of related actions can be effectively conducted. The Secretary of California's Resources Agency determined that ARB meets the criteria for a Certified Regulatory Program and requires ARB to prepare a substitute document. This functionally equivalent document (FED) is intended to disclose potential adverse impacts and identify mitigation measures specific to the actions identified in the Scoping Plan. The analysis generally found that the proposed Low Carbon Fuel Standard, Renewables Portfolio Standard and Water measures have the most potential to cause adverse environmental impacts due to the potential for land conversion when projects are undertaken. Additional environmental analysis will be needed when regulations are adopted and at the individual project level to identify mitigation for project specific impacts.

H. Administrative Burden

ARB conducted a assessment of the administrative burden of implementing the Scoping Plan recommendation. (HSC §38562 (b)(7)) The recommendation calls for ARB to develop a cap-and-trade program – a market-based regulatory program to cap and reduce emissions from the Industrial, Electricity, Natural Gas, and Transportation sectors. This program would require stringent monitoring and reporting on the part of the regulated community, and comprehensive enforcement on the part of ARB. Sources under the cap would need to analyze the best approach for their company to comply with a cap – assessing the cost of reducing emissions and comparing that to the cost of purchasing emission reductions in a market. Although ARB has not previously developed this type of market regulation, there is extensive experience to draw upon from within California, nationally, and internationally. In addition, the other regulatory components of the recommendation would require ARB and other State agencies to adopt a series of measures requiring regulatory development, outreach to stakeholders and the public, implementation by industry, and enforcement for numerous measures and programs.

I. De Minimis Emission Threshold

A minimum level at which regulations are determined not to apply is termed the 'de minimis threshold.' In recommending a de minimis level, ARB must take into account the relative contribution of each source or source category to statewide greenhouse gas emissions and the adverse effect on small business. (HSC §38561(e)) This threshold acts as a buffer below which the burden of regulation is determined to outweigh the potential harmful effect of the minimal level of emissions. However, it should not be assumed that an individual source of greenhouse gas emissions that is minimal if taken by itself will fall below the threshold. ARB often looks at the aggregate emissions from a source category or related source category when determining regulatory applicability.

A source category may be evaluated as the aggregate of businesses doing the same type of work (e.g., semiconductor manufacturers), a type of equipment (cargo handling equipment, cars), a process or product (cans of pressurized duster), or other aggregated sources of

emissions. Emissions of greenhouse gases from any individual entity within these source categories by themselves could be small. However, when emissions from the source category are evaluated, the relative contribution to climate change can be significant.

As ARB developed the Scoping Plan, potential measures were evaluated against criteria that included the relative contribution of the source to climate change. After this review and considering the level of emissions needed to meet the 1990 target established by AB 32, ARB recommends a de minimis level 0.1 $MMTCO_2E$ annual emissions per source category.[74] Source categories whose total aggregated emissions are below this level are not proposed for emission reduction requirements in the Scoping Plan but may contribute toward the target via other means.

ARB and other agencies implementing measures included in the Scoping Plan should carefully consider this de minimis level in developing regulations, and only regulate smaller source categories if there is a compelling necessity.

As each regulation to implement the Scoping Plan is developed, ARB and other agencies will consider more specific de minimis levels below which the regulatory requirements would not apply. These levels will consider the cost to comply, especially for small businesses, and other factors.

[74] The Forest sector was not included in determining the de minimis level because this sector serves both as a source and a sink for carbon, making the concept of a de minimis level less applicable.

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IV. IMPLEMENTATION: Putting the Plan into Action

Adoption of this Scoping Plan will be a groundbreaking step forward for California. However it is only the beginning of a journey that will last for decades, gradually moving the State into a low-carbon, clean energy future. Putting the Scoping Plan into action will be challenging but with adequate commitment and leadership from Californians up and down the state, it will be a success.

A. Personal Action

The greenhouse gas emission reductions required under AB 32 cannot be realized without the active participation of the people of California. While many of the measures in this Plan must be taken by large sources of emissions, such as power plants and industrial facilities, it is the voluntary commitment and involvement of millions of individuals and households throughout the State that will truly make this California's Plan.

Shifts in individual choices and attitudes drive changes in the economy and in institutions. This dynamic of changing individual behavior will influence California's effort to reduce greenhouse gas emissions. For example, as market forces and environmental awareness encourage more people to drive low-greenhouse gas emitting vehicles, the auto manufacturers will respond with more innovative models and more intensive research. Regulations requiring auto manufacturers to provide these cars will complement the market demand.

This means that thinking about climate change and our carbon footprint will naturally become part of how individuals make decisions about travel, work, and recreation. Some families may choose to purchase a more efficient vehicle when it comes time to replace their current model. Households may choose to lower their thermostat to 68 degrees Fahrenheit during the colder months, and raise it to 78 degrees when air conditioning is required. Some households may choose to swap out incandescent light bulbs for more efficient compact fluorescent lights. Others may choose to install solar water heaters, or arrays of solar electric panels on their roofs to take advantage of renewable energy, and lower their household energy bills. Many households may choose to plant trees to shade and cool their homes, and use landscaping and plants that require less water.

This Plan recommends measures that will help support many of these individual decisions to improve energy efficiency. Statewide measures and regional efforts will result in programs to promote public transportation or riding in carpools, subsidize the purchase of energy efficient appliances, or provide incentives to better insulate and weatherize older homes. ARB is fully committed to assuring California consumers have the widest possible choice of vehicles that emit fewer greenhouse gases than today's models, including the most advanced technology vehicles produced anywhere in the world.

Californians have embraced statewide programs that support positive change in home and business behavior. In less than two decades, separating household waste and recycling at home and work have become commonplace, as has the widespread purchase of appliances with the Energy Star label to save energy. Reducing our carbon footprint by moving toward a cleaner more efficient economy will produce a wide range of benefits to individuals, through lower energy bills and a healthier environment for all.

Conservation can also play a key role. By employing practices to use our resources more sparingly, consumers can both save money and reduce greenhouse gas emissions. On August 18, 2008, Governor Arnold Schwarzenegger launched the EcoDriving program – a comprehensive effort to save consumers money at the gas pump, reduce fuel use and cut CO_2 emissions. By following a set of easy-to-use best practices for driving and vehicle maintenance, a typical EcoDriver can improve mileage by approximately 15 percent. Furthermore, safety is improved when driving speeds are reduced, a key EcoDriving strategy.

Similarly, consumers and businesses can save money and reduce greenhouse gas emissions by conserving resources at homes, offices and commercial buildings. For example, wireless monitor devices to provide instantaneous energy-usage information inside the home are being developed to show users how many kilowatt hours they're consuming at any given moment – as well as how much it's costing them.[75] Providing real-time information on appliance energy use can greatly assist consumers in conserving electricity use.

Many Californians concerned about climate change have also begun to buy carbon offsets to mitigate the impact of their daily activities. These can take various forms, including options that allow consumers to add 'carbon credits' when buying airline tickets, or paying a small monthly charge on utility bills to buy green power. ARB will be working to establish clear rules for voluntary reductions and offsets that might be used for compliance with AB 32. These rules will also help establish clear guidelines for these types of voluntary carbon credit programs and provide California's businesses and consumers greater assurance that money spent on these programs result in real reductions in greenhouse gas emissions.

For more information about how to reduce one's personal carbon footprint, visit www.coolcalifornia.org. This web site provides a carbon footprint calculator and a "top ten" list of ways to save energy at home.

B. Public Outreach and Education

To be successful, a climate action program needs an effective public outreach and education program. The Plan calls for a robust statewide program designed to generate awareness and involvement in California's climate change efforts.

[75] The Sacramento Municipal Utility District (SMUD) is subsidizing PowerCost Monitors to 5,000 customers as a part of a demonstration program. [www.smud.org/residential/saving-energy/monitor.html]

The Climate Action Team will convene a steering team that includes State agencies and other public agencies such as the state's air districts, and public and private utilities, which have a strong track record of successful efforts at public education to reduce driving (Spare the Air) or promote energy efficiency and reduce energy demand. With the release of the California Energy Efficiency Strategic Plan, the CPUC has committed to the launch of a new brand for California Energy Efficiency in 2009, focused on energy efficiency opportunities and coordinated with climate change messaging under AB 32. The steering committee will develop a coordinated array of messages and draw upon a wide range of messengers to deliver them. These will include regional and local governments whose individual outreach campaigns can reinforce the broader State outreach themes while also delivering more targeted messages directly tied to specific local and regional programs.

To ensure that all Californians are included in efforts to address climate change, California will also support highly localized efforts at public education and outreach at the community and neighborhood level. This includes service club organizations and existing faith-based communities – churches, mosques and synagogues. Other private-sector entities including businesses and local chambers of commerce will be invited to partner in spreading the word.

1. Involving the Public and Stakeholders in Measure Development

In keeping with the requirements of AB 32 and the legacy of four decades of regulatory development at ARB, we have worked to make this process fully transparent and will continue to do so as regulations to implement the plan are developed. We will continue our efforts to involve the public to the greatest extent feasible at every stage of the process, including informal and formal rulemaking activities. This will include disadvantaged communities and those with localized concerns, as well as affected industries and small businesses.

Local and community meetings and outreach have been and will continue to be a central element of all rulemaking, with State agencies working closely with disadvantaged communities, EJAC, public health experts, and other stakeholders to fully evaluate the impacts associated with California's greenhouse gas emissions reduction strategies. State agencies involved in measure development will continue to meet periodically with communities to assess any challenges to implementation, or to discover possible new measures or approaches. Stakeholders will be invited to participate in the many additional workshops, workgroups and seminars that will be held as individual measures are developed.

2. Education and Workforce Development

The transition to a clean energy future presents California with a tremendous opportunity to continue growing its green economy and to expand the growth of green job opportunities throughout the state. Making this transition will require a technically educated workforce that is equipped with the skills to develop and deploy 21st century technologies. Investments in training, career technical education, worker

transition assistance, and collaboration between public and private partners will be key to ensuring that California fully reaps the economic and job opportunities that will accompany implementation of AB 32.

Setting California on track to a low-carbon future beyond 2020 will be a multi-generational challenge. To meet this challenge, climate-related education in schools must be a central element of California's plan. By 2010, California will develop climate change education components to the State's new K-12 model school curriculum as part of the Education and the Environment Initiative (AB 1548, Pavley, Chapter 665, Statutes of 2003). Expanding the knowledge and opportunities of young people to participate in promoting their own and their communities' environmental health will be an important theme for all these efforts. In the meantime, ARB's educational outreach will continue through the Cool California web pages (www.coolcalifornia.org) and the continued support of student educators through the California Climate Champions programs. ARB will also rely on partners throughout the state to develop and display options for curricula that will enhance the K-12, community college, trade technical training programs, and programs at four-year colleges.

The demand for workers to fill green jobs is rising. There are currently more than 3,000 green businesses in the state, accounting for about 44,000 jobs: 36 percent of these jobs are in professional, scientific, and technical services; 19 percent are in construction; and 15 percent are in manufacturing.[76] Some of these jobs are in new fields, yet many others are simply augmentations of existing skills and vocations such as electrical, construction, machining, auto tech, and heating ventilation and air conditioning. As we move toward 2020, tens of thousands of new green job opportunities will be created.[77] Whether these opportunities come in entirely new fields of employment or in existing areas, it will be critical for California to have a trained workforce available.

Ensuring that California can continue to meet the demand for green jobs will require close coordination between workforce development agencies, businesses, State and local governments, labor unions, and community colleges and universities. Many organizations are already developing strategies and identifying steps to simultaneously meet industry workforce needs and help build a more sustainable economy. For instance, the California Labor and Workforce Development Agency (LWDA) provides a comprehensive range of employment and training services in partnership with State and local agencies and organizations. Similar additional efforts will be crucial in ensuring that the transition to a green economy benefits working

[76] California Economic Strategy Panel. *Clean Technology and the Green Economy; Growing Products, Services, Businesses and Jobs in California's Value Network*, Draft, March 2008. http://www.labor.ca.gov/panel/pdf/DRAFT_Green_Economy_031708.pdf

[77] Tellus Institute and MRG Associates. *Clean Energy: Jobs for America's Future.* As cited in: *Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?* Energy and Resources Group/Goldman School of Public Policy at University of California, Berkeley. April 13, 2004. p. 11 http://rael.berkeley.edu/old-site/renewables.jobs.2006.pdf

families in California by providing a steady supply of livable-wage jobs. In the area of energy efficiency, the California Long Term Energy Efficiency Strategic Plan, adopted by the CPUC, details a vision and supporting strategies for the development of a workforce trained and engaged to achieve California's energy-efficiency objectives.

The following strategies will be key to ensure that California's workforce is equipped to help lead the transition to a clean energy future:

- **Strengthen and expand access to Career and Technical Education (CTE) in California public schools for the next generation of workers who will build a green economy.** Over the past several decades, there has been a steady decline in career and technical education. In 2007, less than one-third of all high school students in the state were enrolled in some form of CTE.[78] To take full advantage of the emerging green economy and meet the goals of AB 32, California needs to expand opportunities for CTE in schools. This could include pursuing strategies such as requiring CTE coursework for all middle- and high-school students; increasing the number of CTE credentialed teachers; expanding investment in facilities and equipment for career and technical education; and aligning educational curricula more closely with the skill and workforce needs of the emerging green economy.

- **Ensure an adequate pipeline of skilled workers who are trained in the new technologies of a greener economy.** While some green jobs will be in new businesses and new occupations, most green jobs are variations of traditional occupations in sectors like construction, utilities, manufacturing and transportation.[79] In light of the fact that forty percent of the nation's skilled workers are slated to retire in the next 5 to 10 years,[80] there is an urgent need for educational and training programs to fill these jobs. Strategies to create a steady pipeline of skilled workers include expanding curriculum choices in schools, colleges, and universities to fully reflect career opportunities available in an economy increasingly centered on clean technologies. Other strategies include offering a greater array of industry- and technology-specific courses that would link directly with postsecondary training such as apprenticeship programs, vocational training, or college.

- **Ensure that California's higher education institutions continue to produce the next generation of clean tech engineers, scientists and business leaders.** In addition to providing valuable research on potential climate-change mitigation and adaptation strategies, California's world-class research institutions are the

[78] Get REAL. *Aligning California's Public Education System with the 21st Century Economy Policy Paper for Discussion at Governor Arnold Schwarzenegger's Summit on Career and Technical Education*, March 6, 2007

[79] Ibid.

[80] The New Apollo Program, Clean Energy, Good Jobs: A National Economic Strategy for the New American Century, July 2008. p. 20 http://apolloalliance.org/downloads/fullreportfinal.pdf (accessed October 12, 2008)

incubators for many of the clean tech companies that will contribute to California's environmental and economic future. It will be critical for California to continue to cultivate university research and training programs in a way that takes full advantage of this valuable state resource.

A successful transition to a clean energy future depends heavily on California's ability to provide a well-trained workforce to meet the demands of the growing green economy. ARB and our key partners will continue working throughout the state to ensure that an adequate supply of skilled workers is positioned to take advantage of the growing opportunities for high quality jobs and careers that implementation of AB 32 will bring.

3. Small Businesses

Small businesses play a crucial role in California's economy. As noted in Chapter III, our analysis indicates that this plan will have a net positive impact on small businesses. These impacts are attributable primarily to the measures in the plan that will deliver significantly greater energy and fuel efficiencies. However, as also noted in the analysis, ensuring that these benefits are realized to the fullest potential will require additional outreach and communication efforts by ARB and many other state and local entities.

One of ARB's Early Action measures is designed to help businesses during AB 32 implementation. With our State partners, we are developing an on-line small business "toolkit" designed for small and medium-sized businesses that will provide a one-stop shop for technical and financial resources. Toolkit components will include a business-specific calculator to assess a company's carbon footprint; a voluntary greenhouse gas inventory protocol for measuring greenhouse gas emissions; recommended best practices for energy, transportation, building, purchasing, and recycling; case studies demonstrating how small and medium California businesses have reduced greenhouse gas emissions; program financing resources; peer-networking opportunities; and an awards program to recognize reductions of greenhouse gas emissions among California businesses.

ARB will also continue working with the many business associations, organizations, and other State partners, such as the Small Business Advocate's AB 32 Small Business Task Force, the Labor and Workforce Development Agency, and Business, Transportation, and Housing Agency that have the resources, input and expertise to provide. These partners will help to further develop and implement an effective outreach plan to provide technical assistance to businesses through a variety of means, including attendance at business events, workshops, and working with local economic development agencies.

C. Implementation of the Plan

This Scoping Plan outlines the regulations and other mechanisms needed to reduce greenhouse gas emissions in California. ARB and other State agencies will work closely

with stakeholders and the public to develop regulatory measures and other programs to implement the Plan. ARB and other State agencies will develop any regulations in accordance with established rulemaking guidelines. Table 32 shows the status of the proposed measures in the plan.

Table 32: Status of Scoping Plan Measures

Existing Laws, Regulations, Policies And Programs
Light-Duty Vehicle Greenhouse Gas Standards (Pavley I)
Renewables Portfolio Standard (to 20%)
Solar Hot Water Heaters
Million Solar Roofs
High Speed Rail
Measures Strengthening & Expanding Existing Policies & Programs
Electricity Efficiency
Natural Gas Efficiency
Renewables Portfolio Standard (from 20% to 33%)
Sustainable Forests
Light-Duty Vehicle Greenhouse Gas Standards (Pavley II)
Discrete Early Actions
Low Carbon Fuel Standard
High GWP in Consumer Products (Adopted)
Smartways
Landfill Methane Capture
High GWP in Semiconductor Manufacturing
Ship Electrification (Adopted)
SF6 in non-electrical applications
Mobile Air Conditioner Repair Cans
Tire Pressure Program
New Measures
California Cap-and-Trade Program Linked to WCI Partner Jurisdictions
Increase Combined Heat and Power
Regional Transportation-Related GHG Targets
Goods Movement Systemwide Efficiency
Vehicle Efficiency Measures
Medium/Heavy Duty Vehicle Hybridization
High GWP Reductions from Mobile Sources
High GWP Reductions from Stationary Sources
Mitigation Fee on High GWP Gases
Oil and Gas Extraction
Oil and Gas Transmission
Refinery Flares
Removal of Methane Exemption from Existing Refinery Regulations

Rulemakings will take place over the next two years. As with all rulemaking processes, there will be ample opportunity for both informal interaction with technical staff in meetings and workshops, and formal interaction. ARB will consider all information and stakeholder input during the rulemaking process. Based on this information, ARB may modify proposed measures to reflect the status of technological development, the cost of the measure, the cost-effectiveness of the measures and other factors before presenting them to the Board for consideration and adoption.

In addition to these existing approaches, AB 32 imposes other requirements for the rulemaking process. Section 38562(b) explicitly added requirements for any regulations adopted for greenhouse gas emissions reductions. ARB also recognizes the need to expand the scope of analysis required when adopting future greenhouse gas emission reduction regulations. These expanded evaluations include the unique enforcement nature of climate change-related regulations and the possible extended permitting considerations and timelines that must be taken into account when establishing compliance dates. An important consideration in developing regulations will be the potential impact on California businesses. The potential for leakage, the movement of greenhouse gas emissions (and economic activity) out of state, will be carefully evaluated during the regulatory development.

As noted above, as the Scoping Plan is implemented and specific measures are developed, ARB and other implementing agencies will also conduct further CEQA analyses, including cumulative and multi-media impacts. ARB must design equitable regulations that encourage early action, do not disproportionately impact low-income and minority communities, ensure that AB 32 programs complement and do not interfere with the attainment and maintenance of ambient air quality standards, consider overall societal benefits (such as diversification of energy resources), minimize the administrative burden, and minimize the potential for leakage. AB 32 requires that, to the extent feasible and in furtherance of achieving the statewide greenhouse gas emission limit, ARB must consider the potential for direct, indirect and cumulative emission impacts from market-based compliance mechanisms, including localized impacts in communities that are already adversely impacted by air pollution, design the program to prevent any increase in emissions, and maximize additional environmental and economic benefits prior to the inclusion of market-based compliance mechanisms in the regulations. As ARB further develops its approach for consideration of these issues in future rulemakings, and updates needed analytical tools and data sets, we will consult with outside experts and the EJAC.

ARB already conducts robust environmental and environmental justice assessments of our regulatory actions. Many of the requirements in AB 32 overlap with ARB's traditional evaluations. In adopting regulations to implement the measures recommended in the Scoping Plan, or including in the regulations the use of market-based compliance mechanisms to comply with the regulations, ARB will ensure that the measures have undergone the aforementioned screenings and meet the requirements established in HSC §38562 (b) (1-9) and §38570 (b) (1-3).

D. Tracking and Measuring Progress

Many State agencies, working with the diverse set of greenhouse gas emissions sources, have collaborated in the process of developing the strategies presented in this plan. As the agency responsible for ensuring that AB 32 requirements are met, ARB must track the regulations adopted and other actions taken by both ARB and other State agencies as the plan is implemented.

The emissions reductions enumerated in this plan are estimates that may be modified based on additional information. As the proposed measures are developed over the coming years, it is possible that some of these strategies will not develop as originally thought or not be technologically feasible or cost-effective at the level given in the plan. It is equally likely that new technologies and strategies will emerge after the initial adoption schedule required in AB 32, that is, regulation adoption by January 1, 2011. If promising new tools or strategies emerge, ARB and other affected State agencies will evaluate how to incorporate the new measures into the AB 32 program. In this way, new strategies ensuring that the commitments in the plan remain whole and that the 2020 goal can be met will be incorporated into the State strategy.

ARB will update the plan at least once every five years (HSC §38561(h)). These updates will allow ARB to evaluate the progress made toward the State's greenhouse gas emission reduction goals and correct the Plan's course where necessary. This section discusses the tracking and measurement of progress that ARB envisions. The Report Cards and audits, along with an evaluation of new technologies – both emerging and those recently incorporated into the Plan – will also provide valuable input into ARB's update process. Continuous atmospheric monitoring of greenhouse gases may also be useful for determining the effectiveness of emission reduction strategies and for future inventory development.

1. Report Card

SB 85 (Budget Committee, Chapter 178, Statutes of 2007) requires every State agency to prepare an annual "Report Card," detailing measures the agency has adopted and taken to reduce greenhouse gas emissions, including the actual emissions reduced as a result of those actions. The information must be submitted to CalEPA, which is then required to compile all the State agency data into a report format, which is made available on the Internet and submitted to the Legislature. The information allows comparisons of each agency's projected and actual greenhouse gas emissions reductions with the targets established by the CAT or the Scoping Plan. This would be the State's 'Report Card' on its efforts to reduce greenhouse gas emissions.

Agencies are also required, as funds are available, to have an outside audit of greenhouse gas-related actions completed every three years to verify actual and projected reductions.

2. Tracking Progress by Implementing Agencies

As the lead agency responsible for implementing AB 32, ARB must track the progress of both our efforts and the efforts of our partners in implementing their respective provisions of this plan. Communication between ARB and the other implementing agencies will be especially important as regulations and programs are developed. In support of the Report Card requirement noted above, ARB will work with CalEPA to develop a process to track and report on progress toward the plan's goals and commitments.

3. Progress Toward the State Government Target

The CAT recently established a State Government Subgroup to work with State agencies to create a statewide approach to meet the Scoping Plan's commitment to reduce greenhouse gas emissions by a minimum of 30 percent by 2020 below the State's estimated business-as-usual emissions – approximately a 15 percent reduction from current levels. State agencies must lead by example by doing their part to reduce emissions and employ practices that can also be transferred to the private sector. The statewide plan will serve as a guide for State agencies to achieve realistic, measurable objectives within specific timelines. This newly created State Government Subgroup will assist State agencies through these steps in a timely manner.

4. Mandatory Reporting Regulation

ARB's mandatory reporting rule, adopted in December 2007, will help the State obtain facility-level data from the largest sources of greenhouse gas emissions in California. This data will help ARB better understand these sources to develop the proposed emissions reduction measures outlined in this plan.

The regulation requires annual reporting from the largest facilities in the state, accounting for 94 percent of greenhouse gas emissions from industrial and commercial stationary sources in California. There are approximately 800 separate sources that fall under the new reporting rules, which include electricity generating facilities, electricity retail providers and power marketers, oil refineries, hydrogen plants, cement plants, cogeneration facilities, and industrial sources that emit over 25,000 tons of carbon dioxide each year from on-site stationary source combustions such as large furnaces. This last category includes a diverse range of facilities such as food processing, glass container manufacturers, oil and gas production, and mineral processing.

Affected facilities will begin tracking their greenhouse gas emissions in 2008, to be reported beginning in 2009 with a phase-in process to allow facilities to develop reporting systems and train personnel in data collection. Emissions for 2008 may be based on best available data. Beginning in 2010, emissions reports will be more rigorous and will be subject to third-party verification. Reported emissions data will allow ARB to improve its facility-based emissions inventory data. Originally, the statewide greenhouse gas inventory was based on aggregated sector data and could

not be broken down to the facility level. The facility-level reporting required under the Mandatory Reporting regulation will improve data on greenhouse gas emissions for individual facilities and their emitting processes. This information could also help improve emissions inventories for criteria pollutants, and provide additional data for assessing cumulative emission impacts on a community level.

ARB emissions reporting requirements are expected to be modified over time as AB 32 is implemented.

E. Enforcement

Enforcement is a critical component of all of the State's regulatory programs, both to ensure that emissions are actually reduced and to provide a level playing field for entities complying with the law. To meet the 2020 target this plan calls for aggressive action by a number of State agencies. Each of those agencies will employ its full range of compliance and enforcement options to ensure that planned reductions are achieved. The remainder of this section discusses ARB's portion of the enforcement program in more detail.

ARB has an extensive and effective enforcement program covering a wide variety of regulated sources, from heavy-duty vehicle idling, to consumer products, to fuel standards and off-road equipment. To increase the effectiveness of its enforcement efforts and provide greater assurance of compliance, ARB also partners with local, State and federal agencies to carry out inspections and, when necessary, prosecute violators.

ARB will continue its strong enforcement presence as the State's primary air pollution control agency. A critical function of this responsibility is to ensure that all enforcement actions are timely, effective, and appropriate with the severity of the situation. ARB will also continue its close working relationship with local air districts in the development and enforcement of applicable regulations contained within the Scoping Plan and collaborate with the appropriate State agencies on greenhouse gas emission reductions measures.

For the stationary source regulations called for in the plan, ARB will work closely with the local air districts that have primary responsibility for implementing and enforcing criteria pollutant regulations. Not only are local air districts familiar with the individual facilities and their compliance history, but information contained in district permits can be used to verify the accuracy of greenhouse gas emissions reported by sources subject to ARB mandatory reporting requirements. Using this data, regulators can also examine any correlation between greenhouse gases and toxic or criteria air pollutants as a result of emissions trading or direct regulations.

ARB will also continue to partner with the California Highway Patrol and other State and local enforcement agencies on mobile source and other laws and regulations where joint enforcement authorities apply.

Although many of the measures in the Scoping Plan are modeled on existing ARB regulations, a multi-sector, regional cap-and-trade program would bring unique enforcement challenges. ARB and CalEPA have begun the process of engaging and consulting with other State agencies, such as California's Department of Justice, Public Utilities Commission, Energy Commission, as well as the Independent System Operator, on market tracking and enforcement. These working group meetings are ongoing and will culminate in a comprehensive enforcement plan to accompany the proposed cap-and-trade program when the Board considers regulatory requirements. This enforcement plan would describe the administrative structures needed for market monitoring, prosecution, and penalty setting. Public input regarding these issues would also be a key part of the public stakeholder process conducted during development of the cap-and-trade programs regulations.

Accurate measurement and reporting of all emissions would be necessary to assure accountability, establish the integrity of allowances, and provide sufficient transparency to sustain confidence in the market. To ensure compliance, ARB would administer penalties for entities that hold an insufficient quantity of allowances to cover their emissions or fail to report their greenhouse gas emissions. Missed compliance deadlines would also result in the application of stringent administrative, civil, or criminal penalties.

This plan recommends that California implement a cap-and-trade program that links with other Western Climate Initiative partner programs to create a regional market system. This system would require California to formalize enforcement agreements with its WCI partner jurisdictions for all phases of cap-and-trade program operations, including verification of emissions, certification of offsets based on common protocols, and detection of and punishment for non-compliance. As needed, California would also work with federal regulatory and enforcement agencies that oversee trading markets, such as the Commodity Futures Trading Commission and the Federal Energy Regulatory Commission. While California would work with other jurisdictions on joint enforcement activities, ARB will exercise all of its authority under HSC §38580 and other provisions of law to enforce its regulations against any violator wherever they may be.

F. State and Local Permitting Considerations

Some of the proposed emissions reduction strategies in this Scoping Plan may require affected entities to modify or obtain state or local permits. California's existing permit process ensures that health and safety concerns are evaluated, met, and when appropriate, mitigated. The State recognizes the potential for conflicts between various federal, state and local permitting requirements, which may cross various media – air, water, etc. CalEPA is actively involved in identifying and addressing these regulatory overlap issues with the ultimate goal of consolidating permits where feasible while maintaining all permit requirements. Two such examples are CalEPA's digester permit working group and the CalEPA-Air District Compost Emissions Work Group.

ARB recognizes that the permitting process may affect the viability of certain strategies and that the length of the permitting process could affect the timing of emissions reductions.

ARB, along with CalEPA and other State agencies, will continue to evaluate steps to ensure that permit requirements harmonize across the affected media.

This Plan has been developed with an understanding of the important cross-media impacts. These efforts will continue during the implementation of the Plan. Particular focus on the potential permitting impacts and cross-media consequences of a proposed rule will take place during the rulemaking process.

G. Role of Local Air Districts

Local air districts are ARB's partners in addressing air pollution. ARB takes primary responsibility for transportation, off-road equipment and consumer products. Local districts lead in controlling industrial, commercial and other stationary sources of air emissions. AB 32 recognizes the need to develop a program that meshes with local and regional activities. Although AB 32 does not provide an explicit role for air districts, their local presence as advocates for clean air and their resources, experience and expertise in regulating and enforcing rules for stationary sources make them a logical choice to have an important role in several aspects of implementing California's greenhouse gas program. ARB would partner with local air districts to develop and effectively enforce both source-specific requirements on industrial sources, and to enforce related programs, such as the high GWP rules, that affect a large number of local businesses.

ARB and local air districts are also actively working to coordinate emission reporting requirements. Some districts, like the South Coast Air Quality Management District, have developed software to allow their industrial sources to simultaneously report their criteria pollutant emissions to the District and their greenhouse gas emissions to ARB. Many air district staff are being trained as third-party verifiers to confirm the greenhouse gas emissions information provided by industrial sources under the mandatory reporting regulation, and, similarly, could provide verification of voluntary greenhouse gas reductions in the future.

Local air districts will be key in both encouraging greenhouse gas emissions reductions from other regional and local government entities, and providing technical assistance to quantify and verify those reductions. Local agencies are an important component of ARB's outreach strategy.

Many local air districts have already taken a leadership role in addressing greenhouse gas emissions in their communities. These efforts are intended to encourage early voluntary reductions. For example, local districts are "lead agencies" under the California Environmental Quality Act (CEQA) for some projects. In order to ensure high-quality mitigation projects, some districts have established programs to encourage local greenhouse gas reductions that could be used as CEQA mitigation. As the State begins to institutionalize mechanisms to generate and verify greenhouse gas emissions reductions, ARB and the districts must work together to smoothly transition to a cohesive statewide program with consistent technical standards.

H. Program Funding

Administration, implementation, and enforcement of the emissions reduction measures contained in the Scoping Plan will require a stable and continuing source of funding. AB 32 authorizes ARB to collect fees to fund implementation of the statute. ARB recently initiated a rulemaking for a fee program to fund administration of the program.

Approximately $36 million per year will be needed on an ongoing basis to fund implementation by ARB and other State agencies, based on the positions and funding included in the 2009-2010 fiscal year budget. Additional revenues are needed to repay the loans from State funds that were used to pay ARB and CalEPA expenses in the startup of the program. ARB is moving on an expedited schedule to develop a fee regulation and expects to take a regulation to the Board in mid 2009, with the aim of beginning to collect fees in the 2009/2010 fiscal year.

V. A VISION FOR THE FUTURE

California has the know-how, ingenuity, research capabilities, and culture of innovation to meet the challenge of addressing climate change. However, reaching the goals we have set for ourselves will not be easy. Successful implementation of many of the proposed programs and measures described in this plan will require strong leadership and a shared understanding of the need to reach viable and lasting solutions quickly.

This challenge will also require establishing a wide range of partnerships, both within California and beyond our borders. We will need to support additional research, and further develop our culture of innovation and technological invention. In order to continue the momentum and the commitment to a clean energy future, we will need to both build on existing solutions and develop new ones.

The following sections lay out some of the elements that will be necessary to forge a broad-based institutional strategy to address climate change both within California and beyond. Also discussed is the need to build partnerships on the regional, national and international levels to ensure that our actions complement and support those being taken on a global scale. This section also looks forward to 2030, showing that California is on the trajectory needed to do our part to stabilize global climate.

A. Collaboration

1. Working Closely with Key Partners

True climate change mitigation will require many parties to work together for a global mitigation plan. California and other states are filling a vacuum created by the current lack of leadership at the federal level. By its bold actions, California is moving the United States closer to a seat at the table among the developed countries that have agreed to reduce their carbon emissions, and lead a new international effort for an agreement to replace the Kyoto Protocol that expires in 2012.

Any national climate program must be built on a partnership with State and local governments to ensure that states can continue their role as incubators of climate change policy and can implement effective programs such as vehicle standards, energy efficiency programs, green building codes, and alternative fuel development.

California will work for climate solutions with key federal agencies, including the U.S. Department of Energy and their national labs, the U.S. Environmental Protection Agency, the U.S. Bureau of Land Management, the U.S. Department of Agriculture, the U.S. Department of Transportation, and others.

Through the Western Climate Initiative and in collaboration with other regional alliances of states, California can promote its own best practices and learn from others while helping to formulate the structure of a regional and ultimately national cap-and-trade program.

2. International

As one of the largest economies in the world, California is committed to working at the international level to reduce global greenhouse gas emissions. As part of this effort, Governor Schwarzenegger and other U.S. governors taking the lead in climate change are co-hosting a Global Climate Summit on Finding Solutions Through Regional and Global Action. This summit, held on November 18th and 19th, 2008, began a state-province partnership with leaders from the U.S., Australia, Brazil, Canada, China, India, Indonesia, Mexico, the European Union, and other nations, taking urgent steps to contain global climate change and jointly setting forth a blueprint for the next global agreement on climate change solutions.

California is also a charter member of the International Carbon Action Partnership (ICAP), an organization composed of countries and regions that have adopted carbon caps and that are actively pursuing the implementation of carbon markets through mandatory cap-and-trade systems. California's continued involvement in ICAP will be very beneficial for sharing experiences and knowledge as we design our own market program.

In addition to participating in ICAP, California hopes to engage developing countries to pursue a low-carbon development path. With developing nations expected to suffer the most from the effects of climate change, California and others have an obligation to share information and resources on cost-effective technologies and approaches for mitigating both emissions and future impacts as changes in climate and the environment occur.

California recognizes the "common but differentiated responsibilities" among developed and developing countries (as articulated in the Kyoto Protocol), but the reality is that rapidly escalating greenhouse gas emissions in developing countries could possibly negate any efforts undertaken in California. To the extent that we are part of the global economy, California's demand for goods manufactured in developing countries further exacerbates growth of greenhouse gas emissions globally. Therefore, it is critical for California to help support the adoption of low-carbon technologies and sustainable development in the developing world.

California can advance the international policy debate through state-provincial partnerships for achieving early climate action in developing countries. This approach envisions commitments by developed countries to provide capacity building through technological assistance and investment support in return for developing countries adopting enhanced mitigation actions. California will consider working with developing countries or provinces that have, at a minimum, pledged to achieve greenhouse gas intensity targets in certain carbon-intensive sectors through

mechanisms, such as minimum performance standards or sector benchmarks. California also recognizes that developing countries have the challenge and responsibility to reduce domestic emissions in a way that will promote sustainable development, but not undermine their economic growth.

One possible manifestation of these collaborations could be the establishment of sectoral agreements that help to grow developing countries' economies in a low-carbon manner. In a sectoral approach, energy-intensive sectors adopt programs for reducing greenhouse gas emissions and/or energy use. Such sector-based approaches seem likely to win the support of developing countries and could also reduce concerns in developed countries about international competitiveness and carbon leakage.

A state-provincial partnership related to imported commodities (such as cement) would enable California to provide incentives to reduce greenhouse gas emissions associated with products that are imported by our state. California should continue to develop current relations and existing partnership arrangements with China – now the largest emitter of greenhouse gases in the world – because in addition to other compelling reasons much of the state's imported cement originates in China. California should also work to establish similar relations with India and other countries to share research on both greenhouse gas mitigation and climate change adaptation activities. Projects in the Mexican border region may also be of particular interest, considering the opportunity to realize considerable co-benefits on both sides of the border.

Deforestation accounts for approximately 20 percent of global greenhouse gas emissions. California has set a strong precedent in the effort to incorporate forest management and conservation into climate policy by adopting the CCAR forest methodology in October 2007. California also hopes to engage developing countries, including Brazil and Indonesia, to reduce emissions and sequester carbon through eligible forest carbon activities. Activities aimed at Reducing Emissions from Deforestation and Forest Degradation (REDD) were excluded from the rules governing the first Kyoto commitment period, but there is considerable momentum behind the effort to include provisions that would recognize such activities in a post-2012 international agreement. Providing incentives to developing countries to help cut emissions by preserving standing forests, and to sequester additional carbon through the restoration and reforestation of degraded lands and forests and improved forest management practices, will be crucial in bringing those countries into the global climate protection effort. California recognizes the importance of establishing mechanisms that will facilitate global partnerships and sustainable financing mechanisms to support eligible forest carbon activities in the developing world.

B. Research

1. Unleash the Potential of California's Universities and Private Sector

Bringing greenhouse gas emissions down to a level that will allow the climate to stabilize will take a generation or longer. Many of the ultimate solutions to achieve stabilization will be developed and implemented well into the future. Innovation in energy and climate will come from people who are now in school. These young people will face unprecedented challenges, and they will need both wisdom and imagination to craft solutions. California's respected public and private academic institutions must continue to develop and fund programs based on climate change science that cut across disciplines to address the multi-dimensional aspects of climate change.

2. Public-Private Partnerships

To most effectively address the climate change dilemma, we must encourage collaborations between academia and the private sector. Industry is well-positioned to quickly attack problems. Combining the vast knowledge housed in universities with businesses' acumen and agility can unleash a powerful collaborative force to tackle the problems associated with climate change.

Several important programs have already been initiated at California universities, including Stanford's Global Climate and Energy Project and the University of California at Berkeley's Energy Biosciences Institute (EBI).[81] These and other efforts need to be recognized and encouraged, along with others that can link the results of research directly to policy decisions that the State must make.

Carbon Sequestration

In addition to terrestrial carbon sequestration or natural carbon sinks, such as forests and soil, CO_2 can be prevented from entering the atmosphere through carbon capture and storage (CCS). This consists of separating CO_2 from industrial and energy-related sources and transporting the CO_2 to a storage location for long-term isolation from the atmosphere. Potential technical storage methods include geological storage, industrial fixation of CO_2 into inorganic carbonates, and other strategies. Large point sources of CO_2 that may pursue CCS include large power plants, fossil fuel-based hydrogen production plants, and oil refineries.[82]

[81] The EBI is being developed in cooperation with Lawrence Berkeley National Laboratory, the University of Illinois at Urbana-Champaign and BP.

[82] Intergovernmental Panel on Climate Change. *Carbon Dioxide Capture and Storage: A Special Report of Working Group III of the IPCC*. Cambridge University Press, UK; 2005. http://www.ipcc.ch/ipccreports/srccs.htm (accessed October 12, 2008)

According to a 2005 report by the Intergovernmental Panel for Climate Change (IPCC), a power plant with CCS could reduce CO_2 emissions to the atmosphere by approximately 80 to 90 percent compared to a plant without CCS (including the energy used to capture, compress and transport CO_2).[83] While more research and development needs to occur, California should both support near-term advancement of the technology and ensure that an adequate framework is in place to provide credit for CCS projects when appropriate.

The State is currently an active member of the West Coast Regional Carbon Sequestration Partnership (WESTCARB), a public-private collaboration to characterize regional carbon sequestration opportunities in seven western states and one Canadian province. Established in 2003, this research project is comprised of more than 80 public and private organizations. WESTCARB is conducting technology validation field tests, identifying major sources of CO_2 in its territory, assessing the status and cost of technologies for separating CO_2 from process and exhaust gases, and determining the potential for storing captured CO_2 in secure geologic formations.[84]

C. Reducing California's Emissions Further – A Look Forward to 2030

In order to assess whether implementing this plan achieves the State's long-term climate goals, we must look beyond 2020 to see whether the emissions reduction measures set California on the trajectory needed to do our part to stabilize global climate.

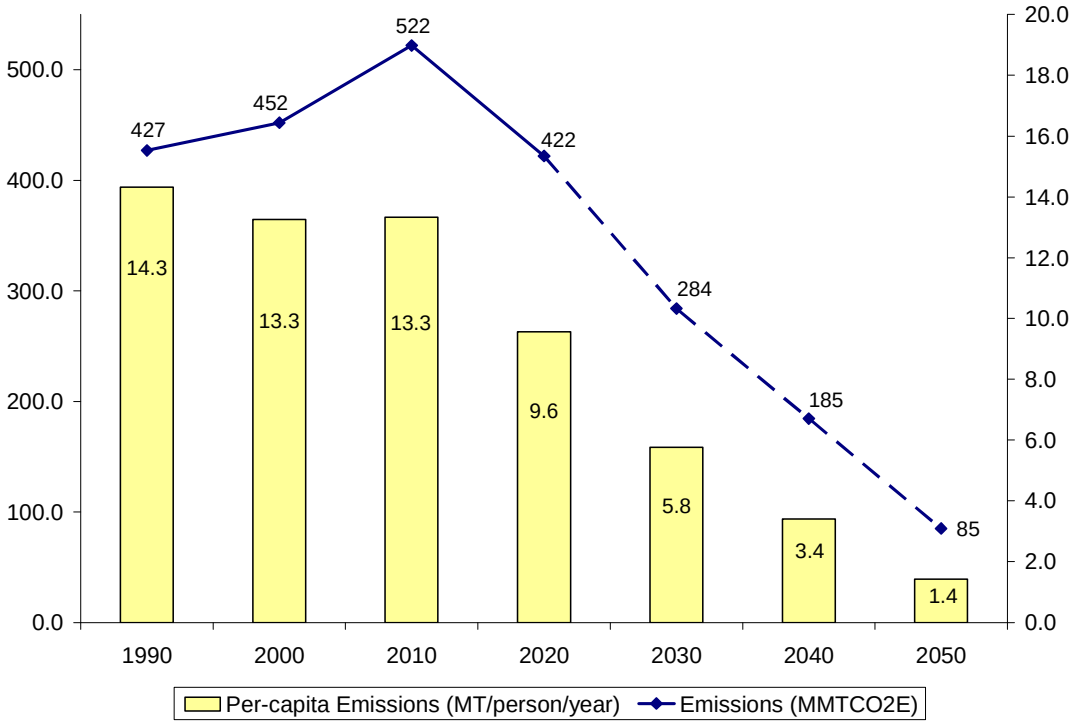
Governor Schwarzenegger's Executive Order S-3-05 calls for an 80 percent reduction below 1990 greenhouse gas emission levels by 2050. This results in a 2050 target of about 85 $MMTCO_2E$ (total emissions), as compared to the 1990 level (also the 2020 target) of 427 $MMTCO_2E$. Climate scientists tell us that the 2050 target represents the level of greenhouse gas emissions that advanced economies must reach if the climate is to be stabilized in the latter half of the 21st century. Full implementation of the Scoping Plan will put California on a path toward these required long-term reductions. Just as importantly, it will put into place many of the measures needed to keep us on that path.

Figure 6 depicts what an emissions trajectory might look like, assuming California follows a linear path from the 2020 AB 32 emissions target to the 2050 goal needed to help stabilize climate. While the measures needed to meet the 2050 goal are too far in the future to define in detail, we can examine the policies needed to keep us on track through at least 2030.

[83] Ibid

[84] WESTCARB. *WESTCARB Overview*. http://www.westcarb.org/about_overview.htm (accessed October 12, 2008)

Figure 6: Emissions Trajectory Toward 2050



To stay on course toward the 2050 target our State's greenhouse gas emissions need to be reduced to below 300 $MMTCO_2E$ by 2030. This translates to an average reduction of four percent per year between 2020 and 2030. An additional challenge comes from the fact that California's population is expected to grow by about 12 percent between 2020 and 2030. To counteract this trend, per-capita emissions must decrease at an average rate of slightly less than five percent per year during the 2020 to 2030 period.

Are such reductions possible by 2030? What measures might be able to provide the needed reductions? How do the needed measures relate to the efforts put into place to reach the 2020 goal? All of these are critical questions, and are addressed below.

The answer to the first question is yes, the reductions are possible. Furthermore, the measures needed are logical expansions of the programs recommended in the Scoping Plan that get us to the 2020 goal. We could keep on track through 2030 by extending those programs in the following ways:

- Using a regional or national cap-and-trade system to further limit emissions from the 85 percent of greenhouse gas emissions in capped sectors (Transportation Fuels and other fuel use, Electricity, Residential/Commercial Natural Gas, and Industry). By 2030 a comprehensive cap-and-trade program could lower emissions in the capped sectors from 365 $MMTCO_2E$ in 2020 to around 250 $MMTCO_2E$ in 2030;

- Achieving a 40 percent fleet-wide passenger vehicle reduction by 2030, approximately double the almost 20 percent expected in 2020;
- Increasing California's use of renewable energy;
- Reducing the carbon intensity of transportation fuels by 25 percent (a further decrease from the 10 percent level set for 2020);
- Increasing energy efficiency and green building efforts so that the savings achieved in the 2020 to 2030 timeframe are approximately double those accomplished in 2020; and
- Continuing to implement sound land use and transportation policies to lower VMT and shift travel modes.

The effects of these strategies are presented in Table 33.

Table 33: Potential Distribution of California Greenhouse Gas Emissions by Sector in 2030

Sector	Potential Emissions ($MMTCO_2E$)
Transportation Fuels*	102
Other Fuel Use*	149
Uncapped Sectors	33
Total	**284**

* Capped sector

With these polices and measures in place, per-capita electricity consumption would decrease by another five percent. Well over half of our electricity demand could be met with zero or near zero greenhouse gas emitting technologies, assuming nuclear and large hydro power holds constant at present-day levels. In response to a lower cap on emissions, existing coal generation contracts would not be renewed, or carbon capture and storage would be utilized to minimize emissions. The remaining electricity generation would come from natural gas combustion either in cogeneration applications or from highly efficient generating units.

By 2030, the transportation sector would undergo a similarly massive transition both in terms of the vehicle fleet and the diversity of fuel supplies. Due to the combination of California's clean car standards (ARB's ZEV program and the Low Carbon Fuel Standard), the number of battery-electric vehicles, plug-in hybrid electric vehicles, and fuel cell vehicles would increase dramatically, to about a third of the vehicle fleet. Flex-fuel vehicles would comprise a large fraction of the remaining fleet, with more efficient gasoline and diesel vehicles making up the difference. Electricity, advanced biofuels, improved gasoline and diesel, renewable natural gas and hydrogen would all play a role in powering this high-tech fleet of efficient vehicles.

Regional land use and transportation strategies would grow in importance and would reverse the trend of per-capita vehicle miles traveled, a reduction of about eight percent below business-as-usual in 2030. With ambitious but reasonable action, statewide passenger vehicle greenhouse gas emissions could be reduced to half of 2020 levels in 2030, which is also about half of business-as-usual for 2030. Efficiency strategies and low carbon fuels for heavy-duty and off-road vehicles, as well as for ships, rail, and aviation, would need to be greatly expanded in order to achieve additional reductions from the transportation sector in 2030.

In tandem with efficiency measures that lower demand for electricity, natural gas and transportation fuels, California's cap-and-trade program would incent large industrial sources as well as commercial and residential natural gas customers to further reduce emissions. By tightening the cap over time, it is expected that facilities in the industrial and natural gas sectors would achieve reductions well beyond those needed to meet the 2020 emissions cap.

The Scoping Plan proposes several measures for reducing high GWP gases that collectively, will substantially reduce emissions. With a transition toward reduced consumption of these gases, improved containment in their end uses, and substitution of low GWP alternative gases, it is expected that emissions from this sector could decrease by 75 percent between 2020 and 2030.

For uncapped sectors, we assume that the agriculture sector will reduce emissions by about 15 percent between 2020 and 2030. Net forest uptake of CO_2 must be preserved or enhanced, likely through both expansion of forests and reduction in carbon loss from forest fires, which are predicted to increase over this time period. This example assumes a 10 percent reduction in direct landfill emissions from the recycling and waste sector; however, aggressive implementation of the suite of measures proposed in this Plan could further reduce emissions from this sector by 2030.

In total, the measures described above would produce reductions to bring California's statewide greenhouse gas emissions to an estimated 284 $MMTCO_2E$ in 2030. While the potential mix of future climate policies articulated in this section is only an example, it serves to demonstrate that the measures in the Scoping Plan can not only move California to its 2020 goal, but also provide an expandable framework for much greater long-term greenhouse gas emissions reductions.

D. Conclusion

California's commitment to address global warming has never been greater. The vast amount of interest, support, and input that ARB has received since this plan began to take shape is evidence of a clear understanding of the need to take action and support for the State's efforts to lead the way. The time has come to shift away from a 'business-as-usual' approach to climate change and to move toward the lasting and sustainable goal of a clean energy future.

Reaching our goals will take a great deal of leadership, commitment, and a willingness to embrace new approaches and seek out new solutions. California's plan to reduce greenhouse gas emissions must also take into account the impacts of this transition and be designed in particular to address the needs of low-income communities, small businesses, and California's working families.

Reaching our goals will also require involvement and support from all levels of government in California, and a coordinated effort with other states, regions, and countries. The solutions and technologies we develop here will be used around the world to help others transition to a clean energy future and contribute to the fight against global warming.

Reaching our goals will also require flexibility. As we move forward, we must be prepared to make mid-course corrections. AB 32 wisely requires ARB to update its Scoping Plan every five years, thereby ensuring that California stays on the path toward a low carbon future.

This plan is part of a new chapter for California that in many ways began with the passage and signing of AB 32. It proposes a comprehensive set of actions designed to reduce greenhouse gas emissions in California, improve our environment, reduce our dependence on oil, diversify our energy sources, save energy, create new jobs, and enhance public health. The challenge California has taken on is large but the opportunities are even greater. It is now time to turn this plan into action.

ACKNOWLEDGMENTS

This Scoping Plan was prepared by the Air Resources Board. This document was made possible by the hard work of numerous contributors. Below is a list of advisory committees and State agencies that directly provided input to this Scoping Plan.

Team Support

Climate Action Team

Climate Action Team Sector Subgroups

- Agriculture
- Cement
- Energy
- Forest
- Green Buildings
- Land Use
- Recycling and Waste Management
- State Fleet
- Water-Energy
- Economics

Advisory Committees

Market Advisory Committee

Environmental Justice Advisory Committee

Economic and Technology Advancement Advisory Committee

State Agencies

Governor's Office of Planning and Research

California Environmental Protection Agency

Business, Transportation and Housing Agency

Resources Agency

State and Consumer Services Agency

Department of Food and Agriculture

California Energy Commission

California Public Utilities Commission

California Transportation Commission

Department of Conservation

Department of Forestry and Fire Protection

Department of General Services

Department of Parks and Recreation

Department of Public Health

Department of Toxic Substances Control

Department of Transportation

Department of Water Resources

Housing and Community Development

Integrated Waste Management Board

Office of Environmental Health Hazard Assessment

State Water Resources Control Board

Department of Pesticide Regulation

BOARD RESOLUTION

State of California
Air Resources Board

Climate Change Scoping Plan

Resolution 08-47

December 11, 2008

Agenda Item No.: 08-10-2

WHEREAS, the Legislature has enacted the Global Warming Solutions Act of 2006 (AB 32; Health and Safety Code section 38500 et seq.), which declares that global warming poses a serious threat to the environment of California and creates a comprehensive multi-year program to reduce greenhouse gas (GHG) emissions that cause global warming;

WHEREAS, the adverse impacts of climate change include more droughts, more frequent and extreme heat waves, erratic storm and flood events, decreases in winter snowpack, a rise in sea level, increases in water temperatures, an increase in coastal erosion, intrusion of sea water, an increase in the duration of wildfire season, and increased occurrences of unhealthy ozone levels;

WHEREAS, climate change mitigation and adaptation measures can be complementary and are often intricately linked;

WHEREAS, AB 32 designates the Air Resources Board (ARB or the Board) as the State agency charged with monitoring and regulating sources of GHG emissions in California in order to reduce these emissions;

WHEREAS, section 38561(a) of the Health and Safety Code directs the Board, on or before January 1, 2009, to prepare and approve a Scoping Plan for achieving the maximum technologically feasible and cost-effective reductions in GHG emissions by 2020;

WHEREAS, section 38561(a) of the Health and Safety Code also requires ARB to consult with all State agencies having jurisdiction over sources of GHGs on all elements of the Scoping Plan that pertain to energy-related matters, to ensure reduction activities adopted and implemented by ARB are complementary, non-duplicative and can be implemented in an efficient and cost-effective manner;

WHEREAS, section 38561(b) of the Health and Safety Code requires the Scoping Plan to identify and make recommendations on direct emission reduction measures, alternative compliance mechanisms, market-based compliance mechanisms, and potential monetary and nonmonetary incentives for sources and categories of sources that the Board finds necessary or desirable to facilitate the achievement of the maximum feasible and cost-effective reductions of GHG emissions by 2020;

WHEREAS, section 38561(c) of the Health and Safety Code requires ARB to consider all relevant information pertaining to greenhouse gas emissions reduction programs in other states, localities, and nations, including the northeastern states of the United States, Canada and the European Union in making the determinations required in Health and Safety Code section 38561(b);

WHEREAS, section 38561(d) of the Health and Safety Code requires ARB to evaluate the total potential costs and total potential economic and noneconomic benefits of the Scoping Plan to California's economy, environment, and public health, using the best available economic models, emissions estimation techniques, and other scientific methods;

WHEREAS, section 38561(e) of Health and Safety Code requires ARB, in developing its plan, to take into account the relative contribution of each source or source category to statewide GHG emissions, and the potential for adverse effects on small businesses, and to recommend a de minimis threshold of GHG emissions below which emission reduction requirements will not apply;

WHEREAS, section 38561(f) of the Health and Safety Code requires ARB, in developing its plan, to identify opportunities for emission reductions measures from all verifiable and enforceable voluntary actions, including, but not limited to, carbon sequestration projects and best management practices;

WHEREAS, section 38561(g) of the Health and Safety Code requires ARB to conduct a series of public workshops to give interested parties an opportunity to comment on the Scoping Plan, and that a portion of these workshops should take place in regions that have the most significant exposure to air pollution, including, but not limited to communities with minority populations, communities with low-income populations, or both;

WHEREAS, section 38652(b) of the Health and Safety Code requires ARB, in adopting greenhouse gas regulations, to the extent feasible and in furtherance of achieving the statewide greenhouse gas emissions limit, to design the regulations in a manner that is equitable and seeks to minimize costs and maximize the total benefits to California; ensure that activities taken to comply with the regulations do not disproportionately impact low-income communities; ensure that activities undertaken pursuant to the regulations complement efforts to achieve and maintain ambient air quality standards and to reduce toxic air contaminant emissions; consider the cost-effectiveness of the regulations; consider overall societal benefits; minimize administrative burden; and minimize leakage;

WHEREAS, section 38565 of the Health and Safety Code requires ARB to ensure that greenhouse gas emission reduction rules, regulations, programs, mechanisms and incentives under ARB's jurisdiction, where applicable and to the extent feasible, direct public and private investment toward the most disadvantaged communities in California;

WHEREAS, sections 39600 and 39601 of the Health and Safety Code authorize the ARB to adopt standards, rules and regulations and to do such acts as may be necessary for the proper execution of the powers and duties granted to and imposed upon the ARB by law;

WHEREAS, ARB has adopted and is implementing numerous programs to reduce criteria pollutants, diesel particulate, and air toxics emissions, including the 2007 State Implementation Plan, the Goods Movement Emissions Reduction Plan, and the Diesel Risk Reduction Plan;

WHEREAS, local air pollution control and air quality management districts are currently responsible for implementing many programs that regulate air pollution from stationary and area sources;

WHEREAS, the Board acknowledges the importance of ensuring adequate and reliable energy supplies while the State implements AB 32;

WHEREAS, in preparing the Proposed Scoping Plan, ARB staff considered advice and input from the Environmental Justice Advisory Committee and the Economic and Technology Advancement Advisory Committee;

WHEREAS, in June 2008 ARB staff prepared and circulated for public review a *Draft Climate Change Scoping Plan* (Draft Plan); staff then held three public workshops to discuss the Draft Plan, considered public comments received on the Draft Plan, and modified the Draft Plan in response to these comments;

WHEREAS, in October 2008 ARB staff prepared and circulated for public review a *Proposed Climate Change Scoping Plan*, in accordance with the requirements set forth in Health and Safety Code section 38561;

WHEREAS, the California Environmental Quality Act (CEQA) requires that no project which may have significant adverse environmental impacts may be adopted as originally proposed if feasible alternatives or mitigation measures are available to reduce or eliminate such impacts, unless specific overriding considerations are identified which outweigh the potential adverse consequences of any unmitigated impacts;

WHEREAS, CEQA allows public agencies to prepare a plan or other written documentation in lieu of an environmental impact report (i.e., a functional equivalent environmental document), once the Secretary of the Resources Agency has certified an agency's regulatory program pursuant to section 21080.5 of the Public Resources Code;

WHEREAS, pursuant to section 21080.5 of the Public Resources Code, the Secretary of the Resources Agency has certified that portion of ARB's regulatory program that

involves the adoption, approval, amendment, or repeal of standards, rules, regulations, or plans;

WHEREAS, Board regulations under ARB's certified regulatory program provide that prior to taking final action on any proposal for which significant environmental issues have been raised, the decision maker shall approve a written response to each such issue;

WHEREAS, on October 15, 2008, ARB staff prepared and circulated for public review, in accordance with CEQA and Board regulations, a functional equivalent environmental document which is set forth in Appendix J to the *Proposed Climate Change Scoping Plan*;

WHEREAS in consideration of the *Proposed Climate Change Scoping Plan*, the written and oral testimony presented by the public, industry and government agencies, and the environmental documentation prepared by Board staff, the Board finds that:

1. ARB staff has consulted with all State agencies, including the Public Utilities Commission (PUC) and the State Energy Resources Conservation and Development Commission (CEC), having jurisdiction over sources of greenhouse gases on all elements of the Plan that pertain to energy-related matters, as required by Health and Safety Code section 38561(a);

2. ARB has carefully considered the joint opinion adopted by the PUC and CEC on October 17, 2008, which recommends strategies to help reduce greenhouse gas emissions from the electricity and natural gas sectors;

3. The recommendations in the *Proposed Scoping Plan* are necessary or desirable to facilitate the achievement of the maximum feasible and cost-effective reductions of greenhouse gas emissions by 2020;

4. ARB has considered all relevant information pertaining to greenhouse gas emissions reduction programs in other states, localities, and nations, including the northeastern states of the United States, Canada and the European Union, as provided in Health and Safety Code section 38561(c);

5. ARB staff prepared an analysis to evaluate the total potential costs and total potential economic and noneconomic benefits of the *Proposed Climate Change Scoping Plan* to California's economy, environment, and public health; this analysis was prepared using the best available economic models, emissions estimation techniques, and other scientific methods, as required by Health and Safety Code section 38561(d);

6. In developing the *Proposed Climate Change Scoping Plan*, ARB took into account the relative contribution of each source or source category to

statewide GHG emissions, and the potential for adverse effects on small businesses, as provided in Health and Safety Code section 38561(e);

7. The *Proposed Climate Change Scoping Plan* recommends a de minimis threshold of GHG emissions below which emission reduction requirements will not apply, as provided in Health and Safety Code section 38561(e);

8. The *Proposed Climate Change Scoping Plan* identifies opportunities for emission reductions measures from all verifiable and enforceable voluntary actions, as provided in Health and Safety Code section 38561(f);

9. In accordance with Health and Safety Code section 38561(g), ARB staff organized over 250 public workshops, workgroup events and formal meetings throughout the State, and participated in over 350 meetings and conferences involving external stakeholders, including workshops in regions of the state that have the most significant exposure to air pollutants;

10. The *Proposed Climate Change Scoping Plan* meets all of the requirements of AB 32.

WHEREAS, pursuant to the requirements of the California Environmental Quality Act and the Board's regulations under its certified regulatory program, the Board further finds that:

11. ARB staff prepared a functional equivalent environmental document for the *Proposed Climate Change Scoping Plan* which indicates that there may be potential adverse environmental impacts from the measures included in the Plan; however, these impacts are speculative and cannot be quantified or further described until the details of the measures are developed and set forth in actual proposed regulations;

12. The Board has considered alternatives to the measures identified in the *Proposed Climate Change Scoping Plan* and has identified no feasible alternatives at this time which would reduce or eliminate any potential adverse environmental impacts, while at the same time ensuring that necessary reductions in greenhouse gas emissions will be achieved;

13. At this time there are no feasible mitigation measures that ARB can impose to lessen the potential adverse impacts of the *Proposed Climate Change Scoping Plan* on the environment, and no less stringent alternatives that will accomplish the goals imposed by AB 32 with fewer potential environmental impacts;

14. None of modifications to the *Proposed Climate Change Scoping Plan* alter any of the conclusions reached in the functional equivalent environmental

document, or would require recirculation of the document as provided in CEQA Guidelines section 15088.5;

15. The potential adverse environmental impacts of the measures included in the *Proposed Climate Change Scoping Plan* are outweighed by the substantial reduction in greenhouse gas emissions and public health benefits that will result from their adoption and implementation;

16. The considerations identified above override any adverse environmental impacts that may occur from adoption and implementation of the *Proposed Climate Change Scoping Plan*;

17. As regulations implementing the *Proposed Climate Change Scoping Plan* are developed, detailed environmental impact analyses, including a discussion of regulatory alternatives and mitigation measures, will be performed as part of the rulemaking process;

18. As regulations implementing the *Proposed Climate Change Scoping Plan* are developed, specific economic impact analyses will be performed in conjunction with the rulemaking process and will be considered by the Board in acting on those regulations;

19. In accordance with Public Resources Code 21081(a)(2), for Scoping Plan measures that are within the responsibility and jurisdiction of another public agency, that agency shall be responsible for completing the appropriate environmental review and, with respect to each significant effect identified in the environmental review, shall be responsible for adopting feasible changes or alterations to the measures to mitigate or avoid, as appropriate, the significant environmental effects that have been identified. An initial list of agencies responsible for Plan measures is included in Appendix C of the Plan.

20. ARB regulations which have been adopted and are included in the measures recommended in the *Proposed Climate Change Scoping Plan* were subjected to environmental review by the Board at the time of their adoption and no further analysis is required at this time; and

21. The Executive Officer is the decision maker for the purposes of responding to environmental issues raised on the *Proposed Climate Change Scoping Plan,* and by approving this Resolution 08-47 the Board is not prejudging any of the responses that will be made by the Executive Officer to these environmental issues.

NOW, THEREFORE, BE IT RESOLVED, that subject to the Executive Officer's approval of written responses to environmental issues that have been raised, the Board is initiating steps toward the final approval of the *Proposed Climate Change Scoping*

Plan and its Appendices, as set forth in Attachments A and B hereto, with the modifications identified at the December 11, 2008 public hearing.

BE IT FURTHER RESOLVED that the Executive Officer is the decision maker for the purposes of title 17, California Code of Regulations, section 60007; the Board directs the Executive Officer to prepare and approve written responses to all significant environmental issues that have been raised, and then to either: (1) return the *Proposed Climate Change Scoping Plan* to the Board for further consideration if it is determined that such action is warranted, or (2) take final action to approve the *Proposed Climate Change Scoping Plan* with the modifications identified at the December 11, 2008 public hearing, any conforming modifications that may be appropriate, and any modifications that are necessary to ensure that all feasible measures or feasible alternatives that would substantially reduce any significant adverse environmental impacts have been incorporated into the final action.

BE IT FURTHER RESOLVED that once final action has been taken by the Executive Officer to approve the *Climate Change Scoping Plan*, as agreed to and modified by the Board, the Board directs the Executive Officer to make the modified Plan available to the public.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to perform the environmental analyses required by CEQA in conjunction with future rulemaking actions to implement the *Climate Change Scoping Plan*, and to ensure that the potential environmental impacts identified in the Plan, and any other impacts are subsequently identified, are avoided or mitigated to the extent feasible.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to ensure that the requirements of Health and Safety Code section 38562(b) are met for all proposed regulations to implement the *Climate Change Scoping Plan*, and that the requirements of Health and Safety Code section 38570(b) are met for all proposed regulations to implement market-based compliance mechanisms.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to design greenhouse gas regulations that affect stationary sources so that they utilize, to the extent practicable and appropriate, local air district permitting programs and compliance determination mechanisms.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to provide funding to the local air districts using State funding mechanisms to reimburse districts for involvement in specific, identified activities related to implementation and enforcement of greenhouse gas emission reduction measures.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to develop a joint workplan with the local air districts to define how to efficiently and effectively implement and administer the Scoping Plan.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to develop a program to provide GHG emissions verifier training without cost to District staff who meet required education and experience qualifications.

BE IT FURTHER RESOLVED that the Board recognizes that emission sources subject to ARB's mandatory reporting regulation must report directly to the State and directs the Executive Officer to develop a software tool that will allow the export of data to the districts.

BE IT FURTHER RESOLVED that the Board recognizes that consistent implementation and enforcement of greenhouse gas emission reduction programs is crucial to minimize administrative burdens and that the future cap-and-trade program, including reporting and verification of offsets, should be administered at the state level.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to establish a working group of public health agencies and organizations, including, but not limited to, the Department of Public Health, the Office of Environmental Health Hazard Assessment, and local public health agencies, to review and provide input to the staff on proposed greenhouse gas reduction measures.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to develop a methodology using available information to assess the potential cumulative air pollution impacts of proposed regulations to implement the Scoping Plan.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to identify communities already adversely impacted by air pollution as specified in Health and Safety Code section 38570 (b)(1) before the adoption of a cap-and-trade program.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to design the implementation of AB 32, including the cap-and-trade system, to complement California's criteria and toxic air contaminant programs and be consistent with ARB's environmental justice policies, in furtherance of achieving the statewide greenhouse gas emissions limit.

BE IT FURTHER RESOLVED that the Board recognizes that through the SB 375 (Stats. 2008, Chapter 728) process, local governments and transportation agencies are key partners in ARB's efforts to reduce greenhouse gas emissions, that improved land use and transportation planning is needed to provide Californians with affordable, high quality options for housing and mobility that will result in reduced greenhouse gas emissions, and that the greenhouse gas reductions associated with more sustainable growth will increase over time.

BE IT FURTHER RESOLVED that the Board recognizes that the technical work of the SB 375 Regional Targets Advisory Committee (RTAC) is critical to building a solid foundation for Board consideration of regional targets.

BE IT FURTHER RESOLVED that as input to the SB 375 target setting process, the RTAC should recommend a method to evaluate the full potential for reducing greenhouse gas emissions in each major region of the state, and statewide, using improved land use patterns, indirect source rules, enhanced bike, walk, and transit infrastructure, and pricing policies where applicable (including congestion, toll, and parking pricing). This evaluation should be done for 2020 and 2035, employ the best available data and models, and identify barriers to achieving this full potential.

BE IT FURTHER RESOLVED that it is the Board's intent that the greenhouse gas emission reductions associated with the SB 375 regional targets represent the most ambitious achievable targets. The estimated reductions in the Scoping Plan will be adjusted to reflect the outcome of the Board's decision on SB 375 targets.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to solicit input from experts to advise ARB on its continuing evaluation of the economic effects of implementing AB 32, including identification of additional models or other economic analysis tools that could be used in the ongoing economic analysis. This will include opportunities for interested parties to share their economic modeling results.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to consider the effects of the program on the overall California economy as staff develops the cap-and-trade regulations and to take into account the joint opinion adopted by the PUC and the CEC on October 17, 2008, while recognizing that the joint opinion was developed based on consideration of the electricity and natural gas sectors, and that the recommendations in the opinion may need to be adapted to meet the needs of the California economy as a whole.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to solicit expert input on key questions related to the distribution or auction of allowances and the use of revenue.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer, as part of the cap-and-trade rulemaking, to consider the economic implications of different cap-and-trade program design options, including:

- various scenarios for allowance distribution (percent auction vs. free distribution, method of distribution);
- various scenarios for the use of auction revenue;
- the initial cap level and the rate of decline of the cap over time;
- the potential supply of offsets within and outside California; and

- the economic and co-benefit effects of limits on the use of offsets.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to coordinate the economic analysis of California's AB 32 program with the analysis conducted for the Western Climate Initiative.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to work with California small businesses during the development of Scoping Plan regulations, to consider the size of the business and type of industry in developing the regulations, and to identify financing programs that could help alleviate costs to small businesses.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to work with the CEC, the PUC and other agencies, as appropriate, to ensure that California's energy demands are met, and that the Scoping Plan and AB 32 are implemented in a manner to avoid disproportionate geographic impacts on energy rates.

BE IT FURTHER RESOLVED that the Board is committed to a cap-and-trade program as an important component of California's comprehensive program to achieve greenhouse gas reductions.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to consider the economic and public health impacts of proposed regulations to implement the Scoping Plan, as well as the requirements of section 38562(b) and 38570(b), as appropriate. For sector-specific regulations affecting sources that are also included in the cap-and-trade program, the staff shall also propose findings to identify the reasons that the emission reductions are best achieved using the proposed regulatory approach.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer, by December 31, 2009, to examine and report on:

- estimates of overall costs and savings and the cost-effectiveness of the reductions, including appropriate inclusion of reductions in co-pollutants;
- estimates of the timing of capital investments, annual expenditures to repay those investments, and the resulting cost savings;
- sensitivity of the results to changes in key inputs, including energy price forecasts and estimates of measure costs and savings; and
- impacts on small businesses.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to update the Board on the public health impacts of climate change as well as the impacts of potential measures that may be taken to mitigate climate change.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to report on the status of the Early Action Measures.

BE IT FURTHER RESOLVED that the Board, in coordination with California Environmental Protection Agency and other state agencies, will take responsibility for the tracking of Scoping Plan implementation and the development of accounting systems to promote consistency and avoid double counting of emission reductions, especially across sectors, to ensure achievement of the AB 32 goals.

BE IT FURTHER RESOLVED that the Board directs the Executive Officer to report on the status of Scoping Plan implementation to the Board twice a year.

I hereby certify that the above is a true and correct copy of Resolution 08-47, as adopted by the Air Resources Board.

Monica Vejar

Monica Vejar, Clerk of the Board

Climate Change, the California Environmental Quality Act, and General Plan Updates: Straightforward Answers to Some Frequently Asked Questions
California Attorney General's Office

At any given time in this State, well over one hundred California cities and counties are updating their general plans. These are complex, comprehensive, long-term planning documents that can be years in the making. Their preparation requires local governments to balance diverse and sometimes competing interests and, at the same time, comply with the Planning and Zoning Law and the California Environmental Quality Act (CEQA).

Local governments have decades of experience in applying state planning law and excellent resources to assist them – such as the "General Plan Guidelines" issued by The Governor's Office of Planning and Research (OPR).[1] They are also practiced in assessing whether general plans may have significant localized environmental effects, such as degradation of air quality, reductions in the water supply, or growth inducing impacts. The impact of climate change, however, has only fairly recently shown up on the CEQA radar.

The fact that climate change presents a new challenge under CEQA has not stopped local governments from taking action. A substantial number of cities and counties already are addressing climate change in their general plan updates and accompanying CEQA documents. These agencies understand the substantial environmental and administrative benefits of a programmatic approach to climate change. Addressing the problem at the programmatic level allows local governments to consider the "big picture" and – provided it's done right – allows for the streamlined review of individual projects.[2]

Guidance addressing CEQA, climate change, and general planning is emerging, for example, in the pending CEQA Guideline amendments,[3] comments and settlements by the Attorney General, and in the public discourse, for example, the 2008 series on CEQA and Global Warming organized by the Local Government Commission and sponsored by the Attorney General. In addition, the Attorney General's staff has met informally with officials and planners from numerous jurisdictions to discuss CEQA requirements and to learn from those who are leading the fight against global warming at the local level.

Still, local governments and their planners have questions. In this document, we attempt to answer some of the most frequently asked of those questions. We hope this document will be useful, and we encourage cities and counties to contact us with any additional questions, concerns, or comments.

- **Can a lead agency find that a general plan update's climate change-related impacts are too speculative, and therefore avoid determining whether the project's impacts are significant?**

  No. There is nothing speculative about climate change. It's well understood that (1) greenhouse gas (GHG) emissions increase atmospheric concentrations of GHGs; (2) increased GHG concentrations in the atmosphere exacerbate global warming; (3) a project that adds to the atmospheric load of GHGs adds to the problem.

  Making the significance determination plays a critical role in the CEQA process.[4] Where a project may have a significant effect on the environment, the lead agency must prepare an Environmental Impact Report (EIR).[5] Moreover, a finding of significance triggers the obligation to consider alternatives and to impose feasible mitigation.[6] For any project under CEQA, including a general plan update, a lead agency therefore has a fundamental obligation to determine whether the environmental effects of the project, including the project's contribution to global warming, are significant.

- **In determining the significance of a general plan's climate change-related effects, must a lead agency estimate GHG emissions?**

  Yes. As OPR's Technical Advisory states:

  > Lead agencies should make a good-faith effort, based on available information, to calculate, model, or estimate the amount of CO2 and other GHG emissions from a project, including the emissions associated with vehicular traffic, energy consumption, water usage and construction activities.[7]

  In the context of a general plan update, relevant emissions include those from government operations, as well as from the local community as a whole. Emissions sources include, for example, transportation, industrial facilities and equipment, residential and commercial development, agriculture, and land conversion.

  There are a number of resources available to assist local agencies in estimating their current and projected GHG emissions. For example, the California Air Resources Board (ARB) recently issued protocols for estimating emissions from local government operations, and the agency's protocol for estimating community-wide emissions is forthcoming.[8] OPR's Technical Advisory contains a list of modeling tools to estimate GHG emissions. Other sources of helpful information include the white paper issued by the California Air Pollution Control Officers Association (CAPCOA), "CEQA and Climate Change"[9] and the Attorney General's website,[10] both of which provide information on currently available models for calculating emissions. In addition, many cities and counties are working with the International Council for Local Environmental Initiatives (ICLEI)[11] and tapping into the expertise of this State's many colleges and universities.[12]

- **For climate change, what are the relevant "existing environmental conditions"?**

  The CEQA Guidelines define a significant effect on the environment as "a substantial adverse change in the physical conditions which exist in the area affected by the proposed project."[13]

  For local or regional air pollutants, existing physical conditions are often described in terms of air quality (how much pollutant is in the ambient air averaged over a given period of time), which is fairly directly tied to current emission levels in the relevant "area affected." The "area affected," in turn, often is defined by natural features that hold or trap the pollutant until it escapes or breaks down. So, for example, for particulate matter, a lead agency may describe existing physical conditions by discussing annual average PM10 levels, and high PM10 levels averaged over a 24-hour period, detected at various points in the air basin in the preceding years.

  With GHGs, we're dealing with a global pollutant. The "area affected" is both the atmosphere and every place that is affected by climate change, including not just the area immediately around the project, but the region and the State (and indeed the planet). The existing "physical conditions" that we care about are the current atmospheric concentrations of GHGs and the existing climate that reflects those concentrations.

  Unlike more localized, ambient air pollutants which dissipate or break down over a relatively short period of time (hours, days or weeks), GHGs accumulate in the atmosphere, persisting for decades and in some cases millennia. The overwhelming scientific consensus is that in order to avoid disruptive and potentially catastrophic climate change, then it's not enough simply to stabilize our annual GHG emissions. The science tells us that we must <u>immediately and substantially reduce</u> these emissions.

- **If a lead agency agrees to comply with AB 32 regulations when they become operative (in 2012), can the agency determine that the GHG-related impacts of its general plan will be less than significant?**

  <u>No.</u> CEQA is not a mechanism merely to ensure compliance with other laws, and, in addition, it does not allow agencies to defer mitigation to a later date. CEQA requires lead agencies to consider the significant environmental effects of their actions and to mitigate them today, if feasible.

  The decisions that we make today do matter. Putting off the problem will only increase the costs of any solution. Moreover, delay may put a solution out of reach at any price. The experts tell us that the later we put off taking real action to reduce our GHG emissions, the less likely we will be able to stabilize atmospheric concentrations at a level that will avoid dangerous climate change.

- **Since climate change is a global phenomenon, how can a lead agency determine whether the GHG emissions associated with its general plan are significant?**

  The question for the lead agency is whether the GHG emissions from the project – the general plan update – are considerable when viewed in connection with the GHG emissions from past projects, other current projects, and probable future projects.[14] The effects of GHG emissions from past projects and from current projects to date are reflected in current atmospheric concentrations of GHGs and current climate, and the effects of future emissions of GHGs, whether from current projects or existing projects, can be predicted based on models showing future atmospheric GHG concentrations under different emissions scenarios, and different resulting climate effects.

  A single local agency can't, of course, solve the climate problem. But that agency can do its fair share, making sure that the GHG emissions from projects in its jurisdiction and subject to its general plan are on an emissions trajectory that, if adopted on a larger scale, is consistent with avoiding dangerous climate change.

  Governor Schwarzenegger's Executive Order S-3-05, which commits California to reducing its GHG emissions to 1990 levels by 2020 and to eighty percent below 1990 levels by 2050, is grounded in the science that tells us what we must do to achieve our long-term climate stabilization objective. The Global Warming Solutions Act of 2006 (AB 32), which codifies the 2020 target and tasks ARB with developing a plan to achieve this target, is a necessary step toward stabilization.[15] Accordingly, the targets set in AB 32 and Executive Order S-3-05 can inform the CEQA analysis .

  One reasonable option for the lead agency is to create community-wide GHG emissions targets for the years governed by the general plan. The community-wide targets should align with an emissions trajectory that reflects aggressive GHG mitigation in the near term and California's interim (2020) [16] and long-term (2050) GHG emissions limits set forth in AB 32 and the Executive Order.

  To illustrate, we can imagine a hypothetical city that has grown in a manner roughly proportional to the state and is updating its general plan through 2035. The city had emissions of 1,000,000 million metric tons (MMT) in 1990 and 1,150,000 MMT in 2008. The city could set an emission reduction target for 2014 of 1,075,000 MMT, for 2020 of 1,000,000 MMT, and for 2035 of 600,000 MMT, with appropriate emission benchmarks in between. Under these circumstances, the city could in its discretion determine that an alternative that achieves these targets would have less than significant climate change impacts.

- **Is a lead agency required to disclose and analyze the full development allowed under the general plan?**

  Yes. The lead agency must disclose and analyze the full extent of the development allowed by the proposed amended general plan,[17] including associated GHG emissions.

This doesn't mean that the lead agency shouldn't discuss the range of development that is likely to occur as a practical matter, noting, for example, the probable effect of market forces. But the lead agency can't rely on the fact that full build out may not occur, or that its timing is uncertain, to avoid its obligation to disclose the impacts of the development that the general plan would permit. Any other approach would seriously underestimate the potential impact of the general plan update and is inconsistent with CEQA's purposes.

- **What types of alternatives should the lead agency consider?**

  A city or county should, if feasible, evaluate at least one alternative that would ensure that the community contributes to a lower-carbon future. Such an alternative might include one or more of the following options:

  - higher density development that focuses growth within existing urban areas;
  - policies and programs to facilitate and increase biking, walking, and public transportation and reduce vehicle miles traveled;
  - the creation of "complete neighborhoods" where local services, schools, and parks are within walking distance of residences;
  - incentives for mixed-use development;
  - in rural communities, creation of regional service centers to reduce vehicle miles traveled;
  - energy efficiency and renewable energy financing (see, e.g., AB 811)[18]
  - policies for preservation of agricultural and forested land serving as carbon sinks;
  - requirements and ordinances that mandate energy and water conservation and green building practices; and
  - requirements for carbon and nitrogen-efficient agricultural practices.

  Each local government must use its own good judgment to select the suite of measures that best serves that community.

- **Can a lead agency rely on policies and measures that simply "encourage" GHG efficiency and emissions reductions?**

  No. Mitigation measures must be "fully enforceable."[19] Adequate mitigation does not, for example, merely "encourage" or "support" carpools and transit options, green building practices, and development in urban centers. While a menu of hortatory GHG policies is positive, it does not count as adequate mitigation because there is no certainty that the policies will be implemented.

  There are many concrete mitigation measures appropriate for inclusion in a general plan and EIR that can be enforced as conditions of approval or through ordinances. Examples are described in a variety of sources, including the CAPCOA's white paper,[20] OPR's Technical Advisory,[21] and the mitigation list on the Attorney General's website.[22] Lead agencies should also consider consulting with other cities and counties that have recently completed general plan updates or are working on Climate Action Plans.[23]

- **Is a "Climate Action Plan" reasonable mitigation?**

  Yes. To allow for streamlined review of subsequent individual projects, we recommend that the Climate Action Plan include the following elements: an emissions inventory (to assist in developing appropriate emission targets and mitigation measures); emission targets that apply at reasonable intervals through the life of the plan; enforceable GHG control measures; monitoring and reporting (to ensure that targets are met); and mechanisms to allow for the revision of the plan, if necessary, to stay on target.[24]

  If a city or county intends to rely on a Climate Action Plan as a centerpiece of its mitigation strategy, it should prepare the Climate Action Plan at the same time as its general plan update and EIR. This is consistent with CEQA's mandate that a lead agency must conduct environmental review at the earliest stages in the planning process and that it not defer mitigation. In addition, we strongly urge agencies to incorporate any Climate Action Plans into their general plans to ensure that their provisions are applied to every relevant project.

- **Is a lead agency also required to analyze how future climate change may affect development under the general plan?**

  Yes. CEQA requires a lead agency to consider the effects of bringing people and development into an area that may present hazards. The CEQA Guidelines note the very relevant example that "an EIR on a subdivision astride an active fault line should identify as a significant effect the seismic hazard to future occupants of the subdivision."[25]

  Lead agencies should disclose any areas governed by the general plan that may be particularly affected by global warming, e.g.: coastal areas that may be subject to increased erosion, sea level rise, or flooding; areas adjacent to forested lands that may be at increased risk from wildfire; or communities that may suffer public health impacts caused or exacerbated by projected extreme heat events and increased temperatures. General plan policies should reflect these risks and minimize the hazards for current and future development.

Endnotes

[1]For a discussion of requirements under general planning law, see OPR's General Plan Guidelines (2003). OPR is in the process of updating these Guidelines. For more information, visit OPR's website at http://www.opr.ca.gov/index.php?a=planning/gpg.html.

[2]OPR has noted the environmental and administrative advantages of addressing GHG emissions at the plan level, rather than leaving the analysis to be done project-by-project. See OPR, Preliminary Draft CEQA Guideline Amendments, Introduction at p. 2

(Jan. 8, 2009), available at http://opr.ca.gov/download.php?dl=Workshop_Announcement.pdf.

[3] OPR issued its Preliminary Draft CEQA Guidelines Amendments on January 8, 2009. Pursuant to Health and Safety Code, § 21083.05 (SB 97), OPR must prepare its final proposed guidelines by July 1, 2009, and the Resources Agency must certify and adopt those guidelines by January 1, 2010.

[4]Cal. Code Regs., tit. 14 (hereinafter "CEQA Guidelines"), § 15064, subd. (a).

[5]CEQA Guidelines, § 15064, subd. (f)(1).

[6]CEQA Guidelines, § 15021, subd. (a).

[7]OPR, CEQA and Climate Change: Addressing Climate Change Through California Environmental Quality Act (CEQA) Review (June 2008), available at http://opr.ca.gov/ceqa/pdfs/june08-ceqa.pdf.

[8] ARB's protocols for estimating the emissions from local government operations are available at http://www.arb.ca.gov/cc/protocols/localgov/localgov.htm.

[9] CAPCOA, CEQA and Climate Change, Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act (January 2008) (hereinafter, "CAPCOA white paper"), available at http://www.capcoa.org/.

[10] http://ag.ca.gov/globalwarming/ceqa/modeling_tools.php

[11] http://www.iclei-usa.org

[12] For example, U.C. Davis has made its modeling tool, UPlan, available at http://ice.ucdavis.edu/doc/uplan; San Diego School of Law's Energy Policy Initiatives Center has prepared a GHG emissions inventory report for San Diego County http://www.sandiego.edu/EPIC/news/frontnews.php?id=31; and Cal Poly, San Luis Obispo City and Regional Planning Department is in the process of preparing a Climate Action Plan for the City of Benicia, see http://www.beniciaclimateactionplan.com/files/about.html.

[13]CEQA Guidelines, § 15002, subd. (g).

[14] CEQA Guidelines, § 15064(h)(1).

[15]See ARB, Scoping Plan at pp. 117-120, available at http://www.arb.ca.gov/cc/scopingplan/document/psp.pdf. (ARB approved the Proposed Scoping Plan on December 11, 2008.)

[16]In the Scoping Plan, ARB encourages local governments to adopt emissions reduction goals for 2020 "that parallel the State commitment to reduce greenhouse gas emissions by approximately 15 percent from current levels . . . ." Scoping Plan at p. 27; see *id.* at Appendix C, p. C-50. For the State, 15 percent below current levels is approximately equivalent to 1990 levels. *Id.* at p. ES-1. Where a city or county has grown roughly at

the same rate as the State, its own 1990 emissions may be an appropriate 2020 benchmark. Moreover, since AB 32's 2020 target represents the State's *maximum* GHG emissions for 2020 (see Health & Safety Code, § 38505, subd. (n)), and since the 2050 target will require substantial changes in our carbon efficiency, local governments may consider whether they can set an even more aggressive target for 2020. See Scoping Plan, Appendix C, p. C-50 [noting that local governments that "meet or exceed" the equivalent of a 15 percent reduction in GHG emissions by 2020 should be recognized].

[17] *Christward Ministry v. Superior Court* (1986) 184 Cal.App.3d 180, 194 [EIR must consider future development permitted by general plan amendment]; see also CEQA Guidelines, §§ 15126 [impact from all phases of the project], 15358, subd. (a) [direct and indirect impacts].

[18] See the City of Palm Desert's Energy Independence Loan Program at http://www.ab811.org.

[19] Pub. Res. Code, § 21081.6, subd. (b); CEQA Guidelines, § 15091, subd. (d); see also *Federation of Hillside and Canyon Assocs.* (2000) 83 Cal.App.4th 1252, 1261 [general plan EIR defective where there was no substantial evidence that mitigation measures would "actually be implemented"].

[20]CAPCOA white paper at pp. 79-87 and Appendix B-1.

[21]OPR Technical Advisory, Attachment 3.

[22]See http://ag.ca.gov/globalwarming/pdf/GW_mitigation_measures.pdf [mitigation list];http://ag.ca.gov/globalwarming/pdf/green_building.pdf [list of local green building ordinances].

[23]See http://opr.ca.gov/ceqa/pdfs/City_and_County_Plans_Addressing_Climate_Change.pdf.

[24]See Scoping Plan, Appendix C, at p. C-49.

[25]CEQA Guidelines, § 15126.2, subd. (a).

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November 4, 2009

VIA E-MAIL & U.S. MAIL

Dave Warner
Director of Permit Services
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1990 East Gettysburg Ave.
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RE: Final Draft Staff Report on Greenhouse Gas Emissions Under CEQA

Dear Mr. Warner:

We have reviewed the San Joaquin Valley Air Pollution Control District's September 17, 2009, Final Draft Staff Report on "Addressing Greenhouse Gas Emissions Under the California Environmental Quality Act."[1] We appreciate the Air District's extensive efforts and leadership in this area.[2] We are concerned, however, that the approaches suggested in the Staff Report will not withstand legal scrutiny and may result in significant lost opportunities for the Air District and local governments to require mitigation of greenhouse gas (GHG) emissions.

The Staff Report sets out a proposed threshold of significance for GHG emissions for stationary source projects under the Air District's permitting authority. A threshold of significance is, in effect, a working definition of significance to be applied on a project-by-project basis that can help a lead agency determine which projects normally will be determined to be less than significant, and which normally will be determined to be significant.[3] In the context of GHG emissions, the relevant question is whether the project's emissions, when considered in conjunction with the emissions of past, current, and probable future projects, are

[1] The Attorney General submits these comments pursuant to his independent power and duty to protect the natural resources of the State. (See Cal. Const., art. V., § 13; Cal. Gov. Code, §§ 12511, 12600-12612; *D'Amico v. Board of Medical Examiners* (1974) 11 Cal.3d 1, 14-15.)

[2] The Staff Report states that "[n]o state agency has provided substantial and helpful guidance on how to adequately address GHG emissions under CEQA, nor has there been guidance on how to determine if such impacts are significant." (Report at p. 2.) In fact, there are numerous sources of guidance, including information on the Attorney General's website (http://ag.ca.gov/globalwarming/ceqa.php), a Technical Advisory issued by the Governor's Office of Planning and Research (http://opr.ca.gov/ceqa/pdfs/june08-ceqa.pdf); and the Resources Agency's proposed CEQA Guidelines amendments (http://ceres.ca.gov/ceqa/guidelines/), which is accompanied by a detailed, 78-page Initial Statement of Reasons (http://ceres.ca.gov/ceqa/docs/Initial_Statement_of_Reasons.pdf).

[3] Cal. Code Regs., tit. 14, § 15064.7, subd. (a).

cumulatively considerable.[4] Thresholds can be a useful interim tool until cities and counties have in place programmatic approaches, e.g., Climate Action Plans, which allow local government to consider a wide variety of mitigation opportunities and can substantially streamline the CEQA process for individual projects.[5] Staff's proposed stationary source GHG threshold relies on implementation of GHG emission control technologies. Under this proposal, projects that implement currently unspecified GHG Best Performance Standards ("BPS") would be deemed to not have significant impacts, regardless of the total amount of GHGs emitted.

The Staff Report also recommends a threshold of significance for cities and counties to use in determining whether a development or transportation project's GHG emissions are significant under CEQA. Like the stationary source threshold, this threshold would also rely on performance measures that are not currently identified. BPS for these projects would be any combination of identified GHG reduction measures that reduce project-specific GHG emission by at least 29 percent as compared to "business as usual," as calculated based on a point system to be developed in the future by the Air District.

The Staff Report contains a useful analysis of possible GHG mitigation measures for a variety of stationary sources and for development and transportation projects. This discussion will certainly assist lead agencies and project proponents in considering what mitigation measures currently are available and should be considered. It is not clear to us, however, how much additional analysis the Air District plans to do to support the proposed CEQA thresholds of significance recommended in the Staff Report. A public agency proposing to adopt a CEQA threshold of significance should be able to answer at least the following questions about its proposed approach:

What defined, relevant environmental objective is the threshold designed to meet, and what evidence supports selection of that objective?

The Staff Report does not discuss a particular environmental objective that would be achieved by implementing the proposed thresholds, such as meeting a GHG emissions reduction trajectory consistent with that set forth in AB 32 and Executive Order S-03-05 within the Air District's jurisdiction.[6] It appears that the Air District has not yet determined what amount of

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[4] Cal. Code Regs., tit. 14, § 15064, subd. (h)(1); see also Initial Statement of Reasons at p. 17 ("Due to the global nature of GHG emissions and their potential effects, GHG emissions will typically be addressed in a cumulative impacts analysis.")

[5] See Proposed Cal. Code Regs., tit. 14, § 15183.5, subd. (b) (describing tiering and streamlining available under "Plans for the Reduction of Greenhouse Gas Emissions"), available at http://ceres.ca.gov/ceqa/docs/FINAL_Text_of_Proposed_Amendemts.pdf; Draft Initial Statement of Reasons (discussing proposed § 15183.5) , available at http://ceres.ca.gov/ceqa/docs/Initial_Statement_of_Reasons.pdf#page=56; see also See Attorney General's General Plan/CEQA Frequently Asked Questions, available at http://ag.ca.gov/globalwarming/pdf/CEQA_GP_FAQs.pdf.

[6] Pursuant to these mandates, California is committed to reducing GHG emissions to 1990 levels by 2020, and to 80 percent below 1990 levels by 2050. These objectives are consistent with the underlying environmental objective of stabilizing atmospheric concentrations of greenhouse gases at a level that will substantially reduce the risk of dangerous climate change. (See AB 32 Scoping Plan at p. 4 ["The 2020 goal was established to be an aggressive,

GHG reduction it is aiming to achieve. Setting a relevant environmental objective is an essential step in establishing any legally defensible threshold of significance; without it, there is nothing against which to gauge the success of the threshold in operation.

What is the evidence that adopting the threshold will meet this objective?

Because the BPS discussed in the Staff Report are described as "illustrative" only, it is not possible at this time to determine whether the BPS ultimately adopted will reduce GHG emissions in the San Joaquin Valley and, if so, by how much. There is no stated commitment to tie BPS proposed in the future to regional GHG reduction objectives.

How does the threshold take into account the presumptive need for new development to be more GHG-efficient than existing development?

The Staff Report seems to assume that if new development projects reduce emissions by 29 percent compared to "business as usual," the 2020 statewide target of 29 percent below "business as usual" will also be achieved, but it does not supply evidence of this. Indeed, it seems that new development must be more GHG-efficient than this average, given that past and current sources of emissions, which are substantially less efficient than this average, will continue to exist and emit.[7]

Will the threshold routinely require new projects to consider mitigation beyond what is already required by law?

Because "business as usual" for a development project is defined by the Staff Report as what was typically done in similar projects in the 2002-2004 timeframe, and requirements affecting GHG emissions have advanced substantially since that date, it appears that the Air District's proposal would award emission reduction "points" for undertaking mitigation measures that are already required by local or state law.[8]

Similarly, we are concerned that project proponents could "game" the system. Under the current proposal, each project will be considered against a hypothetical project that could have been built on the site in the 2002-2004 time period. It is not clear why the project should be compared against a hypothetical project if that hypothetical project could not legally be built

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but achievable, mid-term target, and the 2050 greenhouse gas emissions reduction goal represents the level scientists believe is necessary to reach levels that will stabilize climate."])

[7] We note that CAPCOA expressly found that an approach that would rely on 28 to 33 percent reductions from BAU would have a "low" GHG emissions reduction effectiveness. CAPCOA, CEQA and Climate Change (Jan. 2008) at p. 56, available at http://www.capcoa.org/CEQA/CAPCOA%20White%20Paper.pdf.

[8] To take one important example, Title 24 has undergone two updates since 2002-2004 – in 2005 and 2008. The 2008 Title 24 standards are approximately 15 percent more stringent that the 2005 version. In addition, a significant number of local governments have adopted green building ordinances that go beyond Title 24 in just the past few years, and many more are considering adopting such ordinances as part of their Climate Action Plans. See http://ag.ca.gov/globalwarming/pdf/green_building.pdf.

today,[9] and the approach would appear to offer an incentive to project proponents to artificially inflate the hypothetical project to show that the proposed project is, by comparison, GHG-efficient.[10]

Will operation of the threshold allow projects with large total GHG emissions to avoid environmental review? What evidence supports such a result?

It appears that any project employing certain, as of yet unidentified, mitigation measures would be considered to not be significant, regardless of the project's total GHG emissions, which could be very large. For instance, under the Air District's proposal, it would appear that even a new development on the scale of a small city would be considered to not have a significant GHG impact and would not have to undertake further mitigation, provided it employs the specified energy efficiency and transportation measures. This would be true even if the new development emitted hundreds of thousands of tons of GHG each year, and even though other feasible measures might exist to reduce those impacts.[11] The Staff Report has not supplied scientific or quantitative support for the conclusion that such a large-emitting project, even if it earned 29 "points," would not have a significant effect on the environment.

Will the threshold benefit lead agencies in their determinations of significance?

For the reasons set forth above, we fear that the recommended approach in its current form may unnecessarily subject lead agencies that follow them to CEQA litigation. This would be detrimental not only to the lead agencies, but to the many project proponents who may face unnecessary delay and legal uncertainty.[12]

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[9] The appropriate baseline under CEQA is not a hypothetical future project, but rather existing physical conditions. (Cal. Code Regs., tit. 14, § 15126.2, subd. (a).)

[10] A detailed analysis of the proposed amendments to Rule 2301 (emissions reduction credit banking) is beyond the scope of this letter. It is important, however, that any such plan comply with CEQA's requirements for additionality. As the most recent draft of the proposed CEQA Guidelines notes, only "[r]eductions in emissions that are not otherwise required may constitute mitigation pursuant to this subdivision." Proposed Cal. Code Regs., tit. 14, § 15126.4, subd. (c), available at http://ceres.ca.gov/ceqa/docs/Text_of_Proposed_Changes.pdf.

[11] In the advance of a programmatic approach to addressing GHG emissions, lead agencies must examine even GHG-efficient projects with some scrutiny where total emissions are large. Once a programmatic approach is in place, the lead agency will be able to determine whether even a larger-emitting project is, or is not, consistent with the lead agency's overall strategy for reducing GHG emissions. If it is, the lead agency may be able to determine that its incremental contribution to climate change is not cumulatively considerable.

[12] The Staff Report states that "[l]ocal land-use agencies are facing increasing difficulties in addressing GHG emissions in their efforts to comply with CEQA." (Report at p. 2.) We strongly believe that this experience is not universal. In fact, many cities and counties are actively taking up their role as "essential partners" in addressing climate change (see AB 32 Scoping Plan at p. 26) by making commitments to develop local Climate Action Plans.

We support staff's continued work in this area. However, before formally endorsing or adopting any particular threshold, we recommend that the Air District consider the issues that we have raised in this letter; if warranted, evaluate the approaches currently under consideration by other districts; and, if possible, work with those districts to devise approaches that are complementary and serve CEQA's objectives.

Sincerely,

/ s /

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For EDMUND G. BROWN JR.
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Does "Smart Growth" Matter to Public Finance?

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Abstract. This paper addresses four fundamental questions about the relationship between "smart growth," a fiscally motivated anti-sprawl policy movement, and public finance: Do low-density, spatially extensive land use patterns cost more to support? If so, how large of an influence does sprawl actually have? How does the influence differ among types of spending? And, how does it compare to the influence of other relevant factors? The analysis, which is based on the entire continental United States and uses a series of spatial econometric models to evaluate one aggregate (total direct) and nine disaggregate (education, fire protection, housing and community development, libraries, parks and recreation, police protection, roadways, sewerage, and solid waste disposal) measures of spending, provides the most detailed evidence to date of how sprawl affects the vast sum of revenue that local governments spend every year.

1. Introduction

During the 2002 fiscal year, the 87,576 local governments in the United States—counting all counties, boroughs, municipalities, townships, school districts, and special districts—channeled over $1.14 trillion toward the provision of public services. Of this amount, 38.72% ($441.43 billion) was spent on education services, 11.15% ($127.07 billion) was spent on social services and income maintenance, 9.22% ($105.15 billion) was spent on environmental services and housing, 9.05% ($103.21 billion) was spent on public safety, 5.64% ($64.32 billion) was spent on transportation services, 4.66% ($53.11 billion) was spent on administrative services, and 3.85% ($43.88 billion) was spent paying interest on debt; the remaining 17.71% ($201.92 billion) was spent on utilities, insurance trusts, and other miscellaneous activities and operating costs (Census of Governments 2005). As shown in Table 1, which lists 2002 population, gross state product, and expenditure patterns by state, across all categories, local governments spent a combined national average of $3,959 per capita, a value that, in total, represents 10.95% of the gross domestic product.

Although many factors influence the allocation, distribution, and volume of this spending, there is a growing conviction among urban and regional policymakers that the character of the built environment is one of them. Specifically, the kind of low-density, spatially extensive pattern of growth commonly characterized as "sprawl" (Bruegmann 2005) is thought to raise the cost of public services because it fails to capitalize on economies of scale and/or optimize on facility location. On the other hand, more compact modes of development are believed to reduce costs by concentrating residents together and creating locational efficiencies in access and delivery. The thinking is that, because public finance ultimately plays out across geographic space, the dimensions of the development it supports matter in substantive ways.

Based on this reasoning, advocates of "smart growth," a movement that seeks a holistic rethinking of the contemporary approach to land use planning, have advanced policy frameworks that, among other things, specifically emphasize the importance of fiscal health (DeGrove 2005). For example, the State of Maryland's (1998) *Smart Growth and Neighborhood Conservation Act* establishes "priority funding areas," or specific districts where development is supported via public investment in capital facilities and other needs. Similarly, more established state land use planning mandates in Florida, Oregon, Washington, and elsewhere promote contiguity of growth and concurrency, which requires capacity in necessary infrastructure and services to be in place before development can proceed (see Knaap et al. 2001). What makes the present push for smart growth so striking is that it and its fiscally motivated anti-sprawl policies have been enjoined by states as diverse as Arizona, Maine, Michigan, and Tennessee (Gray 2005). The movement has

also gathered broad-based support at the local level, and, perhaps for that reason, it has produced remarkably consistent land use patterns in communities across the country (Song 2005). In short, on the promise of limiting sprawl and its financial discontents, smart growth has rapidly swept the United States and brought about far-reaching changes in the way that state and local governments plan for development.

But, beyond this political and on-the-ground progress loom difficult questions about the veracity of connections between the built environment and the cost of public services. In particular, there is little empirical evidence that sprawl is more expensive to support and, in fact, research on the issue has produced conflicting results. Moreover, there is no reason to believe that the relationship, if any, applies to all types of expenditures in the same way—it may be, for example, that the influence of the built environment cuts in both directions, raising some costs and lowering others depending on the nature of the service in question. Do low-density, spatially extensive land use patterns cost more to support? If so, how large of an influence does sprawl actually have? How does the influence differ among types of spending? And, finally, how does it compare to the influence of other relevant factors? The answers to these questions are key to understanding how well the anti-sprawl policies of smart growth line up with its objective of promoting fiscal health.[1]

2. Background Discussion

2.1 Measuring and Explaining Sprawl

Sprawl is defined here as the kind of low-density, spatially extensive pattern of development that has become prevalent throughout the United States over the course of the last 50 years (Fulton et al. 2001; Glaeser and Kahn 2004; Bruegmann 2005; Úlfarsson and Carruthers 2006). The best way—and, at present, virtually the only way—to measure the reach and pace of sprawl nationally is via the USDA's (2001) National Resources Inventory (NRI), which provides estimates of the amount of land in major land use categories at the county level for the years 1982, 1987, 1992, and 1997. A limitation of the NRI is that, at high resolution, it is known to have a wide enough margin of error that reported values for, say, the amount of developed land in a given county, may

[1] Note here that public finance is only one of several core concerns of smart growth, which, in fact, has a very broad quality-of-life orientation. For example, the *Smart Growth Network* describes the movement as being motivated by "…a growing concern that current development patterns—dominated by what some call "sprawl"—are no longer in the long-term interest of our cities, existing suburbs, small towns, rural communities, or wilderness areas. Though supportive of growth, communities are questioning the economic costs of abandoning infrastructure in the city, only to rebuild it further out. Spurring the smart growth movement are demographic shifts, a strong environmental ethic, increased fiscal concerns, and more nuanced views of growth." See: *www.smartgrowth.org/about/default.asp?res=1280.*

be imprecise. As a result, the data is not reliable enough to know with certainty that there are "exactly *x* number of acres of developed land in county *i*," so some of its documentation cautions against using it at that level. Because this limitation is sometimes viewed as an issue (Burchfield et al. 2006), it is important to be clear that the warning is there mainly to comply with data reporting requirements set forth by the Office of Management and Budget, which is responsible for the quality of information collected and disseminated by the federal government.[2] All of that said, the NRI does an excellent job of capturing how development patterns vary cross-sectionally and longitudinally or, in other words, how land use in county *i* differs from land use in county *j* and how land use in county *i* has changed between two or more points in time, *t*. Used in this way, the data measures land use representatively, even if individual data points are imprecise in some cases.

To demonstrate the validity of using the NRI for cross-sectional analysis, Figures 1 and 2 compare its (1997) measure of developed land area to the Census Bureau's (2000) measure of urbanized land area[3] in all counties located in the continental United States. Specifically, Figure 1 is a scatter plot that registers acres of developed land on the *x*-axis and acres of urbanized land on the *y*-axis and Figure 2 is a histogram of the absolute value of the difference between the two as a percentage of total county land area.[4] Both charts reveal a high degree of correspondence between the two estimates of land use: The trend line fit to the scatter plot has an R^2 of 0.91 and the histogram indicates that, in 80% of the sample, the difference is a value that ranges between just one and five percent of total county land area. Together, Figures 1 and 2 indicate that the NRI data provides a good overall representation of how development patterns vary across the country, at least with respect to another commonly used measure of land use.

Since this comparison is admittedly rather coarse, it is reassuring that other researchers have come to similar conclusions about the ability of the NRI to representatively measure land use. For example, a recent comparison by Irwin and Bockstael (2006) finds that the NRI lines up exceptionally well with land cover data derived from multispectral satellite imagery. The analysis

[2] The authors have discussed this directly with NRI staff and the reason for the cautionary statement is that the data has statistical properties that require a level of analytical expertise above-and-beyond that of the public at large in order to use and interpret it properly. A statement by OMB on federal data reporting requirements is available online, in the *Federal Register*: *http://www.whitehouse.gov/omb/fedreg/2006/092206_stat_surveys.pdf.*

[3] The Census Bureau categorizes every census block in the country that has an average population density of 1,000 people per square mile, or about 1.5 people per acre, as urban, so summing the area of these blocks by county yields an estimate of the spatial extent of the built-up area within each county. Note that this measure is based on average population density, not actual land use, and some counties register no urbanized land area at all—in these instances, the NRI's measure of developed land area is correspondingly very small.

[4] The histogram is of the values resulting from this calculation: |developed land area – urbanized land area| / total county land area. Note that there are nine counties that do not appear on the histogram because these outliers stretch the figure out too far to be easily readable; in these cases, the differences are 21%, 23%, 25% (× 2), 29% (× 2), 36%, 38%, and 93%.

involves data for just the State of Maryland and uses somewhat larger (multi-county) areas than are of interest here, but the two measures are nearly identical and their close relationship apparently holds across the size-of-place hierarchy, because there is little difference among urban, suburban, exurban, and rural groupings of counties. So, although imperfect, the NRI is consistent with alternative data sources and it remains virtually the only one presently available for comparing land use patterns across the country as a whole.

Returning now to the matter at hand, Figures 3 and 4 illustrate the reach and pace of sprawl in the United States during recent years. Figure 3, which maps changes in aggregate density, measured as the number of people plus jobs per acre of developed land, shows that only about a fifth of all counties (691 out of 3,075) grew more dense between 1982 and 1997. Meanwhile, Figure 4, which maps the proportion of land absorption that took place during the last five years of the whole 15-year timeframe,[5] shows that the trend toward sprawl appears to have accelerated: In nearly half of all counties (1,285 out of 3,075) more than 50% of the overall change in developed land occurred between 1992 and 1997. If the trend were more-or-less constant, the pattern shown on the map would not emerge because the 5-year rate of land absorption would instead be closer to 33%.

The nation's land use has evolved in this way mostly because of population growth combined with rising incomes and falling commuting costs—an early cross-sectional analysis of sprawl found that these basic factors explain nearly 80% of variation in the spatial extent of regions' urbanized land area (Brueckner and Fansler 1983)—but other, more nuanced factors also play a role. In particular, three market failures, the failure of development to internalize (1) the benefits of open space, (2) the social costs of traffic congestion, and (3) the cost of the services that it requires, contribute to a sub-optimal pattern of land use (Brueckner 2000). While each of these is important to understanding sprawl, the third is central to the present analysis because, as a corollary, it suggests that growth would be more dense if it had to pay the full cost of the services needed to support it. In fact, both theoretical (Brueckner 1997; McFarlane 1999) and empirical (Pendall 1999) analyses show that impact fees, which attempt to correct for this problem, promote compact development. So, even though sprawl is largely explained by basic human ecology, it is also fueled by more complicated market failures, at least one of which is linked to public finance. Either way, if the connections between the built environment and the cost of public services are as substantial as many policymakers judge them to be, the trend documented in Figures 3 and 4 suggests that the consequences of sprawl may indeed be quite large.

[5] This figure is calculated as the ratio of the change in developed land area during the last five years and the change in developed land area during the entire time period, or $\Delta_{1992-1997} / \Delta_{1982-1997}$.

2.1 Smart Growth as a Policy Response

Acting on public finance oriented (among other) concerns, a number of states have adopted legislation aimed at limiting sprawl (Carruthers 2002). This began with what is often described as the "first wave" of state land use legislation that evolved out of the environmental movement of the 1960s and 1970s. At the time, the main objective was to create mechanisms for overseeing local decision-making processes, particularly with respect to the conversion of farmland and "developments of regional impact," such as major capital facilities and shopping centers. During the 1980s, the "second wave" of state land use legislation popularized the concept of "growth management," an approach to land use planning that emphasizes the need to accommodate, rather than limit, development through a coordinated effort among local governments. It was during this period that the nationwide conversation first began to shift toward identifying the policy-relevant problems of sprawl and developing specific mechanisms, like concurrency, for addressing them in ways other than restricting growth outright. Finally, the "third wave" of state land use legislation, which emerged in the 1990s, brought "smart growth," with its holistic orientation toward quality of life, to the forefront of urban and regional policy. These frameworks often cast local, rather than state, governments as the agents of land use reform and almost unilaterally cite environmental and/or fiscal motivations for confronting sprawl. The practical appeal of smart growth combined with its on-the-ground success has given it considerable political traction: As of 2005, legislation had been adopted by 20 states[6] and many other initiatives have been implemented independently at the local level (see DeGrove 1984, 1992, 2005 for a complete accounting of the history summarized here).

As opposed to sprawl, the benefits of smart growth for public finance are believed to be at least twofold (Knaap and Nelson 1992). First, advocates often argue that, for many public services, the cost per unit—that is, per person or household—of output is higher for low-density development because it fails to capitalize on economies of scale, which are achieved by concentrating users together. Second, spatially extensive development, whatever the density, is accused of making it difficult to optimize on facility location, especially if it happens in a noncontiguous way. Simply put, the reasoning is that sprawl is inefficient because, other things being equal, the cost of public services is negatively influenced by density and positively influenced by the spatial extent of developed land.

[6] Arizona, Colorado, Connecticut, Delaware, Florida, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, Oregon, Pennsylvania, Rhode Island, Tennessee, Utah, Washington, and Wisconsin (Gray 2005).

The rejoinder for years has been that the "harshness" of high-density, compact built environments acts as a countervailing force that, after a point, overrides any financial efficiency they may achieve (Ladd 1998). Central cities, for example, often require large amounts of public investment for things like police protection and roadway maintenance due to their social complexity and economic primacy, which affect how intensively services are used. The reasoning here is that, like other commodities, public services are subject to both economies and diseconomies of scale, with the latter being a consequence of the kind of congestion, disorder, social pathologies, and other problems found in many densely populated areas. However, it is too rarely pointed out that the connection to the built environment in-and-of-itself may not be as strong as it has been made out to be—a paper by Gordon and Richardson (1997) is a good example—because the perspective seems, at times, to conflate the influence of land use with problems that have more to do with the deterioration and strife experienced by many aged, built-up areas of the country. From this line of reasoning, it follows that high-density, compact development patterns may well be less expensive to support and that the "harshness" of these environments is a different issue that must be dealt with separately.

The few empirical analyses of the relationship between the built environment and the cost of public services have, over time, produced results that are consistent with both of the perspectives just described. Research on the first dimension of sprawl, the density of developed land, essentially began with the Real Estate Research Corporation's (RERC 1974) much-maligned *Costs of Sprawl*. The study finds that low-density development is as much as twice as expensive to support as high-density development, but it has been extensively criticized for, among other things, its failure to control for other relevant factors (Altshuler and Goméz-Ibáñez 1993). Since then, refinements on the approach have mainly continued to find that low-density land use patterns are more expensive to support, but, unfortunately, most produce few generalizable conclusions due to their site-specific focus (see Frank 1989 and Burchell 1998 for reviews and Spier and Stephenson 2002 for an example). Meanwhile, public finance oriented work by Ladd and Yinger (1991) and Ladd (1992, 1994) finds a u-shaped relationship between the number of people per square mile of county land area and per capita spending and, so, concludes that high-density areas are ultimately more, not less, expensive to support. Last, a study of land use patterns by Carruthers and Úlfarsson (2003) finds evidence that density does lower the cost of many services; the analysis measures density via developed land area, not county land area, but it is primarily a hypothesis testing exercise, so it stops short of attempting to measure the magnitude of the relationship between sprawl and public finance in a detailed way.

Research on the second dimension of sprawl, the spatial extent of developed land, emanates from Lösch-style (1954) locational analysis, where the problem is to optimize on the placement of centralized facilities (see Thisse and Zoller 1983). This has traditionally been done on the basis of accessibility and coverage but other criteria, such as equity—which is accepted by many planners as a normative benchmark of urban form (Lynch 1981)—can also be used (Mulligan 1991, 2000; Farhan and Murray 2006). In the present context, the spatial extent of developed land matters in terms of the number and size of facilities needed to serve a given population, plus in terms of the span of the infrastructure needed to support day-to-day activities and deliver services effectively. But, even though capital improvements planning is central to land use planning (Kaiser et al. 1995), very little work has been done to identify how the spatial extent of developed land affects public finance; instead, this dimension of sprawl is usually just treated as implicit in density. A notable exception is a study by Hopkins et al. (2004), which finds that carefully planned development can save revenue by relying on fewer and larger facilities. The analysis by Carruthers and Úlfarsson (2003) also finds evidence that the spatial extent of developed land increases the cost of many public services but, as with density, no attempt is made to measure the size of the influence. In sum, even though locational analysis has long been used for facilities planning, relatively little is known about how the horizontal dimension of sprawl affects public finance.

3. Empirical Analysis

3.1 Modeling Framework

The point of departure for the empirical analysis is a so-called "spillover model" that results from strategic interaction among local governments (Brueckner 1998, 2003):

$$e_i = R(e_j, X_i), \tag{1}$$

where per capita expenditure on public services in jurisdiction i, e_i, depends on per capita expenditure on public services in surrounding jurisdictions j, e_j, plus a vector of local characteristics, X_i. R is described as a "reaction function," (Brueckner 2003, page 177) because it results from jurisdiction i's calculated response to the spending of proximate jurisdictions. Although spillovers can take different forms—for example, due to competition, emulation, and/or other kinds of government behavior—they are treated as a composite here because the focus is squarely on sprawl as a cost factor.

The relationship in equation (1) can be estimated with a spatial lag model (Anselin 1988, 2002), expressed as:

$$e_i = \beta \sum_{j \neq i} \omega_{ij} e_j + X_i \Gamma + \upsilon_i . \quad (2)$$

In this equation, ω_{ij}, $\forall\, j \neq i$, represents a set of spatial weights that aggregate public spending by jurisdictions near to i into a single composite variable; β represents an estimable parameter that describes how per capita expenditure in jurisdiction i is influenced by per capita expenditure in nearby jurisdictions; Γ represents a vector of estimable parameters; and υ_i represents an unobserved, stochastic error term. This modeling framework was originally applied by Case et al. (1993) in a behavioral analysis of state-level spending and is often used in public finance oriented research (see Revelli 2005 for a recent review). Overall, the results of this work show that, because it plays out across geographic space, public finance is subject to systematic spatial dependence.

The present analysis applies the modeling framework just described to examine per capita expenditure on public services, e, by local governments (including state and federal government transfers) at the regional level by using counties as the spatial units, i and j. This adaptation, which is similar to work done by Kelejian and Robinson (1992, 1993), means that each observation generally contains multiple jurisdictions—including the county itself, plus municipalities, school districts, special districts, and, potentially, others—so the spillovers that the analysis captures are really the net of interaction among many entities at multiple tiers of government. It is for this reason that the effect is simply labeled a "composite spillover" and no attempt is made to understand the specific nature of the mechanism/s involved.[7] Even so, the strategic interaction framework is adopted for both theoretical and empirical reasons: First, to recognize the presence of an underlying behavioral model of public finance and second, to avoid an econometric misspecification that does not account for the spatial dependence introduced by various forms of strategic interaction.

Moving on, in addition to the spatially lagged dependent variable, equations (1) and (2) contain a vector, X_i, representing relevant explanatory variables. The specification of the empirical model originates from early work done by Bergstrom and Goodman (1973) and Borcherding and Deacon (1972) and the choice of specific variables is based directly on more recent work done by Ladd and Yinger (1991), Ladd (1992, 1994), Carruthers and Úlfarsson (2003), Solé-Ollé (2005), and Solé-Ollé and Bosch (2005). Although the specification does not match any of these identically—due to data availability, the different purposes of the analyses, and so on—care was taken to ensure it corresponds to the extent possible. In particular, five

[7] Identifying different types of spillovers and their behavioral mechanisms is a complicated venture in-and-of-itself: See, for example, Esteller-Moré and Solé-Ollé (2001), Revelli (2001, 2002, 2003), Bordignon et al. (2003), Lundberg (2006), and Solé-Ollé (2006).

categories of factors, pertaining to the cost of and demand for public services, are hypothesized to influence per capita spending: *Built Environment, Political Structure, Growth and Demographics, Sources of Revenue,* and *Size and Primacy*. The first category is measured via the density of developed land, the percentage of county land area that is developed, the median housing value, and the percentage of housing built before 1940; the second category is measured via the per capita number of municipalities and the per capita number of special districts; the third category is measured via the rate of population change, per capita income, the percentage of the population that is white, the percentage of the population that is less than five years old, and the average household size; the fourth category is measured via the percentage of tax revenue that comes from property taxes, per capita federal revenue, per capita state revenue, and per capita long-term debt; and, last, the fifth category is measured via county land area, the ratio of employment to population, and the average government wage, plus dummy variables for metropolitan and micropolitan counties.

Like the specifications used in other research, this specification is oriented around variables measuring the cost of and demand for local government spending. The key cost factors in the model are: The average government wage, a measure of input costs, and the ratio of employment to population, which measures competition in the job market and, also, how intensively services are used by people who may be nonresidents. Other variables measuring costs include what Ladd (1992, page 278) calls "environmental cost factors," such as the density of developed land and the percentage of county land area that is developed, which describe sprawl, the object of this analysis. (Note here that total county land area is held constant, so the percentage of county land area that is developed measures the spatial extent of development or, in other words, the horizontal dimension of sprawl.) The key demand factors in the model are: Per capita income, a fundamental measure of demand, the median housing value, a measure of the median voter's stake in the outcome of public spending (Fischel 2001), and the percentage of tax revenue that comes from property taxes, which measures the tax price for residents, albeit somewhat roughly because other taxes are also paid. Additional variables measuring demand include factors that relate to the preferences of the population, such as the relative number of young children, and the availability of resources, such as intergovernmental revenue and public indebtedness. Across the board, factors that raise costs and demand, like high government wages and high per capita incomes, are expected to positively influence spending while factors that lower them, like weak employment markets and high tax prices, are expected to negatively influence spending.

Given the principles of smart growth, it is expected that sprawl raises the cost of public services because it fails to capitalize on economies of scale and/or optimize on facility location. If this is the case, other things being equal, per capita spending will be negatively influenced by density and positively influenced by the percentage of county land area that is developed. The two fragmentation variables, per capita municipalities and per capita special districts, are included to control for the political geography of local government finance; generally speaking, if the Tiebout hypothesis (1956) is correct, greater fragmentation will lower per capita spending by way of intergovernmental competition. Finally, there is every reason to suspect upfront, as many residents do, that the rate of population growth negatively influences per capita spending because the existing population almost always finances new development (Ladd 1994). This fear, justified or not, is precisely what led to the widespread adoption of local growth controls during the 1970s and 1980s (Glickfield and Levine 1992).

3.2 Data and Econometric Specification

The empirical model is used to analyze per capita expenditure by local governments in all 3,075 counties[8] of the continental United States during the 2002 fiscal year (Census of Governments 2005). The geographic scope of the analysis is shown in Figure 5, a map of per capita total direct spending by county. Inspection of the figure quickly reveals two major patterns: Expenditures are clustered by both state and region, including, in the latter case, in a way that spills across state lines. The first pattern suggests that fixed effects should be added to an empirical specification of equation (2) in order to account for unobserved factors common to all counties located within the same state; it also suggests that the model should be estimated in a manner that deals with heteroskedasticity introduced by variation in unobservable characteristics relevant to that level. Even more important, the second pattern reinforces the choice of modeling frameworks because spatial relationships that are not confined by state boundaries are clearly visible, even to the naked eye. As already mentioned, failing to account for this pattern of spatial dependence would produce a misspecified model and, ultimately, biased and inefficient estimates of Γ (Anselin 1992).

The modeling framework described in the preceding section is applied identically (for the sake of comparability) to one aggregate and nine disaggregate measures of public spending: Total direct expenditure, education, fire protection, housing and community development, libraries,

[8] The actual number of county equivalents is slightly greater, due to a number of independent cities such as Baltimore, Maryland St. Louis, Missouri, and cities throughout Virginia. These were integrated with appropriate counties when the data was compiled because some data—from the BEA's Regional Economic Information System, for example—is not available at that level, but the entire surface of the continental United States is still represented in the data set.

parks and recreation, police protection, roadways, sewerage, and solid waste management. A description of each measure of spending, taken from the survey form that the Census of Governments uses to collect the data, is provided in Table 2. Table 3 lists the source, units of measurement, and descriptive statistics for all of the continuous variables involved in the analysis; zero values were excluded from the calculations for certain measures of spending because counties where none occurred end up getting dropped in the estimation process. Note that all explanatory variables except for the spatially lagged dependent variable are lagged in time to 1997; this was done in part because the NRI data, which is used for the two measures of sprawl, is available only up until that year. The time lag also makes good practical sense given how the public planning process works, because there is usually a long delay between when expenditure decisions are made and when they are carried out. In order to be consistent, 1997 values of variables collected from decennial census data were estimated by using a time-weighted average of 1990 and 2000 values.

Applying this dataset to equation (2) results in the following structural model of per capita local government expenditure, written in matrix form:

$$e_s^* = \beta_s W e_s^* + \Phi_s + X\Gamma_s + \upsilon_s. \qquad (3)$$

Here, all notation is the same as above, except that e^* indicates that per capita public expenditure is in natural log form (Carruthers and Úlfarsson 2003) and so is its spatial lag, We^*; s denotes each of the ten measures of public spending; Φ represents a vector of state fixed effects, including one for Washington, DC; and W is a 3,075 × 3,075 ($n \times n$) row-standardized weights matrix that describes the spatial connectivity of the data set. The weights matrix was created using the center of each county's population—that is, a point, calculated using census tract-level data, identifying where people are concentrated rather than the geographic center—to identify neighbors. In the scheme, each county i is related to all counties j having population centers located within 50 miles of its own population center or, in the 65 cases where the distance is greater than 50 miles, to a single nearest neighbor. The connectivity of the resulting spatial weights matrix is illustrated in Figure 6.

Last, the behavioral underpinning of the model says that proximate counties are influenced by each other, so We is endogenous to e, and equation (3) cannot be properly estimated using ordinary least squares (OLS). That is, because per capita spending in county i depends on per capita spending in counties j and the other way around, there is a "chicken-or-egg" problem that must be resolved by choosing an appropriate estimator. The approach used here is a spatial two-stage least squares (S2SLS) strategy developed by Kelejian and Prucha

(1998), which involves first regressing We_s on X and WX, the spatial lag of X, to produce predicted values of the endogenous variable and then using the predicted values, $\hat{We}_s$, in place of the actual values in equation (3). The only shortcoming of this strategy is that the exogenous variables, X and WX, are not always good predictors of We_s, so, as a precautionary step, an additional instrument derived from the "three group method"—wherein the instrument is assigned a negative one, zero, or one depending on whether the value of the original variable, We_s, is in the bottom, middle, or top third of its ordinal ranking (Kennedy 2003)—is included in the first stage regression (see, for example, Fingleton and López-Bazo 2003; Fingleton 2005; Fingleton et al. 2005). Like the alternative, maximum likelihood (ML) estimation, this strategy yields efficient, unbiased parameter estimates, even in the presence of spatial error dependence (Das et al. 2003). Recent examples of other work in the area of public finance that use this estimator as opposed to, or along with, an ML estimator include Esteller-Moré and Solé-Ollé (2001), Revelli (2002, 2003), Baicker (2005), and Solé-Ollé (2006).[9]

3.3 Estimation Results

The S2SLS estimation results for the various structural models are shown in Tables 4 – 7; to better illuminate the spatial component of the analysis, the first of these, the table for total direct spending, also includes results for a model estimated via OLS without the spatial lag. Nearly all of the parameter estimates are statistically significant and the adjusted R^2 values, which range from a low of 0.25 (for the housing and community development equation) to a high of 0.68 (for the roadways equation), show that the models do a good job of explaining how per capita spending varies across the United States, especially given that they were not specifically tailored to the individual types of services. As already noted, the number of observations differs from model-to-model because counties where no spending took place during the 2002 fiscal year were dropped in the estimation process. In addition to the parameter estimates and the values of their corresponding *t*-statistics, the tables list elasticities, η_k, which were calculated for each of the continuous explanatory variables at the mean values of the regressors using the appropriate set of counties—that is, the calculations were made after accounting for dropped observations, so they reflect only those that were actually included in the individual models. The elasticities are considered in detail in the next section, which applies the findings of the empirical analysis to address each of the four policy questions that were posed in the introduction. For now, working

[9] In practice, all of the spatial variables, We_s and WX were calculated in *GeoDa*, a program designed for spatial analysis and computation (Anselin 2003; Anselin et al. 2006), then imported into *EViews*, an econometrics program, with the rest of the data, e_s and X, where the two-stage least squares (2SLS) regressions were run using panel settings to identify the states as cross-sections for fixed effects and as clusters for White-adjusted standard errors.

down though the list of explanatory variables, the following paragraphs summarize the estimation results in a general way.

To begin with, the spatially lagged dependent variables, We_s, register positive and highly significant spillover effects in all of the equations. The mediating influence of the strategic interaction is illustrated in Table 4, which includes OLS estimates alongside the S2SLS estimates. Adding the spatial lag to the model and re-estimating it with the appropriate technique lowers the value of most of the parameter estimates, sometimes by a wide margin. For example, compared to the OLS estimates, the S2SLS estimates of the parameters on the two variables measuring sprawl, the density of developed land and the percentage of county land area that is developed, are 15.97% and 5.15% smaller, respectively; on average, the absolute value of the difference in the parameters from the first regression to the second is 10.17%. Because the dependent variables and their spatial lags are both in log form, the parameters on the spatial lags are interpreted as elasticities, so a 1% change, whether positive or negative, in per capita total direct spending in the surrounding region produces a localized ~0.20% change in total direct spending. Of course, the size of this effect varies substantially among the nine disaggregate measures of spending: The elasticity on the spatial lag of per capita spending on police protection (0.3767) is by far the largest and the elasticity on the spatial lag of per capita spending on education (0.1119) is the smallest. Taken as a group, these estimates show that local governments engage in exactly the kind of strategic interaction that motivates the modeling framework, and, just as importantly, that the resulting pattern of spatial dependence in public finance persists even after accounting for the kind of state-level correlation absorbed by the fixed effects.

Next, in the *Built Environment* category, the parameter on the density of developed land, the first measure of sprawl, carries a negative sign and is statistically significant in the total direct, education, parks and recreation, police protection, and roadways models; it is negative and insignificant in all other cases, except for housing and community development where it is positive and highly significant. The parameter on the second measure of sprawl, the percentage of county land area that is developed (holding county land area constant), is positive and statistically significant in all cases except for housing and community development and solid waste management. Median housing value, a demand factor, and the percentage of housing built before 1940, an additional cost factor, also have a positive influence in most of the equations. The only equation where median housing value negatively influences spending is for housing and community development, a service that is mainly channeled to blighted areas in need of redevelopment and/or where people receive rental subsidies, such as assistance under the Section 8 voucher program (Pendall 2000). Meanwhile, aged development requires higher levels of

spending for rehabilitation and maintenance of physical infrastructure like roadways and sewerage. As explained further below, the results from the two measures of sprawl yield clear evidence that smart growth, with its anti-sprawl policies, matters to public finance: The estimates consistently indicate that high-density, compact development costs less to support than low-density, spatially extensive development. More broadly, these findings represent a large step forward in urban and regional policy evaluation, because they are the most detailed measurements to date of the relationship between the built environment and public finance.

The remaining categories of control variables also reveal important relationships. First, in the *Political Structure* category, the two fragmentation variables, per capita municipalities and per capita special districts, supply little evidence that intergovernmental competition lowers the cost of public services. In fact, municipal fragmentation apparently increases per capita spending on education and roadways, possibly by exacerbating various locational inefficiencies; likewise, special districts, which have rapidly reshaped public finance over the past several decades (Foster 1997), appear to have a positive, rather than negative, influence. Second, in the *Growth and Demographics* category, the parameter on the rate of population change is almost always highly significant and negative; the parameter on per capita income is positive whenever significant; the parameter on the percentage of the population that is white is mostly significant, but its sign differs from equation-to-equation; the parameter on the percentage of the population that is less than five years old is mostly insignificant but is very large and positive in the education equation; and the average household size is negative and statistically significant in all but a few of the models. Overall, this category of explanatory variables indicates that rapid population growth negatively influences existing residents' share of spending and that, other things being equal, per capita spending is greater in regions with a high per capita income (at least for select services, like libraries and parks and recreation), a greater proportion of minorities, and younger, smaller families. Third, members of the *Sources of Revenue* category, which, with the exception of the percentage of tax revenue that comes from property taxes, nearly always have a positive influence when significant, provide insight how local governments finance their spending. In two cases, fire protection and parks and recreation, per capita state revenue carries the perverse (negative) sign and is statistically significant, but these may be spurious correlations—or, it may be that certain state funding comes with strings attached that end up causing communities to divert spending away from these particular services. The tax price is interesting because it positively influences per capita spending on education; although this variable, as a demand factor, is expected to carry a negative sign, the positive sign in this case makes at least tentative sense given the interdependency between school quality and property values (Fischel 2001). Fourth, in the

County Size and Primacy category, the parameters on the three cost factors, county land area, the ratio of employment to population, and the average government wage, are always positive when significant and the metropolitan and micropolitan dummy variables show how the different types of spending vary up and down the regional hierarchy. Finally, note that, in order to conserve space, all of the state fixed effects have been suppressed from the tables.

4. Policy Evaluation

The introduction to this paper posed four questions about the reasoning behind the kind of fiscally motivated, anti-sprawl policy frameworks that have swept the United States over the past several decades: Do low-density, spatially extensive land use patterns cost more to support? If so, how large of an influence does sprawl actually have? How does the influence differ among types of spending? And, how does it compare to the influence of other relevant factors? The answers to these questions, which are based on the findings of the empirical analysis, yield clear evidence that smart growth matters to public finance.

4.1 Do Low-density, Spatially Extensive Land Use Patterns Cost More to Support?

The estimation results listed in Tables 4 – 7 show that the density of developed land has a negative effect on five key measures of local government spending: Total direct, education, parks and recreation, police protection, and roadways. The four disaggregate measures are particularly important because, going in order, they are the first, second, sixth, and third largest of the nine types of spending considered here: On average, they account for 44.95%, 6.33%, 1.45%, and 3.76% of total direct spending. Further, if one-tailed hypothesis tests had been assumed—on the grounds that the direction of influence was anticipated in advance—density would have registered a negative effect on fire protection, libraries, and sewerage, too. Density carries the expected negative sign in the model for spending on solid waste management but it does not come close to being statistically significant, even assuming a more liberal one-tailed hypothesis test. The remaining case, housing and community development, which is positively influenced by density, is sensible, because of the higher cost of land acquisition and construction, among other things, in built-up areas. Next, the spatial extent of developed land, measured as the percentage of county land area that is developed while holding county land area constant, has a positive influence in all but two instances, where it does not approach statistical significance. In sum, the results for these two variables show that, other things being equal, the kind of low-density, spatially extensive development patterns that characterize sprawl cost more to support than the high-density, compact development patterns that the smart growth movement advocates.

4.2 How Large of an Influence Does Sprawl Actually Have?

The magnitude of sprawl's overall influence on public finance in the United States is estimated by applying the elasticities for density (η = –0.0136) and percent developed (η = 0.0246) from the total direct expenditure model to two alternative land use scenarios: The first assumes that all counties nationwide developed in a way that was 25% more compact (more dense and less expansively developed) than they are and the second assumes that all counties in the country developed in a way that was 50% more compact.[10] The dollar values associated with these changes are calculated by obtaining the product of: (1) the relevant elasticity, (2) the relevant percent difference, (3) per capita total direct spending during the 2002 fiscal year, and (4) county population. The first scenario suggests that, if the nation's land use patterns had somehow evolved differently, and development everywhere was 25% more dense, public services would cost, in net, $3.63 billion less annually; if it were that much less expansive, public services would cost $6.56 billion less annually. The second scenario suggests that, if development everywhere was 50% more dense, public services would cost $7.25 billion less annually; if it were that much less expansive, public services would cost $13.12 billion less annually. Capitalized at 5%—more-or-less the current long-term interest rate that most local governments are subject to—as an approximation of opportunity costs, the annual values from the two scenarios translate into $72.75 billion and $131.20 billion (25%) and $145.07 billion and $262.40 billion (50%).

Clearly, these numbers are artificial in that they assume a uniformly different outcome of growth throughout the entire country but they nonetheless give a general sense of just how large of an influence sprawl may have had on public finance. That said, the hypothetical savings, especially vis-à-vis the long-term (capitalized) opportunity costs, are nontrivial enough that some places may wish to identify how to better connect financial planning to land use planning: With a population of 88,000 and per capita total direct expenditures of about $3,200, the average county would annually save $1.18 million ($2.36 million) if it were 25% (50%) more dense and $2.13 million ($4.27 million) if it were that much less developed. Like before, capitalizing these values shows that the opportunity costs are large: $23.59 million ($47.18 million) and $42.67 million ($85.33 million) if development was 25% (50%) more compact. In an era of far reaching budget cuts and increased fiscal conservatism among the general public, these figures seem big enough to merit consideration.

[10] The average density of all counties in the country is 2.49 people plus jobs per acre of developed land, so, on average, these scenarios imply densities of 3.11 and 3.73 people plus jobs per acre of developed land, respectively; the average proportion of county land area that is developed 8% so, on average, these scenarios imply 6% and 4%, respectively.

4.3 How Does the Influence Differ Among Types of Spending?

The elasticities reported for the individual expenditures in Tables 5 – 7 show that the magnitude of sprawl's influence depends on the service in question. The density of developed land has the largest absolute effect on housing and community development (η = 0.1124); then on roadways (η = –0.0562); then on parks and recreation (η = –0.0362); then on education (η = –0.0345); and then on police protection (η = –0.0222). So, sprawl lowers the cost of the first of the services affected by density, likely because land and other inputs cost less, but raises the cost of the last four to a decreasing degree. The spatial extent of developed land, meanwhile, has the largest effect on parks and recreation (η = 0.1048); then on fire protection (η = 0.0872); then on sewerage (η = 0.0718); then on libraries (η = 0.0534); then on police protection (η = 0.0370); then on roadways (η = 0.0321); and then on education (η = 0.0128). In more qualitative terms, this dimension of sprawl has the largest influence on services having centralized facilities that may have to be replicated when they otherwise would not; a more moderate influence on linear infrastructure systems that connect to centralized facilities; and the smallest influence on facilities/services that receive heavy day-to-day use. As a set, the elasticities illustrate that there is wide variation in how public finance is affected by the underlying pattern of land use.

4.4 How Does the Influence of Sprawl Compare to the Influence of Other Relevant Factors?

Direct comparison of the various elasticities needs to be tempered by a recognition that they relate different types of explanatory variables, expressed in different units of measurement, to per capita spending. That said, the parameters are, by definition, unit-free metrics and so lend themselves to the kind of general comparison that is of interest here, as long as differences in the nature of what they describe are kept in mind. The column of elasticities listed for the spatial lag model of total direct expenditure in Table 4 shows that the influence of many factors, including the density of developed land (η = –0.0136) and the spatial extent of developed land (η = 0.0246), turns on the one-hundredths of a percent mark. Exceptions to this, where the relationships turn on the tenths of a percent mark, are the spatially lagged dependent variable (η = 0.2039), the percentage of the population that is less than five years old (η = 0.4065), the average household size (η = –0.7777), per capita state revenue (η = 0.1416), and the ratio of employment to population (η = 0.2836).

The larger an elasticity, the more responsive spending is to changes in the corresponding variable, so, at first glance, the figures reported in Table 4 suggest that, categorically, demographic factors have the largest influence on public spending patterns. This finding is not

surprising, given that people's socioeconomic circumstances are what determines what they demand from their local governments. But, in practice, demographic conditions do not vary too far from their mean, so modest cross-sectional differences end up corresponding to relatively large differences in per capita spending. Consider, for example, that the standard deviation of the average household size is only 8.80% of the mean, whereas, for the density and spatial extent of developed land, the standard deviations are 104.94% and 161.75% of the mean, respectively. In short, factors with little variance register a larger influence, because they rarely, if ever, differ from place-to-place by much. Moreover, compared to other factors that may readily be influenced by public policy—most demographic conditions, such as the number of young children, are not among them—the influence of sprawl is large. In particular, the elasticities on the density and spatial extent of developed land are on the level with those for median housing value (η = 0.0843), the percentage of housing built prior to 1940 (η = 0.0337), the rate of population change (η = –0.0251), and most sources of revenue. And, here again, the two measures of sprawl deviate much further from their mean than most of these, which are generally more uniform across the country. So, to answer the question in brief: Compared to other relevant factors, the influence of sprawl is sizable.

5. Summary and Conclusion

This paper began by outlining the connections between smart growth and public finance, then opened an investigation into them by: (1) reviewing previous research pertaining to the topic; (2) estimating a series of spatial econometric models for measuring how the built environment and other relevant cost and demand factors influence local service expenditures; and (3) evaluating the nature and extent of the relationship. The results of the analysis link one of the main ideas behind smart growth—namely, that low-density, spatially extensive development patterns are more expensive to support—directly to public finance. While there is a lot of variation in how the density and the spatial extent of development influence different types of services, other things being equal, sprawl, as a cost factor, nearly always raises per capita spending, and the effects translate into large dollar values when summed across the entire country. They are also quite large on a case-by-case basis when capitalized at a conventional long-term lending rate as approximations of opportunity costs. These findings strongly suggest that the reasoning behind fiscally motivated, anti-sprawl smart growth policy frameworks is sound. Several conclusions and directions for future research follow.

Foremost, the results of the analysis link one of the main ideas behind smart growth to public finance via local government spending, an intermediate output, but they do not necessarily extend to the final outputs that residents eventually enjoy. Going forward, a key question that must be addressed is: Do high-density, compact development patterns make any difference for service quality, or do they just make services less expensive to provide? This question is critical for the smart growth movement because it cuts to the core of its holistic, quality-of-life orientation. It is important to remember, for example, that the point of departure for much of the previous research on how development patterns affect public finance was concern for the poor fiscal health and corresponding depravity that the 1960s, 1970s, and 1980s visited upon many built-up areas of the United States (Ladd and Yinger 1991). Public finance in-and-of itself is closely related to quality-of-life (Gyourko and Tracy 1989, 1991) but, ultimately, it is the low crime rates, good schools, and other tangible outcomes of local government spending that influence where people choose to live (see, for example, Bayoh et al. 2006). For this reason, to the extent that it can ensure that public services are delivered both cost effectively and at a high level of quality, smart growth stands to play a major part in determining places' comparative advantage.

In addition, given its holistic orientation, further evaluations of smart growth should examine its ability to actually achieve more desirable living conditions. The land use reform movement that produced most of the contemporary anti-sprawl policy frameworks was led, at first, by an environmental awakening (Popper 1981) and, later, by critical thought regarding the extent to which development patterns actually serve the best interests of their inhabitants (Calthorpe 1993; Duany et al. 2000). Recent work by Song and Knaap (2003, 2004) shows that people place a premium on housing located in "neo-traditional," or "new urbanist," developments, suggesting that a distinct market for smart growth may have emerged. Whether this is simply a product of aesthetics or of a more complex blend of architectural, environmental, fiscal, and other factors remains an open question, though. The need to resolve the issue is brought into stark relief by the fact that, even though urban and regional policymakers are responsible for shaping settlement patterns into what they somehow "ought to be," they have so far advanced few defensible criteria for favoring one outcome over another (Talen and Ellis 2002). Lynch's (1981) classic work, *Good City Form*, delineates a set of very specific normative criteria—vitality, sense, fit, access, control, efficiency, and justice—for evaluating alternative modes of land use, but policymakers have too often failed to rigorously connect smart growth, or any of its goals, to a framework of this sort. The results presented here indicate that sprawl is not efficient from the standpoint of public finance but, with further research, other criteria, such as

equity and justice, may turn out to be important as well. Lynch's framework holds great promise for helping to advance the cause of smart growth because it provides a source of structure for analyzing land use policies in terms of the quality-of-life benefits they are meant to produce.

Each of these conclusions is highly general because the analysis presented in this paper focuses on aggregate, county-level patterns of public spending. It is not clear that the findings would apply in exactly the same way on a community-by-community basis, so readers should be cautious about interpreting the results in that way. That is, the analysis observes the relationship between sprawl and public finance at the county level, not at the municipal or neighborhood levels, where the principals of smart growth are normally applied. Counties can contain literally hundreds of individual governmental entities—Cook County, Illinois, where Chicago is located, had 539 general and special purpose governments in 2002—so a great deal of heterogeneity lies beneath the surface of the results presented here. Determining whether or not, and just how, the financial consequences of sprawl play out across more localized areas requires further research using individual jurisdictions as the unit of analysis. It may be, for example, that that the size of jurisdictions and the size of the regions they are embedded in are important mediating factors. Similarly, the overall trajectory of growth through time may also make a difference, especially in instances where large areas are often committed to development via comprehensive planning, zoning, and other forms of land use planning before they are actually filled in (Carruthers and Mulligan 2007). In future research, these and other important jurisdiction-level issues deserve careful thought and analysis.

Finally, as an extension of this need for more locally oriented work, the nature of the strategic interaction registered by the empirical models should be investigated further. Specifically, a procedural goal of many smart growth programs is to promote cooperation among local governments as a means of meeting broader societal objectives (Carruthers 2002). Theoretical research (Haughwout 1997, 1999) and applied policy analysis (Orfield 1997, 2002) alike show that, in the case of public finance, there is a great deal of fiscal interdependency within regions and that cooperation, rather than competition, can produce net benefits for all of those involved. Determining how the spillovers captured by the kind of spatial reaction functions estimated here reconcile with this "regionalist" view would also require with the use of disaggregate, jurisdiction-level data, plus, at the very least, discriminating among different forms of interaction in order to more precisely represent the motivations and behavior of individual governments. Although a project like this would be highly involved, particularly if it were done for the entire country, taking the step would add great depth to the study of smart growth by better integrating it with theory of local government behavior. In the end, such an approach is

necessary in order to develop a full understanding of the complex ways in which smart growth matters to public finance; in the meantime, this paper has taken key steps in that direction.

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Table 1. 2002 Population, Gross State Product, and Local Government Expenditures by State

State	Population	GSP ($ mil.)	Expenditure			State	Population	GSP ($ mil.)	Expenditure		
			Total ($ mil.)	Per Capita	Percent GSP				Total ($ mil.)	Per Capita	Percent GSP
US	287,984,799	$10,412,244	$1,140,082	$3,959	10.95%	MO	5,681,045	$187,090	$17,266	$3,039	9.23%
AL	4,480,139	$123,763	$14,642	$3,268	11.83%	MT	910,395	$23,913	$2,262	$2,485	9.46%
AK	640,699	$29,741	$3,051	$4,762	10.26%	NE	1,726,753	$60,571	$7,769	$4,499	12.83%
AZ	5,438,159	$173,052	$20,404	$3,752	11.79%	NV	2,167,867	$82,389	$9,055	$4,177	10.99%
AR	2,706,606	$71,221	$6,123	$2,262	8.60%	NH	1,274,666	$46,106	$3,493	$2,740	7.58%
CA	34,988,088	$1,363,577	$181,512	$5,188	13.31%	NJ	8,576,089	$377,824	$31,826	$3,711	8.42%
CO	4,498,407	$181,246	$19,363	$4,304	10.68%	NM	1,855,400	$53,414	$5,397	$2,909	10.10%
CT	3,458,382	$167,235	$11,211	$3,242	6.70%	NY	19,164,755	$802,866	$123,857	$6,463	15.43%
DE	805,767	$46,991	$2,127	$2,640	4.53%	NC	8,312,755	$301,254	$28,577	$3,438	9.49%
DC	564,624	$67,176	$7,832	$13,871	11.66%	ND	633,571	$20,007	$1,766	$2,787	8.82%
FL	16,677,860	$522,340	$61,756	$3,703	11.82%	OH	11,404,651	$385,657	$42,720	$3,746	11.08%
GA	8,581,731	$307,443	$30,960	$3,608	10.07%	OK	3,487,076	$95,343	$9,384	$2,691	9.84%
HI	1,234,401	$43,806	$2,077	$1,683	5.74%	OR	3,522,342	$115,113	$13,916	$3,951	12.09%
ID	1,343,973	$38,276	$3,743	$2,785	9.78%	PA	12,324,415	$424,820	$43,527	$3,532	10.25%
IL	12,586,839	$486,182	$51,384	$4,082	10.57%	RI	1,069,550	$37,040	$2,894	$2,706	7.81%
IN	6,154,739	$203,296	$20,687	$3,361	10.18%	SC	4,102,568	$122,274	$12,374	$3,016	10.12%
IA	2,934,340	$97,810	$9,928	$3,383	10.15%	SD	760,368	$25,826	$2,011	$2,645	7.79%
KS	2,712,454	$89,875	$9,098	$3,354	10.12%	TN	5,790,312	$191,394	$21,128	$3,649	11.04%
KY	4,088,510	$121,633	$9,995	$2,445	8.22%	TX	21,722,394	$775,459	$77,108	$3,550	9.94%
LA	4,475,003	$134,360	$13,523	$3,022	10.07%	UT	2,336,673	$73,646	$7,599	$3,252	10.32%
ME	1,296,978	$39,027	$3,386	$2,611	8.68%	VT	616,274	$19,419	$1,616	$2,622	8.32%
MD	5,442,268	$202,840	$17,682	$3,249	8.72%	VA	7,286,061	$288,840	$24,033	$3,298	8.32%
MA	6,411,568	$287,191	$25,035	$3,905	8.72%	WA	6,066,319	$233,971	$26,875	$4,430	11.49%
MI	10,039,379	$347,014	$39,489	$3,933	11.38%	WV	1,804,529	$45,259	$3,980	$2,206	8.79%
MN	5,023,526	$199,271	$22,200	$4,419	11.14%	WI	5,439,137	$189,508	$22,077	$4,059	11.65%
MS	2,866,349	$68,550	$8,000	$2,791	11.67%	WY	499,045	$20,326	$2,365	$4,739	11.63%

Sources: Bureau of Economic Analysis (2002, 2006) and Census of Governments (2005).

Table 2. Public Expenditure Variables

Variable	Description
Total Direct Expenditures	Sum of direct expenditures, including salaries and wages
Education	Expenditures on local schools.
Fire Protection	Expenditures incurred for fire fighting and fire prevention, including contributions to volunteer fire units.
Housing and Community Development	Expenditures on urban renewal, slum clearance, and housing projects.
Natural Resources	Flood control, soil and water conservation, drainage, and any other activities for promotion of agriculture and conservation of natural resources.
Libraries	Expenditures on libraries.
Parks and Recreation	Expenditures on parks and recreation, including playgrounds, golf courses, swimming pools, museums, marinas, community music, drama, celebrations, zoos, and other cultural activities.
Police Protection	Expenditures on municipal police agencies, including coroners, medical examiners, vehicular inspection activities, and traffic control and safety activities.
Roadways	Expenditures for construction and maintenance of municipal streets sidewalks, bridges and toll facilities, street lighting, snow removal, and highway engineering, control, and safety.
Sewerage	Expenditures for construction, maintenance, and operation of sanitary and storm sewer systems and sewage disposal plants.
Solid Waste Management	Expenditures on street cleaning and the collection and disposal of garbage.

Source: Census of Governments, form F-28, 2005 Annual Survey of Local Government Finances.

Table 3. Source, Units, and Description of Continuous Variables

			Descriptive Statistics				
Variable	Source	Units	Mean	Median	Maximum	Minimum	Standard Deviation
Per Capita Total Direct	COG, REIS	$	3,220.77	2,970.36	23,676.37	227.93	1,362.98
Per Capita Education	COG, REIS	$	1,449.76	1,357.08	6,935.84	44.79	480.60
Per Capita Fire	COG, REIS	$	49.31	38.44	1,442.15	0.05	51.57
Per Capita Housing	COG, REIS	$	53.08	35.06	870.33	0.04	63.57
Per Capita Libraries	COG, REIS	$	20.43	15.04	356.51	0.02	22.84
Per Capita Parks	COG, REIS	$	47.68	31.22	1700.40	0.07	66.63
Per Capita Police	COG, REIS	$	120.94	108.79	1200.66	0.60	75.84
Per Capita Roadways	COG, REIS	$	205.34	154.61	1914.18	0.13	175.55
Per Capita Sewerage	COG, REIS	$	67.67	50.93	1164.47	0.10	71.03
Per Capita Solid Waste	COG, REIS	$	46.43	38.89	990.33	0.01	42.31
Density	NRI, REIS	#	2.49	2.04	64.26	0.04	2.61
% Developed	NRI, COG	%	0.09	0.04	1.00	0.00	0.13
Median Housing Value	Census	$	85,634.15	76,521.00	759,966.00	5,174.65	45,962.78
% Housing >1940	Census	%	0.20	0.16	0.61	0.00	0.13
Per Capita Municipalities	COG	# (1,000s)	0.30	0.17	4.09	0.00	0.38
Per Capita Special Districts	COG, REIS	# (1,000s)	0.53	0.22	14.44	0.00	0.88
Population Change	COG, REIS	%	0.06	0.05	0.77	–0.39	0.08
Per Capita Income	REIS	$	22,716.03	22,051.55	78,125.29	5,498.18	5,131.32
% White	Census	%	0.86	0.92	1.00	0.05	0.16
% <5 Years Old	Census	%	0.10	0.10	0.18	0.06	0.01
Average Household size	Census	#	2.66	2.62	5.38	0.83	0.23
% Property Tax	COG	%	0.79	0.82	1.00	0.16	0.16
Per Capita Federal Revenue	COG, REIS	$	79.38	45.70	5,038.61	0.00	163.14
Per Capita State Revenue	COG, REIS	$	1,033.36	953.99	7,415.72	0.00	439.59
Per Capita Long-term Debt	COG, REIS	$	1,917.46	1,072.07	12,2810.20	0.00	4,950.10
County Land Area	COG	# (1,000s ac)	616.00	396.00	12,841.00	10.00	836.00
Employment Ratio	REIS	%	0.38	0.37	2.93	0.08	0.14
Average Wage of Government Job	REIS	$	27,614.64	26,528.16	61,626.56	14,534.40	5,840.15

Notes: COG is the US Bureau of Commerce's Census of Governments; REIS is the US Bureau of Economic Analysis' Regional Economic Information System; NRI is the US Department of Agriculture's National Resources Inventory; Census is the US Census Bureau; all dollar values are expressed in 2002 constant dollars; zero values are excluded from the capital facilities, education, fire protection, housing and community development, libraries, natural resources, parks and recreation, roadways, sewerage, and solid waste calculations.

Table 4. OLS and S2SLS Estimates of Total Direct Equation

	OLS			S2SLS		
	Estimated Parameter	Elasticity	*t*-value	Estimated Parameter	Elasticity	*t*-value
Constant	7.59E+00 ***	-	42.06	6.06E+00 ***	-	18.29
Spatial Lag	-	-	-	2.04E-01 ***	0.2039	5.93
Built Environment						
Density	–6.49E-03 ***	–0.0162	–2.51	–5.45E-03 **	–0.0136	–2.10
% Developed	3.05E-01 ***	0.0259	5.97	2.89E-01 ***	0.0246	5.59
Median Housing Value	1.15E-06 ***	0.0985	6.18	9.85E-07 ***	0.0843	5.28
% Housing <1940	1.97E-01 ***	0.0384	2.72	1.73E-01 ***	0.0337	2.40
Political Structure						
Per Capita Municipalities	3.98E-02 $^{n/s}$	0.0119	1.49	2.79E-02 $^{n/s}$	0.0084	1.04
Per Capita Special Districts	5.68E-02 ***	0.0299	4.06	5.53E-02 ***	0.0291	4.13
Growth and Demographics						
Population Change	–4.88E-01 ***	–0.0295	–4.37	–4.15E-01 ***	–0.0251	–3.76
Per Capita Income	1.88E-06 *	0.0427	1.64	1.60E-06 $^{n/s}$	0.0363	1.39
% White	–1.18E-01 *	–0.1008	–1.84	–1.16E-01 *	–0.0993	–1.86
% <5 Years Old	4.31E+00 ***	0.4470	5.85	3.92E+00 ***	0.4065	5.36
Average Household size	–2.85E-01 ***	–0.7588	–4.45	–2.93E-01 ***	–0.7777	–4.66
Sources of Revenue						
% Property Tax	2.27E-01 ***	0.1790	3.52	1.96E-01 ***	0.1545	3.04
Per Capita Federal Revenue	1.31E-04 *	0.0104	1.73	1.28E-04 *	0.0102	1.69
Per Capita State Revenue	1.33E-04 ***	0.1374	3.36	1.37E-04 ***	0.1416	3.49
Per Capita Long-term Debt	1.71E-05 ***	0.0328	11.98	1.70E-05 ***	0.0326	11.73
County Size and Primacy						
County Land Area	2.85E-05 ***	0.0176	3.80	2.49E-05 ***	0.0154	3.54
Employment Ratio	7.62E-01 ***	0.2898	6.87	7.46E-01 ***	0.2836	6.64
Average Government Wage	–1.25E-06 $^{n/s}$	–0.0345	–0.83	–1.23E-06 $^{n/s}$	–0.0340	–0.80
Metropolitan	–2.92E-02 **	-	–2.25	–2.55E-02 **	-	–2.00
Micropolitan	8.22E-03 $^{n/s}$	-	0.61	1.00E-02 $^{n/s}$	-	0.76
n			3,075			3,075
Adjusted R^2			0.60			0.61

Notes: All models were estimated using White-adjusted standard errors clustered by state; all state fixed effects have been suppressed to conserve space; *** denotes two-tailed hypothesis test significant at $p < 0.01$; ** denotes two-tailed hypothesis test significant at $p < 0.05$; * denotes two-tailed hypothesis test significant at $p < 0.10$; $^{n/s}$ denotes two-tailed hypothesis test not significant.

Table 5. S2SLS Estimates of Education, Fire Protection, and Housing and Community Development Equations

	Education			Fire Protection			Housing and Community Development		
	Estimated Parameter	Elasticity	*t*-value	Estimated Parameter	Elasticity	*t*-value	Estimated Parameter	Elasticity	*t*-value
Constant	5.40E+00 ***	-	18.30	3.80E+00 ***	-	7.07	6.26E+00 ***	-	8.76
Spatial Lag	1.12E-01 ***	0.1119	3.08	2.23E-01 ***	0.2235	4.01	1.97E-01 ***	0.1970	3.58
Built Environment									
Density	–1.39E-02 ***	–0.0345	–6.07	–1.27E-02 n/s	–0.0318	–1.64	4.22E-02 ***	0.1124	2.91
% Developed	1.50E-01 ***	0.0128	4.08	1.02E+00 ***	0.0872	5.88	2.92E-01 n/s	0.0276	1.34
Median Housing Value	9.49E-07 ***	0.0813	4.57	4.87E-07 n/s	0.0418	0.70	–2.80E-06 ***	–0.2463	–3.37
% Housing < 1940	–1.56E-01 *	–0.0303	–1.81	5.34E-01 **	0.1039	2.41	2.83E-01 n/s	0.0549	0.81
Political Structure									
Per Capita Municipalities	4.89E-02 **	0.0147	1.99	–1.01E-01 n/s	–0.0304	–1.22	–3.78E-01 ***	–0.1028	–2.56
Per Capita Special Districts	3.56E-02 ***	0.0186	3.62	3.71E-02 n/s	0.0193	1.09	1.15E-01 **	0.0526	2.05
Growth and Demographics									
Population Change	–3.96E-01 ***	–0.0240	–3.29	–1.33E-01 n/s	–0.0081	–0.39	–9.97E-01 **	–0.0594	–2.12
Per Capita Income	9.96E-07 n/s	0.0226	1.24	8.93E-06 **	0.2029	2.38	–2.59E-06 n/s	–0.0590	–0.43
% White	–5.81E-02 n/s	–0.0496	–0.96	–1.20E-01 n/s	–0.1025	–0.71	–1.81E+00 ***	–1.5376	–7.42
% < 5 Years Old	6.33E+00 ***	0.6561	9.41	1.38E+00 n/s	0.1426	0.71	–1.50E+00 n/s	–0.1547	–0.44
Average Household size	–1.36E-01 **	–0.3606	–2.37	–5.92E-01 ***	–1.5753	–4.57	–9.02E-01 ***	–2.3975	–3.69
Sources of Revenue									
% Property Tax	4.29E-01 ***	0.3391	8.44	–1.16E+00 ***	–0.9120	–4.56	–2.43E-01 n/s	–0.1903	–0.84
Per Capita Federal Revenue	4.44E-05 n/s	0.0035	1.27	2.33E-04 ***	0.0186	3.03	1.06E-03 ***	0.0853	3.46
Per Capita State Revenue	2.32E-04 ***	0.2399	5.44	–2.14E-04 ***	–0.2214	–3.43	6.99E-05 n/s	0.0718	0.69
Per Capita Long-term Debt	–6.35E-07 n/s	–0.0012	–0.84	3.46E-06 n/s	0.0067	0.80	–6.57E-06 n/s	–0.0131	–1.28
County Size and Primacy									
County Land Area	1.16E-05 **	0.0072	2.45	6.05E-05 **	0.0374	1.96	4.42E-05 n/s	0.0262	1.23
Employment Ratio	1.81E-01 **	0.0690	3.30	1.80E+00 ***	0.6841	6.34	1.86E+00 ***	0.7240	5.29
Average Government Wage	2.26E-06 n/s	0.0624	1.63	7.04E-06 n/s	0.1946	1.39	–3.35E-06 n/s	–0.0940	–0.41
Metropolitan	–1.11E-02 n/s	-	–0.99	2.89E-01 ***	-	5.32	1.73E-01 ***	-	2.61
Micropolitan	–3.14E-05 n/s	-	0.00	3.32E-01 ***	-	7.55	5.91E-02 n/s	-	0.92
n			3,071			3,056			2,564
Adjusted R^2			0.51			0.42			0.25

Notes: All models were estimated using White-adjusted standard errors clustered by state; all state fixed effects have been suppressed to conserve space; *** denotes two-tailed hypothesis test significant at $p < 0.01$; ** denotes two-tailed hypothesis test significant at $p < 0.05$; * denotes two-tailed hypothesis test significant at $p < 0.10$; n/s denotes two-tailed hypothesis test not significant.

Table 6. S2SLS Estimates of Libraries, Parks and Recreation, and Police Protection Equations

	Libraries			Parks and Recreation			Police Protection		
	Estimated Parameter	Elasticity	*t*-value	Estimated Parameter	Elasticity	*t*-value	Estimated Parameter	Elasticity	*t*-value
Constant	7.52E-01 n/s	-	1.62	7.09E-01 n/s	-	1.24	3.76E+00 ***	-	12.21
Spatial Lag	1.63E-01 ***	0.1628	3.06	2.60E-01 ***	0.2598	5.34	3.77E-01 ***	0.3767	9.17
Built Environment									
Density	–1.25E-02 n/s	–0.0320	–1.59	–1.44E-02 **	–0.0362	–2.30	–8.91E-03 *	–0.0222	–1.76
% Developed	6.02E-01 ***	0.0534	2.80	1.22E+00 ***	0.1048	6.38	4.36E-01 ***	0.0370	4.27
Median Housing Value	2.25E-06 ***	0.1966	2.77	1.91E-06 **	0.1649	2.51	1.13E-06 ***	0.0968	2.91
% Housing < 1940	4.60E-02 n/s	0.0088	0.14	1.82E-01 n/s	0.0354	0.65	1.60E-01 n/s	0.0312	1.28
Political Structure									
Per Capita Municipalities	–3.10E-01 ***	–0.0869	–2.89	–2.01E-01 *	–0.0592	–1.91	–7.96E-02 *	–0.0239	–1.91
Per Capita Special Districts	6.81E-02 **	0.0332	2.04	–2.58E-02 n/s	–0.0133	–0.41	2.94E-02 n/s	0.0155	1.16
Growth and Demographics									
Population Change	–3.27E-01 n/s	–0.0204	–1.04	–9.34E-01 **	–0.0568	–2.33	–4.08E-01 **	–0.0247	–2.53
Per Capita Income	8.84E-06 *	0.2013	1.81	1.20E-05 ***	0.2734	2.65	1.20E-06 n/s	0.0273	0.63
% White	3.98E-01 *	0.3401	1.87	9.48E-01 ***	0.8101	5.19	–3.32E-01 ***	–0.2836	–4.11
% < 5 Years Old	8.91E-01 n/s	0.0923	0.36	2.96E+00 n/s	0.3066	1.55	1.44E+00 n/s	0.1495	1.35
Average Household size	–1.74E-01 n/s	–0.4625	–1.08	–1.53E-01 n/s	–0.4071	–1.20	–4.58E-01 ***	–1.2183	–5.91
Sources of Revenue									
% Property Tax	3.37E-01 n/s	0.2662	1.21	–7.73E-01 ***	–0.6099	–3.37	–4.01E-01 ***	–0.3171	–3.82
Per Capita Federal Revenue	9.35E-05 n/s	0.0075	0.90	1.88E-04 *	0.0150	1.67	–2.82E-05 n/s	–0.0022	–0.54
Per Capita State Revenue	–3.96E-05 n/s	–0.0412	–0.60	–1.68E-04 ***	–0.1740	–2.71	5.83E-05 **	0.0602	2.14
Per Capita Long-term Debt	1.41E-05 ***	0.0269	3.59	6.19E-06 *	0.0121	1.81	6.60E-07 n/s	0.0013	0.33
County Size and Primacy									
County Land Area	8.10E-05 ***	0.0511	2.58	1.16E-04 ***	0.0721	3.97	1.44E-05 n/s	0.0089	1.20
Employment Ratio	1.60E+00 ***	0.6151	5.24	2.67E+00 ***	1.0197	7.19	1.01E+00 ***	0.3837	6.54
Average Government Wage	2.15E-06 n/s	0.0599	0.34	3.76E-06 n/s	0.1042	0.63	5.03E-06 **	0.1389	2.06
Metropolitan	4.23E-02 n/s	-	0.81	1.53E-01 ***	-	3.09	8.95E-02 ***	-	3.94
Micropolitan	–6.19E-02 n/s	-	–1.08	1.46E-01 ***	-	3.12	5.04E-02 ***	-	2.81
n			2,818			3,012			3,075
Adjusted R^2			0.34			0.46			0.60

Notes: All models were estimated using White-adjusted standard errors clustered by state; all state fixed effects have been suppressed to conserve space; *** denotes two-tailed hypothesis test significant at p < 0.01; ** denotes two-tailed hypothesis test significant at p < 0.05; * denotes two-tailed hypothesis test significant at p < 0.10; n/s denotes two-tailed hypothesis test not significant.

Table 7. S2SLS Estimates of Roadways, Sewerage, and Solid Waste Management Equations

	Roadways			Sewerage			Solid Waste Management		
	Estimated Parameter	Elasticity	*t*-value	Estimated Parameter	Elasticity	*t*-value	Estimated Parameter	Elasticity	*t*-value
Constant	3.18E+00 ***	-	8.47	3.78E+00 ***	-	7.01	3.39E+00 ***	-	5.51
Spatial Lag	1.90E-01 ***	0.1898	5.23	1.45E-01 ***	0.1448	2.84	3.06E-01 ***	0.3064	6.16
Built Environment									
Density	–2.25E-02 ***	–0.0562	–3.29	–1.58E-02 n/s	–0.0399	–1.64	–8.85E-03 n/s	–0.0222	–0.89
% Developed	3.78E-01 **	0.0321	2.09	8.33E-01 ***	0.0718	4.49	2.66E-01 n/s	0.0229	1.41
Median Housing Value	1.35E-06 ***	0.1155	2.76	2.36E-06 ***	0.2035	3.82	3.87E-07 n/s	0.0333	0.42
% Housing < 1940	5.97E-01 ***	0.1164	3.75	7.40E-01 ***	0.1451	3.30	3.11E-01 n/s	0.0603	1.07
Political Structure									
Per Capita Municipalities	2.45E-01 ***	0.0738	4.66	–1.16E-01 n/s	–0.0347	–1.49	–2.52E-01 ***	–0.0750	–3.12
Per Capita Special Districts	9.42E-02 ***	0.0497	3.23	–6.45E-03 n/s	–0.0033	–0.21	7.47E-02 **	0.0376	1.98
Growth and Demographics									
Population Change	–3.77E-01 *	–0.0227	–1.66	–5.50E-02 n/s	–0.0033	–0.16	–1.35E+00 ***	–0.0812	–3.94
Per Capita Income	8.92E-07 n/s	0.0203	0.32	1.51E-06 n/s	0.0344	0.35	–5.07E-06 n/s	–0.1153	–1.16
% White	5.18E-01 ***	0.4428	3.63	–1.22E-01 n/s	–0.1046	–0.72	–2.81E-01 n/s	–0.2397	–1.70
% < 5 Years Old	3.72E+00 ***	0.3857	2.65	–4.29E+00 **	–0.4435	–2.32	–1.26E-01 n/s	–0.0130	–0.06
Average Household size	–2.86E-01 ***	–0.7610	–3.62	–1.77E-01 n/s	–0.4712	–1.21	–5.04E-01 ***	–1.3409	–2.86
Sources of Revenue									
% Property Tax	1.35E-01 n/s	0.1067	0.76	–6.92E-01 ***	–0.5456	–2.68	–5.44E-02 n/s	–0.0429	–0.25
Per Capita Federal Revenue	1.36E-05 n/s	0.0011	0.27	1.09E-04 n/s	0.0087	1.21	–1.15E-04 n/s	–0.0090	–1.23
Per Capita State Revenue	1.24E-04 ***	0.1283	2.64	3.64E-05 n/s	0.0377	0.59	8.31E-05 n/s	0.0859	1.56
Per Capita Long-term Debt	6.95E-06 ***	0.0134	2.91	5.89E-06 n/s	0.0114	1.37	1.91E-06 n/s	0.0037	0.46
County Size and Primacy									
County Land Area	4.79E-05 ***	0.0296	3.13	5.26E-05 ***	0.0327	2.44	8.33E-05 ***	0.0509	2.49
Employment Ratio	7.66E-01 ***	0.2916	4.87	1.56E+00 ***	0.5946	3.59	1.49E+00 ***	0.5674	6.13
Average Government Wage	–1.67E-06 n/s	–0.0461	–0.51	–5.58E-06 n/s	–0.1545	–1.18	6.14E-07 n/s	0.0170	0.10
Metropolitan	–1.49E-01 ***	-	–4.56	2.07E-01 ***	-	4.13	–9.22E-02 **	-	–1.94
Micropolitan	–1.19E-01 ***	-	–5.08	2.41E-01 ***	-	6.65	3.34E-02 n/s	-	0.68
n			3,056			2,979			2,995
Adjusted R^2			0.68			0.36			0.31

Notes: All models were estimated using White-adjusted standard errors clustered by state; all state fixed effects have been suppressed to conserve space; *** denotes two-tailed hypothesis test significant at $p < 0.01$; ** denotes two-tailed hypothesis test significant at $p < 0.05$; * denotes two-tailed hypothesis test significant at $p < 0.10$; n/s denotes two-tailed hypothesis test not significant.

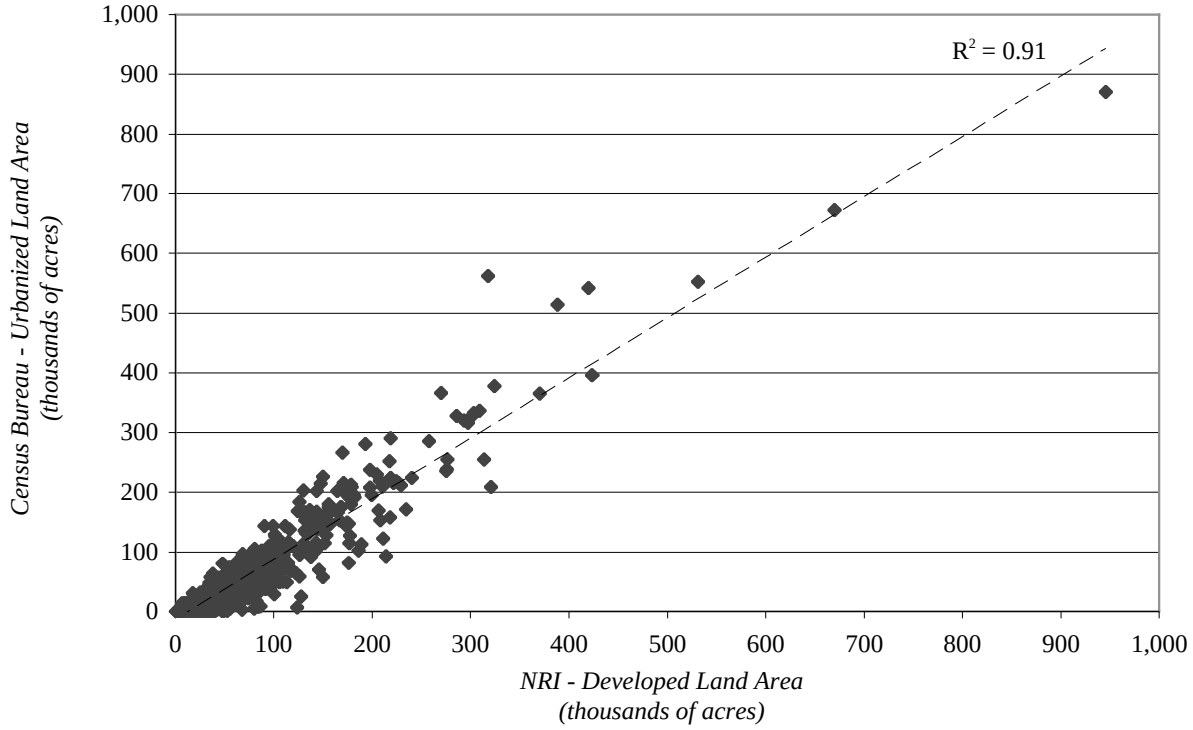

Figure 1. The NRI Measure of Developed Land Versus the Census Bureau's Measure of Urbanized Land

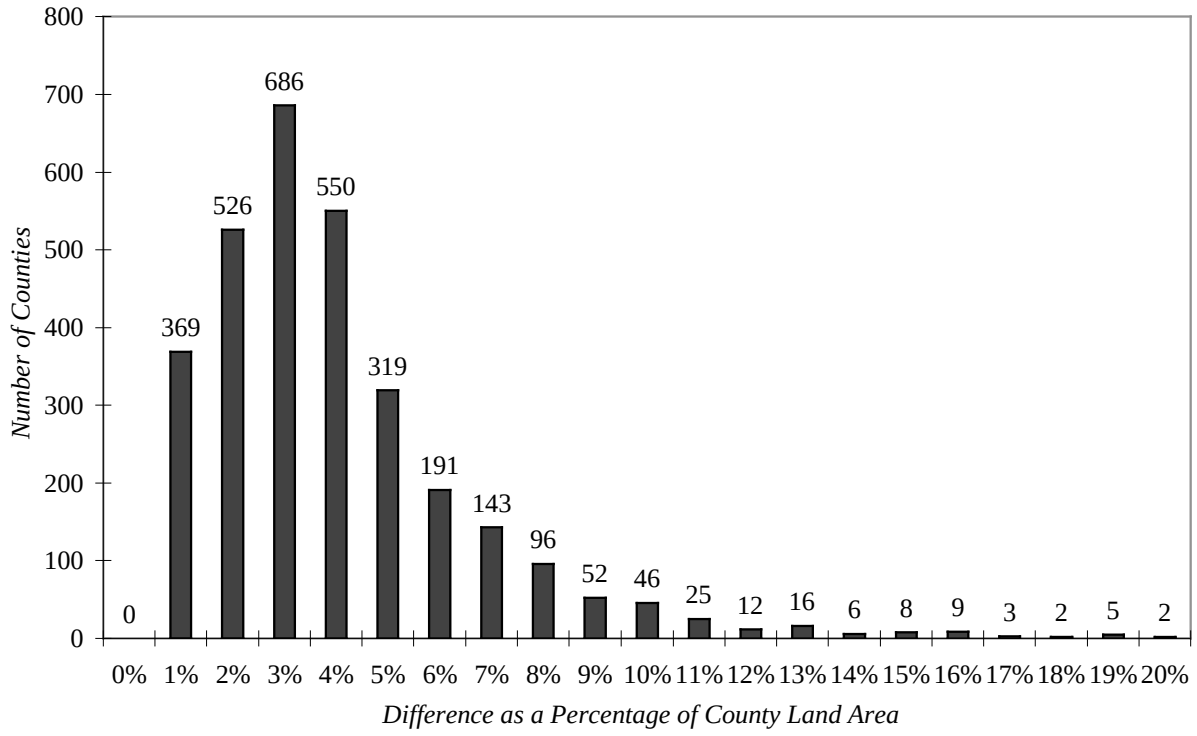

Figure 2. Absolute Value of the Difference Between Acres of Developed Land (NRI) and Acres of Urbanized Land (Census) as a Percentage of County Land Area

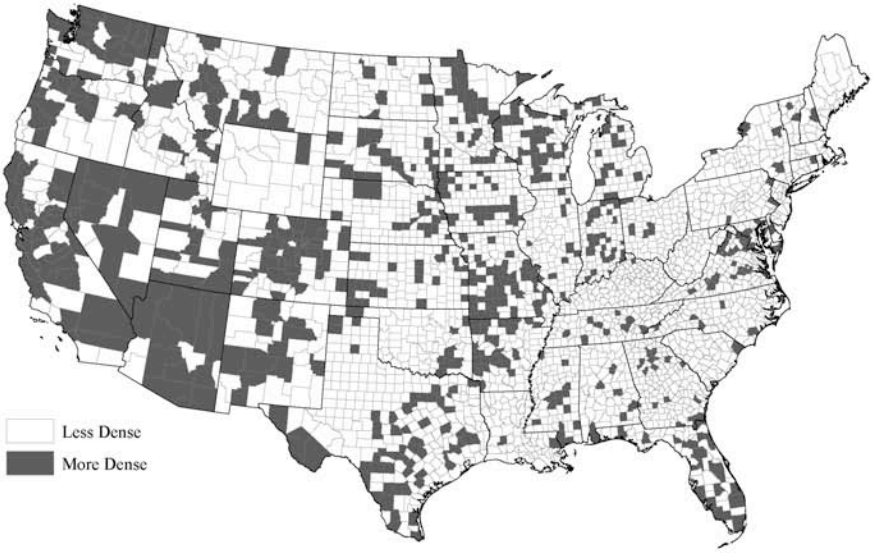

Figure 3. Change in Density, 1982 – 1997

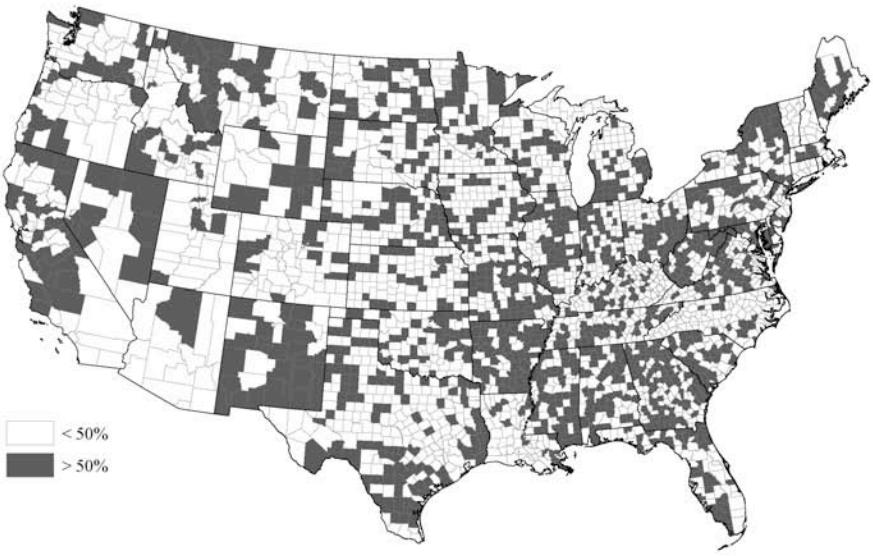

Figure 4. Percent Land Absorption, 1992 – 1997

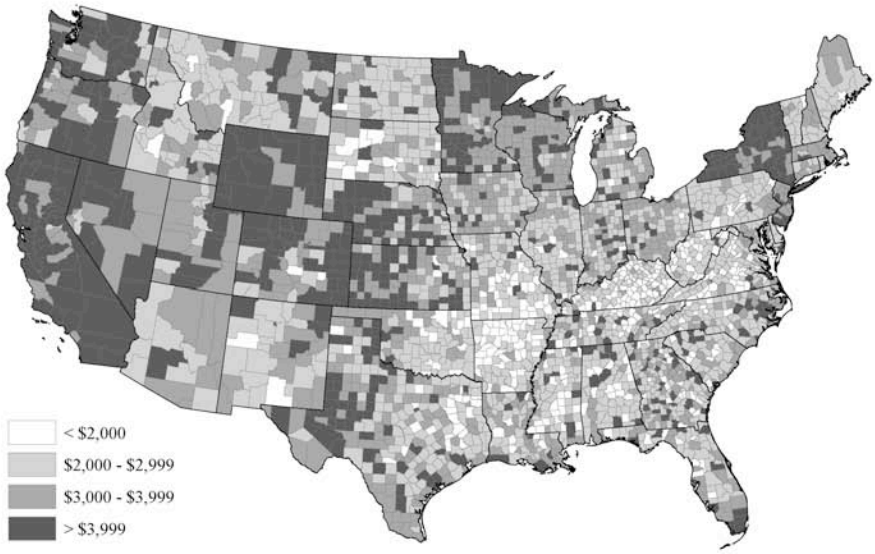

Figure 5. Per Capita Total Direct Expenditure, FY 2002

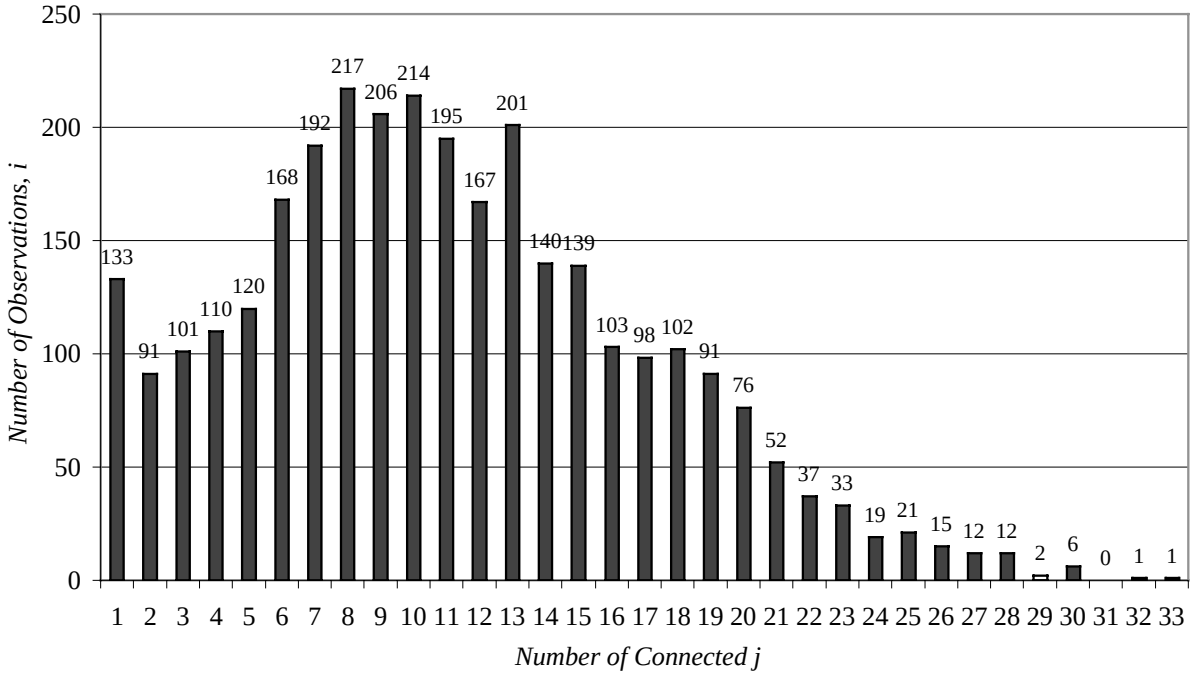

Figure 6. Connectivity of W_{ij}

CALIFORNIA NATURAL RESOURCES AGENCY

FINAL STATEMENT OF REASONS FOR REGULATORY ACTION

Amendments to the State CEQA Guidelines Addressing Analysis and Mitigation of Greenhouse Gas Emissions Pursuant to SB97

December 2009

CALIFORNIA NATURAL RESOURCES AGENCY
FINAL STATEMENT OF REASONS FOR REGULATORY ACTION

December 2009

INTRODUCTION

The California Natural Resources Agency ("the Resources Agency") has adopted certain amendments and additions to certain guidelines implementing the California Environmental Quality Act (Public Resources Code section 21000 *et seq*.) ("CEQA"). Specifically, these amendments implement the Legislature's directive in Public Resources Code section 21083.05 (enacted as part of SB97 (Chapter 185, Statutes 2007)). That section directs the Resources Agency to "certify and adopt guidelines prepared and developed by the Office of Planning and Research" "for the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions[.]" (Pub. Resources Code, § 21083.05(a)-(b).)

CEQA generally requires public agencies to review the environmental impacts of proposed projects, and, if those impacts may be significant, to consider feasible alternatives and mitigation measures that would substantially reduce significant adverse environmental effects. Section 21083 of the Public Resources Code requires the adoption of guidelines to provide public agencies and members of the public with guidance about the procedures and criteria for implementing CEQA. The guidelines required by section 21083 of the Public Resources Code are promulgated in the California Code of Regulations, title 14, sections 15000-15387 (the "Guidelines" or "State CEQA Guidelines"). Public agencies, project proponents, and third parties who wish to enforce the requirements of CEQA, rely on the Guidelines to provide a comprehensive guide on compliance with CEQA. Subdivision (f) of section 21083 requires the Resources Agency, in consultation with the Office of Planning and Research ("OPR"), to certify, adopt and amend the Guidelines at least once every two years.

Section 21083.05, as noted above, requires the promulgation of Guidelines specifically addressing analysis and mitigation of the effects of greenhouse gas emissions. The Resources Agency has adopted the following changes to the Guidelines ("Amendments") to implement that directive:

Add sections: 15064.4, 15183.5 and 15364.5.

Amend sections: 15064, 15064.7, 15065, 15086, 15093, 15125, 15126.2, 15126.4, 15130, 15150, 15183, Appendix F and Appendix G.

In addition to guidelines implementing SB97, some of the amendments listed above are non-substantive corrections.

The Resources Agency considered reasonable alternatives to the Amendments. The Resources Agency has determined that no reasonable alternative would be more effective in carrying out the purpose for which the action is proposed or would be as effective as, and less burdensome to affected private persons than, the Amendments. This conclusion is based on the Resources Agency's determination that the Amendments are necessary to implement the Legislature's directive in SB97 and to update the Guidelines to reflect recent case law. Thus, the Amendments add no additional substantive requirements; rather, the Guidelines merely assist lead agencies in complying with CEQA's existing requirements. The Resources Agency rejected the no action alternative because it would not respond to the Legislature's directive in SB97. There are no alternatives available that would lessen any adverse impacts on small businesses, as any impacts are due to existing requirements of CEQA and not the Amendments.

The Resources Agency also initially determined that the Amendments would not have a significant adverse economic impact on business. The Resources Agency has determined that this action would have no impacts on project proponents. However, the Resources Agency is aware that certain of the statutory changes enacted by the Legislature and judicial decisions, described in greater detail below, that are reflected in the Amendments could have an economic impact on project proponents, including businesses. Among other things, project proponents could incur additional costs in assisting lead agencies to comply with CEQA's requirement for analysis of greenhouse gas emissions. However, the Amendments to the Guidelines merely reflect these legislative and judicial requirements, and the Resources Agency knows of no less costly alternative. The Amendments clarify and update the Guidelines to be consistent with legislative enactments that have modified CEQA, and recent case law interpreting it, but does not impose any new requirements. Therefore, the Amendments would not have a significant, adverse economic impact on business.

Some comments were submitted during the public comment period and during the public hearings on the Proposed Amendments suggesting that the adverse economic impacts could result. For example, some suggested that the addition of forestry resources to the Appendix G checklist may increase the regulatory burden on the agricultural industry. Others suggested that application of the Guidelines to renewable energy projects or those implementing AB32 may be counterproductive. Despite those suggestions, no evidence was presented to the Resources Agency supporting those claims. Moreover, those comments did not provide any rationale challenging the Resources Agency's position that the Proposed Amendments implement existing requirements. Therefore, having considered all of the comments submitted on the Proposed Amendments, the Resources Agency concludes that its initial determination that the proposed action will not have a significant adverse economic impact remains correct.

The Amendments do not duplicate or conflict with any federal statutes or regulations. CEQA is similar in some respects to the National Environmental Policy Act ("NEPA"), 42 U.S.C. sections 4321-4343. Federal agencies are subject to NEPA, which

requires environmental review of federal actions. State and local agencies are subject to CEQA, which requires environmental review before state and local agencies may approve or decide to undertake discretionary actions and projects in California. Although both NEPA and CEQA require an analysis of environmental impacts, the substantive and procedural requirements of the two statutes differ. Most significantly, CEQA requirements for feasible mitigation of environmental impacts exceed NEPA's mitigation provisions. A state or local agency must complete a CEQA review even for those projects for which NEPA review is also applicable, although Guidelines sections 15220-15229 allow state, local and federal agencies to coordinate review when projects are subject to both CEQA and NEPA. Because state and local agencies are subject to CEQA unless exemptions apply, and because CEQA and NEPA are not identical, guidelines for CEQA are necessary to interpret and make specific provisions of SB97 and do not duplicate the Code of Federal Regulations.

FINAL STATEMENT OF REASONS

The Administrative Procedure Act requires that an agency prepare a final statement of reasons supporting its proposed regulation. The final statement of reasons updates the information contained in the initial statement of reasons, contains final determinations as to the economic impact of the regulations, and provides summaries and responses to all comments regarding the proposed action. The initial statement of reasons, as updated and revised, are contained in full in this final statement of reasons. The summaries and responses to comments are included in the Natural Resources Agency's file of this rulemaking proceeding.

Below is a brief background on the science relating to the effects of greenhouse gas emissions, as well as the various initiatives that California is implementing to reduce those emissions. Following that background, OPR's public engagement process and the Natural Resources Agency's rulemaking process is briefly described. Next, this Final Statement of Reasons explains the purpose and necessity of each proposed change to the Guidelines. Finally, Thematic Responses, addressing the major themes that were raised in public comments, are provided.

BACKGROUND ON THE EFFECTS OF GREENHOUSE GAS EMISSIONS AND CALIFORNIA'S EFFORTS TO REDUCE THOSE EMISSIONS

This section provides a brief background on the potential effects of greenhouse gas emissions and California's efforts to reduce those emissions.

What Are Greenhouse Gases?

Certain gases in Earth's atmosphere naturally trap solar energy to maintain global average temperatures within a range suitable for terrestrial life. Those gases – which primarily include carbon dioxide, methane, nitrous oxide, hydrofluorocarbons,

perfluorocarbons and sulfur hexafluoride – act as a greenhouse on a global scale. (Health and Safety Code, § 38505(g).) Thus, those heat-trapping gases are known as greenhouse gases ("GHG").

The Legislature defined "greenhouse gases" to include the six gases mentioned above in California's Global Warming Solutions Act. (Health & Saf. Code, § 38500 et seq.) Similarly, the U.S. EPA has found that those same six gases could be regulated under the authority of the Clean Air Act. According to the U.S. EPA:

> (1) These six greenhouse gas share common properties regarding their climate effects; (2) these six greenhouse gases have been estimated to be the primary cause of human-induced climate change, are the best understood drivers of climate change, and are expected to remain the key driver of future climate change; (3) these six greenhouse gases are the common focus of climate change science research and policy analyses and discussions; [and] (4) using the combined mix of these gases as the definition (versus an individual gas-by-gas approach) is consistent with the science, because risks and impacts associated with greenhouse gas-induced climate change are not assessed on an individual gas approach….

(EPA, Endangerment Finding, 74 Fed. Reg. 66496, 66517 (December 15, 2009).) The United Nations Framework Convention on Climate Change also addresses these six gases. (*Id*. at p. 66519.)

What Causes Greenhouse Gas Emissions?

The incremental contributions of GHGs from innumerable direct and indirect sources result in elevated atmospheric GHG levels. (EPA, Draft Endangerment Finding, 74 Fed. Reg. 18886, 18904 (April 24, 2009) ("cumulative emissions are responsible for the cumulative change in the stock of concentrations in the atmosphere"); see also 74 Fed. Reg. 66496, 66538 (same in Final Endangerment Finding).) Some GHG emissions occur through natural processes such as plant decomposition and wildfires. One large source of GHG emissions, for example, is wildfire on forestlands and rangelands, which release carbon as a result of material being burned. (California Board of Forestry and Fire Protection, *2008 Strategic Plan and Report to the CARB on Meeting AB32 Forestry Sector Targets* (October, 2008), at p. 2.)

Human activities, such as motor vehicle use, energy production and land development, also result in both direct and indirect emissions that contribute to highly elevated concentrations of GHGs in the atmosphere. (California Energy Commission, *Inventory of California Emissions and Sinks: 1990 to 2004* (2006).)[1] Transportation

[1] Multiple statewide emission inventories covering the same period of time may vary. This is largely due to inventories characterizing an emission source by sectors (e.g. agriculture, cement, transportation, etc.) which may not be treated the same depending on the methodology used and access to information. Thus,

alone is estimated to account for nearly 40 percent of California's GHG emissions. (California Air Resources Board, *Climate Change Proposed Scoping Plan* (2008), at p. 11 ("Scoping Plan"); California Energy Commission 2007, *2007 Integrated Energy Policy Report*, CEC-100-2007-008-CMF ("2007 IEPR") at p. 18, Figure 1-2.) Emissions attributable to transportation result largely from development that increases, rather than decreases, vehicle miles traveled: low density, unbalanced land uses separating jobs and housing, and a focus on single-occupancy vehicle travel. (California Energy Commission, The Role of Land Use In Meeting California's Energy and Climate Change Goals. (2007) at p. 9.) In approaching regulation of GHG emissions in California, for example, the California Air Resources Board ("ARB") proposes to regulate various economic sectors that are known to emit GHGs, including electric power, transportation, industrial sources, landfills, commercial and residential sectors, agriculture and forestry. (Scoping Plan, Appendix F.) With a growing population and economy, California's total GHG emissions continue to increase. As explained below, this rapid rate of increase in GHG emissions is causing a change in the composition of atmospheric gases that may cause life threatening adverse environmental consequences.

What Effects May Result from Increased Greenhouse Gas Emissions?

Several measurable effects, including, among others, an increase in global average temperatures have been attributed to increases in GHG emissions resulting from human activity. (Intergovernmental Panel on Climate Change, *Working Group 1 Report: The Physical Science Basis* (2001), at p. 101.) Evidence further indicates that a warmer planet may in turn lead to changes in rainfall patterns, a retreat of polar icecaps, a rise in sea level, and changes in ecosystems supporting human, animal and plant life. (U.S. Environmental Protection Agency, *Technical Support Document for Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act,* April 17, 2009 ("Technical Support Document"), at pp. ES-1 to ES-3.) Climate change is not the only effect of increased GHG emissions. Impacts to human health and ocean acidification are also attributed to increasing concentrations of GHGs in the Earth's atmosphere. (*Id*. at p. 57.)

Globally elevated concentrations of GHGs have been observed to induce a range of associated effects. For example, the effects of atmospheric warming include, but are not limited to, increased likelihood of more frequent and intense natural disasters, increased drought, and harm to agriculture, wildlife, and ecological systems. (Technical Support Document at pp. ES-1, ES-6.) According to a report prepared for the California Climate Change Center:

> Climate change is likely to affect the abundance, production, distribution, and quality of ecosystem services throughout the State of California

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two statewide emissions inventories may be different depending on the agency that created them or its intended application. The CARB is in the process of updating its statewide data and methodologies to be consistent with international and national guidelines. The typical emissions inventory covers 1990 to 2004.

> including the delivery of abundant and clean water supplies to support human consumption and wildlife, climate stabilization through carbon sequestration, the supply of fish for commercial and recreational sport fishing. For example, as described in this report, areas of the state suitable for forage production to support cattle grazing in natural areas could shift as some parts of the state become too dry to support forage and others become wetter. The ability of the State's forests to sequester carbon and support climate stabilization could be hindered as productivity decreases and fires increase. And increased water temperatures in streams due to a decrease in provision of fresh water could seriously reduce salmon reproduction and subsequently reduce the number of salmon available for commercial and recreational harvest. Also, areas of the state suitable for forage production to support cattle grazing in natural areas could shift as some parts of the state become too dry to support forage and others become wetter. All of these ecosystem services have economic value and that value and its distribution is likely to changes under a changing climate.

(Rebecca Shaw, et al., for the California Climate Change Center, *The Impact of Climate Change on California's Ecosystem Services*, March 2009, CEC-500-2009-025-D, at p. 1.)

The effects of increased GHG concentrations are already being felt in California. For example, global atmospheric changes are causing sea levels to rise. An increase of approximately 8 inches has been recorded at the Golden Gate Bridge over the past 100 years. Such sea level rise threatens low coastal areas with inundation and increased erosion. (Scoping Plan, at p. 10.)

While sea levels continue to rise, the Sierra snowpack has been shrinking. Average annual runoff from spring snowmelt has decreased 10% in the last 100 years. Because snow in the Sierra acts as a reservoir, holding winter water for use later in the year, reduced snowpack creates greater potential for summer droughts and reduced hydroelectricity generation. (Office of Environmental Health and Hazard Assessment, April, 2009, Indicators of Climate Change in California, at p. 76.) Climate change is also thought to account for changes in the timing of California's major precipitation events. As explained in a report prepared for the California Climate Change Center:

> reservoirs were designed to store only a fraction of the state's entire yearly precipitation, under the assumption that the annual mountain snowpack would melt at roughly the same time every year. During anomalously high rain or snowmelt events, reservoirs must not only store water, but also discharge excess water to avoid flooding. Water must sometimes be discharged in anticipation of large events to reduce flood risk. The dual functions of storage and flood management require reservoir managers to carefully balance factors such as precipitation, snowmelt timing, reservoir storage capacity, and demand. Even if future precipitation remains

> unchanged, shifts in snowmelt timing can affect California's water supply during the warm season due to reservoir storage capacity constraints.

(Sarah Kapnick and Alex Hall, for the California Climate Change Center, *Observed Changes in the Sierra Nevada Snowpack: Potential Causes and Concerns*, March 2009, CEC-500-2009-016-D, at p. 1.)

Climate change is also expected to increase the number and intensity of forest fires. (Technical Support Document, at p. 91; *see also* Indicators of Climate Change (2009) at p. 131.) A generally warmer climate is associated with a longer summer season, which in turn dries vegetation and fuels making ignition easier and hastens wildfire spread. (*Ibid*; see also A. L. Westerling, for the California Climate Change Center*, Climate Change, Growth and California Wildfire*, March 2009, CEC-500-2009-046-D, at pp. 1-2.) Not only do wildfires release additional carbon and increase air pollutants, but they also cause indirect effects. For example, wildfires reduce vegetative cover leading to increased water runoff, which has affected watersheds and dampens the effectiveness of California's water works infrastructure. This will degrade California's water quality and challenge water treatment operations to provide safe drinking water. Adverse health impacts from heat-related illnesses are expected with hotter temperatures, and, due to poorer air quality, lung disease, asthma, and other respiratory and circulatory problems will be exacerbated. (California Climate Action Team, Executive Summary Report to Governor Schwarzenegger and the California Legislature (2006) at pp. xii to xiii, 27.); see also Technical Support Document, at pp. ES-4, 69-71.)

Why is California Involved in Greenhouse Gas Regulation?

California is vulnerable to the effects of global warming, and, despite its global nature, action to curb GHG emissions is needed on a statewide level. The legislative findings in Assembly Bill 32 (Chapter 448, Statutes 2006) ("AB32"), for example, state:

> … Global warming poses a serious threat to the economic well-being, public health, natural resources, and the environment of California. The potential adverse impacts of global warming include the exacerbation of air quality problems, a reduction in the quality and supply of water to the state from the Sierra snowpack, a rise in sea levels resulting in the displacement of thousands of coastal businesses and residences, damage to marine ecosystems and the natural environment, and an increase in the incidences of infectious diseases, asthma, and other human health-related problems.
>
> … Global warming will have detrimental effects on some of California's largest industries, including agriculture, wine, tourism, skiing, recreational and commercial fishing, and forestry. It will also increase the strain on electricity supplies necessary to meet the demand for summer air-conditioning in the hottest parts of the state.

(Health & Safety Code, § 38501(a), (b).) The Legislature further declared: "action taken by California to reduce emissions of greenhouse gases will have far-reaching effects by encouraging other states, the federal government, and other countries to act." (*Id*. at subd. (d).) As the world's fifteenth largest emitter of GHGs from human activity and natural sources, California is uniquely positioned to act to reduce GHGs. (Scoping Plan, at pp. 11.)

Reducing greenhouse gas emissions is a necessary response to the threats posed by climate change. Efforts to reduce emissions may result in other significant benefits as well. Governor Schwarzenegger laid out the case for action to reduce greenhouse gas emissions in Executive Order S-3-05:

> … California-based companies and companies with significant activities in California have taken leadership roles by reducing greenhouse gas (GHG) emissions, including carbon dioxide, methane, nitrous oxide and hydrofluorocarbons, related to their operations and developing products that will reduce GHG emissions; …
>
> … [C]ompanies that have reduced GHG emissions by 25 percent to 70 percent have lowered operating costs and increased profits by billions of dollars; …
>
> … [T]echnologies that reduce greenhouse gas emissions are increasingly in demand in the worldwide marketplace, and California companies investing in these technologies are well-positioned to profit from this demand, thereby boosting California's economy, creating more jobs and providing increased tax revenue; …
>
> … [M]any of the technologies that reduce greenhouse gas emissions also generate operating cost savings to consumers who spend a portion of the savings across a variety of sectors of the economy; this increased spending creates jobs and an overall benefit to the statewide economy.

Thus, the Governor, Legislature and private sector have concluded that action to reduce greenhouse gas emissions is necessary and beneficial for the State.

<u>What is California Doing to Reduce its Greenhouse Gas Emissions?</u>

Action to curb greenhouse gas emissions is taking place on many fronts. As described above, the private sector has already taken important steps to increase efficiency and lower costs associated with such emissions. Many local governments have also adopted, or are currently developing, various plans and programs designed to reduce community-wide GHG emissions. (Office of Planning and Research, *The California Planner's Book of Lists* (January 2009) ("Book of Lists"), at pp. 92-100; see also Scoping Plan, at p. 26.) Due to its potential vulnerability to the effects of GHG

emissions, and the wide variety of GHG emissions sources within its borders, California has enacted several laws and programs designed to reduce the State's GHG emissions. Several major legislative initiatives are described below.

AB32 – The Global Warming Solutions Act

Assembly Bill 32 (Chapter 448, Statutes 2006) is a key piece of California's effort to reduce its GHG emissions. AB32 requires the California Air Resources Board ("ARB") to establish regulations designed to reduce California's GHG emissions to 1990 levels by 2020. (Health & Safety Code, § 38550.) On December 11, 2008, ARB adopted its Scoping Plan, setting forth a framework for future regulatory action on how California will achieve that goal through sector-by-sector regulation. (ARB, Resolution No. 08-47; see also Health & Safety Code, § 38561.) ARB must adopt, no later than January 1, 2012, rules and regulations to implement the GHG emissions reductions envisioned in the Scoping Plan. (Health & Safety Code, § 38562.)

The AB32 Scoping Plan outlines a set of actions designed to reduce overall GHG emissions in California to 1990 levels by 2020. The Scoping Plan presents GHG emission reduction strategies that combine regulatory approaches, voluntary measures, fees, policies, and programs. Reduction strategies are expected to evolve as technologies develop and progress toward the State's goal is monitored. Thus, the Scoping Plan sets forth the outline of California's strategy to reduce GHG emissions on a statewide basis.

SB375

As noted above, nearly 40 percent of California's GHG emissions come from the State's transportation sector. (Chapter 728, Statutes 2007, § 1(a).) Technology innovation and lower-carbon fuels alone will not reduce transportation-related emissions sufficiently for California to reach the reduction goals set out in AB32. (*Id*. at § 1(c).) Therefore, in SB375, California enacted several measures to reduce vehicular emissions through land-use planning.

Specifically, SB375 requires ARB to develop "greenhouse gas emission reduction targets for the automobile and light truck sector" for each metropolitan planning organization (MPO). (Gov. Code, § 65080(b)(2)(A).) Once that target is set, each MPO must develop a sustainable communities strategy (SCS), as part of its regional transportation plan, that will set forth a development pattern that will achieve the reduction target approved by the ARB. (*Id*. at subd. (b)(2)(B).) The MPO's transportation planning activities must be consistent with the adopted SCS. (*Id*. at subd. (b).) While an SCS does not supersede a local government's land use authority, SB375 created an exemption from CEQA for local transit-oriented residential projects that are consistent with the applicable SCS as an incentive. (*Id*. at subd. (b)(2)(J); Pub. Resources Code, § 21155.1.)

CEQA and SB97

While AB32 and SB375 target specific types of emissions from specific sectors, the California Environmental Quality Act ("CEQA") regulates nearly all governmental activities and approvals. CEQA generally requires that a lead agency analyze the potential adverse environmental impacts of their decisions, and, if those impacts are determined to be significant, to avoid those impacts through mitigation or project alternatives. As awareness of the causes and effects of GHG emissions has increased, those effects began to be addressed in environmental analyses on a project-level basis. Federal courts, moreover, have interpreted the National Environmental Policy Act ("NEPA") to require an analysis of potential impacts of GHG emissions. (*See*, *e.g.*, *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Ad*., 538 F.3d 1172, 1215-1217 (9th Cir. 2008).) Uncertainty developed, however, among public agencies regarding how GHG emissions should be analyzed in environmental documents prepared pursuant to CEQA.

To provide greater certainty to lead agencies, Governor Schwarzenegger signed Senate Bill 97 (Chapter 148, Statutes 2007). (Governor Schwarzenegger's Signing Message, SB 97.) That statute, among other things, constitutes the Legislature's recognition that GHG emissions and the effects of GHG emissions are appropriate subjects for CEQA analysis. Pursuant to SB97, OPR developed, and the Resources Agency will adopt, amendments to the State CEQA Guidelines to address analysis and mitigation of the potential effects of GHG emissions in CEQA documents and processes. As new information or criteria established by ARB in the AB 32 process becomes available, OPR and the Resources Agency will periodically update the CEQA Guidelines to account for that new information. This rulemaking package responds to the Legislature's directive in SB97.

Questions concerning the relationship between AB32, SB375 and CEQA were raised in public comments on the Proposed Amendments. The Resources Agency developed responses to those questions in the Responses to Comments, which are appended to this Final Statement of Reasons. Further discussion of the relationship between AB32, SB375 and CEQA is provided in the Thematic Responses at the end of this Final Statement of Reasons.

BACKGROUND ON THE DEVELOPMENT OF THE PROPOSED AMENDMENTS

OPR developed the Proposed Amendments pursuant to Public Resources Code section 21083.05, which states in part:

> On or before July 1, 2009, the Office of Planning and Research shall prepare, develop, and transmit to the Resources Agency guidelines for the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions as required by this division, including, but not limited to, effects associated with transportation or energy consumption.

In developing the Proposed Amendments, OPR actively sought the input, advice, and assistance of numerous interested parties and stakeholder groups. (Letter from OPR Director, Cynthia Bryant, to Secretary for the Natural Resources Agency, Mike Chrisman, April 13, 2009.) Specifically, OPR met with representatives of numerous agencies and organizations to discuss the perspectives of the business community, the environmental community, local governments, non-governmental organizations, state agencies, public health officials, CEQA practitioners and legal experts. In addition, OPR took advantage of numerous regional and statewide conferences to raise awareness about CEQA and GHG emissions among diverse audiences and to seek their input. These activities satisfy the provisions of Government Code section 11346.45 which require early public involvement in complex proposals.

After publishing a preliminary draft, on January 8, 2009, OPR continued to conduct extensive public outreach, including two public workshops, to receive input on the Preliminary Amendments. Both public workshops were well attended, drawing over two hundred participants representing various California business interests, environmental organizations, local governments, attorneys and consultants. In addition to oral comments at its workshops, OPR received over eighty written comment letters.

Some comments suggested additional amendments to the CEQA Guidelines. Other comments sought clarification of the language in the preliminary amendments. OPR incorporated those suggestions and clarifications to the extent possible and appropriate into its April 13, 2009, submittal to the Resources Agency. Some suggestions were not appropriate for inclusion, however, due to conflict with existing statutory authority and/or case law. For example, some comments submitted to OPR during its public workshops indicated that the Guidelines should be addressed to "Climate Change" rather than just the effects of GHG emissions. The focus in the Guidelines on GHG emissions is appropriate for at least three reasons.

First, the Legislative authorization for the Proposed Amendments refers specifically to guidelines on the "mitigation of greenhouse gas emissions and the effects of greenhouse gas emissions." (Pub. Resources Code, § 21083.05.) Had the Legislature intended the Guidelines to address climate change or global warming specifically, it presumably would have so indicated. Second, the precise "effect" of GHG emissions from a project is a factual matter for the lead agency to determine. Such effects may include "climate change," "global warming" and other changes in the physical environment (increased ocean acidity or sea-level rise, for example). (EPA, Draft Endangerment Finding, 74 Fed. Reg. 18886 (April 24, 2009), Technical Support Document, at pp. ES-2 to ES-3; see further discussion at pages 4-5, above.) Thus, rather than limit analysis to a particular effect, the proposed Guidelines on GHG emissions are consistent with the treatment of air pollutants in the existing Appendix G, which focus largely on the concentration of pollutants. (See, e.g., existing State CEQA Guidelines, Appendix G, III.d.) Third, the focus in a cumulative impacts analysis is "whether any additional effect caused by the proposed project should be considered significant given the existing cumulative effect." (*CBE*, *supra*, 103 Cal. App. 4th at 118.)

Thus, the Proposed Amendments appropriately focus on a project's potential incremental contribution of GHGs rather than on the potential effect itself (i.e., climate change). Notably, however, the Proposed Amendments expressly incorporate the fair argument standard. (See, e.g., proposed Section 15064.4(b)(3).) Thus, if there is any substantial evidence supporting a fair argument that a project's GHG emissions may result in any adverse impacts, including climate change, the lead agency must resolve that concern in an EIR.

THE NATURAL RESOURCES AGENCY'S RULEMAKING PROCESS

The Natural Resources Agency commenced the rulemaking process on the Amendments on July 3, 2009, by publishing its Notice of Proposed Action in the California Regulatory Notice Register. (2009 No. 27-Z.) In addition, the Notice of Proposed Action was mailed to over 640 interested parties, and notices were e-mailed to those parties that requested electronic notification. The Natural Resources Agency also posted the Notice, Proposed Text and Initial Statement of Reasons on its website, and invited public comments on the proposed amendments between July 3, 2009, and August 20, 2009. Public hearings were held on August 18, 2009, and August 20, 2009, in Los Angeles and Sacramento, respectively, at which verbal and written comments and presentations were accepted. To ensure that all interested parties were able to provide written comments if they so chose, the Natural Resources Agency extended the public comment period to August 27, 2009. The Natural Resources Agency received over 80 comment letters on the proposed amendments.

Following review of all public comments received during the public review period and at the public hearings, the Natural Resources Agency determined that further revisions to the proposed text were appropriate. It, therefore, mailed a Notice of Proposed Changes to all hearing attendees and all persons that requested notice. Electronic notices were e-mailed to those requesting such notification. The Notice of Proposed Changes, Revised Text of the proposed amendments, comment letters, and all prior rulemaking documents were posted on the Natural Resources Agency's website. Since all revisions to the proposed amendments were sufficiently related to the originally noticed text, public comment was invited between October 23, 2009, and November 10, 2009. The Natural Resources Agency received over 20 comment letters on the revisions to the proposed amendments.

Following the close of the second public comment period, the Natural Resources Agency reviewed and considered all written comments. The Secretary for Natural Resources determined that, other than two non-substantive, clarifying changes in sections 15126.2(a) and 15126.4(c), described below, no further revisions to the proposed amendments was necessary. Secretary Mike Chrisman adopted the amendments described in this Final Statement of Reasons in December 2009.

Throughout the rulemaking process, staff of the Natural Resources Agency met with all interested parties requesting in person meetings. It also attended and presented at various conferences hosted by, among others, the California Chapter of

the American Planning Association, the California State Bar's Environmental Law Conference, County Counsels Association of California, several county bar association meetings and local government forums to provide updates on the proposed amendments and to ensure widespread participation in the Natural Resources Agency's rulemaking process.

Copies of all relevant rulemaking documents, including hearing transcripts, notices, and agendas, are included in the record of proceedings.

ADOPTED AMENDMENTS

Analysis of GHG emissions in a CEQA document presents unique challenges to lead agencies. Such analysis must be consistent with existing CEQA principles, however. Therefore, the Amendments comprise relatively modest changes to various portions of the existing CEQA Guidelines. Modifications address those issues where analysis of GHG emissions may differ in some respects from more traditional CEQA analysis. Other modifications clarify existing law that may apply both to analysis of GHG emissions as well as more traditional CEQA analyses. The incremental approach in the Amendments is consistent with Public Resources Code section 21083(f), which directs OPR and the Resources Agency to regularly review the Guidelines and propose amendments as necessary.

The Legislature expressly left development of the Guidelines to the discretion of OPR and the Resources Agency. That discretion is governed by the Government Code, which requires that any administrative regulations be consistent, and not conflict, with existing statutory authority. (Gov. Code, § 11342.2.) Thus, the Resources Agency intends, as did OPR, the Amendments to incorporate existing law, and where necessary "to implement, interpret, make specific or otherwise carry out the provisions of the statute." (*Ibid*.) In addition, the Guidelines must be "reasonably necessary" to carry out a legislative directive. (*Ibid*.) Because the determination of "reasonable necessity" implicates an agency's expertise, courts will defer to an agency's findings of necessity unless the action is arbitrary, capricious or without reasonable basis. (*Communities for a Better Environment v. California Resources Agency* (2002) 103 Cal.App.4th 98, 109 ("*CBE*").)

The Amendments include changes to or additions of fourteen sections of the existing Guidelines, as well as changes to Appendices F (Energy Conservation) and G (Environmental Checklist Form). The Amendments are discussed below.

SECTION 15064. DETERMINING THE SIGNIFICANCE OF THE ENVIRONMENTAL EFFECTS CAUSED BY A PROJECT.

Specific Purposes of the Amendment

Amendments are proposed to two subdivisions of the existing section 15064. The first, to subdivision (f)(5), is a grammatical correction that qualifies as a "change without regulatory effect" pursuant to section 100(a)(4) of the Office of Administrative Law's regulations governing the rulemaking process. (Cal. Code Regs., tit. 1, § 100(a)(4).) The second set of amendments is to subdivision (h)(3). The latter amendments are described in detail below.

Cumulative Impacts

Existing subdivision (h)(3) allows an agency to find that a project's potential cumulative impacts are less than significant due to compliance with requirements in a plan or mitigation program. (*CBE, supra,* 103 Cal.App.4th at 111 ("a lead agency's use of existing environmental standards in determining the significance of a project's environmental impacts is an effective means of promoting consistency in significance determinations and integrating CEQA environmental review activities with other environmental program planning and regulation").) In effect, that section creates a rebuttable presumption that compliance with certain plans and regulations reduces a project's potential incremental contribution to a cumulative effect to a level that is not cumulatively considerable.

The existing Guidelines text includes several criteria that define which plans or programs may create such a presumption. To satisfy those criteria, a plan or program must: (1) have been previously approved, (2) contain specific requirements that avoid or substantially lessen the cumulative problem within a defined geographic area, and (3) be either specified in law or approved by a public agency with jurisdiction over affected resources. These criteria ensure that the presumption applies only where plans or programs have undergone public scrutiny and include binding requirements to address a cumulative problem. The existing text lists three types of plans as examples that may be relied upon for a cumulative analysis. The word "e.g." in the existing text indicates, however, that the list is not exclusive. The Third District Court of Appeal upheld what is now section 15064(h)(3) in the *CBE* decision. (*CBE*, *supra*, 103 Cal.App.4th at 115-116.)

Use of Plans and Regulations in a Cumulative Impacts Analysis

The Proposed Amendments include two changes to subdivision (h)(3). First, the Amendments would add several plans and regulations to the list of examples. The Proposed Amendments would add "habitat conservation plan, natural community conservation plan, [and] plans or regulations for the reduction of greenhouse gas emissions" to the list of plans and programs that may be considered in a cumulative

impacts analysis. As explained below, the Resources Agency finds that the added plans and regulations satisfy the criteria in the existing text.

"Habitat conservation plans" are defined in the federal Endangered Species Act, and typically include specific requirements to protect listed species within a defined geographic area. (16 U.S.C. § 1539.) Though a habitat conservation plan ("HCP") may be prepared to address the impacts of one particular project, HCPs may also be, and often have been, prepared to address the impacts of cumulative development within a defined area. (Fish and Wildlife Service and National Marine Fisheries Service, Habitat Conservation Planning and Incidental Take Permit Processing Handbook (November 4, 1996), at pp. 1-6 to 1-7, 1-14 to 1-15.) Most HCPs, other than "low effect HCPs," will also likely need to undergo environmental review under the National Environmental Policy Act. (*Id*. at Ch. 5.) In such cases, an applicable HCP may appropriately be used in a cumulative impacts analysis as described in subdivision (h)(3).

"Natural community conservation plans" ("NCCPs") are defined in the California Natural Community Conservation Planning Act. (Fish & G. Code, §§ 2800 et seq.) The purpose of an NCCP is to conserve natural communities at the ecosystem scale while accommodating compatible land uses. An NCCP includes, among others, measures to avoid or minimize impacts to natural communities, conservation obligations, and compliance monitoring. An NCCP is adopted by the Department of Fish and Game as well as local agencies with land use authority in a defined area. As discretionary acts of public agencies, NCCPs must undergo environmental review pursuant to CEQA. Thus, NCCPs satisfy the criteria in existing subdivision (h)(3).

The Legislature recognized local GHG planning efforts in Health & Safety Code section 38561(c) by directing the California Air Resources Board (ARB) to consider such programs in developing its Scoping Plan. Greenhouse gas emission reduction plans are not currently specified in law. However, the ARB's Climate Change Scoping Plan includes a recommended reduction target for local governments and community-level emissions of 15 percent by 2020. (California Air Resources Board, *Climate Change Proposed Scoping Plan* (2008), at p. 27 ("Scoping Plan").) The Scoping Plan also recognized the important role local greenhouse gas reduction plans would play in achieving statewide reductions. The Scoping Plan itself suggests elements that such plans should include. (Scoping Plan, Appendix C, at p. C-49.)

Independent of the Scoping Plan, many local governments have adopted, or are currently developing, various plans and programs designed to curb GHG emissions. (Office of Planning and Research, *The California Planner's Book of Lists* (January 2009) ("Book of Lists"), at pp. 92-100; see also Scoping Plan, at p. 26.) Other public agencies, such as school districts and public universities, may also adopt greenhouse gas reduction plans to govern their own activities. Provided that such plans contain specific requirements with respect to resources that are within the agency's jurisdiction to avoid or substantially lessen the agency's contributions to GHG emissions, both from its own projects and from private projects it has approved or will approve, such plans may be appropriately relied on in a cumulative impacts analysis. Additional guidance regarding

the characteristics of greenhouse gas reduction plans that may be used in this context is provided in the proposed Section 15183.5, and is explained in greater detail below. Thus, greenhouse gas reduction plans satisfying such criteria would satisfy the criteria in existing subdivision (h)(3).

Finally, requirements addressing a cumulative problem may also take the form of regulations. AB 32, for example, requires ARB to adopt regulations that achieve the maximum technologically feasible and cost effective GHG reductions to reach the adopted state-wide emissions limit. (Health & Safety Code, § 38560.) Pursuant to Health and Safety Code section 38560(b), ARB will adopt a first set of regulations by January 1, 2010. Thus, a lead agency may consider whether ARB's GHG reduction regulations satisfy the criteria in existing subdivision (h)(3).

While section 15064(h)(3) creates a presumption that, where a plan, program or regulation governs a project's GHG emissions, and the project complies with those requirements, those emissions are not cumulatively considerable. That presumption is rebuttable, however. The Proposed Amendments do not alter the standard, reflected in the existing Guidelines, that if substantial evidence supports a fair argument that, despite compliance with the requirements in a plan or program, a project may have a significant effect on the environment, then an EIR must be prepared.

Demonstrating How the Plan, Program or Regulation Addresses Cumulative Impacts

In addition to augmenting the list of plans, programs and regulations that give rise to the presumption that a project's contribution is not cumulatively considerable, the Amendments also contain explanatory language designed to ensure that the plan or regulation relied on in a cumulative impacts analysis actually addresses the cumulative effect of concern for the particular project under consideration. This language is necessary to avoid misapplication of subdivision (h)(3). For example, shortly after ARB identified early action items, some lead agencies determined that a project's contribution of GHG emissions was not cumulatively considerable because the project was not inconsistent with the early action items. (See, e.g., Tentative Ruling, San Bernardino County Superior Court Case Nos. 810232, 800607 (ruling that consistency with CAT Strategies alone does not provide sufficient information about the potential impacts of a project); see also California Environmental Protection Agency, *Climate Action Team Report to Governor Schwarzenegger and the Legislature*, March 2006, at pp. 39-63.) Such an analysis, however, would fail to account for emissions that are not addressed by the early action items. Because those early action items largely addressed industrial-type emissions, consistency with the early action items would have little relevance for a residential subdivision project. Likewise, consistency with plans that are purely aspirational (i.e., those that include only unenforceable goals without mandatory reduction measures), and provide no assurance that emissions within the area governed by the plan will actually address the cumulative problem, may not achieve the level of protection necessary to give rise to this subdivision's presumption. Thus, by requiring that lead agencies draw a link between the project and the specific provisions of a binding plan or regulation, section 15064(h)(3) would ensure that

cumulative effects of the project are actually addressed by the plan or regulation in question.

Demonstrating that compliance with a plan addresses a cumulative problem is already impliedly required by CEQA. For example, an initial study must include sufficient information to support its conclusions. (State CEQA Guidelines, § 15063(d)(3).) Similarly, section 15128 requires a lead agency to explain briefly the reasons that an impact is determined to be less than significant and therefore was not analyzed in an EIR. The added sentence, therefore, reflects existing law and is necessary to ensure that plans are not misapplied in a CEQA analysis.

Policy Goals

Inclusion of additional plans and programs to the list of examples supports two policy goals. First, an expanded list promotes integration of various regulatory mechanisms to reduce duplication. (See, e.g., Pub. Resources Code, § 21003(a) (state policy is that "[l]ocal agencies integrate the requirements of [CEQA] with planning and environmental review procedures otherwise required by law or by local practice …"), (f) ("[a]ll persons and public agencies involved in the environmental review process be responsible for carrying out the process in the most efficient, expeditious manner in order to conserve the available financial, governmental, physical, and social resources with the objective that those resources may be better applied toward the mitigation of actual significant effects on the environment").) Second, the addition of GHG emissions reduction plans and regulations for the reduction of GHG emissions reflects the view of both the OPR and the Resources Agency that the effects of GHG emissions resulting from individual projects are best addressed and mitigated at a programmatic level.

Necessity

The Legislature directed OPR and the Resources Agency to develop guidelines on the analysis of GHG emissions. (Pub. Resources Code, § 21083.05.) The Guidelines must address the determination of whether the "possible effects of a project are individually limited but cumulatively considerable." (*Id*. at § 21083(b)(2).) Due to the global nature of GHG emissions and their potential effects, GHG emissions will typically be addressed in a cumulative impacts analysis. (See, e.g., EPA, Draft Endangerment Finding, 74 Fed. Reg. 18886, 18904 (April 24, 2009) ("cumulative emissions are responsible for the cumulative change in the stock of concentrations in the atmosphere"); California Air Pollution Control Officers Association, *CEQA and Climate Change: Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act* (January 2008) ("CAPCOA White Paper"), at p. 35 ("GHG impacts are exclusively cumulative impacts; there are no non-cumulative GHG emission impacts from a climate change perspective").) Existing section 15064(h) governs the analysis of cumulative effects in an initial study. The proposed amendments to section 15064(h)(3), on determining the significance of cumulative impacts in an initial study, are therefore necessary to carry out this legislative directive.

Reasonable Alternatives to the Regulation, Including Alternatives that Would Lessen Any Adverse Impact on Small Business, and the Resources Agency's Reasons for Rejecting Those Alternatives

The Resources Agency considered reasonable alternatives to the Amendments and determined that no reasonable alternative would be more effective in carrying out the purpose for which the action is proposed or would be as effective as, and less burdensome to affected private persons than, the Amendments. This conclusion is based on the Resources Agency's determination that the Amendments are necessary to implement the Legislature's directive in SB97 in a manner consistent with existing statutes and case law, and that the Amendments add no new substantive requirements. The Resources Agency rejected the no action alternative because it would not achieve the objectives of the Amendments. There are no alternatives available that would lessen any adverse impacts on small businesses, as any impacts would result from the implementation of existing law.

Evidence Supporting an Initial Determination That the Action Will Not Have a Significant Adverse Economic Impact on Business

The Amendments interpret and make specific statutory CEQA provisions and case law interpreting CEQA for determining the significance of GHG emissions that may result from proposed projects. Many lead agencies, and some trial courts, have already determined that CEQA requires analysis and mitigation of GHG emissions independent of the SB97 CEQA Guidelines amendments. The Office of Planning and Research, for example, has cataloged over 1,000 examples of CEQA documents, prepared between July 2006 and June 2009, analyzing and mitigating GHG emissions. (Office of Planning and Research, Environmental Assessment Documents Containing a Discussion of Climate Change (Revised June 1, 2009).) Further, several trial courts have found that existing CEQA law requires analysis and mitigation of GHG emissions. (See, e.g., *Muriettans for Smart Growth v. City of Murrieta et al.*, Riverside Co. Sup. Ct. Case No. RIC463320 (November 21, 2007); *Env. Council of Sac. et al v. Cal. Dept. of Trans*., Sacramento Sup. Ct. Case No. 07CS00967 (July 15, 2008) (citing *Berkeley Keep Jets Over the Bay Committee v. Board of Commissions* (2001) 91 Cal.App. 4th 1344, 1370-1371 and State CEQA Guidelines section 15144 as requiring a lead agency to "meaningfully attempt to quantify the Project's potential impacts on GHG emissions and determine their significance" or at least to explain what steps were undertaken to investigate the issue before concluding that the impact would be speculative).) Finally, federal courts have interpreted the National Environmental Policy Act ("NEPA") to require an analysis of potential impacts of GHG emissions. (*See*, *e.g.*, *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Ad*., 538 F.3d 1172, 1215-1217 (9th Cir. 2008).)[2] Thus, the Amendments to the CEQA Guidelines developed pursuant to SB97 do not create new requirements; rather, they interpret and clarify existing CEQA law.

[2] Federal court decisions interpreting NEPA is persuasive authority in CEQA cases. (*Western Placer Citizens for an Ag. & Rur. Env. v. County of Placer* (2006) 144 Cal.App. 4th 890, 902.)

Because the Amendments do not add any substantive requirements, they will not result in an adverse impact on businesses in California. On the contrary, the amendments to this section are intended to reduce the costs of environmental review on lead agencies and project applicants by encouraging the use of existing environmental analysis where available. (Pub. Resources Code, § 21003(d) (use information in existing EIRs in order to reduce duplication), (f) (environmental review should proceed in the most efficient manner possible).)

SECTION 15064.4. DETERMINING THE SIGNIFICANCE OF IMPACTS FROM GREENHOUSE GAS EMISSIONS

Specific Purposes of the Amendment

A key component of environmental analysis under CEQA is the determination of significance. (Pub. Resources Code § 21002; *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099, 1106-07.) Guidelines on the analysis of GHG emissions must, therefore, include provisions on the determination of significance of those emissions.

New section 15064.4, on the determination of significance of GHG emissions, reflects the existing CEQA principle that there is no iron-clad definition of "significance." (State CEQA Guidelines, § 15064(b); *Berkeley Keep Jets Over the Bay Com. v. Board of Port Comm*. (2001) 91 Cal.App.4th 1344, 1380-81 ("*Berkeley Jets*").) Accordingly, lead agencies must use their best efforts to investigate and disclose all that they reasonably can regarding a project's potential adverse impacts. (*Ibid*; *see also* State CEQA Guidelines, § 15144.) Section 15064.4 is designed to assist lead agencies in performing that required investigation. In particular, it provides that lead agencies should quantify GHG emissions where quantification is possible and will assist in the determination of significance, or perform a qualitative analysis, or both as appropriate in the context of the particular project, in order to determine the amount, types and sources of GHG emissions resulting from the project. Regardless of the type of analysis performed, the analysis must be based "to the extent possible on scientific and factual data." In addition, lead agencies should also consider several factors. The specific provisions of section 15064.4 are discussed below.

Quantitative Analysis

Subdivision (a) of section 15064.4 states that lead agencies should calculate or estimate the GHG emissions resulting from the proposed project. This directive reflects the holding in the *Berkeley Jets* case, which required a Port Commission to quantify emissions of toxic air contaminants even in the absence of a universally accepted methodology for doing so. (*Berkeley Jets*, *supra*, 91 Cal.App.4th at p. 1370 ("The fact that a single methodology does not currently exist that would provide the Port with a precise, or 'universally accepted,' quantification of the human health risk from TAC exposure does not excuse the preparation of any health risk assessment--it requires the Port to do the necessary work to educate itself about the different methodologies that are available") (emphasis in original).) That case also required quantitative analysis of single-event noise, even though the applicable thresholds were expressed as cumulative noise levels. (*Id*. at 1382.) Quantification was required in that context in order to identify existing noise levels, the number of additional flights, the frequency of those flights, the degree to which the increased flights would cause increased noise levels at a given location, and ultimately, the community's reaction to that noise. (*Ibid*.) In other words, quantification would assist the lead agency in determining whether the increased noise would be potentially significant. (*Ibid*. ("CEQA requires that the Port

and the inquiring public obtain the technical information needed to assess whether the ADP will merely inconvenience the Airport's nearby residents or damn them to a somnambulate-like existence"); see also *Protect the Historic Amador Waterways*, *supra*, 116 Cal.App.4th at 1109 ("in preparing an EIR, the agency must consider and resolve every fair argument that can be made about the possible significant environmental effects of a project, irrespective of whether an established threshold of significance has been met with respect to any given effect").)

With the foregoing principles in mind, the quantification called for in proposed section 15064.4(a)(1) is reasonably necessary to ensure an adequate analysis of GHG emissions using available data and tools, in accordance with Public Resources Code Section 21083.05. Even where a lead agency finds that no numeric threshold of significance applies to a proposed project, the holdings in the *Berkeley Jets* and *Protect the Historic Amador Waterways* cases, described above, require quantification of emissions if such quantification will assist in determining the significance of those emissions. OPR and the Resources Agency find that quantification will, in many cases, assist in the determination of significance, as explained below. (State CEQA Guidelines, § 15142 ("An EIR shall be prepared using an interdisciplinary approach which will ensure the integrated use of the natural and social sciences and the consideration of qualitative as well as quantitative factors").)

First, quantification of GHG emissions is possible for a wide range of projects using currently available tools. Modeling capabilities have improved to allow quantification of emissions from various sources and at various geographic scales. (Office of Planning and Research, *CEQA and Climate Change: Addressing Climate Change Through the California Environmental Quality Act Review*, Attachment 2: Technical Resources/Modeling Tools to Estimate GHG Emissions (June 2008); CAPCOA White Paper, at pp. 59-78.) Moreover, one of the models that can be used in a GHG analysis, URBEMIS, is already widely used in CEQA air quality analyses. (CAPCOA White Paper, at p. 59.) Second, quantification informs the qualitative factors listed in proposed section 15064.4(b). Third, quantification indicates to the lead agency, and the public, whether emissions reductions are possible, and if so, from which sources. Thus, if quantification reveals that a substantial portion of a project's emissions result from energy use, a lead agency may consider whether design changes could reduce the project's energy demand.

Proposed section 15064.4(a)(1) also reflects existing case law that reserves for lead agencies the precise methodology to be used in a CEQA analysis. (*See*, *e.g.*, *Eureka Citizens for Responsible Gov't v. City of Eureka* (2007) 147 Cal.App.4th 357, 371-373.) As indicated above, a wide variety of models exist that could be used in a GHG analysis. (CAPCOA White Paper, at pp. 59-78.) Further, not every model will be appropriate for every project. For example, URBEMIS may be an appropriate tool to analyze a typical residential subdivision or commercial use project, but some public utilities projects, such as waste-water treatment plants, may require more specialized models to accurately estimate emissions. (*Id*. at pp. 60-65.) The requirement to

disclose any limitations in the model or methodology chosen also reflects the standard for adequacy of EIRs in existing State CEQA Guidelines section 15151.

Qualitative and Performance Standard Based Analysis

As explained in greater detail below in the Thematic Responses, CEQA does not require quantification of emissions in every instance. If the lead agency determines that quantification is not possible, would not yield information that would assist in analyzing the project's impacts and determining the significance of the GHG emissions, or is not appropriate in the context of the particular project, section 15064.4(a) would allow the lead agency to consider qualitative factors or performance standards. Consideration of qualitative factors is appropriate for several reasons. First, CEQA directs lead agencies to consider qualitative factors. (Pub. Resources Code, § 21001(g) (CEQA's purpose includes to: "require governmental agencies at all levels to consider qualitative factors as well as economic and technical factors and long-term benefits and costs, in addition to short-term benefits and costs and to consider alternatives to proposed actions affecting the environment").) Second, existing section 15064.7 of the State CEQA Guidelines indicate that thresholds of significance may be qualitative, which implies that a determination of significance without a threshold could also evaluate qualitative factors. Third, the existing CEQA Guidelines state that the determination of significance requires a lead agency to use its judgment based on *all* relevant information. (State CEQA Guidelines, § 15064(b); see also *id*. at §§ 15064.7 (thresholds may be qualitative), 15142 (analysis should be interdisciplinary and both qualitative and quantitative).)

Subdivision (a) would also allow a lead agency to rely on performance-based standards to assist in the determination of significance. Just as with quantification, the purpose of engaging in a qualitative or performance standard based analysis is to develop information relevant to a significance determination. Several examples exist of the types of performance standards that might appropriately be used in determining the significance of greenhouse gas emissions. Proposed section 15183.5(b)(1)(D), for example, contemplates that a plan for the reduction of greenhouse gas emissions may contain performance based standards. Where such standards are developed as part of such a plan, a lead agency would have evidence indicating that compliance with such standards would indicate that the impact of greenhouse gas emissions would be less than significant. Further, in adopting SB375, the Legislature acknowledged that regional transportation plans, and the environmental impact reports prepared to analyze those plans, may contain performance standards that would apply to transit priority projects. (See, e.g., Public Resources Code, § 21155.2.) Other potential examples include the Bay Area Air Quality Management District's proposed Best Management Practices for Construction Greenhouse Gas Emissions (calling for use of alternative fuels, local building materials and recycling), and the California Public Utilities Commission's Performance Standard for Power Plans (requiring emissions no greater than a combined cycle gas turbine plant). Compliance with such standards may be relevant to the significance determination, when considered in conjunction with the

project's total projected emissions. Section 15064.4(a) was revised in response to comments to clarify that lead agencies may rely on quantitative or qualitative analyses, or both, in part to emphasize that qualitative analyses and performance standards may be useful supplements to a quantitative analysis.

Similar to use of a significance threshold, a lead agency must exercise care to ensure that performance standards do not replace a full analysis of all potential emissions. (*Protect the Historic Amador Waterways*, *supra*, 116 Cal.App.4th at 1109 ("in preparing an EIR, the agency must consider and resolve every fair argument that can be made about the possible significant environmental effects of a project, irrespective of whether an established threshold of significance has been met with respect to any given effect").) For example, while a Platinum LEED® rating could assist a lead agency in determining whether emissions related to a building's energy use may be significant, that performance standard may not reveal sufficient information to evaluate transportation-related emissions associated with that proposed project.

As indicated above, even a qualitative analysis must be based to the extent possible on scientific and factual data. Further, the type of analysis that is required will depend on the context of a particular project. Given the multitude of different project types and sizes, and different agencies subject to CEQA, the CEQA Guidelines, which are general by necessity, cannot specify precisely when a quantitative analysis may be required or a qualitative analysis may be appropriate. The following hypothetical examples may illustrate, however, how section 15064.4(a) could operate:

> **Project 1**: a small habitat restoration project is proposed in a remote part of California. Workers would drive to the site where they would camp for the duration of the project. Some gas-powered tools and machinery may be required. Cleared brush would either be burned or would decay naturally.
>
> **Project 2**: a large commercial development is proposed in an suburban context. Heavy-duty machinery would be required in various construction phases spanning many months. Following construction, the development would rely on electricity, water and wastewater services from the local utilities. Natural gas burners would be used on site. The development would employ several hundred workers and attract thousands of customers daily. A traffic study has been prepared for the project. The local air quality management district's guidance document recommends that projects of similar size and character should use of URBEMIS, or another similar model, to estimate the air quality impacts of the development.

In the context of Project 2 a quantitative analysis would likely be appropriate. The URBEMIS model, which would likely be used to analyze other emissions, could also be used to estimate emissions from both project-related transportation and on-site indirect emissions (landscaping, hot-water heaters, etc.) Modeling is typically done for projects of like size and character. Other models are readily available to estimate emissions associated with utility use. In the context of Project 2, a lead agency may

find it difficult to demonstrate a good faith effort through a purely qualitative analysis. (See, e.g., *Berkeley Keep Jets Over the Bay Com. v. Board of Port Comm*. (2001) 91 Cal.App.4th 1344, 1370.)

In the context of Project 1, however, a qualitative analysis would likely be appropriate. Project 1's emissions are not easily modeled, and the Project is small in scale. While it may be technically possible, quantification of the emissions may not reveal any additional information that indicates the significance of those emissions or how they may be reduced that could not be provided in a qualitative assessment of emissions sources. (See, e.g., Public Resources Code, § 21003(f) ("public agencies involved in the environmental review process be responsible for carrying out the process in the most efficient, expeditious manner in order to conserve the available financial, governmental, physical, and social resources with the objective that those resources may be better applied toward the mitigation of actual significant effects on the environment").)

Factors Potentially Indicating Significance

The qualitative factors listed in the proposed section 15064.4(b) are intended to assist lead agencies in collecting and considering information relevant to a project's incremental contribution of GHG emissions and the overall context of such emissions. Notably, while subdivision (b) provides a list of factors that should be considered by public agencies in determining the significance of a project's GHG emissions, other factors can and should be considered as appropriate.

Determine Whether Emissions Will Increase or Decrease

The first factor in subdivision (b), for example, asks lead agencies to consider whether the project will result in an increase or decrease in different types of GHG emissions relative to the existing environmental setting. All project components, including construction and operation, equipment and energy use, and development phases must be considered in this analysis. (State CEQA Guidelines, § 15378 (project includes "the whole of the action").) For example, a mass transit project may involve GHG emissions during its construction phase, but substantial evidence may also indicate that it will cause existing commuters to switch from single-occupant vehicles to mass transit use. Operation of such a project may ultimately result in a decrease in GHG emissions. Such analysis, provided that it is supported with substantial evidence and fully accounts for all project emissions, may support a lead agency's determination that GHG emissions associated with a project are not cumulatively considerable.

This section's reference to the "existing environmental setting" reflects existing law requiring that impacts be compared to the environment as it currently exists. (State CEQA Guidelines, § 15125.) This clarification is necessary to avoid a comparison of the project against a "business as usual" scenario as defined by ARB in the Scoping Plan. Such an approach would confuse "business as usual" projections used in ARB's Scoping Plan with CEQA's separate requirement of analyzing project effects in

comparison to the environmental baseline. (*Compare* Scoping Plan, at p. 9 ("The foundation of the Proposed Scoping Plan's strategy is a set of measures that will cut greenhouse gas emissions by nearly 30 percent by the year 2020 as compared to business as usual") *with Fat v. County of Sacramento* (2002) 97 Cal.App.4th 1270, 1278 (existing environmental conditions normally constitute the baseline for environmental analysis); see also *Center for Bio. Diversity v. City of Desert Hot Springs*, Riverside Sup. Ct. Case No. RIC464585 (August 6, 2008) (rejecting argument that a large subdivision project would have a "beneficial impact on CO2 emissions" because the homes would be more energy efficient and located near relatively uncongested freeways).) Business as usual may be relevant, however, in the discussion of the "no project alternative" in an EIR. (State CEQA Guidelines, § 15126.6(e)(2) (no project alternative should describe what would reasonably be expected to occur in the future in the absence of the project).)

Notably, section 15064.4(b)(1) is not intended to imply a zero net emissions threshold of significance. As case law makes clear, there is no "one molecule rule" in CEQA. (CBE, *supra*, 103 Cal.App.4th at 120.)

Thresholds of Significance

The second factor in subdivision (b) asks whether a project exceeds a threshold of significance for GHG emissions. Section 21000(d) of the Public Resources Code expressly directs public agencies to identify whether there are any critical thresholds for health and safety to identify those areas where the capacity of the environment is limited. A threshold is an "identifiable quantitative, qualitative or performance level" at which impacts are normally less than significant. (State CEQA Guidelines, § 15064.7(a); *see also Protect the Historic Amador Waterways*, *supra*, 116 Cal.App.4th at 1107.) Lead agencies may rely on thresholds developed by other agencies that have particular expertise in the subject matter under consideration. (*See*, *e.g.*, State CEQA Guidelines, Appendix G, Sample Question III ("[w]here available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make" a significance determination).) For example, a lead agency may look to standards included in a Basin Plan to assist in the determination of whether water quality impacts are significant. (*Protect the Historic Amador Waterways*, *supra*, 116 Cal.App.4th at 1107 ("[s]uch thresholds can be drawn from existing environmental standards, such as other statutes or regulations").)

Several agencies have developed, or are in the process of developing, thresholds of significance for GHG emissions.[3] For example, thresholds are currently being developed, or have already been adopted by the Bay Area Air Quality Management District for operations and construction,[4] the City of Davis for residential

[3] Reference to these thresholds and proposed thresholds does not reflect an endorsement of those thresholds; rather, they are cited solely for the purpose of demonstrating that agencies are developing such thresholds.

[4] BAAQMD CEQA Guidelines Update: work in progress - http://www.baaqmd.gov/pln/ ceqa/index.htm.

developments,[5] and the South Coast Air Quality Management District for industrial projects.[6] Regardless of the threshold chosen, however, this section does not alter the pre-existing rule under CEQA that if substantial evidence supports a fair argument that a project may result in significant impacts, despite compliance with a threshold, an EIR must be prepared. (*Mejia v. City of Los Angeles* (2005) 130 Cal.App.4th 322, 342.) Further, "in preparing an EIR, the agency must consider and resolve every fair argument that can be made about the possible significant environmental effects of a project, irrespective of whether an established threshold of significance has been met with respect to any given effect." (*Protect the Historic Amador Waterways*, *supra*, 116 Cal.App.4th at 1109.)

Consistent with the above, if relying on a threshold developed by another agency, lead agencies must exercise caution in selecting a threshold to ensure that the threshold is appropriately applied. For CEQA purposes, a threshold identifies a level below which an environmental impact will normally be less than significant. (State CEQA Guidelines, § 15064.7(a).) Some agencies have adopted "thresholds" pursuant to other laws that may not be applicable in the CEQA context. ARB has adopted several thresholds pursuant to AB32, for example, to address specific purposes that are unrelated to CEQA. For example, the *de minimis* threshold governs the level at which emissions will be regulated by ARB's AB32 regulations. (Health & Safety Code, § 38561(e); Scoping Plan, at pp. 96-97.) CEQA does not permit use of a *de minimis* threshold, however. (*CBE*, *supra*, 103 Cal.App.4th at p. 121.) Additionally, the Reporting Threshold is the level at which emissions from large industrial sources are required to be reported. (Scoping Plan, at pp. 108-109; *see also* CARB Board Resolution 07-54 (2007).) Again, this reporting threshold reflects a policy decision regarding regulation by the ARB, but does not address the level at which environmental harm may occur, and does not satisfy a lead agency's duties under CEQA related to review of projects which may result in significant adverse environmental impacts.

Consistency with a Plan or Regulation

Finally, the third factor in subdivision (b) directs consideration of the extent to which a project complies with a plan or regulation to reduce GHG emissions. That section further states, however, that to be used for the purpose of determining significance, a plan must contain specific requirements that result in reductions of GHG emissions to a less than significant level. This clarification is necessary because of the wide variety of climate action plans and GHG reduction plans that are currently being adopted by public agencies. ARB, for example, recently adopted its statewide Scoping Plan. That plan may not be appropriate for use in determining the significance of individual projects, however, because it is conceptual at this stage and relies on the future development of regulations to implement the strategies identified in the Scoping

[5] City of Davis (2009) Greenhouse Gas Emission Threshold and Standards for New Residential Development; Accessed 5/27/09, http://cityofdavis.org/pgs/sustainability/pdfs/15_4.21.09_GHG%20Standards.pdf

[6] SCAQMD (2008) Interim CEQA GHG Significance Threshold for Stationary Sources, Rules and Plans, Accessed 5/27/09 http://www.aqmd.gov/hb/2008/December/081231a.htm.

Plan. (Scoping Plan, at p. 9.) Regulations that will require actual reductions of GHG emissions may not be adopted until 2012. (*Ibid*.) Once those regulations are adopted and being implemented, they may, if appropriate, be used to assist in the determination of significance, similar to the current use of air quality, water quality and other similar environmental regulations. (*CBE*, *supra*, 103 Cal. App. 4th at 111 ("a lead agency's use of existing environmental standards in determining the significance of a project's environmental impacts is an effective means of promoting consistency in significance determinations and integrating CEQA environmental review activities with other environmental program planning and regulation").)

In addition to the regulations that will be developed to implement the Scoping Plan, this factor would also allow lead agencies to consider plans that are developed to reduce GHG emissions on a regional or local level. (Scoping Plan, at p. 26.) The proposed section 15064.4(b)(3) is intended to be read in conjunction with the section 15064(h)(3), as proposed to be amended, and proposed section 15183.5. Those sections each indicate that local and regional plans may be developed to reduce GHG emissions. If such plans reduce community-wide emissions to a level that is less than significant, a later project that complies with the requirements in such a plan may be found to have a less than significant impact.

Notably, CEQA does not provide a specific definition of "comply" in the context of determining a project's consistency with a particular plan. Some guidance may be gleaned, however, from case law interpreting the requirement that a local government's activities be consistent with its General Plan. In that context, a "zoning ordinance [for example] is consistent with the city's general plan where, considering all of its aspects, the ordinance furthers the objectives and policies of the general plan and does not obstruct their attainment." (*City of Irvine v. Irvine Citizens Against Overdevelopment* (1994) 25 Cal. App. 4th 868, 879.) Reading section 15064.4 together with 15064(h)(3), however, to demonstrate consistency with an existing GHG reduction plan, a lead agency would have to show that the plan actually addresses the emissions that would result from the project. Thus, for example, a subdivision project could not demonstrate "consistency" with the ARB's Early Action Measures because those measures do not address emissions resulting from a typical housing subdivision. (ARB, Expanded List of Early Action Measures to Reduce Greenhouse Gas Emissions in California Recommended for Board Consideration, October 2007; see also State CEQA Guidelines, §§ 15063(d)(3) (initial study must be supported with information to support conclusions), 15128 (determination in an EIR that an impact is less than significant must be briefly explained).)

Necessity

The Legislature directed OPR and the Resources Agency to develop guidelines on the analysis of GHG emissions. (Pub. Resources Code, § 21083.05.) A key component of environmental analysis under CEQA is the determination of significance. (*Id*. at § 21002; *Protect the Historic Amador Waterways, supra,* 116 Cal.App.4th at

1106-07.) The new section 15064.4, on determining the significance of impacts of GHG emissions, is therefore necessary to carry out this legislative directive.

Reasonable Alternatives to the Regulation, Including Alternatives that Would Lessen Any Adverse Impact on Small Business, and the Resources Agency's Reasons for Rejecting Those Alternatives

The Resources Agency considered reasonable alternatives to the Amendments and determined that no reasonable alternative would be more effective in carrying out the purpose for which the Amendments were proposed or would be as effective as, and less burdensome to affected private persons than, the Amendments. This conclusion is based on the Resources Agency's determination that the Amendments are necessary to implement the Legislature's directive in SB97 in a manner consistent with existing statutes and case law, and the Amendments add no new substantive requirements. The Resources Agency rejected the no action alternative because it would not achieve the objectives of the Amendments. There are no alternatives available that would lessen any adverse impacts on small businesses, as any impacts would result from the implementation of existing law.

Evidence Supporting an Initial Determination That the Action Will Not Have a Significant Adverse Economic Impact on Business

The Amendments interpret and make specific statutory CEQA provisions and/or case law interpreting CEQA for determining the significance of GHG emissions that may result from proposed projects. Many lead agencies, and some trial courts, have already determined that CEQA requires analysis and mitigation of GHG emissions independent of the SB97 CEQA Guidelines amendments. The Office of Planning and Research, for example, has cataloged over 1,000 examples of CEQA documents, prepared between July 2006 and June 2009, analyzing and mitigating GHG emissions. (Office of Planning and Research, Environmental Assessment Documents Containing a Discussion of Climate Change (Revised June 1, 2009).) Further, several trial courts have found that existing CEQA law requires analysis and mitigation of GHG emissions. (See, e.g., *Muriettans for Smart Growth v. City of Murrieta et al.*, Riverside Co. Sup. Ct. Case No. RIC463320 (November 21, 2007); *Env. Council of Sac. et al v. Cal. Dept. of Trans*., Sacramento Sup. Ct. Case No. 07CS00967 (July 15, 2008) (citing *Berkeley Keep Jets Over the Bay Committee v. Board of Commissions* (2001) 91 Cal.App. 4th 1344, 1370-1371 and State CEQA Guidelines section 15144 as requiring a lead agency to "meaningfully attempt to quantify the Project's potential impacts on GHG emissions and determine their significance" or at least to explain what steps were undertaken to investigate the issue before concluding that the impact would be speculative).) Finally, federal courts have interpreted the National Environmental Policy Act ("NEPA") to require an analysis of potential impacts of GHG emissions. (*See*, *e.g.*, *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Ad*., 538 F.3d 1172, 1215-1217 (9th Cir. 2008).)[7] Thus, the amendments to the CEQA Guidelines developed pursuant to SB97 do not create new requirements; rather, they interpret and clarify existing CEQA law.

Because the Amendments do not add any substantive requirements, they will not result in an adverse impact on businesses in California. On the contrary, by providing greater certainty to lead agencies regarding the determination of significance of GHG emissions, the cost of environmental analysis, and potential litigation, may be reduced.

[7] Federal court decisions interpreting NEPA is persuasive authority in CEQA cases. (*Western Placer Citizens for an Ag. & Rur. Env. v. County of Placer* (2006) 144 Cal.App. 4th 890, 902.)

SECTION 15064.7. THRESHOLDS OF SIGNIFICANCE

Specific Purposes of the Amendment

Proposed subdivision (c) of section 15064.7 would allow a lead agency to adopt a threshold developed by another agency, or recommended by experts, provided that such threshold is supported with substantial evidence. This proposed regulation is reasonably necessary because many lead agencies perform general governmental functions, and may lack the specific expertise necessary to develop their own thresholds of significance for GHG emissions. Such agencies may rely on thresholds developed by other agencies with specialized expertise (such as an air quality management district) in conducting their CEQA analyses. (OPR, Thresholds of Significance: Criteria for Defining Environmental Significance, September 1994, at p. 7.) In fact, Appendix G of the State CEQA Guidelines expressly encourages lead agencies to rely on thresholds established by local air quality management districts. (State CEQA Guidelines, Appendix G, Question III.)

Several local and regional air districts are in the process of developing thresholds for GHG emissions. As noted above, for example, thresholds are currently being developed, or have already been adopted by the Bay Area Air Quality Management District for operations and construction, the City of Davis for residential developments, and the South Coast Air Quality Management District for industrial projects. Lead agencies within the jurisdiction of an air district, or other agency, that adopts a GHG emissions threshold may adopt such a threshold as its own. In adopting any threshold of significance, including one developed by an expert or agency with specialized expertise, the lead agency must support the threshold with substantial evidence in the administrative record. (State CEQA Guidelines, § 15064.7(b).)

Independent experts may also develop such thresholds for use by public agencies. For example, the California Air Pollution Control Officers Association has published a White Paper on developing thresholds of significance for GHG emissions. (CAPCOA White Paper, at pp. 31-58.) A lead agency could potentially use CAPCOA's suggestions in developing its own thresholds. Because any threshold must be supported with substantial evidence, and must be adopted through a public process, any threshold recommended by an expert that is ultimately adopted will undergo sufficient scrutiny to ensure its legitimacy. (State CEQA Guidelines, § 15064.7(b).)

Necessity

The Legislature directed OPR and the Resources Agency to develop guidelines on the analysis of GHG emissions. (Pub. Resources Code, § 21083.05.) Defining "significance" is a critical step in the lead agency's impact analysis and therefore needs to be addressed as part of the Proposed Action. Section 21000(d) of the Public Resources Code encourages the development of thresholds. These sections together

require OPR and the Resources Agency to develop and adopt regulations governing the adoption of thresholds of significance for GHG emissions.

Reasonable Alternatives to the Regulation, Including Alternatives that Would Lessen Any Adverse Impact on Small Business, and the Resources Agency's Reasons for Rejecting Those Alternatives

The Resources Agency considered reasonable alternatives to the Amendments and determined that no reasonable alternative would be more effective in carrying out the purpose for which the action is proposed or would be as effective as, and less burdensome to affected private persons than, the Amendments. This conclusion is based on the Resources Agency's determination that the Amendments are necessary to implement the Legislature's directive in SB97 in a manner consistent with existing statutes and case law, and Amendments add no new substantive requirements. The Resources Agency rejected the no action alternative because it would not achieve the objectives of the Amendments. There are no alternatives available that would lessen any adverse impacts on small businesses, as any impacts would result from the implementation of existing law.

Evidence Supporting an Initial Determination That the Action Will Not Have a Significant Adverse Economic Impact on Business

The Amendments interpret and make specific statutory CEQA provisions and/or case law interpreting CEQA for determining the significance of GHG emissions that may result from proposed projects. Many lead agencies, and some trial courts, have already determined that CEQA requires analysis and mitigation of GHG emissions independent of the SB97 CEQA Guidelines amendments. The Office of Planning and Research, for example, has cataloged over 1,000 examples of CEQA documents, prepared between July 2006 and June 2009, analyzing and mitigating GHG emissions. (Office of Planning and Research, Environmental Assessment Documents Containing a Discussion of Climate Change (Revised June 1, 2009).) Further, several trial courts have found that existing CEQA law requires analysis and mitigation of GHG emissions. (See, e.g., *Muriettans for Smart Growth v. City of Murrieta et al.*, Riverside Co. Sup. Ct. Case No. RIC463320 (November 21, 2007); *Env. Council of Sac. et al v. Cal. Dept. of Trans*., Sacramento Sup. Ct. Case No. 07CS00967 (July 15, 2008) (citing *Berkeley Keep Jets Over the Bay Committee v. Board of Commissions* (2001) 91 Cal.App. 4th 1344, 1370-1371 and State CEQA Guidelines section 15144 as requiring a lead agency to "meaningfully attempt to quantify the Project's potential impacts on GHG emissions and determine their significance" or at least to explain what steps were undertaken to investigate the issue before concluding that the impact would be speculative).) Finally, federal courts have interpreted the National Environmental Policy Act ("NEPA") to require an analysis of potential impacts of GHG emissions. (*See*, *e.g.*, *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Ad*., 538 F.3d 1172, 1215-1217 (9th Cir. 2008).) Thus, the amendments to the CEQA Guidelines developed pursuant to SB97 do not create new requirements; rather, they interpret and clarify existing CEQA law.

Because the Amendments do not add any substantive requirements, they will not result in an adverse impact on businesses in California. On the contrary, by providing greater certainty to lead agencies regarding the determination of significance of GHG emissions, the cost of environmental analysis, and potential litigation, may be reduced.

SECTION 15065. MANDATORY FINDINGS OF SIGNIFICANCE

Specific Purposes of the Amendment

The amendment to section 15065(b)(1) would change the word "preliminary" to "public." The purpose of this amendment is to make section 15065 consistent with section 21064.5 of the Public Resources Code. The latter provision defines a mitigated negative declaration to be a negative declaration where mitigation measures are added to a project "before the proposed negative declaration and initial study are released for *public* review[.]" (State CEQA Guidelines, § 15070(b)(1).) In contrast, existing CEQA Guidelines section 15065(b)(1), dealing with mandatory findings of significance, would require a commitment to mitigation prior to "preliminary" review. "Preliminary Review," as that term is used in section 15060, refers to a period following receipt of an application during which a lead agency determines whether an exemption applies to the project or whether an EIR would clearly be prepared. Read literally, existing section 15065 would require a commitment to mitigation before an initial study is even conducted. Because the statutory definition of mitigated negative declaration contemplates that mitigation measures may be developed during the preparation of the initial study prior to public review, the change in 15065 from "preliminary" to "public" is appropriate.

Necessity

Section 21083 of the Public Resources Code directs OPR to develop, and the Resources Agency to adopt, guidelines on the implementation of CEQA. The Amendment is necessary to ensure that those guidelines are consistent with relevant statutory definitions.

Reasonable Alternatives to the Regulation, Including Alternatives that Would Lessen Any Adverse Impact on Small Business, and the Resources Agency's Reasons for Rejecting Those Alternatives

The Resources Agency considered reasonable alternatives to the Amendments and determined that no reasonable alternative would be more effective in carrying out the purpose for which the action is proposed or would be as effective as, and less burdensome to affected private persons than, the Amendments. This conclusion is based on the Resources Agency's determination that the Amendmentswould make the existing Guidelines easier to follow as a result of greater internal consistency. The Resources Agency rejected the no action alternative because it would not achieve the objectives of the Amendments. There are no alternatives available that would lessen any adverse impacts on small businesses, as any impacts would result from the implementation of existing law.

Evidence Supporting an Initial Determination That the Action Will Not Have a Significant Adverse Economic Impact on Business

The Amendments interpret and make specific existing statutory CEQA provisions and/or case law interpreting CEQA. Because the Amendments do not add any substantive requirements, they will not result in an adverse impact on businesses in California. On the contrary, by providing greater consistency within the Guidelines, the cost of environmental analysis, and potential litigation, may be reduced.

SECTION 15086. CONSULTATION CONCERNING DRAFT EIR

The revision to this section is a non-substantive correction to this section's reference to the California Air Resources Board. This revision, therefore, qualifies as a "change without regulatory effect" pursuant to section 100(a)(4) of the Office of Administrative Law's regulations governing the rulemaking process. (Cal. Code Regs., tit. 1, § 100(a)(4).)

SECTION 15093. STATEMENT OF OVERRIDING CONSIDERATIONS

Specific Purposes of the Amendment

Section 21081(b) of the Public Resources Code provides that a lead agency may approve or carry out a project with significant and unavoidable impacts only after the lead agency makes a finding that "specific overriding economic, legal, social, technical or other benefits of the project outweigh the significant effects on the environment." The State CEQA Guidelines describes the factors that a lead agency must weigh in determining whether to approve a project with adverse environmental effects:

> CEQA recognizes that in determining whether and how a project should be approved, a public agency has an obligation to balance a variety of public objectives, including economic, environmental, and social factors and in particular the goal of providing a decent home and satisfying living environment for every Californian. An agency shall prepare a statement of overriding considerations as described in Section 15093 to reflect the ultimate balancing of competing public objectives when the agency decides to approve a project that will cause one or more significant effects on the environment.

(State CEQA Guidelines, § 15021(d).) The California Supreme Court has further observed that "an agency's decision that the specific benefits a project offers outweigh any environmental effects that cannot feasibly be mitigated … lies at the core of the lead agency's discretionary responsibility under CEQA…." (*City of Marina v. Board of Trustees of Cal. State Univ* (2006) 39 Cal.4th 341, 368.)

In the context of GHG emissions, some projects may cause adverse environmental impacts but still provide an overall benefit of reducing GHG emissions on a statewide or regional level. For example, a city may make a policy choice to allow increased housing density within a jobs-rich region in order to reduce region-wide GHG emissions from vehicles and transportation. (See, e.g., 2007 IEPR, at p. 210.) Though the introduction of new housing within the jurisdiction may result in near-term or local adverse impacts related to GHG emissions, doing so may assist the region as a whole in meeting region-wide reduction targets. Thus, subdivision (a) of section 15093 was revised to expressly allow a lead agency to consider this type of environmental benefit of a project in making a statement of overriding considerations.

The revision to section 15093(a) accomplishes two objectives. First, it reminds lead agencies and the public that even a project that appears environmentally beneficial may itself cause adverse environmental impacts, and such impacts must undergo full CEQA review, and, if applicable, a statement of overriding considerations. Second, it discourages purely local interests from dominating consideration of a project by expressly allowing a lead agency to consider region- and statewide benefits of a project. Further, "economic, legal, social, technical and other benefits" could be interpreted to refer to local benefits. This addition would ensure that lead agencies may consider

regional and statewide benefits in considering a project's adverse impacts. Finally, the proposed addition makes clear, consistent with section 15021(d) of the existing State CEQA Guidelines, that the lead agency may consider environmental benefits to balance a project's significant adverse environmental effects that remain even after the adoption of all available feasible mitigation measures.

Necessity

The Legislature directed OPR and the Resources Agency to develop guidelines on the analysis of GHG emissions. (Pub. Resources Code, § 21083.05.) If a lead agency determines that a project's GHG emissions will result in significant and unavoidable impacts, a lead agency may only approve the project if it makes specified findings. (*Id*. at § 21081(b).) This amendment is necessary to ensure that a lead agency considers state-wide and regional benefits of a project in addition to purely local benefits. Because consideration of state-wide and region-wide benefits may also apply to impacts unrelated to GHG emissions, the amendment was worded broadly to address any significant environmental impact.

Reasonable Alternatives to the Regulation, Including Alternatives that Would Lessen Any Adverse Impact on Small Business, and the Resources Agency's Reasons for Rejecting Those Alternatives

The Resources Agency considered reasonable alternatives to the Amendments and determined that no reasonable alternative would be more effective in carrying out the purpose for which the action is proposed or would be as effective as, and less burdensome to affected private persons than, the Amendments. This conclusion is based on the Resources Agency's determination that the Amendments are necessary to implement the Legislature's directive in SB97 in a manner consistent with existing statutes and case law, and the Amendments add no new substantive requirements. The Resources Agency rejected the no action alternative because it would not achieve the objectives of the proposed revisions. There are no alternatives available that would lessen any adverse impacts on small businesses, as any impacts would result from the implementation of existing law.

Evidence Supporting an Initial Determination That the Action Will Not Have a Significant Adverse Economic Impact on Business

The Amendments interpret and/or make specific statutory CEQA provisions and case law interpreting CEQA for making statements of overriding considerations. Because the Amendments do not add any substantive requirements, they will not result in an adverse impact on businesses in California.

SECTION 15125. ENVIRONMENTAL SETTING

Specific Purposes of the Amendment

Section 15125 reflects existing law requiring examination of project impacts in relation to the existing environment. Subsection (d) states that lead agencies should consider whether the proposed project is inconsistent with applicable local and regional plans. That subsection provides a non-exclusive list of plans for potential consideration. The Amendments would add specific plans, regional blueprint plans and greenhouse gas reduction plans to subdivision (d). The added plans are necessary to ensure that GHG emissions analyses in such plans are addressed.

Specific Plans

Specific Plans address a defined geographic area within the area covered by a General Plan. (Gov. Code, § 65450 ("After the legislative body has adopted a general plan, the planning agency may, or if so directed by the legislative body, shall, prepare specific plans for the systematic implementation of the general plan for all or part of the area covered by the general plan").) Specific Plans must contain "[s]tandards and criteria by which development will proceed, and standards for the conservation, development, and utilization of natural resources, where applicable." (*Id*. at § 65451(a)(3).) Thus, given that so many local governments are addressing GHG emissions in their policy documents, and that Specific Plans must contain standards and criteria, it is likely that Specific Plans may address GHG emissions, and consistency with adopted Specific Plans should be considered in EIRs.

Regional Blueprint Plans

Regional Blueprint Plans are being developed in many of California's Metropolitan Planning Organizations through grants provided by the California Department of Transportation. While originally designed to address transportation efficiencies, Regional Blueprint Plans typically involve smart growth planning with an aim to reducing vehicle miles traveled at a regional level. As a result, Regional Blueprint Plans can provide information regarding the region's existing transportation setting and identify methods to reduce region-wide transportation-related impacts. (Scoping Plan, Appendix C, at pp. C-74-C-84.) Land use decisions impact many sectors responsible for GHG emissions, including transportation, electricity, water, waste, and others. However, the primary impact of land use development on GHG emissions relates to vehicle use. (Land Use Subcommittee of the Climate Action Team, *LUSCAT Submission to CARB Scoping Plan on Local Government, Land Use, and Transportation* (2008), at p. 13.) Blueprint Plans highlight this relationship between land use and transportation and how this relationship may impact a local community's and region's GHG emissions. Analysis of GHG reduction is not required by Blueprint grants but it is recommended. Therefore, Blueprint Plans provide an indication of the GHG emissions potentially created or reduced by the plan. (LUSCAT (2009), at p. 30.) Given the large percentage of GHG emissions that result from transportation in

California, a project's consistency with a Regional Blueprint Plan can provide information indicating whether the project could have significant environmental impacts related to GHG emissions. (*Ibid*.) Regional Blueprint Plans may, therefore, provide evidence to assist the lead agency in determining whether a project may tend to increase or decrease GHG emissions relative to the existing baseline. Thus, where such a plan has been developed and adopted by an MPO, lead agencies may find it useful to evaluate the project's consistency with that Blueprint Plan.

Plans for the Reduction of Greenhouse Gas Emissions

The Amendments would add plans for the reduction of greenhouse gas emissions to the list of plans in section 15125(d). Many local and regional plans now include policies relating to, and analyses of, GHG emissions. (OPR, Book of Lists, at pp. 92-100; Scoping Plan, at p. 26.) Many such plans include detailed information on the jurisdiction's inventory of GHG emissions and measures to reduce such emissions. (*Ibid*.) Such plans may also include prescriptions for specific mitigation measures to address GHG emissions. (Scoping Plan, Appendix C, at p. C-49.) Where such a plan has been developed and adopted within the relevant jurisdiction, a project's inconsistency with that plan could be an indication of potential adverse environmental impacts.

Notably, while section 15125(d) requires an EIR to discuss any inconsistencies of a project with the listed plans, it does not mandate a finding of significance resulting from any identified inconsistencies. The plans simply provide information regarding the project's existing setting and inconsistency may be an indication of potentially significant impacts. The determination of significance is to be made by the lead agency.

Necessity

The Legislature directed OPR and the Resources Agency to develop guidelines addressing the mitigation of GHG emissions and the effects of the GHG emissions. (Pub. Resources Code, § 21083.05.) As indicated above, one potential indicator of a project's potential GHG emissions impacts is whether the project is consistent with applicable plans that have addressed that impact. Thus, the addition of plans that may address GHG emissions to the list of plans in the existing section 15125 is reasonably necessary to ensure that such analysis occurs.

Reasonable Alternatives to the Regulation, Including Alternatives that Would Lessen Any Adverse Impact on Small Business, and the Resources Agency's Reasons for Rejecting Those Alternatives

The Resources Agency considered reasonable alternatives to the Amendments and determined that no reasonable alternative would be more effective in carrying out the purpose for which the action is proposed or would be as effective as, and less burdensome to affected private persons than, the Amendments. This conclusion is based on the Resources Agency's determination that the Amendments are necessary to

implement the Legislature's directive in SB97 in a manner consistent with existing statutes and case law, and the Amendments add no new substantive requirements. The Resources Agency rejected the no action alternative because it would not achieve the objectives of the Amendments. There are no alternatives available that would lessen any adverse impacts on small businesses, as any impacts would result from the implementation of existing law.

Evidence Supporting an Initial Determination That the Action Will Not Have a Significant Adverse Economic Impact on Business

The Amendments interpret and make specific statutory CEQA provisions and/or case law interpreting CEQA for analyzing the effects of GHG emissions that may result from proposed projects. Many lead agencies, and some trial courts, have already determined that CEQA requires analysis and mitigation of GHG emissions independent of the SB97 CEQA Guidelines amendments. The Office of Planning and Research, for example, has cataloged over 1,000 examples of CEQA documents, prepared between July 2006 and June 2009, analyzing and mitigating GHG emissions. (Office of Planning and Research, Environmental Assessment Documents Containing a Discussion of Climate Change (Revised June 1, 2009).) Further, several trial courts have found that existing CEQA law requires analysis and mitigation of GHG emissions. (See, e.g., *Muriettans for Smart Growth v. City of Murrieta et al.*, Riverside Co. Sup. Ct. Case No. RIC463320 (November 21, 2007); *Env. Council of Sac. et al v. Cal. Dept. of Trans*., Sacramento Sup. Ct. Case No. 07CS00967 (July 15, 2008) (citing *Berkeley Keep Jets Over the Bay Committee v. Board of Commissions* (2001) 91 Cal.App. 4th 1344, 1370-1371 and State CEQA Guidelines section 15144 as requiring a lead agency to "meaningfully attempt to quantify the Project's potential impacts on GHG emissions and determine their significance" or at least to explain what steps were undertaken to investigate the issue before concluding that the impact would be speculative).) Finally, federal courts have interpreted the National Environmental Policy Act ("NEPA") to require an analysis of potential impacts of GHG emissions. (*See*, *e.g.*, *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Ad*., 538 F.3d 1172, 1215-1217 (9th Cir. 2008).) Thus, the amendments to the CEQA Guidelines developed pursuant to SB97 do not create new requirements; rather, they interpret and clarify existing CEQA law.

Because the Amendments do not add any substantive requirements, they will not result in an adverse impact on businesses in California. On the contrary, the amendments to this section are intended to reduce the costs of environmental review on lead agencies and project applicants by encouraging the use of existing environmental information where available. (Pub. Resources Code, § 21003(d) (use information in existing EIRs in order to reduce duplication), (f) (environmental review should proceed in the most efficient manner possible).)

SECTION 15126.2. CONSIDERATION AND DISCUSSION OF SIGNIFICANT ENVIRONMENTAL EFFECTS.

Amendments are proposed to two subdivisions of the existing section 15126.2. The first, to subdivision (c), adds a cross-reference to the Public Resources Code and another section of the State CEQA Guidelines. This revision, therefore, qualifies as a "change without regulatory effect" pursuant to section 100(a)(4) of the Office of Administrative Law's regulations governing the rulemaking process. (Cal. Code Regs., tit. 1, § 100(a)(4).) The second change, made in response to public comments, adds a sentence to the end of existing subdivision (a). That change is described in greater detail below.

Specific Purposes of the Amendment

Several comments submitted as part of the Natural Resources Agency's SB97 rulemaking process urged it to develop guidance addressing the analysis of the impacts of climate change on a project. These comments similarly suggested that such guidance was appropriate in light of the release of the draft California Climate Adaptation Strategy (Adaptation Strategy), developed pursuant to Executive Order S-13-2008. In considering such comments, it is important to understand several key differences between the Adaptation Strategy and the California Environmental Quality Act. First, the Adaptation Strategy is a policy statement that contains recommendations; it is not a binding regulatory document. Second, the Adaptation Strategy focuses on how the State can plan for the effects of climate change. CEQA's focus, on the other hand, is the analysis of a particular project's greenhouse gas emissions on the environment, and mitigation of those emissions if impacts from those emissions are significant. Given these differences, CEQA should not be viewed as the tool to implement the Adaptation Strategy; rather, as indicated in the Strategy's key recommendations, advanced programmatic planning is the primary method to implement the Adaptation Strategies.

There is some overlap between CEQA and the Adaptation Strategy, however. As explained in both the Initial Statement of Reasons and in the Adaptation Strategy, section 15126.2 may require the analysis of the effects of a changing climate under certain circumstances. (Initial Statement of Reasons, at pp. 68-69.) In particular, Section 15126.2 already requires an analysis of placing a project in a potentially hazardous location. Further, several questions in the Appendix G checklist already ask about wildfire and flooding risks. Many comments on the proposed amendments asked for additional guidance, however.

Having reviewed all of the comments addressing the effects of climate change, the Natural Resources Agency revised the proposed amendments to include a new sentence in Section 15126.2 clarifying the type of analysis that would be required. Existing section 15126.2(a) provides an example of a potential hazard requiring analysis: placing a subdivision on a fault line. The new sentence adds further examples, as follows:

> Similarly, the EIR should evaluate any potentially significant impacts of locating development in other areas susceptible to hazardous conditions (e.g., floodplains, coastlines, wildfire risk areas) as identified in authoritative hazard maps, risk assessments or in land use plans addressing such hazards areas.

According to the Office of Planning and Research, at least sixty lead agencies already require this type of analysis. (California Governor's Office of Planning and Research, State Clearinghouse, The California Planners' Book of Lists (January, 2009), at p. 109.) This addition is reasonably necessary to guide lead agencies as to the scope of analysis of a changing climate that is appropriate under CEQA.

As revised, section 15126.2 would provide that a lead agency should analyze the effects of bringing development to an area that is susceptible to hazards such as flooding and wildfire, both as such hazards currently exist or may occur in the future. Several limitations apply to the analysis of future hazards, however. For example, such an analysis may not be relevant if the potential hazard would likely occur sometime after the projected life of the project (i.e., if sea-level projections only project changes 50 years in the future, a five-year project may not be affected by such changes). Additionally, the degree of analysis should correspond to the probability of the potential hazard. (State CEQA Guidelines, § 15143 ("significant effects should be discussed with emphasis in proportion to their severity and probability of occurrence").) Thus, for example, where there is a great degree of certainty that sea-levels may rise between 3 and 6 feet at a specific location within 30 years, and the project would involve placing a wastewater treatment plant with a 50 year life at 2 feet above current sea level, the potential effects that may result from inundation of that plant should be addressed. On the other extreme, while there may be consensus that temperatures may rise, but the magnitude of the increase is not known with any degree of certainty, effects associated with temperature rise would not need to be examined. (State CEQA Guidelines, § 15145 ("If, after thorough investigation, a lead agency finds that a particular impact is too speculative for evaluation, the agency should note its conclusion and terminate the discussion of the impact").) Lead agencies are not required to generate their own original research on potential future changes; however, where specific information is currently available, the analysis should address that information. (State CEQA Guidelines, § 15144 (environmental analysis "necessarily involves some degree of forecasting. While seeing the unforeseeable is not possible, an agency must use its best efforts to find out and disclose all that it reasonably can").)

The decision in *Baird v. County of Contra Costa* (1995) 32 Cal.App.4th 1464, does not preclude this analysis. In that case, the First District Court of Appeal held that a county was not required to prepare an EIR due solely to pre-existing soil contamination that the project would not change in any way. (Id. at 1468.) No evidence supported the petitioner's claim that the project would "expose or exacerbate" the pre-existing contamination, which was located several hundred to several thousand feet from the project site. (Id. at n. 1.) Moreover, the project would have no other significant effects on the environment, and other statutes exist to protect residents from contaminated soils. Thus, the question confronting that court was whether pre-existing contamination near the project was, by itself, enough to require preparation of an EIR. It held that, in those circumstances, an EIR was not required. That court also acknowledged, however, that where there is a potential for ultimately changing the environment, an EIR could be required. (Id. at p. 1469.) Thus, unlike the circumstances in the *Baird* case, the analysis required in section 15126.2(a) would occur if an EIR was otherwise required. Similarly, the addition to that section contemplates hazards which the presence of a project could exacerbate (i.e., potential upset of hazardous materials in a flood, increased need for firefighting services, etc.).

This revision was described in the Natural Resources Agency's Notice of Proposed Changes and the public was invited to present comments on that change. The Natural Resources Agency determined that the change was sufficiently related to the original proposal described in the Notice of Proposed Action, so a fifteen day comment period was appropriate. It is sufficiently related because the Notice of Proposed Action explained that the rulemaking activity was intended to address the directive in SB97 to provide guidelines on the analysis of the "effects of greenhouse gas emissions." As explained in the Initial Statement of Reasons, the Natural Resources Agency initially chose not to provide specific guidance on the analysis of the effects of placing development in an area subject to the effects of climate change because the Agency interpreted existing section 15126.2(a) to already require that analysis under certain circumstances. As indicated above, however, many comments on the proposed amendments suggested revisions to section 15126.2(a) to provide additional guidance. The areas susceptible to hazards include those that may result from a changing climate. Thus, the change is sufficiently related that a reasonable person would be put on notice that such a change could occur as a result of the rulemaking activity described in the Notice of Proposed Action.

Finally, following review of comments on this revision, the Natural Resources Agency clarified that this analysis applies only to "potentially significant" effects of locating developing in areas susceptible to hazards. Because this revision clarifies the last sentence in section 15126.2(a), consistent with the Public Resources Code, and does not alter the requirements, rights, responsibilities, conditions, or prescriptions contained in the originally proposed text, this revision is nonsubstantial and need not be circulated for additional public review. (Government Code, § 11346.8(c); Cal. Code Regs., tit. 1, § 40.)

Necessity

The Legislature directed OPR and the Resources Agency to develop guidelines addressing the analysis of the effects of GHG emissions. (Pub. Resources Code, § 21083.05.) As explained above, the effects of GHG emissions include flooding, sea-level rise and wildfires. Thus, the addition of a clarifying sentence to existing section 15126.2(a), requiring analysis of the effects of placing developing in hazardous locations, is reasonably necessary to ensure that such analysis occurs with respect to areas subject to potential hazards resulting from climate change.

Reasonable Alternatives to the Regulation, Including Alternatives that Would Lessen Any Adverse Impact on Small Business, and the Resources Agency's Reasons for Rejecting Those Alternatives

The Resources Agency considered reasonable alternatives to the Amendments and determined that no reasonable alternative would be more effective in carrying out the purpose for which the action is proposed or would be as effective as, and less burdensome to affected private persons than, the Amendments. This conclusion is based on the Resources Agency's determination that the Amendments are necessary to implement the Legislature's directive in SB97 in a manner consistent with existing statutes and case law, and the Amendments add no new substantive requirements. The Resources Agency rejected the no action alternative because it would not achieve the objectives of the Amendments. There are no alternatives available that would lessen any adverse impacts on small businesses, as any impacts would result from the implementation of existing law.

Evidence Supporting an Initial Determination That the Action Will Not Have a Significant Adverse Economic Impact on Business

The Amendments interpret and make specific statutory CEQA provisions and/or case law interpreting CEQA for analyzing the effects of GHG emissions that may result from proposed projects. Many lead agencies, and some trial courts, have already determined that CEQA requires analysis and mitigation of GHG emissions independent of the SB97 CEQA Guidelines amendments. The Office of Planning and Research, for example, has cataloged over 1,000 examples of CEQA documents, prepared between July 2006 and June 2009, analyzing and mitigating GHG emissions. (Office of Planning and Research, Environmental Assessment Documents Containing a Discussion of Climate Change (Revised June 1, 2009).) Further, several trial courts have found that existing CEQA law requires analysis and mitigation of GHG emissions. (See, e.g., *Muriettans for Smart Growth v. City of Murrieta et al.*, Riverside Co. Sup. Ct. Case No. RIC463320 (November 21, 2007); *Env. Council of Sac. et al v. Cal. Dept. of Trans*., Sacramento Sup. Ct. Case No. 07CS00967 (July 15, 2008) (citing *Berkeley Keep Jets Over the Bay Committee v. Board of Commissions* (2001) 91 Cal.App. 4th 1344, 1370-1371 and State CEQA Guidelines section 15144 as requiring a lead agency to "meaningfully attempt to quantify the Project's potential impacts on GHG emissions and determine their significance" or at least to explain what steps were undertaken to

investigate the issue before concluding that the impact would be speculative).) Finally, federal courts have interpreted the National Environmental Policy Act ("NEPA") to require an analysis of potential impacts of GHG emissions. (*See*, *e.g.*, *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Ad*., 538 F.3d 1172, 1215-1217 (9th Cir. 2008).) Thus, the amendments to the CEQA Guidelines developed pursuant to SB97 do not create new requirements; rather, they interpret and clarify existing CEQA law.

Because the Amendments do not add any substantive requirements, they will not result in an adverse impact on businesses in California. On the contrary, by providing greater certainty to lead agencies regarding the analysis that may be required of the potential effects of climate change on a project, the cost of environmental analysis, and potential litigation, may be reduced.

SECTION 15126.4. CONSIDERATION AND DISCUSSION OF MITIGATION MEASURES PROPOSED TO MINIMIZE SIGNIFICANT EFFECTS.

Specific Purposes of the Amendment

Section 21083.05 of the Public Resources Code expressly requires OPR and the Resources Agency to develop regulations on the "mitigation of greenhouse gas emissions." The goals of this legislative mandate are to (1) reduce GHG emissions and (2) to provide consistency in the development of GHG emissions reduction measures. There is no indication, however, that the Legislature intended to alter any existing laws governing mitigation under CEQA. The Amendments, therefore, interpret and make specific existing CEQA law and regulations for mitigation of significant impacts resulting from GHG emissions.

Existing section 15126.4 provides guidance on CEQA's general mitigation requirements. To emphasize that mitigation of GHG emissions is subject to those existing CEQA requirements, OPR and the Natural Resources Agency added a new subdivision (c) to the existing section 15126.4. The Amendments identify five general methods of mitigation that may be tailored to the specific circumstances surrounding a specific project. In response to public comments, the Natural Resources Agency provided additional guidance, described below, in the lead-in sentences introducing those five broad categories of mitigation.

Mitigation of Greenhouse Gas Emissions

Comments submitted on the Amendments indicated general concerns that mitigation for GHG emissions may not be effective or reliable. To further clarify the existing mitigation requirements that would apply to measures to reduce greenhouse gas emissions, the Natural Resources Agency revised the lead-in sentences in subdivision (c). Specifically, the Natural Resources Agency added that all mitigation must be supported with substantial evidence and be capable of monitoring or reporting. This addition reflects the requirement in Public Resources Code that a lead agency's findings on mitigation be supported with substantial evidence and that it must adopt a mitigation monitoring and reporting program along with the project if mitigation measures are required. (Public Resources Code, §§ 21081(a)(1), 21081.6.)

In response to comments, the Natural Resources Agency had originally also proposed to add a sentence indicating that only emissions reductions that were not required by some other law or contract could qualify as mitigation. In response to comments on that proposed revision, that sentence is no longer proposed to be added to the lead-in section; rather, subdivision (c)(3) will be clarified, as described below.

Mitigation Identified in an Existing Plan

The first type of mitigation of GHG emissions that may be considered includes measures identified in an existing plan. As indicated above, many agencies are

beginning to address GHG emissions at a planning level. (OPR, Book of Lists, at pp. 92-100.) Some of those GHG reduction plans include specific measures that may be applied on a project-by-project basis. (*Ibid*; *see also* Scoping Plan, Appendix C, at p. C-49.) Proposed subdivision (c)(1), therefore, would encourage lead agencies to look to adopted plans for sources of mitigation measures that could be applied to specific projects.

Project Design Features

The second type of measure that a lead agency should consider is project design features that will reduce project emissions. Various project design features could be used to reduce GHG emissions from a wide variety of projects. The CAPCOA White Paper provides examples of various project design features that may reduce emissions from commercial and residential buildings. (CAPCOA White Paper, at pp. B-13 to B-18.) For example, according to the California Energy Commission, "[r]esearch shows that increasing a community's density and its accessibility to jobs centers are the two most significant factors for reducing vehicle miles traveled," which is an important component of reducing statewide emissions. (California Energy Commission 2007, *2007 Integrated Energy Policy Report*, CEC-100-2007-008-CMF ("2007 IEPR"), at p. 12; see also CEC, *The Role of Land Use in Meeting California's Energy and Climate Goals* (2007) at p. 20.) This subdivision also refers specifically to measures identified in Appendix F, which include a variety of measures designed to reduce energy use. By encouraging lead agencies to consider changes to the project itself, this subdivision further encourages the realization of co-benefits such as reduced energy costs for project occupants, increased amenities for non-vehicular transportation, and others. Thus, project design can reduce GHG emissions directly through efficiency and indirectly through resource conservation and recycling. (Green Building Sector Subgroup of the Climate Action Team, Scoping Plan Measure Development and Cost Analysis (2008) at p. 6 to 9.)

Off-Site Measures

The third type of measures addressing GHG emissions is off-site measures including offsets. Proposed subdivision (c)(3) recognizes the availability of various off-site mitigation measures. Such measures could include, among others, the purchase of carbon offsets, community energy conservation projects, and off-site forestry projects. (*See*, *e.g.*, South Coast Air Quality Management District, SoCal Climate Solutions Exchange (June 2008), at pp.1; Rodeo Refinery Settlement Agreement, BAAQMD Carbon Offset Fund; Recommendations of the ETAAC, Final Report (February 2008) at pp. 9-5; ARB, Staff Report: Proposed Adoption of California Climate Action Registry Forestry Greenhouse Gas Protocols for Voluntary Purposes (October 17, 2007), at p. 15 ("[t]he three protocols together – the sector, project, and certification protocols – are a cohesive and comprehensive set of methodologies for forest carbon accounting, and furthermore contain all the elements necessary to generate high quality carbon credits"); see also Scoping Plan, Appendix C, at pp. C-21 to C-23.) Off-site mitigation may be appropriate under various circumstances. For example, such mitigation may be

appropriate where a project is incapable of design modifications that would sufficiently reduce GHG emissions within the project boundaries. In that case, a lead agency could consider whether emissions reductions may be achieved through such measures as energy-efficiency upgrades within the community or reforestation programs.

The reference to "offsets" in subdivision(c)(3) generated several comments during the public review period. The offsets concept is familiar in other aspects of air quality regulation. The Federal Clean Air Act, for example, provides that increases in emissions from new or modified sources in a nonattainment area must be offset by reductions in existing emissions within the nonattainment area. (See, e.g., 42 U.S.C. § 7503(a)(1)(A).) California laws also apply to offsets and emissions credits. (See, e.g., Health & Saf. Code, § 39607.5.) Those other laws generally require that emissions offsets must be "surplus" or "additional". Comments on the proposed amendments suggested that to be used for CEQA mitigation purposes, offsets should also be "additional." Thus, the Natural Resources Agency further refined the revisions it publicized on October 23, 2009, by deleting the lead-in sentence stating that "Reductions in emissions that are not otherwise required may constitute mitigation pursuant to this subdivision," and amending subdivision (c)(3) to state that mitigation may include "Off-site measures, including offsets <u>that are not otherwise required</u>, to mitigate a project's emissions[.]"

Moving this concept from the general provisions on mitigation of greenhouse gas emissions to the provision on offsets does not materially alter the rights or conditions in the originally proposed text because the "not otherwise required" concept would only make sense in the context of offsets. Because this revision clarifies section 15126.4(c)(3), consistent with the Public Resources Code and cases interpreting it, and does not alter the requirements, rights, responsibilities, conditions, or prescriptions contained in the originally proposed text, this revision is nonsubstantial and need not be circulated for additional public review. (Government Code, § 11346.8(c); Cal. Code Regs., tit. 1, § 40.)

<u>Sequestration</u>

The fourth type of GHG emissions mitigation measure is sequestration. Indeed, one way to reduce a project's GHG emissions is to sequester project-related GHG emissions and thereby prevent them from being released into the atmosphere. At present, the most readily available, and accountable, way to sequester GHGs is forest management. California forests have a "unique capacity to remove [carbon dioxide, a GHG,] from the air and store it long-term as carbon." (Scoping Plan, Appendix C, at p. C-165.) Forest sequestration functions are, therefore, a key part of the ARB's Scoping Plan and reduction effort. (Scoping Plan, at pp. 64-65.)

The California Climate Action Team has also identified several forest-related sequestration strategies, including, reforestation, conservation forest management, conservation (i.e., avoided development), urban forestry, and fuels management and biomass. (ARB, Staff Report: Proposed Adoption of California Climate Action Registry

Forestry Greenhouse Gas Protocols for Voluntary Purposes (October 17, 2007), at pp. 6-7.) ARB has adopted Forest Protocols for large forestry projects. (ARB, Resolution 07-44 (adopting California Climate Action Registry Forestry Sector Protocol (September 2007), Forest Project Protocol (September 2007) and Forest Verification Protocol (May 2007).) ARB has also adopted Urban Forest Protocols for urban forestry projects. (California Climate Action Registry, Urban Forest Project Reporting Protocol and Verification Protocol (August 2008) (ARB adopted on September 25, 2008).) Such projects could be located on the project site or off-site. (Urban Forest Project Reporting Protocol, at pp. 4-5.) The protocols include methods of measuring the ability of various forestry projects to store capture and store carbon.

Consistent with section 15126.4(a), a lead agency must support its choice of, and its determination of the effectiveness of, any reduction measures with substantial evidence. Substantial evidence in the record must demonstrate that any mitigation program or measure is will result in actual emissions reductions. As a practical matter, where a mitigation program or measure is consistent with protocols adopted or approved by an agency with regulatory authority to develop such a program, a lead agency will more easily be able to demonstrate that off-site mitigation will actually result in emissions reductions. Examples of such protocols include the forestry protocols described above. Where a mitigation proposal cannot be verified with an existing protocol, a greater evidentiary showing may be required.

Measures to be Implemented on a Project-by-Project Basis

Finally, the fifth type of measure that could reduce GHG emissions at a planning level is the development of binding measures to be implemented on a project-specific basis. As explained in greater detail in the discussion of proposed section 15183.5, below, ARB's Scoping Plan strongly encourages local agencies to develop plans to reduce GHG emissions throughout the community. In addition, the CEC's Power Plant Siting Committee is assessing the impacts of GHG emission from proposed new power plants and how they can be mitigated. Comments received during the CEC's informational proceedings warranted a lengthy discussion on the practical application of a programmatic approach to mitigating GHG emissions from new power plants. (CEC, *Committee Guidance on Fulfilling California Environmental Quality Act Responsibilities for Greenhouse Gas Impacts in Power Plant Siting Applications* (2009) at p. 26 to 28.) Existing State CEQA Guidelines sections 15168(b)(4) and 15168(c)(3) recognize that programmatic documents provide an opportunity to develop mitigation plans that will apply on a project-specific basis. Proposed subdivision (c)(5) recognizes that, for a planning level decision, appropriate mitigation of GHG emissions may include the development of a program to be implemented on a project-by-project basis. (State CEQA Guidelines, § 15126.4(a)(2) ("[i]n the case of the adoption of a plan, policy, regulation, or other public project, mitigation measures can be incorporated into the plan, policy, regulation or project design").)

This type of mitigation is subject to the limits of existing law, however. Thus, proposed subdivision (c)(5) should not be interpreted to allow deferral of mitigation.

Rather, it is subject to the rule in existing section 15126.4(a)(1)(B) that such measures "may specify performance standards which would mitigate the significant effect of the project and which may be accomplished in more than one specified way." (*See also San Joaquin Raptor Rescue Center v. County of Merced* (2007) 149 Cal. App. 4th 645, 670-71.)

Suggestions Rejected

During its public involvement process, OPR received comments on its preliminary draft of the proposed amendments related to mitigation. Some comments suggested provisions that were not included in these Proposed Amendments. Several comments, for example, suggested that the Guidelines provide a specific "hierarchy" of mitigation requiring lead agencies to mitigate GHG emissions on-site where possible, and to allow consideration and use of off-site mitigation only if on-site mitigation is impossible or insufficient. OPR and the Resources Agency recognize that there may be circumstances in which requiring on-site mitigation may result in various co-benefits for the project and local community, and that monitoring the implementation of such measures may be easier. However, CEQA leaves the determination of the precise method of mitigation to the discretion of lead agencies. (State CEQA Guidelines, § 15126.4(a)(1)(B); *see also San Franciscans Upholding the Downtown Plan v. City & Co. of San Francisco* (2002) 102 Cal. App. 4th 656, 697.)

Several comments also suggested that mitigation for GHG emissions must be "real, permanent, quantifiable, verifiable, and enforceable." The Proposed Amendments do not include such standards, however, for several reasons. The proposed standard appears to have been derived from section 38562(d) of the Health and Safety Code, which prescribes requirements for regulations to be promulgated to implement AB32. AB32 is a separate statutory scheme, and, as noted above, there is no indication that the legislature intended to alter standards for mitigation under CEQA. Similarly, standards for mitigation under CEQA already exist and are set out in section 15126.4(a). Specifically, mitigation must be fully enforceable, which implies that the measure is also real and verifiable. Additionally, substantial evidence in the record must support an agency's conclusion that mitigation will be effective, and in the context of an EIR, courts will defer to an agency's determination of a measure's effectiveness. (*Environmental Council of Sacramento v. City of Sacramento* (2006) 147 Cal.App.4th 1018, 1041 (mitigation ratio is supportable even at less than 1:1 given the project's circumstances); *Ass'n of Irritated Residents v. County of Madera* (2003) 107 Cal.App.4th 1383, 1398 (lead agency has discretion to resolve dispute regarding the effectiveness of an EIR's mitigation measures).) No existing law requires CEQA mitigation to be quantifiable. Rather, mitigation need only be "roughly proportional" to the impact being mitigated. (State CEQA Guidelines, § 15126.4(a)(4)(B); see also id. at § 15142.)

Necessity

The Legislature directed OPR and the Resources Agency to develop guidelines on the mitigation of GHG emissions. (Pub. Resources Code, § 21083.05.) The proposed subdivision (c) sets out types of mitigation of GHG emissions that a lead agency may consider. Thus, that subdivision is reasonably necessary to implement the Legislature's directive.

Reasonable Alternatives to the Regulation, Including Alternatives that Would Lessen Any Adverse Impact on Small Business, and the Resources Agency's Reasons for Rejecting Those Alternatives

The Resources Agency considered reasonable alternatives to the proposed action and determined that no reasonable alternative would be more effective in carrying out the purpose for which the action is proposed or would be as effective as, and less burdensome to affected private persons than, the proposed action. This conclusion is based on the Resources Agency's determination that the proposed action is necessary to implement the Legislature's directive in SB97 in a manner consistent with existing statutes and case law, and the proposed action adds no new substantive requirements. The Resources Agency rejected the no action alternative because it would not achieve the objectives of the proposed revisions. There are no alternatives available that would lessen any adverse impacts on small businesses, as any impacts would result from the implementation of existing law.

Evidence Supporting an Initial Determination That the Action Will Not Have a Significant Adverse Economic Impact on Business

The proposed action interprets and makes specific statutory CEQA provisions and/or case law interpreting CEQA for mitigating the impacts of GHG emissions that may result from proposed projects. Many lead agencies, and some trial courts, have already determined that CEQA requires analysis and mitigation of GHG emissions independent of the SB97 CEQA Guidelines amendments. The Office of Planning and Research, for example, has cataloged over 1,000 examples of CEQA documents, prepared between July 2006 and June 2009, analyzing and mitigating GHG emissions. (Office of Planning and Research, Environmental Assessment Documents Containing a Discussion of Climate Change (Revised June 1, 2009).) Further, several trial courts have found that existing CEQA law requires analysis and mitigation of GHG emissions. (See, e.g., *Muriettans for Smart Growth v. City of Murrieta et al.*, Riverside Co. Sup. Ct. Case No. RIC463320 (November 21, 2007); *Env. Council of Sac. et al v. Cal. Dept. of Trans*., Sacramento Sup. Ct. Case No. 07CS00967 (July 15, 2008) (citing *Berkeley Keep Jets Over the Bay Committee v. Board of Commissions* (2001) 91 Cal.App. 4th 1344, 1370-1371 and State CEQA Guidelines section 15144 as requiring a lead agency to "meaningfully attempt to quantify the Project's potential impacts on GHG emissions and determine their significance" or at least to explain what steps were undertaken to investigate the issue before concluding that the impact would be speculative).) Finally, federal courts have interpreted the National Environmental Policy Act ("NEPA") to require an analysis of potential impacts of GHG emissions. (*See*, *e.g.*, *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Ad*., 538 F.3d 1172, 1215-1217 (9th

Cir. 2008).) Thus, the amendments to the CEQA Guidelines developed pursuant to SB97 do not create new requirements; rather, they interpret and clarify existing CEQA law.

Because the proposed action does not add any substantive requirements, it will not result in an adverse impact on businesses in California. On the contrary, by providing greater certainty to lead agencies regarding the determination of significance of GHG emissions, the cost of environmental analysis, and potential litigation, may be reduced.

SECTION 15130. DISCUSSION OF CUMULATIVE IMPACTS

Specific Purposes of the Amendment

The Proposed Amendments include two revisions to the existing section 15130 of the State CEQA Guidelines. The two proposed amendments are described below.

Section 15130(b)(1)(B)

Section 21083(b) of the Public Resources Code requires that an EIR be prepared if the "possible effects of a project are individually limited but cumulatively considerable." That section further defines "cumulatively considerable" to mean that "the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects."

In determining whether a project may have significant cumulative impacts, a lead agency must engage in a two-step process. First, it must determine the extent of the cumulative problem. To do so, a lead agency must examine the "effects of past projects, the effects of other current projects, and the effects of probable future projects." Once it does so, the lead agency then determines whether the project's incremental contribution to that problem is cumulatively considerable. Section 21100(e) further provides that "[p]reviously approved land use documents, including but not limited to, general plans, specific plans, and local coastal plans, may be used in a cumulative impact analysis."

The existing Guideline section 15130(b) addresses the first step of the process. It offers two options for estimating the effects resulting from past, present and reasonably foreseeable projects. A lead agency may either rely on a list of such projects, or a summary of projections to estimate cumulative impacts. Existing section 15130(b)(1)(B) allows a lead agency to rely on projections in a land use document or certified environmental document that addresses the cumulative impact under consideration.

The proposed amendments would clarify that plans providing such projections need not be limited to land use plans, so long as the plan evaluates the relevant cumulative effect. The proposed amendments would also allow a lead agency to rely on information provided in regional modeling programs. The best projections of the cumulative effect of GHG emissions may be available in up-to-date models such as the International Council for Local Environmental Initiative's Local Government GHG Protocol[8] and the California Climate Action Reserve's Registry general,[9] industry[10] and

[8] ICLEI (2008) Local Government Operations Protocol; Accessed 6/08/09, http://www.icleiusa.org/action-center/tools/lgo-protocol-1

[9] California Climate Action Registry (2009) General Reporting Protocol: Accessed 6/08/09, http://www.climateregistry.org/resources/docs/protocols/grp/GRP_3.1_January2009.pdf

project type protocols.[11] Such projections may also be supplied in plans that are not strictly "land use" plans. For example, regional transportation plans in certain areas will ultimately include sustainable community strategies which will include projections a region's GHG emissions and related cumulative effects. (Gov Code, § 65080(b)(2).) Finally, some agencies are beginning to develop GHG reduction plans or climate action plans that may also include such projections. (ARB, Scoping Plan, Appendix C, at p. C-49; OPR, Book of Lists, at pp. 92-100.)

The proposed amendments are consistent with section 21083 of the Public Resources Code and CEQA case law. Section 21083 requires consideration of "the effects of past projects, the effects of other current projects, and the effects of probable future projects." Projections in the listed types of plans and models may include inventories of existing emissions and projected future emissions. Section 21100 of the Public Resources Code provides that land use plans "may" be used in a cumulative impacts analysis, but that section does not purport to limit the types of plans that can be used in a cumulative impacts analysis to land use plans. Finally, case law has supported reliance on projections provided by industry, for example, to satisfy the requirement for a discussion of impacts caused by closely related projects. (*Ass'n of Irritated Residents*, *supra*, 107 Cal. App. 4th at 1404.)

While models may provide the most up to date information, lead agencies should still look first to information provided in adopted or certified environmental documents. First, such information has already gone through a public and agency review process. Second, to the extent the model provides information that is not provided in the prior environmental document, the relationship of the model and applicable plans must be explained, along with any changes in circumstances.

Section 15130(d)

The Office of Planning and Research had originally proposed the addition of certain plans to section 15130(d). That section states that previously approved land use plans may be used in a cumulative impacts analysis. Those additions were inadvertently excluded from the proposed amendments that were made available for public review on July 3, 2009. Therefore, the revisions were added to revisions that were made publicly available on October 23, 2009.

The added plans include regional transportation plans and plans for the reduction of greenhouse gas emissions. This change is sufficiently related to the proposal that was originally published. Those plans were proposed for addition to other sections of the proposed amendments, for example, and comments were submitted regarding the use of such plans in cumulative impacts analysis. Plans for the reduction of greenhouse gas emissions were described under section 15064(h)(3), above. Regional

[10] California Climate Action Registry (2005) Industry Specific Protocols: Accessed 06/08/09, http://www.climateregistry.org/tools/protocols/industry-specific-protocols.html
[11] California Climate Action Registry (2007) Project Protocols: Accessed 06/08/09, http://www.climateregistry.org/tools/protocols/project-protocols.html

transportation plans may contain information regarding transportation-related greenhouse gas emissions that may be useful in a cumulative impacts analysis. As explained above, regional transportation plans in certain areas will ultimately include sustainable community strategies which will include projections a region's GHG emissions and related cumulative effects. (Gov Code, § 65080(b)(2).) Thus, these additions are reasonably necessary to ensure that public agencies perform a cumulative impacts analysis of greenhouse gas emissions as required by Public Resources Code section 21083.05. The additions are also consistent with Public Resources Code section 21100(e) which provides that previously adopted land use plans may be used in a cumulative impacts analysis.

Section 15130(f)

The Natural Resources Agency originally proposed to add subdivision (f) to section 15130 to clarify that sections 21083 and 21083.05 of the Public Resources Code do not require a detailed analysis of GHG emissions solely due to the emissions of other projects. (State CEQA Guidelines, § 15130(a)(1); *Santa Monica Chamber of Commerce v. City of Santa Monica* (2002) 101 Cal.App.4th 786, 799.) Rather, proposed subdivision (f) would have provided that a detailed analysis is required when evidence shows that the incremental contribution of the project's GHG emissions is cumulatively considerable when added to other cumulative projects. (*CBE*, *supra*, 103 Cal.App.4th at 119-120.) In essence, the proposed addition would be a restatement of law as applied to GHG emissions. Analysis of GHG emissions as a cumulative impact is consistent with case law arising under the National Environmental Policy Act. (*See*, *e.g.*, *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Ad*., 538 F.3d 1172, 1215-1217 (9th Cir. 2008).) Other portions of these proposed Guidelines address how lead agencies may determine whether a project's emissions are cumulatively considerable. (See, e.g., Proposed Sections 1506(h)(3) and 15064.4.)

Public comments noted, however, that the new subdivision merely restated the law, and was capable of misinterpretation. The Natural Resources Agency, therefore, determined that because other provisions of the Amendments address the analysis of greenhouse gas emissions as a cumulative impact, and because the reasoning of those is fully explained in the Initial Statement of Reasons, subdivision (f) should not be added to the CEQA Guidelines. The deletion was reflected in the revisions that were made available for further public review and comment on October 23, 2009.

Necessity

Sections 21083 and 21083.05 of the Public Resources Code respectively require that an EIR analyze cumulative impacts and that the effects of GHG emissions be analyzed in CEQA documents. The Amendments include guidance to assist lead agencies to evaluate the cumulative impacts of GHG emissions where an EIR is required. Thus, the Amendments are reasonably necessary to implement the Legislature's directive.

Reasonable Alternatives to the Regulation, Including Alternatives that Would Lessen Any Adverse Impact on Small Business, and the Resources Agency's Reasons for Rejecting Those Alternatives

The Resources Agency considered reasonable alternatives to the Amendments and determined that no reasonable alternative would be more effective in carrying out the purpose for which the action is proposed or would be as effective as, and less burdensome to affected private persons than, the Amendments. This conclusion is based on the Resources Agency's determination that the Amendments are necessary to implement the Legislature's directive in SB97 in a manner consistent with existing statutes and case law, and the Amendments add no new substantive requirements. The Resources Agency rejected the no action alternative because it would not achieve the objectives of the Amendments. There are no alternatives available that would lessen any adverse impacts on small businesses, as any impacts would result from the implementation of existing law.

Evidence Supporting an Initial Determination That the Action Will Not Have a Significant Adverse Economic Impact on Business

The Amendments interpret and make specific statutory CEQA provisions and/or case law interpreting CEQA for analysis and mitigation of GHG emissions that may result from proposed projects. Many lead agencies, and some trial courts, have already determined that CEQA requires analysis and mitigation of GHG emissions independent of the SB97 CEQA Guidelines amendments. The Office of Planning and Research, for example, has cataloged over 1,000 examples of CEQA documents, prepared between July 2006 and June 2009, analyzing and mitigating GHG emissions. (Office of Planning and Research, Environmental Assessment Documents Containing a Discussion of Climate Change (Revised June 1, 2009).) Further, several trial courts have found that existing CEQA law requires analysis and mitigation of GHG emissions. (See, e.g., *Muriettans for Smart Growth v. City of Murrieta et al.*, Riverside Co. Sup. Ct. Case No. RIC463320 (November 21, 2007); *Env. Council of Sac. et al v. Cal. Dept. of Trans*., Sacramento Sup. Ct. Case No. 07CS00967 (July 15, 2008) (citing *Berkeley Keep Jets Over the Bay Committee v. Board of Commissions* (2001) 91 Cal.App. 4th 1344, 1370-1371 and State CEQA Guidelines section 15144 as requiring a lead agency to "meaningfully attempt to quantify the Project's potential impacts on GHG emissions and determine their significance" or at least to explain what steps were undertaken to investigate the issue before concluding that the impact would be speculative).) Finally, federal courts have interpreted the National Environmental Policy Act ("NEPA") to require an analysis of potential impacts of GHG emissions. (*See*, *e.g.*, *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Ad*., 538 F.3d 1172, 1215-1217 (9th Cir. 2008).) Thus, the amendments to the CEQA Guidelines developed pursuant to SB97 do not create new requirements; rather, they interpret and clarify existing CEQA law.

Because the Amendments do not add any substantive requirements, they will not result in an adverse impact on businesses in California. On the contrary, the

amendments to this section are intended to reduce the costs of environmental review on lead agencies and project applicants by encouraging the use of existing environmental analysis where available. (Pub. Resources Code, § 21003(d) (use information in existing EIRs in order to reduce duplication), (f) (environmental review should proceed in the most efficient manner possible).)

SECTION 15150. INCORPORATION BY REFERENCE

Specific Purposes of the Amendment

The existing CEQA Guidelines allow lead agencies to incorporate information from other documents by reference. (State CEQA Guidelines, § 15150.) Doing so permits a lead agency to avoid repetitious analysis of general matters and to reduce paperwork. (Pub. Resources Code § 21003 (it is state policy that "persons and public agencies involved in the environmental review process be responsible for carrying out the process in the most efficient, expeditious manner in order to conserve the available financial, governmental, physical, and social resources with the objective that those resources may be better applied toward the mitigation of actual significant effects on the environment").) Existing Guidelines section 15150(f) provides that "[i]ncorporation by reference is most appropriate for including long, descriptive, or technical materials that provide general background but do not contribute directly to the analysis of the problem at hand."

The key requirements for documents that may be incorporation by reference are set forth in the statutory definition of "EIR." (Pub. Resources Code, § 21061.) Those requirements include:

- The incorporated information is a matter of public record or is generally available to the public; and
- The incorporated information is reasonably available for inspection at a public place or public building.

Descriptions of global, statewide and regional GHG emissions are particularly well-suited to incorporation by reference. Such descriptions can be technical and lengthy. (Public Policy Institute of California, Climate Policy at the Local Level: A Survey of California's Cities and Counties (November 2008), at pp. 24-32 (describing barriers and constraints to adoption of climate action plans and policies).) General descriptions may also remain current enough to be used in several successive environmental documents. In fact, OPR has found that many agencies are addressing GHG emissions in programmatic documents that could be incorporated by reference into later documents. (OPR, Book of Lists, at pp. 92-100.) Thus, the Resources Agency and OPR find that addition of subdivision (e)(4) is reasonably necessary to effectuate the legislative directive that public agencies conduct environmental review in the most efficient manner possible.

Necessity

The Legislature directed OPR and the Resources Agency to develop guidelines on the analysis of GHG emissions. (Pub. Resources Code, § 21083.05.) The Legislature has further directed that resources be conserved wherever possible in the analysis of environment impacts. (*Id*. at § 21003.) Thus, the amendment to add GHG

analyses to the list of documents that may be incorporated by reference is reasonably necessary to implement the Legislature's directive.

Reasonable Alternatives to the Regulation, Including Alternatives that Would Lessen Any Adverse Impact on Small Business, and the Resources Agency's Reasons for Rejecting Those Alternatives

The Resources Agency considered reasonable alternatives to the Amendments and determined that no reasonable alternative would be more effective in carrying out the purpose for which the action is proposed or would be as effective as, and less burdensome to affected private persons than, the Amendments. This conclusion is based on the Resources Agency's determination that the Amendments are necessary to implement the Legislature's directive in SB97 in a manner consistent with existing statutes and case law, and the proposed action adds no new substantive requirements. The Resources Agency rejected the no action alternative because it would not achieve the objectives of the proposed revisions. There are no alternatives available that would lessen any adverse impacts on small businesses, as any impacts would result from the implementation of existing law.

Evidence Supporting an Initial Determination That the Action Will Not Have a Significant Adverse Economic Impact on Business

The Amendments interpret and make specific statutory CEQA provisions and/or case law interpreting CEQA for analysis and mitigation of GHG emissions that may result from proposed projects. Many lead agencies, and some trial courts, have already determined that CEQA requires analysis and mitigation of GHG emissions independent of the SB97 CEQA Guidelines amendments. The Office of Planning and Research, for example, has cataloged over 1,000 examples of CEQA documents, prepared between July 2006 and June 2009, analyzing and mitigating GHG emissions. (Office of Planning and Research, Environmental Assessment Documents Containing a Discussion of Climate Change (Revised June 1, 2009).) Further, several trial courts have found that existing CEQA law requires analysis and mitigation of GHG emissions. (See, e.g., *Muriettans for Smart Growth v. City of Murrieta et al.*, Riverside Co. Sup. Ct. Case No. RIC463320 (November 21, 2007); *Env. Council of Sac. et al v. Cal. Dept. of Trans*., Sacramento Sup. Ct. Case No. 07CS00967 (July 15, 2008) (citing *Berkeley Keep Jets Over the Bay Committee v. Board of Commissions* (2001) 91 Cal.App. 4th 1344, 1370-1371 and State CEQA Guidelines section 15144 as requiring a lead agency to "meaningfully attempt to quantify the Project's potential impacts on GHG emissions and determine their significance" or at least to explain what steps were undertaken to investigate the issue before concluding that the impact would be speculative).) Finally, federal courts have interpreted the National Environmental Policy Act ("NEPA") to require an analysis of potential impacts of GHG emissions. (*See*, *e.g.*, *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Ad*., 538 F.3d 1172, 1215-1217 (9th Cir. 2008).) Thus, the amendments to the CEQA Guidelines developed pursuant to SB97 do not create new requirements; rather, they interpret and clarify existing CEQA law.

Because the Amendments do not add any substantive requirements, they will not result in an adverse impact on businesses in California. On the contrary, the amendments to this section are intended to reduce the costs of environmental review on lead agencies and project applicants by encouraging the use of existing environmental analysis where available. (Pub. Resources Code, § 21003(d) (use information in existing EIRs in order to reduce duplication), (f) (environmental review should proceed in the most efficient manner possible).)

SECTION 15183. PROJECTS CONSISTENT WITH A COMMUNITY PLAN OR ZONING

Specific Purposes of the Amendment

Section 21083.3 of the Public Resources Code provides that projects that are consistent with a General Plan, Community Plan or Zoning may not need to analyze cumulative effects that have already been analyzed in an EIR on the prior planning or zoning action. The exemption may apply, for example, where "uniformly applied development policies or standards" will substantially mitigate a cumulative effect. (Pub. Resources Code, § 21083.3(d).) The statute does not define what types of development policies or standards may be used in this context. It does provide, however, that such standards or policies must have been adopted by the lead agency with a finding, supported with substantial evidence, that the policy or standard will substantially mitigate the environmental effect under consideration. (*Ibid*.) Existing Guidelines section 15183 provides several non-exclusive examples of policies and standards that might apply in the context of section 21083.3, including grading ordinances and floodplain protection ordinances.

The inclusion of "[r]equirements for reducing greenhouse gas emissions, as set forth in adopted land use plans, policies or regulations" among the list of examples of "uniformly applied development policies or standards" is consistent with the direction in section 21083.3. First, the text provides that such requirements would be "adopted" by the lead agency. Second, they would be "development policies or standards" because the requirements would be contained in an adopted "land use plan, policy or regulation." Finally, such requirements could substantially mitigate the effects of GHG emissions by "reducing greenhouse gas emissions" in the adopting jurisdiction. (Proposed Section 15183.5(b) would provide elements that may be included in a GHG emissions reduction plan that might be used in the context of section 15183.)

One comment submitted during OPR's public involvement process questioned whether such requirements relating to reductions in GHG emissions would be kept current. (See, e.g., Letter from Joyce Dillard to OPR, January 26, 2009.) Section 21083.3 specifically provides, however, that such requirements would not apply in this context if "substantial new information shows that the policies or standards will not substantially mitigate the environmental effect." (Pub. Resources Code, § 21083.3(d).) Therefore, lead agencies have an incentive to ensure that their policies remain current.

Necessity

The Legislature directed OPR and the Resources Agency to develop guidelines on the analysis of GHG emissions. (Pub. Resources Code, § 21083.05.) The addition to section 15183 is reasonably necessary to carry out the legislature's intent that projects that are consistent with General Plans, Community Plans and Zoning benefit from streamlined CEQA review. Several jurisdictions are beginning to include requirements for reducing GHG emissions in their general plans. (OPR, Book of Lists,

at pp. 92-100; Scoping Plan, Appendix C, at p. C-49.) The addition is also reasonably necessary to effectuate the legislature's intent that OPR and the Resources Agency provide guidance on how to analyze GHG emissions.

Reasonable Alternatives to the Regulation, Including Alternatives that Would Lessen Any Adverse Impact on Small Business, and the Resources Agency's Reasons for Rejecting Those Alternatives

The Resources Agency considered reasonable alternatives to the Amendments and determined that no reasonable alternative would be more effective in carrying out the purpose for which the action is proposed or would be as effective as, and less burdensome to affected private persons than, the Amendments. This conclusion is based on the Resources Agency's determination that the Amendments are necessary to implement the Legislature's directive in SB97 in a manner consistent with existing statutes and case law, and the Amendments add no new substantive requirements. The Resources Agency rejected the no action alternative because it would not achieve the objectives of the proposed revisions. There are no alternatives available that would lessen any adverse impacts on small businesses, as any impacts would result from the implementation of existing law.

Evidence Supporting an Initial Determination That the Action Will Not Have a Significant Adverse Economic Impact on Business

The Amendments interpret and make specific statutory CEQA provisions and/or case law interpreting CEQA for analysis and mitigation of GHG emissions that may result from proposed projects. Many lead agencies, and some trial courts, have already determined that CEQA requires analysis and mitigation of GHG emissions independent of the SB97 CEQA Guidelines amendments. The Office of Planning and Research, for example, has cataloged over 1,000 examples of CEQA documents, prepared between July 2006 and June 2009, analyzing and mitigating GHG emissions. (Office of Planning and Research, Environmental Assessment Documents Containing a Discussion of Climate Change (Revised June 1, 2009).) Further, several trial courts have found that existing CEQA law requires analysis and mitigation of GHG emissions. (See, e.g., *Muriettans for Smart Growth v. City of Murrieta et al.*, Riverside Co. Sup. Ct. Case No. RIC463320 (November 21, 2007); *Env. Council of Sac. et al v. Cal. Dept. of Trans*., Sacramento Sup. Ct. Case No. 07CS00967 (July 15, 2008) (citing *Berkeley Keep Jets Over the Bay Committee v. Board of Commissions* (2001) 91 Cal.App. 4th 1344, 1370-1371 and State CEQA Guidelines section 15144 as requiring a lead agency to "meaningfully attempt to quantify the Project's potential impacts on GHG emissions and determine their significance" or at least to explain what steps were undertaken to investigate the issue before concluding that the impact would be speculative).) Finally, federal courts have interpreted the National Environmental Policy Act ("NEPA") to require an analysis of potential impacts of GHG emissions. (*See*, *e.g.*, *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Ad*., 538 F.3d 1172, 1215-1217 (9th Cir. 2008).) Thus, the amendments to the CEQA Guidelines developed pursuant to

SB97 do not create new requirements; rather, they interpret and clarify existing CEQA law.

Because the Amendments do not add any substantive requirements, they will not result in an adverse impact on businesses in California. On the contrary, the amendments to this section are intended to reduce the costs of environmental review on lead agencies and project applicants by encouraging the use of existing environmental analysis where available. (Pub. Resources Code, § 21003(d) (use information in existing EIRs in order to reduce duplication), (f) (environmental review should proceed in the most efficient manner possible).)

SECTION 15183.5. TIERING AND STREAMLINING THE ANALYSIS OF GREENHOUSE GAS EMISSIONS

Specific Purposes of the Amendment

In adopting SB375, the Legislature found that "[n]ew provisions of CEQA should be enacted so that the statute encourages … local governments to make land use decisions that will help the state achieve its climate goals under AB 32[.]" (Statutes 2008, Ch. 728, § 1(f).) ARB's Scoping Plan similarly recognizes the important role that local governments play in reducing the State's GHG emissions. (ARB, Scoping Plan, at p. 26.) In particular, local government "[d]ecisions on how land is used will have large impacts on the GHG emissions that will result from the transportation, housing, industry, forestry, water, agriculture, electricity, and natural gas sectors." (*Ibid*.) Decision-making on urban growth and land use planning begins with local general plans. (Gov. Code, § 65030.1 ("The Legislature … finds that decisions involving the future growth of the state, most of which are made and will continue to be made at the local level, should be guided by an effective planning process, including the local general plan, and should proceed within the framework of officially approved statewide goals and policies directed to land use, population growth and distribution, development, open space, resource preservation and utilization, air and water quality, and other related physical, social and economic development factors").)

GHG emissions may be best analyzed and mitigated at a programmatic level. "For local government lead agencies, adoption of general plan policies and certification of general plan EIRs that analyze broad jurisdiction-wide impacts of GHG emissions can be part of an effective strategy for addressing cumulative impacts and for streamlining later project-specific CEQA reviews." (OPR, Technical Advisory: CEQA and Climate Change: Addressing Climate Change Through California Environmental Quality Act (CEQA) Review, June 19, 2008, at p. 8.) Other lead agencies may also address GHG emissions programmatically in long range development plans, facilities master plans, and other long-range planning documents.

This emphasis on long-range planning is consistent with state policy expressed in CEQA. The Legislature has clearly stated its preference that lead agencies tier environmental documents wherever feasible. (Pub. Resources Code, § 21093(b).) Specifically:

> The Legislature finds and declares that tiering of environmental impact reports will promote construction of needed housing and other development projects by (1) streamlining regulatory procedures, (2) avoiding repetitive discussions of the same issues in successive environmental impact reports, and (3) ensuring that environmental impact reports prepared for later projects which are consistent with a previously approved policy, plan, program, or ordinance concentrate upon environmental effects which may be mitigated or avoided in connection with the decision on each later project. The Legislature further finds and

> declares that tiering is appropriate when it helps a public agency to focus upon the issues ripe for decision at each level of environmental review and in order to exclude duplicative analysis of environmental effects examined in previous environmental impact reports.

(Pub. Resources Code, § 21093(a).) The Amendments, therefore, include the addition of a new section 15183.5 to address both tiering and streamlining of GHG analyses, as well as the proper use of GHG reduction plans in CEQA analyses. Explanation of the rationale of each new subdivision is provided below.

Existing Methods of Streamlining and Tiering

Because GHG emissions raise a cumulative concern, analysis of such emissions in a long-range planning document lends itself to tiering and use in later project-specific environmental review. (Pub. Resources Code, § 21093.) The Legislature has created several tiering and streamlining methods, reflected in various provisions of the existing State CEQA Guidelines, that can reduce duplication in the analysis of GHG emissions. Subdivision (a) clarifies that existing provisions in the State CEQA Guidelines regarding tiering and streamlining may be applied to the analysis of GHG emissions.

Greenhouse Gas Emissions Reduction Plans

Many jurisdictions are beginning to address GHG emissions reductions in "climate action plans" and "gas emissions reduction plans." (OPR, Book of Lists, at pp. 92-100; see also, Scoping Plan, Appendix C, at p. C-49.) ARB's Scoping Plan specifically encourages local governments to develop such plans, and has created a local government operations protocol to assist in that effort. (Scoping Plan, at p. 26.) A community-wide emissions protocol is also under development.

Some comments raised during OPR's public involvement process expressed concern that due to a lack of legislative criteria for such plans, existing provisions in the CEQA Guidelines regarding cumulative impacts may be misused. (See, e.g., Letter from Center for Biological Diversity, et al., to OPR, February 2, 2009, at p. 2.) For example, without specific guidance, a lead agency could erroneously rely on a plan with purely aspirational intent to determine that a later project's cumulative impact is less than significant pursuant to section 15064(h)(3). The proposed subdivision (b) provides criteria to assist lead agencies in determining whether an existing greenhouse gas reduction plan is an appropriate document to use in a cumulative impacts analysis under CEQA.

The existing CEQA Guidelines allow lead agencies to rely on plans for cumulative analysis where the plan has been adopted in a public review process and contains specific requirements to avoid or substantially lessen a cumulative problem. (State CEQA Guidelines, § 15064(h)(3).) The criteria set out in proposed subdivision (b)(1) are designed to ensure that a greenhouse gas reduction plan would satisfy the

requirements described in sections 15064(h)(3) and 15130(d), for the reasons described below.

Criteria (A) and (C) are necessary to define the scope of GHG emissions within the defined geographic area and the incremental contribution of activities that will occur within that area to those emissions. (State CEQA Guidelines, § 15064(h)(3) (plan addresses cumulative impacts "within the geographic area in which the project is located").) Criterion (B) establishes a benchmark to assist the lead agency in determining whether the plan provisions will avoid or substantially lessen cumulative effects of the area's GHG emissions. (*Ibid*. (plan "provides specific requirements that will avoid or substantially lessen the cumulative problem").) Criteria (D) and (E) are necessary to demonstrate that the plan will actually avoid or substantially lessen the cumulative effects of those emissions. (*Ibid*.) Finally, criterion (F) reflects the requirement in sections 15064(h)(3) and 15130(d) that the plan be adopted through a public review process, as well as case law requiring that mitigation plans themselves undergo environmental review. (*California Native Plant Society v. County of El Dorado* (2009) 170 Cal. App. 4th 1026, 1053 (mitigation "programs may offer the best solution to environmental planning challenges, by providing some certainty to developers while adequately protecting the environment" but "in order to provide a lawful substitute for the 'traditional' method of mitigating CEQA impacts, that is, a project-by-project analysis, the fee program must be evaluated under CEQA").) Notably, the criteria provided in subdivision (b) are largely consistent with the elements that ARB recommends be included in a greenhouse gas reduction plan. (ARB, Scoping Plan, Appendix C, at p. C-49.)

Subdivision (b)(2) describes the uses and limitations of plans for the reduction of greenhouse gas emissions in a cumulative impacts analysis for later projects. Specifically, it provides a safeguard to ensure that the later activity was actually addressed in the plan for the reduction of greenhouse gas emissions, and that any applicable requirements of the plan are incorporated into the later project. This requirement is similar the requirement in case law that a lead agency determine that a particular threshold appropriately addresses the impact of concern. (*Protect the Historic Amador Waterways*, *supra*, 116 Cal.App.4th at 1109 ("in preparing an EIR, the agency must consider and resolve every fair argument that can be made about the possible significant environmental effects of a project, irrespective of whether an established threshold of significance has been met with respect to any given effect").) Finally, subdivision (b)(2) makes specific the requirement that, while the existence of an applicable plan for the reduction of greenhouse gas emissions may create a presumption that compliance with that plan will reduce the incremental contribution of later activities to a less than cumulatively considerable level, the existence of substantial evidence supporting a fair argument to the contrary may still require preparation of an EIR.

<u>Special Situations</u>

Subdivision (c) provides necessary clarification of the partial exemption provided in sections 21155.2 and 21159.28 of the Public Resources Code, enacted as part of SB375 (see description above). The limitation on analysis of global warming applies only to the effects caused by GHG emissions from cars and light duty trucks. That limitation should be read in conjunction with section 21083.05 of the Public Resources Code and State CEQA Guideline sections 15064.4 and 15126.4 which require analysis of all sources of GHG emissions and mitigation if those emissions are significant. Thus, projects that qualify for the limitation in sections 21155.2 and 21159.28 must still analyze emissions resulting from, as applicable, energy use, land conversion, and other direct and indirect sources of emissions. This clarification is reasonably necessary to effectuate the legislative directive in section 21083.3 that OPR and Resources develop guidelines on the analysis of GHG emissions and to avoid confusion regarding the streamlining provisions provided by SB375.

Necessity

The Legislature directed OPR and the Resources Agency to develop guidelines on the analysis of GHG emissions. (Pub. Resources Code, § 21083.05.) The Legislature has also directed that EIRs be tiered wherever possible, and that duplication be minimized. (*Id*. at §§ 21003, 21093, 21094.) Section 15183.5, which provides guidance on tiering and streamlining of GHG emissions analyses, is therefore reasonably necessary to carry out these directives.

Reasonable Alternatives to the Regulation, Including Alternatives that Would Lessen Any Adverse Impact on Small Business, and the Resources Agency's Reasons for Rejecting Those Alternatives

The Natural Resources Agency considered reasonable alternatives to the Amendments and determined that no reasonable alternative would be more effective in carrying out the purpose for which the Amendments are proposed or would be as effective as, and less burdensome to affected private persons than, the Amendments. This conclusion is based on the Natural Resources Agency's determination that the Amendments are necessary to implement the Legislature's directive in SB97 in a manner consistent with existing statutes and case law, and the Amendments add no new substantive requirements. The Natural Resources Agency rejected the no action alternative because it would not achieve the objectives of the Amendments. There are no alternatives available that would lessen any adverse impacts on small businesses, as any impacts would result from the implementation of existing law.

Evidence Supporting an Initial Determination That the Action Will Not Have a Significant Adverse Economic Impact on Business

The Amendments interpret and make specific statutory CEQA provisions and/or case law interpreting CEQA for analysis and mitigation of GHG emissions that may result from proposed projects. Many lead agencies, and some trial courts, have already determined that CEQA requires analysis and mitigation of GHG emissions independent

of the SB97 CEQA Guidelines amendments. The Office of Planning and Research, for example, has cataloged over 1,000 examples of CEQA documents, prepared between July 2006 and June 2009, analyzing and mitigating GHG emissions. (Office of Planning and Research, Environmental Assessment Documents Containing a Discussion of Climate Change (Revised June 1, 2009).) Further, several trial courts have found that existing CEQA law requires analysis and mitigation of GHG emissions. (See, e.g., *Muriettans for Smart Growth v. City of Murrieta et al.*, Riverside Co. Sup. Ct. Case No. RIC463320 (November 21, 2007); *Env. Council of Sac. et al v. Cal. Dept. of Trans*., Sacramento Sup. Ct. Case No. 07CS00967 (July 15, 2008) (citing *Berkeley Keep Jets Over the Bay Committee v. Board of Commissions* (2001) 91 Cal.App. 4th 1344, 1370-1371 and State CEQA Guidelines section 15144 as requiring a lead agency to "meaningfully attempt to quantify the Project's potential impacts on GHG emissions and determine their significance" or at least to explain what steps were undertaken to investigate the issue before concluding that the impact would be speculative).) Finally, federal courts have interpreted the National Environmental Policy Act ("NEPA") to require an analysis of potential impacts of GHG emissions. (*See*, *e.g.*, *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Ad*., 538 F.3d 1172, 1215-1217 (9th Cir. 2008).) Thus, the Amendments to the CEQA Guidelines developed pursuant to SB97 do not create new requirements; rather, they interpret and clarify existing CEQA law.

Because the Amendments do not add any substantive requirements, they will not result in an adverse impact on businesses in California. On the contrary, the amendments to this section are intended to reduce the costs of environmental review on lead agencies and project applicants by encouraging the use of existing environmental analysis where available. (Pub. Resources Code, § 21003(d) (use information in existing EIRs in order to reduce duplication), (f) (environmental review should proceed in the most efficient manner possible).)

SECTION 15364.5. GREENHOUSE GAS

Specific Purposes of the Amendment

The Legislature has not included a definition of "greenhouse gases" in CEQA, though it did include a definition in AB32. (Health & Saf. Code, § 38505(g).) Thus, new section 15364.5 adds a definition of greenhouse gases. The specified gases are consistent with existing law as they are defined to include those identified by the Legislature in section 38505(g) of the Health and Safety Code.

Notably, the definition in AB32 states that GHG "includes all of the following…." In so stating, the Legislature implies that other gases may also be considered GHGs. The ARB's Scoping Plan also acknowledges that other gases contribute to climate change. (Scoping Plan, at p. 11.) In fact, the EPA's Endangerment Finding explained that several other gases share attributes with GHGs but would not be appropriate for regulation under the Clean Air Act at this time. (EPA Endangerment Finding, at pp. 18896-98.) Therefore, similar to the statutory definition of GHGs in AB32, the definition in the Amendments is not exclusive to the six primary GHGs. The purpose of a more expansive definition is to ensure that lead agencies do not exclude from consideration GHGs that are not listed, so long as substantial evidence indicates that such non-listed gases may result in significant adverse effects. This approach is consistent with the Supreme Court's directive that CEQA be interpreted to provide the fullest possible protection to the environment. (*Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal. 3d 376, 390.)

Necessity

The Legislature directed OPR and the Resources Agency to develop guidelines on the analysis of GHG emissions. (Pub. Resources Code, § 21083.05.) Section 15364.5 is necessary to make specific the instruction to analyze GHG emissions because it states which gases are considered to be "greenhouse gases" and should be included in the analysis.

Reasonable Alternatives to the Regulation, Including Alternatives that Would Lessen Any Adverse Impact on Small Business, and the Resources Agency's Reasons for Rejecting Those Alternatives

The Natural Resources Agency considered reasonable alternatives to the Amendments and determined that no reasonable alternative would be more effective in carrying out the purpose for which the action is proposed or would be as effective as, and less burdensome to affected private persons than, the Amendments. This conclusion is based on the Natural Resources Agency's determination that the Amendments are necessary to implement the Legislature's directive in SB97 in a manner consistent with existing statutes and case law, and the Amendments add no new substantive requirements. The Natural Resources Agency rejected the no action

alternative because it would not achieve the objectives of the Amendments. There are no alternatives available that would lessen any adverse impacts on small businesses, as any impacts would result from the implementation of existing law.

Evidence Supporting an Initial Determination That the Action Will Not Have a Significant Adverse Economic Impact on Business

The Amendments interpret and make specific statutory CEQA provisions and/or case law interpreting CEQA for analysis and mitigation of GHG emissions that may result from proposed projects. Many lead agencies, and some trial courts, have already determined that CEQA requires analysis and mitigation of GHG emissions independent of the SB97 CEQA Guidelines amendments. The Office of Planning and Research, for example, has cataloged over 1,000 examples of CEQA documents, prepared between July 2006 and June 2009, analyzing and mitigating GHG emissions. (Office of Planning and Research, Environmental Assessment Documents Containing a Discussion of Climate Change (Revised June 1, 2009).) Further, several trial courts have found that existing CEQA law requires analysis and mitigation of GHG emissions. (See, e.g., *Muriettans for Smart Growth v. City of Murrieta et al.*, Riverside Co. Sup. Ct. Case No. RIC463320 (November 21, 2007); *Env. Council of Sac. et al v. Cal. Dept. of Trans*., Sacramento Sup. Ct. Case No. 07CS00967 (July 15, 2008) (citing *Berkeley Keep Jets Over the Bay Committee v. Board of Commissions* (2001) 91 Cal.App. 4th 1344, 1370-1371 and State CEQA Guidelines section 15144 as requiring a lead agency to "meaningfully attempt to quantify the Project's potential impacts on GHG emissions and determine their significance" or at least to explain what steps were undertaken to investigate the issue before concluding that the impact would be speculative).) Finally, federal courts have interpreted the National Environmental Policy Act ("NEPA") to require an analysis of potential impacts of GHG emissions. (*See*, *e.g.*, *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Ad*., 538 F.3d 1172, 1215-1217 (9th Cir. 2008).) Thus, the Amendments to the CEQA Guidelines developed pursuant to SB97 do not create new requirements; rather, they interpret and clarify existing CEQA law.

Because the Amendments do not add any substantive requirements, they will not result in an adverse impact on businesses in California. On the contrary, the addition of this section is intended to reduce the costs of environmental review on lead agencies and project applicants by assisting lead agencies in determining which gases should be included in an analysis.

APPENDIX F. ENERGY CONSERVATION

Specific Purposes of the Amendment

CEQA's requirement to analyze and mitigate energy impacts of a project is substantive, and is not merely procedural. (*People v. County of Kern* (1976) 62 Cal.App.3d 761, 774.) Despite the requirement, lead agencies have not consistently included such analysis in their EIRs. (Remy et al., Guide to CEQA, 11th Ed. 2007, at pp. 1007-1008, n. 34.) The following revisions to Appendix F are, therefore, reasonably necessary to ensure that lead agencies comply with the substantive directive in section 21100(b)(3).

Introduction

The revisions to the introduction section include a cross-reference to section 21100(b)(3) of the Public Resources Code to direct lead agencies to the statutory directive underlying Appendix F. This section also includes an addition to make clear that energy impacts that have already been analyzed may not need to be repeated in later EIRs. This sentence is consistent with the Legislative intent in CEQA that information in existing environmental review be used to "reduce delay and duplication in preparation of subsequent environmental impact reports." (Pub. Resources Code, § 21003(d).)

EIR Contents

The amendments to Appendix F revise the section on EIR Contents to clarify that lead agencies "shall" analyze energy conservation in their EIRs. The word "shall" indicates that the duty is mandatory, and makes Appendix F consistent with Public Resources Code section 21100(b)(3). While Appendix F is revised to make clear that an energy analysis is mandatory, the amendments to this section would also make clear that the energy analysis is limited to effects that are applicable to the project.

"Lifecycle"

The amendments to Appendix F remove the term "lifecycle." No existing regulatory definition of "lifecycle" exists. In fact, comments received during OPR's public workshop process indicate a wide variety of interpretations of that term. (Letter from Terry Rivasplata et al. to OPR, February 2, 2009, at pp. 5, 12 and Attachment; Letter from Center for Biological Diversity et al. to OPR, February 2, 2009, at pp. 17.) Thus, retention of the term "lifecycle" in Appendix F could create confusion among lead agencies regarding what Appendix F requires.

Moreover, even if a standard definition of the term "lifecycle" existed, requiring such an analysis may not be consistent with CEQA. As a general matter, the term could refer to emissions beyond those that could be considered "indirect effects" of a project as that term is defined in section 15358 of the State CEQA Guidelines.

Depending on the circumstances of a particular project, an example of such emissions could be those resulting from the manufacture of building materials. (CAPCOA White Paper, at pp. 50-51.) CEQA only requires analysis of impacts that are directly or indirectly attributable to the project under consideration. (State CEQA Guidelines, § 15064(d).) In some instances, materials may be manufactured for many different projects as a result of general market demand, regardless of whether one particular project proceeds. Thus, such emissions may not be "caused by" the project under consideration. Similarly, in this scenario, a lead agency may not be able to require mitigation for emissions that result from the manufacturing process. Mitigation can only be required for emissions that are actually caused by the project. (State CEQA Guidelines, § 15126.4(a)(4).) Conversely, other projects may spur the manufacture of certain materials, and in such cases, consideration of the indirect effects of a project resulting from the manufacture of its components may be appropriate. A lead agency must determine whether certain effects are indirect effects of a project, and where substantial evidence supports a fair argument that such effects are attributable to a project, that evidence must be considered. However, to avoid potential confusion regarding the scope of indirect effects that must be analyzed, the term "lifecycle" has been removed from Appendix F.

Types of Energy Use

The amendments to Appendix F clarify that project design may achieve energy savings through measures related to water use and solid waste disposal. (California Energy Commission, Water Supply-Related Electricity Demand in California, CEC 500-2007-114 (November 2007), at p. 3 (reporting that water related energy use, including water movement, treatment and heating, annually accounts for approximately 20 percent of California's electricity consumption); Scoping Plan, Appendix C, at pp. C-158 to C-160.) The addition of these potential sources of energy reductions is consistent with the direction in section 21100(b)(3) to identify mitigation measures to reduce inefficient consumption of energy.

Grammar and Syntax

Finally, several minor revisions to Appendix F were made to improve grammar and syntax. Such revisions qualify as a "change without regulatory effect" pursuant to section 100(a)(4) of the Office of Administrative Law's regulations governing the rulemaking process. (Cal. Code Regs., tit. 1, § 100(a)(4).)

Necessity

The Legislature directed OPR and the Natural Resources Agency to develop guidelines on the analysis and mitigation of GHG emissions. (Pub. Resources Code, § 21083.05.) Since a significant source of GHG emissions results from energy use (consumption), these Amendments appropriately addressed energy use and conservation as a subject for CEQA analysis. Additionally, the legislature requires that lead agencies analyze energy use in their EIRs. (*Id*. at § 21100(b)(3).) The

amendments to Appendix F are, therefore, necessary to ensure that lead agencies implement these directives.

Reasonable Alternatives to the Regulation, Including Alternatives that Would Lessen Any Adverse Impact on Small Business, and the Resources Agency's Reasons for Rejecting Those Alternatives

The Natural Resources Agency considered reasonable alternatives to the Amendments and determined that no reasonable alternative would be more effective in carrying out the purpose for which the action is proposed or would be as effective as, and less burdensome to affected private persons than, the Amendments. This conclusion is based on the Natural Resources Agency's determination that the Amendments are necessary to implement the Legislature's directive in SB97 in a manner consistent with existing statutes and case law, and the Amendments add no new substantive requirements. The Natural Resources Agency rejected the no action alternative because it would not achieve the objectives of the Amendments. There are no alternatives available that would lessen any adverse impacts on small businesses, as any impacts would result from the implementation of existing law.

Evidence Supporting an Initial Determination That the Action Will Not Have a Significant Adverse Economic Impact on Business

The Amendments interpret and make specific statutory CEQA provisions and/or case law interpreting CEQA's requirements for analysis and mitigation of energy use. Because the Amendments do not add any substantive requirements, they will not result in an adverse impact on businesses in California.

APPENDIX G. INITIAL STUDY CHECKLIST

Specific Purposes of the Amendment

The Amendments include revisions to several portions of Appendix G, which contains a sample environmental checklist that lead agencies may use to satisfy the requirement to prepare an initial study. The amendments and their necessity are described below.

Note Regarding Use of the Checklist

The amendments would add a note to the beginning of Appendix G to clarify the checklist contained therein is only a sample that may be modified as necessary to suit the lead agency and to address the particular circumstances of the project under consideration. The addition is necessary for two reasons. First, several lead agencies have expressed concern that the checklist does not reflect the circumstances existing in that particular agency. (See, e.g., Letter from Napa County – Department of Conservation, Development, and Planning to OPR, January 26, 2009; Letter from County of San Bernardino - Land Use Services Department to OPR, February 2, 2009.) Second, the Third District Court of Appeal recently issued an opinion that clarified that all substantial evidence regarding potential impacts of a project must be considered, even if the particular potential impact is not listed in Appendix G. (*Protect the Historic Amador Waterways*, *supra*, 116 Cal.App.4th at 1109.) Thus, the note emphasizes that Appendix G does not mandate a particular form that must be used for an Initial Study; rather, it provides merely an example.

Forest Resources

The amendments would add several questions addressing forest resources in the section on Agricultural Resources. Forestry questions are appropriately addressed in the Appendix G checklist for several reasons. First, forests and forest resources are directly linked to both GHG emissions and efforts to reduce those emissions. For example, conversion of forests to non-forest uses may result in direct emissions of GHG emissions. (See, e.g., California Energy Commission Baseline GHG Emissions for Forest, Range, and Agricultural Lands in California (March, 2004) at p. 19.) Such conversion would also remove existing carbon stock (i.e., carbon stored in vegetation), as well as a significant carbon sink (i.e., rather than emitting GHGs, forests remove GHGs from the atmosphere). (Scoping Plan, Appendix C, at p. C-168.) Thus, such conversions are an indication of potential GHG emissions. Changes in forest land or timberland zoning may also ultimately lead to conversions, which could result in GHG emissions, aesthetic impacts, impacts to biological resources and water quality impacts, among others. Thus, these additions are reasonably necessary to ensure that lead agencies consider the full range of potential impacts in their initial studies. In the same way that an EIR must address conversion of prime agricultural land or wetlands as part of a project (addressing the whole of the action requires analyzing land clearance in advance of project development), so should it analyze forest removal.

During OPR's public involvement process, some commenters suggested that conversion of forest or timber lands to agricultural uses should not be addressed in the Initial Study checklist. (Letter from California Farm Bureau Federation to OPR, February 2, 2009; Letter from County of Napa, Conservation, Development and Planning Department, to OPR, January 26, 2009.) As explained above, the purpose of the Amendments is to implement the Legislative directive to develop Guidelines on the analysis and mitigation of GHG emissions. Although some agricultural uses also provide carbon sequestration values, most agricultural uses do not provide as much sequestration as forest resources. (Climate Action Team, *Carbon Sequestration* (2009), Chapter 3.3.8 at p. 3.21; California Energy Commission, *Baseline GHG Emissions for Forest, Range, and Agricultural Lands in California* (2004), at p. 2.) Therefore, such a project could result in a net increase in GHG emissions, among other potential impacts. Thus, such potential impacts are appropriately addressed in the Initial Study checklist. See the Thematic Responses, below, for additional discussion of this issue.

Greenhouse Gas Emissions

The additions also include two questions related to GHG emissions. These questions are necessary to satisfy the Legislative directive in section 21083.05 that the effects of GHG emissions be analyzed under CEQA. The questions are intended to provoke a full analysis of such emissions where appropriate. More detailed guidance on the context of such an analysis is provided in other sections throughout the Guidelines. Despite the detailed provisions in the Guidelines themselves, questions related to GHG emissions should also appear in the checklist because some lead agencies will not seriously consider an environmental issue unless it is specifically mentioned in the checklist. (*Protect the Historic Amador Waterways*, *supra*, 116 Cal. App. 4th at 1110.)

Transportation

The Amendments make four primary changes to the questions involving transportation and traffic.

First, question (a) changes the focus from an increase in traffic at a given location to the effect of a project on the overall circulation system in the project area. This change is appropriate because an increase in traffic, by itself, is not necessarily an indicator of a potentially significant *environmental* impact. (Ronald Miliam, AICP, *Transportation Impact Analysis Gets a Failing Grade When it Comes to Climate Change and Smart Growth*; *see also* Land Use Subcommittee of the Climate Action Team LUSCAT Submission to CARB Scoping Plan on Local Government, Land Use, and Transportation Report (May, 2008) at pp. 31, 36.) Similarly, even if some projects may result in a deterioration of vehicular level of service – that is, delay experienced by drivers – the overall effectiveness of the circulation system as a whole may be improved. (*Ibid*.) Such projects could include restriping to provide bicycle lanes or creating dedicated bus lanes. Even in such cases, however, any potential adverse air

quality or other impacts would still have to be addressed as provided in other sections of the checklist. Finally, the change to question (a) also recognizes that the lead agency has discretion to choose its own metric of analysis of impacts to intersections, streets, highways and freeways. (Pub. Resources Code, § 21081.2(e); *Eureka Citizens for Responsible Gov't v. City of Eureka, supra,* 147 Cal.App.4th at 371-373 (lead agency has discretion to choose its methodology).) Thus, "level of service" may or may not be the applicable measure of effectiveness of the circulation system.

Second, the revision to question (b) clarifies the role of a congestion management program in a CEQA analysis. Specifically, it clarifies that a congestion management program contains many elements in addition to a level of service designation. (Gov. Code § 65088 et seq.) The clarification is also necessary to address any projects within an "in-fill opportunity zone" that may be exempted from level of service requirements. (*Id*. at § 65088.4.)

Third, the amendments eliminate the existing question (f) regarding parking capacity. Case law recognizes that parking impacts are not necessarily environmental impacts. (*San Franciscans Upholding the Downtown Plan v. City and County of San Francisco, supra,* 102 Cal.App.4th at 697.) The focus of the Initial Study checklist should be on direct impacts of a project. Therefore, the question related to parking is not relevant in the initial study checklist. As noted above, however, if there is substantial evidence indicating adverse indirect environmental impacts from a project related to parking capacity, the lead agency must address such potential impacts regardless of whether the checklist contains parking questions. (*Ibid*.) Additional discussion of this issue is included in the Thematic Responses, below.

Finally, the amendments revise existing question (g), now question (f), to address the performance and safety of certain modes of alternative transportation. These revisions were made in response to comments received on the Amendments. While the primary objective of the Amendments is to provide guidance on the analysis and mitigation of greenhouse gas emissions, this revision was determined to be necessary to support the use of alternative transportation.

Necessity

The Legislature directed OPR and the Resources Agency to develop guidelines on the analysis of GHG emissions. (Pub. Resources Code, § 21083.05.) An initial study may be used to assist in the determination of whether a project may have a significant effect on the environment. (*Protect the Historic Amador Waterways*, *supra*, 116 Cal. App. 4th at 1110.) Appendix G of the State CEQA Guidelines is intended to provide a sample of an initial study that lead agencies may use. (*Ibid*.) Amendment of Appendix G to include questions that will assist a lead agency in determining whether a project may result in significant impacts related to GHG emissions is, therefore, necessary to carry out the Legislature's directive in section 21083.05 of the Public Resources Code.

Reasonable Alternatives to the Regulation, Including Alternatives that Would Lessen Any Adverse Impact on Small Business, and the Resources Agency's Reasons for Rejecting Those Alternatives

The Natural Resources Agency considered reasonable alternatives to the Amendments and determined that no reasonable alternative would be more effective in carrying out the purpose for which the action is proposed or would be as effective as, and less burdensome to affected private persons than, the Amendments. This conclusion is based on the Natural Resources Agency's determination that the Amendments are necessary to implement the Legislature's directive in SB97 in a manner consistent with existing statutes and case law, and the Amendments add no new substantive requirements. The Natural Resources Agency rejected the no action alternative because it would not achieve the objectives of the Amendments. There are no alternatives available that would lessen any adverse impacts on small businesses, as any impacts would result from the implementation of existing law.

Evidence Supporting an Initial Determination That the Action Will Not Have a Significant Adverse Economic Impact on Business

The Amendments interpret and make specific statutory CEQA provisions and/or case law interpreting CEQA for analysis and mitigation of GHG emissions that may result from proposed projects. Many lead agencies, and some trial courts, have already determined that CEQA requires analysis and mitigation of GHG emissions independent of the SB97 CEQA Guidelines amendments. The Office of Planning and Research, for example, has cataloged over 1,000 examples of CEQA documents, prepared between July 2006 and June 2009, analyzing and mitigating GHG emissions. (Office of Planning and Research, Environmental Assessment Documents Containing a Discussion of Climate Change (Revised June 1, 2009).) Further, several trial courts have found that existing CEQA law requires analysis and mitigation of GHG emissions. (See, e.g., *Muriettans for Smart Growth v. City of Murrieta et al.*, Riverside Co. Sup. Ct. Case No. RIC463320 (November 21, 2007); *Env. Council of Sac. et al v. Cal. Dept. of Trans*., Sacramento Sup. Ct. Case No. 07CS00967 (July 15, 2008) (citing *Berkeley Keep Jets Over the Bay Committee v. Board of Commissions* (2001) 91 Cal.App. 4th 1344, 1370-1371 and State CEQA Guidelines section 15144 as requiring a lead agency to "meaningfully attempt to quantify the Project's potential impacts on GHG emissions and determine their significance" or at least to explain what steps were undertaken to investigate the issue before concluding that the impact would be speculative).) Finally, federal courts have interpreted the National Environmental Policy Act ("NEPA") to require an analysis of potential impacts of GHG emissions. (*See*, *e.g.*, *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Ad*., 538 F.3d 1172, 1215-1217 (9th Cir. 2008).) Thus, the amendments to the CEQA Guidelines developed pursuant to SB97 do not create new requirements; rather, they interpret and clarify existing CEQA law.

Because the Amendments do not add any substantive requirements, they will not result in an adverse impact on businesses in California. On the contrary, the

amendments to Appendix G are intended to reduce the costs of environmental review on lead agencies and project applicants by assisting lead agencies in determining which topics should be addressed in an Initial Study.

NON-SUBSTANTIAL CHANGES

On October 23, 2009, the Natural Resources Agency made available for public review certain changes to its originally proposed amendments. Those changes were described in the Notice of Proposed Changes. In response to comments on those changes, the Natural Resources Agency has made two non-substantial changes. Because those changes clarify the text that was made available for public review, and do not alter the requirements, rights, responsibilities, conditions, or prescriptions contained in the originally proposed text, the revisions are nonsubstantial and need not be circulated for additional public review. (Government Code, § 11346.8(c); Cal. Code Regs., tit. 1, § 40.) Those revisions are described below.

Section 15126.2(a)

As explained in the Notice of Proposed Changes, the revisions to the proposed text included a clarifying sentence in section 15126.2 indicating that an environmental impact report should analyze the effect of placing a project in areas susceptible to hazardous conditions. That revision specifically lists types of areas (including floodplains, coastlines and wildfire risk areas) that may be most impacted by the effects of a changing climate. The revision would also clarify that analysis of such hazards is appropriate where such areas are specified in authoritative hazard maps, risk assessments or land use plans.

The Natural Resources Agency further revised section 15126.2(a) in response to comments. That section was revised as follows:

> Similarly, the EIR should evaluate ~~**the**~~ **any potentially significant** impacts of locating development in other areas susceptible to hazardous conditions (e.g., floodplains, coastlines, wildfire risk areas) as identified in authoritative hazard maps, risk assessments or in land use plans addressing such hazards areas.

This change does not alter the rights, responsibilities, conditions, or prescriptions contained in the originally proposed text because the Public Resources Code already provides that an EIR is only required for those impacts that are potentially significant. (Public Resources Code, § 21002.1(a).) Because this revision clarifies the last sentence in section 15126.2(a), consistent with the Public Resources Code, this revision is nonsubstantial and need not be circulated for additional public review. (Government Code, § 11346.8(c); Cal. Code Regs., tit. 1, § 40.)

Section 15126.4(c)

The Natural Resources Agency also further revised text related to mitigation that was made publicly available as described in the October 23, 2009, Notice of Proposed Changes in response to comments on that text. The revision clarifies that the qualification that measures to mitigate greenhouse gas emissions must not otherwise be required applies in the context of offsets and is not intended to contradict case law recognizing that changes in a project that are required to comply with existing environmental standards may qualify as mitigation. Thus, section 15126.4(c) was revised as follows:

> (c) Mitigation Measures Related to Greenhouse Gas Emissions.
>
> Consistent with section 15126.4(a), lead agencies shall consider feasible means, supported by substantial evidence and subject to monitoring or reporting, of mitigating the significant effects of greenhouse gas emissions**. ~~Reductions in emissions that are not otherwise required may constitute mitigation pursuant to this subdivision.~~** Measures to mitigate the significant effects of greenhouse gas emissions may include, among others:
>
> (1) Measures in an existing plan or mitigation program for the reduction of emissions that are required as part of the lead agency's decision;
>
> (2) Reductions in emissions resulting from a project through implementation of project features, project design, or other measures, such as those described in Appendix F;
>
> (3) Off-site measures, including offsets **that are not otherwise required**, to mitigate a project's emissions;
>
> (4) Measures that sequester greenhouse gases;
>
> (5) In the case of the adoption of a plan, such as a general plan, long range development plan, or plans for the reduction of greenhouse gas emissions, mitigation may include the identification of specific measures that may be implemented on a project-by-project basis. Mitigation may also include the incorporation of specific measures or policies found in an adopted ordinance or regulation that reduces the cumulative effect of emissions.

This change does not alter the rights, responsibilities, conditions, or prescriptions contained in the originally proposed text because the Public Resources Code already provides that to be considered mitigation, a measure must be tied to impacts resulting from the project. Section 21002 of the Public Resources Code, the source of the

requirement to mitigate, states that "public agencies should not approve projects as proposed if there are … feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects[.]" Similarly, section 21081(a)(1) specifies a finding by the lead agency in adopting a project that "[c]hanges or alterations have been required in, or incorporated into, the project which mitigate or avoid the significant effects on the environment." Both statutory provisions expressly link the changes to be made (i.e., the "mitigation measures") to the significant effects of the project. Because this revision clarifies section 15126.4(c), consistent with the Public Resources Code, this revision is nonsubstantial and need not be circulated for additional public review. (Government Code, § 11346.8(c); Cal. Code Regs., tit. 1, § 40.)

THEMATIC RESPONSES

Several themes emerged in the comments submitted on the Natural Resources Agency's proposed amendments to the CEQA Guidelines addressing greenhouse gas emissions. While the Natural Resources Agency has responded individually to each comment it received, the following provides general responses to several issues that were raised repeated in the comments.

Quantitative versus Qualitative Analysis

Many comments focused on section 15064.4's recognition of lead agency discretion in determining whether to analyze a project's greenhouse gas emissions using either qualitative or quantitative methods, or both. Some comments suggested that a qualitative analysis would not satisfy CEQA's informational mandates. Other comments indicated that qualitative analysis is consistent with CEQA, and may be particularly appropriate in the context of a negative declaration. Other comments asked for examples of how performance standards could be used in such an analysis. As explained in the Initial Statement of Reasons, the Natural Resources Agency finds that CEQA leaves to lead agencies the choice of the most appropriate methodology to analyze a project's impacts, and that rule should continue to apply in the context of greenhouse gas emissions. The reasoning supporting this determination is set forth below.

First, nothing in CEQA prohibits use of a qualitative analysis or requires the use of a quantitative analysis. As explained in the Initial Statement of Reasons, CEQA directs lead agencies to consider qualitative factors. (Initial Statement of Reasons, at p. 19; Public Resources Code, § 21001(f).) Further, the existing CEQA Guidelines recognize that thresholds of significance, which are used in the determination of significance, may be expressed as quantitative, qualitative or performance-based standards. (State CEQA Guidelines, § 15064.7.) Moreover, even where quantification is technically or theoretically possible, "CEQA does not require a lead agency to conduct every test or perform all research, study, and experimentation recommended or demanded by commentors." (State CEQA Guidelines, § 15204(a); see also *Ass'n of*

Irritated Residents v. County of Madera (2003) 107 Cal.App.4th 1383, 1396-1398; *San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus* (1996) 27 Cal.App.4th 713, 728.)[12]

Second, the comments do not appropriately distinguish between the determination of significance and the informational standards governing the preparation of environmental documents. The purpose of section 15064.4 is to assist the lead agency in determining whether a project's greenhouse gas emissions may be significant, which would require preparation of an EIR, and if an EIR is prepared, to determine whether such emissions are significant, which would require the imposition of feasible mitigation or alternatives. The existing CEQA Guidelines contain several provisions governing the informational standards that apply to various environmental documents. Conclusions in an initial study, for example, must be "briefly explained to indicate that there is some evidence to support" the conclusion. (State CEQA Guidelines, § 15063(d) (emphasis added).) Similarly, if an EIR is prepared, a determination that an impact is not significant must be explained in a "statement briefly indicating the reasons that various possible significant effects of a project" are in fact not significant. (State CEQA Guidelines, § 15128 (emphasis added).) If the impact is determined to be significant, the impact "should be discussed with emphasis in proportion to their severity and probability of occurrence." (State CEQA Guidelines, § 15143.) The explanation of significance in an EIR must be "prepared with a sufficient degree of analysis to provide decisionmakers with information which enables them to make a decision which intelligently takes account of environmental consequences" and must demonstrate "adequacy, completeness, and a good faith effort at full disclosure." (State CEQA Guidelines, § 15151.) In sum, while proposed section 15064.4(a) reflects the requirement that a lead agency base its significance determination on substantial evidence, whether quantitative, qualitative or both, it does not, as some comments appear to fear, alter the rules governing the sufficiency of information in an environmental document.

Third, the discretion recognized in section 15064.4 is not unfettered. A lead agency's analysis, whether quantitative or qualitative, would be governed by the standards in the first portion of section 15064.4. The first sentence applies to the context of greenhouse gas emissions the general CEQA rule that the determination of significance calls for a careful judgment by the lead agency. (Proposed § 15064.4(a) ("[t]he determination of the significance of greenhouse gas emissions calls for a careful judgment by the lead agency consistent with the provisions in section 15064").) The second sentence sets forth the requirement that the lead agency make a good-faith effort to describe, calculate or estimate the amount of greenhouse gas emissions

[12] Notably, as administrative regulations, the development of the proposed regulations is governed by the Administrative Procedures Act. Government Code section 11340.1(a) states the Legislature's intent that administrative regulations substitute "performance standards for prescriptive standards wherever performance standards can be reasonably expected to be as effective and less burdensome, and that this substitution shall be considered during the course of the agency rulemaking process." Thus, absent authority in CEQA that would prohibit a qualitative analysis, section 15064.4 appropriately recognizes a lead agency's discretion to determine what type of analysis is most appropriate to determine the significance of a project's greenhouse gas emissions.

resulting from a project. That sentence has been further revised, as explained in greater detail below, to provide that the description, calculation or estimation is to be based "to the extent possible on scientific and factual data." The third sentence advises that the exercise of discretion must be made "in the context of a particular project." Thus, as provided in existing section 15146, the degree of specificity required in the analysis will correspond to the degree of specificity involved in the underlying project. In other words, even a qualitative analysis must demonstrate a good-faith effort to disclose the amount and significance of greenhouse gas emissions resulting from a project.

Fourth, the discretion recognized in proposed section 15064.4 would not enable a lead agency to ignore evidence submitted to it as part of the environmental review process. For example, if a lead agency proposes to adopt a negative declaration based on a qualitative analysis of the project's greenhouse gas emissions, and a quantitative analysis is submitted to that lead agency supporting a fair argument that the project's emissions may be significant, an EIR would have to be prepared. The same holds true if a lead agency proposes to adopt a negative declaration based on a quantitative analysis, and qualitative evidence supports a fair argument that the project's emissions may be significant. (*Berkeley Keep Jets Over the Bay Com. v. Board of Port Comm*. (2001) 91 Cal.App.4th 1344, 1382; *Oro Fino Gold Mining Corp. v. County of El Dorado* (1990) 225 Cal. App. 3d 872, 881-882 (citizens' personal observations about the significance of noise impacts on their community constituted substantial evidence that the impact may be significant and should be assessed in an EIR, even though the noise levels did not exceed general planning standards).) Similarly, even if an EIR is prepared, a lead agency would have to consider and resolve conflicts in the evidence in the record. (State CEQA Guidelines, § 15151 ("EIR should summarize the main points of disagreement among the experts"); *Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099, 1109.)

Finally, regarding performance standards, several examples exist of the types of performance standards that might appropriately be used in determining the significance of greenhouse gas emissions. Proposed section 15183.5(b)(1)(D), for example, contemplates that a plan for the reduction of greenhouse gas emissions may contain performance based standards. Where such standards are developed as part of such a plan, a lead agency would have evidence indicating that compliance with such standards would indicate that the impact of greenhouse gas emissions would be less than significant. Further, in adopting SB375, the Legislature acknowledged that regional transportation plans, and the environmental impact reports prepared to analyze those plans, may contain performance standards that would apply to transit priority projects. (See, e.g., Public Resources Code, § 21155.2.) Other potential examples[13] include the Bay Area Air Quality Management District's proposed Best Management Practices for Construction Greenhouse Gas Emissions (calling for use of alternative fuels, local building materials and recycling), and the California Public Utilities Commission's Performance Standard for Power Plans (requiring emissions no greater

[13] The Natural Resources Agency does not necessarily endorse the use of these performance standards. Lead agencies must determine whether a particular standard is appropriate based on the substantial evidence supporting it and the context of the particular project.

than a combined cycle gas turbine plant). As with either a qualitative or quantitative analysis, reliance on performance standards must be supported with "scientific or factual data" indicating that compliance with the standard will ensure that impacts of greenhouse gas emissions are less than significant.

In sum, the proposed section 15064.4(a) appropriately reflects the standards in CEQA governing the determination of significance and the discretion CEQA leaves to lead agencies to determine how to analyze impacts. Mandating that lead agencies must quantify emissions whenever quantification is possible would be a departure from the CEQA statute.

Existing Environmental Setting

Several comments focused on the phrase "existing environmental setting" in section 15064.4(b)(1). Some comments urged, for example, that only "net" emissions should be considered. Comments from energy producers suggested that the phrase "existing environmental system" should encompass the entire energy system, which extends beyond California's borders. Some comments suggested that section 15064.4 should include a lifecycle analysis.

Section 15064.4(b)(1) advises lead agencies to consider the extent to which a project would increase or decrease greenhouse gas emissions compared to the existing environmental setting. In performing this analysis, a lead agency must account for all project phases, including construction and operation, as well as indirect and cumulative impacts. (State CEQA Guidelines, §§ 15063(a) ("[a]ll phases of project planning, implementation, and operation must be considered in the initial study…"), 15064(h) (addressing cumulative impacts), 15126 ("[a]ll phases of a project must be considered when evaluating its impact on the environment: planning, acquisition, development, and operation"), 15358(a)(2) (defining "effects" to include indirect effects), 15378.) The "setting" to be described varies depending on the project and the potential environmental resources that it may affect. In *Friends of the Eel River v. Sonoma County Water Agency* (2003) 108 Cal. App. 4th 859, for example, the lead agency failed to adequately describe the environmental setting by limiting its discussion primarily to the southern portions of its water system. Framing the setting narrowly resulted in impacts to the northern portion of the water system being ignored. Finding that section 15125 is to be construed broadly to ensure the fullest protection to the environment, the court in that case held that the lead agency was required to disclose that increased use of the southern portion of the water system would require greater diversions from the northern portion, and to analyze the impacts on species in the northern portion of the system. (*Id*. at pp. 873-875.) In the context of power generation, to the extent that a project may cause changes in greenhouse gas emissions in an existing power system, and substantial evidence substantiates such changes, those changes may be considered pursuant to section 15064.4(b)(1).

Similarly, if an agency has performed an analysis that demonstrates that a particular process for waste treatment does not result in an increase in greenhouse gas emissions compared to biogenic emissions that already occurs in the atmosphere, that evidence may support a conclusion that the project would not cause an increase in greenhouse gas emissions. Thus, to the extent a lead agency does not consider biogenic emissions to be new emissions, and its analysis is supported with substantial evidence, the text in section 15064.4(b)(1) would be broad enough to encompass those emissions, subject to the limitation that such analysis could not be used in a way that would mask the effects of emissions associated with the project. For example, if the emissions occurring in the short-term will have impacts that differ from emissions occurring in the future, those differences may need to be analyzed.

Finally, some comments suggested that the Guidelines should authorize a "net" or "lifecycle" analysis for projects that operate within a closed system. Nothing in section 15064.4 precludes such analysis where such analysis complies with the provision of section 15064, and where substantial evidence supports the ultimate conclusions and findings. However, since a "net" analysis may only be appropriate or possible in limited cases, the Natural Resources Agency deliberately chose to draft section 15064.4 broadly. Additionally, in some situations, a true "net" analysis may not be technically feasible or scientifically possible, and determination of an appropriate baseline for determining a "net" effect may be difficult.

As explained below, the Natural Resources Agency has deliberately avoided the term "lifecycle," however, to the extent an agency equates "lifecycle" with what occurs in the existing environmental setting, section 15064.4 authorizes lead agencies to consider such evidence.

Thresholds of Significance

Some comments expressed concern that the proposed amendments did not establish a statewide threshold of significance. Others suggested that most lead agencies are not qualified to establish their own thresholds, and if they do adopt thresholds, they should be required to adopt the most stringent threshold possible.

The CEQA Guidelines do not establish thresholds of significance for other potential environmental impacts, and SB97 did not authorize the development of a statewide threshold as part of this CEQA Guidelines update. Rather, the proposed amendments recognize a lead agency's existing authority to develop, adopt and apply their own thresholds of significance or those developed by other agencies or experts. As set forth in the existing section 15064.7, a threshold is "an identifiable quantitative, qualitative or performance level of a particular environmental effect, non-compliance with which means the effect will normally be determined to be significant by the agency and compliance with which means the effect normally will be determined to be less than significant." Because a threshold would be used in the determination of significance,

the threshold would need to be supported with substantial evidence. (State CEQA Guidelines, § 15064.7(b).)

As explained in a recent decision of the Third District Court of Appeal, "[p]ublic agencies are … encouraged to develop thresholds of significance for use in determining whether a project may have significant environmental effects." (*Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099, 1108.) Nothing in CEQA requires that thresholds be developed by experts or expert agencies; however, "thresholds can be drawn from existing environmental standards, such as other statutes or regulations." (*Id*. at p. 1107.) Regardless of who develops the threshold, if an agency adopts a threshold, it must be supported with substantial evidence. (State CEQA Guidelines, § 15064.7(b).) Additionally, "thresholds cannot be used to determine automatically whether a given effect will or will not be significant[;]" "[i]nstead, thresholds of significance can be used only as a measure of whether a certain environmental effect "will *normally* be determined to be significant" or "*normally* will be determined to be less than significant" by the agency. (Guidelines, § 15064.7, subd. (a), italics added.)" (*Protect the Historic Amador Waterways*, *supra*, 116 Cal.App.4th at pp. 1108-1109.) Proposed subdivision (c) of section 15064.7 recognizes the principles described above by expressly recognizing that experts and expert agencies may be developing thresholds that other public agencies may find useful in their own CEQA analyses, but requiring, as a safeguard, that any such threshold be supported with substantial evidence.

Notably, nothing in either AB32 or SB97 requires a finding of significance for any particular level of increase in greenhouse gas emissions. AB32, and regulations implementing that statute, will require reductions in emissions from certain sectors in the economy, but do not preclude new emissions. Moreover, as explained in the Initial Statement of Reasons, the proposed amendments do not establish a zero emissions threshold of significance because "there is no 'one molecule rule' in CEQA. (*CBE*, *supra*, 103 Cal.App.4th at 120.)" (Initial Statement of Reasons, at p. 20.)

Some comments suggested that any numeric thresholds that are developed should not be set at such a low level that adverse economic impacts would result. While economic issues are appropriate in the determination of feasibility of mitigation and alternatives, it is not appropriate in the determination of significance (see, e.g., Public Resources Code, § 21002), so a threshold should not be designed with economic impacts in mind. Moreover, even a "high" threshold would not relieve agencies of the requirement to consider any evidence indicating that a project may have a significant effect despite falling below a threshold. (*Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099, 1109; *Mejia v. City of Los Angeles* (2005) 130 Cal.App.4th 322, 342.)

Mitigation Hierarchy

CEQA's substantive mandate requires that "public agencies should not approve projects as proposed if there are … feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects[.]" (Public Resources Code, § 21002.) The statute defines feasible to mean "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors." (Public Resources Code, § 21061.1.) The Legislature further provided that a lead agency may use its lawful discretion to mitigate significant impacts to the extent provided by other laws:

> In mitigating or avoiding a significant effect of a project on the environment, a public agency may exercise only those express or implied powers provided by law other than this division. However, a public agency may use discretionary powers provided by such other law for the purpose of mitigating or avoiding a significant effect on the environment subject to the express or implied constraints or limitations that may be provided by law.

(Public Resources Code, § 21004.) Cities and counties may rely on their constitutional police powers, for example, while the ability of other agencies to require mitigation may be limited by the scope of their statutory authority. Mitigation is also subject to constitutional limitations; i.e., there must be a nexus between the mitigation measure and the impact it addresses, and the mitigation must be roughly proportional to the impact of the project. (*Nollan v. California Coastal Comm'n* (1987) 483 U.S. 825; *Dolan v. City of Tigard* (1994) 512 U.S. 374; State CEQA Guidelines, § 15126.4(a)(4).)

CEQA itself imposes very few limitations on a lead agency's discretion to impose mitigation. For example, agencies may not mitigate the effects of a housing project by reducing the proposed number of units if other feasible mitigation measures are available. (Public Resources Code, § 21159.26.) Similarly, the Legislature has prescribed specific types of mitigation in only very limited circumstances; i.e., impacts to archeological resources and oak woodlands. (Public Resources Code, §§ 21083.2, 21083.4.)

SB 97 specifically called for guidelines addressing the mitigation of greenhouse gas emissions. In doing so, however, the Legislature did not alter a lead agency's discretion, authority or limitations on the imposition of mitigation where the impacts of a project's greenhouse gas emissions are significant. Thus, as explained in the Initial Statement of Reasons, the existing CEQA rules apply to the mitigation of greenhouse gas emissions.

Within the scope of a lead agency's existing authority, the CEQA Guidelines already contain provisions that recognize a lead agency's obligation to balance various factors in determining how or whether to carry out a project. (State CEQA Guidelines, § 15021(d).) Further, the Guidelines already require that "[w]here several measures are available to mitigate an impact, each should be discussed and the basis for selecting a particular measure should be identified." (State CEQA Guidelines, § 15126.4(a)(1)(B).)

Additionally, public agencies are directed to adopt their own implementing procedures, consistent with CEQA and the State CEQA Guidelines, which could set forth the types of mitigation that a particular agency finds to be most appropriate for projects subject to its approval. (State CEQA Guidelines, § 15022.) The Natural Resources Agency cannot, however, state in the State CEQA Guidelines that all lead agencies have the authority to prioritize types of mitigation measures, or to establish any particular priority order for them. Each lead agency must determine the scope of its own authority based on its own statutory or constitutional authorization.

Reliability and Effectiveness of Mitigation

Some comments expressed concern about the reliability and efficacy of some mitigation strategies. In response to such comments, the Natural Resources Agency further revised section 15126.4(c) to expressly require that any measures, in addition to being feasible, must be supported with substantial evidence and be capable of monitoring or reporting. (See Revised Section 15126.4(c) (October 23, 2009).) This addition reflects the requirements in Public Resources Code section 21081.5 that findings regarding mitigation be supported with substantial evidence and the monitoring or reporting requirement in section 21081.6.

The text of proposed section 15126.4(c), addressing mitigation of greenhouse gas emissions, also requires that mitigation measures be effective. The first sentence of that section requires that mitigation be "feasible." Further, the statue defines "feasible" to mean "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors." (Public Resources Code, § 21061.1 (emphasis added); see also State CEQA Guidelines § 15364 (adding "legal" factors to the definition of feasibility.) A recent decision of the Third District Court of Appeal confronting questions regarding the effectiveness of a mitigation measure explained: "concerns about whether a specific mitigation measure 'will actually work as advertised,' whether it 'can … be carried out,' and whether its 'success … is uncertain' go to the feasibility of the mitigation measure[.]" (*California Native Plant Society v. City of Rancho Cordova* (2009) 172 Cal. App. 4th 603, 622-623.) Thus, by requiring that lead agencies consider feasible mitigation of greenhouse gas emissions, section 15126.4(c) already requires that such measures be effective.

Off-site Mitigation and Offsets

Relatively little authority addresses the question of how close of a causal connection must exist between off-site emissions reductions and project implementation in order to be adequate mitigation under CEQA. CEQA requires lead agencies to mitigate or avoid the significant effects of proposed projects where it is feasible to do so. While the CEQA statute does not define mitigation, the State CEQA Guidelines define mitigation to include:

(a) Avoiding the impact altogether by not taking a certain action or parts of an action.

(b) Minimizing impacts by limiting the degree or magnitude of the action and its implementation.

(c) Rectifying the impact by repairing, rehabilitating, or restoring the impacted environment.

(d) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.

(e) Compensating for the impact by replacing or providing substitute resources or environments.

(State CEQA Guidelines, § 15370.) As subdivision (e) implies, off-site measures may constitute mitigation under CEQA, and such measures have been upheld as adequate mitigation in CEQA case law. (See, e.g., *California Native Plant Society v. City of Rancho Cordova* (2009) 172 Cal. App. 4th 603, 619-626.)

Whether on-site or off-site, to be considered mitigation, the measure must be tied to impacts resulting from the project. Section 21002 of the Public Resources Code, the source of the requirement to mitigate, states that "public agencies should not approve projects as proposed if there are … feasible mitigation measures available which would substantially lessen the significant environmental effects of such projects[.]" Similarly, section 21081(a)(1) specifies a finding by the lead agency in adopting a project that "[c]hanges or alterations have been required in, or incorporated into, the project which mitigate or avoid the significant effects on the environment." Both statutory provisions expressly link the changes to be made (i.e., the "mitigation measures") to the significant effects of the project. Courts have similarly required a link between the mitigation measure and the adverse impacts of the project. (*Save Our Peninsula Comm. v. Monterey County Bd. of Supervisors* (2001) 87 Cal. App. 4th 99, 128-131 (EIR must discuss "the history of water pumping on [the off-site mitigation] property and its feasibility for providing an actual offset for increased pumping on the [project] property").) The text of sections 21002 and 21081, and case law requiring a "nexus" between a measure and a project impact, together indicate that "but for" causation is a necessary element of mitigation. In other words, mitigation should normally be an activity that occurs in order to minimize a particular significant effect. Or, stated another way and in the context of greenhouse gas emissions, emissions reductions that would occur without a project would not normally qualify as mitigation.

Notably, this interpretation of the CEQA statute and case law is consistent with the Legislature's directive in AB32 that reductions relied on as part of a market-based compliance mechanism must be "in addition to any greenhouse gas emission reduction otherwise required by law or regulation, and any other greenhouse gas emission

reduction that otherwise would occur." (Health and Safety Code, § 38562(d)(2).) While AB32 and CEQA are separate statutes, the additionality concept may be applied analytically in the latter as follows: greenhouse gas emission reductions that are otherwise required by law or regulation would appropriately be considered part of the existing baseline. Pursuant to section 15064.4(b)(1), a new project's emissions should be compared against that existing baseline.

Thus, in light of the above, and in response to concerns raised in the comments, the Natural Resources Agency has revised section 15126.4(c)(3) to state that mitigation includes: "Off-site measures, including offsets that are not otherwise required, to mitigate a project's emissions[.]" This provision is intended to be read in conjunction with the statutory mandate in Public Resources Code sections 21002 and 21081 that mitigation be tied to the effects of a project.

This provision would not limit the ability of a lead agency to create, or rely on the creation of, a mechanism, such as an offset bank, created prospectively in anticipation of future projects that will later rely on offsets created by those emissions reductions. The Initial Statement of Reasons referred, for example, to community energy conservation projects. (Initial Statement of Reasons, at p. 38.) Such a program could, for example, identify voluntary energy efficiency retrofits that would not occur absent implementation of the program, and then fund the retrofits through the sale of offsets that would occur as a result of the retrofit. Emissions reductions that occur as a result of a regulation requiring such reduction, on the other hand, would not constitute mitigation.

Some comments opined that offsets are highly uncertain and of questionable legitimacy. The Initial Statement of Reasons, however, cites several sources discussing examples of offsets being used in a CEQA context. Further, the ARB Scoping Plan describes offsets as way to "provide regulated entities a source of low-cost emission reductions, and … encourage the spread of clean, efficient technology within and outside California." (Scoping Plan, Appendix C, at p. C-21.) The Natural Resources Agency finds that the offset concept is consistent with the existing CEQA Guidelines' definition of "mitigation," which includes "[r]ectifying the impact by repairing, rehabilitating, or restoring the impacted environment" and "[c]ompensating for the impact by replacing or providing substitute resources or environments." (State CEQA Guidelines, §§ 15370(c), (e).)

While the proposed amendments recognize offsets as a potential mitigation strategy, they do not imply that offsets are appropriate in every instance. The efficacy of any proposed mitigation measure is a matter for the lead agency to determine based on the substantial evidence before it. Use of the word "feasible" in proposed Section 15126.4(c) requires the lead agency to find that any measure, including offsets, would be "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors." (State CEQA Guidelines, § 15364.)

Thus, the Natural Resources Agency finds that by expressly requiring that any mitigation measure be feasible, supported with substantial evidence, and capable of monitoring or reporting, section 15126.4(c) adequately addresses the concern stated in the comment that offsets may be of questionable legitimacy.

Use of Plans for the Reduction of Greenhouse Gas Emissions in a Cumulative Impacts Analysis

Section 15183.5 was developed to address tiering and streamlining the analysis of greenhouse gas emissions. Subdivision (a) highlights existing tiering and streamlining mechanisms in CEQA that may be used to address the analysis and mitigation of greenhouse gas emissions. Those mechanisms are often used for general plans and other long range planning documents. Subdivision (a) therefore recognizes that lead agencies may choose to include a programmatic analysis of greenhouse gas emissions in those long range plans. That subdivision did not create any new tiering or streamlining provisions; rather, it cross-references existing mechanisms. Each mechanism has its own benefits and drawbacks, and the use of any analysis of greenhouse gas emissions contained in such a document would be governed by the specific provisions cited in subdivision (a).

Subdivision (b), on the other hand, acknowledges that, in addition to the long range documents mentioned in subdivision (a), some agencies are voluntarily developing stand-alone plans focused specifically on the reduction of greenhouse gas emissions. Subdivision (b) is not a tiering mechanism. Tiering is governed by section 15152 of the existing CEQA Guidelines. The purpose of section 15183.5(b) is much narrower. Because climate action plans and greenhouse gas reduction plans are voluntary, and not subject to any legislative criteria or requirements, subdivision (b) was developed "to assist lead agencies in determining whether an existing greenhouse gas reduction plan is an appropriate document to use in a cumulative impacts analysis under CEQA." (Initial Statement of Reasons, at p. 54.) Specifically, a project that is consistent with a plan that satisfies the criteria in subdivision (b) may benefit from the presumption created in sections 15064(h)(3) and 15130(d) that the project's cumulative impacts are less than significant due to compliance with the plan. Subdivision (b) does not create or authorize any plans; rather, it provides a tool to determine whether a plan for the reduction of greenhouse gas emissions may be used in a cumulative impacts analysis as provided in section 15064(h)(3) or 15130(d). Section 15183.5(b) does not require that public agencies develop plans for the reduction of greenhouse gas emissions, nor does it prohibit public agencies from developing individual ordinances and regulations to address individual sources of greenhouse gas emissions.

As an example, if a general plan EIR analyzed and mitigated greenhouse gas emissions, a lead agency would likely use the specific streamlining provision applicable to general plan EIRs in section 15183, and not the more general provision in 15183.5(b). A stand alone "climate action plan" that was not analyzed in a program EIR, master EIR, or other mechanism identified in 15183.5(a) may still be used in a

cumulative impacts analysis pursuant to sections 15064(h)(3) or 15130(d), but only if that climate action plan contains the elements listed in section 15183.5(b)(1).

Some comments suggested that section 15183.5(b) should identify specific types of plans to which it would apply. That section was developed precisely because plans for the reduction of greenhouse gas emissions are not specified in law and are so varied. They have been variously titled “climate action plans”, “sustainability plans”, “greenhouse gas reduction plans”, etc. Contents of such plans also vary widely. Thus, the Natural Resources Agency cannot specifically identify which plans satisfy the criteria in subdivision (b). That determination must be made by the individual lead agency based on whether the specific plan under consideration satisfies each of the criteria in subdivision (b)(1).

Notably, public agencies are required to develop their own procedures to implement CEQA. (State CEQA Guidelines, § 15022.) If a lead agency determines that it does not have a plan for the reduction of greenhouse gas emissions that contains the criteria set forth in section 15183.5(b), but its collective policies, ordinances and other requirements nevertheless ensure that the incremental contribution of individual projects is not cumulatively considerable, and substantial evidence supports that determination, it could include such an explanation and support in its own implementing procedures.

Some comments questioned how a Sustainable Communities Strategy or Alternative Planning Strategy should be treated in light of section 15183.5. SB375 encourages programmatic analysis and planning for greenhouse gas emissions from cars and light-duty trucks, and provides specific CEQA streamlining benefits for certain types of projects that are consistent with a Sustainable Communities Strategy (SCS) or an Alternative Planning Strategy (APS). Given the specificity of those statutory provisions, sections 21155 through 21155.3 and 21159.28 of the Public Resources Code in particular, the Office of Planning and Research and the Natural Resources Agency did not find that additional guidance on those provisions was necessary at this time. Proposed section 15183.5(c), however, clarifies that while certain projects consistent with an SCS or APS may not need to analyze greenhouse gas emissions from cars and light-duty trucks, emissions from other sources still may require analysis and mitigation. As SB97 requires the CEQA Guidelines to be updated every two years to incorporate new information, additional guidance regarding the relationship between CEQA and SB375 may be developed as necessary. (See also the discussion of AB32, SB375 and CEQA, above.)

Definition of Greenhouse Gas Emissions

Several comments objected to the definition of greenhouse gas emissions in the Guidelines. Some suggested that it should be strictly limited to the gases identified in AB32. Other thought it should include all potential greenhouse gas emissions. Still others wanted to exclude biogenic emissions from the definition.

As explained in the Initial Statement of Reasons, the definition of greenhouse gases in AB32 states that GHG "includes all of the following…." (Health and Safety Code, § 38505(g).) The Legislature thus implied that other gases may also be considered GHGs. Further, the ARB Scoping Plan also acknowledged that other gases contribute to climate change. (Scoping Plan, at p. 11.) Consistent with the definition in the Health and Safety Code, the proposed definition in the Proposed Amendments is not exclusive to the six primary GHGs. The purpose of a more expansive definition is to ensure that lead agencies do not exclude from consideration GHGs that are not listed, so long as substantial evidence indicates that such non-listed gases may result in significant adverse effects. This approach is consistent with the Supreme Court's directive that CEQA be interpreted to provide the fullest possible protection to the environment. (*Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal. 3d 376, 390.)

While the definition could not be strictly limited to the six gases identified in AB32, the Natural Resources Agency concluded that specific mention of other potential greenhouse gases was also not appropriate. Notably, the federal Environmental Protection Agency limited its proposed endangerment finding to those same six listed gases. It did so because the six gases are well studied, and have been the focus of climate change research. (Federal Register, v. 74, 18886, 18895 (April 24, 2009).) It is not necessary to list each of the known potential greenhouse gases because the proposed definition in section 15364.5 is written broadly, stating that the greenhouse gas emissions "are not limited to" the listed examples. As further explained in the Initial Statement of Reasons, the "purpose of a more expansive definition is to ensure that lead agencies do not exclude from consideration GHGs that are not listed, so long as substantial evidence indicates that such non-listed gases may result in significant adverse effects." (Initial Statement of Reasons, at p. 58.) Because the CEQA Guidelines must be updated periodically to reflect developments relating to greenhouse gas emissions, the Natural Resources Agency may expand the definition of greenhouse gas emissions if necessary to reflect the most current science and practice.

The Natural Resources Agency also concluded that the definition of greenhouse gas emissions should not differentiate between biogenic and anthropogenic emissions. SB97 does not distinguish between the sources of greenhouse gas emissions. Notably, neither AB32 nor the Air Resources Board's Scoping Plan distinguishes between biogenic and anthropogenic sources of greenhouse gas emissions. On the contrary, the Scoping Plan identifies methane from, among other sources, organic wastes decomposing in landfills as a source of emissions that should be controlled. (Scoping Plan, at pp. 62-63.)

Forestry

Some comments objected to the inclusion of questions related to forest resources in the Appendix G questions in the section on agricultural resources.

SB97 called for guidance on the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions. (Public Resources Code, § 21083.05.) As explained in the Initial Statement of Reasons, forest conversions may result in direct greenhouse gas emissions. Further, such conversions remove existing forest stock and the potential for further carbon sequestration. (Initial Statement of Reasons, at p. 63.) Sequestration is recognized as a key mitigation strategy in the Air Resources Board's Scoping Plan. (Scoping Plan, Appendix C, at p. C-168.)

The addition of questions related to forestry does not target the establishment of agricultural operations. The questions ask about *any* conversion of forests, not just conversions to other agricultural operations. Moreover, analysis of impacts to forestry resources is already required. The Legislature has declared that "forest resources and timberlands of the state are among the most valuable of the natural resources of the state" and that such resources "furnish high-quality timber, recreational opportunities, and aesthetic enjoyment while providing watershed protection and maintaining fisheries and wildlife." (Public Resources Code, § 4512(a)-(b).) Because CEQA defines "environment" to include "land, air, water, minerals, flora, fauna, noise, [and] objects of historic or aesthetic significance" (Public Resources Code, section 21060.5), and because forest resources have been declared to be "the most valuable of the natural resources of the state," projects affecting such resources must be analyzed, whether or not specific questions relating to forestry resources appear in Appendix G. (*Protect the Historic Amador Waterways v. Amador Water Agency* (2004) 116 Cal.App.4th 1099, 1109.) In effect, suggestions that the Appendix G questions be limited to conversions to "non-agricultural uses" ask the Natural Resources Agency to adopt changes that are inconsistent with CEQA, which it cannot do.

Questions related to greenhouse gas emissions in Appendix G are not sufficient to address impacts related to forestry resources. As explained in the Initial Statement of Reasons, not only do forest conversions result in greenhouse gas emissions, but may also "remove existing carbon stock (i.e., carbon stored in vegetation), as well as a significant carbon sink (i.e., rather than emitting GHGs, forests remove GHGs from the atmosphere)." (Initial Statement of Reasons, at p. 63.) Further, conversions may lead to "aesthetic impacts, impacts to biological resources and water quality impacts, among others." The questions related to greenhouse gas emissions would not address such impacts. Thus, the addition of forestry questions to Appendix G is appropriate both pursuant to SB97 and the Natural Resources Agency's general authority to update the CEQA Guidelines pursuant to Public Resources Code section 21083(f).

"Level of Service" and Transportation Impact Analysis

The Natural Resources Agency acknowledges the concern expressed by some comments that the use of level of service metrics in CEQA analysis has led to an auto-centric focus. The Office of Planning and Research and the Natural Resources Agency have participated in extensive outreach with stakeholder groups to revise question (a) in the transportation section of Appendix G to accomplish the following goals:

- Assess traffic impacts on intersections, streets, highways and freeways as well as impacts to pedestrian, non-vehicular and mass-transit circulation

- Recognize a lead agency's discretion to choose methodology, including LOS, to assess traffic impacts

- Harmonize existing requirements in congestion management programs, general plans, ordinances, and elsewhere

In response to public comments submitted on proposed amendments, the Natural Resources Agency further refined question (a) to shift the focus from the capacity of the circulation system to consistency with applicable plans, policies that establish objective measures of effectiveness.

Some comments advocated leaving the existing text in question (a) of the transportation section of Appendix G intact. As explained in the Initial Statement of Reasons,

> [Q]uestion (a) changes the focus from an increase in traffic at a given location to the effect of a project on the overall circulation system in the project area. This change is appropriate because an increase in traffic, by itself, is not necessarily an indicator of a potentially significant environmental impact. (Ronald Miliam, AICP, Transportation Impact Analysis Gets a Failing Grade When it Comes to Climate Change and Smart Growth; see also Land Use Subcommittee of the Climate Action Team LUSCAT Submission to CARB Scoping Plan on Local Government, Land Use, and Transportation Report (May, 2008) at pp. 31, 36.) Similarly, even if some projects may result in a deterioration of vehicular level of service – that is, delay experienced by drivers – the overall effectiveness of the circulation system as a whole may be improved. (*Ibid*.) Such projects could include restriping to provide bicycle lanes or creating dedicated bus lanes. Even in such cases, however, any potential adverse air quality or other impacts would still have to be addressed as provided in other sections of the checklist. Finally, the change to question (a) also recognizes that the lead agency has discretion to choose its own metric of analysis of impacts to intersections, streets, highways and freeways. (Pub. Resources Code, § 21081.2(e); *Eureka Citizens for Responsible Gov't v. City of Eureka*, *supra*, 147 Cal.App.4th at 371-373 (lead agency has discretion to choose its methodology).) Thus, "level of service" may or may not be the applicable measure of effectiveness of the circulation system.

(Initial Statement of Reasons, at pp. 64-65.) Further, evidence presented to the Natural Resources Agency indicates that "mitigation" of traffic congestion may lead to even greater environmental impacts than might result from congestion itself. (See, e.g.,

Cervero, Robert. (July, 2001). *Road Expansion, Urban Growth, and Induced Travel: A Path Analysis*. Journal of the American Planning Association, Vol. 69 No. 2. American Planning Association (confirming "induced demand" phenomenon associated with capacity improvements).)

While the terms "volume to capacity ratio" and "congestion at intersections" no longer appear in question (a), nothing precludes a lead agency from including such measures of effectiveness in its own general plan or policies addressing its circulation system. Though the Office of Planning and Research originally recommended specifying "vehicle miles traveled" as a question in Appendix G, it later revised its recommendation to allow lead agencies to choose their own measures of effectiveness. (Letter from OPR Director, Cynthia Bryant, to Secretary for the Natural Resources Agency, Mike Chrisman, April 13, 2009.) Thus, as revised, question (a) accommodates lead agency selection of methodology, including, as appropriate, vehicle miles traveled, levels of service, or other measures of effectiveness.

Other comments objected to any mention of the phrase "level of service" in question (b) of the transportation section of the Appendix G checklist. That question, as revised, would ask whether a project would conflict with the provisions of a congestion management program. The Government Code, beginning at section 65088, requires Congestion Management Agencies, in urbanized areas, to adopt Congestion Management Programs covering that agency's cities and county, and in consultation with local governments, transportation planning agencies, and air quality management districts. A CMP must, pursuant to statute, contain level of service standards for certain designated roadways. A CMP must also include a land use analysis program to assess the impact of land use decisions on the regional transportation system. A CMA may require that land use analysis to occur through the CEQA process. Thus, level of service standards cannot be deleted from the Appendix G checklist altogether. The proposed amendments did, however, amend question (b) to put level of service standards in the broader context of the entire CMP, which should also contain travel demand measures and other standards affecting the circulation system as a whole. Beyond this amendment, however, the Natural Resources Agency cannot remove level of service standards entirely from the Appendix G checklist.

Notably, the primary purpose of the proposed amendments is to update the CEQA Guidelines on the analysis and mitigation of greenhouse gas emissions. While certain changes to Appendix G were proposed pursuant to the Natural Resources Agency's general authority to update the CEQA Guidelines, those changes were modest and were intended to address certain misapplications of CEQA in a way that hinders the type of development necessary to reduction of greenhouse gas emissions. Transportation planning and impact analysis continues to evolve, as new multimodal methods of analysis and guidelines on the integration of all modes of transportation and users into the circulation system are being developed. Additional updates to Appendix G may be appropriate in the future to address those developments.

Parking

As explained in the Initial Statement of Reasons, the Natural Resources Agency concluded that the question related to parking adequacy should be deleted from the Appendix G checklist in part as a result of the decision in *San Franciscans Upholding the Downtown Plan v. City and County of San Francisco* (2002) 102 Cal.App.4th 656. The court in that case distinguished the social impact of inadequate parking from actual adverse environmental impacts. In particular, that court explained:

> [T]here is no statutory or case authority requiring an EIR to identify specific measures to provide additional parking spaces in order to meet an anticipated shortfall in parking availability. The social inconvenience of having to hunt for scarce parking spaces is not an environmental impact; the secondary effect of scarce parking on traffic and air quality *is*. Under CEQA, a project's social impacts need not be treated as significant impacts on the environment. An EIR need only address the *secondary physical* impacts that could be triggered by a social impact.

(*Id*. at p. 698 (emphasis in original).) The Natural Resources Agency is aware of no authority requiring an analysis of parking adequacy as part of a project's environmental review. Rather, the Agency concurs with the court in the *San Franciscans* case that inadequate parking is a social impact that may, depending on the project and its setting, result in secondary effects. Consistent with existing CEQA Guidelines section 15131(a), deletion of the parking adequacy question from Appendix G checklist will ensure that the "focus of the analysis shall be on the physical changes." Specifically, the Appendix G checklist contains questions asking about possible project impacts to air quality and traffic.

Some comments pointed to examples of potential adverse impacts that could result from parking shortages, such as double-parking and slower circulation speeds, and referred specifically to a study of "cruising" behavior by Donald Shoup that noted that cruising could result in emissions of carbon dioxide. The relationship between parking adequacy and air quality is not as clear or direct as some comments imply. Mr. Shoup, for example, submitted comments to the Natural Resources Agency supporting the deletion of the parking question. (See, Letter from Donald Shoup, Professor of Urban Planning, University of California, Los Angeles, October 26, 2009.) In those comments, Mr. Shoup opines that cruising results not from the number of parking spaces associated with a project, but rather from the price associated with those parking spaces. (*Ibid*.) The Natural Resources Agency also has evidence before it demonstrating that providing parking actually causes greater emissions due to induced demand. The California Air Pollution Control Officers Association CEQA White Paper, for example, suggests reducing available parking as a way to reduce greenhouse gas emissions. (Greg Tholen, et al. (January, 2008). CEQA & Climate Change: Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act. California Air Pollution Control Officers Association, at Appendix B, pp. 8-9.)

Moreover, parking analyses do not typically address either air quality or traffic impacts; rather, such analyses often focus on the number of parking spaces necessary to satisfy peak demand, which is often established by a local agency as a parking ratio (i.e., one space per 250 square feet of office space). (See, e.g., Shoup, Donald. (1999). In Lieu of Required Parking. Journal of Planning Education and Research, Vol. 18 No. 4. Association of Collegiate Schools of Planning, at p. 309.) Thus, the question in Appendix G related to parking adequacy does not necessarily lead to the development of information addressing actual environmental impacts.

In sum, nothing in the CEQA statute, or cases interpreting that statute, require an analysis of parking demand. Further, parking supply is not a reasonable proxy for direct physical impacts associated with a project because parking supply may in some circumstances adversely affect air quality and traffic while in other circumstances, it may create air quality and traffic benefits. Thus, maintaining the parking question in the general Appendix G checklist is not necessary to effectuate the purposes of the CEQA statute.

The Natural Resources Agency acknowledges, however, that parking supply may lead to social impacts that agencies may wish to regulate. Cities and counties can, and do, include parking related policies in their municipal ordinances and general plans. (See, e.g., Office of Planning and Research, General Plan Guidelines, at pp. 59-60.) To the extent an agency has developed parking related policies in a general plan, zoning ordinance, or other regulation, consistency with those policies could be analyzed as a potential land use impact. Public agencies must, moreover, develop their own procedures to implement CEQA, and so may include parking-related questions in their own checklist if appropriate in their own circumstances. (State CEQA Guidelines, §§ 15022, 15063(f).)

AB32, SB375 and CEQA

Many comments suggested various links between CEQA, AB32 and SB375. While there is some overlap between the statutes, each contains its own requirements and serves its own purposes. While recognizing the role of regulatory programs in addressing cumulative impacts analysis in CEQA, the Proposed Amendments deliberately avoided linking the determination of significance under CEQA to compliance with AB32. The following addresses the CEQA effect of compliance with AB32 and SB375.

<u>The Effect of Consistency with the Scoping Plan and the Regulations Implementing AB32</u>

The Initial Statement of Reasons explained that the Scoping Plan "may not be appropriate for use in determining the significance of individual projects … because it is conceptual at this stage and relies on the future development of regulations to

implement the strategies identified in the Scoping Plan." (Initial Statement of Reasons, at p. 14.) Compliance with the regulations implementing the Scoping Plan, on the other hand, might be relevant in determining the significance of a project's emissions, if the particular regulation or regulations specifically addresses the emissions from the project. (*Ibid*.) Compliance with regulations is specifically addressed in section 15064(h)(3) and 15064.4(b)(3).

Specifically, both sections provide that a lead agency may consider compliance with such regulations, and if relying on regulations to determine that an impact is less than significant, the lead agency must explain how that particular regulation addresses the impact of the project. Both sections also recognize that a lead agency must still consider whether any evidence supports a fair argument that a project may still have a significant impact despite compliance with the regulation.

<u>The Effect of Consistency with Plans for the Reduction of Greenhouse Gas Emissions, Sustainable Communities Strategies and Alternative Planning Strategies.</u>

Several comments questioned whether the references in the Proposed Amendments to "greenhouse gas reduction plans" were intended to include a Sustainable Communities Strategy (SCS) or Alternative Planning Strategy (APS).

SB375 created both the SCS and APS as strategies to be adopted by metropolitan planning organizations for the purpose of achieving greenhouse gas emissions reductions targets established by the California Air Resources Board. SB375 inserted specific provisions into CEQA governing the review of projects that are consistent with an APS or SCS. (See, e.g., Public Resources Code, §§ 21155-21155.3, 21159.28.) Because of the specificity of those provisions, the Office of Planning and Research and the Natural Resources Agency determined that no further guidance was needed in the Proposed Amendments to address the use of an SCS or APS.

As explained in the Initial Statement of Reasons, however, OPR and the Natural Resources Agency observed that many jurisdictions were adopting plans specifically for the purpose of addressing and reducing greenhouse gas emissions. (Initial Statement of Reasons, at pp. 12-13.) Those plans may be titled Climate Action Plans, Greenhouse Gas Reduction Plans, Sustainability Plans, etc. While recognizing the great variety of such plans, as well as the lack of legislative or other direction regarding the content of such plans, OPR and the Natural Resources Agency proposed the addition of a new Guidelines section 15183.5(b) to establish criteria for those plans if they are to be used in a CEQA cumulative impacts analysis as provided in sections 15064(h)(3) and 15130(d). The proposed amendments to section 15064(h)(3) and addition of section 15183.5(b) were not intended to limit or affect the use of an APS or SCS as provided in the Public Resources Code.

SB375 included provisions that would exempt certain types of projects from CEQA, and would apply the substantial evidence standard of review to other types of projects reviewed under a Sustainable Communities Environmental Assessment. Some

comments raised concerns that the proposed amendments, and section 15064(h)(3) in particular, may conflict with those provisions of SB375. The last sentence of Section 15064(h)(3), which acknowledges the application of the fair argument standard in the determination of whether to prepare an EIR, complies with existing law. (*CBE*, *supra*, 103 Cal.App.4th at 115-116.) SB375's specific statutory provisions, and not section 15064(h)(3), would control for a project that satisfies the conditions in those provisions. Thus, there is no conflict between the existing language in Section 15064(h)(3) and SB375.

Comments were also raised about the application of section 15125(d), which requires a discussion of a project's consistency with applicable regional plans, to an APS or SCS. One comment suggested that, for CEQA purposes, an SCS and APS are interchangeable. The Natural Resources Agency disagrees. An Alternative Planning Strategy is not a land use plan with which land use consistency should be analyzed under CEQA. (Government Code, § 65080(b)(2)(H)(v).) For that reason, the Natural Resources Agency deliberately did not propose to add "Alternative Planning Strategy" to the list of plans to be considered in an environmental setting pursuant to section 15125. There is no similar statement precluding analysis of consistency with a Sustainable Communities Strategy, however. Thus, the reference to a "regional transportation plan" in the existing section 15125(d) remains appropriate. As explained above, and the Initial Statement of Reasons, the reference to "plans for the reduction of greenhouse gas emissions" is intended to cover a broad range of plans that may be adopted by state and local agencies. The specific statutory provisions governing an Alternative Planning Strategy or Sustainable Communities Strategy would, however, control.

Similarly, some comments expressed concern regarding the application of the new Appendix G question asking about a project's consistency with applicable plans for the reduction of greenhouse gas emissions. That Appendix G question, as revised, asks whether a project would: "Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?" (Emphasis added.) In response to comments, the Natural Resources Agency replaced the word "any" with the word "an" to clarify that only a plan determined to be applicable by the lead agency, and not any plan developed by any person or entity, should be considered in determining whether a project would result in a significant impact relating to greenhouse gas emissions. Government Code section 65080(b)(2)(H)(v) states: an "alternative planning strategy shall not constitute a land use plan, policy, or regulation, and the inconsistency of a project with an alternative planning strategy shall not be a consideration in determining whether a project may have an environmental effect" for CEQA purposes. By operation of that Government Code Section 65080(b)(2)(H)(v), an alternative planning strategy would not constitute "an applicable plan" for purposes of the Appendix G question. Notably, as explained in the Initial Statement of Reasons, the Appendix G checklist is meant to provide a sample checklist of questions designed to provoke thoughtful consideration of general environmental concerns. (Initial Statement of Reasons, at p. 63.) Because it is provided as a sample only, the Office of Planning and Research and the Natural Resources Agency found that it would not be possible to

identify with specificity each plan that or may not apply to a particular jurisdiction or project.

Lead agencies, however, have discretion to revise the checklist in a way that is most appropriate for their own jurisdiction. If an individual agency in a region where an APS was prepared finds it necessary or desirable to restate Government Code Section 65080(b)(2)(H)(v) in its own checklist, it may do so. Further, while inconsistency with an APS is not, by itself, an indication of a potentially significant impact, other project characteristics would need to be considered as indicated in Section 15064.4 and other provisions of the CEQA Guidelines. Because Government Code Section 65080(b)(2)(H)(v) already provides that an APS is not a land use plan for CEQA purposes, and the Appendix G question asks only about "an applicable plan," the question need not specify an exception for an APS.

The Effect of Compliance with Regulations Implementing AB32 or Other Laws Intended to Reduce Greenhouse Gas Emissions

Some comments urged that lead agencies should be able to rely on sector-wide reductions in emissions that may result from implementation of AB32 and other regulations in mitigating an individual project's impacts. Those comments appeared to conflate the requirement that a lead agency consider cumulative impacts (i.e., the impacts resulting from a project's emissions when added to other past, present and reasonably foreseeable future emissions) with the requirement that a lead agency mitigate the significant effects of a project. The proposed amendments contain several provisions addressing the analysis of greenhouse gas emissions as a cumulative effect. For example, Section 15064(h)(3) and 15130(d) would encourage lead agencies to use existing plans for the reduction of greenhouse gas emissions in cumulative impacts analysis. Additionally, Section 15130(b)(1)(B) is proposed for amendment to allow lead agencies to use projections of emissions contained in certain plans and models. Thus, the proposed amendments would allow a lead agency to consider a project in the context of other emissions resulting from the same or other sectors.

To the extent comments suggested that reductions in emissions resulting from implementation of AB32 elsewhere can mitigate the significant effects of a separate project under CEQA, the Natural Resources Agency disagrees. (See discussion below on off-site mitigation.)

A project's compliance with regulations or requirements implementing AB32 or other laws and policies is not irrelevant. Section 15064.4(b)(3) would allow a lead agency to consider compliance with requirements and regulations in the determination of significance of a project's greenhouse gas emissions. Lead agencies should note, however, that compliance with one requirement, affecting only one source of a project's emissions, may not necessarily support a conclusion that all of the project's emissions are less than significant.

Projects That Implement AB32 or Otherwise Assist in Achieving the State's Emissions Reductions Goals

Finally, some comments noted that projects implementing AB32, or that would somehow assist the State in achieving a low-carbon future, should not be considered significant under CEQA, and that requiring such projects to mitigate their emissions would frustrate implementation of AB32. CEQA requires analysis and mitigation of a project's significant adverse environmental impacts, even if that project may be considered environmentally beneficial overall. As the Third District Court of Appeal recently explained:

> "[I]t cannot be assumed that activities intended to protect or preserve the environment are immune from environmental review. [Citations.]" …. There may be environmental costs to an environmentally beneficial project, which must be considered and assessed.

(*Cal. Farm Bureau Fed. v. Cal. Wildlife Cons. Bd.* (2006) 143 Cal. App. 4th 173, 196.) Nothing in SB97 altered this rule. Thus, lead agencies must consider whether the greenhouse gas emissions resulting from beneficial projects may be significant, and if so, whether any feasible measures exist to mitigate those emissions. If such emissions are found to be significant and unavoidable, proposed amendments to section 15093 would expressly allow lead agencies to consider the region-wide and statewide environmental benefits of a project in determining whether project benefits outweigh its adverse environmental impacts.

"Adaptation" and Analysis of the Effects of Climate Change on a Project

Several comments submitted as part of the Natural Resources Agency's SB97 rulemaking process urged it to incorporate the California Climate Adaptation Strategy (Adaptation Strategy) into the CEQA Guidelines. In considering such comments, it is important to understand several key differences between the Adaptation Strategy and the California Environmental Quality Act. First, the Adaptation Strategy is a policy statement that contains recommendations; it is not a binding regulatory document. Second, the Adaptation Strategy focuses on how the State can plan for the effects of climate change. CEQA's focus, on the other hand, is the analysis of a particular project's greenhouse gas emissions on the environment, and mitigation of those emissions if impacts from those emissions are significant. Given these differences, CEQA should not be viewed as the tool to implement the Adaptation Strategy; rather, as indicated in the Strategy's key recommendations, advanced programmatic planning is the primary method to implement the Adaptation Strategies.

There is some overlap between CEQA and the Adaptation Strategy, however. As explained in both the Initial Statement of Reasons and in the Adaptation Strategy, section 15126.2 may require the analysis of the effects of a changing climate under certain circumstances. (Initial Statement of Reasons, at pp. 68-69.) In particular,

Section 15126.2 already requires an analysis of placing a project in a potentially hazardous location. Further, several questions in the Appendix G checklist already ask about wildfire and flooding risks. Many comments on the proposed amendments asked for additional guidance, however.

Having reviewed all of the comments addressing the effects of climate change, the Natural Resources Agency revised the proposed amendments to include a new sentence in Section 15126.2 clarifying the type of analysis that would be required. Existing section 15126.2(a) provides an example of a potential hazard requiring analysis: placing a subdivision on a fault line. The new sentence adds further examples, as follows:

> Similarly, the EIR should evaluate any potentially significant impacts of locating development in other areas susceptible to hazardous conditions (e.g., floodplains, coastlines, wildfire risk areas) as identified in authoritative hazard maps, risk assessments or in land use plans addressing such hazards areas.

According to the Office of Planning and Research, at least sixty lead agencies already require this type of analysis. (California Governor's Office of Planning and Research, State Clearinghouse, The California Planners' Book of Lists (January, 2009), at p. 109.) This addition is reasonably necessary to guide lead agencies as to the scope of analysis of a changing climate that is appropriate under CEQA.

As revised, section 15126.2 would provide that a lead agency should analyze the effects of bringing development to an area that is susceptible to hazards such as flooding and wildfire, both as such hazards currently exist or may occur in the future. Several limitations apply to the analysis of future hazards, however. For example, such an analysis may not be relevant if the potential hazard would likely occur sometime after the projected life of the project (i.e., if sea-level projections only project changes 50 years in the future, a five-year project may not be affected by such changes). Additionally, the degree of analysis should correspond to the probability of the potential hazard. (State CEQA Guidelines, § 15143 ("significant effects should be discussed with emphasis in proportion to their severity and probability of occurrence").) Thus, for example, where there is a great degree of certainty that sea-levels may rise between 3 and 6 feet at a specific location within 30 years, and the project would involve placing a wastewater treatment plant with a 50 year life at 2 feet above current sea level, the potential effects that may result from inundation of that plant should be addressed. On the other extreme, while there may be consensus that temperatures may rise, but the magnitude of the increase is not known with any degree of certainty, effects associated with temperature rise would not need to be examined. (State CEQA Guidelines, § 15145 ("If, after thorough investigation, a lead agency finds that a particular impact is too speculative for evaluation, the agency should note its conclusion and terminate the discussion of the impact").) Lead agencies are not required to generate their own original research on potential future changes; however, where specific information is currently available, the analysis should address that information. (State CEQA

Guidelines, § 15144 (environmental analysis "necessarily involves some degree of forecasting. While seeing the unforeseeable is not possible, an agency must use its best efforts to find out and disclose all that it reasonably can").)

The decision in *Baird v. County of Contra Costa* (1995) 32 Cal.App.4th 1464, does not preclude this analysis. In that case, the First District Court of Appeal held that a county was not required to prepare an EIR due solely to pre-existing soil contamination that the project would not change in any way. (*Id*. at 1468.) No evidence supported the petitioner's claim that the project would "expose or exacerbate" the pre-existing contamination, which was located several hundred to several thousand feet from the project site. (*Id*. at n. 1.) Moreover, the project would have no other significant effects on the environment, and other statutes exist to protect residents from contaminated soils. Thus, the question confronting that court was whether pre-existing contamination near the project was, by itself, enough to require preparation of an EIR. It held that, in those circumstances, an EIR was not required. That court also acknowledged, however, that where there is a potential for ultimately changing the environment, an EIR could be required. (*Id*. at p. 1469.) Thus, unlike the circumstances in the *Baird* case, the analysis required in section 15126.2(a) would occur if an EIR was otherwise required. Similarly, the addition to that section contemplates hazards which the presence of a project could exacerbate (i.e., potential upset of hazardous materials in a flood, increased need for firefighting services, etc.).

Finally, while the revision in section 15126.2 is consistent with the general objective of the Adaptation Strategy and is consistent with the limits of CEQA, not all issues addressed in the Adaptation Strategy are necessarily appropriate in a CEQA analysis. Thus, the revision in section 15126.2 should not be read as implementation of the entire Adaptation Strategy. Unlike hazards that can be mapped, other issues in the Adaptation Strategy, such as the health risks associated with higher temperatures, are not capable of an analysis that links a project to an ultimate impact. Habitat modification and changes in agriculture and forestry resulting from climate change similarly do not appear to be issues that can be addressed on a project-by-project basis in CEQA documents. Water supply variability is an issue that has already been addressed in depth in recent CEQA cases. (*See*, *e.g.*, *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 434-435 ("If the uncertainties inherent in long-term land use and water planning make it impossible to confidently identify the future water sources, an EIR may satisfy CEQA if it acknowledges the degree of uncertainty involved, discusses the reasonably foreseeable alternatives—including alternative water sources and the option of curtailing the development if sufficient water is not available for later phases—and discloses the significant foreseeable environmental effects of each alternative, as well as mitigation measures to minimize each adverse impact.").) Further, legislation has been developed to ensure that lead agencies identify adequate water supplies to serve projects many years in the future under variable water conditions. (See, e.g., Water Code, § 10910 *et seq*.; Government Code, § 66473.7.) Thus, the analysis called for in section 15126.2(a) should be directed primarily at hazards, and not all aspects of the Adaptation Strategy.

Additional Changes

Several comments suggested revisions or requested clarification of issues that were not addressed in this rulemaking package. The Initial Statement of Reasons explained:

> [T]he Proposed Amendments suggest relatively modest changes to various portions of the existing CEQA Guidelines. Modifications address those issues where analysis of GHG emissions may differ in some respects from more traditional CEQA analysis. Other modifications are suggested to clarify existing law that may apply both to analysis of GHG emissions as well as more traditional CEQA analyses. The incremental approach in the Proposed Amendments is consistent with Public Resources Code section 21083(f), which directs OPR and the Resources Agency to regularly review the Guidelines and propose amendments as necessary.

(Initial Statement of Reasons, at p. 9.) Additionally, Public Resources Code section 21083.05(c) requires that the CEQA Guidelines be updated periodically "to incorporate new information or criteria established by the State Air Resources Board pursuant to" AB32. Therefore, the CEQA Guidelines will continually be updated to reflect evolving information and practice and to address developments regarding analysis of greenhouse gas emissions in the courts.

Determination Regarding Impacts on Local Government and School Districts

The Natural Resources Agency has determined that the Amendments to the State CEQA Guidelines do not impose additional requirements or costs on local government or school districts. Among other things, Public Resources Code section 21083.05 (reflected in amendments to State CEQA Guidelines sections 15064.4, 15064.7(c), 15126.4(c), 15130, 15183.5, 15364.5, and Appendix G) clarifies that CEQA requires analysis of a project's greenhouse gas emissions. Public Resources Code sections 21002 and 21004 (reflected in State CEQA Guidelines section 15126.4) require a lead agency to impose feasible mitigation where a project will cause significant adverse environmental impacts. Public Resources Code sections 21003 and 21093 (reflected in the amendments to State CEQA Guidelines sections 15064, 15125, 15130, 15150 and 15183, and new State CEQA Guidelines sections 15064.4 and 15183.5) encourage lead agencies to tier environmental impact reports wherever possible and to use existing analyses to reduce duplication and expense. The decision in Berkeley Keep Jets Over the Bay Com. v. Board of Port Comm. (2001) 91 Cal.App.4th 1344, 1370, 1382 (reflected in proposed State CEQA Guidelines section 15064.4), requires that potential adverse impacts be quantified where it is possible to do so and quantification will assist in the determination of significance of the impact.

The Amendments to the State CEQA Guidelines described above merely reflect existing legislative requirements and judicial decision interpreting those requirements. Therefore, this rulemaking activity does not itself impose any costs on local government or school districts.

Determination Regarding Potential Economic Impacts Directly Affecting Business

The Natural Resources Agency has determined that the Amendments will not have a significant, statewide adverse economic impact directly affecting business. The guidelines required by sections 21083 and 21083.05 of the Public Resources Code are promulgated in the California Code of Regulations, title 14, sections 15000-15387 (the "State CEQA Guidelines"). The Natural Resources Agency has determined that most of the amendments will have no impacts on business.

CEQA applies to activities of public agencies, including projects that are funded, proposed, or approved by public agencies. Thus, the amendments to the State CEQA Guidelines would apply to public agencies, and not directly to businesses. The Natural Resources Agency is aware, however, that certain requirements reflected in the amendments that have been enacted by the Legislature and developed in case law interpreting CEQA could have an indirect economic impact on business. Among other things, project proponents could incur additional costs in assisting lead agencies to comply with the requirement to quantify greenhouse gas emissions, if possible, as part of an analysis of the effects of such emissions. Project proponents may also incur costs in implementing mitigation measures to reduce such emissions. However, the amendments to the Guidelines merely reflect existing requirements. (See, e.g., Pub. Resources Code, §§ 21004 ("a public agency may use discretionary powers … for the purpose of mitigating or avoiding a significant effect on the environment"), 21083.05 (requiring the development of guidelines on the analysis and mitigation of greenhouse gas emissions "as required by this division"); *Berkeley Keep Jets Over the Bay Com. v. Board of Port Comm*. (2001) 91 Cal.App.4th 1344, 1370, 1382 (potential hazardous emissions and noise impacts must be quantified where it is possible to do so and quantification will assist in the determination of significance of the impact).)

Many lead agencies, and some trial courts, have already determined that CEQA requires analysis and mitigation of GHG emissions independent of the SB97 CEQA Guidelines amendments. The Office of Planning and Research, for example, has cataloged over 1,000 examples of CEQA documents, prepared between July 2006 and June 2009, analyzing and mitigating greenhouse gas emissions. (Office of Planning and Research, Environmental Assessment Documents Containing a Discussion of Climate Change (Revised June 1, 2009).) Further, several trial courts have found that existing CEQA law requires analysis and mitigation of GHG emissions. (See, e.g., *Muriettans for Smart Growth v. City of Murrieta et al., Riverside Co*. Sup. Ct. Case No. RIC463320 (November 21, 2007); *Env. Council of Sac. et al v. Cal. Dept. of Trans.*, Sacramento Sup. Ct. Case No. 07CS00967 (July 15, 2008) (citing *Berkeley Keep Jets Over the Bay Committee v. Board of Commissions* (2001) 91 Cal.App. 4th 1344, 1370-

1371 and State CEQA Guidelines section 15144 as requiring a lead agency to "meaningfully attempt to quantify the Project's potential impacts on GHG emissions and determine their significance" or at least to explain what steps were undertaken to investigate the issue before concluding that the impact would be speculative).) Finally, federal courts have interpreted the National Environmental Policy Act ("NEPA") to require an analysis of potential impacts of GHG emissions. (See, e.g., *Ctr. for Biological Diversity v. Nat'l Highway Traffic Safety Ad.*, 538 F.3d 1172, 1215-1217 (9th Cir. 2008).) Thus, the amendments to the CEQA Guidelines developed pursuant to SB97 do not create new requirements; rather, they interpret and clarify existing CEQA law.

Additionally, some of amendments included in this rulemaking activity may tend to reduce costs associated with environmental analysis of greenhouse gas emissions. For example, the amendments to the Guidelines encourage tiering and streamlining of existing environmental analyses to the extent possible in order to reduce duplication. Such tiering and streamlining mechanisms are also consistent with existing law. (See, e.g., Pub. Resources Code, § 21093 (lead agencies shall tier environmental impact reports wherever possible).)

The amendments update the State CEQA Guidelines to be consistent with legislative enactments and judicial decisions that have modified CEQA, but do not themselves impose any new requirements. Therefore, the amendments do not have a significant, adverse economic impact directly affecting business.

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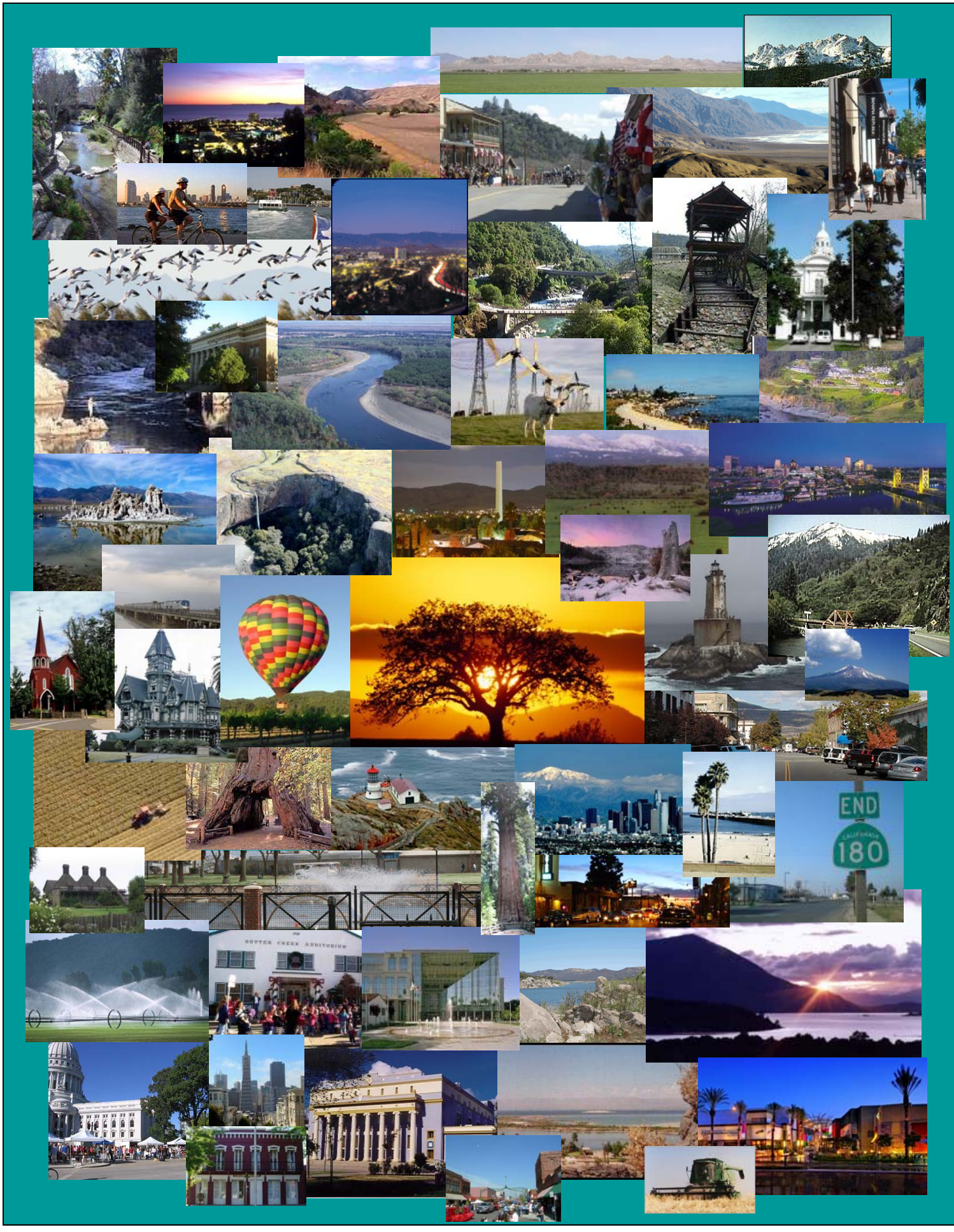
CAPCOA

CALIFORNIA AIR POLLUTION CONTROL OFFICERS ASSOCIATION

Model Policies for Greenhouse Gases in General Plans

A Resource for Local Government to Incorporate General Plan Policies to Reduce Greenhouse Gas Emissions

June 2009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Disclaimer

The California Air Pollution Control Officers Association (CAPCOA) has prepared this white paper consideration of model policies for addressing greenhouse gas emissions in General Plans to provide a common platform of information and tools to support local governments.

This paper is intended as a resource, not a guidance document. It is not intended, and should not be interpreted, to dictate the manner in which a city or county chooses to address greenhouse gas emissions in the context of its General Plan.

This paper has been prepared at a time of flux in California law and regulation, as well as accepted practice, regarding how climate change should be addressed in government programs. There is pending litigation that may have bearing on these decisions, as well as active legislation at the federal level. And finally, our understanding of the science of climate change continues to evolve, too. In the face of this uncertainty, local governments are working to understand the new expectations, and how best to meet them. This paper is provided as a resource to local policy and decision makers to enable them to make the best decisions they can during this period of uncertainty.

Finally, this white paper reviews requirements, discusses policy options, and highlights methods, tools, and resources available, but it is not intended to provide legal advice and should not be construed as such. Questions of legal interpretation, or requests for legal advice, should be directed to the jurisdiction's counsel.

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This paper on Model Policies for Addressing Greenhouse Gas Emissions in General Plans benefited from the hard work and creative insights of many people. CAPCOA appreciates the efforts of all who contributed their time and energy to the project. In particular, the Association thanks the following individuals:

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…and other air district staff members who offered insight and expertise.

Approved For Release by the CAPCOA Board of Directors

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List of Acronyms and Abbreviations

Acronym/ Abbreviation	Meaning
AB 32	Assembly Bill 32 Global Warming Solutions Act of 2006
AFV	Alternative Fuel Vehicle
AG	Attorney General
AMI	Advanced Metering Infrastructure
ARB	Air Resources Board
APCD	Air Pollution Control District
APS	Alternative Planning Strategy
AQMD	Air Quality Management District
BAAQMD	Bay Area Air Quality Management District
BOF	Board of Forestry
Cal/EPA	California Environmental Protection Agency
Cal Fire	California Department of Forestry and Fire Protection
CAISO	California Independent System Operator
CAP	Climate Action Plan
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resource Board
CAS	Climate Adaptation Strategy
CAT	Climate Action Team
CCA	Community Choice Aggregation
CCAP	Climate Change Action Plan
CCAR	California Climate Action Registry
CCC	California Conservation Corps
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CDFA	California Department of Food and Agriculture
CH_4	Methane
CIWMB	California Integrated Waste Management Board
CO_2	Carbon Dioxide
CO2e	Carbon Dioxide Equivalent
CPUC	California Public Utilities Commission
DOC	Department of Conservation
DFG	Department of Fish and Game
DGS	Department of General Services
DPC	Delta Protection Committee
DTSC	Department of Toxics Substances Control
DWR	Department of Water Resources
EIR	Environmental Impact Report
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EPIC	Environmental Protection Indicators for California
EPS	Emissions Performance Standard

List of Acronyms and Abbreviations

Acronym/ Abbreviation	Meaning
ESP	Energy Service Provider
FAR	Floor Area Ratio
GHG	Greenhouse Gas
GWP	Global Warming Potential
HFC	Hydrochlorofluorocarbons
HSR	High Speed Rail
HOV	High Occupancy Vehicle Lanes
ICLEI	International Council for Local Environmental Initiatives (now known as Local Governments for Sustainability)
IOU	Investor Owned Utility
IPCC	International Panel on Climate Change
LAFCO	Local Area Formation Commission
LEED	Leadership in Energy and Environmental Design
LCFS	Low Carbon Fuel Standard
LNG	Liquefied Natural Gas
LUSCAT	Land Use Subgroup of the Climate Action Team
$MMTCO_2e$	Million Metric Tons Carbon Dioxide Equivalent
MPO	Metropolitan Planning Organizations
MWh	Megawatt hour
MVAC	Motor Vehicle Air Conditioning
NAS	National Academy of Sciences
NAST	National Assessment Synthesis Team
N_2O	Nitrous Oxide
NO_X	Oxides of Nitrogen
ODS	Ozone Depleting Substances
OFA	Office of Fleet Administration
OPAR	Caltrans Office of Policy Analysis and Research
OPC	California Ocean Protection Council
OPR	State Office of Planning Research
PIER	Public Interest Energy Research Program
PFC	Perfluorocarbon
PHEV	Plug-In Electric Hybrid Vehicles
PG&E	Pacific Gas & Electric
POU	Publicly Owned Utilities
PM	Particulate Matter
PPB	Parts Per Billion
PPM	Parts Per Million
PPT	Parts Per Trillion
RHNA	Regional Housing Needs Assessment
RPS	Renewable Portfolio Standards
RTAC	Regional Targets Advisory Committee
RTP	Regional Transportation Plan

List of Acronyms and Abbreviations

Acronym/ Abbreviation	Meaning
RTIP	Regional Transportation Improvement Program
RTPA	Regional Transportation Planning Agency
S-3-05	Executive Order S-3-05
SABRC	State Agency Buy Recycled Campaign
SB	Senate Bill
SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SCEA	Sustainable Communities Environmental Assessment
SCS	Sustainable Communities Strategy
SCSA	State and Consumer Services Agency
SDG&E	San Diego Gas & Electric
SEA Change	Strategic Energy Alliance for Change
SJVAPCD	San Joaquin Valley Air Pollution Control District
SF_6	Sulfur Hexafluoride
SLOAPCD	San Luis Obispo Air Pollution Control District
SMAQMD	Sacramento Metropolitan Air Quality Management District
SRI	Solar Reflectance Index
SWAMP	Surface Water Ambient Monitoring Program
SWIM	System for Water Information Management
SWRCB	State Water Resources Control Board
TBD	To Be Determined
TMM	Traffic Mitigation Measures
TPP	Transit Priority Projects
UGB	Urban Growth Boundary
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds
WCI	Western Climate Initiative
ZEV	Zero Emissions Vehicle

Executive Summary

Global climate change has been clearly documented and is predicted to have substantial effects on the world we live in, not only in parts of the world that are far away, but here in California. Emissions of greenhouse gases (GHGs) must be curtailed if we hope to minimize the extent and impact of climate change. The majority of GHG emissions come from combustion of fossil fuels for energy and transportation. While renewable energy sources, cleaner fuels, and green technology will help to reduce GHG emissions, we also need significant changes in how we design and construct our "built environment" to meet our climate protection goals.

The General Plans developed and implemented by cities and counties must be at the heart of any effort to change our built environment, and many of these local governments have stepped up to the challenge. In order to support their important efforts, the California Air Pollution Control Officers Association (CAPCOA) has prepared this report of Model Policies for Greenhouse Gases in General Plans. The report is intended to serve as a resource for cities and counties. It discusses General Plan structure and options for including GHG policies in existing General Plan Elements, or by creating a separate GHG Element and/or GHG Reduction Plan. The Model Policies Report contains a menu of model language for inclusion in the General Plan Element(s). The report does not dictate policy decisions, rather, it provides cities and counties with an array of options to help them address GHGs in their General Plans.

The statutory and regulatory landscape affecting GHG emissions and climate planning in California has evolved considerably over the last several years. The Governor's Executive Order 2-3-05, and the Global Warming Solutions Act of 2006 (AB 32) establish the broad policy goals for the state for 2020 and 2050. To meet these goals, the Air Resources Board (ARB) has identified discrete Early Action Measures that will be adopted and enforceable by 2010, and approved a Scoping Plan that lays out the longer term strategy for rulemaking and market mechanisms to reduce GHG emissions. The Scoping Plan specifically includes reductions from local government operations and land use decisions. In addition to this core framework, there are a number of other important statutes and regulations affecting GHGs from motor vehicles, fuels, energy production and use, and land use planning, among others. In particular, SB 375 (Steinberg) was signed by the Governor in 2008, and puts in place the framework for regional targets for GHG reductions, and improved regional planning to meet them. There are also new sources for incentive funding to support clean energy and transportation, and reductions of GHG emissions. And the implementation of some programs that have been in place for a long time, such as the building standards in Title 24 and the California Environmental Quality Act (CEQA), is evolving in response to our heightened concern about climate change.

The role of local governments is increasingly in the spot light as we choose our path to a greener and more sustainable future. There are a number of ways cities and counties can reduce GHG emissions. Reductions need to be made in GHG emissions from local government operations, including energy use, waste and recycling, water delivery and wastewater treatment, transportation, and the built environment. Local governments also have a key role to play in educating local businesses and communities, and supporting

their efforts to reduce GHG emissions. Cities and counties can also ensure the impacts of GHG emissions are mitigated when projects are reviewed under CEQA. And, of course, GHG reduction polices can be incorporated into the regional and local planning efforts, including the General Plan.

Integrated regional planning (as supported by Steinberg's SB 375) can provide a framework for cities and counties to contribute to GHG reductions needed for the region to meet the target set by ARB. Cities and counties can also make explicit local commitments to reduce GHG emissions, and adopt Climate Action Plans to make those reductions happen. Policies can be incorporated into existing General Plan Elements. Alternatively a separate element can be created specifically to address GHGs and climate change. In order to be effective, local planning efforts alternatives must be evaluated for consistency with regional plans, including Blueprint Plans, Air Quality Management Plans, and Regional Transportation Plans. The robust and coordinated planning effort envisioned here provides important opportunities to streamline the CEQA review process while ensuring the environment is protected.

As we plan for and implement GHG reduction strategies, it is critical that we review our progress, not only to ensure that we are reaching our goals, but also to ensure that we are not creating unintended and potentially adverse outcomes. Air quality and public health must still be protected, and we must ensure equal protection for all Californians regardless of their income status or ethnic background.

General Plans are, in a broad sense, comprised of goals, objectives, policies, standards, and/or implementation measures, as well as a set of maps and diagrams that describe a vision for the community's future development. The law requires that the General Plan be internally consistent, and there are specific measures of that consistency. Because of this, new policies for GHG need to be considered in the context of the existing elements. These include the mandatory elements, including land use, conservation, circulation, open space, housing, noise, safety, and, in certain circumstances, air quality, as well as non-mandatory elements, such as energy, economic development, capital improvements and public facilities, community design, water, and agriculture. The way the different elements interrelate is an important consideration when incorporating policies for GHGs in the General Plan, and ensuring that those policies are internally consistent throughout the Plan.

The majority of this report is comprised of model policies for GHG reduction that can be incorporated into a jurisdiction's General Plan. Model language is provided in nine major categories: GHG Reduction Planning (overall); Land Use and Urban Design; Transportation; Energy Efficiency; Alternative Energy; Municipal Operations; Waste Reduction and Diversion; Conservation and Open Space; and Education. In addition to the model language, the report provides a worksheet in the form of a table to facilitate the evaluation of the policies for local use, considering specific local factors and criteria. The table also has links to examples of plans that have incorporated the model policy, or a similar policy, to provide a more in-depth understanding of what has been done, under what circumstances, and how.

Finally the report contains technical appendices that provide more detailed information about greenhouse gases, programs that address them, the projected impacts of climate change, climate science, the top ten actions local governments should take, the roles of different agencies on climate and GHG, and examples of plans and policies that have been adopted in California as well as other resources.

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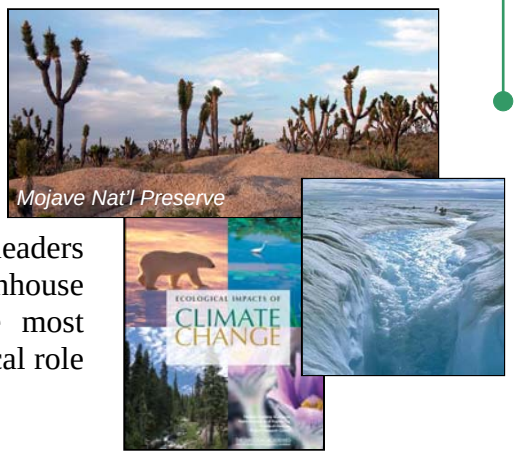
Chapter 1: Introduction



NAS Brochure

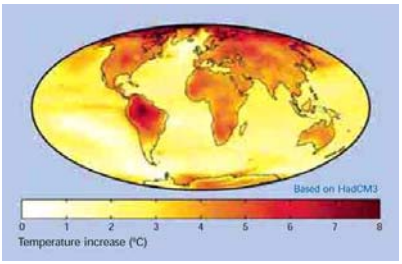
Climate change has already begun to have real and significant impacts on our world and our lives. Some of the changes seem trivial, while others are alarming. As the climate changes more over the next decades, the impacts we see will affect us in increasingly dramatic ways. Recognizing this, the public and government leaders have called for action to reduce emissions of greenhouse gases in the hope that we can stave off the most catastrophic effects. Local government has a critical role to play in this effort.

Because the vast majority of greenhouse gas emissions come from burning fossil fuels, there is tremendous interest in alternative fuels, renewable energy, green technology, and energy conservation as means to cut emissions. There is great promise in these solutions, however alone they are not enough. Studies show that in order to cut emissions to the levels needed, in time to make a difference, we will have to make significant changes in how we live our daily lives, and specifically in how we organize our communities and infrastructure. The key to this organization, and to changing it, is the General Plan that cities and counties develop and implement.

Addressing climate change in a General Plan is no small task. Historically, local air districts have assisted cities and counties in developing the Air Quality Element of their General Plans. In the last few years, air districts across California have been asked by cities and counties for help integrating greenhouse gas emission reduction strategies into their General Plans as they update them. In response, the air districts have pooled their resources through the California Air Pollution Control Officers Association (CAPCOA) to develop a series of Model Policies for Greenhouse Gases in General Plans, and supporting material. CAPCOA would like to acknowledge the Climate Focus Group at ICF Jones & Stokes, and Rimpo and Associates, for their assistance in collecting and compiling information on policies that have been adopted to address GHG emissions.

General Information on Climate Change

An understanding of climate change, and its current and potential future effects on our communities and resources, is essential to good decision making. A detailed description of the science and implications of climate change is provided in the technical appendices at the end of this document. The following provides a basic summary of the issue.



Source: www.scienceschools.org

Climate change is a shift in the "average weather" that a given region experiences. This is measured by changes in the features that we associate with weather, such as temperature, wind patterns, precipitation, and storms. Global climate change means change in the

climate of the Earth as a whole. The Earth's natural climate has always been, and still is, constantly changing. The climate change we are seeing today, however, differs from previous climate change in both its rate and its magnitude.

Human activities are exerting a major influence on some of the key factors that govern climate by changing the composition of the atmosphere and by modifying the land surface. The concentration of carbon dioxide (CO2) in the atmosphere has risen about 30 percent since the late 1800s (National Assessment Synthesis Team [NAST], 2001). This increase has resulted from the burning of coal, oil, and natural gas, and the destruction of forests around the world to provide space for agriculture and other human activities. Concentrations of other greenhouse gases caused by human activities have also increased significantly: for example methane has risen nearly 20% and nitrous oxides over 150% during the same period. Average global surface temperatures have shown a corresponding increase of more than 1° F over the past 100 years, with an average increase of 9° F in the polar regions. The nine warmest years on record have all occurred in the last decade. Figure 1 (right) shows the change in temperature over the last one thousand years. Figure 2 (below) provides thermal maps representing the high and the low in the range of predicted changes in temperature.

Figure 1: Temperature History

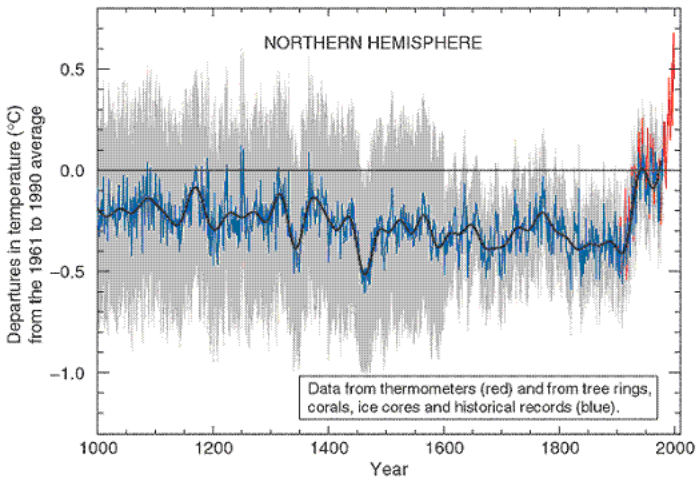
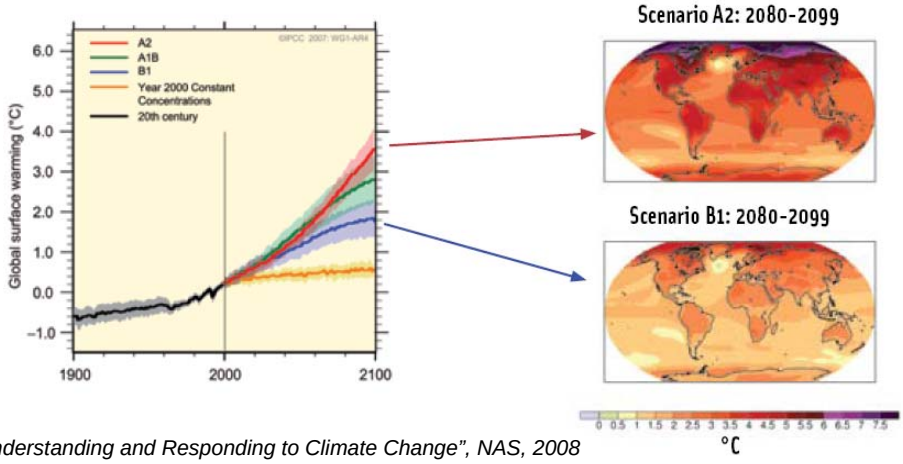


Figure 2:
Temperature Projection Scenarios

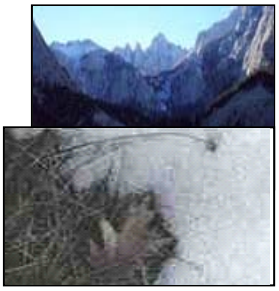


Source: "Understanding and Responding to Climate Change", NAS, 2008

Global projections of population growth and assumptions about energy use indicate that the CO2 concentration will continue to rise, likely reaching between two and three times its late-19th-century level of 280 ppm (parts per million) by 2100, depending on the level and timeliness of preventative actions taken by California and the rest of the world. Such increases in CO2 and other GHGs in the atmosphere and the resulting increase in average global temperatures are predicted to have significant consequences worldwide that will vary in nature and severity depending on location. Impacts predicted for California are summarized below.

Projected Climate Change Impacts in California

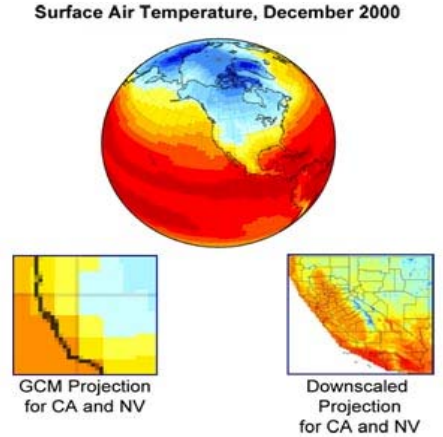
In California and throughout western North America, signs of a changing climate are evident. During the last 50 years, winter and spring temperatures have been warmer, spring snow levels in lower- and mid-elevation mountains have dropped, snowpack has been melting one to four weeks earlier, and flowers are blooming one to two weeks earlier. These regional changes are consistent with global trends. If left unchecked, by the end of the century CO2 concentrations could reach levels at which climate change impacts would severely impact our public health, economy, and environment.



State of the art climate modeling was performed for the California Energy Commission (CEC) to determine potential future impacts of climate change in California under three different scenarios: a low emissions scenario that assumes aggressive action is taken to reduce GHG emissions, a medium emissions scenario assuming a moderate level of GHG reductions, and a high emissions scenario that assumes little action is taken to reduce emissions. The range of potential impacts modeled was summarized in a 2006 CEC document called: *"Our Changing Climate: Assessing the Risks to California."* This document outlines the growing severity of consequences predicted statewide as temperature rises, and also identifies those impacts that may be unavoidable and for which we will need to develop coping and adaptation strategies. The report contains significant existing climate change scientific evidence to support the need for regulating GHG emissions. The CEC prepared a biennial update on the risks to California from climate change, and has summarized key points in the brochure: *"The Future is Now."*

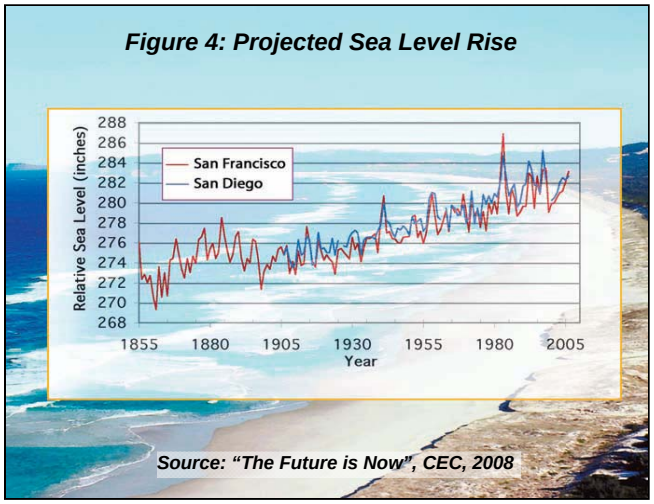
As the atmospheric concentration of GHGs increases, California can anticipate increased average temperatures of 1 to 2 degrees F in the next few decades, and perhaps as much as 10°F by the end of the century. Figure 3 (right) shows results of thermal modeling performed for the CEC, including grid scales for the western region of the U.S., downscaled to California and Nevada. The higher temperatures will increase the formation of smog during summer months with the number of days with unhealthy air more than doubling under the worst-case scenario. In addition, there will be as many as 100 more days each year where temperatures exceed 90°F, and a corresponding rise in illness and death from extreme heat. While total annual precipitation in the state is not expected to change substantially, a much greater percentage will fall as rain instead of snow, with a corresponding decrease in snowpack and the spring runoff that supplies water to the state's agriculture and major urban centers. Reduced water supplies and increased temperatures will directly impact which crops can be grown in California, and this may lead to a greater incidence of disease and pest damage. This damage will also affect the state's forests which will likely sustain a sharp increase in catastrophic wildfires. Finally, as shown in Figure 4, the predicted rise in sea level from 1 to 3 meters by the end of the century will drastically alter California's extensive coast, as well as low-lying inland areas, and land along tributaries, inlets, and bays. A more detailed discussion of predicted impacts is presented in Appendix D.

Figure 3: Thermal Modeling



Source: "Climate Change Impacts Assessment: Second Biennial Science Report to the California Climate Action Team", CEC, 2008

Figure 4: Projected Sea Level Rise



Source: "The Future is Now", CEC, 2008

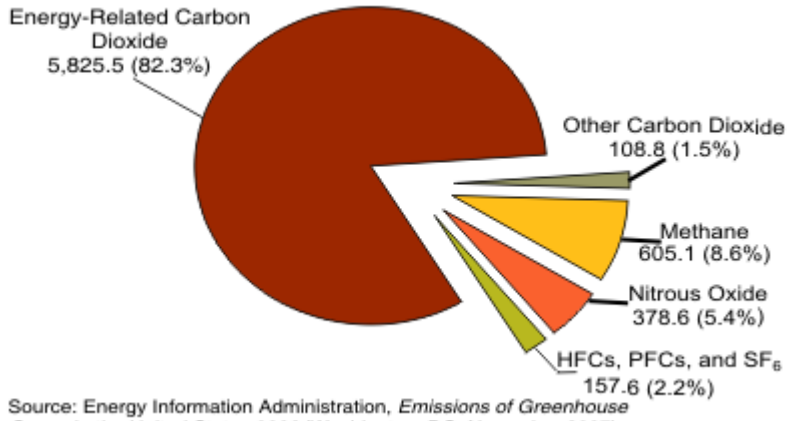
Greenhouse Gases and Their Sources

Carbon dioxide is the most dominant greenhouse gas; however a number of other gases also contribute significantly to climate change, including methane (CH4), nitrous oxide (N2O), sulfur hexafluoride (SF6), hydrochlorofluorocarbons (HFCs) and perfluorocarbons (PFCs). Each gas has a different heat trapping capacity compared to CO2. For instance, methane is 21 times more effective at trapping heat in the atmosphere compared to the same mass of CO2, while some of the fluorocarbons have thousands of times more heat trapping capacity as CO2. To account for these differences when

comparing emissions for the different compounds, the emissions are generally expressed in terms of CO2 equivalents (CO2e). Thus, generic references to GHG emissions generally mean CO2 equivalent emissions.

As shown in Figure 5, CO2 makes up approximately 84% of total GHG emissions by volume, with nitrous oxide and methane contributing about 6% and 7% respectively. SF6, HFCs and PFCs, collectively referred to as high global warming potential (GWP) gases, represent the remaining 3% of statewide GHG emissions. High GWP gases are compounds with significantly higher heat-trapping capacity than CO2.

Figure 5: US Greenhouse Gas Emissions by Gas, 2006



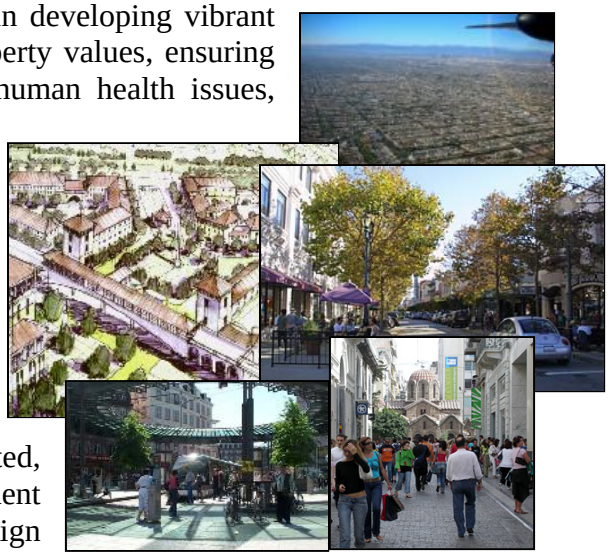
Source: Energy Information Administration, *Emissions of Greenhouse Gases in the United States 2006* (Washington, DC, November 2007)

From a land use standpoint, carbon dioxide and methane are the most important GHGs that local government has the potential to significantly influence and will be the primary focus of the recommended policies and reduction strategies identified in this document.

Increasing CO2 concentrations in the atmosphere primarily result from increased combustion of fossil fuels. Fossil fuel combustion accounts for 98 percent of California CO2 emissions, generating 360 million metric tons of CO2 in 2002; this represents approximately 7 percent of total U.S. emissions from this source category. The transportation sector is the largest contributor in California, accounting for 38% of CO2 emissions, with gasoline combustion the greatest portion of those emissions.

Methane accounted for approximately 6 percent of California's total GHG (CO2e) emissions in 2002. Methane is produced during anaerobic decomposition of organic matter in biological systems. Decomposition occurring in landfills accounts for the majority of anthropogenic CH4 emissions in California and in the United States as a whole. Agricultural processes such as enteric fermentation, manure management, and rice cultivation are also significant sources of CH4 in California.

What Is The Land Use Connection?



Land use planning is a critical element in developing vibrant and livable communities, increasing property values, ensuring economic vitality, addressing potential human health issues, promoting transportation efficiency, ensuring affordable housing, and improving environmental protection. The distribution of different types of land uses, their design, their accessibility, and their intensity can have profound effects on energy use, water use, and vehicle miles of travel.

When properly designed and located, compact, accessible, mixed-use development using energy and water-saving design techniques requires less energy and less vehicle travel than the typical development patterns over the past 60 years. Thus, land use planning is an area of opportunity for guiding development and land use decisions in a manner that considers the heat-trapping emissions of human activity and aims to reduce such emissions. Unfortunately, there is no "one size fits all," cookie cutter approach to effective land use planning. A project that might be beneficial, and reduce VMT and other energy needs, in one situation can actually work in the negative, increasing VMT and energy demands, if sited without proper regard to the circumstances and needs of the site, the community, and the region. For this reason, recommended strategies and approaches should always be considered in context, and evaluated for their appropriateness based on the specific circumstances in which they would be implemented.

What Does This Document Contain?

The California Air Pollution Control Officers Association (CAPCOA) Model Policies for GHGs in General Plans (Model Policies Report) is a resource document intended to help cities and counties address climate change and GHG emissions in their General Plans. The Model Policies Report provides a variety of useful information, including a toolbox of policies, strategies and model language that can be used in General Plans. The Model Policies Report identifies the various issues related to GHG emissions that may cut across several elements of a General Plan; interrelationships of these elements were considered when developing the set of potential development policies for consideration. In addition, the Model Policies Report reviews and analyzes the efficacy of the different goals, objectives, policies & implementation measures available to reduce GHG emissions.

Finally, the Model Policies Report provides model language for GHG policies in General Plan elements, including a list/menu of approaches that are currently being used so that jurisdictions can choose which approaches are most appropriate to them. The Model Policies Report is intended to offer flexible guidance to allow for different approaches to address GHG in General Plans.

This document is focused on issues surrounding the reduction of greenhouse gas emissions. An equally important challenge related to climate change is planning for adaptation to environmental change (such as sea level rise and other climate effects) that is inevitable, regardless of success in reducing greenhouse gas emissions. Local land use planning should also consider how to plan for climate-resilient communities in light of foreseeable environmental change, but that is not the focus of this document.

What Is the Purpose of This Document?

This document provides local jurisdictions with relevant information for considering climate change and GHG reductions in General Plan development and updates. Since the passage of the Global Warming Solutions Act of 2006 (Assembly Bill 32, or AB 32), and Executive Order S-03-05 (EO S-03-05), there has been substantial interest at the State level in finding ways to reduce statewide GHG emissions. The California Air Resources Board (ARB) is given the primary responsibility to develop strategies and regulations to reduce California's overall GHG emissions to 1990 levels by 2020. As required under AB 32, the ARB adopted a Scoping Plan calling for targeted reductions of CO2 from various sectors, including a proposed 2 million metric ton reduction from land use and local government.

The California Attorney General's Office (AG) has taken an active role in the cause of climate change and GHG emissions reductions. The AG has written over 20 extensive project comment letters concerning climate change, some of which were directed toward cities and counties addressing climate change in their General Plans. As an example of his commitment to this role, the AG litigated San Bernardino County based on its failure to analyze in its General Plan Environmental Impact Report (EIR) the increased greenhouse gas emissions that would result from the county's proposed General Plan update. The suit was settled, and although not binding on other communities, the precedent-setting settlement between the AG and San Bernardino County has led many to believe that an EIR for a General Plan must inventory GHG emissions, describe impacts due to the forecasted emissions, and identify feasible mitigation measures to reduce those emissions. Further, mitigations adopted in a General Plan EIR often will require the amendment of General Plan goals, objective, policies, or implementation measures in order to feasibly reduce GHG emissions.

Local governments will face many challenges ahead in reducing GHG emissions. To help provide foundational information, in January 2008, CAPCOA published a white paper entitled, "CEQA & Climate Change"-- a resource document developed to assist public agencies in establishing procedures for reviewing GHG emissions from projects subject to the California Environmental Quality Act (CEQA). This Model Policies Report

continues CAPCOA's efforts to provide meaningful information and tools to local jurisdictions in response to the rapidly evolving regulations in regards to GHGs and climate change. When developing the Model Policies Report, CAPCOA took into account the range of requirements a community must address in preparing or updating a General Plan: internal consistency; equal status among elements; consistency between elements; consistency within elements; area plan consistency; and long-term perspective.

For Whom Is This Document Intended?

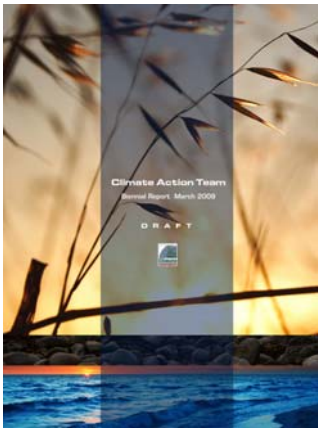
This document is intended for use by local city and county policy and decision makers. The State of California requires each city and county to prepare a comprehensive, long-term General Plan. One of the main purposes of a General Plan is for the jurisdiction to articulate its development goals, objectives, principles and policies for all land areas under its control. Decision and policy makers may find this document useful when evaluating how to incorporate policies and goals related to climate change in their General Plan. Planners and General Plan practitioners may also find this document useful as a general reference.

Colusa County

Over the last several years, a number of new programs have been established to reduce emissions of GHGs. While most of these do not operate directly on or through General Plans, they create a strong foundation upon which General Plan elements for GHGs can be built. This section of the report provides a brief summary of the key programs. Appendix B provides additional description of programs specifically implementing AB 32. Additional information on other programs is summarized in Appendix C. The appendices also provide links to respective program websites where more detailed information can be found.

State Reduction Targets for GHGs (Executive Order S-3-05)

The first comprehensive state policy to address climate change was established through an Executive Order of the Governor of California. In 2005, Governor Schwarzenegger issued California Executive Order S-3-05, which established ambitious GHG reduction targets for the state: reduce GHG emissions to 2000 levels by 2010, reduce to 1990 levels by 2020, and reduce emissions 80% below 1990 levels by 2050. These targets reflect the world-wide emission reduction trajectory identified by the International Panel on Climate Change (IPCC) as being necessary to avert catastrophic global climate change. Under the Executive Order, each state agency is directed to identify and pursue actions within their purview that could contribute to the necessary emission reductions. The Secretary of the California Environmental Protection Agency (Cal/EPA) has the role of coordinating the emission reduction efforts, through the Governor's Climate Action Team, which the Secretary chairs.



On April 1, 2009, California's Climate Action Team released a draft of its second report to the Governor and the Legislature.

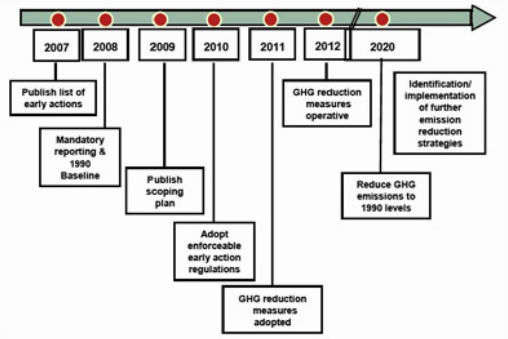
This Executive Order is binding only on state agencies, and has no force of law for local governments; however, S-3-05 was important for two reasons. First, it obligated state agencies to implement GHG emission reduction strategies. Second, the signing of the Order sent a clear signal to the Legislature about the framework and content for legislation to reduce GHG emissions.

Global Warming Solutions Act of 2006 (AB 32)

California AB 32, the "Global Warming Solutions Act of 2006," codifies the State's GHG emissions target by directing the ARB to reduce the State's global warming emissions to 1990 levels by 2020. ARB regulations must begin phasing in by 2012. AB 32 was co-authored by Assembly Member Fran Pavley and Assembly Speaker Favian Núñez; it was signed and passed into law by Governor Arnold Schwarzenegger on September 27, 2006.

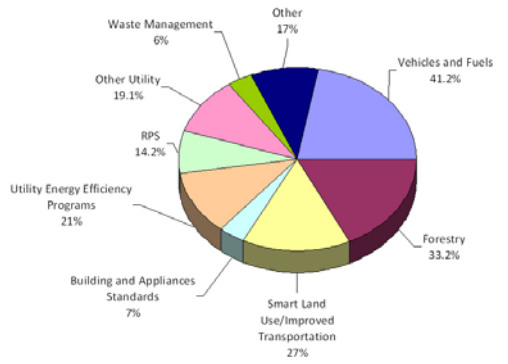
As shown in Figure 6, AB 32 defines a number of milestones to be met in the effort to achieve the 2020 emissions target. It vests the principle authority to implement the program in the ARB, but provides that the Secretary of Cal/EPA will coordinate across state agencies. The cornerstone of the program is the development and adoption by ARB of a Scoping Plan that identifies specific reduction strategies, implementation mechanisms, and timelines. The statute requires that ARB adopt the Scoping Plan by the end of 2008, and that regulations to implement the Plan's strategies must be enforceable by 2012. The statute also requires the ARB to adopt discrete early action measures in 2007, and to study the feasibility and effectiveness of market mechanisms to achieve the needed emission reductions. Finally, it provides that progress towards attainment of criteria air pollutant standards should not be impaired by the climate program, nor should the program create or exacerbate impacts on communities. Figure 7 shows the key GHG emitting sectors of California's economy.

Figure 6: AB 32 Timeline



Source: ARB Staff Report on Early Action Measures

Figure 7:



Source: March 2006 Climate Action Team Report

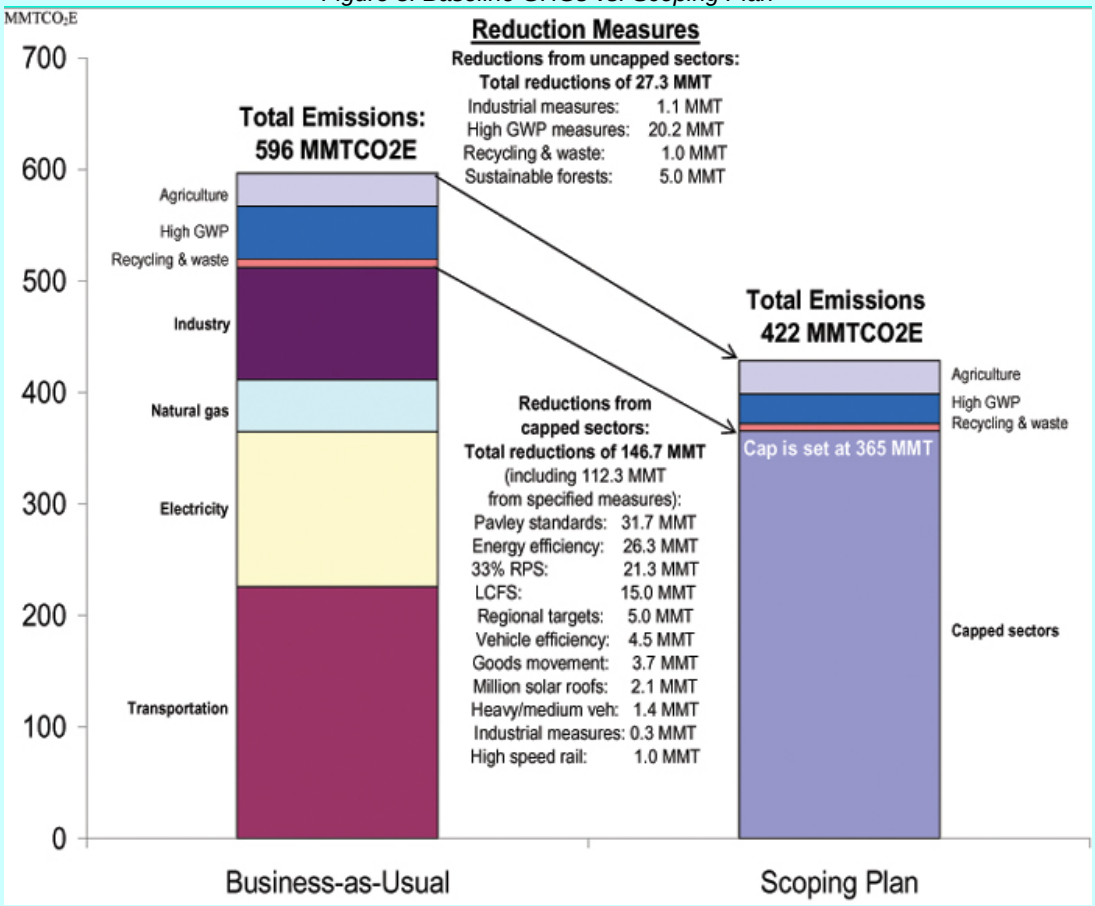
Early Action Measures:

The ARB approved a package of discrete early action measures in June, 2007. The core measures are three proposed rulemakings, including the codification of the Low Carbon Fuel Standard called for in the Governor's Executive Order S-1-07 (see discussion later in this chapter), the capture and recovery of refrigerants with high global warming potential during the servicing of automobile air conditioning systems, and the capture and recovery of methane from landfills, with additional reductions to come from other smaller scope regulations, and as co-benefits from criteria pollution rulemaking efforts. In October, 2007, the ARB added measures to the list, including reductions anticipated from improved energy efficiency at cement manufacturing plants, rulemaking on refrigerants, tire inflation programs, and other programs in trucking and at the ports. Further details on these programs are provided in Appendix B of this report.

Scoping Plan: The Scoping Plan was approved by the ARB Board in November, 2008. The Plan does several things. First, it specifies the target level of GHG emissions that must be achieved by 2020, and estimates the levels that would occur in the absence of measures to reduce emissions – the "business-as-usual" scenario. The difference represents the quantity of emissions that must be reduced by the measures in the plan. Second, the Plan identifies a mix of strategies to achieve the mandated reductions, and estimates the emission reductions that can be expected from each strategy or measure. Finally, the Plan provides general direction for the implementation of key strategies, recognizing that the details of the requirements will be developed through the public rulemaking process.

In December of 2007, the ARB approved the baseline inventory analysis of the GHG emissions in California in 1990; total GHG emissions were 427 MMTCO2(e). ARB estimates that under the business-as-usual scenario, GHG emissions will rise to 596 MMTCO2(e) by 2020. In order to comply with the mandates of AB 32, California must implement strategies sufficient to remove 169 MMTCO2(e). This represents an overall reduction of 30% from business-as-usual, and about 10% from the levels emitted today.

Figure 8: Baseline GHGs vs. Scoping Plan

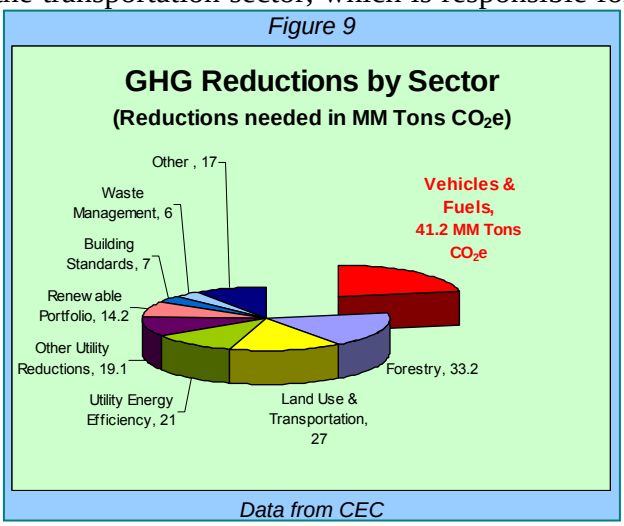


Source: ARB Scoping Plan, Fig. 3, p. 21

On a per capita basis, each Californian will be responsible for nearly 14 tons of CO2(e) in 2020 under a business-as-usual scenario, and that needs to be reduced to about 10 tons for each man, woman, and child. Figure 8 shows the GHG emissions under baseline conditions, and as they are projected to be in 2020, with full implement-tation of the Scoping Plan.

The Scoping Plan identifies measures and strategies in 19 basic categories, and Figure 9 shows the reductions needed from key categories. The greatest contribution comes from the transportation sector, which is responsible for about 60.2 MMTCO2(e) in reductions.

Figure 9



Data from CEC

The reductions (shown parenthetically in MMTCO2(e) for each category) come from implementation of GHG emission standards for vehicles (31.7), the Low Carbon Fuel Standard (15), vehicle efficiency measures (4.8), goods movement improvements (3.7), reductions from medium and heavy duty vehicles (2.5), and implementation of high speed rail (1). The electricity sector is the second largest contributor, with a total of 49.7 MMTCO2(e), coming from energy efficiency measures (26.4), acceleration of the Renewable Energy Portfolio Standard (21.2), and deployment of SB 1 (Murray) the Million Solar Roofs Initiative (2.1). Other sectors include reductions in emissions of GHGs with high global warming potential (16.2), sustainable forestry (5), efficiencies in water movement, treatment, and storage (4.8), improvements in land use (5), direct local government actions to reduce GHGs (15% reduction below present levels; tons TBD), control of methane at landfills (1), and methane capture at large dairies (1). The amount of reductions from the large industrial sector is yet to be determined, and the balance of the needed emission reductions is expected to come from the market-based cap and trade program (34.4).

Specifically in regard to reductions from improvements in land use, the Scoping Plan discusses establishing Regional Targets for GHG reduction, and requiring an integrated planning process for transportation, air quality, and General Plans. This approach is further supported by SB 375 (Steinberg), which the Governor signed in September, 2008. The legislation is discussed below, and the concept of Regional Targets and integrated planning is further explored in Section 4 of this report.

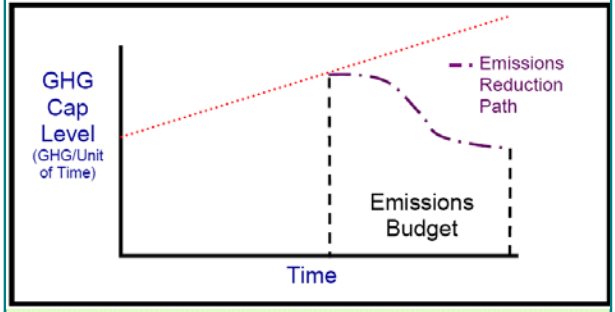
Toolkit available at:
www.coolcalifornia.org

The Scoping Plan discusses two primary ways in which local governments can achieve direct GHG reductions (that is, reductions that do not result from improved land use planning). Local governments can take actions to reduce energy use at their own facilities, increase their recycling, reduce their waste and water use, reduce the energy used in the handling and treatment of waste and

water, and reduce the carbon emissions from their vehicle fleets and from trips to and from their facilities. Similarly, local governments can adopt policies that support reductions in these same areas by businesses and residents within their communities. These kinds of local government actions form the fabric of the Model Policies, and the effective development and integration of thee strategies is the focus of the remaining sections of this report.

There has been considerable interest in the market-based elements of the AB 32 program. Although many of the details remain to be determined through public rulemaking, the Scoping Plan provides certain basic information about market-based efforts. Market-based programs generally fall into three categories: incentives, fees and fee-bates, and cap-and-trade systems. The Scoping Plan envisions a role for all three. Incentives are contemplated for broad, consumer-based programs, such as installation of solar technology, or early adoption of energy efficiency technologies. Fees are envisioned primarily as a mechanism to fund program administration, not as an emission reduction strategy; however, some consideration is given to establishing a fee on upstream carbon (attached to distribution of fuels and electricity) as a backstop measure. The greatest attention is given to a cap-and-trade market mechanism, a system in which a limited number of "allowances" to emit GHG are available, and emitters must either reduce emissions to match the allowances they hold, or they must purchase allowances from another emitter who holds more than needed to cover emissions. The total available allowances would decrease as the 2020 deadline approaches. The Scoping Plan proposes a market that would initially cover a subset of sectors, but would expand to include essentially all sectors over time. The Plan also contemplates a market that is initially linked throughout the western U.S. and Canada, and in which initial allowances are assigned through a combination of targeted allocation and open auction, but which transitions to a market where all allowances are auctioned. It is not yet clear how local governments would be covered under a market system. Figure 10, above, gives a graphical representation of the baseline emissions over time (shown in red) compared to the declining cap (shown in purple). Additional discussion of the cap-and-trade program is provided in Appendix B.

Figure 10: Cap and Trade Program



Source: ARB Meeting Materials- AB 32 Program Design Technical Stakeholders Meeting, April 25, 2008, p. 3

Greenhouse Gas Emission Standards for Vehicles (AB 1493)

Passed in 2002, before the overarching climate program was established, AB 1493 (Chapter 200, Statutes of 2002) was authored by Assembly Member Fran Pavley. The bill required ARB to develop and adopt the nation's first GHG emission standards for automobiles, and the emission

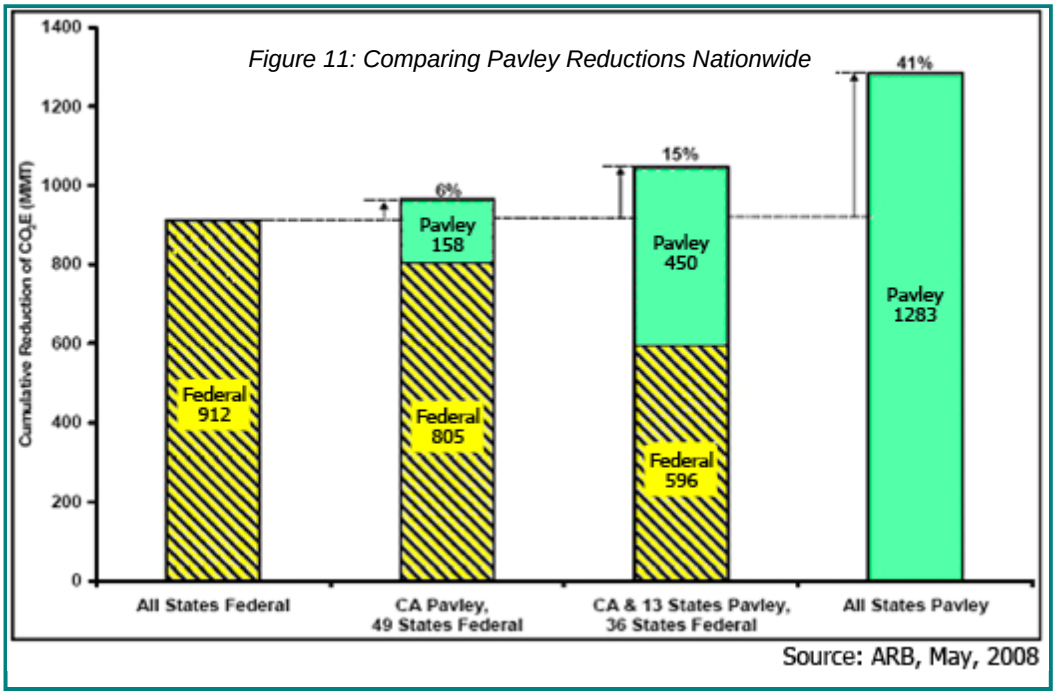
limits it requires are commonly referred to as the Pavley Standards. The ARB approved GHG emission limits for light duty vehicles in 2004. The standards become effective in 2009 and would reduce GHG emissions from California passenger vehicles by about 22 percent by 2012 and about 30 percent by 2016.

Although the federal government generally reserves the authority to establish tailpipe emission standards for motor vehicles, the federal Clean Air Act provides that California may establish such standards; however, any standards adopted by the state must be granted a waiver from the federal preemption by the U.S. EPA before they can be enforced. In December, 2007, EPA denied California's waiver request for the Pavley standards and in early 2008 California's Attorney General filed a petition in federal court to challenge that denial. Seventeen states supported the petition, and the U.S. Congress lodged inquiries into the EPA decision. The Obama administration agreed to review the matter, and in February, 2009, the Administrator of EPA requested comments on the reconsideration of the waiver petition.

In addition to the waiver denial, implementation of the standards has also been challenged in court in a lawsuit filed by automobile manufacturers. The suit alleges that the standards are de facto fuel efficiency standards, which are the exclusive purview of the federal government.

The Pavley standards account for about 19 percent of the emission reductions specified in the Scoping Plan. Although the federal government has adopted new fuel efficiency standards, ARB estimates that between 2009 and 2016, Pavley standards will achieve 56% more reduction in GHG emissions in California (about 19 million metric tons) compared to the federal standards, and by 2020 the difference is 49%. Figure 11 compares the total national emission reductions achieved by different implementation scenarios for the Pavely standards. If the Pavley standards are not ultimately

Figure 11: Comparing Pavley Reductions Nationwide



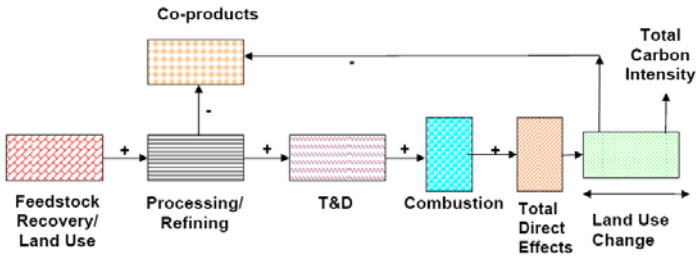
implemented, the lost reductions of GHG will need to be recovered through additional measures, beyond the reductions already identified in the Scoping Plan. ARB suggests the use of a carbon fee on the sale of new vehicles with GHG emissions greater than would have been allowed under the Pavley standards; the fees would be rebated back to the purchasers of vehicles with GHG emissions lower than the Pavley standards. The fees would have to be established at a price point that would inventivize purchasing behavior that results in the same emissions profile as the Pavley standards would have.

Low Carbon Fuel Standard (Executive Order S-1-07)

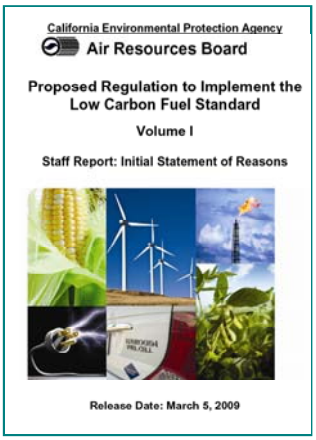
In his January 2007 State of the State message, Governor Schwarzenegger asserted California's leadership in clean energy and environmental policy by establishing a Low-Carbon Fuel Standard (LCFS) by Executive Order. This first-in-the-world greenhouse gas standard for transportation fuels will spark research in alternatives to oil and reduce GHG emissions. Executive Order S-1-07, the Low Carbon Fuel Standard (LCFS) (issued on January 18, 2007), calls for a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020. The carbon intensity of a fuel is a direct measure of the GHGs emitted during the full life-cycle of the fuel, including directly emitted CO2 as well as other GHG associated with each step in the fuel cycle (a.k.a., "well-to-wheels" for fossil fuels and "seed-to-wheel" or "field-to-wheel" for biofuels). Figure 12 shows the components of a combustion fuel life cycle. The Executive Order instructed the California Environmental Protection Agency to coordinate activities between the University of California, the California Energy Commission and other state agencies to develop and propose a draft compliance schedule to meet the 2020 target. Furthermore, it directed ARB to consider initiating regulatory proceedings to establish and implement the LCFS.

Figure 12:

Block Diagram for the various Components for a Fuel Pathway



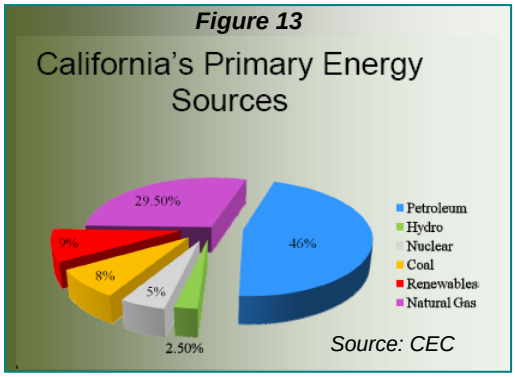
source: ARB LCFS Staff Report



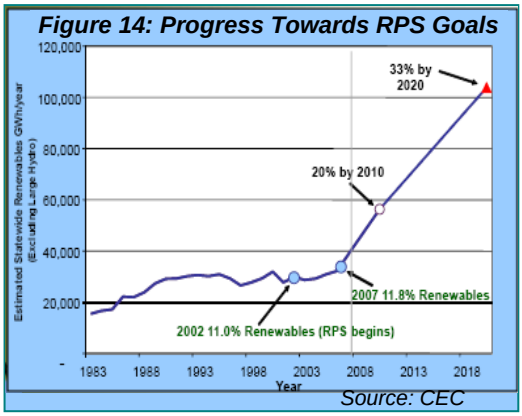
In response, ARB identified the LCFS as an early action item with a regulation to be adopted and implemented by 2010. The standard was approved by the Board in April, 2009. It establishes a baseline level of carbon intensity for affected providers, and places a declining cap on that intensity where each year fewer GHGs may be emitted. This is a market-based program that uses carbon intensity credits for fuels sold, where fuels that have lower carbon intensity than required yield "excess" credits that may be used to offset other, higher intensity fuels, or may be banked for use in future years, or sold to other providers who have not been able to reduce the intensity of their fuels to meet the cap.

Renewable Energy Portfolio (SB 1078 and SB 107)

Established in 2002 under SB 1078 (Sher, see: Chapter 516, Statutes of 2002) and accelerated in 2006 under SB 107 (Simitian, see: Chapter 464, Statutes of 2006), California's Renewable Portfolio Standard (RPS) obligates investor-owned utilities (IOUs), energy service providers (ESPs) and community choice aggregators (CCAs) to procure an additional 1% of retail sales per year from eligible renewable sources until 20% is reached, no later than 2010. ARB's Scoping Plan identifies a target RPS of 33% by 2020.



The California Public Utilities Commission (CPUC) and California Energy Commission (CEC) are jointly responsible for implementing the program. Figure 14a shows the mix of energy sources in California in 2008, and Figure 14b shows progress towards the RPS goals. As of July, 2008, the largest IOUs in California had renewable portfolios as follows: Pacific Gas and Electric (PG&E) - 11.4% ; Southern California Edison (SCE) - 15.7%; San Diego Gas & Electric (SDG&E) - 5.2%.



Improved Land Use Planning (SB 375)

In September, 2008, the Governor signed Senate Bill 375 (Steinberg). This bill has five main provisions:

1. It requires ARB to establish regional targets for reductions in greenhouse gas emissions from use of light duty vehicle (passenger cars and small trucks) associated with land use decisions.

2. It requires that metropolitan planning agencies (MPOs) create a Sustainable Communities Strategy (SCS) in their Regional Transportation Plans (RTPs) to meet the reduction targets established by ARB.

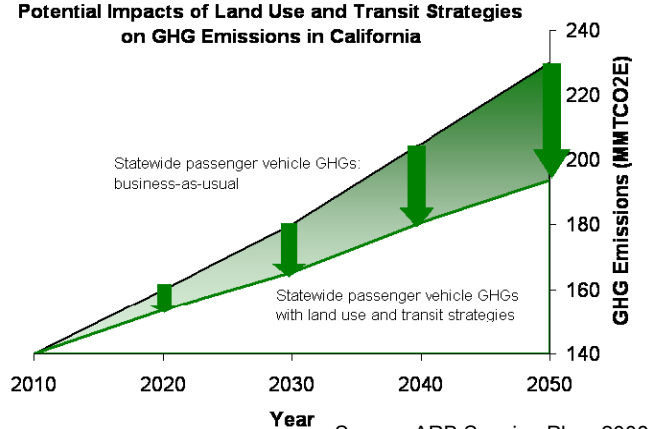
3. It requires that funding decisions for regional transportation projects be internally consistent within the RTP.

4. It aligns the Regional Housing Needs Assessment (RHNA) with the RTP.

5. It provides CEQA relief, in the form of streamlining and exemptions, for projects that are consistent with the SCS.

Targets- ARB is required to approve regional GHG emission reduction targets by September 30, 2010, and to review them, and update them as appropriate, on an eight-year schedule. The targets may be expressed in terms of total tons of emissions to be reduced, reductions per capita, per household, or another metric identified by the air board. ARB has already indicated that the reductions attributed to land use in the Scoping Plan are not, necessarily, the same as the reduction targets that will be assigned to regions under SB 375. ARB believes the Scoping Plan is not an enforceable commitment (unlike the State Implementation Plan for attaining national ambient air quality standards, for example); rather, it is a best estimate, and a general road map. ARB believes the SB 375 process will result in more accurate and specific assessments of the magnitude of reductions that are achievable through sustainable transportation planning. Figure 15 shows the emissions projected from passenger vehicles between 2010 and 2050, and the reductions targeted in the Scoping Plan for that sector.

Figure 15:
Potential Impacts of Land Use and Transit Strategies on GHG Emissions in California



Source: ARB Scoping Plan, 2008

To guide the establishment of the regional targets, from which all other provisions flow, SB 375 creates a Regional Targets Advisory Committee (RTAC) with representation from affected stakeholders, including local government, air districts, and MPOs. The committee will make recommendations to ARB on the factors to be considered by ARB in setting the targets, and on the methodologies to be used. The RTAC does not give explicit recommendations about the targets themselves; however, individual MPOs may make recommendations regarding their own specific target. The RTAC recommendations are due to the ARB by September 30, 2009, which leaves the ARB one year to establish the targets after the RTAC makes its recommendations.

Sustainable Communities Strategy- Metropolitan Planning Organizations (or their subdivisions) are required to develop a Sustainable Communities Strategy that will constitute the land use element of the Regional Transportation Plan. The SCS is required to do all of the following:

- Identify the general location of uses, residential densities, and building intensities within the region;

- Identify areas within the region sufficient to house all the population of the region, including all economic segments of the population, over the course of the planning period of the RTP (i.e., 25 years), taking into account net migration into

the region, population growth (presumably referring to natural increase), household formation, and employment growth;

- Identify areas within the region sufficient to house an eight-year projection of the regional housing need (i.e., an eight-year RHNA);
- Identify a transportation network to service the transportation needs of the region;
- Gather and consider the best practically available scientific information regarding resource areas and farmland in the region;
- Consider state housing goals;
- Forecast a development pattern for the region, which when integrated with the transportation network and other transportation measures and policies, will achieve, to the extent practicable, the targeted greenhouse-gas emission reduction from automobiles and light trucks, while also permitting the RTP to comply with the Clean Air Act;
- In doing all of the above, consider spheres of influence that have been adopted by Local Area Formation Commissions (LAFCOs).

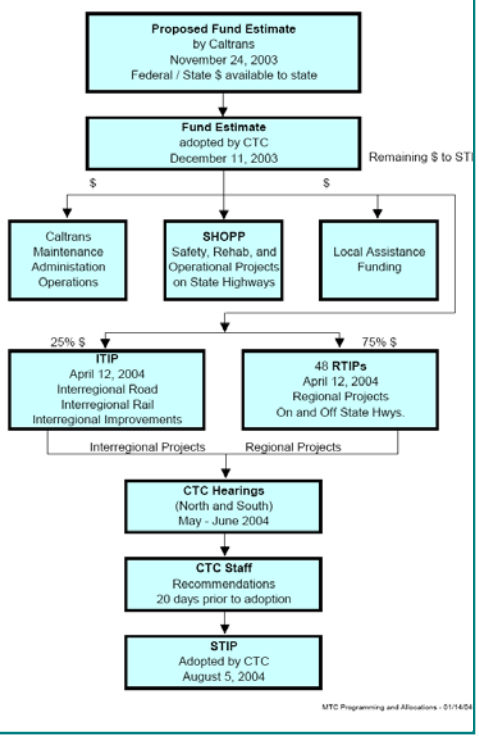
The SCS will also embody the plan to achieve the GHG reductions needed to meet the region's target. It must contain all feasible measures to reduce GHG, but the determination of feasibility is left to the MPOs. The MPOs are required to quantify the emissions reductions that will result from implementation of the SCS, and compare the expected reductions to what is required to meet the targets established by ARB. The bill acknowledges that implementing all feasible strategies under the SCS may not yield sufficient emission reductions to meet the regional target. If that is the case, the MPO is required to develop an Alternative Planning Strategy (APS) that includes additional strategies (including those that were rejected from the SCS on the basis of feasibility) sufficient to reach the target.

Because the SCS is part of the RTP, it is tied to federal transportation planning law and structures. The bill specifies, however, that the SCS is *not* a land use plan, and SB 375 does not confer land use authority on the MPOs. Technically, SB 375 does not require the local General Plan to conform to the SCS. Conformity is strongly encouraged, however, through funding incentives and CEQA streamlining. It is important to note here that the APS is not part of the SCS, and is therefore not part of the RTP. Under SB 375, the APS is not a binding

commitment; however, consistency with the APS can provide some streamlining and regulatory relief under CEQA. Finally, both the SCS and the APS are subject to approval by ARB, but ARB's role is limited to a determination of whether the measures included in the SCS and/or the APS will achieve the target ARB established for the region.

Funding- Although SB 375 does not explicitly direct transportation funding to specific types of projects or measures, it does affect the flow of transportation dollars indirectly. The bill requires that the RTP be internally consistent, meaning that transportation funding allocated under the umbrella of the RTP must be allocated consistent with the programmatic elements of the plan, including the SCS. So if the SCS calls for or prioritizes a specific type of transportation project, funding must be allocated to that type of project, rather than a project type that is not included in the RTP or has been awarded low priority. The same construct does not extend to the APS, however, because it is explicitly not part of the RTP. Figure 16 is a diagram of the process by which the RTIP is created in the Bay Area; for further information, see www.mtc.ca.gov.

Figure 16:
2004 STIP PROCESS
(State Highway Account)



Source: MTC

Affordable Housing- The bill makes specific changes to the requirements for the housing element of the General Plan, to align the Regional Housing Needs Assessment (RHNA) with the RTP. Broadly, it does the following:

- In areas where the RTP is on a four-year review cycle, the bill changes the review cycle under RHNA to eight years, such that the RTP and the RHNA will be reviewed together on a regular basis. In areas where the RTP remains on a five-year review cycle, the RHNA cycle remains at five years.

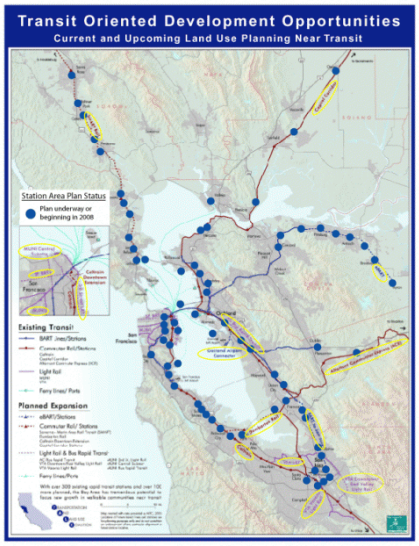
- Requires that the concurrent review of the RTP and the RHNA begin in the first RTP update after 2010, and that two assessments be consistent. Cities and counties are required to amend the Housing Element in their General Plans within the specified time frame, or to be placed on a more frequent four-year RHNA review cycle.

- Establishes a timeline for completing zoning changes to reflect the RHNA, and severely restricts the local authority on project review for affordable housing if the timeline is not met. Specifically, the local authority may only act to disapprove a project, and only if the project would result in a serious health risk.

Streamlining of CEQA- To incentivize projects that are consistent with the SCS or APS, the bill provides certain exemptions from, or streamlining of, requirements under CEQA. Specifically, streamlining is provided for residential projects meeting certain criteria, and for projects that fall under the newly defined category of "transit priority project."

Residential Projects Consistent with SCS/APS: The bill reduces CEQA requirements for a residential development (or a mixed-use development that devotes at least 75% of the square footage to residential uses) if it meets both of the following requirements: 1) the project is consistent with an SCS or APS that ARB has determined will achieve the regional targets, and 2) the project implements the mitigation measures required under an applicable prior environmental document. A project meeting these criteria does not have to describe or discuss in any CEQA document growth-inducing impacts, any project-specific or cumulative vehicle impacts on global warming or the regional transportation network, or a reduced residential density alternative to vehicle impacts.

Transit Priority Projects: The bill defines a new category of project, "Transit Priority Projects," and establishes a categorical exemption from review under CEQA for such projects, provided they meet additional specified criteria. Projects that meet the definition of the category, but not the additional criteria, are afforded other streamlining of CEQA requirements, but are not fully exempt. The definition of "Transit Priority Projects" is based on four factors:



- The project is consistent with the SCS or APS, whichever has been determined by ARB to meet the assigned reduction targets; and
- The project meets specified mixed-use criteria; and
- The project has a minimum net density of at least 20 units per acre; and
- The project is within a half mile of a major transit stop (existing or planned), or a "high quality" transportation corridor.

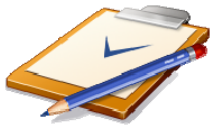
A categorical exemption is provided for TPPs that conform to all criteria on a specified list, as well as at least one additional criterion from a list of options. The TPP must meet all of the following criteria:

- The project is no larger than 8 acres and not more than 200 units;
- The project can be served by existing utilities and has paid all applicable in-lieu and development fees;
- The project does not have a significant effect on historical or environmental resources (e.g. natural habitat);

- The project has remediated any environmental hazards to applicable standards and is not subject to significant and defined catastrophic risks;
- The project is not located on developed open space;
- The buildings in the project are 15 percent more energy efficient than required by California law and the project is designed to achieve 25 percent less water usage than the average household use in the region;
- The project does not result in the net loss of affordable housing units in the area;
- The project does not include any single-story building larger than 75,000 square feet;
- The project incorporates mitigation measures from previous environmental impact reports;
- The project does not conflict with nearby industrial uses.

To meet the categorical exemption, the TPP must also conform to at least one of the following:

- At least 20 percent of the housing units will be sold to families of moderate income, or not less than 10 percent of the housing will be rented to families of low income, or not less than 5 percent of the housing will be rented to families of very low income and the developer commits to the continued availability of the non-market units (55 years for rental units, 30 years for ownership units); **or**



- The developer pays in-lieu fees equivalent to costs of meeting the first requirement; **or**
- The project provides public open space equal to or greater than five acres per 1,000 residents.

TPPs that do not meet the criteria for a full categorical exemption from CEQA can qualify for streamlining under a Sustainable Communities Environmental Assessment or by implementing approved Traffic Mitigation Measures.

A TPP may be reviewed under a Sustainable Communities Environmental Assessment (SCEA) if the project incorporates all feasible mitigation measures, performance standards, or criteria from an applicable prior environmental impact report. The SCEA is similar to an EIR, but it does not have to address potential growth-inducing impacts, any project-specific cumulative impacts on climate change from the use of light duty

vehicles, or any other cumulative effects of the project that have been addressed and mitigated in prior environmental documents. In addition to this streamlining, the bill provides that a legal challenge of the SCEA is to be reviewed under a standard of "substantial evidence" rather than under the "fair argument" standard that is generally applied to EIRs.

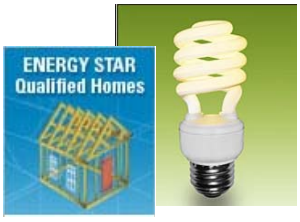
The bill also authorizes cities and counties to adopt specific Traffic Mitigation Measures (TMMs) to apply specifically to TPPs. The TMMs include such measures as requirements for the installation of traffic control improvements, street or road improvements, transit passes for future residents, or other measures that will avoid or mitigate the traffic impacts of transit priority projects. Any TPP that implements the approved TMMs is not required to identify or implement any additional measures to mitigate traffic impacts under CEQA.

Alternative and Renewable Fuel & Vehicle Technology Program (AB 118)

In October 2007, Governor Schwarzenegger signed AB 118 (Nunez, Statutes of 2007), into law. AB 118 provides approximately $200 million annually through 2015 for three new programs to fund air quality improvement projects and develop and deploy technology and alternative and renewable fuels. The bill creates a dedicated revenue stream for the programs via increases to the smog abatement, vehicle registration, and vessel registration fees. The three new programs are: the Air Quality Improvement Program administered by ARB, the Alternative and Renewable Fuel and Vehicle Technology Program administered by the California Energy Commission, and the Enhanced Fleet Modernization Program administered by the Bureau of Automotive Repair.

The Air Quality Improvement Program will provide about $50 million per year for grants to fund clean vehicle and equipment projects which reduce criteria and toxic air pollutants as well as research on the air quality impacts of alternative fuels and advanced technology vehicles. ARB will be developing guidelines for the Air Quality Improvement Program and the Alternative and Renewable Fuel and Vehicle Technology Program to ensure that both programs complement efforts to meet the federal and state ambient air quality standards and to reduce air toxics.

California Energy Efficiency Standards (Title 24, Chapter 6)



Title 24, Part 6 (California's Energy Efficiency Standards for Residential and Nonresidential Buildings) of the California Code of Regulations was first established in 1978 in response to a legislative mandate to reduce California's energy consumption. The standards are updated periodically to allow consideration and

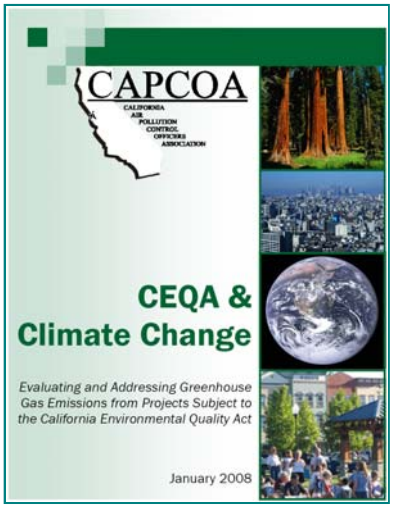
incorporation of new energy efficiency technologies and methods. These standards are mandatory and thus new building permitted by City and County governments must comply with the standards in effect at the time. These standards also promote cost-effective means to reduce energy use and thus GHG emissions for new development relative to business as usual conditions.

The Energy Commission adopted the 2008 Standards on April 23, 2008, and the Building Standards Commission approved them for publication on September 11, 2008. These new Standards will be in effect as of July 1, 2009. The requirement for when the 2008 Standards must be followed is dependent on when the application for the building permit is submitted. If the application is submitted after 7/1/09, the 2008 Standards must be met.

California Environmental Quality Act

The California Environmental Quality Act (CEQA) (Pub. Res. Code §21000 et seq.) is not specific to GHG regulation and does not create specific new mandates for General Plans; however, its basic goal is to ensure that environmental impacts of proposed projects are evaluated, and significant impacts are mitigated and disclosed to the public. CEQA substantially influences the approval process for General Plans. The evaluation is done through an Environmental Impact Report (EIR) which provides State and local agencies and the general public with detailed information on potentially significant environmental impacts a proposed project is likely to have and ways to mitigate those impacts, and also to evaluate potential alternatives to the project.

Because of the global nature of the climate change problem, most projects will not result in GHG emissions that are individually significant. CEQA also requires consideration of whether impacts are *cumulatively* significant, however. The determination of significance is made by the agency with primary jurisdiction over the project. CEQA allows the agency to establish thresholds for significance, based upon sufficient scientific evidence, but thresholds are not required.



In January of 2008, CAPCOA released a resource document called *CEQA and Climate Change*, that reviewed the various options available to lead agencies to determine significance of a project. The document also evaluated tools and methodologies, and provided a list of mitigation strategies. A more comprehensive discussion of CEQA and its applicability to GHG emissions is provided in that document.

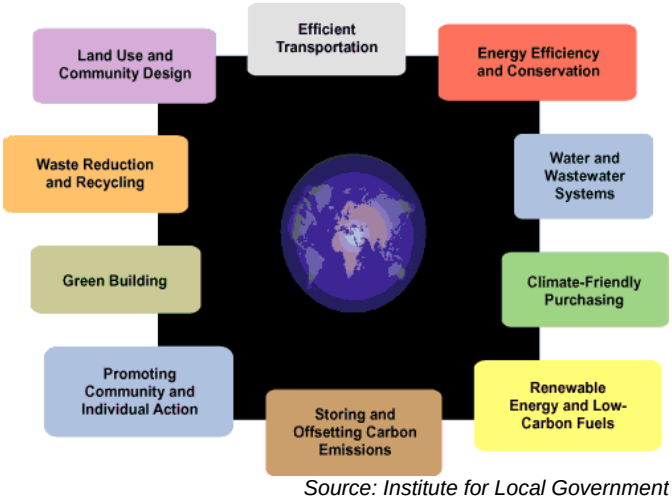
On April 13, 2009, the Governor's Office of Planning and Research sent proposed amendments of the CEQA Guidelines to the Secretary of the Resources Agency for promulgation. The proposed amendments contain

recommended changes to fourteen sections of the existing guidelines, including: the determination of significance as well as thresholds; statements of overriding consideration; mitigation; cumulative impacts; and specific streamlining approaches. Overall, the proposal includes the same basic approaches covered in the CAPCOA document. The proposed Guidelines also include an explicit requirement that EIRs analyze GHG emissions resulting from a project when the incremental contribution of those emissions may be cumulatively considerable. A copy of the full proposal, as well as the letter of transmittal, may be found at: www.opr.ca.gov.

An important consideration of CEQA with respect to planning is the growing consensus that a robust effort to address GHG emissions at the General Plan level can substantially streamline subsequent project review under CEQA, provided the project is consistent with the GHG reduction policies in the Plan. This is specifically allowed in the OPR proposal, and is being further developed in the context of SB 375. Although the specifics of what is entailed here have yet to be established, the concept is important to consider in shaping the policies included in the General Plan.

Local government has an enormously important role to play in reaching the goals of AB 32, and more importantly, in the achieving the greater long term goal of preventing catastrophic climate change. There are many strategies a local government can undertake that will reduce GHG emissions, and help minimize the extent of climate change that does occur. Some of the strategies depend on coordinated action with other agencies and levels of government; others can be implemented independently.

This section of the report is mainly focused on the more immediate actions local governments can take, including direct reductions from local government operations; the role of local government in fostering reductions in the business sector and in local communities; and lead agency obligations to address GHG emissions under CEQA. This chapter also touches briefly on the crucial, longer term role of local government: establishing over-arching plans that will achieve reductions through changes to land use and transportation, resource management, and the efficiency of the built environment. The Institute for Local Government provides resources and a forum for sharing ideas on many of these important topics (see www.cacities.org). The role of local government in planning for GHG reductions is explored more fully in Chapter 4.



Source: Institute for Local Government

Reductions in Local Government Operations

There are five core areas of local government operations that are responsible for GHG emissions. These include: energy use, waste and recycling, water delivery and wastewater treatment, transportation, and the build environment.

In addition, there are actions the local government can take to preserve open space and undertake reforestation, for example, that can mitigate or offset the emissions resulting from operations.

A brief discussion of each operational area is included below. These lists are not exhaustive; rather, they provide a sampling, and links are provided in the References section of this report where additional information and examples can be found. Finally, the discussion here is limited to emissions from operations as opposed to those associated with policies governed by the General Plan, a discussion of which follows.

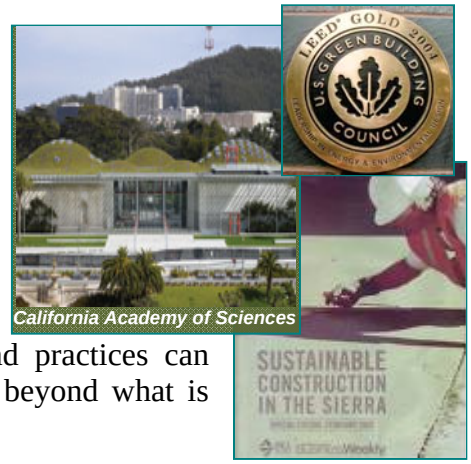
Energy Use: The buildings, equipment, and infrastructure of local government all use energy. In general, newer purchases and installations tend to be more energy efficient, but there are plenty of opportunities to enhance efficiency and cut energy use. Buildings can be made more efficient by upgrading insulation and installing low emissive glass, using high-efficiency lighting with timers and sensors, installing cool roofs, and simply adjusting heating and cooling levels. Alternative energy sources can be developed, such as installation of solar collectors, or landfill gas to energy projects. Local governments can also change the emissions profile of the energy they purchase from their energy providers. Equipment that heats and cools buildings can be upgraded to the most efficient models, as can computers, telecommunications, and office equipment. And infrastructure such as street lighting and traffic signals can be upgraded with state-of-the art technology such as halogen bulbs and solar collectors and storage at power or signal poles. Lifecycle carbon costs of maintaining infrastructure as diverse as roads, bridges, and transit facilities can be evaluated so that the least carbon-intensive materials and procedures are used.

Waste and Recycling: There are GHG emissions associated with the energy involved in waste handling, and due to methane from waste decomposition as well as some GHG with high global warming potential from foam products and refrigerants released during the handling of these materials. Local governments are users of waste and recycling systems for their own operational waste. To reduce emissions from their own operational waste stream, jurisdictions can enhance employee access to recycling, create purchasing guidelines to emphasize recycled materials, less packaging, and to avoid products that release more potent GHGs. In one creative example, the City of San Francisco is replacing bottled water at coolers and in dispensers with filters on drinking fountains. Local governments also may operate or exercise contractual control over waste handling programs, depending on how these services are structured and provided in their jurisdictions. Emissions from this portion of the waste stream can be reduced through methane recovery, recovery of potent GHG from foam and refrigerant systems, and other adjustments to collection systems.

Water Delivery and Wastewater Treatment: Movement, storage, and treatment of water and wastewater use significant amounts of energy. Local governments can reduce their own water use by installing low-flow fixtures, by inspecting, repairing and replacing leaking components, especially irrigation and other water supply at remote sites that often go unnoticed for long periods, and through xeriscaping. Water reclamation and graywater systems can also trim the carbon footprint from water use, and managing time of demand with large water users can significantly alter the energy needs at peak delivery times.

Transportation: Local governments can reduce the GHG emissions of their vehicles by replacing older vehicles with the highest efficiency vehicle that can perform the needed function. They can also reduce the overall size of the fleet by increasing the use of pooled vehicles instead of assigned vehicles, and encouraging carpooling when on government business. As employers, local governments can institute programs to increase employee use of alternate modes of transportation, such as transit, carpooling, biking, and walking to work, and they can offer compressed work schedules, telecommuting, and even satellite offices. If properly designed, many of these strategies can also help decrease GHG from the public accessing the jurisdiction's services, as can offering access to services online.

The Built Environment: Commitments to highly efficient construction in their own new facilities is one way local governments can reduce carbon emissions from the built environment. Many local governments are building or retrofitting their facilities to LEED certification standards. The siting of new facilities is also an opportunity to improve access by employees and the public and reduce transportation related emissions. In addition, when it establishes the building codes for its jurisdiction, local government has the opportunity to significantly alter the energy used in constructing, maintaining, and using the built environment. A careful review of local needs and practices can identify opportunities for energy performance well beyond what is required under California's Title 24 standards.



Mitigation Projects: Separate from its core operational mission, a local jurisdiction can undertake projects or actions for the purpose of mitigating or offsetting GHG emissions. Examples of these projects include securing the development rights to land that might otherwise be developed (especially where the site does not lend itself to sustainable transportation planning) and undertaking reforestation projects either in open space that has been previously deforested, or through urban forestry efforts. Advanced technology demonstration projects can also ease the transition to new technologies and enhance public acceptance of them, for example purchasing or leasing a plug-in hybrid, fuel cell, or full electric vehicle and demonstrating its use at public events. Some local governments purchase emissions offsets for certain transportation-related emissions, such as

air travel, although any GHG emissions can be offset. When offsets are purchased, the jurisdiction should take extra precaution in verifying the value of the offsets, as some are of dubious origin.

Fostering GHG Reductions in the Business and Community Sectors

In addition to implementing programs to reduce its own carbon emissions, local government has an important role to play in bringing others to the table and helping them to reduce their GHG emissions. Local governments can develop public education and outreach programs, can establish public-private partnerships and programs to publicly recognize achievements, and offer incentives (non-monetary as well as financial) for actions that reduce GHG emissions. Examples of these types of actions are also provided as model policies in Chapter 6, but they can also be implemented without the benefit of an overarching plan.

Education and outreach programs would include events such as conferences, workshops, or fairs, featured speakers, public service announcements, print messages, and online information or interactive sites. Ideally, topics will span a broad range, including the fundamentals of climate change and how our actions contribute to it, down specific actions or projects, such as a "lights out" campaign, a "green tip of the day" or a how-to workshop on gardening with drought-tolerant, native plants. Programs involving schools are also beneficial, and model units on climate and conservation are available; events like poster contests and recycle drives are a good way to get children involved.

Local governments are also in a unique position to work with local businesses on climate protection projects and partnerships. Many of the GHG reduction strategies that rely on improved efficiency in energy, water, fuel use, or waste reduction, can generate significant cost savings for businesses over a fairly short time frame. A local government that has implemented some of these strategies in its own municipal operations is in a good position to demonstrate savings, but even if the government does have data of its own to share, it can encourage business participation in these types of programs.

Small Business Toolkit available at: www.coolcalifornia.org

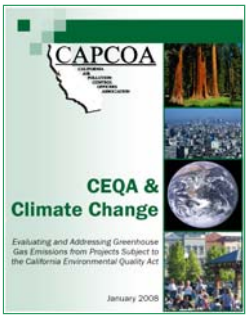
Suggestions include working with the local chamber of commerce, business associations, or business-focused civic groups to establish a forum to share efforts and results, such as

newsletters, or a monthly breakfast meeting or luncheon. Local government can also help establish demonstration projects, and can publicly recognize local leaders with awards or in public service messages.

Incentives are another important tool to encourage actions that reduce GHG emissions in the near term. To be effective, the incentive does not have to be monetary. As noted above, public recognition can be a powerful motivator, but local governments have other tools they can use to promote GHG emission reductions. Examples include preferred parking for electric or alternative fuel vehicles, and express permitting of projects on a "green project" list. Financial incentives can be small or large, beginning with free compact fluorescent light bulbs or reduced transit fairs on a designated "don't drive" day, to rebates for high efficiency toilets and electric lawn mowers, to creative financing for energy efficiency improvements or installation of solar panels. In some cases, the government can partner with the private sector for sponsorship of these kinds of efforts, which can help defray some of the costs.

Mitigating Impacts through Project Review

Local governments review proposed projects under CEQA, either as a lead or a responsible agency. Until recently, climate change was not considered an environmental impact under CEQA, and GHG emissions associated with projects were not quantified, disclosed, or mitigated. This has changed, however, and there is now broad recognition that these are potentially significant impacts, either individually or cumulatively, and that they do need to be addressed. Some jurisdictions recognized this early on and began to evaluate climate impacts during their CEQA review process. Following the passage of AB 32 in 2006, greater attention was paid to this issue, and in 2007, California's Attorney General put local governments on notice that these impacts could no longer be overlooked. There was a fair amount of confusion, however, about how to quantify GHG emissions, at what level they would be considered significant, and what steps could be taken to mitigate them.



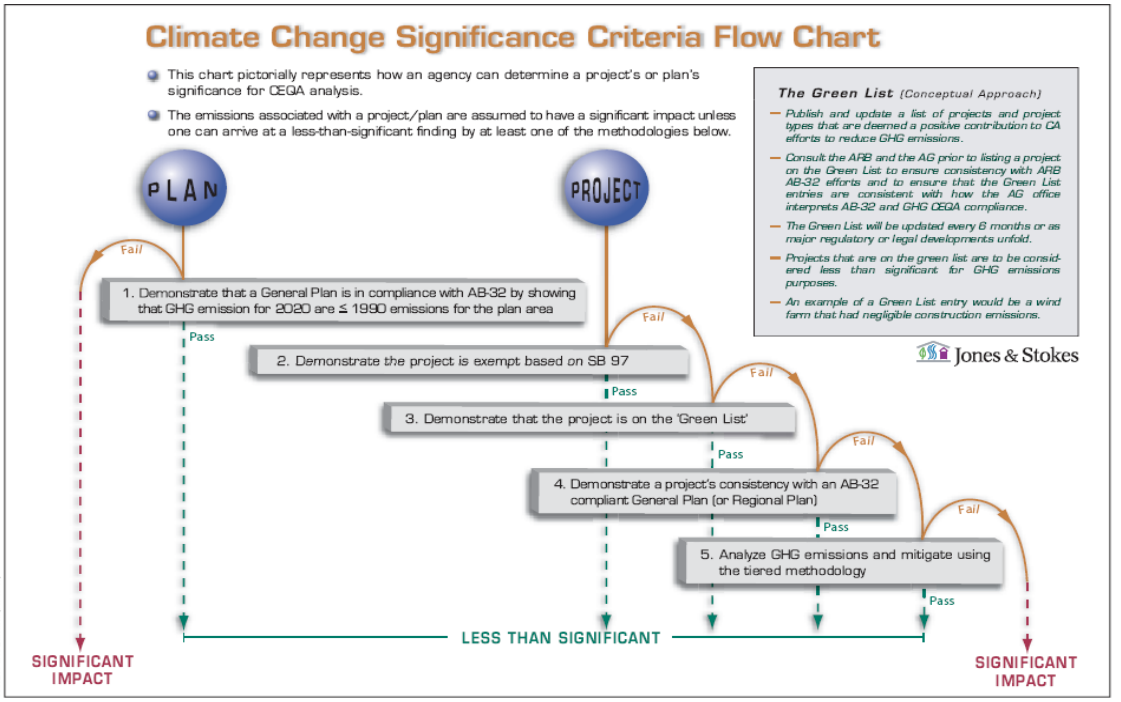
In January of 2008, CAPCOA released a resource document, *CEQA and Climate Change*, that collected and presented information to support local governments as they undertake a review of GHG emissions from projects subject to CEQA. The document considered approaches to determining significance of emissions, evaluated available methodologies and tools for quantifying GHG emissions, and provided a summary of GHG mitigation measures for projects.

Three approaches to determining significance are explored in the CAPCOA document, including the benefits and potential concerns associated with each. Significance can be determined without first establishing a significance threshold; in this case, the determination will be made on a case by case basis, which creates uncertainty and may be

vulnerable to challenge. A significance threshold can be set at zero, on the premise that any GHG emissions contribute in a cumulative way to the global problem; this approach is simple in its construct and provides certainty, but the work associated with preparing and reviewing EIRs on all projects is likely to overwhelm the system and lessen the effectiveness of review across the board. A significance threshold can be set at an emission level other than zero; the chief challenge for this approach is to identify and scientifically support an appropriate threshold, and the CAPCOA report evaluates several different options for doing this. Of particular interest are two elements discussed in the non-zero approach. These are: the role of robust treatment of GHG emission reduction policies in the General Plan, and the creation of a "Green List" of projects that will reduce or mitigate GHG emissions, both which could be used to substantially streamline the review process under CEQA. Figure 17 presents these non-zero threshold concepts in a flow diagram.

The CAPCOA report also evaluates a number of technical models and tools currently

Figure 17



Source: CEQA and Climate Change, CAPCOA 2008

available for quantifying GHG emissions, as well as several that are still under development. The report concludes that there is currently sufficient information to quantify GHG emissions for the purposes of evaluating projects under CEQA, but that improvements in several key areas will greatly improve the sensitivity and usefulness of available methods.

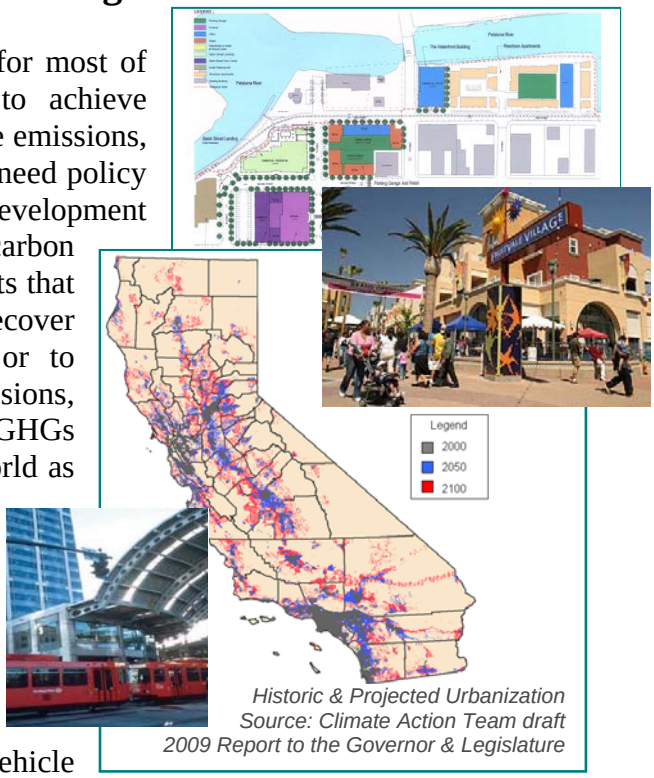
Finally the CAPCOA report compiles and presents information on measures to mitigate GHG emissions. It includes tables that provide information on measure applicability, jurisdiction, feasibility, effectiveness, secondary effects, and cost.

CAPCOA will provide a supplement to its report in 2009, with a summary of new developments in CEQA review of GHG, including policies and thresholds adopted since the original report, advances in methods and tools, and innovative strategies to mitigate impacts. Readers interested in additional information about mitigating emissions of GHGs from projects subject to CEQA are encouraged review CAPCOA's report and the 2009 supplement. Readers should also keep in mind that many of the mitigation strategies that are summarized in the CAPCOA report can be implemented even if there is no project subject to CEQA review, on a voluntary basis.

Finally, as discussed in Chapter 2, on April 13, 2009, the Governor's Office of Planning and Research recommended CEQA Guidelines changes to the Secretary of Natural Resources. The proposed changes include a new section that specifies that previously established standards of mitigation apply to GHG emissions. They also address the use of General Plans to streamline mitigation requirements, and specify that in order to use this approach, the General Plan must be specific enough in its treatment of the project type in an actual measure. The OPR package also proposes revisions to Appendix F that contain specific energy efficiency measures that may reduce GHG emissions.

Reducing Emissions through Planning

Transportation and energy use account for most of the emissions of GHGs. In order to achieve substantial and lasting reductions in these emissions, we need technological advances and we need policy advances. On the technology front, development alternative energy sources and low carbon fuels, more efficient vehicles and products that use less energy, and mechanisms to recover energy lost without beneficial work, or to capture and sequester or destroy emissions, will make a significant cut in the GHGs emitted by living and working in our world as we do now. But that is not enough to avoid the worst impacts of global climate change. We also need innovative policies that change the patterns of our lives to produce fewer GHGs. This means creating communities that are designed to decrease the use of single occupancy vehicle travel, to encourage the use of local products, and to minimize waste. The key to creating these communities is the General Plan.



Historic & Projected Urbanization
Source: Climate Action Team draft 2009 Report to the Governor & Legislature

Powerful forces and competing needs have combined to create the land use patterns we see today across California. It is neither quick nor easy to change these patterns, and

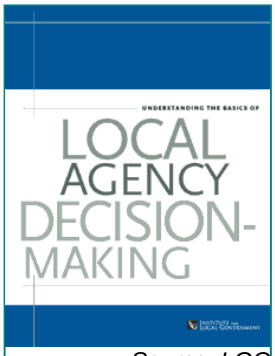
there are significant obstacles to overcome. Funding is one of the obstacles. In the Scoping Plan, ARB commits to work with other State agencies and with local governments to secure funding to support the planning needed to achieve real changes. Another obstacle is the uncertainty about outcome. Notwithstanding such obstacles, some local governments have moved forward with creative planning that has revitalized the urban core zones in their areas with transit-oriented, mixed-use, high-density development of brownfield sites. The results are vibrant, livable, walkable communities where local residents work, shop, and play, and which attract visitors and bring economic vitality along with quality of life. Examples can be seen in both urban settings such as Sacramento, as well as in suburban areas like Fruitvale in the San Francisco East Bay, and even more rural settings, such as Petaluma and Windsor in Sonoma County. By encouraging more of these models of sustainable design, we can demonstrate that they are not only feasible, but successful. In its Scoping Plan, ARB suggests that one possible use of revenue from the auction of credits in a cap and trade system, or from carbon fees, would be to provide incentives for sustainable land use design. Opportunities to support sustainable planning should be cultivated, to ensure that the most successful approaches are recognized and replicated.

The planning that local governments undertake, namely the General Plan, and any specific Area Plans or Climate Action Plans, can form the basis for thoughtful and effective actions to reduce GHG emissions from local activities. When this planning is undertaken in concert with broader regional planning, such as “Blueprint” planning, regional transportation planning, and air quality planning, the impact of GHG reduction efforts is multiplied many times. Chapter 4 discusses the role of these planning efforts, and how they interrelate to effectively respond to the challenge of climate protection.

Introduction

The commitment to reduce GHG emissions under AB 32, in and of itself, highlights the importance of effective long-term planning by local government to minimize GHG produced by land use and transportation patterns, use of natural resources, and the built environment. When it is considered together with the newly approved changes to regional transportation planning under SB 375, there is an overwhelming call to enhance our planning efforts and remake our communities so that they are sustainable, and sustaining. We have the tools to accomplish this, and now we have a substantial statutory underpinning to support the effort.

There are several key planning approaches a local agency can rely on to address climate protection goals. The intersection of AB 32 and SB 375 will result in regional GHG reduction targets in most metropolitan areas, with accompanying regional planning. This effort will be most effective if local governments support and reflect GHG reduction policies in their own local planning efforts. Local governments can also adopt separate Climate Action Plans that focus on an overarching commitment to greenhouse gas emissions reduction, and set forth the specific policies and mechanisms to achieve that reduction. Jurisdictions can incorporate climate protection goals into their General Plans, either through a stand-alone element or by integrating into existing elements. They can also rely on, draw from, and align with the measures in other regional plans, including "Blueprint" plans, air quality plans, and transportation plans. These options are not mutually exclusive; in fact, they will provide the most robust reductions in greenhouse gases if they are implemented in concert, with careful attention to coordination of goals and optimizing limited resources. An added benefit of a more comprehensive approach is the potential to simplify the administrative process associated with review of projects under CEQA, while ensuring the highest standard of environmental protection.



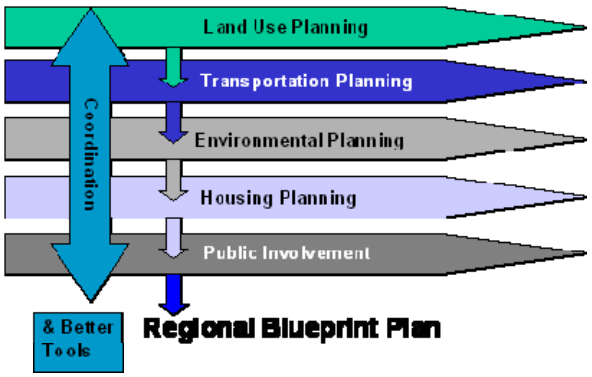
Source: LGC

Finally, as this coordinated planning effort moves forward it is important not to lose sight of the potential for unintended consequences, and to ensure a mechanism to review progress and outcomes, and to ensure those consequences, specifically any that would harm environmental justice goals, are addressed with prompt, mid-course corrections.

Regional Targets and Planning

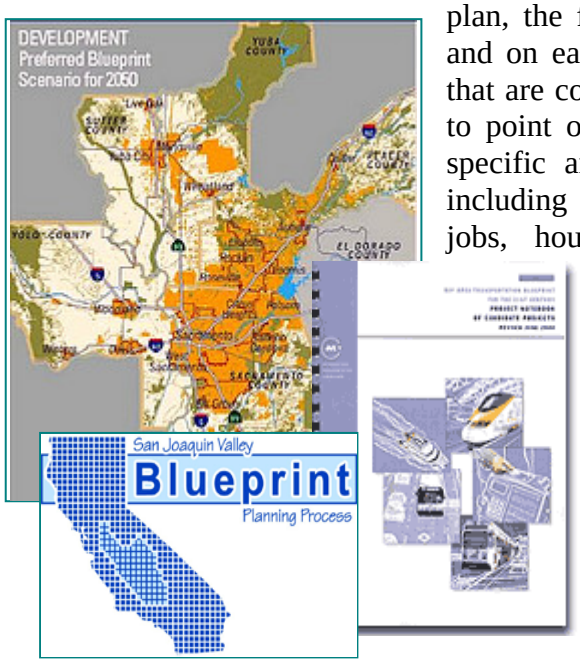
Recent studies with models of land use and transportation related emissions show that improved planning and design can reduce GHG from this sector by a significant amount. In the near term, that is by 2020, the emission reductions are relatively modest, on the order of 4% from the business-as-usual scenario. But because the benefits from these types of improvements accrue incrementally over time, as new planning policies are implemented and transportation patterns and habits change in response, the emission

reductions in out years are much greater. By 2030, reductions are projected to double, and by 2050, could be as much as 18%.



Source: www.fhwa.dot.gov

In order to actually achieve these reductions, air quality, land use, and transportation planning will need to be integrated regionally. These efforts have already begun in several large metropolitan areas, using a "Blueprint" planning model. This model allows the cities and counties within the region to collectively select future growth scenarios for land use and transportation that lead to more sustainable communities and cleaner air, including fewer emissions of GHGs. The plans are developed through a public process and provide for local accountability. Each jurisdiction incorporates the agreed-upon growth scenario into its General Plan. The success of the effort depends on the robustness of the Blueprint plan, the faithful incorporation into each General Plan, and on each jurisdiction making project-level decisions that are consistent with its General Plan. It is important to point out here that the planning needs to be highly specific and consider a number of important factors, including (but certainly not limited to) where current jobs, housing, and transportation infrastructure are placed, and the relationship of those things to the residents the project is intended to serve. While "high density" development is generally considered a product of "good" planning, if it is the wrong project, in the wrong place – that is, if it is implemented without consideration of all of the elements that contribute to the current pattern of land use and transportation – that high density project could actually exacerbate existing problems.



Recognizing the potential for long-term, durable reductions, ARB has proposed to establish regional GHG emission reduction targets. According to the Scoping Plan, ARB envisions a regional planning process that will: (1) Use integrated scenario modeling to align regional transportation plans and local General Plans; (2) Take into consideration other State policy goals; (3) Incorporate performance indicators to monitor progress; (4) Coordinate local and regional planning efforts to achieve maximum emission reductions; and (5) Establish priorities for and direct State resources to help local and regional governments meet the regional GHG targets.

As discussed in Chapter 2 of this report, SB 375 (Steinberg) establishes a statutory framework for this integrated regional planning approach. The Steinberg bill requires that ARB assign regional GHG reduction targets to specified metropolitan areas. Among other things, the bill also provides that ARB must approve the emission reduction quantification that underpins the Sustainable Communities Strategy (SCS) developed by these regions, or their alternate plan that contains additional reduction measures if the primary strategy fails to meet the assigned targets.

Under SB 375, the ARB is not given the authority or responsibility to determine the land use and transportation policies for any given region, nor is the regional planning body (the MPO) given any specific land use authority under SB 375. Land use decisions are still vested in the local city or county government. Because the SCS is part of the Regional Transportation Plan, however, and because SB 375 requires that funding allocated under the RTP be consistent with the programmatic and policy elements of the RTP, the bill essentially ties transportation funding for the RTP to implementation of the SCS policies.

Another important clarification is that the Alternate Plan is not part of the RTP, and therefore transportation funding is not linked to implementation of this plan. In order to incentivize its implementation, the bill provides exemptions from certain CEQA review requirements for projects consistent with SCS and ACS that achieve the regional target reductions in GHG emissions, as approved by ARB.

Finally, while there is material overlap between the policies that will be embodied in the regional SCS and the GHG reductions from measures in the city or county's General Plan or Climate Action Plan, they are not the same. The SCS is a transportation driven strategy, whereas the General Plan and the Climate Action Plan address other important opportunities for GHG reduction in addition to transportation. In the best case, the measures in the SCS will be reflected in and complemented by the measures in the General Plan and the Climate Action Plan.

Source: www.sacregionblueprint.org

Climate Action Plans and Commitments

In the Scoping Plan, ARB recognizes the value of local Climate Action Plans and commitments to reduce GHG emissions. Climate Action Plans provide an overarching policy direction for local governments committed to reducing GHG emissions within their jurisdictions. Many areas have

already established these plans; examples and references are included in Appendix G.

An effective Climate Action Plan will have several core elements, including an inventory of emissions, a target for reductions, timeframes, milestones, and tracking and accountability mechanisms, and strategies for achieving the reductions. First, as its foundation, the Plan will rely on a complete inventory of GHG emissions in what will become the Plan's base year. Although AB 32 identifies 1990 as a base year for California, most local jurisdictions do not have the underlying data necessary to establish GHG emissions in 1990. Rather than approximate emissions in that year, local governments are better served by selecting a year for which they have complete and accurate data on energy use, vehicle miles traveled, and other key parameters that affect GHG emissions. In selecting the year, it is helpful to also choose a year that is not heavily influenced by an unusual event or circumstance.

The inventory should include GHG emissions from three aspects of the local jurisdiction. There are emissions that result directly from local government operations, emissions associated with local government policies and decisions, and emissions from the community within the jurisdiction. Working with ICLEI and CCAR, ARB has adopted a reporting protocol for local government operations' GHG emissions. Information on calculating emissions associated with policies and decisions (essentially, land use and transportation emissions, as well as other sectors address in the General Plan) can be found in the CAPCOA report, *CEQA and Climate Change*, in the section on Analytical Methodologies. ARB is currently developing a reporting protocol for local communities, as well as a "Local Government Toolkit" which is available at www.coolcalifornia.org. Examples of Climate Action Plans that have baseline inventories are provided in Appendix G. There are also businesses and organizations that provide consulting services in this area.

In choosing emission reduction targets, the jurisdiction should consider the statewide GHG reduction targets, any assigned regional targets, and what is feasible for the jurisdiction to achieve. ARB has estimated that reductions of 28% from business-as-usual are needed on a statewide basis to reach the goals of AB 32. But the business-as-usual scenario may be difficult for a local jurisdiction to calculate. If the goals of AB 32 are presented as a reduction from the average statewide GHG emissions between 2002 and 2004, a reduction of almost 10% is needed. If a local government can establish a baseline looking at average annual emissions between 2002 and 2004, a reduction target to reduce the total GHG emissions from the jurisdiction by 10% by 2020 would be

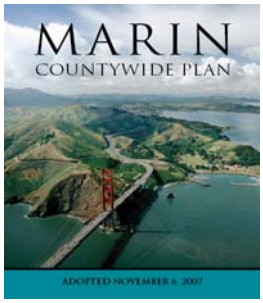
consistent with AB 32. While 10% may not sound like a large number, it is important to remember that the current trend is one of significant emissions growth. Regional targets for metropolitan areas will be developed and assigned pursuant to SB 375. Local feasibility will need to be assessed based on the jurisdiction's inventory and in consideration of local input through a public process.

AB 32 provides a fairly straightforward timeframe for achieving reductions in GHG emissions. Areas that adopted Climate Action Plans before the passage of AB 32 may have identified other deadlines for reaching their targets. For those areas, it may be useful to review their reduction targets and deadlines to ensure that the local commitments are consistent with statewide goals to the extent feasible. In addition to overall deadlines, however, intermediate milestones are important, and the Plan should specify mechanisms to measure progress, as well as make midcourse corrections if reductions are not being realized as anticipated. Milestones can be based on actual reductions in GHG, but because some analysis is needed to determine GHG emissions and reductions, there should also be performance milestones that reflect progress implementing plan elements.

Climate Protection in General Plans

Whether or not a local government adopts a Climate Action Plan, its General Plan should address climate change, its potential impacts, and local contributions to the problem. The Governor's Office of Planning and Research (OPR) is preparing guidance on this, which will be forwarded to the California Resources Agency for formal adoption. In addition, the California Attorney General has challenged the EIRs for General Plans that have failed to address climate change. Policies to mitigate climate change should be incorporated into the General Plan either within existing elements, or in a separate Greenhouse Gas Reduction element.

Incorporating Policies into Existing General Plan Elements- Existing General Plans will invariably contain policies (and any associated goals, objectives, policies, standards and implementation measures) that help to reduce GHG emissions. However, they are just as likely to contain policies that work against that goal. There are opportunities to strengthen existing General Plan policies and/or incorporate new policies that reduce emissions. Several options exist for integrating additional policies, including the three discussed below.



Policies may be incorporated into a jurisdiction's existing General Plan elements through a General Plan amendment. In this scenario, no additional elements would be necessary. Identifying existing policies in each General Plan element that already do or could help reduce GHG emissions would be a critical first step in assessing the type and nature of new policies needed. Categorizing existing helpful policies by their function would greatly aid this assessment; the following are important categories to include: land use, circulation, energy efficiency, alternative energy, municipal operations, waste reduction, conservation, and education. Incorporation of these policies should include a comprehensive review of all elements of

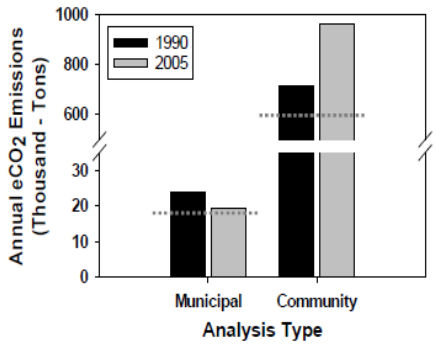
the General Plan to ensure that conflicting policies are eliminated as part of the amendment, in the interest of maintaining internal consistency.

Creating a Climate Change Element- A new climate change element could be added as an amendment to an existing General Plan. This should again be accompanied by a comprehensive review of the General Plan to identify and revise or eliminate conflicting policies. The element could include an introduction about climate change, a GHG inventory if feasible, and new and existing policies organized into the following categories: land use, circulation, energy efficiency, alternative energy, municipal operations, waste reduction, conservation, and education. These three main components of a climate change element are discussed further below.

The Introduction*:* The introduction should provide descriptive background information on climate change and its impacts to inform the reader on the issue and the need for incorporating new General Plan policies to reduce GHG emissions. Information needed for the introduction can be found in the first chapter in this report, as well as in Appendix D. Additional information is available from the Air Resources Board (www.arb.ca.gov), the Energy Commission (www.energy.ca.gov) the Climate Action Team (www.climatechange.ca.gov), and the National Academies of Science, Division of Earth and Life Science (www.dels.nas.edu/dels/).

The GHG Inventory*:* As described for Climate Action Plans, above, a greenhouse gas inventory is an important tool for establishing a baseline of existing emissions within the jurisdiction. This will greatly aid the process of determining the type, scope and number of GHG reduction policies to be included, particularly in the context of meeting regional GHG targets; it will also facilitate tracking of policy implementation and effectiveness. GHG inventories for local jurisdictions typically consist of two distinct components: one for the city/county as a whole defined by its geographical borders, and the second for emissions resulting from the city/county's municipal operations.

Fig. 18: Example Display of Municipal & Community Emissions

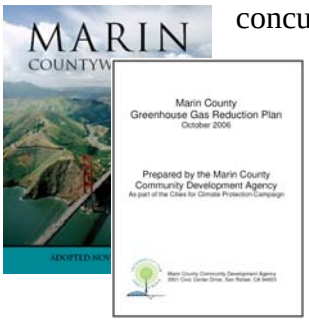


The municipal inventory would effectively be a subset of the community-scale inventory (the two are not mutually exclusive). Preparing an inventory is not required in order to incorporate General Plan policies that reduce GHG emissions, but it's highly advisable and is a critical component of any Climate Action Plan. The inventory may be included as an appendix to the General Plan. Figure 18 shows municipal and community emissions as calculated for the City of Chula Vista.

Objectives and Policies: As mentioned above, identifying existing General Plan objectives and policies that could or do reduce GHG emissions and categorizing them appropriately is a key step in determining what new policies may be needed to achieve established GHG reduction goals. The following eight category designations are recommended for this purpose: land use, circulation, energy efficiency, alternative energy, municipal operations, waste reduction, conservation, and education. These categories help associate the identified policies with how the reductions are achieved and indicate which General Plan element would contain related policies. Figure 19 shows how reductions in different categories add together to reach the overall target. The new objectives and policies developed for inclusion in this element would also be categorized in the same fashion, with the document structure similar to the other elements in the existing General Plan. Including a matrix or table of all the new and existing/revised policies in the element and the categories under which they fall is a helpful tool in developing implementation mechanisms.

Preparing a Climate Action Plan and Updating the General Plan

A jurisdiction may prepare a Climate Action Plan (CAP) prior to a General Plan update, concurrently with a General Plan update, or following a General Plan update. As described above, the Climate Action Plan would: provide background information on the causes of climate change and projections of its impacts on California and the jurisdiction; present estimates of the jurisdiction's baseline greenhouse gas emissions inventory and reduction target; describe recommended emission reduction actions in the key target sectors; and, identify next steps required over the near term to implement the plan.



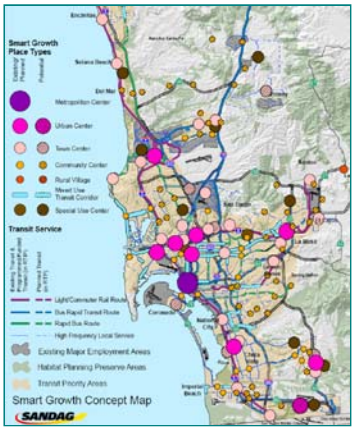
Preparation of a CAP prior to updating the General Plan would provide much of the information needed to incorporate appropriate GHG reduction policies into the update. That may not be feasible, however, and is not essential to the preparation of an effective General Plan update with sufficient climate protection measures. However, developing a CAP subsequent to completing the General Plan update may necessitate further revision of the General Plan to provide a general policy basis for the CAP actions.

Coordination with Other Regional Plans

Coordination with regional blueprint plans, regional transportation plans and air district attainment plans, is critical to ensuring the measures within each plan support and do not conflict with the other plans, and that they are working together to reduce GHG emissions. Communication and coordination can improve effectiveness and reduce costs.

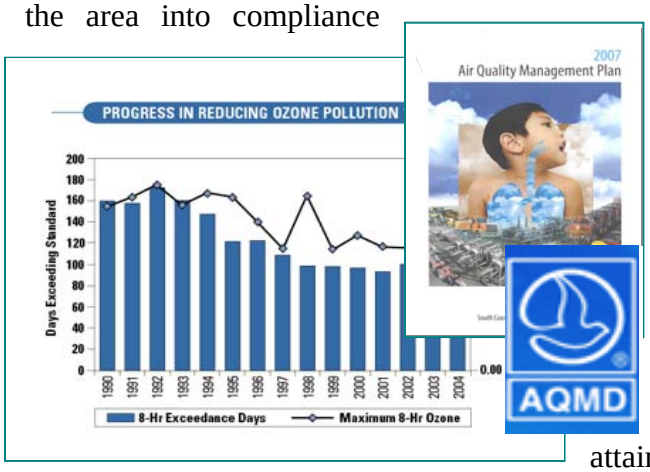
Association of Bay Area Governments
Bay Area Air Quality Management District
Bay Conservation and Development Commission
Metropolitan Transportation Commission

Coordination with Blueprint Plans: As discussed above, the AB 32 Draft Scoping Plan encourages local governments to incorporate regional "blueprint plans" into their General Plans. Blueprint plans are envisioned as regional guidance for land use decision-making that would be adopted by the applicable Regional Transportation Planning Agency or Metropolitan Planning Organization. Each regional blueprint would establish recommended land use patterns, transportation systems, and transportation investments to reduce GHG emissions, as well as other air pollutants and congestion within the defined region. The Proposed Scoping Plan does not identify specific mandates for General Plans, but recommends incentives for promoting consistency with one another, such as CEQA streamlining. Cities and counties should take an active part in drafting the blueprint plans through cooperation with the Regional Transportation Planning Agency or Metropolitan Planning Organization so that the plans reflect the cities' and counties' approaches to GHG emissions reductions.



Coordination with Air Quality Management Plans: California has 35 air pollution control districts (APCDs) and air quality management districts (AQMDs), each covering one or more counties. Air districts are governed by locally elected officials (or individuals appointed by locally elected officials) and have regulatory control over stationary sources of air pollutants such as industrial and manufacturing facilities. They are also responsible under CEQA for evaluating and recommending appropriate mitigation for air quality impacts of new development. Air districts also administer a variety of incentive programs to reduce emissions from diesel equipment, including engines, trucks, construction equipment, commercial vessels and other local emission sources.

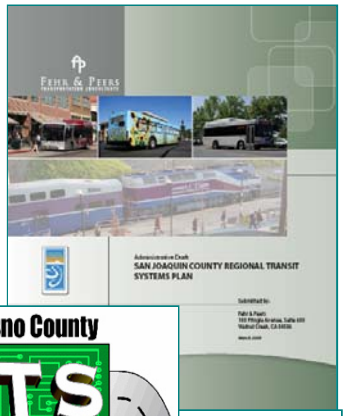
Air quality attainment plans are prepared by an air pollution control district or air quality management district for a county or region designated as a nonattainment area. The plans identify the control measures and market mechanisms that will be implemented to bring the area into compliance with the national and /or California ambient air quality standards within a specified timeframe. There are often policies, regulations, and programs within an attainment plan that may affect or influence local government activities. Participation by jurisdictions in the public review process required prior to adoption of an attainment plan is important to ensure all the planning efforts work together in achieving mutual goals. The local attainment plan can also be an important resource for jurisdictions embarking on GHG planning efforts. Many of the GHG



reduction strategies also reduce other air pollutants, and may therefore already be addressed in the local attainment plan, which can then be a starting point from which to expand the GHG plan. Even if the attainment plan does not contain some of the measures where there is overlap, coordination is important to determine how the two plans will impact each other, and if there are efficiencies, synergies, or even disbenefits between them. For this reason, it is important to contact your local air district when embarking on your GHG Plan.

Coordination with Regional Transportation Plans: The Regional Transportation Plan (RTP) is a long-term blueprint of a region's transportation system. These plans are normally the product of recommendations and studies carried out and put forth by a Metropolitan Planning Organization (MPO) or Regional Transportation Planning Agency (RTPA). The Plan identifies and analyzes the mobility needs of the metropolitan region and creates a framework for prioritizing and funding transportation projects to meet those needs during the timeframe of the plan. RTPs are typically updated every four to five years and have a twenty to thirty year planning horizon.

In developing the RTP, the MPO or RTPA must analyze population and growth trends and projections, regional land use and development patterns, existing transportation system efficiency for travel and goods movement, and the projected funding available to accomplish needed improvements. Thus, the MPO or RTPA must coordinate closely with local governments to ensure the RTP reflects the growth and development expectations of local General Plans. The adopted RTP must also be consistent with federal transportation planning requirements, and the projected emissions from transportation projects listed in the Plan must be incorporated into the local or regional air quality attainment plan.

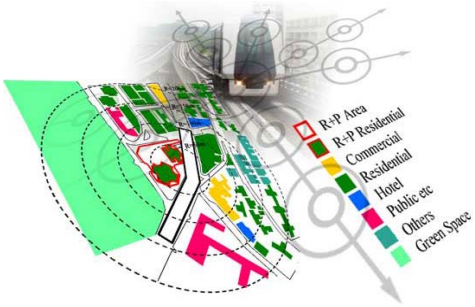


As described in Chapter 2 and at the beginning of this chapter, SB 375 requires RTPs to also contain a Sustainable Communities Strategy and (if needed) an Alternative Planning Strategy designed to meet the regional GHG reduction targets established by ARB. Although the legislation does not require local governments to incorporate the SCS into its own local planning efforts, there are strong incentives to do so.

CEQA Streamlining

The previous discussion of SB 375 outlined specific CEQA streamlining it affords. Even greater streamlining is possible, however, when the local government has adopted a Climate Action Plan, used it as the basis for addressing climate change in its General Plan, and made sure that those efforts reflect, to the extent possible, regional reduction targets and planning for transportation sustainability. When done in a thoughtful and comprehensive way, this integrated planning effort will yield a robust GHG mitigation

strategy with a programmatic EIR that, applied consistently to individual projects, can significantly reduce the procedural and administrative burden of review under CEQA, while ensuring full environmental protection.



The degree to which CEQA requirements can be streamlined will be directly proportional to the specificity of the applicable plans, and the extent to which they are consistent with each other. For example, the exemptions and streamlining under SB 375 generally rely upon the quantitative demonstration that the SCS/APS meets the regional target, and the existence of approved mitigation measures for transportation projects. In order to demonstrate that the target is met, the transportation models will require more detailed information about demand, use patterns, and other specific factors than is typically used in RTPs today. Some of this detail will have to come from local land use patterns and growth commitments. If the coordination between the local and regional plans is poor, the data will either not be available or will be conflicting, which will render the demonstration unapprovable.

The opportunity for CEQA streamlining also calls for greater specificity in the General Plan. For example, by including a "Green List" of projects in the plan and conducting the environmental review of the projects upfront, the local government can provide downstream relief from further review. This saves resources while preserving environmental protection, and it also enhances the viability of desirable projects.

The application of CEQA to a ubiquitous pollutant with such serious global impacts has raised a number of difficult policy questions, not the least of which concerns the appropriate basis for establishing a threshold of significance. Without engaging in a discussion of the various arguments here, it should be pointed out that the debate can be substantially minimized by undertaking a more thorough and coordinated planning effort upfront and limiting the involvement with CEQA for specific projects.

Unintended Consequences and Assuring Environmental Justice

Many of the measures that will be implemented to reduce GHG emissions will have co-benefits reducing criteria and toxic air pollution, and others are specifically designed to enhance the livability of local communities. But sometimes there are conflicts instead of co-benefits, and sometimes changes to communities can adversely affect some groups within the community, especially those who have lower incomes or are people of color. This kind of unintended consequence should be avoided.

A first step in avoiding environmental justice impacts is to actively seek and incorporate participation from all sectors of the community. This should include outreach efforts in

non-traditional as well as traditional media, and may rely on local advocacy groups, and religious and civic organizations. Where languages other than English are used, efforts should be made to provide information and materials in the language(s) most used. The goal of these outreach efforts is true communication, which is two-way. When done successfully, the agency will have explained what it is proposing and what the expected impacts are, and the community members will not only understand those things, but will have the opportunity to have their suggestions and concerns heard and addressed.

In addition to the existing mechanisms for tracking progress towards the goals of a plan or group of plans, it is important to establish a process and a schedule to review the impacts of implementation and especially to look for unintended and potentially adverse outcomes. This review should also include communication with the community. In the unfortunate, and hopefully rare situation where unintended and potentially adverse outcomes are found, steps should be taken to eliminate or mitigate those outcomes right away.

Although addressing climate change is a very important goal, it is not the only goal, and in certain circumstances it is expressly not the goal that governs. Specifically, AB 32 clearly states that climate protection will not come at the expense of air quality and public health protection. In addition, California law guarantees equal environmental protection to all Californians regardless of income status or ethnic background.

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The General Plan is the gateway to transforming our communities into more efficient, low-carbon, sustainable, vital places for us, our families, and our neighbors to live, work, and play. It is within this framework that the web of interactions between policies can be examined and aligned to produce the world we want for our future. The remainder of this report is devoted to exploring the General Plan process and ways to maximize its effectiveness for reducing GHG emissions and lessening the impact of climate change. This chapter discusses legal requirements for General Plans in California and their relation to potential new goals, objectives, policies, and implementation mechanisms to reduce GHG emissions. The General Plan requirements are set out in Section 65300 et seq. of the California Government.

Introduction

Every city and county must adopt "a comprehensive, long term General Plan" (§65300). The General Plan must cover a local jurisdiction's entire planning area and address the broad range of issues associated with a city's or county's development. The General Plan includes diagrams that illustrate the distribution of land uses, location of hazards, and location of the traffic circulation system. A city or county General Plan is expected to reflect local conditions and circumstances, while meeting the minimum requirements set out in state law (§65300.7).

These requirements are discussed in detail in the *General Plan Guidelines* issued by the Governor's Office of Planning and Research, which offers advisory, not mandatory, suggestions for the content of General Plans. In a broad sense, a General Plan is made up of text describing goals, objectives, policies, standards, and/or implementation measures, as well as a set of maps and diagrams. Together, these constituent parts paint a picture of the community's future development. In framing the model policies set forth in Chapter 6 of this report, CAPCOA used the following framework of goals, objectives, policies, standards, and implementation measures:

- Goal - A goal is a general direction for the jurisdiction. It is an ideal future end related to health, safety, or general welfare. "The General Plan shall consist of a statement of development policies and shall include a diagram or diagrams and text setting forth objectives, principles, standards, and plan proposals." (§65302) A goal is a general expression of community values and, therefore, may be abstract in nature and is generally not quantified or time-dependent. *Example: The County shall reduce its greenhouse gas emissions consistent with state and federal planning to reduce the scale and intensity of climate change effects on the County, the state, and the planet.*

- Objective - An objective is a specified end. It should be achievable, measurable and time-specific. An objective may pertain to one particular aspect of a goal or it may be one of several successive steps toward goal achievement. Consequently, there may be more than one objective for each goal. *Example: The County shall reduce its greenhouse gas emissions by 30 percent relative to business as usual emissions projected for year 2020.*

- Policy - A policy is a specific statement that guides decision-making. It indicates a commitment of the local legislative body to a particular course of action. A policy is based on and helps implement a General Plan's objectives. *Example: The County shall require new residential and commercial buildings to be energy-efficient in order to reduce greenhouse gas emissions.*

- Standards - A standard is a rule or measure establishing a level of quality or quantity that must be complied with or satisfied. Standards define the abstract terms of objectives and policies with concrete specifications. *Example: All new residential buildings shall achieve a minimum of 50 points on the Greenpoints rating system and all new commercial buildings shall achieve a minimum standard of LEED certification.*

- Implementation Measures - An implementation measure is an action, procedure, program, or technique that carries out General Plan policy. The General Plan is a policy document and is implemented by other governmental regulations and actions. Many General Plans include at least one corresponding implementation measure for each policy. *Example: The County shall establish a Green Building Ordinance that includes minimum requirements for residential and commercial energy efficiency within 24 months of adoption of the General Plan.*

Consistency

The overriding legal requirement for a General Plan is that it be internally consistent. "In construing the provisions of this article, the Legislature intends that the General Plan and elements and parts thereof comprise an integrated, internally consistent and compatible statement of policies for the adopting agency." (§65300.5). This requirement will come into play as GHG reducing measures are introduced into a General Plan, because so many of the measures cut across elements. So, for example, a land use policy supporting pedestrian-friendly streetscapes in a neighborhood center must be aligned with the transportation measures affecting that same neighborhood center, to ensure that they are compatible. If the transportation measures called for the removal of a planted median strip and the addition of traffic lanes through the neighborhood center, the elements would not be internally consistent.
Consistency is evaluated in five ways:

- All elements are equal - No element can supersede other elements or be the "default" element for resolution of conflicts between General Plan policies.

- Consistency between elements – The requirements of one element may not conflict with the requirements nor hinder the furtherance of goals and objectives of another element.

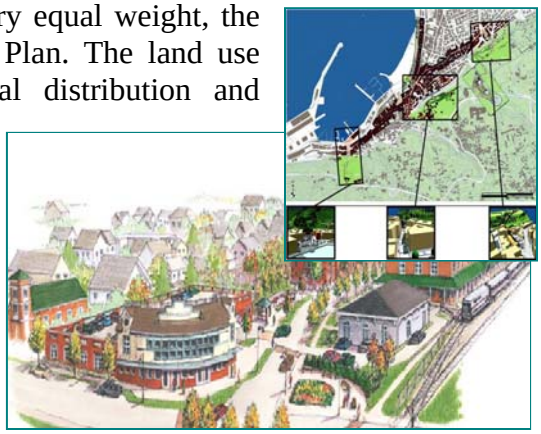
- Consistency within elements – Each element must be internally consistent between its various goals, objectives, and policies.

- Area Plan Consistency – If the General Plan includes Community or Area Plans, those must also be consistent with the overall General Plan.

- Text/Diagram consistency - Diagrams must be consistent with the General Plan's text and vice-versa.

GHG Reduction Opportunities in General Plan Mandatory Elements

Land Use Element



Although all elements of the General Plan carry equal weight, the land use element is the heart of the General Plan. The land use element must address the "proposed general distribution and general location and extent of the uses of the land for housing, business, industry, open space, including agriculture, natural resources, recreation, and enjoyment of scenic beauty, education, public buildings and grounds, solid and liquid waste disposal facilities, and other categories of public and private uses of land" (§65302[a]). The land use element shall include a statement of the standards of population density and building intensity recommended for the various districts and other territory covered by the plan. In addition, the land use element must identify and annually review those areas covered by the plan that are subject to flooding.

The land use element should, consistent with §65302(a), address each of the following issues to the extent that it is relevant:

- Distribution of housing, business, and industry;

- Distribution of open space, including agricultural land;

- Distribution of mineral resources and provisions for their continued availability;

- Distribution of recreation facilities and opportunities;
- Location of educational facilities;
- Location of public buildings and grounds;
- Location of future solid and liquid waste facilities;
- Identify areas subject to flooding;
- Identify existing Timberland Preserve Zone lands; and
- Other categories of public and private uses of land.

The key opportunities in the land use element related to GHG reductions include:

- Foster land use intensity near, along with connectivity to, retail and employment centers and services to reduce vehicle miles travelled and increase the efficiency of delivery of services through adoption and implementation of smart growth principles and policies;
- Improve the local jobs/housing balance to reduce vehicle miles travelled;
- Zone for appropriate mixed use development to encourage walking and bicycling for short trips, rather than vehicles;
- Link residential and commercial development to transit facilities;
- Reduce parking requirements to facilitate higher density development that fosters access by walking, biking and public transit;
- Identify potential sites for renewable energy facilities and transmission lines;
- Promote recycling to reduce waste and energy consumption; and
- Identify appropriate sites for waste recovery facilities to minimize escape of GHGs.

Conservation Element

Generally stated, the conservation element must address "the conservation, development, and utilization of natural resources including water and its hydraulic force, forests, soils, rivers and other waters, harbors, fisheries, wildlife, minerals, and other natural resources" (§65302[d]). This

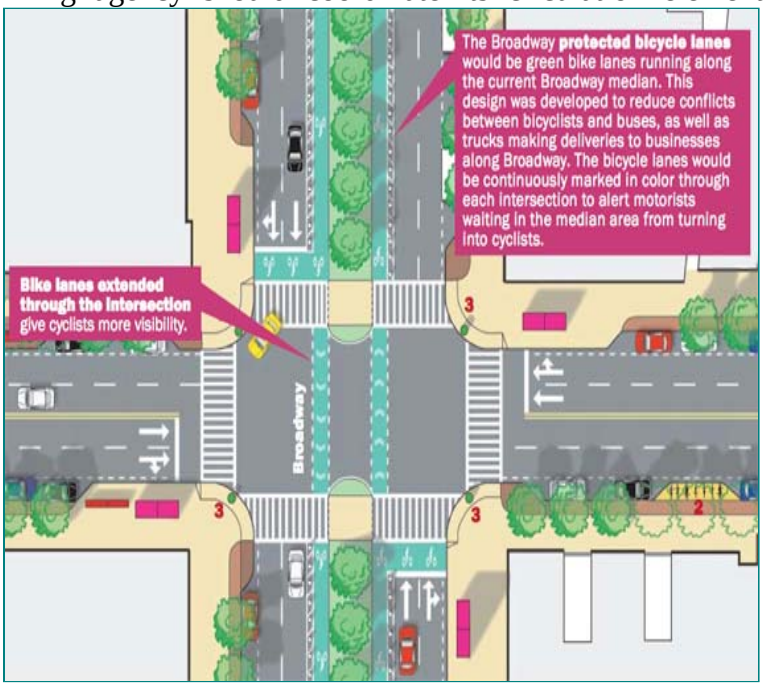
includes, but is not limited to, consideration of water supply to meet future needs, flood protection, the effects of development on water resources, erosion control, pollution prevention, and watershed protection.

The key opportunities in the conservation element related to GHG reductions include:

- Conserve natural lands for carbon sequestration;
- Identify lands suitable for wind power generation;
- Conserve water to promote energy efficiency;
- Promote recycling and waste recovery; and
- Promote urban forestry and reforestation as feasible.

Circulation Element

The circulation element is required "to identify the general location and extent of existing and proposed major thoroughfares, transportation routes, terminals, any military airports and ports, and other local public utilities and facilities, all correlated with the land use element of the plan" (§65302[b]). Typically, the circulation element describes the road system and its minimum development standards, as well as provisions for non-motorized transportation. The local planning agency should coordinate its circulation element provisions with applicable state and regional transportation plans (see §65103[f] and §65080, et seq.). Likewise, the state must coordinate its plans with those of local governments (§65080(a)). The federal government is under a similar obligation (Title 23 USC §134). If the circulation element is to be an effective basis for exactions, it must be based upon traffic studies that are sufficiently detailed to link land uses and related demand to future dedications.



The circulation element's policies can be a means of reducing vehicle miles traveled, a substantial indicator of GHG production from transportation. Key opportunities in the circulation element related to GHG reductions include:

- Identify and prioritize infrastructure improvements needed to support increased use of alternatives to private vehicle travel, including transit, bicycle, and pedestrian modes;
- Coordinate with adjacent municipalities, transit providers, and regional transportation planning agencies to develop mutual policies and funding mechanisms to increase the use of alternative transportation;
- Establish higher priorities for transit funding relative to street and road construction and maintenance;
- Incorporate "Complete Streets" policies that foster equal access by all users, including pedestrians and bicyclists;
- Promote linkages between development locations and transportation facilities;
- Preserve transportation corridors for renewable energy transmission and for new transit lines;
- Identify appropriate locations for intermodal transportation stations; and
- Identify opportunities, in cooperation with transit providers, to provide financing for transit operations and maintenance.

Open Space Element

The open space element is to identify open space for: (1) the preservation of natural resources; (2) the managed production of resources, including but not limited to, forest lands, rangeland, agricultural lands, areas required for recharge of groundwater basins, bays, estuaries, marshes, rivers and streams, and areas containing major mineral deposits; (3) outdoor recreation, including but not limited to, areas of outstanding scenic, historic and cultural value, areas particularly suited for park and recreation purposes, including access to lakeshores, beaches, and rivers and streams; and areas that link major recreation and open-space reservations; (4) for public health and safety; (5) open space in support of the mission of military installations, that comprises areas adjacent to military installations, military training routes, and underlying restricted airspace that can provide additional buffer zones to military activities and complement the resource values of the military lands; and (6) for

the protection of places, features, and objects of cultural value to Native American tribes (§65560).

The key opportunities in the open space element related to GHG reductions include:

- Identify existing and potential future urban growth boundaries to limit sprawling development patterns and foster a more compact urban form;
- Conserve natural lands for carbon sequestration; and
- Promote trail systems to facilitate bicycle and pedestrian trips in lieu of vehicle travel.

Housing Element

A General Plan is required to include a housing element "that facilitate[s] the improvement and development of housing to make adequate provision for the housing needs of all economic segments of the community" (§65580[d]). The housing element must provide opportunities for the private and public sectors to develop sufficient housing meet the jurisdiction's allocated share of the region's housing needs. Unlike the other elements of the General Plan, the housing element requirements are quite detailed and must be followed carefully. In addition, the housing element is subject to review by the state's Housing and Community Development Department for consistency with state law. The housing element must be updated every five years.

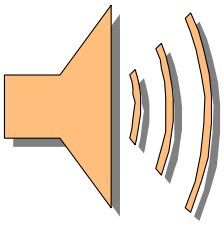
The key opportunities and constraints in the housing element related to GHG reductions include:

- Identify sites for higher density housing closer to employment centers, retail and services, and transit facilities;
- Identify sites for affordable housing for workers close to employment centers;
- Establish or support programs to assist in the energy-efficient retrofitting of older affordable housing units; and
- Balance additional upfront costs for energy efficiency and affordable housing economic considerations by providing or supporting programs to finance energy-efficient housing.

Noise Element

The noise element must identify and appraise noise problems in the community for the purpose of avoiding conflicts with noise-sensitive land uses (§65302[f]).

The noise element does not contain any measures that directly reduce GHG emissions. However, some of the potential GHG reduction strategies in other elements such as increased residential density, mixed use, expanded transit services, and wind energy could adversely affect the noise environment, which would be an issue for the noise element to address. The noise element's development standards may need to be strengthened to ensure that higher densities and mixed uses avoid excessive noise exposure for residents. At the same time, some GHG reduction strategies, for example, those that increase energy efficiency by adding insulation, may have a positive impact on the noise environment.



Safety Element

The safety element is to provide for the protection of the community from any unreasonable risks associated with the effects of seismically induced surface rupture, ground shaking, ground failure, tsunami, seiche (wave), and dam failure; slope instability leading to mudslides and landslides; subsidence, liquefaction, and other seismic hazards, and other geologic hazards known to the legislative body; flooding; and wildland and urban fires (§65302[g]).

With inevitable climate change impacts already occurring and predicted to occur in the future, adaptation to changes in safety hazards, such as potential increase in wildland fire potential or coastal or delta flooding resulting from sea level rise, would be topics of discussion in future safety elements. Adaptation planning for climate change impacts is an important and growing issue area that should be incorporated into local and regional planning processes. As this paper only focuses on GHG reductions, issues related to adaptation are not discussed further.

Air Quality Element (Mandatory Only in the San Joaquin Valley)

Many cities and counties throughout the State have adopted air quality elements. They establish policies for reducing emissions from stationary, mobile, and area sources of air pollution. In most cases, the local air district either provides model elements, or assists the city or county in development of the element. The cities and counties within the jurisdiction of the San Joaquin Valley Air Pollution Control District are required to adopt an air quality element. Under statute, the element is to integrate land use plans, transportation plans, and air quality plans, as well as provide for multimodal transportation options that will reduce vehicle trips (§65302.1). Cities and counties

should contact their local air district when developing an air quality element.

The key opportunities and constraints in an air quality element related to GHG reductions include:

- Integrate land use plans and transportation plans;
- Provide multimodal transportation options;
- Co-benefits of criteria pollutant reduction strategies that also reduce GHG emissions and vice versa; and
- Disbenefits of potential GHG emissions reductions strategies on criteria and other pollutants.

GHG Reduction Opportunities in Non-Mandatory Elements

State planning law authorizes cities and counties to adopt additional elements that "address any other subjects which, in the judgment of the legislative body, relate to the physical development of the county or city" (§65303). There are no statutory requirements for the subjects or content of any of these optional elements. Following are some of the common optional elements. Keep in mind that each city and county has its own definition of what the element should contain.

Energy

A number of cities and counties have adopted energy elements as part of their General Plans. There are no energy element guidelines or standard set of required contents. In some jurisdictions, these elements establish policies for energy extraction. In others, they are concerned with the conservation of energy.

The key opportunities in an energy element related to GHG reductions include:

- Energy-efficiency requirements for residential, commercial, and industrial construction under local jurisdiction that exceed current standards;
- Facilitate residential and commercial renewable energy facilities (solar array installations, individual wind energy generators, etc.);
- Promote cogeneration facilities for combined heating and electricity;
- Facilitate renewable energy facilities and transmission line siting;
- Establish energy-efficiency standards for public facilities;

- Establish policies to reduce municipal and community petroleum consumption through changes in the vehicle fleet; enhancement and promotion of public transit, carpooling and other transportation modes to reduce employee and student commute trips;

- Establish policies to reduce GHG production by city and county operations, such as improved energy efficiency of public buildings, recycling at public buildings.

Economic Development

Economic development elements generally establish policies intended to encourage economic development within the community. These may include establishing incentives for development, identifying areas of greatest development potential, and creating the basis for other economic development activities to be undertaken by the jurisdiction.

The key opportunities in an economic element related to GHG reductions include:

- Incentives for investment in and deployment of renewable energy technologies;

- Incentives for development of local green technology businesses and locally produced green products;

- Incentives for investment in residential and commercial energy efficiency improvements;

- Incentives for employers to provide workforce housing, thereby reducing the length of trips to work;

- Policies to enhance sales tax revenues that promote incorporation of larger retail uses within downtown areas and mixed use developments to facilitate access by alternative transportation, in favor of larger retail or mixed use developments on the urban fringe;

- Establish financing districts (in charter cities) to encourage installation of solar panels and other energy-efficient improvements (e.g., City of Berkeley Solar Financing District, 11/07);

- Encourage implementation of AB 811 (Levine, see Chapter 159, Statutes of 2008), Renewable Energy Resource Credit (7/08), for low interest loans for energy improvements; and

- Use AB 811 to finance the installation of distributed generation renewable energy sources or energy efficiency improvements to lots or parcels which are developed and where the costs and time delays involved in creating an assessment district pursuant to other provisions of law would be prohibitively large relative to the cost of the public improvements to be financed.

Capital Improvements/Public Facilities

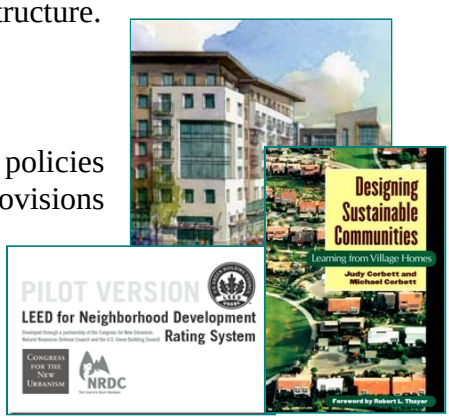
Capital improvements are often discussed in the circulation element of the General Plan. However, some cities and counties have adopted separate capital improvements or public facilities elements that discuss expected demand resulting from growth under the General Plan and identify necessary facilities to serve that growth. In some cases, the element will estimate costs and recommend implementation methods for raising the needed funding.

The key opportunities in a capital improvements/public facilities element related to GHG reductions include:

- Establish energy-efficiency standards for public facilities;
- Promote solar installation opportunities for public facilities;
- Other building design energy and water efficiency standards for public facilities;
- Establish purchasing and procurement policies that support the use of green products and services; and
- Identify needs and funding sources for alternative transportation modes such as bicycle facilities and improved transit infrastructure.

Community Design

Community design elements typically provide a set of policies that promote better urban design. These often include provisions for aesthetic treatments, architectural design guidelines, and preferred street design.



The key opportunities in a community design element related to GHG reductions include:

- Incorporate urban design principles that promote higher residential densities in attractive forms with easily accessible parks and recreation opportunities nearby;

- Use urban design standards to facilitate clustered, higher-density, mixed use communities with greater potential for transit ridership, alternatives to vehicle travel, and shorter trips;

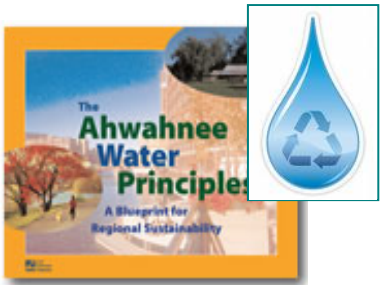
- Establish policies and design principles to incorporate inviting public spaces in high density, mixed use communities;

- Incorporate "Complete Streets" policies that foster equal access by all users, including pedestrians and bicyclists; and

- Promote water-efficient and energy-efficient housing and commercial areas.

Water

A water element typically identifies projected water demand based on the General Plan growth. It describes water supplies within the city or county (most water elements have been adopted by counties) and policies for matching future demand.



Available from: Local Government Commission

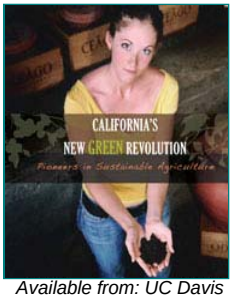
The key opportunities in a water element related to GHG reductions include:

- Incorporate water conservation measures for municipal operations and throughout the community to reduce GHG emissions from pumping and water delivery; and

- Adopt policies and standards to facilitate water recycling for use on landscaping, agricultural operations, and other applications where potable water is not required, to reduce pumping-related GHG emissions.

- Because energy used in moving water through the system is a major component of the GHG inventory, include measures that reduce peak demand for water, and therefore allow for smaller pumps that use less energy overall.

Agriculture



Available from: UC Davis Small Farm Center

Agricultural elements typically identify the highest quality farmland within the city or county (most agricultural elements have been adopted by counties) and establish policies that protect that land from premature conversion to other uses. The goals of an agricultural element are usually aimed at preserving the long-term viability of the agricultural economy of the city or county.

The key opportunities in an agricultural element related to GHG reductions include:

- Establishment of minimum parcel sizes for agricultural lands outside of Agricultural Preserves and restrictions on non-agriculture related development and uses on agricultural parcels to enhance the viability of local agriculture and prevent additional sprawl development that increases dependence on and emissions from private vehicles;

- Development of policies and incentives (e.g., carbon credit programs) to promote voluntary preservation of farmland for carbon sink purposes;

- Adoption of policies and programs that facilitate local farmers markets and farmer co-ops that allow residents to purchase local farm goods and reduce emissions from transportation of agricultural products; and

- Support for agricultural industries that reduce the need to move agricultural products long distances for processing or packaging.

- To the extent the agricultural element addresses water use, it should be noted that efficiencies here, or use of alternatives, can provide substantial GHG reductions.

Element Interrelationships

This section discusses the interrelationships between the mandated General Plan elements by identifying the cross-cutting issues for GHG emissions and opportunities for reductions, categorized by each required element. As previously described, a General Plan must be internally consistent across all adopted elements; thus, cross-cutting issues must be evaluated closely to ensure the goals, objectives, policies and implementation measures in one element do not conflict with, or hinder the implementation of, the requirements of other elements. Cross-cutting issues are first identified in a matrix format; those issues are then matched with the critical relationships that must be established across the elements in a General Plan to identify appropriate linkages and enhance internal consistency. Some examples of consistency considerations include the following:

- Density and Transit-Oriented Development – If increased density and transit-oriented development are strategies used to reduce vehicle miles travelled (and their associated GHG emissions), then the General Plan must provide the land use designations to allow such density to occur, identify the locations where those strategies are to be applied, and identify the land and other infrastructure necessary to facilitate transit connections. This requires consistency between the land use, circulation, housing, and possibly other elements of the General Plan. Further, site constraints such as toxics contamination, noise, or air quality emissions hot spots need to be considered before designating sites for high density and transit-oriented development in order to maintain consistency with the noise and safety elements.

- Specific Plans, Community Plans, and Area Plans: These types of land use plans are used to implement the General Plan. Where the General Plan provides for the preparation of any of these more specific land use plans to implement its strategies, those plans must be consistent with the policies of the General Plan. In particular, development intensity, population density, and location within the community, and roads and transportation facilities will be important facets of plan consistency.

- Energy-Efficiency Requirements – If new policies are added to increase the energy-efficiency requirements beyond that established in current Title 24 standards, these requirements could raise the cost of housing, which could affect the jurisdiction's ability to meet its mandatory requirements for the provision of affordable housing under the housing element. Those policies must not impede the jurisdiction's ability to meet its assigned share of the regional housing need. This requires coordination between the land use, housing, and energy (if one exists) elements.

- Renewable Energy – If new policies require further reliance on renewable energy for municipal and community electricity, then the General Plan must also address the availability of land for new facilities and transmission lines and their compatibility with existing and future adjacent uses. This requires coordination between the land use, circulation, and energy (if one exists) elements and possibly the open space and agriculture elements for transmission lines.

Table 1 (on the next page) summarizes the key element interrelationships relevant to broad GHG reduction strategies. This is also not a comprehensive list of GHG reduction approaches, but is intended to highlight the key linkages between General Plan elements for the strategies with greatest potential for GHG reductions that are under the control or influence of local land use authorities.

Table 1. Element Interrelationships for Greenhouse Gas Emission Reduction Strategies

Reduction Strategy	Key Element Interrelationships
Promotion of jobs/housing balance	Local governments can promote economic development to provide employment for the future workforce of the county and housing appropriate to that workforce to reduce out-of-area and out-of County commute miles and associated vehicle emissions. Mandatory Elements: LAND USE, HOUSING Optional Elements: ECONOMIC DEVELOPMENT
Increased housing density/mixed use/TOD/infill development	Local governments can designate areas of increased density in proximity to employment centers, services, transit linkages, and alternatives to single-occupancy vehicle travel. Mandatory Elements: LAND USE, CIRCULATION, HOUSING, OPEN SPACE Optional Elements: COMMUNITY DESIGN, ECONOMIC DEVELOPMENT
Increased transit	Local government can facilitate increased transit use through efficient links between employment centers, services, and clustered residential areas and to different modes of travel in cooperation with adjacent cities/counties, transportation providers, and regional transportation agencies. Local governments must also address safety and noise issues for new facilities. Mandatory Elements: CIRCULATION, LAND USE, NOISE, SAFETY. AIR QUALITY Optional Elements: AIR QUALITY
Alternative vehicles and alternatives to vehicle travel other than transit	Local government can facilitate bicycle and pedestrian linkages between residential areas, schools, services, centers of employment and recreation. Local government can also utilize alternatively-fueled vehicles for municipal operations and require recharging stations for electric vehicles at new private development Mandatory Elements: CIRCULATION, LAND USE, OPEN SPACE Optional Element: PUBLIC FACILITIES, AIR QUALITY
Energy-Efficiency (public)	Local governments can undertake cost-effective energy-efficient investments, while saving energy costs over the long run. Mandatory Element: LAND USE Optional Elements: ENERGY, PUBLIC FACILITIES, COMMUNITY DESIGN
Energy-Efficiency (private)	Local governments can promote or require energy-efficiency in new residential, commercial, and industrial development that will reduce GHG emissions related to electricity and natural gas consumption. This can include support for programs to retrofit existing residences and businesses. Mandatory Elements: HOUSING, LAND USE Optional Elements: ENERGY, COMMUNITY DESIGN

Reduction Strategy	Key Element Interrelationships
Renewable Energy (utility)	Local governments can identify sites for new renewable energy facilities and transmission lines. Mandatory Elements: LAND USE, CIRCULATION, CONSERVATION Optional Element: ENERGY, AGRICULTURE
Renewable Energy (residential/commercial)	Local governments must balance between the GHG reductions from residential/commercial solar and wind installations and concerns about safety, noise, and aesthetics. Policies should encourage these uses while establishing safety, noise, and aesthetics standards, consistent with state law. Mandatory Elements: LAND USE, NOISE, SAFETY Optional Element: ENERGY
Waste Reduction, Recycling, Reuse, and Recovery	Local governments can promote waste reduction, increased recycling, waste diversion, waste to energy and waste recovery through direct action. Mandatory Elements: LAND USE, CONSERVATION, SAFETY Optional Elements: ENERGY, PUBLIC FACILITIES, AIR QUALITY
Water Conservation and Recycling	Local governments can promote water conservation and recycling through landscaping and irrigation requirements and limitations, fixture and appliance requirements, and expanded use of reclaimed water. Plan policies would set the stage for water conservation and recycling ordinances. Mandatory Elements: LAND USE, CONSERVATION, SAFETY Optional Elements: ENERGY, PUBLIC FACILITIES, AIR QUALITY

Introduction

This chapter provides a presentation of an overarching climate change goal (to reduce municipal greenhouse gas emissions in a manner that is consistent with AB 32) and related objectives, policies, and implementation measures for incorporation into a General Plan - whether as part of an Air Quality element, as a separate Climate Change element, or interspersed throughout other existing elements as appropriate within a General Plan. The model policies provided in this section are grouped by General Plan element, and are provided in a format that should be readily included in a city or county's General Plan. The city or county has full discretion on where to place the policies, whether to change their format or content, and, indeed, whether to incorporate them at all. This report and policies in it are not intended in any way to dictate what a city or county chooses to include in its plan; that choice remains the purview of the locally elected officials who approve the city or county's General Plan.

However, if and when a city or county chooses to incorporate GHG reduction strategies into its General Plan, or into another guiding document, such as a Climate Action Plan, the following policies represent the best practices and current knowledge in land use planning. The climate change policies presented here were compiled through an extensive review of General Plans and Climate Action Plans from cities and counties throughout the State that are already moving forward to address climate change and GHG emissions. CAPCOA, with the help of its contractors, surveyed current practices in the field and aggregated them into model policies to ease the burden on staff at already strapped city and county land use agencies. Those staff remain the experts on their local land use circumstances and needs, however, and their knowledge and judgment, with the oversight of their policy boards, will shape when and how GHG reduction strategies are applied within their jurisdictions. This is not an exhaustive list -- local governments are encouraged to address climate change and GHG emissions through additional or reworked policies and implementation measures according to their unique needs.

The Model Policies

The menu of objectives, policies, and implementation measures is grouped around nine General Plan elements, including one new element, "Greenhouse Gas Reduction Planning." A city or county can place the policies it selects into the most relevant existing General Plan element, if the city or county is integrating GHG reduction strategies throughout its General Plan. On the other hand, the city or county may choose to group all GHG reduction policies under one element, in which case the Greenhouse Gas Reduction Planning element could be broadened to accommodate that. The nine greenhouse gas reduction categories for which model policies are provided are as follows:

1) Greenhouse Gas Reduction Planning (overall);
2) Land Use and Urban Design;
3) Transportation;

4) Energy Efficiency;
5) Alternative Energy;
6) Municipal Operations;
7) Waste Reduction and Diversion;
8) Conservation and Open Space; and
9) Education.

These categories do not correspond exactly to standard California General Plan elements. Some of the policies in this chapter correspond to multiple standard elements, and some do not correspond to any of the required California General Plan elements. These policies could be included in a separate Climate Change element. Please see the table at the end of this chapter for suggestions on which standard elements some of the policies may correspond to. A broad policy goal is identified for GHG reductions in each of these nine categories; more specific objectives are identified within each category; and the model policies are grouped by objective, and are numbered accordingly.

Focus of Policies for Different Communities

There are over 500 cities and counties in California. These jurisdictions range in size from the City of Los Angeles, with over 4 million residents, to the City of Dorris, with less than 900 residents. The eastern portion of the state north of San Bernardino County, and the northern tier of counties from Modoc to Mendocino are generally rural, with only small cities. Although climate change is a global concern and activities throughout the state are contributors, the capability to incorporate and implement climate-related General Plan policies and the applicability of those policies varies among cities and counties.

Policies suitable in urban and suburban areas in the Bay Area, San Joaquin Valley, SCAG region, and San Diego may be infeasible in rural areas that have different land use and resource bases . For that reason, the policies discussed above cannot be considered “one size fits all” solutions. Therefore, providing suggestions about the suitability of policies by general region of the state makes sense.

Air Quality Co-benefits from Greenhouse Gas Reduction Measures

When considering the implementation of a climate change measure, it is vital to consider and discuss the environmental co-benefits associated with GHG reduction measures. If one does not clearly show the co-benefits, then a third party could assume that the only function of a GHG reduction measure is to reduce GHG emissions.

It is well known within the environmental planning community that almost all efforts to reduce GHG emissions result in significant reductions in conventional air pollutant emissions. For instance, most efforts to reduce automobile use through smart growth design principles or improvements in public transit should result in reductions in both

GHG emissions and conventional pollutants associated with smog (such as NOx, PM, VOCs, and ozone). Additionally, efforts to conserve electricity will reduce both GHG emissions and conventional pollutant emissions from power plants.

There are limited scenarios where GHG reductions may cause local air quality impacts. For example, efforts to increase certain types of distributed power generation through the non-optimal combustion of landfill gas may produce localized NOx emissions that contribute to regional smog. Likewise, increasing densities near transit hubs and transportation corridors could increase exposure to unhealthy diesel emissions in certain areas. Fortunately, the potential for adverse air quality impacts from GHG reduction programs and plans is small; in the overwhelming majority of cases, measures implemented to reduce GHG emissions will also contribute to improved air quality.

Since a majority of Californians live in areas where air quality does not meet state and federal health standards for at least one pollutant, GHG reduction measures make sense from a direct and *local* public benefit perspective since they would likely contribute to improved local air quality. Clearly identifying the co-benefits of implementing such measures will potentially engender the support of a broader range of the community.

The communities surrounding the major California ports are a good example. Given the public health concern regarding diesel particulate matter emissions from ships and heavy duty vehicle use near ports, it is highly likely that local residents would prefer and support GHG programs that reduce exposure to pre-existing and well-known local air quality problems to a greater extent than GHG reduction programs that do not have local air quality improvement benefits. Addressing both GHG emissions and local health concerns simultaneously should be encouraged and may determine the selection of optimal multi-target reduction measures.

In general, public support and acceptance of GHG reduction efforts will be enhanced by the clear presentation of the co-benefits associated with these actions. This presents a significant opportunity to local decisionmakers to help improve public health and welfare in their local communities while simultaneously addressing the critical issue of climate change.

Worksheet for Evaluating Policies

Table 2 provides a worksheet for evaluating the expected impact of these policies, as well as factors that affect their implementation. The impacts will vary depending on a number of factors specific to each city and county. As stated previously, the effectiveness of many of these policies depends on how they are applied. For example, a number of the model land use policies are designed to support high-density development near the city center. Done properly, this strategy will result in a workforce that lives near the jobs it fills, and that relies on transit, biking, and walking to commute to work and school, and to reach a broad range of nearby services. If, for example, the housing is not in the proper price range for the workers who fill the local jobs, or if those jobs cannot be easily and safely reached using transit or other modes of transportation, the effect of the strategy

will be much less, and may even be negative. In the worst case, the housing could be purchased by people who work in remote areas and commute to their workplaces in single-occupancy vehicles, and this new housing could displace other housing that was in better balance with the local jobs, causing those workers to commute into the urban core. In the worksheet, each policy is referenced by number and name. For more detail on the policy, please refer to the text of the corresponding model policy, following in this chapter. The worksheet addresses the following factors:

- Implementation Examples: To the extent that CAPCOA has information, this information is already entered in the worksheet, to show the reader/practitioner examples of places this policy has been adopted or implemented in practice.

- Appropriate General Plan Element: This information is also already entered into the worksheet, to suggest (but not dictate) the most appropriate element or elements where the referenced model policy could be incorporated.

- Relative Effectiveness Reducing GHGs: We suggest ranking measures based on your estimate of their relative effectiveness, considering the local environment and constraints. This does not have to be quantitative; a rating of 1 to 3, or 1 to 5, could be used, or Low-Medium-High, for example. For more information on estimating effectiveness, consult the CAPCOA document on CEQA and Climate Change, the California Climate Action Registry, ICLEI[1], or the ARB Local Government Toolkit.

- Relative Difficulty to Implement: This is intended to be a measure of how prepared a jurisdiction is to implement a measure (do you have the necessary authority, knowledge, infrastructure, and resources, for example) as well as the expected political acceptability and the acceptance by the community.

- Relative Time for Reductions to Occur: This is not intended to be a precise measure, rather a qualitative one. We suggest "near term," "mid term," and "long term" for example, or another system for sorting and ranking measures based on when the return is expected to occur.

- Relative Cost: Measures could be rated qualitatively, for example as low, medium, or high costs, or between $ and $$$$$, with more dollar signs indicating a higher relative cost. Alternatively, a rough cost range could be used.

As cities and counties review these model policies and select the ones that are most appropriate for their jurisdictions, they should make clear and careful decisions about criteria that will properly target the policies to best achieve their intended result.

The model policies are provided in a form that begins, "The City/County will…" To reiterate, this is not meant to dictate what any city or county will do; rather, if a city or

[1] ICLEI is Local Governments for Sustainability

county wishes to incorporate a model policy, the policy has been written to allow the city or county to simply insert its name into the policy in place of "The City/County." As already stated, if other language or another format is preferred, the city or county has full discretion to make any such changes.

As previously noted, the California Air Resources Board has developed an online toolkit of measures for local governments to reduce global warming pollution, available at www.coolcalifornia.org. This toolkit contains emissions inventory utilities, case studies of local governments who have effectively reduced their global warming pollution, financial assistance available for conservation efforts, and other valuable information.

Greenhouse Gas Reduction Planning Policies

Goal: Reduce GHG emissions from all activities within the City/County boundaries to support the State's efforts under AB-32 and to mitigate the impact of climate change on the City/County, State, and world.

Objective GHG-1: By 2020, the City/County will reduce greenhouse gas emissions from within its boundaries to a level 30% less than the level that would otherwise occur if all activities continued under a "business as usual" scenario.

GHG-1.1 Emission Inventories: The City/County will establish GHG emissions inventories including emissions from all sectors within the City/County, using methods approved by, or consistent with guidance from, the ARB; the City/County will update inventories every 3 years to incorporate improved methods, better data, and more accurate tools and methods, and to assess progress.

1.1.1 The City/County will establish a baseline inventory of GHG emissions including municipal emissions, and emissions from all business sectors and the community.

1.1.2 The City/county will define a "business as usual" scenario of municipal, economic, and community activities, and prepare a projected inventory for 2020 based on that scenario.

GHG-1.2 Climate Action Plans: The City/County will establish plans to reduce or encourage reductions in GHG emissions from all sectors within the City/County.

1.2.1 The City/County will establish a Municipal Climate Action Plan which will include measures to reduce GHG emissions from municipal activities by at least 30% by 2020 compared to the "business as usual" municipal emissions (including any reductions required by ARB under AB 32).

1.2.2 The City/County will, in collaboration with the business community, establish a Business Climate Action Plan, which will include measures to reduce GHG emissions from business activities, and which will seek to reduce emissions by at least 30% by 2020 compared to "business as usual" business emissions.

1.2.3 The City/County will, in collaboration with the stakeholders from the community at large, establish a Community Climate Action Plan, which will include measures reduce GHG emissions from community activities, and which will seek to reduce emissions by

at least 30% by 2020 compared to "business as usual" community emissions.

1.2.4 Or: The City / County will, in collaboration with the stakeholders from the community at large, establish a CCAP, which will include measures to reduce GHG from community, municipal and business activities by at least 30% by 2020, compared to "business as usual".

GHG-1.1*A* **Emission Inventories:** *(Alternative form)* The City/County will establish GHG emissions inventories including emissions from all sectors within the City/County, using methods approved by, or consistent with guidance from, the ARB; the City/County will update inventories every 4 years to incorporate improved methods, better data, and more accurate tools and methods, and to assess progress.

1.1.1 The City/County will establish a baseline inventory of GHG emissions including municipal emissions, and emissions from all business sectors and the community.

GHG-1.2*A* **Climate Action Plans:** *(Alternative form)* The City/County will establish plans to reduce or encourage reductions in GHG emissions from all sectors within the City/County.

1.2.1 The City/County will establish a Municipal Climate Action Plan which will include measures to reduce GHG emissions from municipal activities by at least 15% by 2020 compared to the baseline municipal emissions inventory (including any reductions required by ARB under AB 32).

1.2.2 The City/County will, in collaboration with the business community, establish a Business Climate Action Plan, which will include measures to incentivize and support reductions in GHG emissions from business activities, and which will seek to reduce emissions by at least 15% by 2020 compared to the baseline business emissions inventory (including any reductions required by ARB under AB-32).

1.2.3 The City/County will, in collaboration with the stakeholders from the community at large, establish a Community Climate Action Plan, which will include measures to incentivize and support reductions in GHG emissions from community activities, and which will seek to reduce emissions by at least 15% by 2020 compared to the baseline community emissions inventory (including any reductions any reductions required by ARB under AB-32).

Objective GHG-2 The City/County will ensure that its local Climate Action, Land Use, Housing, and Transportation Plans are aligned with, support, and enhance any regional plans that have been developed consistent with state guidance to achieve reductions in GHG emissions.

GHG-2.1 Sustainable Communities Strategy/Regional Blueprint Planning: The City/County will participate in the Sustainable Communities Strategy/Regional Blueprint Planning effort and will ensure that local plans are consistent with the Regional Plan.

Land Use and Urban Design Policies

Goal: Promote land use strategies that decrease reliance on automobile use, increase the use of alternative modes of transportation, maximize efficiency of urban services provision and reduce emissions of GHGs.

Objective LU-1: The City/County will adopt and implement a development pattern that utilizes existing infrastructure; reduces the need for new roads, utilities and other public works in new growth areas; and enhances non-automobile transportation.

LU-1.1 Urban Growth Boundary: The City will establish an urban growth boundary (UBG) with related ordinances or programs to limit suburban sprawl; the City/County will restrict urban development beyond the UGB and streamline entitlement processes within the UGB for consistent projects.

1.1.1 Urban development should occur only where urban public facilities and services exist or can be reasonably made available.

1.1.2 The improvement and expansion of one urban public facility or service should not stimulate development that significantly precedes the City's, or other affected jurisdiction's, ability to provide all other necessary urban public facilities and services at adequate levels.

LU-1.2 Reserve Limits: The City/County will redirect new growth into existing city/urban reserve areas.

LU-1.3 Infill: The City/County will encourage high-density, mixed-use, infill development and creative reuse of brownfield, under-utilized and/or defunct properties within the urban core.

LU-1.4 Urban Service Lines: The City/County will maintain a one dwelling unit per 10 acre minimum lot size or lower density in areas outside designated urban service lines.

1.4.1 Adopt an urban-rural transition zone along the urban service line to ensure that land uses within the City / County are compatible with adjacent open space and agricultural uses.

LU-1.5 Density: The City/County will increase densities in urban core areas to support public transit.

1.5.1 Remove barriers to the development of accessory dwelling units in existing residential neighborhoods inside urban service lines.

LU-1.6 Road Width: The City/County will reduce required road width standards wherever feasible to calm traffic and encourage alternative modes of transportation.

LU-1.7 Parking Spaces: The City/County will reduce parking space requirements, unbundle parking from rents and charge for parking in new developments.

LU-1.8 Bicycle Facilities: The City/County will add bicycle facilities to city streets and public spaces.

LU-1.9 Levels of Service: The City/County will discourage the extension of urban levels of service for new development beyond existing urban service lines, and, if necessary, use zoning to assure that development occurs only if public services are adequate.

Objective LU-2: Promote infill, mixed-use, and higher density development, and provide incentives to support the creation of affordable housing in mixed use zones.

LU-2.1 Mixed-Use Development: The City/County will plan for and create incentives for mixed-use development.

2.1.1 The City/County will identify sites suitable for mixed-use development within an existing urban service line and will establish appropriate site-specific standards to accommodate the mixed uses. Site-specific standards could include:

2.1.1.1 Increasing allowable building height or allowing height limit bonuses;

2.1.1.2 Allowing flexibility in applying development standards (such as FAR[2] and lot coverage) based on the location, type, and size of the units, and the design of the development;

2.1.1.3 Allowing the residential component to be additive rather than within the established FAR for that zone, and eliminating maximum density requirements for residential uses in mixed use zones;

2.1.1.4 Allowing reduced and shared parking based on the use mix, and establishing parking maximums where sites are located within 0.25 miles of a public transit stop;

2.1.1.5 Allowing for tandem parking, shared parking and off-site parking leases;

[2] FAR is Floor Area Ratio

2.1.1.6 Requiring all property owners in mixed-use areas to unbundle parking from commercial and residential leases;

2.1.1.7 Creating parking benefit districts, which invest meter revenues in pedestrian infrastructure and other public amenities;

2.1.1.8 Establishing performance pricing of street parking, so that it is expensive enough to promote frequent turnover and keep 15 percent of spaces empty at all times.

2.1.2 The City/County will seek funding to prepare specific plans and related environmental documents to facilitate mixed-use development at selected sites, and to allow these areas to serve as receiver sites for transfer of development rights away from environmentally sensitive lands and rural areas outside established urban growth boundaries.

2.1.3 The City/County will enable prototype mixed-use structures for use in neighborhood center zones that can be adapted to new uses over time with minimal internal remodeling.

2.1.4 The City/County will identify and facilitate the inclusion of complementary land uses not already present in local zoning districts, such as supermarkets, parks and recreational fields, schools in neighborhoods, and residential uses in business districts, to reduce the vehicle miles traveled and promote bicycling and walking to these uses.

EMPHASIS OF DEVELOPMENT

USE	COMMERCIAL	OFFICE	RESIDENTIAL
Retail	50-70%	10-30%	10-30%
Office	0-20%	50-70%	0-30%
Residential	20-40%	0-30%	50-80%
Public	10-30%	10-30%	10-30%

2.1.5 The City/County will work with employers developing larger projects to ensure local housing opportunities for their employees, and engage employers to find ways to provide housing assistance as part of their employee benefits packages; major projects in mixed-use areas should include work-force housing where feasible.

2.1.6 The City/County will revise zoning ordinance(s) to allow local-serving businesses, such as childcare centers, restaurants, banks, family medical offices, drug stores, and other similar services near employment centers to minimize midday vehicle use.

2.1.7 The City / County will develop form-based community design standards to be applied to development projects and land use plans, using a comprehensive community outreach, for areas designated mixed-use

2.1.8 Mix affordable housing units with market rate units as opposed to building segregated affordable housing developments.

Objective LU-3: Promote greater linkage between land uses and transit, as well as other modes of transportation.

LU-3.1 Transit-Supportive Density: The City/County will implement a Housing Overlay Zone for transit centers and corridors. This shall include average minimum residential densities of 25 units per acre within one quarter mile of transit centers; average minimum densities of 15 units per acre within one quarter mile of transit corridors; and minimum FAR of 0.5:1 for non-residential uses within a quarter mile of transit centers or corridors.

LU-3.2 Transit-Oriented Development: The City/County will identify transit centers appropriate for mixed-use development, and will promote transit-oriented, mixed use development within these targeted areas, including:

3.2.1 Amending the Development Code to encourage mixed-use development within one-half mile of intermodal hubs and future rail stations; to offer flexible standards for affordable housing; and to establish minimum residential densities and non-residential FAR;

3.2.2 Rezoning commercial properties to residential and/or mixed-use where appropriate;

3.2.3 Providing expanded zoning for multi-family housing;

3.2.4 Providing maximum parking standards and flexible building height limitations;

3.2.5 Providing density bonus programs;

3.2.6 Establishing guidelines for private and public spaces;

3.2.7 Providing incentives for redevelopment of underutilized areas, such as surface parking lots;

3.2.8 Establishing a minimum pedestrian and bicycle connectivity standard;

3.2.9 Creating parking benefit districts, which invest meter revenues in pedestrian infrastructure and other public amenities;

3.2.10 Establishing performance pricing of street parking, so that it is expensive enough to promote frequent turnover and keep 15 percent of spaces empty at all times;

3.2.11 Discouraging auto-oriented development.

LU-3.3 Transit-oriented Brownfield Development: The City/County will promote the development of brownfield sites and other underused or defunct properties near existing public transportation.

LU-3.4 Public Transit Development Focus: The City/County will ensure new development is designed to make public transit a viable choice for residents, including:

3.4.1 Locating medium-high density development near activity centers that can be served efficiently by public transit and alternative transportation modes;

3.4.2 Locating medium-high density development near streets served by public transit whenever feasible;

3.4.3 Linking neighborhoods to bus stops by continuous sidewalks or pedestrian paths.

LU-3.5 City-centered Corridors: The City/County will establish city-centered corridors, directing development to existing transportation corridors.

LU-3.6 Transit-oriented Development Design Standards: The City / County will develop form-based community design standards to be applied to development projects and land use plans, using a comprehensive community outreach program, for areas designated mixed-use *(suggestion: check language with FBCI[3])*

LU-3.7 Affordable Housing: Affordable housing will be located in transit-oriented development whenever feasible.

Objective LU-4: Promote development and preservation of neighborhood characteristics that encourage walking and bicycle riding in lieu of automobile-based travel.

LU-4.1 Pedestrian-oriented Character: The City/County will create and preserve distinct, identifiable neighborhoods whose characteristics support pedestrian travel, especially within, but not limited to, mixed-use and transit-oriented development areas, including:

[3] FBCI is the Form-Based Codes Institute

4.1.1 Designing or maintaining neighborhoods where the neighborhood center can be reached in approximately five minutes of walking;

4.1.2 Increasing housing densities from the perimeter to the center of the neighborhood;

4.1.3 Directing retail, commercial, and office space to the center of the neighborhood;

4.1.4 Encouraging pedestrian-only streets and/or plazas within developments, and destinations that may be reached conveniently by public transportation, walking, or bicycling;

4.1.5 Allowing flexible parking strategies in neighborhood activity centers to foster a pedestrian-oriented streetscape;

4.1.6 Providing continuous sidewalks with shade trees and landscape strips to separate pedestrians from traffic;

4.1.7 Encouraging neighborhood parks and recreational centers near concentrations of residential areas (preferably within one quarter mile) and include pedestrian walkways and bicycle paths that encourage non-motorized travel.

LU-4.2 Pedestrian Access: The City/County will ensure pedestrian access to activities and services, especially within, but not limited to, mixed-use and transit-oriented development areas, including:

4.2.1 Ensuring new development that provides pedestrian connections in as many locations as possible to adjacent development, arterial streets, thoroughfares;

4.2.2 Ensuring a balanced mix of housing, workplaces, shopping, recreational opportunities, and institutional uses, including mixed-use structures;

4.2.3 Locating schools in neighborhoods, within safe and easy walking distances of residences served;

4.2.4 For new development, primary entrances shall be pedestrian entrances, with automobile entrances and parking located to the rear;

4.2.5 Support development where automobile access to buildings does not impede pedestrian access, by consolidating driveways between buildings or developing alley access;

4.2.6 Street parking provided shall be utilized as a buffer between sidewalk pedestrian traffic and the automobile portion of the roadway;

4.2.7 Establish pedestrian and bicycle connectivity standards for new development, with block sizes between 1 and 2 acres;

4.2.8 For existing areas that do not meet established connectivity standards, prioritize the physical development of pedestrian connectors;

4.2.9 Prioritizing grade-separated bicycle / pedestrian crossings where appropriate to enhance connectivity or overcome barriers such as freeways, railways and waterways.

Objective LU-5: Review fee structures and other opportunities to provide financial and administrative incentives to support desired land uses, development patterns, and alternative modes of transportation.

LU-5.1 Developer Fees: The City/County will promote desired land uses by scaling developer fees based on desired criteria, for example:

5.1.1 Increasing or reducing fees proportionally with distance from the city center or preferred transit sites;

5.1.2 Increasing or reducing fees based on the degree to which mixed uses are incorporated into the project;

5.1.3 Reducing fees for creative re-use of brownfield sites;

5.1.4 Increasing fees for the use of greenfield sites.

LU-5.2 Administrative Fees and Streamlining: The City/County will provide fast-track permitting and reductions in processing fees for desired projects. The City/County will research and implement a program of incentives for development projects that are fully consistent with the Sustainable Communities Strategy / Regional Plan.

LU-5.3 Incentives and Loans: The City/County will provide incentive funding and/or infrastructure loans to support desired projects.

LU-5.4 Infrastructure Preference: The City/County will give preference for infrastructure improvements that support or enhance desired land uses and projects.

Objective LU-6: The City/County will mitigate climate change by decreasing heat gain from pavement and other hard surfaces associated with infrastructure.

LU-6.1 Hardscape Heat Gain: The City/County will reduce heat gain from pavement and other hardscaping, including:

6.1.1 Reduce street rights-of-way and pavement widths to pre-World War II widths (typically 22 to 34 feet for local streets, and 30 to 35 feet for collector streets, curb to curb), unless landscape medians or parkway strips are allowed in the center of roadways;

6.1.2 Reinstate the use of parkway strips to allow shading of streets by trees;

6.1.3 Include shade trees on south- and west-facing sides of structures;

6.1.4 Include low-water landscaping in place of hardscaping around transportation infrastructure and in parking areas;

6.1.5 Install cool roofs, green roofs, and use cool paving for pathways, parking, and other roadway surfaces;

6.1.6 Establish standards that provide for pervious pavement options;

6.1.7 Remove obstacles to xeriscaping, edible landscaping and low-water landscaping.

Transportation Policies

Goal: Reduce GHG emissions by reducing vehicle miles traveled and by increasing or encouraging the use of alternative fuels and transportation technologies.

Objective TR-1: The City/County will reduce VMT-related emissions by encouraging the use of public transit through adoption of new development standards that will require improvements to the transit system and infrastructure, increase safety and accessibility, and provide other incentives.

TR-1.1 Transportation Planning: The City/County will ensure that new developments incorporate both local and regional transit measures into the project design that promote the use of alternative modes of transportation.

TR-1.1.1 Project Selection: The City / County shall give priority to transportation projects that will contribute to a reduction in vehicle miles traveled per capita, while maintaining economic vitality and sustainability.

TR-1.1.2 Equal Pedestrian Access: The City / County shall include sidewalks, separated sidewalks whenever possible, on both sides of all new street improvement projects, except where there are severe topographic or natural resource constraints.

TR-1.1.3 Public Involvement: Carry out a comprehensive public involvement and input process that provides information about transportation issues, projects, and processes to community members and other stakeholders, especially to those traditionally underserved by transportation services.

TR-1.2 System Interconnectivity: The City/County will create an interconnected transportation system that allows a shift in travel from private passenger vehicles to alternative modes, including public transit, ride sharing, car-sharing, bicycling and walking.

1.2.1 Ensure transportation centers are multi-modal to allow transportation modes to intersect;

1.2.2 Provide adequate and affordable public transportation choices, including expanded bus routes and service, as well as other transit choices such as shuttles, light rail, and rail;

1.2.3 To the extent feasible, extend service and hours of operation to underserved arterials and population centers or destinations such as colleges;

1.2.3A Focus transit resources on high-volume corridors and high-boarding destinations such as colleges, employment centers and regional destinations;

1.2.4 Coordinate schedules and routes across service lines with neighboring transit authorities;

1.2.5 Support programs to provide "station cars" for short trips to and from transit nodes (e.g., neighborhood electric vehicles);

1.2.6 Study the feasibility of providing free transit to areas with residential densities of 15 dwelling units per acre or more, including options such as removing service from less dense, underutilized areas to do so;

1.2.7 Employ transit-preferential measures, such as signal priority and bypass lanes. Where compatible with adjacent land use designations, right-of-way acquisition or parking removal may occur to accommodate transit-preferential measures or improve access to transit. The use of access management should be considered where needed to reduce conflicts between transit vehicles and other vehicles;

1.2.8 Provide safe and convenient access for pedestrians and bicyclists to, across, and along major transit priority streets;

1.2.9 Use park-and-ride facilities to access transit stations only at ends of regional transitways or where adequate feeder bus service is not feasible.

TR-1.3 Transit System Infrastructure: The City/County will upgrade and maintain transit system infrastructure to enhance public use, including:

1.3.1 Ensure transit stops and bus lanes are safe, convenient, clean and efficient;

1.3.2 Ensure transit stops have clearly marked street-level designation, and are accessible;

1.3.3 Ensure transit stops are safe, sheltered, benches are clean, and lighting is adequate;

1.3.4 Place transit stations along transit corridors within mixed-use or transit-oriented development areas at intervals of three to four blocks, or no less than one-half mile.

TR-1.4 Customer Service: The City/County will enhance customer service and system ease-of-use, including:

1.4.1 Develop a Regional Pass system to reduce the number of different passes and tickets required of system users;

1.4.2 Implement "Smart Bus" technology, using GPS and electronic displays at transit stops to provide customers with "real-time" arrival and departure time information (and to allow the system operator to respond more quickly and effectively to disruptions in service);

1.4.3 Investigate the feasibility of an on-line trip planning program.

TR-1.5 Transit Funding: The City/County will prioritize transportation funding to support a shift from private passenger vehicles to transit and other modes of transportation, including:

1.5.1 Give funding preference to improvements in public transit over other new infrastructure for private automobile traffic;

1.5.2 Before funding transportation improvements that increase roadway capacity and VMT, evaluate the feasibility and effectiveness of funding projects that support alternative modes of transportation and reduce VMT, including transit, and bicycle and pedestrian access.

TR-1.6 Transit and Multimodal Impact Fees: The City/County will assess transit and multimodal impact fees on new developments to fund public transportation infrastructure, bicycle infrastructure, pedestrian infrastructure and other multimodal accommodations.

Objective TR-2: The City/County will implement traffic and roadway management strategies to improve mobility and efficiency, and reduce associated emissions.

TR-2.1 System Monitoring: The City/County will monitor traffic and congestion to determine when and where the city needs new transportation facilities in order to increase access and efficiency.

TR-2.2 Arterial Traffic Management: The City/County will modify arterial roadways to allow more efficient bus operation, including bus lanes and signal priority/ preemption where necessary.

TR-2.3 Signal Synchronization: The City/County will expand signal timing programs where emissions reduction benefits can be demonstrated, including maintenance of the synchronization system, and will coordinate with adjoining jurisdictions as needed to optimize transit operation while maintaining a free flow of traffic.

TR-2.4 HOV Lanes: The City/County will encourage the construction of high-occupancy vehicle (HOV) lanes or similar mechanisms whenever necessary to relieve congestion and reduce emissions.

TR-2.5 Delivery Schedules: The City/County will establish ordinances or land use permit conditions limiting the hours when deliveries can be made to off-peak hours in high traffic areas.

Objective TR-3: The City/County will reduce VMT related-emissions by implementing and supporting trip reduction programs.

TR-3.1 Ride-Share Programs: The City/County will promote ride sharing programs, including:

3.1.1 Designate a certain percentage of parking spaces for ride-sharing vehicles;

3.1.2 Designate adequate passenger loading, unloading, and waiting areas for ride-sharing vehicles;

3.1.3 Provide a web site or message board for coordinating shared rides;

3.1.4 Encourage private, for-profit community car-sharing, including parking spaces for car share vehicles at convenient locations accessible by public transit;

3.1.5 Hire or designate a rideshare coordinator to develop and implement ridesharing programs.

TR-3.2 Employer-based Trip Reduction: The City/County will support voluntary, employer-based trip reduction programs, including:

3.2.1 Provide assistance to regional and local ridesharing organizations;

3.2.2 Advocate for legislation to maintain and expand incentives for employer ridesharing programs;

3.2.3 Require the development of Transportation Management Associations for large employers and commercial/ industrial complexes;

3.2.4 Provide public recognition of effective programs through awards, top ten lists, and other mechanisms.

TR-3.3 Ride Home Programs: The City/County will implement a city/county wide “guaranteed ride home” program for those who commute by public

transit, ride-sharing, or other modes of transportation, and encourage employers to subscribe to or support the program.

TR-3.4 Local Area Shuttles: The City/County will encourage and utilize shuttles to serve neighborhoods, employment centers and major destinations.

3.4.1 The City/County will create a free or low-cost local area shuttle system that includes a fixed route to popular tourist destinations or shopping and business centers;

3.4.2 The City/County will work with existing shuttle service providers to coordinate their services.

TR-3.5 Low- and No-Travel Employment Opportunities: The City/County will facilitate employment opportunities that minimize the need for private vehicle trips, including:

3.5.1 Amend zoning ordinances and the Development Code to include live/work sites and satellite work centers in appropriate locations;

3.5.2 Encourage telecommuting options with new and existing employers, through project review and incentives, as appropriate.

TR-3.6 Congestion Pricing: Advocate for a regional, market-based system to price or charge for auto trips during peak hours

Objective TR-4: The City/County will support bicycle use as a mode of transportation by enhancing infrastructure to accommodate bicycles and riders, and providing incentives.

TR-4.1 Development Standards for Bicycles: The City/County will establish standards for new development and redevelopment projects to support bicycle use, including:

4.1.1 Amending the Development Code to include standards for safe pedestrian and bicyclist accommodations, including:

4.1.1.1 "Complete Streets" policies that foster equal access by all users in the roadway design;

4.1.1.2 Bicycle and pedestrian access internally and in connection to other areas through easements;

4.1.1.3 Safe access to public transportation and other non-motorized uses through construction of dedicated paths;

4.1.1.4 Safe road crossings at major intersections, especially for school children and seniors;

4.1.1.5 Adequate, convenient and secure bike parking at public and private facilities and destinations in all urban areas;

4.1.1.6 Street standards will include provisions for bicycle parking within the public right of way;

4.1.2 Require new development and redevelopment projects to include bicycle facilities, as appropriate with the new land use, including:

4.1.2.1 Construction of weatherproof bicycle facilities where feasible, and at a minimum, bicycle racks or covered, secure parking near the building entrances;

4.1.2.2 Provision and maintenance of changing rooms, lockers, and showers at large employers or employment centers.

4.1.3 Prohibit projects that impede bicycle and pedestrian access, such as large parking areas that cannot be safely crossed by non-motorized vehicles, and developments that block through access on existing or potential bicycle and pedestrian routes;

4.1.4 Encourage the development of bicycle stations at intermodal hubs, with attended or "valet" bicycle parking, and other amenities such as bicycle rental and repair, and changing areas with lockers and showers;

4.1.5 Conduct a connectivity analysis of the existing bikeway network to identify gaps, and prioritize bikeway development where gaps exist.

TR-4.2 Bicycle and Pedestrian Trails: The City/County will establish a network of multi-use trails to facilitate safe and direct off-street bicycle and pedestrian travel, and will provide bike racks along these trails at secure, lighted locations.

TR-4.3 Bicycle Safety Program: The City/County will develop and implement a bicycle safety educational program to teach drivers and riders the laws, riding protocols, routes, safety tips, and emergency maneuvers.

TR-4.4 Bicycle and Pedestrian Project Funding: The City/County will pursue and provide enhanced funding for bicycle and pedestrian facilities and access projects, including, as appropriate:

4.4.1 Apply for regional, State, and federal grants for bicycle and pedestrian infrastructure projects;

4.4.2 Establish development exactions and impact fees to fund bicycle and pedestrian facilities;

4.4.3 Use existing revenues, such as state gas tax subventions, sales tax funds, and general fund monies for projects to enhance bicycle use and walking for transportation.

TR-4.5 Bicycle Parking: Adopt bicycle parking standards that ensure bicycle parking sufficient to accommodate 5 to 10% of projected use at all public and commercial facilities, and at a rate of at least one per residential unit in multiple-family developments *(suggestion: check language with League of American Bicyclists).*

Objective TR-5: The City/County will establish parking policies and requirements that capture the true cost of private vehicle use and support alternative modes of transportation.

TR-5.1 Parking Policy: The City/County will adopt a comprehensive parking policy to discourage private vehicle use and encourage the use of alternative transportation, including:

5.1.1 Reduce the available parking spaces for private vehicles while increasing parking spaces for shared vehicles, bicycles, and other alternative modes of transportation;

5.1.2 Eliminate or reduce minimum parking requirements for new buildings;

5.1.3 "Unbundle" parking (require that parking is paid for separately and is not included in the base rent for residential and commercial space);

5.1.4 Use parking pricing to discourage private vehicle use, especially at peak times;

5.1.5 Create parking benefit districts, which invest meter revenues in pedestrian infrastructure and other public amenities;

5.1.6 Establish performance pricing of street parking, so that it is expensive enough to promote frequent turnover and keep 15 percent of spaces empty at all times;

5.1.7 Encourage shared parking programs in mixed-use and transit-oriented development areas.

TR-5.2 Event Parking Policies: The City/County will establish policies and programs to reduce onsite parking demand and promote ride-sharing and public transit at large events, including:

5.2.1 Promote the use of peripheral parking by increasing on-site parking rates and offering reduced rates for peripheral parking;

5.2.2 Encourage special event center operators to advertise and offer discounted transit passes with event tickets;

5.2.3 Encourage special event center operators to advertise and offer discount parking incentives to carpooling patrons, with four or more persons per vehicle for on-site parking;

5.2.4 Promote the use of bicycles by providing space for the operation of valet bicycle parking service.

TR-5.3 Parking "Cash-out" Program: The City/County will require new office developments with more than 50 employees to offer a Parking "Cash-out" Program to discourage private vehicle use.

TR-5.4 Electric/Alternative Fuel Vehicle Parking: The City/County will require new commercial and retail developments to provide prioritized parking for electric vehicles and vehicles using alternative fuels.

Objective TR-6: The City/County will support and promote the use of low- and zero-emission vehicles, and alternative fuels, and other measures to directly reduce emissions from motor vehicles.

TR-6.1 Low and Zero Emission Vehicles: The City/County will support and promote the use of low- and zero-emission vehicles, including:

6.1.1 Develop the necessary infrastructure to encourage the use of zero-emission vehicles and clean alternative fuels, such as development of electric vehicle charging facilities and conveniently located alternative fueling stations;

6.1.2 Encourage new construction to include vehicle access to properly wired outdoor receptacles to accommodate ZEV and/or plug in electric hybrids (PHEV);

6.1.3 Encourage transportation fleet standards to achieve the lowest emissions possible, using a mix of alternate fuels, PZEV or better fleet mixes;

6.1.4 Establish incentives, as appropriate, to taxicab owners to use alternative fuel or gas-electric hybrid vehicles.

TR-6.2 Vehicle Idling: The City/County will enforce State idling laws for commercial vehicles, including delivery and construction vehicles.

Energy Efficiency Policies

Goal: Reduce emissions from the generation of electricity by reducing electricity use through increased efficiency.

Objective EE-1 The City/County will establish green building requirements and standards for new development and redevelopment projects, and will work to provide incentives for green building practices and remove barriers that impede their use.

EE-1.1 Green Building Ordinance: The City/County will adopt a Green Building Ordinance that requires new development and redevelopment projects for both residential and commercial buildings to incorporate sufficient green building methods and techniques to qualify for the equivalent of a current LEED Certified rating, GreenPoints, or equivalent rating system.

EE-1.2 Green Building Flexibility: The City/County will allow increased height limits and/or flexibility in other standards for projects that incorporate energy efficient green building practices.

EE-1.3 Green Building Barriers: The City/County will identify and remove regulatory or procedural barriers to implementing green building practices within its jurisdiction, such as updating codes, guidelines, and zoning, and will ensure that all plan review and building inspection staff are trained in green building materials, practices, and techniques.

EE-1.4 Green Building Incentives: The City/County will support the use of green building practices by:

1.4.1 Providing information, marketing, training, and technical assistance about green building practices;

1.4.2 Establishing guidelines for green building practices in residential and commercial development;

1.4.3 Providing financial incentives, including reduction in development fees, administrative fees, and expedited permit processing for projects that use green building practices.

Objective EE-2 The City/County will establish policies and standards to increase energy efficiency at new developments.

EE-2.1 Improved Building Standards: The City/County will adopt energy efficiency performance standards for buildings that achieve a greater reduction in energy and water use than otherwise required by state law, including:

2.1.1 Standards for the installation of "cool roofs";

2.1.2 Performance standards for heat transfer across the building envelope that result in increased insulation and the use of low-emissive windows;

2.1.3 Requirements to install high-efficiency plumbing fixtures and tankless water heaters;

2.1.4 Performance standards that specify high-efficiency space heating and cooling systems;

2.1.5 Requirements for improved overall efficiency of lighting systems;

2.1.6 Requirements for the use of Energy Star® appliances and fixtures in discretionary new development;

2.1.7 New lots shall be arranged and oriented to maximize effective use of passive solar energy.

EE-2.2 Affordable Housing Energy Efficiency: Affordable housing development shall incorporate energy efficient design and features to the maximum extent feasible.

2.2.1 The City/County will target local funds, including redevelopment and community development block grant resources, to assist affordable housing developers in meeting the energy efficiency requirements.

EE-2.3 Outdoor Lighting: The City/County will establish outdoor lighting standards in the Zoning Ordinance, including:

2.3.1 Requirements that all outdoor lighting fixtures be energy efficient, such as:

2.3.1.1 Full cut-off light fixtures at parking lots and on buildings;

2.3.1.2 Photocells or astronomical time switches on all permanently installed exterior lighting;

2.3.1.3 Directional and shielded LED lights for exterior lighting *(for example, see: www.nightwise.org)*, and install exterior and security lights with motion detectors.

2.3.2 Requirements that light levels in all new development, parking lots, and street lighting not exceed state standards;

2.3.3 Requirements that lighting at the urban-rural boundary be designed to provide one-half the light standard for urban areas;

2.3.4 Prohibition against continuous all-night outdoor lighting in sports stadiums, construction sites, and rural areas unless required for security reasons.

EE-2.4 Residential Wood Burning: The City/County will establish or enhance local ordinances that prohibit solid fuel wood-burning devices in mixed-use high-density development and restrict the installation of wood-burning appliances in new or redeveloped single family residential properties to those that burn pellets, natural gas, or propane, or at a minimum, EPA certified wood-burning units.

Objective EE-3: The City/County will establish policies and standards to reduce exterior heat gain and heat island effects.

EE-3.1 Exterior Heat Gain: The City/County will establish standards for new development and for large redevelopment or rehabilitation (for example, additions of more than 25,000 square feet commercial or 100,000 square feet industrial), to reduce exterior heat gain for 50% of non-roof impervious site landscape (roads, sidewalks, courtyards, parking lots, and driveways), including:

3.1.1 Achieving 50% paved surface shading with vegetation within 5 years, in consultation with city/county arborist;

3.1.2 Use of paving materials with a Solar Reflective Index (SRI) of at least 29, or open grid paving systems;

3.1.3 Covered parking (underground, beneath decking or roofs, or beneath a building), where any roof-covered parking uses roofing material with SRI of at least 29.

EE-3.2 Heat Island Mitigation: The City/County will adopt a Heat Island Mitigation Plan that requires cool roofs, cool pavements, and strategically placed shade trees, and will actively inspect and enforce state requirements for cool roofs on non-residential re-roofing projects.

Objective EE-4: The City/County will pursue policies and programs to improve energy efficiency of existing buildings.

EE-4.1 Energy Audits: The City/County will require the performance of energy audits for residential and commercial buildings prior to completion of sale, and that audit results and information about opportunities for energy efficiency improvements be presented to the buyer.

EE-4.2 Energy Efficiency Funding: The City/County will pursue incentives, grants, and creative financing for projects that improve energy efficiency, including, for example, the option for property owners to pay for such improvements through long-term assessments on their property tax bills.

EE-4.3 Community Energy Program: The City/County will implement an outreach and incentive program to promote energy efficiency and conservation in the community, including:

4.3.1 Launch an "energy efficiency challenge" campaign for community residents;

4.3.2 Implement a low-income weatherization assistance program;

4.3.3 Implement conservation campaigns specifically targeted to residents, and separately to businesses;

4.3.4 Promote the purchase of Energy Star® appliances, including, where feasible, incentive grants and vouchers;

4.3.5 Promote participation in the local "Green Business" program;

4.3.6 Distribute free CFL bulbs or other efficiency fixtures to community members;

4.3.7 Offer exchange programs for high-energy-use items, such as halogen torchiere lamps;

4.3.8 Adopt an ordinance requiring energy upgrades at time of property sale.

Alternative Energy Policies

Goal: The City/County will seek to reduce emissions associated with electrical generation by promoting and supporting the generation and use of alternative energy.

Objective AE-1: The City/County will establish policies and programs that facilitate the siting of new renewable energy generation.

AE-1.1 Site Designation: The City/County will identify possible sites for production of renewable energy (such as solar, wind, small hydro, and biogas), as compatible with surrounding uses, and will protect and promote that use, including:

1.1.1 Designate suitable sites to prioritize their development for renewable energy generation;

1.1.2 Evaluate potential land use, environmental, economic, and other constraints on that use, and mitigate such constraints, as feasible;

1.1.3 Adopt measures to protect the renewable energy use of the sites and their resources, such as utility easements, rights-of-way, and land set-asides.

AE-1.2 Removing Barriers: The City/County will identify and remove or otherwise address barriers to renewable energy production, including:

1.2.1 Review and revise building and development codes, design guidelines, and zoning ordinances to remove such barriers;

1.2.2 Work with related agencies, such as fire, water, health and others that may have policies or requirements that adversely impact the development or use of renewable energy technologies;

1.2.3 Develop protocols for safe storage of renewable and alternative energy products with the potential to leak, ignite or explode, such as biodiesel, hydrogen, and/or compressed air.

AE-1.3 Zoning Flexibility: The City/County will allow renewable energy projects in areas zoned for open space, where consistent with the Open Space element, and other uses and values.

Objective AE-2 The City/County will promote and require renewable energy generation, and co-generation projects where feasible and appropriate.

AE-2.1 **On-site Renewable Energy Generation:** The City/County will require that new office/retail/commercial or industrial development, or major rehabilitation (e.g., additions of 25,000 square feet commercial, or 100,000 square feet industrial) incorporate renewable energy generation either on- or off-site to provide 15% or more of the project's energy needs.

AE-2.2 **Co-generation Projects:** The City/County will promote and encourage co-generation projects for commercial and industrial facilities, provided they meet all applicable air quality standards and provide a net reduction in GHG emissions associated with energy production.

AE-2.3 **Green Utilities:** The City/County will promote and support green utilities, and will evaluate the creation of a locally or regionally owned green utility, perhaps in coordination with other regional strategies.

Objective AE-3: The City/County will promote, support, and require, as appropriate, the development of solar energy.

AE-3.1 **Solar-ready Buildings:** The City/County will require that, where feasible, all new buildings be constructed to allow for easy, cost-effective installation of solar energy systems in the future, using such "solar-ready" features as:

3.1.1 Designing the building to include optimal roof orientation (between 20 to 55 degrees from the horizontal), with sufficient south-sloped roof surface;

3.1.2 Clear access without obstructions (chimneys, heating and plumbing vents, etc.) on the south sloped roof;

3.1.3 Designing the roof framing to support the addition of solar panels;

3.1.4 Installation of electrical conduit to accept solar electric system wiring;

3.1.5 Installation of plumbing to support a solar hot water system and provision of space for a solar hot water storage tank.

AE-3.2 **Solar Homes Partnership:** The City/County will require that residential projects of 6 units or more participate in the California Energy Commission's New Solar Homes Partnership, which provides rebates to developers who offer solar power in at least 50% of new units, or a program with similar provisions.

AE-3.3 **Passive Solar Design:** The City/County will require that any building constructed in whole or in part with City/County funds incorporate passive solar design features, such as daylighting and passive solar heating, where feasible.

AE-3.4 Protection of Solar Elements: The City/County will protect active and passive solar design elements and systems from shading by neighboring structures and trees, as consistent with existing tree shading requirements.

Objective AE-4: The City/County will pursue and provide economic incentives and creative financing for renewable energy projects, as well as other support for community members or developers seeking funding for such projects.

AE-4.1 Renewable Energy Incentives: The City/County will provide, where possible, grants, rebates, and incentives for renewable energy projects, including reduced fees and expedited permit processing.

AE-4.2 Creative Financing: The City/County will provide, where feasible, creative financing for renewable energy projects, including subsidized or other low-interest loans, and the option to pay for system installation through long-term assessments on individual property tax bills.

AE-4.3 Partnerships: The City/County will pursue partnerships with other governmental entities and with private companies and utilities to establish incentive programs for renewable energy.

AE-4.4 Information and Support: The City/County will establish and maintain a clearinghouse of information on available funding alternatives for renewable energy projects, rates of return, and other information to support developers and community members interested in pursuing renewable energy projects.

Objective AE-5: The City/County will implement measures to support the purchase and use of renewable and alternative energy.

AE-5.1 Green Electricity Purchasing: The City/County will establish targets for the purchase of renewable energy, in excess of the state Renewable Portfolio Standards, using such mechanisms as green tags or renewable energy certificates.

AE-5.2 Community Choice Aggregation: The City/County will evaluate the feasibility and effectiveness of using Community Choice Aggregation as a model for providing renewable energy to meet the community's electricity needs, including potential partnerships with other jurisdictions.

Municipal Operations Policies

Goal: Reduce GHG emissions from municipal facilities and operations, and by purchasing goods and services that embody or create fewer GHG emissions.

Objective MO-1: The City/County will enhance the energy efficiency of its facilities.

MO-1.1 Energy Efficiency Plan: The City/County will prepare and implement a comprehensive plan to improve energy efficiency of municipal facilities, including:

1.1.1 Conduct energy audits for all municipal facilities;

1.1.2 Retrofit facilities for energy efficiency where feasible and when remodeling or replacing components, including increased insulation, installing green or reflective roofs and low-emissive window glass;

1.1.3 Implement an energy tracking and management system;

1.1.4 Install energy-efficient exit signs, street signs, and traffic lighting;

1.1.5 Install energy-efficient lighting retrofits and occupancy sensors, and institute a "lights out at night" policy;

1.1.6 Retrofit heating and cooling systems to optimize efficiency (e.g., replace chillers, boilers, fans, pumps, belts, etc.);

1.1.7 Install Energy Star® appliances and energy-efficient vending machines;

1.1.8 Improve efficiency of water pumping and use at municipal facilities, including a schedule to replace or retrofit system components with high-efficiency units (i.e., ultra-low-flow toilets, fixtures, etc.);

1.1.9 Provide chilled, filtered water at water fountains and taps in lieu of bottled water;

1.1.10 Install a central irrigation control system and time its operation for off-peak use;

1.1.11 Adopt an accelerated replacement schedule for energy inefficient systems and components.

MO-1.2 Efficiency Requirement for New Facilities: The City/County will require that any newly constructed, purchased, or leased municipal space meet minimum standards as appropriate, such as:

1.2.1 Requirements for new commercial buildings to meet LEED criteria established by the U.S. Green Building Council;

1.2.2 Requirements for new residential buildings to meet criteria of the Energy Star® New Homes Program established by U.S. EPA;

1.2.3 Incorporation of passive solar design features in new buildings, including daylighting and passive solar heating;

1.2.4 Retrofitting of existing buildings to meet standards under Title 24 of the California Building Energy Code, or to achieve a higher performance standard as established by the City/County;

1.2.5 Retrofitting of existing buildings to decrease heat gain from non-roof impervious surfaces with cool paving, landscaping, and other techniques.

MO-1.3 Training & Support: The City/County will ensure that staff receives appropriate training and support to implement objectives and policies to reduce GHG emissions, including:

1.3.1 Provide energy efficiency training to design, engineering, building operations, and maintenance staff;

1.3.2 Provide information on energy use and management, including data from the tracking and management system, to managers and others making decisions that influence energy use;

1.3.3 Provide energy design review services to departments undertaking new construction or renovation projects, to facilitate compliance with LEED standards.

Objective MO-2: The City/County will improve efficiency at municipal systems and reduce GHG emissions from vehicle and equipment engines.

MO-2.1 Wastewater System Efficiency: The City/County will maximize efficiency of wastewater treatment and pumping equipment.

MO-2.2 Drinking Water System Efficiency: The City/County will maximize efficiency at drinking water treatment, pumping, and distribution facilities, including development of off-peak demand schedules for heavy commercial and industrial users.

MO-2.3 Fleet Replacement: The City/County will establish a replacement policy and schedule to replace fleet vehicles and equipment with the most fuel-

efficient vehicles practical, including gasoline hybrid and alternative fuel or electric models.

MO-2.4 Small Tools and Equipment: Install outdoor electrical outlets on buildings to support the use of electric lawn and garden equipment, and other tools that would otherwise be run with small gas engines or portable generators.

Objective MO-3: The City/County will implement measures to reduce employee vehicle trips and to mitigate emissions impacts from municipal travel.

MO-3.1 Trip Reduction Program: The City/County will implement a program to reduce vehicle trips by employees, including:

3.1.1 Providing incentives and infrastructure for vanpooling and carpooling, such as pool vehicles, preferred parking, and a website or bulletin board to facilitate ride-sharing;

3.1.2 Providing subsidized passes for mass transit;

3.1.3 Offering compressed work hours, off-peak work hours, and telecommuting, where appropriate;

3.1.4 Offer a guaranteed ride home for employees who use alternative modes of transportation to commute.

MO-3.2 Bicycle Transportation Support: The City/County will promote and support the use of bicycles as transportation, including:

3.2.1 Providing bicycle stations with secure, covered parking, changing areas with storage lockers and showers, as well as a central facility where minor repairs can be made;

3.2.2 Providing bicycles, including electric bikes, for employees to use for short trips during business hours;

3.2.3 Implementing a police-on-bicycles program;

3.2.4 Providing a bicycle safety program, and information about safe routes to work.

MO-3.3 Municipal Parking Management: The City/County will implement a Parking Management Program to discourage private vehicle use, including:

3.3.1 Encouraging carpools and vanpools with preferential parking and a reduced parking fee;

3.3.2 Institute a parking cash-out program;

3.3.3 Renegotiate employee contracts, where possible, to eliminate parking subsidies;

3.3.4 Install on-street parking meters with fee structures designed to discourage private vehicle use;

3.3.5 Establish a parking fee for all single-occupant vehicles.

MO-3.4 Travel Mitigation: The City/County will mitigate business-related travel, especially air travel, through the annual purchase of verified carbon offsets.

MO-3.5 Transit Access to Municipal Facilities: Municipal employment and service facilities shall be located on major transit corridors, unless their use is plainly incompatible with other uses located along major transit corridors.

Objective MO-4: The City/County will enhance renewable energy generation, and implement programs for load management and demand response.

MO-4.1 Load Management and Demand Response: The City/County will design and implement peak load management and demand response programs for water pollution control, supply and treatment, and distribution, including interface with existing automated systems for building energy management and SCADA systems.

MO-4.2 Renewable Energy Installation: The City/County will install renewable energy systems at its facilities where feasible, including:

4.2.1 Solar collection systems on municipal roofs;

4.2.2 Solar water heating for municipal pools;

4.2.3 Waste-to-energy systems at waste handling operations.

Objective MO-5: The City/County will manage its stock of vegetation to reduce GHG emissions.

MO-5.1 Urban Tree Management: The City/County will conduct a comprehensive inventory and analysis of the urban forest, and coordinate tree maintenance responsibilities with all responsible departments, consistent with best management practices.

MO 5.2 Landscaping: The City/County will evaluate existing landscaping and options to convert reflective and impervious surfaces to landscaping, and will install or replace vegetation with drought-tolerant, low-maintenance

native species or edible landscaping that can also provide shade and reduce heat-island effects.

Objective MO-6: The City/County will use its purchasing power to promote reductions in GHG emissions by the suppliers of its goods and services.

MO-6.1 Purchasing Practices: The City/County will adopt purchasing practices and standards to support reductions in GHG emissions, including preferences for energy-efficient office equipment, and the use of recycled materials and manufacturers that have implemented green management practices.

MO-6.2 Contracting Practices: The City/County will establish bidding standards and contracting practices that encourage GHG emissions reductions, including preferences or points for the use of low or zero emission vehicles and equipment, recycled materials, and provider implementation of other green management practices.

Waste Reduction and Diversion Policies

Goal: Reduce GHG emissions waste through improved management of waste handling and reductions in waste generation.

Objective WRD-1: The City/County will improve emissions control at waste handling facilities.

WRD-1.1 Methane Recovery: The City/County will establish methane recovery at all wastewater and solid waste treatment facilities.

WRD-1.2 Waste to Energy: The City/County will implement waste-to-energy projects where characteristics meet criteria for effective energy generation.

WRD-1.3 Best Management Practices: The City/County will utilize best management practices at all waste handling facilities.

Objective WRD-2: The City/County will implement enhanced programs to divert solid waste from landfill operations.

WRD-2.1 Diversion Targets: The City/County will achieve a solid waste diversion of 75% of the waste stream by 2020.

WRD-2.2 Diversion Services: The City/County will expand jurisdiction-wide waste diversion services to include, for example, single stream curbside recycling, and curbside recycling of food and greenwaste.

WRD-2.3 Construction and Demolition Waste: The City/County will adopt a Construction and Demolition Waste Recovery Ordinance, requiring building projects to recycle or reuse a minimum percentage of unused or leftover building materials, including:

2.3.1 Require all new development and major rehabilitation projects (additions of 25,000 square feet commercial or 100,000 square feet industrial) to recycle or salvage XX% of non-hazardous construction and demolition debris (excluding excavated soil and land-clearing debris);

2.3.2 Require preparation of a construction waste management plan identifying materials to be diverted from disposal, and how material will be stored and handled;

2.3.3 Establish clear and consistent guidelines for calculation methods, recordkeeping, and reporting to document compliance with the plan;

2.3.4 Establish clear and consistent guidelines for how and when used construction materials can be used in new or remodel construction.

WRD-2.4 Reuse Center: The City/County will establish a reuse/recycling center where furniture, appliances, building materials, and other useful, non-hazardous items may be dropped off or purchased for a nominal fee.

WRD-2.5 Program Promotion: The City/County will promote and expand recycling programs, purchasing policies, and employee education to reduce the amount of waste produced.

Objective WRD-3: The City/County will enhance regional coordination on waste management.

WRD-3.1 Regional Coordination: The City/County will coordinate with other agencies in its region to develop and implement effective waste management strategies and waste-to-energy technologies.

Conservation and Open Space Policies

Goal: Conserve natural resources such as water and open space to minimize energy used and GHG emissions and to preserve and promote the ability of such resources to remove carbon from the atmosphere.

Objective COS-1: The City/County will adopt and implement a comprehensive strategy to increase water conservation and the use of recycled water.

COS-1.1 Water Consumption Reduction Target: The City/County will reduce per capita water consumption by X% by 2020.

COS-1.2 Water Conservation Plan: The City/County will establish a water conservation plan that may include such policies and actions as:

1.2.1 Tiered rate structures for water use;

1.2.2 Restrictions on time of use for landscape watering, and other demand management strategies;

1.2.3 Performance standards for irrigation equipment and water fixtures;

1.2.4 Requirements that increased demand from new construction be offset with reductions so that there is no net increase in water use.

COS-1.3 Recycled Water Use: The City/County will establish programs and policies to increase the use of recycled water, including:

1.3.1 Create an inventory of non-potable water uses within the jurisdiction that could be served with recycled water;

1.3.2 Produce and promote the use of recycled water for agricultural, industrial, and irrigation purposes, including grey water systems for residential irrigation;

1.3.3 Produce and promote the use of treated, recycled water for potable uses where GHG emissions from producing such water are lower than from other potable sources.

COS-1.4 Water Conservation Outreach: The City/County will implement a public education and outreach campaign to promote water conservation, and will highlight specific water-wasting activities to discourage, such as the watering of non-vegetated surfaces and using water to clean sidewalks and driveways.

Objective COS-2: The City/County will ensure that building standards and permit approval processes promote and support water conservation.

COS-2.1 Water-Efficient Design: The City/County will establish building design guidelines and criteria to promote water-efficient building design, including minimizing the amount of non-roof impervious surfaces around the building(s).

COS-2.2 Water-Efficient Infrastructure and Technology: The City/County will establish menus and check-lists for developers and contractors to ensure water-efficient infrastructure and technology are used in new construction, including low-flow toilets and shower heads, moisture-sensing irrigation, and other such advances.

COS-2.3 Gray Water System Standards: The City/County will establish criteria and standards to permit the safe and effective use of gray water (on-site water recycling), and will review and appropriately revise, without compromising health and safety, other building code requirements that might prevent the use of such systems.

Objective COS-3: The City/County will establish programs and policies to ensure landscaping and forests are installed and managed to optimize their climate benefits.

COS-3.1 Water-Efficient Landscapes: The City/County will install water-efficient landscapes and irrigation, including:

3.1.1 Planting drought-tolerant and native species, and covering exposed dirt with moisture-retaining mulch;

3.1.2 Installing water-efficient irrigation systems and devices, including advanced technology such as moisture-sensing irrigation controls;

3.1.3 Installing edible landscapes that provide local food.

COS-3.2 Shade Tree Planting: The City/County will promote the planting of shade trees and will establish shade tree guidelines and specifications, including:

3.2.1 Recommendations for tree planting based on the land use (residential, commercial, parking lots, etc.);

3.2.2 Recommendations for tree types based on species size, branching patterns, whether deciduous or evergreen, whether roots are invasive, etc.;

3.2.3 Recommendations for placement, including distance from structures, density of planting, and orientation relative to structures and the sun.

COS-3.3 Urban Forestry Management: The City/County will develop an Urban Forestry Program to consolidate policies and ordinances regarding tree planting, maintenance, and removal, including:

3.3.1 Establish a tree-planting target and schedule to support the goals of the California Climate Action Team to plant 5 million trees in urban areas by 2020;

3.3.2 Establish guidelines for tree planting, including criteria for selecting deciduous or evergreen trees low-VOC-producing trees, and emphasizing the use of drought-tolerant native trees and vegetation.

Objective COS-4: The City/County will establish policies and programs to develop and preserve conservation areas, including forested areas, agricultural lands, wildlife habitat and corridors, wetlands, watersheds, and groundwater recharge areas, that remove and sequester carbon from the atmosphere.

COS-4.1 Conservation Area Development: The City/County will establish programs and funding mechanisms to create protected conservation areas, including:

4.1.1 Imposing mitigation fees for development on lands that would otherwise be conservation areas, and use the funds generated to protect other areas from development;

4.1.2 Proposing for voter approval a small tax increment (e.g., a quarter cent sales tax, perhaps for a finite time period that could be renewed) to fund the purchase of development rights in conservation areas, or purchase of the land outright.

COS-4.2 Conservation Area Preservation: The City/County will establish policies to preserve existing conservation areas, and to discourage development in those areas.

Education and Outreach Policies

Goal: Increase public awareness of climate change and climate protection challenges, and support community reductions of GHG emissions through coordinated, creative public education and outreach, and recognition of achievements.

Objective EO-1: The City/County will establish a coordinated, creative public outreach campaign, including publicizing the importance of reducing GHG emissions and steps community members can take to reduce their individual impacts.

EO-1.1 Outreach Methods: The City/County will use a variety of media and methods to promote climate awareness and GHG reduction, including:

1.1.1 TV and radio spots with local celebrities and community leaders;

1.1.2 Advertising "Green Tips" in the local paper;

1.1.3 Collaborating with utilities, business associations, civic groups, and non-profits to place tips and articles in billing materials or newsletters;

1.1.4 Designing and maintaining an interactive Climate Protection website and collaborating with other organizations to link to the website.

EO-1.2 Outreach Topics: The City/County will coordinate with other agencies and outreach efforts to align messages on topics such as:

1.2.1 Energy efficiency and conservation, and green energy;

1.2.2 Trip reduction, public transit, carpooling, vanpooling, and alternative modes of transportation;

1.2.3 Green building and energy-efficient design;

1.2.4 Waste reduction, recycling, and composting;

1.2.5 Water conservation and water-efficient design and products;

1.2.6 The benefits of buying local, and information about locally grown, prepared, and manufactured goods and local services.

Objective EO-2: The City/County will work with local businesses and energy providers on specific, targeted outreach campaigns and incentive programs.

EO-2.1 Energy Efficiency Campaigns: The City/County will collaborate with local energy suppliers and distributors to establish energy conservation

programs, Energy Star® appliance change-out programs, rebates, vouchers, and other incentives to install energy-efficient technology and products and to cooperate on advertising.

EO-2.2 **Pedestrian and Bicycle Promotion:** The City/County will work with local community groups and downtown business associations to organize and publicize walking tours and bicycle events, and to encourage pedestrian and bicycle modes of transportation.

Objective EO-3: The City/County will organize events and workshops to promote GHG-reducing activities.

EO-3.1 **Waste Reduction:** The City/County will organize workshops on waste reduction activities for the home or business, such as backyard composting, or office paper recycling, and will schedule recycling dropoff events and neighborhood chipping/mulching days.

EO-3.2 **Water Conservation:** The City/County will organize workshops on water conservation activities, such as selecting and planting drought-tolerant, native plants in landscaping, and installing advanced irrigation systems.

EO-3.3 **Energy Efficiency:** The City/County will organize workshops on steps to increase energy efficiency in the home or business, such as weatherizing the home or building envelope, installing smart lighting systems, and how to conduct a self-audit for energy use and efficiency.

EO-3.4 **Climate Protection Summit/Fair:** The City/County will organize an annual Climate Protection Summit or Fair, to educate the public on current climate science, projected local impacts, and local efforts and opportunities to reduce GHG emissions, including exhibits of the latest technology and products for conservation and efficiency.

EO-3.5 **Schools Programs:** The City/County will develop and implement a program to present information to school children about climate change and ways to reduce GHG emissions, and will support school-based programs for GHG reduction, such as school based trip reduction and the importance of recycling.

Objective EO-4: The City/County will sponsor competitions and awards to encourage GHG reductions and recognize success.

EO-4.1 **Climate Champions Awards:** The City/County will establish a Climate Champions Awards program to acknowledge outstanding private and public efforts to reduce GHG emissions.

EO-4.2 **GHG Reduction / Climate Protection Competitions:** The City/County will sponsor competitions and contests with prizes for promoting climate protection and reducing GHG emissions, including such contests as:

4.2.1 Poster contests at schools, with winning entrants receiving scholarship grants and recognition at the Climate Protection Summit/Fair, and posters used in outreach campaigns or compiled in calendars;

4.2.2 Waste diversion contests between schools, businesses, civic organizations, and Scout troops or other groups, with prizes for the greatest percent waste diverted and recognition at the Climate Protection Summit/Fair, and similar contests for planting trees, reducing vehicle trips, or other desired behaviors;

4.2.3 Walkathons, relays, or other similar fundraising challenges, with funds raised to support community climate protection programs and activities.

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Table 2: Worksheet for Model Policies Evaluation

Greenhouse Gas Reduction Planning Policies							
Goal: Reduce GHG emissions from all activities within the City/County boundaries to support the State's efforts under AB32 and to mitigate the impact of climate change on the City/County, State, and world.							
Objective: GHG-1 By 2020, the City/County will reduce greenhouse gas emissions from within its boundaries to a level 30% less than the level that would otherwise occur if all activities continued under a "business as usual" scenario, or to a level 15% less than the levels in 2009.							
Model Policy #	Policy Name/ Subject Area	Implementation Examples (click on link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
GHG-1.1	Emissions Inventories	Cal Poly Pomona GHG inventory	Conservation				
GHG-1.1.1	Baseline Inventory	San Carlos	Conservation				
GHG-1.1.2	Business As Usual Scenario	San Carlos	Conservation				
GHG-1.2	Climate Action Plan (CAP)		Conservation				
GHG-1.2.1	Municipal CAP	San Carlos City of Los Angeles City of Santa Monica – Sustainable City Progress City of Calabasas Issue Paper on GHG Reduction Strategies City of Santa Monica Sustainable Strategies Green County San Bernardino City of Huntington Beach	Conservation				
GHG-1.2.2	Business CAP	The Walt Disney Corporation	Conservation				
GHG-1.2.3	Community CAP	San Carlos	Conservation				
GHG-1.1A	Emissions Inventory Alternative		Conservation				
GHG-1.1	Baseline Inventory – alt		Conservation				
GHG-1.2A	Climate Action Plan (CAP) Alternative		Conservation				
GHG-1.2.1A	Municipal CAP - alt		Conservation				
GHG-1.2.2A	Business CAP - alt		Conservation				
GHG-1.2.3A	Community CAP - alt		Conservation				
Objective: GHG-2 The City/County will ensure that its local Climate Action, Land Use, Housing, and Transportation Plans are aligned with, support, and enhance any regional plans that have been developed consistent with state guidance to achieve reductions in GHG emissions.							
GHG-2.1	Sustainable Communities/ Regional Blueprint	Institute for Local Government Strategies	Land Use/ Circulation				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Land Use and Urban Design Policies							
Goal: Promote land use strategies that decrease reliance on automobile use, increase the use of alternative modes of transportation, and reduce emissions of GHGs.							
Objective: LU-1 The City/County will adopt and implement a development pattern that enhances non-automobile transportation.							
Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
LU-1.1	Urban Growth Boundary	County of Santa Clara Urban Growth Boundary Portland Metropolitan Area Petaluma 2025 General Plan Land Use GOAL 1-G-3: Maintain a well-defined boundary at the edge of urban development. Page 1-15 Land Use GOAL 1-G-4: Urban Growth Boundary Maintain a parcel-specific Urban Growth Boundary. Page 1-17	Land Use / Open Space				
LU-1.1.1	Location of Urban Development		Land Use / Open Space				
LU-1.1.2	Timing of Urban Development		Land Use / Open Space				
LU-1.2	Reserve Limits	Agricultural Land Reserve	Land Use				
LU-1.3	Infill	Smart Infill Greenbelt Alliance State of California Interim Hearing: Best Practices Successful Infill Development Marin Countywide Plan Goal CD-6 Page 3-30, Community Development, Built Environment Element	Land Use				
LU-1.4	Urban Service Lines	Santa Cruz County Urban Services Line	Land Use				
LU-1.4.1	Urban-Rural Transition Zone		Land Use				
LU-1.5	Density	City of Pasadena 2004 General Plan	Land Use				
LU-1.5.1	Barriers to Accessory Units		Land Use				
LU-1.6	Road Width		Circulation				
LU-1.7	Parking Spaces	Victoria Transport Policy Institute Parking Management Los Angeles Department of Transportation Parking and Smart Growth Study MTC Parking Best Practices see page 29 through fin MTC Parking Toolbox see page 29-33 Parking Policy Transit Oriented Development: Lessons for Cities Transit Agencies & Developers	Land Use				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
LU-1.8	Bicycle Facilities	San Francisco Municipal Transportation Authority Bicycle Parking San Francisco Bicycle Coalition Bike Parking at Work Alameda Bicycle	Circulation				
LU-1.9	Levels of Service	San Francisco Department of Public Health 1 / 2 San Francisco County Transportation Authority 1 / 2	Land Use				
Objective: LU-2 Promote infill, mixed use, and higher density development, and provide incentives to support the creation of affordable housing in mixed use zones.							
LU-2.1	Mixed-Use Development	Marin Countywide Plan Goal CD-8, Policy CD 8.7 Page 3-39, Community Development, Built Environment Element Goal DES-2, DES-3, Community Development, Built Environment Element Page 3-84	Land Use				
LU-2.1.1	Site-Specific Standards		Land Use				
LU-2.1.1.1	Allowable Building Height		Land Use				
LU-2.1.1.2	Flexible Development Standards		Land Use				
LU-2.1.1.3	Additive Residential Component/ Eliminate Density		Land Use				
LU-2.1.1.4	Reduced and Shared Parking		Land Use				
LU-2.1.1.5	Tandem and Offsite Parking		Land Use				
LU-2.1.1.6	Unbundle Parking from Leases		Land Use				
LU-2.1.1.7	Parking Benefit Districts		Land Use				
LU-2.1.1.8	Performance Pricing of Parking		Land Use				
LU-2.1.2	Supportive Pre-planning		Land Use				
LU-2.1.3	Prototype Adaptive Use Buildings		Land Use				
LU-2.1.4	Facilitate Complementary Uses		Land Use				
LU-2.1.5	Employer-Assisted Housing		Housing				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
LU-2.1.6	Services Near Employment Centers		Land Use				
LU-2.1.7	Form-based Standards		Land Use				
LU-2.1.8	Non-segregated Affordable Housing		Land Use				
Objective LU-3 Promote greater linkage between land uses and transit, as well as other modes of transportation.							
LU-3.1	Housing Overlay Zone	Marin Countywide Plan Goal CD-2, Policy CD-2.3; Page 3-15, Community Development, Built Environment Element	Land Use				
LU-3.2	Transit-oriented Mixed-use	US Federal Highway Administration: Fruitvale Transit Village Project Marin Countywide Plan Goal DES-2 Page 3-60, Community Design, Built Environment Element Smart Communities Network Transit Strategies	Land Use				
LU-3.2.1	Amend Code to Promote Transit-oriented Mixed-use		Land Use				
LU-3.2.2	Rezone to Allow Mixed Use		Land Use				
LU-3.2.3	Expand Zoning for Multi-Family Housing		Land Use				
LU-3.2.4	Flexible Parking & Bldg. Height		Land Use				
LU-3.2.5	Density Bonus Programs	County of San Diego Density Bonus Program	Land Use				
LU-3.2.6	Guidelines for Private/Public Spaces		Land Use				
LU-3.2.7	Incentives for Redevelopment	City of Knoxville Downtown Incentives	Land Use				
LU-3.2.8	Pedestrian/ Bicycle Connectivity		Land Use				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
LU-3.2.9	Parking Benefit Districts		Land Use				
LU-3.2.10	Performance Pricing for Parking		Land Use				
LU-3.2.11	Discourage Auto-oriented Development		Land Use				
LU-3.3	Transit-oriented Brownfield Development	Marin Countywide Plan Goal CD-6, Page 3-31, Community Development, Built Environment Element Multi Housing News Case Study Windsor, Ontario Brownfield's Strategy	Land Use				
LU-3.4	Public Transit Development Focus	Marin Countywide Plan Goal DES-2 Page 3-60, Community Design, Built Environment Element Victoria Transport Policy Institute 21 TOD Projects in California - Caltrans MTC - 10 Transit Oriented Development Profiles	Land Use				
LU-3.4.1	Density Near Activity Centers	City of Sacramento Smart Growth Strategy	Land Use				
LU-3.4.2	Density Near Transit Routes		Land Use				
LU-3.4.3	Links to Transit Stops		Land Use				
LU-3.5	City-centered Corridors	Map of Marin County	Land Use				
LU-3.6	Transit-oriented Development Design Standards		Land Use				
LU-3.7	Affordable Housing		Land Use				
Objective: LU-4 Promote development and preservation of neighborhood characteristics that encourage walking and bicycle riding in lieu of automobile-based travel.							
LU-4.1	Pedestrian-oriented Character	City of Los Angeles	Land Use				
LU-4.1.1	Design Short Walk to Center		Land Use				
LU-4.1.2	Increase Density Towards Center		Land Use				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
LU-4.1.3	Direct Business Space to Center		Land Use				
LU-4.1.4	Pedestrian Only Streets/Plazas	Urban Design International Santa Monica's Third Street Promenade Abstract	Circulation				
LU-4.1.5	Flexible Parking for Streetscape		Circulation				
LU-4.1.6	Continuous Separated Sidewalks		Circulation				
LU-4.1.7	Bike/Walk Paths to Parks		Circulation				
LU-4.2	Pedestrian Access	City of Los Angeles Marin Countywide Plan Goal TR-2 Page 3-159, Transportation, Built Environment Element	Circulation				
LU-4.2.1	Connectivity of Development		Land Use				
LU-4.2.2	Balanced Mix of Development	Petaluma 2025 General Plan Goal 1-G-1, page 1-14; Maintain a balanced land use program that meets the long-term residential, employment, retail, institutional, education, recreation, and open space needs of the community.	Land Use				
LU-4.2.3	Locate Schools w/ Safe Routes	Transportation Authority of Marin Safe Routes to Schools Transform Safe Routes to School	Land Use				
LU-4.2.4	Entrances to New Development		Land Use				
LU-4.2.5	Location of Driveways		Land Use				
LU-4.2.6	Street Parking as Buffer		Land Use				
LU-4.2.7	Pedestrian/ Bicycle Connectivity		Land Use				
LU-4.2.8	Develop Pedestrian Connectors		Land Use				
LU-4.2.9	Grade-separated Crossings		Land Use				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
Objective LU-5 Review fee structures and other opportunities to provide financial and administrative incentives to support desired land uses, development patterns, and alternative modes of transportation.							
LU-5.1	Developer Fees	ABAG memo to JPC PolicyLink Infill bonuses and Incentives Brownfields Smart Growth Incentives & Loans for Businesses – New Jersey	Land Use				
LU-5.1.1	Proportional to Distance from Center		Land Use				
LU-5.1.2	Incentivize Mixed Use		Land Use				
LU-5.1.3	Reduce fees for Brownfield Redevelopment		Land Use				
LU-5.1.4	Fees for Greenfield Development		Land Use				
LU-5.2	Admin. Fees & Streamlining		Land Use				
LU-5.3	Incentives & Loans		Land Use				
LU-5.4	Infrastructure Preference		Land Use				
Objective LU-6 The City/County will mitigate climate change by decreasing heat gain from pavement and other hard surfaces associated with infrastructure.							
LU-6.1	Hardscape Heat Gain	Cool Houston Plan	Land Use				
LU-6.1.1	Reduce Pavement Widths		Circulation				
LU-6.1.2	Include Parkway Strips		Circulation				
LU-6.1.3	Shade Trees on South and West		Land Use				
LU-6.1.4	Replace Hardscape with Low-Water Landscape		Land Use				
LU-6.1.5	Cool Roofs & Paving	Cool Houston Plan Cool Roof Rating Council	Land Use				
LU-6.1.6	Pervious Pavement Standards		Land Use				
LU-6.1.7	Xeriscaping		Land Use				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Transportation Policies							
Goal: Reduce GHG emissions by reducing vehicle miles traveled and by increasing or encouraging the use of alternative fuels and transportation technologies.							
Objective: TR-1 The City/County will reduce VMT-related emissions by encouraging the use of public transit through adoption of new development standards that will require improvements to the transit system and infrastructure, increase safety and accessibility, and provide other incentives.							
Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
TR-1.1	Transportation Planning	San Francisco Municipal Transportation Authority	Circulation				
TR-1.1.1	Project Selection						
TR-1.1.2	Equal Pedestrian Access		Circulation				
TR-1.1.3	Public Involvement		Circulation				
TR-1.2	System Interconnectivity	San Francisco Municipal Transportation Authority	Circulation				
TR-1.2.1	Multi-modal Transportation Ctrs.	RTD Fastracks	Circulation				
TR-1.2.2	Provide Transportation Options	City of Santa Monica Sustainable Transportation	Circulation				
TR-1.2.3	Extend Transit Service & Hours	King County Night Service	Circulation				
TR-1.2.3A	Focus Transit Resources		Circulation				
TR-1.2.4	Coordinate Across Service Lines	RTD Fastracks	Circulation				
TR-1.2.5	Support "Transit Cars"	King County Free Transit Area	Circulation				
TR-1.2.6	Free Transit Feasibility		Circulation				
TR-1.2.7	Transit Preference Measures		Circulation				
TR-1.2.8	Safe Access Along Major Streets		Circulation				
TR-1.2.9	Park-and-ride Locations		Circulation				
TR-1.3	System Infrastructure	RTD Fastracks	Circulation				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
TR-1.3.1	Efficient, Convenient Bus Stops		Circulation				
TR-1.3.2	Bus Stop Signage & Access		Circulation				
TR-1.3.3	Safe, Clean, Lighted Bus Stops		Circulation				
TR-1.3.4	Transit Station Locations		Circulation				
TR-1.4	Customer Service		Circulation				
TR-1.4.1	Develop Regional Pass System	Bay Area Translink	Circulation				
TR-1.4.2	Implement Smart Bus Technology	AC Transit	Circulation				
TR-1.4.3	Online Trip Planning		Circulation				
TR-1.5	Transit Funding		Circulation				
TR-1.5.1	Funding Preference for Transit		Circulation				
TR-1.5.2	Evaluate Feasible Alternatives		Circulation				
TR-1.6	Transportation Impact Fees	San Francisco County Transportation Authority Transportation Impact Fee	Circulation				
Objective: TR-2 The City/County will implement traffic and roadway management strategies to improve mobility and efficiency, and reduce associated emissions.							
TR-2.1	System Monitoring		Circulation				
TR-2.2	Arterial Traffic Mgt.		Circulation				
TR-2.3	Signal Synchronization		Circulation				
TR-2.4	HOV Lanes	MTC Riverside County Transportation Commission SANBAG HOV	Circulation				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
TR-2.5	Delivery Schedules		Circulation				
Objective: TR-3 The City/County will reduce VMT-related emissions by implementing and supporting trip reduction programs.							
TR-3.1	Ride-Share Programs	King County Ride Share Program UC Irvine Transportation Services	Circulation				
TR-3.1.1	Designated Ride-share Parking		Circulation				
TR-3.1.2	Provide Loading, Unloading, & Waiting Areas		Circulation				
TR-3.1.3	Ride Coordination Support	San Francisco Car and Van Pool	Circulation				
TR-3.1.4	Support Car-sharing Services	San Francisco Car Sharing	Circulation				
TR-3.1.5	Ride-share Coordinator	South Coast AQMD Rule 2202	Circulation				
TR-3.2	Employer-based Trip Reduction	San Francisco Transit Benefit Ordinance	Circulation				
TR-3.2.1	Support Ride-share Organizations	South Coast AQMD Rule 2202	Circulation				
TR-3.2.2	Support Ride-share Legislation		Circulation				
TR-3.2.3	Support Transp. Mgt. Assns.		Circulation				
TR-3.2.4	Recognize Effective Programs		Circulation				
TR-3.3	Ride Home Programs	San Francisco Emergency Ride Home Metro Transit Rider Programs	Circulation				
TR-3.4	Local Area Shuttles	City of Burlingame Public Transportation Caltrain Shuttle Services	Circulation				
TR-3.4.1	Reduced-cost Shuttle Service		Circulation				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
TR-3.4.2	Shuttle Service Coordination		Circulation				
TR-3.5	Low- and No-Travel Employment Opportunities		Circulation				
TR-3.5.1	Zoning & Codes for Live-Work		Land Use				
TR-3.5.2	Support Telecommuting	San Francisco Telecommuting Policy	Circulation				
TR-3.6	Congestion Pricing		Circulation				
Objective TR-4 The City/County will support bicycle use as a mode of transportation by enhancing infrastructure to accommodate bicycles and riders, and providing incentives.							
TR-4.1	Development Standards for Bicycles	San Francisco Municipal Transportation Authority Bicycle Plan	Circulation				
TR-4.1.1	Amend Code to Accommodate Bikes & Pedestrians	San Francisco Municipal Transportation Authority Livable Streets Caltrans Pedestrian & Bicycle Facilities in CA	Circulation				
TR-4.1.1.1	"Complete Streets" Policies	San Francisco Municipal Transportation Authority Livable Streets	Circulation				
TR-4.1.1.2	Include Access thru Easements		Circulation				
TR-4.1.1.3	Dedicated Bike/Pedestrian Paths	New York City Transportation City of Berkeley Transportation	Circulation				
TR-4.1.1.4	Safe Road Crossings	City of Berkeley Transportation	Circulation				
TR-4.1.1.5	Bicycle Parking	King County Bike Facilities City of Albuquerque Biking & Walking	Circulation				
TR-4.1.1.6	Street Standards for Bike Parking		Circulation				
TR-4.1.2	Bike Facilities in New Development	King County Bike Facilities	Circulation				
TR-4.1.2.1	Weather Protected Bike Parking		Circulation				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
TR-4.1.2.2	Changing Rooms, Showers, etc.		Circulation				
TR-4.1.3	Prohibit Projects that Impede Bicycle/ Pedestrian Transit		Circulation				
TR-4.1.4	Bicycle Support Services	San Francisco Municipal Transportation Authority Bicycle Plan	Circulation				
TR-4.1.5	Connectivity Analysis		Circulation				
TR-4.2	Bicycle and Pedestrian Trails	City of Berkeley Transportation City of Albuquerque Biking & Walking	Circulation				
TR-4.3	Bicycle Safety Program	City of Berkeley Transportation California DMV Bike Rules and Safety	Circulation				
TR-4.4	Bicycle and Pedestrian Project Funding		Circulation				
TR-4.5	Bicycle Parking		Circulation				
TR-4.4.1	Apply for Infrastructure Grants	City of Olympia Neighborhood Sustainability Grants	Circulation				
TR-4.4.2	Devel. Exactions & Impact Fees		Circulation				
TR-4.4.3	Redeploy Existing Revenues		Circulation				
Objective TR-5 The City/County will establish parking policies and requirements that capture the true cost of private vehicle use and support alternative modes of transportation.							
TR-5.1	Parking Policy	Redwood City Downtown Parking Management Plan MTC Parking Best Practices	Land Use				
TR-5.1.1	More Parking for Shared Vehicles		Land Use				
TR-5.1.2	Eliminate/ Reduce Parking Minimums	City of Alameda Memo Parking Management Strategy	Land Use				
TR-5.1.3	Require Unbundled Parking	City of Santa Monica Transportation Management	Land Use				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
TR-5.1.4	Increase Parking Rates	Redwood City	Land Use				
TR-5.1.5	Limit Parking Times		Circulation				
TR-5.1.6	Performance Pricing of Parking		Circulation				
TR-5.1.7	Shared Parking		Circulation				
TR-5.2	Event Parking Policies	San Francisco Municipal Transportation Agency Events Parking City of Berkeley Special Events Parking	Circulation				
TR-5.2.1	Promote Peripheral Parking		Circulation				
TR-5.2.2	Transit Discounts to Events		Circulation				
TR-5.2.3	Carpool Parking at Events		Circulation				
TR-5.2.4	Valet Bike Parking at Events	Secure Valet Bike Parking	Circulation				
TR-5.3	Parking Cash-out Program	City of Santa Monica Transportation Management	Circulation				
TR-5.4	Elec./Alt. Fuel Vehicle Policies	City of Albuquerque Alternative Fuels Program	Circulation				
Objective TR-6 The City/County will support and promote the use of low and zero emission vehicles, and alternative fuels, and other measures to directly reduce emissions from motor vehicles.							
TR-6.1	Low and Zero Emission Vehicles	City of Olympia Sustainability City of Columbus Green Fleet	Circulation				
TR-6.1.1	Electric & Alt. Fuel Infrastructure	San Francisco Municipal Transportation Agency Clean Air Initiatives	Circulation				
TR-6.1.2	Charging Access in New Development		Circulation				
TR-6.1.3	Fleet Standards	San Jose Green Fleet Policy	Circulation				
TR-6.1.4	Elec./Alt Fuel Taxicab Incentives		Circulation				
TR-6.2	Vehicle Idling	Minneapolis Anti Idling Ordinance	Circulation				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
Energy Efficiency Policies							
Goal: Reduce emissions from the generation of electricity by reducing electricity use through increased efficiency.							
Objective: EE-1 The City/County will establish green building requirements and standards for new development and redevelopment projects, and will work to provide incentives for green building practices and remove barriers that impede their use.							
EE-1.1	Green Building Ordinance	Berkeley Residential Energy Conservation Ordinance; San Francisco Residential Energy Conservation Ordinance; Rohnert Park Green Building Ordinance; City of Los Angeles – Green Building	Conservation				
EE-1.2	Green Building Flexibility	Santa Monica	Conservation				
EE-1.3	Green Building Barriers		Conservation				
EE-1.4	Green Building Incentives	Arlington Green Building Incentives; Matrix of Examples; Build It Green Examples	Conservation				
EE-1.4.1	Information, Training, & Technical Assistance	Mothers of East LA Local group, environmental awareness, green business	Conservation				
EE-1.4.2	Guidelines for Green Building	Build It Green Guidelines and Checklist	Conservation				
EE-1.4.3	Financial Incentives		Conservation				
Objective: EE-2 The City/County will establish policies and standards to increase energy efficiency at new developments.							
EE-2.1	Improved Building Standards	City of Boulder Residential Building Guide	Conservation				
EE-2.1.1	"Cool Roofs" Standards	CA Title 24 2008 Update	Conservation				
EE-2.1.2	Building Envelope Heat Transfer		Conservation				
EE-2.1.3	High-Efficiency Plumbing	Alliance for Water Efficiency	Conservation				
EE-2.1.4	High-Efficiency Heating & Cooling	Solano County Green Building Ordinance	Conservation				
EE-2.1.5	Overall Lighting Efficiency	San Francisco Fluorescent Lighting Efficiency Ordinance; Chittenden County, VT Lighting Program	Conservation				
EE-2.1.6	Energy Star® Appliances	Palm Desert Ord. 1124 Section 24.30.050	Conservation				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
EE-2.1.7	Orientation of New Lots		Conservation				
EE-2.2	Affordable Housing Energy Efficiency	The Chicago Housing Authority Energy Cost Savings Program City of Denver	Housing Conservation				
EE-2.2.1	Redevelopment Grants		Housing Conservation				
EE-2.3	Outdoor Lighting	Chittenden County, VT Lighting Program	Land Use Conservation*				
EE-2.3.1	Outdoor Lighting Efficiency Standards		Conservation See EE-2.3				
EE-2.3.1.1	Full Cut-off Fixtures		Conservation See EE-2.3				
EE-2.3.1.2	Photocells or Timed Switches		Conservation See EE-2.3				
EE-2.3.1.3	Directional/ Shielded LED Lights		Conservation See EE-2.3				
EE-2.3.2	Light Level Standards		Land Use Conservation				
EE-2.3.3	Urban/Rural Light Levels		Land Use Conservation				
EE-2.3.4	Prohibit Continuous Lighting		Land Use Conservation				
EE-2.4	Residential Wood Burning	Bay Area AQMD	Conservation*				
Objective: EE-3 The City/County will establish policies and standards to reduce exterior heat gain and heat island effects.							
EE-3.1	Exterior Heat Gain	Cool Houston Plan Page 5	Land Use Conservation*				
EE-3.1.1	50% Paved Surface Shading	City of Fresno Performance Standard for Parking Lot Shading	Land Use Conservation				
EE-3.1.2	Standards for Paving Materials	New Jersey Standard for Paving	Land Use Conservation				
EE-3.1.3	Standards for Roofing Materials	CA Title 24 2008 Update	Land Use Conservation				

* Best-judgment category, i.e. depending on city/county circumstances and scope of General Plan elements, policy could also be included in other mandatory element or in other optional element

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click on link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
EE-3.2	Heat Island Mitigation	Cool Houston Plan City of Chicago	Land Use Conservation				
Objective EE-4 The City/County will pursue policies and programs to improve energy efficiency of existing buildings.							
EE-4.1	Energy Audits	Austin Energy Audits	Energy*				
EE-4.2	Energy Efficiency Funding	City of Ann Arbor	Energy				
EE-4.3	Community Energy Program	Community Energy Services Corporation Portland Community Energy Project	Energy				
EE-4.3.1	"Energy Efficiency Challenge"		Energy				
EE-4.3.2	Low-income Weatherization Assistance	Portland Block by Block Weatherization Program	Energy, Housing				
EE-4.3.3	Conservation Campaigns	Ashland Conservation Program	Energy				
EE-4.3.4	Promote Energy Star®		Energy				
EE-4.3.5	Promote "Green Business"	Ashland Conservation Program San Francisco Green Business Program	Energy, Economic Development*				
EE-4.3.6	Distribute Free CFL Bulbs, etc.	Los Angeles Department of Water and Power	Energy				
EE-4.3.7	Exchange Programs for High-Energy Bulbs/Fixtures	Marin County (torchiere exchange), many cities, EPA Change A Light Campaign	Energy				
EE-4.3.8	Require Point of Sale Energy Upgrades	Berkeley RECO Berkely CECO San Francisco RECO	Energy				

* Best-judgment category, i.e. depending on city/county circumstances and scope of General Plan elements, policy could also be included in other mandatory element or in other optional element

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Alternative Energy Policies							
Goal: The City/County will seek to reduce emissions associated with electrical generation by promoting and supporting the generation and use of alternative energy.							
Objective: AE-1 The City/County will establish policies and programs that facilitate the siting of new renewable energy generation.							
Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
AE-1.1	Site Designation		Energy, Land Use				
AE-1.1.1	Renewable Energy Devel. Sites		Energy, Land Use				
AE-1.1.2	Evaluate & Mitigate Constraints		Energy, Land Use				
AE-1.1.3	Protect Renewable Energy Uses		Energy, Land Use				
AE-1.2	Removing Barriers	Ontario, Canada	Energy, Land Use				
AE-1.2.1	Revise Codes, Zoning, Guidance		Energy, Land Use				
AE-1.2.2	Work with Other Agencies		Energy				
AE-1.2.3	Develop Safety Protocols		Energy				
AE-1.3	Zoning Flexibility		Energy, Land Use				
Objective: AE-2 The City/County will promote and require renewable energy generation, and co-generation projects where feasible and appropriate.							
AE-2.1	On-site Renewable Energy Generation	US EPA Renewable Energy Generation Many examples, page 26	Energy				
AE-2.2	Co-Generation Projects	City of Boulder Co-Generation	Energy				
AE-2.3	Green Utilities	Austin Energy Green Riverside	Energy				
Objective AE-3 The City/County will promote, support, and require, as appropriate, the development of solar energy.							
AE-3.1	Solar-ready Buildings	Vancouver, Canada	Energy				
AE-3.1.1	Roof Orientation & Slope	Solar Santa Monica Santa Monica Community Energy Independence Initiative – part of the Solar Santa Monica program	Energy				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click on link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
AE-3.1.2	Clear Access on South Slope		Energy				
AE-3.1.3	Include Roof Framing Support		Energy				
AE-3.1.4	Include Electrical Conduit		Energy				
AE-3.1.5	Include Plumbing and Appliance Space		Energy				
AE-3.2	Solar Homes Partnership		Energy				
AE-3.3	Passive Solar Design	City of Santa Barbara	Energy				
AE-3.4	Protection of Solar Elements	San Jose Solar Access Design Guidelines	Energy, Land Use				
Objective AE-4 The City/County will pursue and provide economic incentives and creative financing for renewable energy projects, as well as other support for community members or developers seeking funding for such projects.							
AE-4.1	Renewable Energy Incentives	City of Santa Clara California Production Incentives for Renewable Energy					
AE-4.2	Creative Financing	City of Berkeley					
AE-4.3	Partnerships	Nevada Southwest Energy Partnership					
AE-4.4	Information & Support	City of Santa Monica page 49 San Diego Regional Energy Office Page 37					
Objective AE-5 The City/County will implement measures to support the purchase and use of renewable and alternative energy.							
AE-5.1	Green Electricity Purchasing	City of Santa Clara					
AE-5.2	Community Choice Aggregation	Marin County Clean Energy					

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Municipal Operations Policies							
Goal: Reduce GHG emissions from municipal facilities and operations, and by purchasing goods and services that embody or create fewer GHG emissions.							
Objective: MO-1 The City/County will enhance the energy efficiency of its facilities.							
Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
MO-1.1	Energy Efficiency Plan	California Energy Commission GHG Reporting Protocol	Energy*				
MO-1.1.1	Conduct Audits		Energy				
MO-1.1.2	Retrofit Facilities		Energy				
MO-1.1.3	Implement Tracking & Mgt.		Energy				
MO-1.1.4	Install Efficient Traffic Signs/ Lights		Energy				
MO-1.1.5	Retrofit Indoor Lighting		Energy				
MO-1.1.6	Retrofit Heating & Cooling Systems		Energy				
MO-1.1.7	Install Energy Star® Appliances		Energy				
MO-1.1.8	Increase Water Pumping Efficiency		Energy				
MO-1.1.9	Chilled, Filtered Water Fountains		Energy				
MO-1.1.10	Centralize, Optimize Irrigation		Energy				
MO-1.1.11	Accelerate Replacement Cycles		Energy				
MO-1.2	Efficiency Requirement for New Facilities		Energy				
MO-1.2.1	LEED Certify New Buildings		Energy				

* Best-judgment category, i.e. depending on city/county circumstances and scope of General Plan elements, policy could also be included in other mandatory element or in other optional element

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click on link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
MO-1.2.2	Energy Star® New Homes Program for Residential Units		Energy				
MO-1.2.3	Incorporate Passive Solar						
MO-1.2.4	Retrofit to Title 24 or Better		Energy				
MO-1.2.5	Decrease Heat Gain		Energy				
MO-1.3	Training & Support		Energy				
MO-1.3.1	Train Design, Engineering, Operations, Maintenance Staff		Energy				
MO-1.3.2	Provide Energy Use Data		Energy				
MO-1.3.3	Provide Energy Design Review		Energy				
Objective: MO-2 The City/County will improve efficiency at municipal systems and reduce GHG emissions from vehicle and equipment engines.							
MO-2.1	Wastewater System Efficiency		Energy*				
MO-2.2	Drinking Water System Efficiency		Energy				
MO-2.3	Fleet Replacement		Energy				
MO-2.4	Small Tools & Equipment		Energy				
Objective MO-3 The City/County will implement measures to reduce employee vehicle trips and to mitigate emissions impacts from municipal travel.							
MO-3.1	Trip Reduction Program		Circulation				
MO-3.1.1	Support Employee Van/ Carpools		Circulation				
MO-3.1.2	Subsidize Mass Transit for Staff		Circulation				

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Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click on link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
MO-3.1.3	Offer Alt. Work Schedules		Circulation				
MO-3.1.4	Offer Guaranteed Ride Home		Circulation				
MO-3.2	Bicycle Transportation Support		Circulation				
MO-3.2.1	Provide "Bicycle Stations"		Circulation				
MO-3.2.2	Provide Bicycles for Check-out		Circulation				
MO-3.2.3	Implement "Police on Bikes"		Circulation				
MO-3.2.4	Implement Bike Safety Program		Circulation				
MO-3.3	Municipal Parking Mgt.		Circulation				
MO-3.31	Parking for Van/Carpools		Circulation				
MO-3.3.2	Institute Parking Cash-out Program		Circulation				
MO-3.3.3	Eliminate Parking Subsidies		Circulation				
MO-3.3.4	Fees for Private Vehicle Parking		Circulation				
MO-3.3.5	Fees for Single Occ. Vehicles		Circulation				
MO-3.4	Travel Mitigation		Circulation				
MO-3.5	Transit Access to Municipal Facilities		Circulation				
Objective MO-4 The City/County will enhance renewable energy generation, and implement programs for load management and demand response.							
MO-4.1	Load Management & Demand Response		Energy				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
MO-4.2	Renewable Energy Installation		Energy				
MO-4.2.1	Solar Collections Systems		Energy				
MO-4.2.2	Solar Water Heating Systems		Energy				
MO-4.2.3	Waste-to-Energy Systems		Energy				
Objective MO-5 The City/County will manage its vegetation inventory to reduce GHG emissions.							
MO-5.1	Urban Tree Management	Million Trees Los Angeles (considered to be part of GHG program)	Land Use				
MO-5.2	Landscaping		Land Use				
Objective MO-6 The City/County will use its purchasing power to promote reductions in GHG emissions by the suppliers of its goods and services.							
MO-6.1	Purchasing Practices		Energy, Conservation, Municipal Ops*				
MO-6.2	Contracting Practices		See MO-6.1				

* Best-judgment category, i.e. depending on city/county circumstances and scope of General Plan elements, policy could also be included in other mandatory element or in other optional element

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
Waste Reduction and Diversion Policies							
Goal: Reduce GHG emissions from waste through improved management of waste handling and reductions in waste generation.							
Objective: WRD-1 The City/County will improve emissions control at waste handling facilities.							
WRD-1.1	Methane Recovery		Conservation				
WRD-1.2	Waste to Energy	California Energy Commission California Energy Commission Bioenergy Action Plan California Energy Commission Biomass White Paper See Policies, page 29	Conservation				
WRD-1.3	Best Management Practices		Conservation				
Objective: WRD-2 The City/County will implement enhanced programs to divert solid waste from landfill operations.							
WRD-2.1	Diversion Targets	City of San Francisco Zero Waste Targets	Conservation				
WRD-2.2	Diversion Services	Petaluma 2025 General Plan General Plan 4.4 Solid Waste, page 4-10 City of Albuquerque Recycling and Waste Reduction Programs Austin Recycling Ordinance Marin Countywide Plan GOAL PFS-4, Efficient Processing and Reduced Landfill Disposal of Solid Waste. page 3-206	Conservation				
WRD-2.3	Construction & Demolition Waste	San Francisco Construction and Demolition Debris Recovery Program 1 / 2	Conservation				
WRD-2.3.1	Recycle Targets for Large Projects		Conservation				
WRD-2.3.2	Construction Waste Mgt. Plan		Conservation				
WRD-2.3.3	Establish Compliance Methods & Guidelines		Conservation				
WRD-2.3.4	Establish Reuse Guidelines		Conservation				
WRD-2.4	Reuse Center		Conservation				
WRD-2.5	Program Promotion		Conservation				
Objective WRD-3 The City/County will enhance regional coordination on waste management.							
WRD-3.1	Regional Coordination		Conservation				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Conservation and Open Space Policies							
Goal: Conserve natural resources such as water and open space to minimize energy used and GHG emissions and to preserve and promote the ability of such resources to remove carbon from the atmosphere.							
Objective: COS-1 The City/County will adopt and implement a comprehensive strategy to increase water conservation and the use of recycled water.							
Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
COS-1.1	Water Consumption Reduction Target	City of Sacramento Urban Water Management Plan 1 / 2					
COS-1.2	Water Conservation Plan	Green County San Bernardino					
COS-1.2.1	Tiered Rate Structure						
COS-1.2.2	Time-of-use Restrictions						
COS-1.2.3	Performance Standards						
COS-1.2.4	Offset New Demand						
COS-1.3	Recycled Water Use	City of San Jose Water Conservation & Recycling Honolulu Ecology of Wastewater					
COS-1.3.1	Non-potable Use Inventory	City of Olympia					
COS-1.3.2	Promote Recycled Water Use	City of Olympia Reclaimed Water					
COS-1.3.3	Potable Recycled Water Use	City of Olympia					
COS-1.4	Water Conservation Outreach	Albuquerque Bernalillo County Water Utility Authority					
Objective: COS-2 The City/County will ensure that building standards and permit approval processes promote and support water conservation.							
COS-2.1	Water Efficient Design	City of Minneapolis Green Initiatives	Conservation				
COS-2.2	Water Efficient Infrastructure & Technology	City of Santa Barbara Water Conservation Sustainable Options	Conservation				
COS-2.3	Gray Water System Standards		Conservation				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
Objective COS-3 The City/County will establish programs and policies to ensure landscaping and forests are installed and managed to optimize their climate benefits.							
COS-3.1	Water-Efficient Landscapes	Stop Waste Model Ordinance Landscaping	Conservation				
COS-3.1.1	Drought Resistant Planting		Conservation				
COS-3.1.2	High-Efficiency Irrigation	City of Santa Barbara Water Conservation	Conservation				
COS-3.1.3	Installing Edible Landscapes		Conservation				
COS-3.2	Shade Tree Planting	City of Albuquerque Urban Forestry	Conservation				
COS-3.2.1	Recommend Plants by Land Use	City of Seattle Tree and Landscaping Regulations	Conservation				
COS-3.2.2	Consider Tree Characteristics	City of Albuquerque Tree Planting	Conservation				
COS-3.2.3	Recommend Placement		Conservation				
COS-3.3	Urban Forestry Management	City of Seattle Urban Forest Management Plan	Conservation, Open Space				
COS-3.3.1	Set Tree Planting Target	Raleigh Tree Planting Program	Conservation				
COS-3.3.2	Establish Planting Guidelines	City of Seattle Street Tree Planting Procedures	Conservation				
Objective COS-4 The City/County will establish policies and programs to develop and preserve conservation areas, including forested areas, agricultural lands, wildlife habitat and corridors, wetlands, watersheds, and groundwater recharge areas, that remove and sequester carbon from the atmosphere.							
COS-4.1	Conservation Area Development		Conservation, Open Space				
COS-4.1.1	Mitigation Fees on Development		Conservation, Open Space				
COS-4.1.2	Sales Tax for Conservation		Conservation, Open Space				
COS-4.2	Conservation Area Preservation	Honolulu Exceptional Tree Program	Conservation, Open Space				

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Education and Outreach Policies							
Goal: Increase public awareness of climate change and climate protection challenges, and support community reductions of GHG emissions through coordinated, creative public education and outreach, and recognition of achievements.							
Objective: EO-1 The City/County will establish a coordinated, creative public outreach campaign, including publicizing the importance of reducing GHG emissions and steps community members can take to reduce their individual impacts.							
Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
EO-1.1	Outreach Methods	City of San Mateo SMART Speakers	Climate Change or GHG, possibly Conservation				
EO-1.1.1	TV and Radio Spots	City of San Mateo SMART Media	See EO-1.1				
EO-1.1.2	"Green Tips" in Local Paper		See EO-1.1				
EO-1.1.3	Messages in Others' Newsletters, Billing Materials, etc.		See EO-1.1				
EO-1.1.4	Climate Protection Website	City of San Mateo SMART City of Palo Alto City of Minneapolis	See EO-1.1				
EO-1.2	Outreach Topics	City of San Mateo SMART Speakers	See EO-1.1				
EO-1.2.1	Energy Efficiency & Conservation	City of San Mateo SMART Carbon Counter	Energy, Conservation, GHG*				
EO-1.2.2	Trip Reduction & Alt. Modes	City of San Mateo SMART Carbon Counter City of Albuquerque Alternative Transportation	See EO-1.1				
EO-1.2.3	Green Building & Design	City of San Mateo Green Building	Conservation, Energy, Land Use				
EO-1.2.4	Waste Reduction, Recycling & Composting	San Francisco Composting Program City of San Mateo SMART Carbon Counter San Bernardino Reusable Bag Program	Conservation				
EO-1.2.5	Water Conservation & Efficient Design	Albuquerque Bernalillo County Water Utility Authority	Conservation, Land Use				

* Best-judgment category, i.e. depending on city/county circumstances and scope of General Plan elements, policy could also be included in other mandatory element or in other optional element

Table 2: Worksheet for Model Policies Evaluation (cont'd.)

Model Policy #	Policy Name/ Subject Area	Implementation Examples (click link to visit website)	Appropriate General Plan Element	Relative Effectiveness Reducing GHGs	Relative Difficulty to Implement	Relative Time for Reductions to Occur	Relative Cost
EO-1.2.6	Buying Local	San Francisco Farmers Market San Francisco Green Map City of Minneapolis Homegrown	See EO-1.1				
Objective: EO-2 The City/County will work with local businesses and energy providers on specific, targeted outreach campaigns and incentive programs.							
EO-2.1	Energy Efficiency Campaigns	City of Minneapolis Energy Challenge	Energy				
EO-2.2	Pedestrian and Bicycle Promotion	City of Berkeley Bike and Walking Maps 511 Bicycle Maps	Circulation				
Objective EO-3 The City/County will organize events and workshops to promote GHG-reducing activities.							
EO-3.1	Waste Reduction	Bay Area Green Business Program Shop Green City of Palo Alto Zero Waste Program	Conservation				
EO-3.2	Water Conservation	Bay Area Green Business Program Shop Green	Conservation				
EO-3.3	Energy Efficiency		Energy				
EO-3.4	Climate Protection Summit/Fair	Alameda County Downtown Menlo Park Goes Green Block Parties	Conservation, GHG				
EO-3.5	Schools Programs	City of Scottsdale EnviroKidsFest The Association for the Advancement of Sustainability in Higher Education	Energy, Conservation, GHG				
Objective EO-4 The City/County will sponsor competitions and awards to encourage GHG reductions and recognize success.							
EO-4-1	Climate Champions Awards	Climate All Stars Conference Columbus Green Spot	Conservation, Energy, GHG				
EO-4.2	GHG Reduction/ Climate Protection Competitions	Climate Protection Campaign Silicon Valley Leadership Group	See EO-4.2				
EO-4.2.1	Poster Contests at Schools, with Scholarships, Public Recognition	Climate Protection Campaign	See EO-4.2				
EO-4.2.2	Waste Diversion Contests between Schools or Other Groups	Waste Free Schools	See EO-4.2 (Especially Conservation)				
EO-4.2.3	Walkathons, Relays, & Other Challenges		See EO-4.2				

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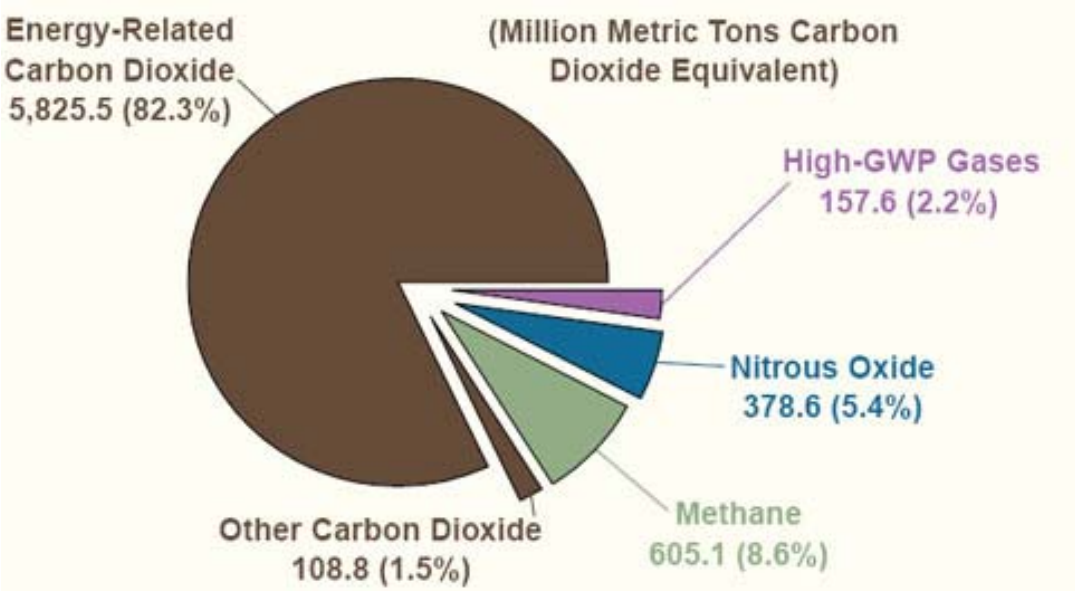
Appendix A

Greenhouse Gas Emissions in California

The characteristics, sources, and units used to quantify the six greenhouse gases (GHGs) listed in AB 32 are documented in this section in order of abundance in the atmosphere: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). (Water vapor, the most abundant GHG, is not included because natural concentrations and fluctuations far outweigh anthropogenic influences). Figure A-1 below shows U.S. emissions of these gases in 2006, with HFCs, PFCs and SF_6 collectively referred to as high-GWP (global warming potential) gases.

Figure A-1. U.S. Greenhouse Gas Emissions by Gas, 2006



Source: Energy Information Administration estimates,
http://www.eia.doe.gov/oiaf/1605/ggrpt/figure_1.html.
Note: High-GWP Gases include HFCs, PFCs, and SF_6.

In order to simplify reporting and analysis, methods have been set forth to describe emissions of GHGs in terms of a single gas. The most commonly accepted method to compare GHG emissions is the GWP methodology developed by the Intergovernmental Panel on Climate Change (IPCC). The IPCC defines the GWP of every GHG on a normalized scale of CO2e that compares the atmospheric heating potential of each GHG over a 100-year period to that of the same mass of CO2. (CO2 has a GWP of 1 by definition.) Generally, GHG emissions are quantified in terms of metric tons of CO2 equivalent (CO2e) emitted per year. For example, the IPCC finds that nitrous oxide has a GWP of 310 and methane has a GWP of 21. Thus, one ton of nitrous oxide emissions is represented as 310 tons of CO2e, and one ton of methane is 21 tons of CO2e. This allows for the summation of different GHG emissions into a single total.

Table A-1, below, lists the GWP of each GHG, its atmospheric life and concentration. Atmospheric concentration of a given compound is commonly described in units of parts

per million (ppm), parts per billion (ppb) or parts per trillion (ppt), referring to the number of molecules of the compound in a sampling of one million, one billion or one trillion molecules of air.

Table A-1: Global Warming Potentials, Lifetimes and Abundances of Several Significant GHGs

Gas	Global Warming Potential (100 years)	Atmospheric Life (years)	1998 Atmospheric Concentration (ppt[1])
CO_2	1	50–200	365,000,000
CH_4	21	9–15	1,745
N_2O	310	120	314
HFC-23	11,700	264	14
HFC-134a	1,300	14.6	7.5
HFC-152a	140	1.5	0.5
CF_4	6,500	50,000	80
C_2F_6	9,200	10,000	3
SF_6	23,900	3,200	4.2

[1] ppt is a mixing ratio unit indicating the concentration of a pollutant in parts per trillion by volume.
Source: IPCC 1996; IPCC 2001.

Table A-2, below, lists the anthropogenic (man-made) emissions of GHGs as CO2e equivalents. As shown, CO2 is by far the largest component of worldwide CO2e emissions, followed by CH4, N2O, and high-GWP gases.

Table A-2: Global Anthropogenic Greenhouse Gas Emissions (CO_2 e)

Gas	CO_2e Percentage
CO_2 (deforestation, decay of biomass, etc)	17.3%
CO_2 (other)	2.8%
CO_2 (fossil fuel use)	56.6%
CH_4	14.3%
N_2O	7.9%
High-GWP[1] Gases (includes HFCs, PFCs, and SF6)	1.1%

[1] GWP stands for Global Warming Potential. Source: Olivier et al., 2005, 2006 in IPCC 2007b.

CO_2

CO2 is the most important GHG and accounts for more than 75% of all anthropogenic GHG emissions. Its long atmospheric lifetime (on the order of decades to centuries) ensures that atmospheric concentrations of CO2 will remain elevated for decades after

GHG mitigation efforts to reduce GHG concentrations are implemented (Olivier et al. 2005, 2006 in IPCC 2007b).

Increasing concentrations of CO2 in the atmosphere are largely due to emissions from the burning of fossil fuels, gas flaring, cement production, and land use changes. Three quarters of anthropogenic CO2 emissions are the result of fossil burning (and to a very small extent, cement production and gas flaring); the remainder results from land-use changes (IPCC 2007a).

Anthropogenic emissions of CO2 have increased concentrations in the atmosphere most notably since the industrial revolution; the concentration of CO2 has increased from about 280 ppm to 379 ppm over the last 250 years (IPCC 2001). IPCC estimates that the present atmospheric concentration of CO2 has not been exceeded in the last 650,000 years and is likely to be the highest ambient concentration in the last 20 million years (IPCC 2007a; IPCC 2001).

CH_4

CH4 , the main component of natural gas, is the second largest contributor to anthropogenic GHG emissions and has a GWP of 21 (Association of Environmental Professionals 2007; IPCC 1996). Anthropogenic emissions of methane primarily result from growing rice, raising cattle, combusting natural gas, and coal mining (National Oceanic and Atmospheric Administration 2005). Atmospheric methane has increased from a pre-industrial concentration of 715 parts per billion to 1,775 parts per billion in 2005 (IPCC 2001). Though it is unclear why, atmospheric concentrations of CH4 have not risen as quickly as anticipated (National Oceanic and Atmospheric Administration 2005).

N_2O

N2O is a powerful GHG, with a GWP of 310 (IPCC 1996). Anthropogenic sources of N2O include agricultural processes, nylon production, fuel-fired power plants, nitric acid production and vehicle emissions. Nitrous oxide is also used in rocket engines, racecars, and as an aerosol spray propellant. Agricultural processes which result in anthropogenic N2O emissions are fertilizer use and microbial processes in soil and water (Association of Environmental Professionals 2007). N2O concentrations in the atmosphere have increased from pre-industrial levels of 270 parts per billion to 319 parts per billion in 2005 (IPCC 2001).

HFCs

HFCs are man-made chemicals used in commercial, industrial and consumer products and have high GWPs (EPA 2006a). HFCs are generally used as substitutes for ozone depleting substances (ODS) in automobile air conditioners and refrigerants. As seen in Table A-1, the most abundant HFCs, in order from most abundant to least, are HFC-134a (35 parts per trillion), HFC-23 (17.5 parts per trillion), and HFC-152a (3.9 parts per

trillion). Concentrations of HFCs have risen from zero to current levels. Because these chemicals are man-made, they do not exist naturally in ambient conditions.

PFCs

The most abundant PFCs include CF4 (PFC-14) and C2F6 (PFC-116). These man-made chemicals are emitted largely from aluminum production and semiconductor manufacturing processes. PFCs are extremely stable compounds that are only destroyed by very high-energy ultraviolet rays, which result in the very long lifetimes of these chemicals, as shown in Table A-1 (Environmental Protection Agency 2006). PFCs have large GWPs and have risen from zero to the current concentration levels shown in Table A-1.

SF_6

SF6, another man-made chemical, is used as an electrical insulating fluid for power distribution equipment, in the magnesium industry, in semiconductor manufacturing and also as a trace chemical for study of oceanic and atmospheric processes (Environmental Protection Agency 2006a). In 1998, atmospheric concentrations of sulfur hexafluoride were 4.2 parts per trillion, and steadily increasing in the atmosphere. SF6 is the most powerful of all GHGs listed in IPCC studies with a GWP of 23,900 (IPCC 1996).

Appendix B

AB 32 Programs

California's major law for reducing greenhouse gas (GHG) emissions is stipulated in Assembly Bill 32 (AB 32, Nunez) approved by Governor Schwarzenegger in 2006. The goals in AB 32 aim at reducing GHG emissions to 1990 levels by 2020 - a reduction of approximately 30 percent. The main strategies for making these reductions are outlined in the Scoping Plan adopted by the California Air Resources Board (ARB) in December 2008 and in the Discrete Early Action measures identified by ARB in 2007. The following are summaries of AB 32 Programs for reducing GHG emissions.

Discrete Early Action Measures

AB 32 established a statewide target for GHG reductions by 2020. AB 32 further required the ARB to adopt a plan and individual measures to achieve the maximum technologically feasible and cost-effective reductions in GHG emissions. AB 32 required ARB to identify a list of Discrete Early Action measures for implementation by January 1, 2010. ARB identified in 2007 nine Discrete Early Action measures, including potential regulations affecting landfills, motor vehicle fuels, refrigerants in cars, port operations and other sources. Refer to the ARB website at http://www.arb.ca.gov/cc/ccea/ccea.htm for detailed information about each measure and the timeline for implementation. Short descriptions of the Discrete Early measures follows.

Low Carbon Fuel Standard (LCFS)

The LCFS requires fuel providers to ensure that the mix of fuel they sell into the California market meets, on average, a declining standard for carbon intensity. By 2020, the LCFS will produce a 10 percent reduction in the carbon content of all passenger vehicle fuels sold in California. This is expected to replace 20 percent of on-road gasoline consumption with lower-carbon fuels, more than triple the size of the state's renewable fuels market, and place more than 7 million alternative fuel or hybrid vehicles on California's roads. The LCFS will use market-based mechanisms that allow providers to choose how they reduce emissions while responding to consumer demand. For example, providers may purchase and blend more low-carbon ethanol into gasoline products, purchase credits from electric utilities supplying low-carbon electrons (i.e., low carbon fuels used in the generation of electricity) to electric passenger vehicles, or diversify into low-carbon hydrogen as a product. In addition, new strategies yet to be developed will be included.

Landfill Methane Capture

This control measure will reduce methane emissions from municipal solid waste landfills by requiring gas collection and control systems on landfills where these systems are not currently required and will establish statewide performance standards to maximize methane capture efficiencies. Additionally, as part of this process, ARB and California Integrated Waste Management Board (CIWMB) staff will explore opportunities to increase energy recovery from landfill methane gas.

Reductions from Mobile Air Conditioning

These measures will control HFC release from do-it-yourself motor vehicle air conditioning (MVAC) servicing; require addition of leak tightness testing and repair during Smog Checks; enforce federal regulations on banning HFC release from MVAC servicing and dismantling; and require the use of low global warming potential (GWP) refrigerants for new MVAC.

Semiconductor Reduction

This measure proposes to reduce perfluorocarbon (PFC) and fluorinated gas from the semiconductor industry. The regulation will be designed to achieve the maximum reductions in PFC fluorinated gas emissions that are technically feasible and cost-effective.

SF_6 Reductions

SF6 is a potent GHG with a GWP of 23,900, one of the highest GWPs currently identified. SF6 is a versatile gas used in a multitude of sectors including the electric utility and semiconductor industries. (Utility and semiconductor industry-related emissions will be addressed under separate strategies.) This early action focuses on the non-utility and semiconductor-related emissions of SF6. Specifically, the strategy reduction measures will consider a potential ban on the use of SF6 where technologically feasible and cost-effective alternatives are available. The main uses of SF6 in California that are not directly related to utilities or semiconductor manufacturing include: magnesium casting operations; consumer products (tennis balls); medical uses (ultrasounds, eye surgery); tracer gas in leak testing (including fume hood testing), research and bioterrorism studies; insulator for particle accelerators; and etchant for flat panel display units.

High-GWP Consumer Products

Measures under this Discrete Early Action focus on reducing the use of compounds with high GWP in consumer products. This will be done by adding and modifying product category definitions in the existing consumer products regulation and establishing new or lower volatile organic compound (VOC) limits for multiple categories. The measures would also reduce the use of compounds with high GWP in pressurized gas duster products. A number of other modifications or clarifications are also proposed, including prohibiting the use of specified toxic air contaminants in carpet and upholstery cleaners, fabric protectants, multi-purpose lubricants, penetrants, sealant or caulking compounds, and spot removers. The consumer products measure is estimated to reduce CO2 equivalent emissions by 250,000 metric tons per year.

Heavy Duty Vehicle Measures

Under this Early Action measure, new and existing on-road tractors and trailers operating on California highways would need to be equipped with technologies to improve fuel efficiency. It is based on the U.S. EPA's SmartWay Program, which approves technologies, such as aerodynamic equipment and low-rolling resistance tires, and certifies tractors and trailers that incorporate these technologies. The proposed regulation would provide GHG and NOx emission reductions throughout California. Tractors and trailers that comply with the proposed regulation by proper use of aerodynamic equipment and low-rolling resistance tires are expected to achieve a fuel efficiency improvement ranging from 7 to 10 percent and provide GHG and oxides of nitrogen (NOx) emission reductions throughout California.

Tire Pressure Program

Maintaining proper tire pressure on vehicles improves fuel economy, and therefore reduces GHG emissions. This measure would place requirements on the automotive service industry regarding tire pressure checks and inflation pressure retention. While current federal law requires auto manufactures to install tire pressure monitoring systems in all new vehicles beginning September 1, 2007, owners of older vehicles lack this important tool.

Shore Power

Port electrification was identified as a Discrete Early Action measure. The proposed regulation, while reducing diesel PM and NOx emissions, would also result in significant reductions of CO2 emissions as a co-benefit of requiring cleaner grid supplied electrical generation for ocean-going vessels while docked. Auxiliary engines typically power lighting, ventilation, pumps, communication, and other onboard equipment while a ship is docked at a berth. The proposed regulations would require some vessels to turn off their auxiliary engines; it is expected, but not required, that many of those vessels would then receive their electrical power from shore while at berth.

AB 32 Scoping Plan

The Scoping Plan outlines a variety of measures and programs to reduce GHG emissions to 1990 levels by 2020. The plan includes development of a California cap-and-trade program that will be integrated with a broader regional market to maximize cost-effective opportunities to achieve GHG emissions reductions. The plan also includes transformational measures designed to help pave the path toward California's clean energy future. The following are summaries of the proposed AB 32 measures and programs.

California Cap-and-Trade Program

A cap-and-trade program sets the total amount of GHG emissions allowable for facilities under the cap and allows covered sources, including producers and consumers of energy, to determine the least expensive strategies to comply. The emissions allowed under the cap will be denominated in metric tons of CO2e. The currency will be in the form of allowances which the State will issue based upon the total emissions allowed under the cap during any specific compliance period. Emission allowances can be banked for future use, encouraging early reductions and reducing market volatility. The ability to trade allows facilities to adjust to changing conditions and take advantage of reduction opportunities when those opportunities are less expensive than buying additional emissions allowances. California is working closely with other states and provinces in the Western Climate Initiative (WCI) to design a regional cap-and-trade program that can deliver reductions of GHG throughout the region. ARB will develop a cap-and-trade program for California that will link with the programs in the other WCI Partner jurisdictions to create a regional cap-and-trade program. In addition, a federal cap-and-trade program is being contemplated, and legislation (the Waxman-Markey Bill) is being developed. If the federal program is enacted, the development and implementation of the program will need to be closely coordinated with California. Federal preemption is a possibility.

California Light-Duty Vehicle GHG Standards

There are a number of programs identified under AB 32 that reduce GHGs by the way of light-duty vehicle emission standards. These programs include the AB 1493 (Pavley) GHG vehicle standards, zero-emission vehicle (ZEV) program, and the AB 118 (Nunez) Air Quality Improvement Program/Alternative and Renewable Fuel and Vehicle Technology Program.

AB 1493 directed ARB to adopt vehicle standards that lowered GHG emissions to the maximum extent technologically feasible, beginning with the 2009 model year. ARB adopted regulations in 2004 and applied to the U.S. EPA in 2005 for a waiver under the federal Clean Air Act to implement the regulation. The Pavley regulations incorporate both performance standards and market-based compliance mechanisms. To obtain additional reductions from the light-duty fleet, ARB plans to adopt a second, more stringent, phase of the Pavley regulations. U.S. EPA however, denied the California waiver in 2008 the issues entered litigation. As of February 2009, EPA began reconsidering the waiver request.

The ZEV program will play an important role in helping California meet its 2020 and 2050 GHG emissions reduction requirements. Through 2012, the program requires placement of hundreds of ZEVs (including hydrogen fuel cell and battery electric vehicles) and thousands of near-zero emission vehicles (including plug-in hybrids, conventional hybrids, compressed natural gas vehicles). In the mid-term (2012-2015), the program will require placement of increasing numbers of ZEVs and near-zero emission vehicles in California. In 2009, the Board will review the ZEV program to ensure it is

optimally designed to help the State meet its 2020 target and put us on the path to meeting our 2050 target of an 80 percent reduction in GHG emissions from 1990 levels.

Under AB 118 (Núñez, Chapter 750, Statutes of 2007), ARB is administering the Air Quality Improvement Program, which provides approximately $50 million per year for grants to fund clean vehicle/equipment projects and research on the air quality impacts of alternative fuels and advanced technology vehicles. AB 118 also created the Alternative and Renewable Fuel and Vehicle Technology Program and authorized CEC to spend up to $120 million per year over seven years (2008-2015) to develop, demonstrate, and deploy innovative technologies to transform California's fuel and vehicle types.

Energy Efficiency Programs

The Scoping Plan relies heavily on energy efficiency to reach its GHG emissions reduction goals. Programs include the California Long Term Energy Efficiency Strategic Plan and the Solar Hot Water and Efficiency Act of 2007.

Renewables Portfolio Standard

California's current Renewables Portfolio Standard (RPS) is intended to increase procurement from eligible renewable energy resources to reach 20 percent by 2010. Increased use of renewables will decrease California's reliance on fossil fuels, thus reducing emissions of GHGs from the electricity sector. Based on Governor Schwarzenegger's call for a statewide 33 percent RPS, the Scoping Plan anticipates that California will have 33 percent of its electricity provided by renewable resources by 2020, and includes the reduction of GHG emissions based on this level. Achieving the 33 percent goal will require broad-based participation from many parties and the removal of certain barriers. The CEC, CPUC, California Independent System Operator (CAISO), and ARB are working with California utilities and other stakeholders to formally establish and meet this goal.

Regional Transportation-Related GHG Targets

On September 30, 2008, Governor Arnold Schwarzenegger signed SB 375 (Steinberg) which establishes mechanisms for the development of regional targets for reducing passenger vehicle GHG emissions. Through the SB 375 process, regions will work to integrate development patterns and the transportation network in a way that achieves the reduction of GHG emissions while meeting housing needs and other regional planning objectives. This new law reflects the importance of achieving significant additional reductions of GHG emissions from changed land use patterns and improved transportation to help achieve the goals of AB 32. SB 375 requires ARB to develop, in consultation with metropolitan planning organizations (MPOs), passenger vehicle GHG emissions reduction targets for 2020 and 2035 by September 30, 2010. It sets forth a collaborative process to establish these targets, including the appointment by ARB of a Regional Targets Advisory Committee (RTAC) to recommend factors to be considered and methodologies for setting GHG emissions reduction targets. RTAC members were

appointed in January 2009. An explanation of SB 375 from bill author Darrell Steinberg can be found at the Institute for Local Government website at http://www.ca-ilg.org/sb375 .

Million Solar Roofs Program

The Million Solar Roofs Program is a ratepayer-financed incentive program aimed at transforming the market for rooftop solar systems by driving down costs over time. Created under Senate Bill 1, the Million Solar Roofs Program includes CPUC's California Solar Initiative and CEC's New Solar Homes Partnership, and requires publicly-owned utilities (POUs) to adopt, implement and finance a solar incentive program. This measure would offset electricity from the grid, thereby reducing GHG emissions.

Industrial Emissions

These measures would be implemented through a regulation requiring each facility to conduct an energy efficiency audit of individual combustion and other direct sources of GHGs within the facility to determine the potential reduction opportunities, including criteria air pollutants and toxic air contaminants. The audit would include an assessment of the impacts of replacing or upgrading older, less-efficient units such as boilers and heaters, or replacing units with combined heat and power units. In addition, ARB has identified four specific measures for development and implementation, two for oil and gas recovery operations and gas transmission, and two for refineries.

High-Speed Rail

The Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century was approved by California voters in 2008. A high-speed rail (HSR) system is part of the statewide strategy to provide more mobility choice and reduce GHG emissions. This measure supports implementation of plans to construct and operate an HSR system between northern and southern California. As planned, the HSR is a 700-mile-long rail system capable of speeds in excess of 200 miles per hour on dedicated, fully-grade separated tracks with state-of-the-art safety, signaling and automated rail control systems. The system would serve the major metropolitan centers of California in 2030 and is projected to displace between 86 and 117 million riders from other travel modes in 2030.

Green Building Strategy

A Green Building strategy offers a comprehensive approach to reducing direct and upstream GHG emissions that cross-cut multiple sectors including Electricity/Natural Gas, Water, Recycling/Waste, and Transportation. Green buildings are designed, constructed, renovated, operated, and maintained using an integrated approach that reduces GHG emissions by maximizing energy and resource efficiency. Employing a whole-building design approach can create synergies that result in multiple benefits at

little or no net cost, allowing for efficiencies that would never be possible on an incremental basis.

Recycling and Waste

ARB will work with the California Integrated Waste Management Board (CIWMB) to develop and implement programs to reduce waste and materials at the source of generation and increase recycling which will result in the reduction of GHG emissions and other co-benefits. ARB will also work with the California Department of Food and Agriculture, the Department of Transportation, and others to provide direct incentives for the use of compost in agriculture and landscaping. Further, CIWMB will explore the use of incentives for all recycling and waste management measures, including commercial recycling, and for local jurisdictions to encourage the collection of residentially and commercially generated food scraps for composting and in-vessel anaerobic digestion.

Sustainable Forests

The 2020 Scoping Plan target for California's forest sector is to maintain the current 5 MMTCO2e of sequestration through sustainable management practices, including reducing the risk of catastrophic wildfire, and the avoidance or mitigation of land use changes that reduce carbon storage. California's Board of Forestry and Fire Protection has the existing authority to provide for sustainable management practices, and will, at a minimum, work to maintain current carbon sequestration levels. The Resources Agency and its departments will also have an important role to play in implementing this measure.

Water

Six GHG emission reduction measures are proposed for the water sector: water use efficiency; water recycling; water system energy efficiency; reuse urban runoff; increased renewable energy production; and public goods charge. Three of the measures target reducing energy requirements associated with providing reliable water supplies and two measures are aimed at reducing the amount of non-renewable electricity associated with conveying and treating water. The final measure focuses on providing sustainable funding for implementing these actions.

Agriculture

The Scoping Plan encourages the capture of methane (CH_4) through use of manure digester systems at dairies to provide emission reductions on a voluntary basis. This measure is also a renewable energy strategy to promote the use of captured gas for fuels or power production. Nitrogen fertilizer, which produces N2O emissions, is the other significant source of GHGs in the agricultural sector. ARB has begun a research program to better understand the variables affecting fertilizer N2O emissions, and based on the findings, will explore opportunities for emission reductions.

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Appendix C

Other Programs to Reduce GHG Emissions

There are many programs already underway in California at the state, regional and local levels to reduce GHG emissions. These programs seek new and innovative ways to require or promote reductions in GHG emissions through new standards and incentives designed to increase energy efficiencies and renewable energy production, advance green technologies and cleaner fuels, and improve our land use development patterns and waste management, among others. Such programs are occurring worldwide. Appendix C focuses only on the major GHG emission reduction programs in California.

State of California

Assembly Bill 118(Nunez) - Alternative and Renewable Fuel and Vehicle Technology Funding

This program is intended to increase the use of alternative and renewable fuels and innovative technologies that will transform California's fuel and vehicle types to help attain the state's climate change policies. Upon appropriation by the State, approximately $120 million will be allocated annually as incentives to public agencies, vehicle and technology consortia, businesses, public-private partnerships, workforce training partnerships and collaboratives, fleet owners, consumers, recreational boaters, and academic institutions, for projects that:

Develop and improve alternative and renewable low-carbon fuels;

- Optimize alternative and renewable fuels for existing and developing engine technologies;
- Produce alternative and renewable low-carbon fuels in California;
- Decrease the overall impact of an alternative and renewable fuel's life-cycle carbon footprint and increase sustainability;
- Expand fuel infrastructure, fueling stations, and equipment;
- Improve light-, medium-, and heavy-duty vehicle technologies;
- Retrofit medium and heavy-duty on-road and non-road vehicle fleets;
- Expand infrastructure connected with existing fleets, public transit, and transportation corridors; and
- Establish workforce training programs, conduct public education and promotion, and create technology centers.

Senate Bill 1368 (Peralta) - GHG Emissions Performance Standards

The law limits long-term investments in baseload generation by the state's utilities to power plants that meet an emissions performance standard (EPS) jointly established by the California Energy Commission (CEC) and the California Public Utilities Commission (PUC).

The CEC has designed regulations that:

- Establish a standard for baseload generation owned by, or under long-term contract to, publicly owned utilities, of 1,100 lbs CO2 per megawatt-hour (MWh). This will encourage the development of power plants that meet California's growing energy needs while minimizing their emissions of GHGs;

- Require posting of notices of public deliberations by publicly owned utilities on long-term investments on the CEC website. This will facilitate public awareness of utility efforts to meet customer needs for energy over the long term while meeting the State's standards for environmental impact, and;

- Establish a public process for determining the compliance of proposed investments with the EPS.

California Solar Initiative

The California Solar Initiative a collaborative effort between the PUC and CEC initiated in 2006, has a statewide goal to install 3,000 MW of new solar electricity capacity by 2016 - moving the state toward a cleaner energy future and helping lower the cost of solar systems for consumers. The initiative has a statewide budget of $3.3 billion over 10 years. The California Solar Initiative provides solar incentives to customers in investor-owned utility territories of Pacific Gas & Electric, Southern California Edison, and San Diego Gas & Electric. These three utilities represent about 75-80% of California's electricity use. The California Solar Initiative provides cash back for solar for existing homes, and existing and new commercial, industrial, government, non-profit, and agricultural properties.

Executive Order S-14-08

On November 17, 2008 Governor Schwarzenegger signed Executive Order (EO) S-14-08 directing all state agencies to work toward a 33% RPS by 2020. A 33% renewable energy target would further California’s efforts to address climate change and lead the nation in clean energy policy. Specifically, the Executive Order stated the following:

- The EO calls for a new, more aggressive renewable energy target, increasing the current goal of obtaining 20% of California’s energy from clean, renewable resources by 2010 to 33% by 2020.

- The EO directs a restructuring of the process for developing specific renewable energy sites. The EO has a goal of reducing permitting process times for developing renewable energy sites by 50 percent.

- The Governor will propose legislation that will codify the new higher standards and reform the renewable pricing structure at the PUC to make them competitive and get projects built sooner.

Landfill Methane Capture Strategies

The California Integrated Waste Management Board (CIWMB) has identified strategies for increasing landfill methane capture to reduce methane emissions by 2020. The Landfill Methane Capture Strategy includes three core components:

- Install New Methane Control Systems at Landfills Currently Without Control Systems. The control measure will reduce methane emissions from landfills by requiring gas collection and control systems on landfills generating significant methane where these systems are not currently required; it will also establish statewide performance standards to maximize methane capture efficiencies.

- Maximize Landfill Methane Capture Efficiencies. The CIWMB is developing a guidance document to help landfill operators and regulators evaluate potential actions to achieve additional GHG emission reductions from landfills beyond what are currently occurring with existing landfill practices. The study is based on an evaluation of existing state-of-the-practice technologies, as reflected in published literature, reports to regulatory agencies, and the project team's familiarity and experience with specific landfill and landfill gas practices and projects.

- Increase Recovery of Landfill Gas as a Biomass Renewable Energy Source. The CIWMB is providing technical assistance and incentives, and further developing options, in consultation with ARB, CEC, and PUC, to increase recovery of landfill gas. The CIWMB awarded two grants totaling $1 million to demonstrate commercial scale production of liquefied natural gas (LNG) vehicle fuel from landfill gas. The CIWMB is also providing matching funding to demonstrate an innovative anaerobic composting design and process sited at a landfill to increase recovery of biogas for energy and recover a residual compost product from yard wastes otherwise used as landfill alternative daily cover.

California Adaptation Strategy

The California Resources Agency is currently developing a California Adaptation Strategy. The strategy will be developed by collecting, synthesizing, and communicating to the greatest extent possible, how sea level rise, temperature rise and duration, and precipitation changes due to climate change will exacerbate existing fire, flood, water quality, air quality, habitat loss, human health and drought. The Strategy will also

examine how risks associated with these changes will impact the state's economy, infrastructure, human populations, and environment. In addition, it will also outline those solutions which can be implemented that promote resiliency to climate change impacts posing the greatest risks to California and consider key economic, health, and environmental issues.

Caltrans Climate Action Program

The California Department of Transportation (Caltrans) Office of Policy Analysis and Research (OPAR) Climate Action Program coordinates the department's effort in response to AB 32, the Climate Action Team (CAT), the Governor's executive orders, Administration policies, and related legislative rulings. OPAR works with the CAT, ARB, regional agencies, and other stakeholders on cross-agency policy framework and research focusing on GHG emissions reduction and energy-efficiency measures. The program's functional responsibilities include:

- Coordinating and monitoring climate activities and strategies across departmental programs, including planning functions statewide;
- Serving as a primary point of contact for issues related to climate change and transportation energy; and
- Working to mainstream GHG emissions reduction and energy-efficiency measures into transportation planning and project development.

California Water Plan

The California Department of Water Resources (DWR) addresses climate change in its California Water Plan, which is updated every five years. The plan provides a framework for water managers, legislators, and the public to consider options and make decisions regarding California's water future. In addition, DWR in October 2008 released its report *Managing an Uncertain Future; Climate Change Adaptation Strategies for California's Water* which focuses discussion on the need for California's water managers to adapt to impacts of climate change. The report proposes 10 adaptation strategies in four categories which may be incorporated into the California Water Plan

Air Districts

Air Pollution Control Districts and Air Quality Management Districts throughout the state have implemented a variety of climate protection programs over the past several years. The following is a small sampling of some air district programs.

Bay Area Air Quality Management District

In 2005, the Bay Area Air Quality Management District (BAAQMD) initiated a Climate Protection Program that acknowledges the link between climate protection and programs to reduce air pollution in the greater San Francisco Bay Area. The Board of Directors also formed a standing Committee on Climate Protection to provide direction on BAAQMD climate protection activities. BAAQMD is continually seeking ways to integrate climate protection into current District functions, including grant programs, CEQA commenting, regulations, inventory development, and outreach. In addition, the District's climate protection program emphasizes collaboration with ongoing climate protection efforts at the local and State level, public education and outreach and technical assistance to cities and counties. The following are some of BAAQMD's Climate Protection Programs:

- *Climate Protection Grant Program:* In 2007 the BAAQMD awarded $3 million to fund 53 local projects that will significantly reduce the Bay Area's carbon footprint. This $3 million represents the largest single source of funding available for climate protection projects in the Bay Area, and makes the District one of the top funders of climate protection activities in the country.

    - *4th and 5th Grade Curriculum: Protect Your Climate* is a climate protection curriculum targeted at 4th and 5th graders. The curriculum's 16 lessons investigate the science and causes of climate change and how students can take action to protect our climate. Through hands-on activities, students learn ways to reduce GHG emissions from energy, waste, and transportation. Lessons are connected to the California state content standards. After successfully completing a pilot year in 2007-2008, the curriculum program was expanded to include 40 classrooms in the 2008-2009 school year. The participating teachers and approximately 1,000 students in the program are learning how to take action for climate protection in their classrooms, homes, and communities

    - *GHG Regional Inventory*: In 2006 the BAAQMD published *Source Inventory of Bay Area GHG Emissions*, the Bay Area Regional GHG Emission Inventory for base year 2002. The District is developing an updated regional GHG emission inventory which will reflect Bay Area emissions from the year 2005.

    - *ICLEI-BAAQMD Workshop Series:* The BAAQMD has an ongoing partnership with ICLEI-Local Governments for Sustainability to host a series of local government workshops on developing GHG emission inventories and selecting climate protection strategies. Workshops have been hosted for local governments in San Mateo, Santa Clara, and Marin counties. The District and partners ICLEI, PG&E and MTC have provided workshop participants with city-specific data sets and hands-on training. Over 30 local government staff have participated and developed GHG emission inventories for their communities.

- *GHG Fee for Stationary Sources Adopted:* On May 21, 2008, BAAQMD's Board of Directors approved a new fee on air pollution sources in the region to help defray the costs of the District's climate protection work. Industrial facilities and businesses that are currently required to submit an air quality permit to operate will have the modest fee of 4.4 cents per metric ton of GHG emissions added to their permit bill. The fee will apply to Climate Protection Program activities related to stationary sources.

Sacramento Metropolitan Air Quality Management District

The Sacramento Metropolitan Air Quality Management District (SMAQMD) has started a formal program to address climate change. Elements include GHG inventory, work practices, commute incentives, building retrofits and education. Currently SMAQMD is researching and developing enhancements to the District's Climate Protection Program. Those enhancements include: 1) the creation of a GHG emissions "bank," 2) the creation of a program which would facilitate GHG mitigation for CEQA purposes, 3) an enhanced reporting system and; 4) assurances that climate protection measures do not cause increases in criteria pollutants. In addition, SMAQMD has done the following in regards to the Climate Protection Program.

- *California Climate Action Registry (CCAR) and The Climate Registry* The SMAQMD joined the CCAR in March of 2006 and is a founding member of The Climate Registry. The Climate Registry consists of organizations that are voluntarily taking actions to reduce their GHGs. Among the required actions are annually tracking and reporting their GHGs and having them certified by an independent auditer. The District has completed its emissions inventory for 2005, 2006 and 2007 and all three years of data have been certified.

- *Greenergy® member* The SMAQMD subscribes to this Sacramento Metropolitan Utility District program which matches electricity use with renewable electricity sources.

- *Clean Vehicles* Most of the SMAQMD vehicles are hybrids. Employees regularly use these vehicles to conduct air quality inspections at the sites. (Currently, of the District's 23 vehicles, 19 are 2005 Toyota Priuses. When their lease ends in February 2011, the District will look to replace the Priuses with even greener vehicles.)

- *Alternate Transportation Policies* The SMAQMD provides incentives to employees to commute using public transit, car or van pools, and bicycles or by walking. Over 60% of the District's employee work trips are made by alternate modes instead of driving alone.

- *Building Retrofits* The SMAQMD has already implemented several measures at its main office building to improve energy efficiency and reduce its carbon footprint, including: 1) replacing light bulbs with more energy-efficient bulbs, 2)

installing motion sensors on the majority of its light switches and placing other lights on timers and 3) installing a new digitally-based HVAC control system. The District is pursuing LEED EB (Existing Building) certification (level still TBD) for its building and a next step is to have a LEED EB Gap Analysis performed to determine what steps remain to achieve LEED EB certification.

San Joaquin Valley Unified Air Pollution Control District

In August 2008 the San Joaquin Valley Air Pollution (SJVAPCD) Control District's Governing Board adopted a Climate Change Action Plan (CCAP). The CCAP directed the Air Pollution Control Officer to develop guidance documents to assist land use and other permitting agencies in addressing GHG emissions as part of the CEQA process; investigate the development of a GHG banking program; enhance the existing emissions inventory process to include GHG emissions reporting consistent with new state requirements; and administer voluntary GHG emission reduction agreements. These items would then be brought before the District's Governing Board for their consideration in late summer 2009. The goals of the CCAP are to assist local land use agencies comply with CEQA for projects with GHG emissions, assist Valley businesses in complying with state law related to GHGs, and to ensure that collateral emissions from GHG emission reduction projects do not adversely impact public health or environmental justice communities in the Valley. The following are potential programs considered within the CCAP: (1) GHG guidance for CEQA; (2) carbon exchange program; (3) GHG emissions reporting; and (4) voluntary GHG mitigation agreements. The implementation of these actions, if determined to be warranted and feasible, will be determined with extensive stakeholder input.

South Coast Air Quality Management District

The South Coast Air Quality Management District (SCAQMD) is actively engaged in Climate Change activities to maximize the synergies between strategies to reduce criteria pollutants, toxics, and greenhouse gases (GHG). The following highlights selected SCAQMD efforts:

- *Climate Change Committee*: In Spring 2008, the SCAQMD established a Board-level Climate Change Committee to oversee SCAQMD's efforts related to implementation of AB 32 and provide enhanced guidance to local governments regarding climate change issues.

- *Climate Change Policy*: In September 2008, the SCAQMD Board approved a formal Climate Change Policy. It states: *"It is the policy of the South Coast Air Quality Management District (SCAQMD) to actively seek opportunities to reduce emissions of criteria, toxic, and climate change pollutants and maximize synergistic effects of strategies that reduce emissions in more than one of these categories. It is the policy of the SCAQMD to assist businesses and local governments implementing climate change measures, decrease the agency's*

carbon footprint and provide information regarding climate change to the public. If greenhouse gas reduction strategies have potential negative impacts or slow progress in reducing criteria or toxic pollutants, the impacts must be carefully evaluated and disclosed. In these instances, public health protection should prevail in the majority of circumstances. This policy provides additional direction to staff relative to future actions related to greenhouse gas emission reductions and climate change."

The Policy includes 8 specific action areas to implement the above policy.

- *Inventory*: To show its support for efforts to inventory and reduce GHG emissions, SCAQMD has voluntarily prepared a GHG inventory. The SCAQMD has also reported voluntarily to the California Climate Action Registry (CCAR) for the last several years.

- *SoCal Climate Solutions Exchange*: The objective of the SoCal Climate Solutions Exchange is to ensure real, surplus, verifiable GHG reductions from voluntary, early actions. This provides incentives for local investments and assists local businesses in capturing voluntary early GHG reductions. Added benefits are the retention of co-pollutant benefits and stimulus for the local economy. Three rules were adopted in late 2008 and early 2009 to implement this program – Rule 2700 – General; Rule 2701 – SoCal Climate Solutions Exchange; and Rule 2702 – GHG Reduction Program. SCAQMD staff serves as the verifiers for emission reductions that follow pre-approved protocols.

- *California Environmental Quality Act (CEQA)*: To provide guidance to local lead agencies on determining significance for GHG emissions in their CEQA documents, the SCAQMD convened a GHG CEQA Significance Threshold Working Group. Members of the working group include government agencies implementing CEQA and representatives from various stakeholder groups that will provide input to the SCAQMD staff on developing GHG CEQA significance thresholds. On December 5, 2008, the SCAQMD Governing Board adopted an interim GHG significance threshold for projects where the SCAQMD is lead agency. Work is underway regarding recommendations for a GHG threshold for other applications.

- *Technology Advancement Assistance:* SCAQMD oversees a comprehensive program to co-sponsor public-private demonstration and deployment projects for lower-emission fuels, vehicles, and technologies in local fleets. Co-funded fleet acquisitions include low-emission natural gas school & transit buses, clean heavy-duty vehicles, plug-in hybrid electric conversions, and other advanced propulsion vehicles & equipment.

- *Technical and Policy Forums*: The SCAQMD periodically holds clean-energy forums and roundtables to bring together experts on a variety of topics, including GHG reduction strategies. Archived event materials can be viewed at the

SCAQMD website: visit aqmd.gov, click on upper tab "Technology," then select "Technology Forums" from the drop-down menu.

- *Leading by Example*: The SCAQMD headquarters facility is considered a "green building" because of its unique design and state-of-the art features such as fuel cells, 60-kilowatt micro turbines, high efficiency chillers, and energy efficient lighting. The building's exterior design includes windows of a high-efficiency glass which allows light in, but keeps heat out. The building roof is a reflective material which aids in reducing air conditioning load during sunny days. The SCAQMD maintains one of the largest alternatively-fueled fleets in the country, with vehicles running on electricity, compressed natural gas, gasoline, hydrogen or other hybrid combinations.

San Luis Obispo County Air Pollution Control District

In November 2005, the SLOAPCD Board adopted its Climate Protection Plan. Implementation of the plan has been given a high priority and resulted in the following activities and accomplishments:

- *Community Outreach:* A comprehensive outreach program for climate protection was developed, with a countywide survey conducted to determine the level of public knowledge and action on the issue. Presentations have been made to every city council and the county as well as at various public forums regarding the impacts of climate change and how to reduce greenhouse gas emissions locally. A community stakeholder group has been formed with representatives from all local jurisdictions meeting regularly to discuss development of GHG inventories and action plans.

- *GHG Inventory Development:* Municipal and communitywide GHG inventories are being compiled for all local jurisdictions in the region, with a regional emissions report and action plan to be developed based on the inventories.

- *Grant Funding for GHG Reduction Programs:* The District has allocated $440,000 in grant funds for climate protection to provide incentive grants for reducing GHGs in the county; a third of those funds will be used as seed money for implementation of community climate action plans initiated by local jurisdictions.

- *Evaluation of Existing District Programs:* District staff have completed a review of existing regulations and programs to determine the level of GHG reductions already achieved by those programs and what changes can be made to enhance those reductions.

- *Regional Planning:* The District is working with the Council of Governments, LAFCO and the County to develop a preliminary Sustainable Communities

Strategy to include in the 2010 update of the Regional Transportation Plan.

- *Community Partnerships and Programs:* The District is a founding member or on the steering committee for several community groups working to reduce energy consumption and GHG emissions, including the following: The Strategic Energy Alliance for Change (SEAChange) which sponsors public forums and outreach on renewable energy and clean fuels; the Central Coast Clean Cities Coalition, which fosters the advancement and use of clean fuels; the 2030 Challenge Task Force, whose mission is to promote the achievement of carbon free, zero energy buildings by 2030; and SLO Car Free, whose goal is to promote car-free tourism throughout the County.

Ventura County APCD

- *Air – the search for one clean breath***:** a 41-minute award-winning high-definition film produced by the District and funded primarily by a U.S. Environmental Protection Agency grant, features information on climate change via a visit to the British Antarctic Core Survey Program at Cambridge, England, to interview Dr. Robert Mulvaney, an international ice core expert. DVD copies were given to every air district in the country, and the film is being screened throughout the United States and internationally. Teacher lessons for the film will be available online this summer at www.airthefilm.org. They will be aligned with the California State content standards for science, history, and social science. Several of the lessons will concentrate on global climate change.

- *Climate Change Presentations:* The District markets a 20-minute PowerPoint presentation on Global Climate Change to service organizations, senior groups, schools and other organizations. Since its inception in 2008, the program has been presented to over 600 individuals.

- *District Legislative Platform*: The District has amended its legislative platform to allow for the support legislation that implements cost-effective measure to reduce greenhouse gases.

- *Green Urban Fleets*: The District is providing funding to support low-carbon alternative fuel fleets operating in urban environments.

Northern Sonoma County APCD

The Northern Sonoma County Air Pollution Control District participates in climate protection programs on its own as an air district and through CAPCOA. Most District efforts, however, are undertaken in partnership with the County of Sonoma, its nine cities, the Sonoma County Water Agency, and the Agriculture and Open Space Preservation District. Key District efforts include:

- Offering small grants for projects that reduce GHG emissions through its "Sustainability and Trip Reduction Program," approved by the District's Board in 2008.

- Working with local high schools and the Sonoma County Climate Protection Campaign to incorporate climate change awareness and analysis of student travel patterns into the curriculum, and to support campaigns to reduce VMT associated with commute to school.

- Participation in the steering committee overseeing the efforts to achieve the commitment made by Sonoma County and all of its nine cities to reduce GHG emissions by 25% by 2015.

- Participation in the county-wide effort to deploy a vehicle charging network to support electric vehicle technology.

- Participation in the partnership with Nissan to deploy 1,000 electric vehicles in Sonoma County by 2011.

Regional GHG Reduction Programs

The Western Climate Initiative (WCI)

The WCI is a cooperative effort of seven U.S. states and four Canadian provinces that are collaborating to identify, evaluate, and implement policies to reduce GHG emissions, including the design and implementation of a regional cap-and-trade program. The Initiative began in February 2007 with the governors of Arizona, California, New Mexico, Oregon, and Washington, who have since been joined by the premiers of British Columbia, Manitoba, Ontario, and Quebec, and the governors of Montana and Utah. Participation in the WCI reflects each partner's strong commitment to identify, evaluate, and implement collective and cooperative actions addressing climate change. In addition, WCI was created to focus on a market-based cap-and-trade system.

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Appendix D

Projected Climate Change Impacts to California

In California and throughout western North America, signs of a changing climate are evident. During the last 50 years, winter and spring temperatures have been warmer, spring snow levels in lower- and mid-elevation mountains have dropped, snowpack has been melting one to four weeks earlier, and flowers are blooming one to two weeks earlier. These regional changes are consistent with global trends. If left unchecked, by the end of the century CO2 concentrations could reach levels at which climate change impacts would severely impact our public health, economy, and environment.

State of the art climate modeling was performed for the California Energy Commission (CEC) to determine potential future impacts of climate change in California under three different scenarios: a low emissions scenario that assumes aggressive action is taken to reduce GHG emissions, a medium emissions scenario assuming moderate level GHG reductions, and a high emissions scenario that assumes little action is taken to reduce emissions. The range of potential impacts modeled was summarized in a 2006 CEC document called: "Our Changing Climate: Assessing the Risks to California." The document details the growing severity of consequences predicted statewide as temperature rises, and also identifies those impacts that may be unavoidable and for which we will need to develop coping and adaptation strategies. That information is summarized below to aid jurisdictions in determining the scope and focus of the policies needed to address climate change through the General Plan process.

Increase in the Number of Extreme Heat Days

Current models predict that extreme heat events in California will worsen in both frequency and intensity over the next several decades. Heat waves that once lasted days could last for weeks or even most of an entire season. Heat waves are especially dangerous to vulnerable groups, such as infants, the elderly and those with pre-existing health conditions.

The impacts of heat waves tend to be greater in urban areas because of the "heat island" effect and higher levels of air pollution from transportation. The heat island effect occurs when urban areas replace natural land cover with darker man-made materials such as pavement for parking lots and roads. These materials tend to collect and retain heat at a higher rate than a natural landscape, which causes the urban areas to be hotter than nearby open spaces. Heat island area impacts are expected to increase the frequency, duration, and intensity of conditions conducive to air pollution formation. Health impacts may be influenced by the timing and characteristics of heat waves. Extreme heat events that happen early in the summer tend to result in more deaths than those that occur later in the summer, as people have not yet acclimatized to warmer weather. Moreover, nighttime minimum temperatures are increasing more rapidly than daytime maximum temperatures, which can further increase temperature stress to the elderly and people with pre-existing health conditions, such as circulatory, respiratory and nervous system problems. Furthermore, extreme heat related illnesses place stress on health infrastructure and can lead to significant economic costs.

Increased electricity demand is an additional concern associated with extreme heat days, as the heavy demand to operate air conditioning raises the risk of power shortages. Heavy electricity usage, which is often generated using fossil fuels, means more pollutant emissions, including GHGs.

Increase in the Number and Intensity of Wildfires

Wildfires can have a severe impact on California's air quality and public health. In the coming years, wildfires are expected to increase in intensity and frequency due to climate change, producing more extreme bad air days and longer fire seasons. This negatively impacts the health of the population and results in higher economic costs to California.

Smoke is made up of a mixture of gases and fine particles produced when wood and other organic matter burn. Fine particulate matter (PM) from smoke can cause a variety of adverse health effects ranging from eye and respiratory tract irritation to serious illness, such as reduced lung function, bronchitis, aggravation of asthma, and premature death. aggravation of pre-existing respiratory and cardiovascular disease and increased mortality. PM can also affect the body's immune system and make it more difficult to remove inhaled foreign materials from the lungs, such as pollen and bacteria.

Wildfires also have major economic impacts, costing California hundreds of millions of dollars in firefighting and medical costs; damage to property, natural areas and agricultural lands; loss in tourism, other businesses and employment; increased insurance rates; and a host of other impacts.

Rise in Sea Level and Increased Risk of Flooding

California sea levels have risen about 7 inches over the past 150 years and are projected to rise an additional 4 to 28 inches over the next century as a result of climate change. As sea levels rise, California can expect species and habitat shifts, changes in intensity and frequency of rainfall and coastal storms, increased flooding and changes in runoff patterns. A rise in coastal water temperatures is also anticipated, which will affect water quality and conditions for all marine life that depend on oxygen.

California coastal areas are especially vulnerable to rising sea levels. Increasingly severe winter storms, high tides, and rising mean sea levels are expected to cause more frequent and severe erosion, flooding, and damage to coastal structures. California coastal areas are at risk for the following:

- Erosion of beaches and bay shores;
- Inundation of low-lying uplands;
- Increased flooding and erosion of marshes, wetlands and tidal flats;
- Increased flooding and storm damage in low-lying coastal areas;

- Vulnerable to episodic storm surges and destructive waves that penetrate further inland; and
- Increased salinity in estuaries, marshes, coastal rivers, and coastal aquifers.

Water supplies are also at risk. Rising sea levels would aggravate saltwater intrusion which would degrade California's estuaries, coastal aquifers, wetlands, and groundwater aquifers, and threaten the quality and reliability of the Sacramento-San Joaquin River Delta water transfer system. Higher tide levels caused by higher sea levels could also pose problems to the Delta levee systems with a risk of more inland inundation and the corresponding threat to water quality.

Decrease in Snowpack and Early Run-Off: Effects on Water Supply

Water is already a scarce resource in California and is likely to become more scarce in the coming decade. Water demand is expected to increase because of rising temperatures and increasing population; at the same time, water supply is expected to decrease. California's water supply system relies on a network of dams, reservoirs and canals which are dependent upon water supplied by the snowpack in the Sierra Nevada Mountains. The Sierra Nevada snowpack provides natural water storage, storing winter precipitation in the form of snow and releasing it in the spring and early summer as the snow melts. This system is estimated to hold about half the storage capacity of California's major reservoirs.

Recent studies show that if heat-trapping GHG emissions continue unabated, more precipitation will fall as rain instead of snow, and the snow that does fall will melt earlier, reducing the Sierra Nevada spring snowpack by as much as 70 to 90 percent by the end of this century. Decreasing snowmelt and spring stream flows coupled with increasing demand for water could lead to increasing water shortages, which could exacerbate drought conditions and increase the diversion of rivers in California. The Central Valley relies heavily on Sierra Nevada snowmelt in the summer for drinking water and agriculture. As river flows decrease, competition for scarce water resources increases. California Energy Commission reports project a 15% to 30% reduction in surface water supply to California's cities and farms over this century as a result of climate change.

Increase in the Intensity of Severe Storms

The IPCC predicts changes in precipitation due to increasing global surface temperatures. Rising global surface temperatures are expected to increase the activity of the world's hydrologic cycle and increase the moisture content of the atmosphere. In addition, rising temperatures are expected to increase water vapor in the atmosphere which is a GHG and will likely provide a positive feedback mechanism for climate warming. Global average precipitation is expected to increase during this century; however, it will not be

distributed evenly. Certain areas are expected to receive extra precipitation while others, including California and the southwestern deserts, are expected to receive less.

Research indicates that climate change can cause hurricanes and tropical storms to become more intense, last longer, and have stronger winds. Scientists hypothesize that higher water temperatures are one of the causes of longer and stronger storms, since hurricanes and tropical storms get their energy from warm water. As sea surface temperatures rise, developing storms will contain more energy. Weather patterns have also become more variable, causing longer and drier droughts and longer winter and spring flooding. In recent years, due to high-intensity storms, water flows on many California rivers have been the largest on record. Levees, dams, and flood bypasses are forced to manage flows for which they weren't designed.

Specifically to California, the Sacramento-San Joaquin River Delta is susceptible to flooding. The Delta is composed of 70 islands and tracts and has land surfaces at or below mean sea level. Some Delta Islands are now 25 feet below mean sea level as a result of farming and soil erosion. Levee failure is a significant threat and could result in potential loss of human life, damage to property, and agricultural crops, significant harm to the Delta's fragile ecosystem, disruption of utilities and highways, and water supply disruption due to levee failure and changes in salinity levels.

Effects on Human Health Due to Climate Change

Summer temperatures in California under some climate models are projected to increase by 2°C to 7°C (3.6°F to 12.6°F) by the end of this decade. These temperature increases are expected to affect human health in a number of ways including negative effects on air pollution, heat-related mortality, effects on various infectious diseases, and increase in wildfires.

Higher temperatures are expected to increase the frequency, duration, and intensity of conditions conducive to ozone formation, a pervasive air pollution problem in California causing a wide range of respiratory and cardiovascular problems, particularly for the elderly and very young. Considerable improvement in ozone levels has been achieved over the past three decades as a result of California's aggressive anti-pollution programs. However, under a moderate warming scenario, climate models predict a potential increase of 75 to 85 percent more days with weather conducive to ozone formation in Los Angeles and the San Joaquin Valley, relative to today's conditions.

Likewise, if temperatures rise to the higher warming range, by 2100 there could be up to 100 more days per year with temperatures above 90°F in Los Angeles and above 95°F in Sacramento. Extremely high temperatures increase the number of people who die on a given day by causing the cardiovascular system to work harder to keep the body cool, aggravating existing heart problems; increasing respiratory distress; and causing heat exhaustion. This is predicted to result in two to three times more heat-related deaths than occur today.

Climate change may also increase the risk of some infectious diseases, particularly those that thrive in warm areas. Diseases often associated with hot weather, including the West Nile virus, cholera, and Lyme disease are spreading rapidly throughout North America and Europe because increased temperatures in these areas allow disease carriers such as mosquitoes, ticks, and mice to thrive.

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Appendix E

Top 10 Actions by Local Governments and Communities

Top Ten Actions by Local Governments and Communities

The most effective and efficient greenhouse gas reductions within the control of local governments will depend on the particular greenhouse gas (GHG) profile within each community, the status of GHG reduction planning to date, and the economic conditions relative to different strategies. Not all strategies will work equally within the diversity of cities and counties in California. However, the following ten strategies are widely applicable throughout California in varying degrees and are the recommended initial local government focus for future General Plan policies, Climate Action Plan development, and Blueprint Planning:

1) promotion of smart growth, jobs/housing balance, transit-oriented development, and infill development through land use designations, zoning, and public-private partnerships;

2) support for and funding of transit, bicycle, and pedestrian connections through transit and trail planning and regional cooperation;

3) promotion of energy- and water-efficient buildings (e.g., LEED buildings) through green building ordinances, project timing prioritization, and other implementing tools;

4) promotion of green procurement and alternative fuel vehicle use through municipal mandates and voluntary bid incentives;

5) support for alternative fuel facilities and infrastructure through land use designations, zoning, and public-private partnerships;

6) support for renewable energy generation (utility and residential) through feasibility evaluations, land use designations, and zoning;

7) promotion of waste diversion, recycling, energy efficiency and energy recovery in cooperation with public services districts and private entities;

8) support for urban and rural forestry through tree planting requirements and programs;

9) community outreach and education to foster community involvement, input, and support for GHG reduction planning and implementation; and

10) regional cooperation to find cross-regional efficiencies in GHG reduction investments and to plan for regional transit, energy generation, and waste recovery facilities.

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Appendix F

Agency Responsibilities for Programs on Climate and GHGs

Appendix F: Agency Responsibilities for Programs on Climate and GHGs

Appendix F provides information on California State agencies and how they are addressing climate change and GHG reductions in their policies and programs. The following are thumbnail summaries of State programs for reducing GHG emissions. Links are provided at the end of each summary where additional information can be found.

Climate Action Team (CAT)

Established by Governor Schwarzenegger under an Executive Order S-05-05 on June 1, 2005, the CAT coordinates state-level actions relating to Climate Change. The Team is led by the Secretary of the California Environmental Protection Agency and includes the Secretary of the Business, Transportation and Housing Agency, Secretary of the Department of Food and Agriculture, Secretary of the Resources Agency, Chairperson of the Air Resources Board, Chairperson of the Energy Commission and President of the Public Utilities Commission. The CAT is charged with implementing global warming emission reduction programs and reporting on the progress made toward meeting the statewide GHG reduction targets that were established in the Executive Order. The CAT is divided into 11 subgroups which are focused on supporting the Scoping Plan--the roadmap to meet the state's GHG reduction goals. The CAT members will play a key role in developing and implementing the reduction measures adopted in the Scoping Plan. Furthermore, the Executive Order mandated the preparation of a biennial assessment on climate change science, impacts, and adaptation. The CAT has released the draft Climate Action Team Biennial Report for 2009. The draft report can be found at this link: http://www.energy.ca.gov/2009publications/CAT-1000-2009-003/CAT-1000-2009-003-D.PDF . The draft report addresses four climate change topics which include: impacts of climate change on California's public health, infrastructure and natural resources; economic impacts of climate change on California; climate change research in California; and state efforts to adapt to current and future effects of climate change.
http://www.climatechange.ca.gov/climate_action_team/index.html

California Air Resources Board (CARB)

CARB is tasked to oversee California's major initiatives for reducing climate change or GHG emissions as outlined in AB 32, and 2005 Executive Order S-3-05. These efforts aim at reducing GHG emissions to 1990 levels by 2020 - a reduction of approximately 30 percent, and then an 80 percent reduction below 1990 levels by 2050. The main strategies for making these reductions are outlined in the Scoping Plan which was adopted by the Board in December 2008.

The Scoping Plan provides an outline for actions to reduce California's GHG emissions. The Scoping Plan now requires the CARB and other state agencies to adopt regulations and other initiatives reducing GHGs. Many of these measures will be developed in 2009 and 2010 and go into effect in 2012. The following are some of the regulations and activities that CARB will be implementing: energy efficiency/co-benefits audits of large stationary sources; refinery flare recovery; SF6 emission reduction from the electrical

sector and particle accelerators; landfill methane control measures; stationary equipment refrigerant management program; and foam recovery and destruction program. For a complete list of regulations and measures that CARB is considering, please see the Scoping Plan at:
http://www.arb.ca.gov/cc/scopingplan/scopingplan.htm .

In addition to AB 32, CARB is involved with other state climate change programs which include SB 375 and Clean Car Standards (AB 1493—Pavley). As described in Chapter 2, SB 375 is a state law that requires CARB to set regional targets to reduce greenhouse gas emissions from passenger vehicles for 2020 and 2035. If regions develop integrated land use, housing and transportation plans that meet the SB 375 targets, new projects in these regions can be relieved of certain review requirements under CEQA. The targets apply to the regions in the State covered by the 18 metropolitan planning organizations (MPOs).

Under AB 1493, CARB adopted regulations that achieve the maximum feasible and cost-effective reduction in greenhouse gas emissions from motor vehicles. The regulations would reduce GHG emissions from California passenger vehicles by about 22 percent by 2012 and about 30 percent by 2016. For these regulations, however, the Federal Clean Air Act requires a waiver from the U.S. EPA. Initially, the request was denied, but the U.S. EPA as of February 2009 is currently reconsidering rehearing of the waiver request.
http://www.arb.ca.gov/cc/cc.htm

Board of Forestry

The Board of Forestry (BOF) has been involved in the development of forest protocols and how the Forest Practices Act could better address climate mitigation and adaptation policies. BOF has worked with Cal Fire to update the 2003 Assessment of Forests and Rangelands to provide more discussions and analysis on climate change; BOF also helps develop the State's Fire Management Plan which provides policy direction for the state on combating fires. In developing this plan, BOF will consider climate change in its considerations. Furthermore, CARB's Scoping Plan states that the forest sector must achieve a "no net loss" target, which means it must achieve reductions in CO2 equivalent to the current statewide forest carbon budget. BOF has further been tasked by CARB to implement approaches to reach this target. BOF plans to use a combination of regulatory, statutory and incentive-based approaches to meet these goals.
http://www.fire.ca.gov/resource_mgt/resource_mgt_EPRP_Climate/climate_change_board.php

California Coastal Commission

The California Coastal Commission is developing a planning manual for how stakeholders should address climate change within the California Coastal Act (CCA). The Coastal Commission is planning to develop a document and website that will help stakeholders interpret and implement projects under the CCA. In addition the Commission completed the following in connection with its climate change activities: a

workshop on climate change for the Commission Board; establishment of an internal climate change task force to better understand the relationship between climate change and the CCA; addressing how to incorporate GHG mitigation requests into permit conditions within large projects before the Commission; and participation on the Coastal States Organization Climate Change Work Group, which developed a report, "The Role of Coastal Zone Management Programs in Adaptation to Climate Change."
http://www.coastal.ca.gov/climate/climatechange.html

California Coastal Conservancy

The California Coastal Conservancy has taken the following actions in regards to climate change: developing Climate Change Grant Assessment Criteria for project design; reduction of the Conservancy's overall carbon footprint; and improved planning for future climate impacts to land and water management efforts. The Conservancy is also interested in the "permanent protection or restoration of important habitat corridors affecting significant populations of various species" as an important measure of success. The Conservancy will assess both land and freshwater species as pertaining to climate change impacts.
http://www.scc.ca.gov/index.php?cat=26

California Conservation Corps (CCC)

The CCC has taken the following actions in regards to climate change: implementing a number of programs to reduce its carbon footprint; promoting a more environmentally-friendly labor force by increasing spikes (work from mobile camps) to project work sites to reduce vehicle mileage and maximize time on tasks; increasing fleet vehicle use; developing demonstration projects that sequester carbon and reduce energy and water use; engaging in additional urban and wildland forestry projects, such as tree planting and fuel reduction activities and; participating in climate education that furthers climate action awareness through highly visible project work and public education strategies.
http://www.ccc.ca.gov/#

California Department of Food and Agriculture (CDFA)

The CDFA is addressing the issues of global warming through development of carbon sequestration strategies and GHG reduction strategies for agriculture, promotion of energy and water use efficiency in agriculture, biological control measures, and support for biofuels development. Some specific programs administered include the Rice Straw Utilization Program, which ties into carbon sequestration and biofuels production. Other projects in the Minor Crops Block Grant Program address carbon sequestration and energy efficiency in agriculture. The CDFA is also seeking to reduce the use of petrochemical-based pesticides and fertilizers, which release GHG to the atmosphere, through the Biological Control Program, which substitutes biological organisms for pesticides, and the Fertilizer Research and Education Program, which reduces fertilizer use and promotes carbon sequestration. The Drainage Water Reduction Program and

Reuse and Salt Utilization Program result in more efficient use of irrigation water, resulting in less energy used for water pumping. The CDFA promotes the California production and use of bioethanol and biodiesel as renewable fuels. The Dairy Digester Cost Share Program expands the use of dairy digesters, which convert dairy manure and the methane gas derived from it into electricity, process heat, compost, and carbon dioxide. The conversion of dairy methane to carbon dioxide reduces the global warming potential by about 90% while providing energy.
http://www.cdfa.ca.gov/AHFSS/Emergency_Preparedness/Climate_Change.html

California Department of Forestry and Fire Protection (Cal Fire)

Cal Fire has taken the following actions in regards to climate change: reducing Cal Fire's carbon footprint; participating as an active member of the CAT Forest and Land-Use Sector Groups; assisting in the development of the original forest carbon protocols that were recently adopted by CARB; actively developing new protocols on public lands, urban forestry, and working forests; developing the climate strategy for the Forestry CAT that included detailed descriptions on Reforestation/Afforestation, Forest Conservation, Forest Management, Urban Forestry, and Fuels Reduction/Biomass Production; and participating in several current programs that improve the ability of our forests to adapt to the projected impacts of climate change in California. These programs include the California Forest Improvement Program, the Vegetation Management Program, the Nursery and Seed Bank Program, the Urban Forestry Program, the Forest Legacy Program, and Fuel Hazard Reduction.
http://www.fire.ca.gov/index.php

California Energy Commission (CEC)

The CEC has played an important role in coordinating and implementing state activities addressing climate change. These activities include the following: involvement in a number of activities supporting implementation of AB 32 and other climate activities such as reductions in GHG emissions through energy efficiency, renewable energy and alternative transportation fuel programs; serving on the CAT and leading the Land Use Subgroup of the Climate Action Team (LUSCAT); participating on 11 CAT subgroups responsible for developing action items that will result in quantifiable greenhouse gas emission reductions; conducting a joint proceeding with the CPUC on AB 32 implementation in the electric sector and making joint recommendation to the ARB in February 2008; conducting scientific research on climate change through the Public Interest Energy Research Program (PIER) and the California Climate Change Center; developing climate research and a Development, Demonstration and Deployment Road Map with the ARB and other state agencies to achieve GHG emission reduction and adaptation goals; providing technical support to the California Climate Action Registry in developing greenhouse gas emission protocols; qualifying third-party organizations to provide technical assistance and certification of emissions baselines and inventories; supporting CARB's statewide greenhouse gas emissions inventory for updates and

accuracy; participating in the working groups of the Western Climate Initiative to identify, evaluate and implement collective and cooperative ways to reduce GHGs in the West; and providing policy guidance and monitoring international, national and regional developments and activities impacting clean energy and climate change issues.

Furthermore, the CEC's PIER Program supports research to produce environmentally sound, safe, reliable and affordable energy services and products. In conjunction with other state agencies, PIER is addressing climate change by leading the development of a long-term climate change research plan for California. Under PIER, energy efficiency and generation technologies are under development that could significantly contribute to the decline of in-state greenhouse gas emissions. In addition, PIER is seeking to improve understanding of the implications of climate change by supporting research on potential costs and impacts was well as possible adaptation and mitigation measures. http://www.energy.ca.gov/climatechange/index.html

California Environmental Protection Agency (Cal/EPA)

Under existing law, the CARB, CEC, and the California Climate Action Registry all have responsibilities with respect to control of greenhouse gas emissions. New legislation requires the Secretary for Environmental Protection to coordinate greenhouse gas emission reductions and climate change activity in state government. Cal/EPA is addressing climate change through its assessment of environmental indicators in the Environmental Protection Indicators for California (EPIC) project. EPIC was created to develop scientifically based measures that convey complex information on environmental status and trends in an easily understandable format. EPIC supports Cal/EPA's commitment to using measurable results in judging the effectiveness of the state's efforts directed at environmental protection. In its first year, EPIC developed a framework in which to select indicators that are important in tracking the state of California's environment. For climate change, the indicators selected were carbon dioxide emissions, air temperature, Sierra Nevada snowmelt runoff, and sea level rise in California. In the future, EPIC will investigate other greenhouse gas emissions, such as methane and nitrous oxides, and correlate different data sets that show increasing climate patterns in California. Cal/EPA will continue to evaluate, improve, and expand on the EPIC project to ensure that it provides meaningful information for understanding the state of the California environment for planning and decision making.
http://www.climatechange.ca.gov/

California Integrated Waste Management Board (CIWMB)

The CIWMB is addressing climate change issues through recycling programs, which avoid emissions from the energy-intensive processing of virgin raw materials; through sustainable building activities, which emphasize energy, water, and materials efficiency thereby reducing emissions from their production and transport; and through landfill gas collection, which directly uses landfill greenhouse gas emissions for fuel. The CIWMB is implementing the State Agency Buy Recycled Campaign (SABRC) program which,

under state law, requires all state agencies to use recycled products when available and increase acceptance and awareness of recycled-content product use in the private sector as well as state and local government. CIWMB runs the one of the largest recycled-content databases on the web, including construction and demolition recycling databases. The CIWMB has played a key role in the Sustainable Buildings Task Force, and is currently developing the Sustainable Building Training Program. In an interagency study, the CIWMB will develop a methodology to incorporate life-cycle costing into the state's capital outlay design. CIWMB participated in the Collaborative for High Performance Schools to assist in building energy and resource-efficient California schools and runs a program to promote efficient landscape design and maintenance practices among landscaping professionals. CIWMB also has been instrumental in the U.S. Green Building Council's Green Building Rating System. The CIWMB is pursing conversion technologies such as gasification and hydrolysis of solid waste to produce alternative fuels such as ethanol, thereby offsetting greenhouse gas emissions from fossil fuel sources. The conversion of solid waste destined for landfills to useful products such as ethanol reduces the organic fraction going into landfills. It is the organic fraction which generates landfill gas, a significant source of greenhouse gas emissions. The CIWMB also directly benefits greenhouse gas reduction by ensuring compliance with state minimum standards for landfill gas monitoring, collection, and control.
http://www.ciwmb.ca.gov/climate/

California Ocean Protection Council (OPC)

OPC has taken the following actions in regards to climate change: coordinating ocean impacts; establishing policies that will guide those agencies responsible for ocean protection; and helping to coordinate the state's efforts to adapt to the ocean impacts of climate change. OPC is working on determining potential impacts along the coast due to sea level rise, including impacts to public infrastructure.
http://www.opc.ca.gov/

California Public Utilities Commission (CPUC)

The CPUC is responsible for a number of energy-related policies and initiatives that benefit consumers and the economy, and have corresponding reductions in GHGs. Some of these policies and initiatives are described as follows:

- Energy Efficiency - The CPUC launched an energy efficiency and conservation campaign in which the agency allocated almost $3 billion in funding for energy efficiency programs in 2006-2008.

- Renewable Energy - California has the most ambitious goals in the nation for renewable energy. The State’s Renewable Portfolio Standard requires utilities to obtain 20% of their power from renewable resources by 2010, as mandated under SB 107 (Simitian). The CPUC oversees utility progress toward this goal and identifies steps toward meeting the Governor’s target of 33% by 2020.

- Emissions Performance - The CPUC instituted a new GHG emissions performance standard to regulate contracts with electricity generation facilities. Mandated by SB 1368 (Perata), the standard, known as EPS, ensures that any long-term power commitments to meet California's energy needs are at least as clean as California's existing energy portfolio.

- Emerging Technologies - The CPUC approved $11 million per year in funding support for emerging energy efficiency technologies from 2006 through 2008.

- Advanced Metering - The CPUC has authorized distribution tariffs since 2001 to fund utility incentives for customer-owned clean generation such as fuel cells and solar energy. This is a part of a plan for replacing conventional customer electric meters with an Advanced Metering Infrastructure (AMI), giving customer new access to information and greater control over their energy use and bills. http://www.cpuc.ca.gov/PUC/energy/climate+change/

California Resources Agency

The California Resources Agency is providing leadership in promoting and implementing climate policies across the state through its 25 departments, commissions, boards and conservancies, through the Governor's Climate Action Team efforts, and through engagement in national and international climate policy dialogues. These efforts range from working to reduce the Resource Agency's overall carbon footprint, to setting state climate policy direction through the development of a state climate adaptation strategy, to representing California in the recent U.N. Framework Convention on Climate Change Convention in Indonesia. The Resources Agency has been active in developing a climate adaptation strategy (CAS) for the state that begins to address how California can and should prepare for short-, medium-, and long-term risks from expected climate impacts. Mitigating carbon emissions has and should be a central focus of California climate policies, but helping California adapt to known climate impacts will need to be on equal footing to address climate risks to the state's resources. In addition, the Resources Agency is:

- In the process of accounting for all Resources-wide GHG emissions. At the same time, the Agency is working with all of its departments, commissions, boards, and conservancies to reduce its overall carbon footprint in internal operations, project activities, and amongst its grantees and contractors when possible;

- Leading the Forestry Climate Action Team Scoping Group. The Resources Agency has been Chairing the Forestry Climate Action Team (FCAT) sector group that has focused on developing a forest sector strategy for the Scoping Plan, revising the state's greenhouse gas inventory for the forests, developing new forest protocols, discussing offsets, and the climate adaptation strategy for the forest sector;

- Revising CEQA Guidelines to address greenhouse gas mitigation and adaptation. Under SB 97 (Dutton), the Resources Agency is working with the Governor's Office of Planning and Research to develop Technical Guidelines for how GHGs should be considered in the California Environmental Quality Act (CEQA). It is planned that this effort will be completed by 2010;

- Providing Climate Policy Coordination and Leadership within the Agency. Monthly "Climate Leaders" meetings with the Lead Climate person within each Resources organization are held to discuss recent happenings on climate-related topics;

- Revising bond-money grant guidelines to incorporate climate change. The Resources Agency is developing climate change grant criteria for several programs within its organization to begin to track the carbon emissions and sequestration from Resources programs;

- Initiating a forestry sub-group as part of the Western Climate Initiative, with Washington and Oregon;

- Partnering with the Coastal States Organization (CSO). The Resources Agency chairs the CSO where the Chair's Initiative proposes that coastal climate change be one of the three top priorities of the CSO. The organization has adopted the Adaptation to Climate Change Policy to better coordinate state and national efforts. The Coastal States Stewardship Foundation, in collaboration with the Coastal States Organization, is creating the Coastal States Campaign to Adapt to Climate Change;

- Involved with the West Coast Governors' Agreement on Ocean Health. Part of the recommendations from the West Coast Governors Agreement on Ocean Health Action Plan will be to address climate change adaptation by conducting a west-coast-wide assessment of anticipated impacts of climate change over the next several decades and setting a plan for how to adapt to such changes. http://resources.ca.gov/energy_and_climate_change.html

California Department of Transportation (Caltrans)

Caltrans is addressing climate change by reducing emissions through energy efficiency measures and use of alternative technologies to lessen the emissions from the state transportation system, vehicle fleet, and reduction of time spent in cars and in traffic. In fiscal year 2001/2002 Caltrans surpassed energy efficiency goals by saving $7.5 million, primarily due to the statewide Light Emitting Diode (LED) Traffic Signal upgrade project. This achievement has led to significant emissions reductions in energy generation, and is being expanded through implementation of non-vehicular energy conservation activities, such as reducing the energy to traffic signals, roadway and sign lighting, facility operations and procedures, and bridge and tunnel operations. Caltrans' Greening the Fleet Initiative uses viable, emerging technologies to reduce mobile source

emissions. So far, nineteen hybrids and 758-gas/propane bi-fuel trucks were purchased. Low emission trucks have replaced 54 diesel-powered trucks, and zero emission static inverters have replaced generators on 34 trucks. Solar panels have replaced fossil fuel-powered accessories. These efforts will continue with the goal of making significant emissions reductions and leading California fleet operators. Caltrans will also reduce mobile source emissions through its transportation energy efficiency program, the Smart Transportation and Livable Community Initiative, with the goal of reduced fuel consumption and vehicle miles traveled, and increased transit ridership and vehicle occupancy. The Transportation System Management and Congestion Relief programs seek to reduce emissions by minimizing travel demand and congestion while maximizing traffic efficiency. Applications include electronic toll collection on bridges, traffic signals, ramp meters, and many more. The New Technology Program will continue to research, demonstrate, and deploy new technologies to increase travel efficiency.
http://www.dot.ca.gov/hq/tpp/offices/opar/climate.html

Department of Conservation (DOC)

The DOC is addressing climate change issues and GHG reductions through a number of actions and programs which include the following:

- The DOC is working with The Climate Registry and several of its members in devising documentation procedures for several emission sources, such as work travel in personal vehicles and rental cars that are currently not required but strongly encouraged.

- Both the Division of Recycling and the Division of Land Resource Protection have revised their grant programs to include GHG reduction as a means to encourage and support lower-emitting projects.

- DOC participates on the following CAT subcommittees: Land Use, Recycling and Waste, Agriculture, Water, Energy and Economic.

- DOC's Division of Oil, Gas and Geothermal Resources is working with the California Energy Commission and other state and federal agencies, as mandated by AB 1925 (Blakesee). DOC is helping to assess the technical and economic feasibility of carbon sequestration in California.

- DOC established a department-wide Climate Action Team (CoolCATS) consisting of representatives from each Division. This team will measure DOC's carbon footprint and identify meaningful and feasible strategies to reduce that footprint.

- Each division within DOC is systematically educating their staff on the principles of sustainability. http://www.conservation.ca.gov/Index/Pages/Index.aspx

Delta Protection Committee (DPC)

The DPC has identified sea level rise as a central threat facing the Delta in the DPC 2006-2011 Strategic Plan. The DPC has initiated a process to update its 1995 Land Use and Resource Management Plan for the Primary Zone of the Delta and will include findings on climate change policies and recommendations for action that local and state government can take to address the impacts of climate change on the Delta.
http://www.delta.ca.gov/

Department of Fish and Game (DFG)

The DFG is addressing climate change issues and GHG reductions through a number of actions and programs which include the following:

- Implementing California's Wildlife Action Plan which identifies climate change as one of DFG's four primary stressors affecting wildlife (along with growth and development, water management conflicts, and invasive species) and makes recommendations to incorporate climate change science in restoration work.

- Providing climate leadership through personnel additions.

- Taking a lead among the state fish and wildlife agencies to begin to address the uncertainty associated with a changing climate through landscape scale efforts that support managing robust populations and healthy habitats. The Department also has many targeted efforts underway focused at climate change research, monitoring and other more specific actions.

- Creating a task force to provide the leadership to reduce or mitigate the production of greenhouse gases by the Department, and to prepare for the current and future harmful impacts of climate change on California's natural resources through policy and meaningful action.

- Convening stakeholders and partners from the NGO community, academia, state and federal agencies. This stakeholder group will provide direct input to the Director's Task Force as well as maintaining and increasing communication and collaboration among stakeholders and Department of Fish and Game.

- Developing a website that will serve as both a resource to Department employees as well as a message to the public and partners about the Department of Fish and Game's commitment to addressing the challenges of a changing climate in all of its endeavors.

- Evaluating the carbon impact of all departmental operations as part of the Climate Change Registry and as a Resources Agency-wide effort.

- Participating with the Resources Agency on the forestry, land-use and water, energy and transportation CAT subgroups, and advising the state on factors relating to adaptation and mitigation for climate change effects on wildlife and natural resources.

- Working with State Parks, Cal Fire and other Resources Agency departments and the Biodiversity Council to build a comprehensive library of published literature, popular articles, and other information on climate change effects that will be made available to the public. DFG has also developed complementary data and enhanced close collaboration with sister state agencies to help inform decisions ranging from levee placement to park management to highway interchange placement.

- Representing wildlife interests on the climate action working group of the Western Governors Association and the Climate Change subcommittee for the Association of Fish and Wildlife Agencies. http://www.dfg.ca.gov/climatechange/

Department of General Services (DGS)

The DGS is addressing climate change issues and GHG reduction through a number of actions and programs which include the following:

- Developing and implementing energy savings strategies such as the Better Buildings Program, ensuring energy savings in state building projects and schools.

- Assisting, through the Office of Fleet Administration's (OFA) Alternative Fuel Vehicle (AFV) Program, state agencies in meeting federal AFV purchasing requirements, which helps reduce dependence on foreign oil and help reduce GHG emissions.

- Establishing a vehicle purchase policy which requires gasoline vehicles purchased for the state fleet to meet the Air Resources Board’s ultra low-emission vehicle standard.

- Promoting the use of recycled products in the construction and maintenance of state buildings

- Monitoring in real time the energy use in state facilities to foster conservation efforts. http://www.green.ca.gov/default.htm

Department of Toxic Substances Control (DTSC)

The DTSC is addressing climate change issues through its Pollution Prevention and Technology Development Program. Hazardous waste reduction and recycling activities reduce impacts on the environment as well as the impacts from transportation, management and disposal. As one example, the development of water-based cleaning systems in lieu of solvent-based systems reduces resource consumption and promotes sustainability. Through the incorporation of life-cycle thinking, DTSC's pollution prevention activities take a holistic, multi-media approach, incorporating energy and materials efficiency as well as air, land and water emissions reductions.
http://www.dtsc.ca.gov/

Department of Water Resources (DWR)

The DWR is addressing climate change issues through a number of actions and programs which include the following:

- Developing a DWR Renewable Resources Policy that would meet the intent of the State's Renewable Portfolio Standards by establishment of a goal under which a percentage of load would be met by use of renewable resources.
- Refurbishing generating and pumping units to increase their efficiency as part of the State Water Project Energy Efficiency Improvements.
- Promoting combined-cycle plants and renewable resources at its facilities.
- Developing an adaptation plan for the state's water resources within the State Water Plan effort.
- Serving as a co-leader and actively participating in the CAT Water and Energy Scoping Group.
- Actively pursuing projects and research that promote carbon sequestration on DWR lands. www.water.ca.gov/climatechange/

Office of Planning and Research (OPR)

OPR is addressing climate change through education about using renewable energy sources, and through Smart Growth, and Vital Communities Initiatives. Innovative Clean Air Technologies (ICAT), GIS State Energy Map, Energy Educational Forum, and Stationary Fuel Cell Collaborative are among the initiatives led by the office. OPR held renewable energy forums from May through November of 2001 in an effort to meet the Governor's goal to increase renewable sources to supply twenty percent of all California's energy needs by 2010. The forums focused on biomass, wind, geothermal, solar, and fuel cell energy, which lead to significant reductions in greenhouse gas emissions as

compared to fossil fuel generated energy. OPR led an Interagency Task Force on Green Accounting that revised the 1987 Standard Practices Manual (2001) which provided finance and accounting procedures for using life-cycle analysis for state projects. The same Task Force is worked on a Comprehensive Energy Efficiency and Renewable Plan for the State On-Site State Buildings and a "Renewable Grid Connected Generation Plan" which supports the financial potential of the Governor's Renewable Portfolio Standard. Furthermore, addressing climate change and GHGs in CEQA projects has emerged as a major issue. Pursuant to Senate Bill 97 (Dutton)(Chapter 185, 2007) OPR is in the process of developing CEQA guidelines "for the mitigation of greenhouse gas emissions or the effects of greenhouse gas emissions." OPR is required to "prepare, develop, and transmit" the guidelines to the Resources Agency on or before July 1, 2009. As part of its continuing service to professional planners, land use officials, and CEQA practitioners, OPR, in collaboration with the California Resources Agency, Cal/EPA, and ARB, has published a technical advisory containing informal guidance for public agencies as they address the issue of climate change in their CEQA documents.
http://opr.ca.gov/index.php?a=ceqa/index.html

State and Consumer Services Agency (SCSA)

SCSA which also houses the Department of General Services (DGS) and the Department of Consumer Affairs, has used the emissions reductions of energy savings programs such as the Building Better Buildings program, energy conservation awareness programs such as the Flex Your Power campaign, as well as emissions reduced from mobile sources in the "Green Fleet" program to address climate change in California. Along with the CIWMB, the SCSA has ensured significant energy and resource savings in major state building projects which amount to over $1 billion, substantially cutting emissions from energy generation. An example of this is the Capitol Area East End project. DGS, as property managers for numerous state government buildings, is cutting energy use through building electricity metering, energy control systems, and extensive recycling. Through the DGS, the Alternative Fuel Vehicle Program is creating a government fleet that produces less greenhouse gas emissions than standard gasoline powered cars by relying on Ultra Low Emission and Super Ultra Low Emission vehicles. The program is also working to deploy fuel cell vehicles as part of the state fleet and to promote the use of electric vehicles. SCSA also promotes energy conservation and efficiency in homes and schools through education and awareness programs. An example is the Flex Your Power campaign implemented by the Department of Consumer Affairs.
http://www.scsa.ca.gov/

State Lands Commission

The State Lands Commission is addressing climate change issues through a number of actions and programs which include the following:

- Inclusion of GHG emissions from leases in environmental impact reports (EIRs). The Commission is requiring greenhouse gas reports for leases involving major

projects. For projects that completed their EIRs before AB 32, the Commission is requiring a supplemental report on greenhouse gases. For example, a supplemental greenhouse gas report was produced for the Poseidon desalination project since the EIR was completed before passage of AB 32.

- Sea Level Rise Planning. The Commission is requiring that oil terminals be modified so that they can accommodate anticipated sea level rise over the life of the terminal. The Commission is beginning to consider the effects rising sea levels will have on the mean high tide line and, consequently, State Lands' jurisdiction. http://www.slc.ca.gov/

State Parks

The State Parks is addressing climate change issues and GHG reductions through a number of actions and programs which include the following:

- Planning a reduction strategy by using solar power systems, installing better insulation, and by buying lower-emission vehicles. In addition, the buildings Parks hopes to build (e.g., restrooms, visitor centers, etc., using bond funds) will have to meet high energy-efficiency standards by Executive Order of the Governor.

- Promoting carbon sequestration in State Park projects. Because forests and other plants absorb and store carbon dioxide from the atmosphere, Parks is trying to reduce its total amount of GHGs affecting our climate through Parks land stewardship and land acquisition strategies.

- Working with universities to monitor the success of different species at different altitudes in the face of climate change. And, consistent with Parks' educational mission, the entire project will be interpreted to visitors as a working example of climate change adaptation and mitigation.

- Modifying its land stewardship priorities to help species adapt to the effects of climate change. The available science suggests Parks need to be purchasing and protecting habitat corridors that move up in elevation so species have somewhere to migrate as the temperatures increase. State Parks also have to consider how an increase in sea level could affect our properties, in particular coastal properties. Sea level rise may require relocating our coastal infrastructure.

- Hosting a seminar with UC Berkeley's California Center for Environmental Law and Policy and the Resources Legacy Fund that brought together public land managers, non-profits and significant donors (who collectively will be spending hundreds of millions of dollars in the coming several years) together with scientists, academics and other experts to develop new acquisition priorities and restoration practices.

- Engaging the public in a meaningful way to help them understand the issue of climate change and to inspire them to constructive action. Parks can teach visitors about the impacts of climate change on parks and inspire them to adapt to climate change by making positive lifestyle changes. Parks can become models of climate-change best practices showcasing both what is at risk and what can be done about it. Parks is beginning to consider how climate change fits into existing planning efforts. http://www.parks.ca.gov/?page_id=21491

State Water Resources Control Board (SWRCB)

The SWRCB is addressing adaptation to climate change with increased environmental data collection and information management that assist in determining correlation between climate change, water supply changes and water quality effects. Through the Surface Water Ambient Monitoring Program (SWAMP), water quality monitoring has increased the gathering of data about overall surface water conditions. SWRCB is also implementing the System for Water Information Management (SWIM) that will increase the availability of such information to researchers, the public, and other interests. The SWRCB is working through the Joint Agency Climate Team and other forums, to identify and coordinate water quality related issues. Increased climate variability and warming has the potential to significantly affect water quality in the state, therefore this data collection and management system will assist in the planning of adaptations to meet water quality objectives.
http://www.waterboards.ca.gov/water_issues/programs/climate/

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Appendix G

Examples and Resources

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Appendix G: Examples and Resources

Appendix G provides an example of a General Plan approach from Marin County. A link has been provided at the end of the Marin County excerpt for readers who wish to view the Marin County General Plan in its entirety. In addition there are several additional reference links for General Plans and Climate Action Plans. The intent is to augment the guidance in the main body of this report with real-world examples of what others have done.

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2.7 Atmosphere and Climate

Background

Although air quality in Marin County is generally very good, emissions from within the county may contribute to pollution problems elsewhere in the region and climate changes that are occurring on a global scale. In some parts of the Bay Area, ozone levels exceed National Ambient Air Quality Standards and particulate concentrations exceed State standards (Figures 2-9 and 2-13). Vehicle traffic produces most of the emissions leading to increased ozone levels, while construction activities, wood burning, off-road travel, and agriculture generate some measured particulate matter.

The Bay Area Air Quality Management District (BAAQMD) encourages local jurisdictions to implement policies that will help improve regional air quality, and to especially recognize sensitive receptors. This Section of the Countywide Plan provides a regulatory framework for articulating air quality objectives consistent with regional air quality programs. The Transportation, Energy and Green Building, Public Facilities and Services, and Community Development sections of the Built Environment Element also include policies and programs intended to reduce the impact of future development on air quality and global warming.

On a global scale, data indicate an increase in mean surface air temperatures over historic levels and climate models predict this warming will continue. Scientists expect that the average global surface temperature could rise 1°F to 4.5°F in the next 50 years, and 2.2° to 10°F in the next century. A rise of this magnitude is significant: For example, the difference in temperature between 1995 and the temperature during the ice ages was 5°F to 8°F. Mounting scientific evidence suggests that the discharge by human activities of gases that trap heat in the atmosphere is largely responsible for this trend. A major consequence of global warming is melting glaciers and warmer waters, which cause the oceans to expand and rise. Sea level rise and higher evaporation rates are expected to increase storm frequency and severity. The resulting economic loss from increased storm activity will be equally dramatic: It has already increased tenfold over the past 40 years. Climate change will amplify existing environmental problems, such as erosion, storm-surge floods, and landslide risk, and changes to the water cycle will further stress domestic water supply as well as indigenous plant and animal populations. Further complicating the issue of climate change is the high level of complexity and uncertainty associated with modeling and predicting climate behavior. While it is clear that damage resulting from weather-related events is already on the rise, it is not known whether future changes will be gradual or abrupt. Nor is it clearly understood what the full spectrum of impacts will be. Given the global risks to economic, environmental, and social stability, it is imperative that climate change be addressed at all levels of government.

> *"Everybody talks about the weather, but nobody does anything about it."*
>
> — Mark Twain

Fortunately, local governments can play a meaningful role in addressing climate change, by instituting measures that reduce the vulnerability and increase the adaptability of Marin's physical infrastructure, economic activities, and natural systems. Furthermore, steps taken to address climate change will yield positive benefits in local efforts to improve air quality, as vehicle traffic and energy generation are major contributors to both greenhouse gases and air pollution. For example, construction of a modern world class transportation system in Marin County will contribute to further reducing greenhouse gas emissions and improving air quality.

The issue of climate change is ultimately part of the larger challenge of fostering sustainable communities. Climate change goals are more effectively accomplished when efforts are focused on integrating principles of sustainability within sectors such as transportation, buildings, ecosystems, and water systems. While the aim of this Section is to provide a framework for addressing atmosphere and

climate change, the detailed policies and programs that address climate protection are located throughout the Countywide Plan and are referenced here in this section.

Key Trends and Issues

How clean is the air in Marin?

Air quality indicators show improvement. Marin has experienced a drop both in the total number of days exceeding State Ambient Air Quality Standards and in the number of days exceeding safe levels of ozone since 1996. Marin also has had a reduction in the number of days that safe levels of particulate matter have been exceeded in the county since 1996 (Figure 2-9). Ozone precursor pollutants have decreased locally, and are expected to continue to decline.

Figure 2-9 Summary of Measured Air Quality Exceedances

Pollutant	Standard	Monitoring Station	Days Exceeding Standard				
			2000	2001	2002	2003	2004
Ozone (O_3)	NAAQS 1-hr	San Rafael	0	0	0	0	0
		BAY AREA	3	1	2	1	0
	NAAQS 8-hr	San Rafael	0	0	0	0	0
		BAY AREA	4	7	7	7	0
	CAAQS 1-hr	San Rafael	0	0	0	0	0
		BAY AREA	12	15	16	19	7
Fine Particulate Matter (PM_{10})	NAAQS 24-hr	San Rafael	0	0	0	0	0
		BAY AREA	0	0	0	0	0
	CAAQS 24-hr	San Rafael	0	2	2	0	1
		BAY AREA	7	10	6	6	7
Fine Particulate Matter ($PM_{2.5}$)	NAAQS 24-hr	San Rafael	0	--	--	--	--
		BAY AREA	1	5	7	0	1
All Other (CO, NO_2, Lead, SO_2)	All Other	San Rafael	0	0	0	0	0
		BAY AREA	0	0	0	0	0

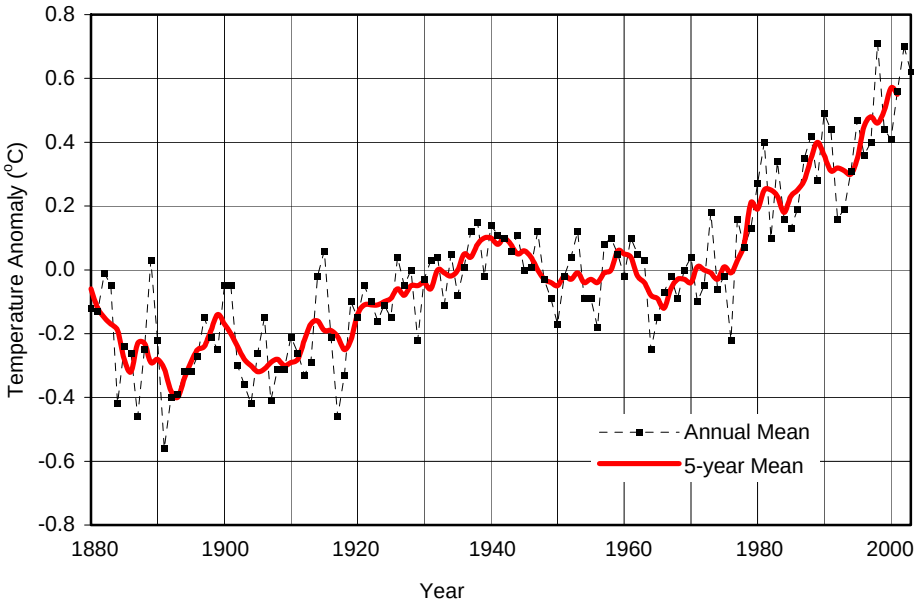
Source: 2000-2004 Bay Area Air Quality Management District.

Pollution levels can be reduced. Most particulate matter comes from areawide sources, such as combustion of wood and other nonclean fuels, and from homes and businesses without emission-control devices. Simple measures such as requiring clean-burning stoves can achieve improvements in air quality. Reducing motor vehicle use can result in significantly cleaner air.

Are temperatures rising globally?

The 10 warmest years of the 20th century all occurred after 1985, with 1998 the warmest year on record. The average of all global climate models suggests about a 3°F to 10°F rise in global temperature over the next 50 to 100 years. Global surface temperatures have increased about 1°F over the 20th century, with approximately 70% (or 0.7°F) of that change occurring in the last 25 years. The following graph illustrates the increasing rate and magnitude of global surface air temperatures.

Figure 2-10 Global Temperature



Source: NASA Goddard Institute for Space Studies.

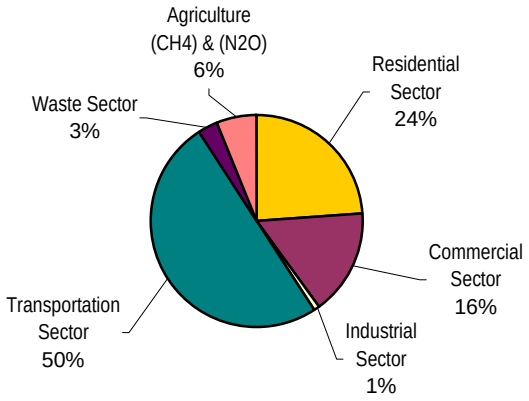
Is sea level rising?

Globally, sea level has risen 4 to 8 inches over the past century. The Intergovernmental Panel on Climate Change (IPCC) notes it is very likely that the 20th-century warming has contributed significantly to rising sea levels, through thermal expansion of seawater and loss of land ice. The EPA estimates that sea level is likely to rise 1.8 feet along most of the West Coast by 2100. By comparison, the San Francisco Bay level has increased about 4 inches since 1850. Given a 1-foot rise in sea level, the current 100-year high in the storm surge felt on the levee system of inland San Francisco Bay and Delta would become the 10-year high. In other words, the frequency of a 100-year event would increase tenfold.

What activities are contributing to the greenhouse gases in Marin?

Marin emits nearly 3 million tons of carbon dioxide every year. Vehicle traffic accounts for 50% of the total emissions, and energy use by buildings (residential, commercial and industrial combined) accounts for 41%.

Figure 2-11 Countywide Emissions Analysis



Source: Community Development Agency,
Greenhouse Gas Emissions Analysis Report 2000.

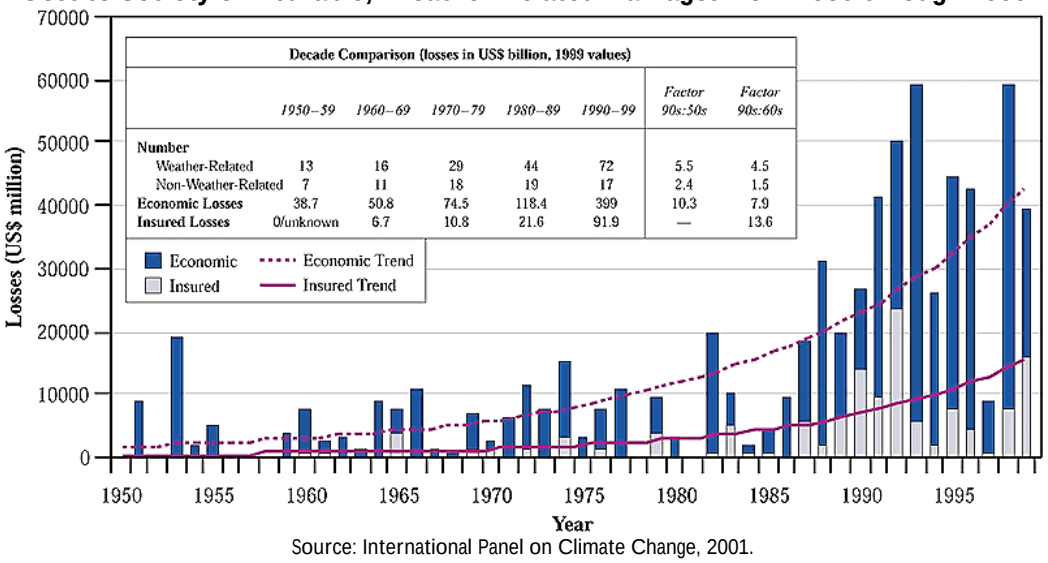
Has climate change affected the global economy?

Challenges resulting from weather- and climate-related events include changes to world food production and supply, migration, and access to clean water and energy. As indicated in the table below, costs have increased substantially since 1980.

"The climate system is being pushed hard enough that change will become obvious to the man in the street in the next decade."

– James E. Hansen, director of NASA's Goddard Institute for Space Studies, quoted in *Newsweek*, January 22, 1996

Figure 2-12
Cost to Society of Insurable, Weather-Related Damages from 1950 through 1999



Source: International Panel on Climate Change, 2001.

What Are the Desired Outcomes?

GOAL AIR-1

Improved Regional Air Quality. Promote planning and programs that result in the reduction of airborne pollutants measured within the county and the Bay Area.

Policies

AIR-1.1 Coordinate Planning and Evaluation Efforts. Coordinate air quality planning efforts with local, regional, and State agencies, and evaluate the air quality impacts of proposed plans and development projects.

AIR-1.2 **Meet Air Quality Standards.** Seek to attain or exceed the more stringent of federal or State Ambient Air Quality Standards for each measured pollutant (Figure 2-13).

AIR-1.3 **Require Mitigation of Air Quality Impacts.** Require projects that generate potentially significant levels of air pollutants, such as quarry, landfill operations, or large construction projects, to incorporate best available air quality mitigation in the project design.

Why is this important?

It is essential to use a regional approach to improving air quality, since polluted air flows from one place to another.

Environment: Cleaner air and water mean healthier marine and terrestrial ecosystems.

Economy: Poor air quality is linked to a higher incidence of public health costs associated with respiratory illnesses. The California Air Resources Board (CARB) suggests that the annual health impacts of exceeding state health-based standards for ozone and particulate matter include 6,500 premature deaths, 4,000 hospital admissions for respiratory disease, and 350,000 asthma attacks. The loss of productive workdays also affects the local economy. The American Lung Association (ALA) states that asthma accounts for an estimated three million lost workdays for adults nationally.

Equity: Poor air quality is linked to a higher incidence of respiratory illnesses. Asthma, which can be triggered and/or caused by poor air quality, currently affects 2.3 million Californians. In Marin, there were 17,083 cases of asthma in 2004, which translates to an impact on 7% of the population.

How will results be achieved?

Implementing Programs

AIR-1.a ***Inform Local and Regional Agencies.*** Notify local and regional jurisdictions of proposed projects in unincorporated areas that may affect regional air quality, as identified by project type and size thresholds in the *BAAQMD CEQA Guidelines, Assessing the Air Quality Impacts of Projects and Plans* (Figure 2-14).

AIR-1.b ***Evaluate Air Quality Impacts of Proposed Projects and Plans.*** As part of the Environmental Review Process, use the current BAAQMD CEQA Guidelines to evaluate the significance of air quality impacts from projects or plans, and to establish appropriate minimum submittal and mitigation requirements necessary for project or plan approval.

AIR-1.c ***Take Part in Regional Programs.*** Continue to participate in the Cities for Climate Protection and Spare the Air programs.

AIR-1.d ***Cooperate to Enforce Air Quality Standards.*** Cooperate with the U.S. Environmental Protection Agency (EPA), the California Air Resources Board, and the BAAQMD to measure air quality at emission sources (including transportation corridors) and to enforce the provisions of the Clean Air Act and State as well as regional policies and established standards for air quality.

Figure 2-13 California and National Ambient Air Quality Standards

Pollutant	Averaging Time	California Standards	NATIONAL STANDARDS [a]	
			Primary [b,c]	Secondary [b,d]
Ozone	8-hour	0.07 ppm (154 µg/m^3)	0.08 ppm (176 µg/m^3)	—
	1-hour	0.09 ppm (180 µg/m^3)	— [e]	Same as primary
Carbon Monoxide	8-hour	9 ppm (10 µg/m^3)	9 ppm (10 µg/m^3)	—
	1-hour	20 ppm (23 µg/m^3)	35 ppm (40 µg/m^3)	—
Nitrogen Dioxide	Annual	—	0.053 ppm (100 µg/m^3)	Same as primary
	1-hour	0.25 ppm (470 µg/m^3)	—	—
Sulfur Dioxide	Annual	—	0.03 ppm (80 µg/m^3)	—
	24-hour	0.04 ppm (105 µg/m^3)	0.14 ppm (365 µg/m^3)	—
	3-hour	—	—	0.5 ppm (1,300 µg/m^3)
	1-hour	0.25 ppm (655 µg/m^3)	—	—
PM_{10}	Annual	20 µg/m^3	50 µg/m^3	Same as primary
	24-hour	50 µg/m^3	150 µg/m^3	Same as primary
$PM_{2.5}$	Annual	12 µg/m^3	15 µg/m^3	—
	24-hour	—	65 µg/m^3	—
Lead	Calendar quarter	—	1.5 µg/m^3	Same as primary
	30-day average	1.56 µg/m^3	—	—

Notes: (a) Standards, other than four ozone and those based on annual averages, are not to be exceeded more than once a year. The ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.
(b) Concentrations are expressed first in units in which they were promulgated. Equivalent units given in parenthesis.
(c) Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health. Each state must attain the primary standards no later than three years after that state's implementation plan is approved by the EPA.
(d) Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
(e) The national one-hour ozone standard was revoked by U.S. EPA on June 15, 2005.

Source: 2004 Bay Area Air Quality Management District.

Figure 2-14
Projects with Potentially Significant Emissions

Land Use Category	Trip Generation Rate	Size of Project Likely to Generate 80 lb/day NOx
Housing		
Single Family	9.4/d.u.	320 units
Apartments	5.9/d.u.	510 units
Retail		
Discount Store	48.3/1000 sq.ft.	87,000 sq.ft.
Regional Shopping Center	96.2/1000 sq.ft.	44,000 sq.ft.
Supermarket	178/1000 sq.ft.	24,000 sq.ft.
Office		
General Office	10.9/1000 sq.ft.	280,000 sq.ft.
Government Office	68.9/1000 sq.ft.	55,000 sq.ft.
Office Park	12.8/1000 sq.ft.	210,000 sq.ft.
Medical Office	37.1/1000 sq.ft.	110,000 sq.ft.
Other		
Hospital	13.8/1000 sq.ft.	240,000 sq.ft.
Hotel	8.7/room	460 rooms

Note: Trip rates for many land uses will vary depending upon size of project. See latest edition of Trip Generation, Institute of Transportation Engineers.

Source: 1999 Bay Area Air Quality Management District.

AIR-1.e ***Conduct Public Education Program.*** Educate regarding the reason for requiring using best management practices to improve air quality.

AIR-1.f ***Limit Residential Wood Burning.*** Continue to implement the ordinance that phases out the use of older, polluting wood-burning appliances and limits the installation of wood-burning devices in new or renovated homes to pellet stoves, EPA-certified woodstoves and fireplace inserts, or natural gas or propane appliances.

AIR-1.g ***Require Control Measures for Construction and Agricultural Activity.*** Require reasonable and feasible measures to control particulate emissions (PM-10 and PM-2.5) at construction sites and during agricultural tilling activity, pursuant to the recommendations in the BAAQMD CEQA Guidelines, which may include the following:

- Watering active construction or agricultural tilling areas.
- Covering hauled materials.
- Paving or watering vehicle access roads.
- Sweeping paved and staging areas.

What Are the Desired Outcomes?

GOAL AIR-2

Protection from Emissions. Minimize the potential impacts from land uses that may emit pollution and/or odors on residential and other land uses sensitive to such emissions (see Map 2-16, Sensitive Receptor Sites in Unincorporated Marin County).

Policy

AIR-2.1 Buffer Emission Sources and Sensitive Land Uses. Consider potential air pollution and odor impacts from land uses that may emit pollution and/or odors when locating (a) air pollution sources, and (b) residential and other pollution-sensitive land uses in the vicinity of air pollution sources (which may include freeways, manufacturing, extraction, hazardous materials storage, landfill, food processing, wastewater treatment, and other similar uses).

Why is this important?

People and sensitive plants and animals need to be protected from sources of air pollution.

Environment: Air pollution creates stress on fragile and sensitive ecosystems by reducing reproductive capacity and food sources.

Economy: Lowering pollutants from area-wide and point sources would lower public health costs associated with respiratory illnesses and lead to fewer sick days at the workplace.

Equity: Children, people who are ill, and elderly people are particularly sensitive to air pollution. Places where they congregate need protection from polluted air.

How will results be achieved?

Implementing Programs

AIR-2.a ***Require Separation Between Air Pollution Sources and Other Land Uses.*** Only allow (a) emission sources or (b) other uses in the vicinity of air pollution or odor sources if the minimum screening distances between sources and receptors established in the BAAQMD CEQA Guidelines can be met, unless detailed project-specific studies demonstrate compatibility with adjacent uses despite separations that do not meet the screening distance requirements.

AIR-2.b ***Protect Sensitive Receptors Near High-Volume Roadways.*** Amend the Development Code to require mitigation measures such as increased indoor air filtration to ensure the protection of sensitive receptors (facilities where individuals are highly susceptible to the adverse effects of air pollutants, such as housing, child care centers, retirement

homes, schools, and hospitals) near freeways, arterials, and other major transportation corridors.

AIR-2.c *Health Risk Analysis for Sensitive Receptors.* Require that projects involving sensitive receptors proposed within 150 feet of freeways shall include an analysis of the potential health risks. Mitigation measures that comply with adopted standards of the BAAQMD for control of odor/toxics for sensitive receptors shall be identified in order to reduce these risks to acceptable levels.

What Are the Desired Outcomes?

GOAL AIR-3

Reduction of Vehicle-Generated Pollutants. Reduce vehicle trips and emissions, and improve vehicle efficiency, as means of limiting the volume of pollutants generated by traffic.

Policy

AIR-3.1 **Institute Transportation Control Measures.** Support a transportation program that reduces vehicle trips, increases ridesharing, and meets or exceeds the Transportation Control Measures recommended by BAAQMD in the most recent Clean Air Plan to reduce pollutants generated by vehicle use.

Why is this important?

Vehicle emissions are a major source of air pollution, and reduction of vehicle trips will improve air quality.

Environment: Vehicle travel is responsible for 54% of nitrogen oxides, 73% of carbon monoxide, and 79% of the particulate matter released in Marin. These pollutants create stress on Marin's marine and terrestrial ecosystems through a loss of species diversity and reproduction capacity.

Economy: In addition to alleviating the economic burden of public health costs, a reduction in vehicle trips will reduce traffic congestion. In 2006, over 9,400 productive hours were lost each weekday as a result of traffic congestion and delay.

Equity: Based on EPA's most current data, vehicle generated sources are responsible for 91% of the air-related cancer risk in Marin County. Furthermore, lower income neighborhoods tend to be nearest to major transportation routes; thus, these residents are exposed to higher levels of mobile source pollutants. One study finds that in the Bay Area, prevalence of asthma and bronchitis symptoms is about 7% higher for children in neighborhoods with higher levels of traffic pollutants compared with other children in the study.

How will results be achieved?

Implementing Programs

AIR-3.a *Support Voluntary Employer-Based Trip Reduction.* Provide assistance to regional and local ridesharing organizations, and advocate legislation to maintain and expand employer ridesharing incentives, such as tax deductions or credits.

AIR-3.b *Utilize Clean Vehicle Technology.* Promote new technologies and other incentives, such as allowing zero or partial zero emission vehicles rated at 45 miles or more per gallon in Marin County carpool lanes, and replacing fleet vehicles with these and similar clean vehicles.

"Adding lanes to solve traffic congestion is like loosening your belt to solve obesity."

— Glen Hemistra

AIR-3.c *Consider Model Clean Vehicle Requirements.* Research and consider adoption of an ordinance or standards that provide a set of voluntary measures to incorporate clean vehicles in fleets and promote the use of clean alternative fuels.

AIR-3.d *Reduce Peak-Hour Congestion.* Implement recommended Bay Area Air Quality Management District (BAAQMD) Transportation Control Measures in the Clean Air Plan to reduce vehicle emissions and congestion during peak commute periods.

AIR-3.e *Improve Arterial Traffic Management.* Modify arterial roadways to allow more-efficient bus operation, including possible signal preemption, and expand signal-timing programs where air quality benefits can be demonstrated.

What Are the Desired Outcomes?

GOAL AIR-4

Minimization of Contributions to Greenhouse Gases. Prepare policies that promote efficient management and use of resources in order to minimize greenhouse gas emissions. Incorporate sea level rise and more extreme weather information into the planning process.

Policies

AIR-4.1 **Reduce Greenhouse Gas Emissions.** Adopt practices that promote improved efficiency and energy management technologies; shift to low-carbon and renewable fuels and zero emission technologies.

AIR-4.2 **Foster the Absorption of Greenhouse Gases.** Foster and restore forests and other terrestrial ecosystems that offer significant carbon mitigation potential.

Why is this important?

Major contributors to greenhouse gas emissions, such as vehicle traffic and building energy use, can be reduced on a local level through the implementation of sustainable development policies.

Environment: Increased greenhouse gas emissions lead to climate change, which could include increases in temperature and shifting amounts of rainfall. Changes in temperature and water availability affect terrestrial and marine ecosystems. Furthermore, higher temperatures lead to higher evaporation rates, as well as reductions in stream flow and an increased frequency of droughts. Droughts are a problem in Marin, where 80% of our water comes from rainfall.

Economy: Mitigation measures that reduce emissions can result in substantial savings. The Tellus Institute estimates that California can save 1.9 billion dollars annually by 2020 through adoption of more stringent building codes and standards, efficiency programs, and increased supply of energy from renewable sources.

Equity: Access to clean water, energy, and mineral resources, and availability of productive arable land are all threatened by changes in climate. Weather- and temperature-related issues will add strain to an already overburdened public health system. Furthermore, low income families will be disproportionately impacted as they will be the least able to adapt to the effects of climate change.

How will results be achieved?

Implementing Programs

AIR-4.a ***Reduce Greenhouse Gas Emissions Resulting from Energy Use in Buildings.*** Implement energy efficiency programs and use of renewable energy. (Also see EN-1, EN-2, PFS-2, and TR-4.)

Carbon Dioxide

The Ecological Footprint shows that the single largest human demand on ecosystems comes from carbon dioxide emissions. The land area required to absorb this waste product makes up over half the Ecological Footprint of the average Marin resident. If Marin County reduced its carbon dioxide emissions by 20%, it could reduce its total footprint by an area equal to almost the entire size of Marin County.

Changing Scientific Understanding of Human Influences on Climate Change

1990: "Our judgment is that global mean surface air temperature has increased [though] the unequivocal detection of the enhanced greenhouse effect is not likely for a decade or more."

1995: "The balance of evidence suggests a discernible human influence on global climate."

2001: "The Earth's climate system has demonstrably changed on both global and regional scales. There is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities."

AIR-4.b ***Reduce Greenhouse Gas Emissions Resulting from Transportation.*** Increase clean-fuel use, promote transit-oriented development and alternative modes of transportation, and reduce travel demand. (Also see TR-4, AIR-3, DES-2, HS-2, HS-3, CD-2, CD-3, and EC-1.)

AIR-4.c ***Reduce Methane Emissions Released from Waste Disposal.*** Encourage recycling, decrease waste sent to landfills, require landfill methane recovery, and promote methane recovery for energy production from other sources. (See PFS-3.)

Cities for Climate Protection Milestones

In August 2002, the Board of Supervisors partnered with the Cities for Climate Protection Campaign to address climate change through five actions:

1. Analyze baseline greenhouse gas emissions.
2. Set a target for reducing emissions.
3. Develop a local action plan for pursuing emissions reductions measures.
4. Implement local action plan.
5. Monitor progress.

Source: www.iclei.org.

"New analyses suggest that 15%–37% of a sample of 1,103 land plants and animals would eventually become extinct as a result of climate changes expected by 2050."

— *Nature Medicine*, 2004

AIR-4.d ***Reduce Greenhouse Gas Emissions from Agriculture.*** Compile an inventory of agricultural greenhouse gas emissions. Partner with AgStar, the U.S. Department of Agriculture, and the U.S. Department of Energy to encourage the use of methane recovery technologies and determine potential use in energy production.

AIR-4.e ***Reduce County Government Contributions to Greenhouse Gas Emissions.*** Where feasible, replace fleet vehicles with hybrid fuel and other viable alternative fuel vehicles, increase energy efficiency of County-maintained facilities, increase renewable energy use at County-maintained facilities, adopt purchasing practices that promote emissions reductions, and increase recycling at County-maintained facilities. (Also see EN-1, EN-2, PFS-3, TR-4, EC-1 and PH-1.)

AIR-4.f ***Establish a Climate Change Planning Process.*** Continue implementation of the approved Marin County Greenhouse Gas Reduction Plan. Integrate this plan into long-range and current planning functions of other related agencies. Establish and maintain a process to implement, measure, evaluate, and modify implementing programs, using the Cities for Climate Protection Campaign as a model (see the sidebar).

AIR-4.g ***Work with Bay Area Governments to Address Regional Climate Change Concerns.*** Play a leading role to encourage other local governments to commit to addressing climate change. Participate in programs such as the Cities for Climate Protection Campaign to address local and regional climate change concerns.

AIR-4.h *Evaluate the Carbon Emissions Impacts of Proposed Developments.* Incorporate a carbon emissions assessment into land use plans and the environmental impact report for proposed projects.

AIR-4.i *Work with Appropriate Agencies to Determine Carbon Uptake and Storage Potential of Natural Systems.* Study Marin's wetlands, forests, baylands, and agricultural lands to determine the potential to sequester carbon over time. Determine their value as carbon sinks.

AIR-4.j *Acquire and Restore Natural Resource Systems.* Take and require all technically feasible measures to avoid or minimize potential impacts on existing natural resource systems that serve as carbon sinks. (Also see CD-1, BIO-2, BIO-3, BIO-4, BIO-5, OS-1, and OS-2.)

AIR-4.k *Encourage the Planting of Trees.* Adopt urban forestry practices that encourage re-forestation as a means of storing carbon dioxide. (Also see BIO-1, DES-3.)

AIR-4.l *Preserve Agricultural Lands.* Protect agricultural lands and soils that serve as carbon sinks. (Also see AG-1.)

AIR-4.m *Focus Development in Urban Corridors.* Build in urban corridors and limit development in natural resource areas. Encourage green spaces that serve as carbon sinks in urban corridors. (Also see CD-1, CD-2, and DES-3.)

AIR-4.n *Monitor for Carbon Storage Research.* Monitor federal and international research on technological approaches to carbon storage.

AIR-4.o *Implement Proposed State Programs to Reduce Greenhouse Gas Emissions.* Implement proposed State programs to reduce greenhouse gas emissions, including the Renewable Portfolio Standards, California Fuel Efficiency (CAFE) standards, and carbon cap and trade programs.

What Are the Desired Outcomes?

GOAL AIR-5

Adaptation to Climate Change. Adopt policies and programs that promote resilient human and natural systems in order to ease the impacts of climate change.

Policies

AIR-5.1 **Determine Marin-Specific Climate Change.** Participate in research that examines the effects of climate change on human and natural systems in Marin.

AIR-5.2 **Prepare Response Strategies for Impacts.** Prepare appropriate response strategies that aid systems in adapting to climate change based on sound scientific understanding of the potential impacts.

Why is this important?

Adapting to climate change will require accurate scientific understanding as well as an institutionalized policy framework.

Environment. Wildlife distributions, population size, population density, and behavior are directly affected by changes in climate and indirectly through changes in vegetation. As wildlife tries to adapt to changes in the environment caused by shifting temperature and precipitation patterns, the already high number of threatened and endangered species could see a marked increase. New analyses suggest that 15% to 37% of a sample of 1,103 land plants and animals would eventually become extinct as a result of climate changes expected by 2050.

"My interest is in the future, because I am going to spend the rest of my life there."

— Charles Kettering

Economy. Aquaculture products brought $2.4 million into Marin's economy, representing 5.4% of Marin's entire agriculture industry. Warmer ocean waters and saltwater inundation due to climate change may impact coastal ecosystems by speeding the decline in fish populations and marine ecosystems already stressed from habitat loss and reduced freshwater flows. A report sponsored by the United Nations stated that worldwide economic losses could soar to $150 billion a year within the next 10 years.

Equity. Adopting and fostering resilience within the natural and built environments will save significant resources, speed recovery, and protect public health and safety for people of all income levels.

How will results be achieved?

Implementing Programs

AIR-5.a ***Coordinate with Local and Regional Agencies.*** Coordinate with the U.S. Geological Survey, Bay Conservation and Development Commission, California Coastal Commission and other monitoring agencies to study near-term and long-term high-probability climate change effects. Explore funding and collaborations with Bay Area partners in the Cities for Climate Protection Campaign in order to share resources, achieve economies of scale, and develop plans and programs that are optimized to address climate change on a regional scale.

AIR-5.b ***Study the Effect of Climate Change.*** Determine how climate change will affect the following:

Natural Systems: Changes in water availability, shifting fog regimes (and the effect on coastal redwoods and fire ecology), temperature changes, and shifting seasons.

Biological Resources: Changes in species distribution and abundance in estuary ecosystems resulting from salinity changes and flooding. For marine ecosystems, determine changes in distribution and abundance resulting from warmer waters, rising sea level, and changes in ocean currents and freshwater inflows.

Environmental Hazards: Runoff, fire hazards, floods, landslides and soil erosion, and the impact on coastal and urban infrastructure.

Built Environment: Effect of flooding and rising sea level on sewage systems, property, and infrastructure.

Water Resources: Runoff, changes in precipitation, increases and decreases in drought, salinity changes, sea level rise, and shifting seasons.

Agricultural and Food Systems: Food supply, economic impacts, and effect on grazing lands.

Public Health: Temperature-related health effects, air quality impacts, extreme weather events, and vector-, rodent-, water-, and food-borne diseases.

AIR-5.c *Prepare Response Strategies.* In coordination with the California Coastal Commission, the Bay Conservation and Development Commission, water districts, wildlife agencies, and flood control districts, prepare response strategies for Marin's human and natural systems. Current response strategies include the following:

Water Resources: Improve drainage systems, harvesting flows, and recharge designs in order to direct runoff to landscaped areas where the water can percolate into the soil. (See WR-1.)

Biological Resources: Limit development such that coastal wetlands are able to migrate inland in response to sea level rise, wildlife corridors and ecotones are protected, and development impacts are minimized. Promote the restoration of wetlands and riparian areas to provide capacity for high water and flood flows. (Also see BIO-2, BIO-4, BIO-5, OS-2, DES-1, and DES-5.)

Public Health: General strengthening of public health infrastructure and health-oriented environmental management, such as with air and water quality, and community and housing design.

Built Environment: Assess development located in coastal areas that are subject to sea level rise and increased flooding, and develop a response strategy, such as a planned retreat program, for the relocation of facilities in low-lying areas. Work with the County flood control and water districts to prepare a plan for responding to a potential rise in the sea level, consider developing flood control projects, and amend County Code Chapters 11, 22, 23, and 24 to include construction standards for areas potentially subject to increased flooding from a rise in sea level.

Environmental Hazards: Develop response strategies that cope with increasing storm events, flooding, fire, landslides, and soil erosion. Establish surveillance systems. With the development of advanced (spatial) surveillance technology, it is conceivable that such systems will be expanded to address forest health and productivity, monitoring biotic vectors and natural elements, as well as tree and storm responses. (Also see EH-3, EH-4, BIO-1, and PH-1.)

"The causes and effects of climate change occur around the world. Individuals, communities, and nations must work together cooperatively to stop global climate change."

— The Environmental Justice and Climate Change Initiative

AIR-5.d ***Monitor Local Climate Change.*** Encourage appropriate local and regional agencies to track the following environmental indicators of climate change:

- Sea level (also see EH-3)
- Minimum and maximum temperature
- Precipitation
- Timing and volume of river flow
- River temperatures
- Sea surface temperatures
- Diversity and abundance of fish stocks and sea birds

AIR-5.e ***Seek Resources for Response Strategies.*** Explore funding and collaborative opportunities that share resources, to develop plans and programs that are optimized on a regional scale.

AIR-5.f ***Protect and Enhance Native Habitats and Biodiversity.*** Effectively manage and enhance native habitat, maintain viable native plant and animal populations, and provide for improved biodiversity throughout Marin. Require identification of sensitive biological resources and commitment to adequate protection and mitigation. (Also see BIO-1 and BIO-2.)

"It is not the strongest of the species that survive, nor the most intelligent, but the one most responsive to change."

— Charles Darwin

AIR-5.g ***Conduct Public Outreach and Education.*** Increase public awareness about climate change, and encourage Marin residents and businesses to become involved in activities and lifestyle changes that will aid in reducing greenhouse gas emissions.

AIR-5.h ***Implement Floodplain Ordinances.*** Continue to implement ordinances that regulate floodplain development to ensure that project-related and cumulative flooding impacts are minimized or avoided through conditions of project approval as required by the ordinances.

AIR-5.i ***Modify Construction Standards.*** Amend the Marin County Code to include construction standards for areas threatened by future sea level rise.

Figure 2-15 Relationships of Goals to Guiding Principles

This figure illustrates the relationships of each goal in this Section to the Guiding Principles.

Goals	Guiding Principles: 1. Link equity, economy, and the environment locally, regionally, and globally.	2. Minimize the use of finite resources and use all resources efficiently and effectively.	3. Reduce the use and minimize the release of hazardous materials.	4. Reduce greenhouse gas emissions that contribute to global warming.	5. Preserve our natural assets.	6. Protect our agricultural assets.	7. Provide efficient and effective transportation.	8. Supply housing affordable to the full range of our workforce and diverse community.	9. Foster businesses that create economic, environmental, and social benefits.	10. Educate and prepare our workforce and residents.	11. Cultivate ethnic, cultural, and socioeconomic diversity.	12. Support public health, safety, and social justice.
AIR-1 Improved Regional Air Quality	•		•	•	•							•
AIR-2 Protection from Emissions	•		•	•	•							•
AIR-3 Reduction of Vehicle-Generated Pollutants	•		•	•	•		•					•
AIR-4 Minimization of Contributions to Greenhouse Gases	•	•	•	•		•	•		•			•
AIR-5 Adaptation to Climate Change					•	•				•		•

How Will Success Be Measured?

Indicator Monitoring

Nonbinding indicators, benchmarks, and targets[1] will help to measure and evaluate progress. This process will also provide a context in which to consider the need for new or revised implementation measures.

Indicators	Benchmarks	Targets
Number of days of poor air quality.	No exceedences in 2000.	No increase through 2015.
Amount of greenhouse gas emissions countywide.	2,849,000 tons CO_2 in 1990.	Reduce 15% by 2015.
Amount of greenhouse gas emissions from County government sources.	15,200 tons CO_2 in 1990.	Reduce 15% – 20% by 2015.

[1]Many factors beyond Marin County government control, including adequate funding and staff resources, may affect the estimated time frame for achieving targets and program implementation.

Program Implementation

The following table summarizes responsibilities, potential funding priorities, and estimated time frames for proposed implementation programs. Program implementation within the estimated time frame[1] will be dependent upon the availability of adequate funding and staff resources.

Figure 2-16
Atmosphere and Climate Program Implementation

Programs	Responsibility	Potential Funding	Priority	Time Frame
AIR-1.a – Inform Local and Regional Agencies.	CDA	Existing budget	High	Ongoing
AIR-1.b – Evaluate Air Quality Impacts of Proposed Projects and Plans.	CDA	Existing budget	High	Ongoing
AIR-1.c – Take Part in Regional Programs.	CDA	Existing budget	High	Ongoing
AIR-1.d – Cooperate to Enforce Air Quality Standards.	CDA, EPA, CA Air Resources Board, BAAQMD	Existing budget, State and federal funds	High	Ongoing
AIR-1.e – Conduct Public Education Program	CDA, BAAQMD	Existing budget and may require additional grants or revenue[2]	High	Ongoing
AIR-1.f – Limit Residential Wood Burning.	CDA	Existing budget, Tobacco Settlement Funds	Medium	Ongoing
AIR-1.g – Require Control Measures for Construction and Agricultural Activity.	CDA, Agricultural Commissioner	Existing budget	High	Ongoing
AIR-2.a – Require Separation Between Air Pollution Sources and Other Land Uses.	CDA, BAAQMD	Existing budget	High	Ongoing
AIR-2.b – Protect Sensitive Receptors Near High-Volume Roadways.	CDA	Existing budget	Medium	Long term
AIR-2.c – Health Risk Analysis for Sensitive Receptors.	CDA	Existing budget	Medium	Short term

[1]Time frames include: Immediate (0–1 years); Short term (1–4 years); Med. term (4–10 years); Long term (10–20 years); and Ongoing.

[2]Completion of this task is dependent on acquiring additional funding. Consequently, funding availability could lengthen or shorten the time frame and ultimate implementation of this program.

Programs	Responsibility	Potential Funding	Priority	Time Frame
AIR-3.a – Support Voluntary Employer-Based Trip Reduction.	DPW, Transportation Authority of Marin (TAM), CDA	Existing Budget, will require additional grants or other revenue[2]	Medium	Med. Term
AIR-3.b – Utilize Clean Vehicle Technology.	1. CDA/CalTrans-carpool lanes, 2. DPW- County fleet	1. Existing budget, 2. Will require additional grants or other revenue[2]	1. Medium, 2. Medium	1. Ongoing, 2. Long term
AIR-3.c – Consider Model Clean Vehicle Requirements.	DPW	Will require additional grants or other revenue[2]	Medium	Long term
AIR-3.d – Reduce Peak-Hour Congestion.	TAM	TFCA	Medium	Ongoing
AIR-3.e – Improve Arterial Traffic Management.	DPW, TAM	Grants, traffic mitigation fees, transportation sales tax[2]	Medium	Ongoing
AIR-4.a – Reduce Greenhouse Gas Emissions Resulting from Energy Use in Buildings.	CDA	Existing budget and may require additional grants or revenue[2]	Medium	Med. Term
AIR-4.b – Reduce Greenhouse Gas Emissions Resulting from Transportation.	1. TAM, CDA, 2. DPW	General Fund, TAM budget, TLC/HIP Grants, and will require additional grants or other revenue[2]	1. Medium, 2. Medium	1. Ongoing, 2. Long term
AIR-4.c – Reduce Methane Emissions Released from Waste Disposal.	DPW	Will require additional grants or other revenue[2]	Medium	Long term
AIR-4.d – Reduce Greenhouse Gas Emissions from Agriculture.	Agricultural Commissioner, CDA, USDA, USDOE	Grants, existing budget	Medium	Ongoing
AIR-4.e – Reduce County Government Contributions to Greenhouse Gas Emissions.	DPW	Will require additional grants or other revenue[2]	High	Pending
AIR-4.f – Establish a Climate Change Planning Process.	CDA	Existing budget and may require additional grants or revenue[2]	High	Immediate
AIR-4.g – Work with Bay Area Governments to Address Regional Climate Change Concerns.	CDA, ABAG, International Council for Local Environmental Initiatives (ICLEI)	Existing budget and may require additional grants or revenue[2]	High	Ongoing
AIR-4.h – Evaluate the Carbon Emissions Impacts of Proposed Developments.	CDA	Existing budget and may require additional grants or revenue[2]	High	Ongoing

Programs	Responsibility	Potential Funding	Priority	Time Frame
AIR-4.i – Work with Appropriate Agencies to Determine Carbon Uptake and Storage Potential of Natural Systems.	CDA, California Energy Commission (CEC), BAAQMD, other municipalities	Will require additional grants or revenue[2]	Low	Long term
AIR-4.j – Acquire and Restore Natural Resource Systems.	MCOSD	Will require additional grants or revenue[2]	High	Ongoing
AIR-4.k – Encourage the Planting of Trees.	CDA, NGO's, CBO's	Will require additional grants or revenue[2]	Medium	Ongoing
AIR-4.l – Preserve Agricultural Lands.	CDA, MALT, CBO's	Will require additional grants or revenue[2]	High	Ongoing
AIR-4.m – Focus Development in Urban Corridors.	CDA	Existing budget	High	Ongoing
AIR-4.n – Monitor for Carbon Storage Research.	CDA, ICLEI	Existing budget and may require additional grants or revenue[2]	Medium	Ongoing
AIR-4.o – Implement Proposed State Programs to Reduce Greenhouse Gas Emissions.	CDA	Existing budget and may require additional grants or revenue[2]	Medium	Ongoing
AIR-5.a – Coordinate with Local and Regional Agencies.	CDA, Bay Conservation and Development Commission (BCDC), CCC, BAAQMD, USGS, ICLEI	Existing budget and may require additional grants or revenue[2]	High	Ongoing
AIR-5.b – Study the Effect of Climate Change.	CDA, BCDC, CCC, BAAQMD, USGS, ICLEI	Will require additional grants or revenue[2]	Medium	Ongoing
AIR-5.c – Prepare Response Strategies.	CDA, CCC, BCDC, Water Districts, Resource Protection Agencies, ICLEI	Existing budget, will require additional grants or revenue[2]	High	Ongoing
AIR-5.d – Monitor Local Climate Change.	CDA, CCC, BCDC, Water Districts, Resource Protection Agencies, ICLEI	Existing budget and may require additional grants or revenue[2]	Medium	Ongoing
AIR-5.e – Seek Resources for Response Strategies.	CDA, CCC, BCDC, Water Districts, Resource Protection Agencies, ICLEI	Existing budget and may require additional grants or revenue[2]	Medium	Ongoing

Programs	Responsibility	Potential Funding	Priority	Time Frame
AIR-5.f – Protect and Enhance Native Habitats and Biodiversity.	Parks & Open Space, CDA, CBO's	Existing budget and may require additional grants or revenue[2]	High	Ongoing
AIR-5.g – Conduct Public Outreach and Education.	CDA, CBO's, ICLEI	Existing budget and may require additional grants or revenue[2]	Medium	Ongoing
AIR-5.h – Implement Floodplain Ordinances.	CDA/DPW	Existing budget	High	Ongoing
AIR-5.i – Modify Construction Standards.	CDA/DPW	Existing budget and may require additional grants or revenue[2]	Medium	Long term

(Note: This is an extract of the Marin County General Plan that highlights the applicability to air quality and greenhouse gases. The entire Marin County General Plan 2020 can be found at:
(http://www.co.marin.ca.us/depts/cd/main/fm/cwpdocs/CWP_CD2.pdf)

Additional Links to General Plans and Climate Action Plans:

The following examples of general plans and climate action plans were reviewed and were also found to be good resources. These examples have addressed climate change and have provided good goals, objectives, policies, standards and/or implementations measures for their jurisdiction and environment. These goals, objectives, policies, standards and implementation measures have been addressed in a stand-alone document as in the San Francisco Climate Action Plan, Sonoma County Climate Action Plan, and the City of Riverside General Plan; or the goals, objectives, policies, standards and implementation measures have been incorporated into the existing general plan elements as in the City of Beverly Hills Draft General Plan, City of Sacramento General Plan and Sonoma County General Plan.

City of Beverly Hills Draft General Plan can be found at:
http://www.ci.beverly-hills.ca.us/services/planning/plan/draft_general_plan.asp

City of Riverside General Plan can be found at:
http://www.riversideca.gov/planning/2008-0909/GP/13_Air_Quality_Element.pdf

City of Sacramento General Plan can be found at:
http://www.sacgp.org/

San Francisco Climate Action Plan can be found at:
http://www.sfenvironment.org/downloads/library/climateactionplan.pdf

Sonoma County General Plan can be found at:
http://www.sonoma-county.org/prmd/gp2020/adopted/index.htm

Sonoma County Community Climate Action Plan can be found at:
http://www.coolplan.org/

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Appendix H

California Attorney General Guidance on General Plans

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Appendix H: California Attorney General Guidance on General Plans

The California Attorney General's Office has compiled a list of General Plan, CEQA-related Frequently Asked Questions and their answers to assist cities and counties in their General Plan updates. The following is the Attorney General Office's document entitled *'Climate Change, the California Environmental Quality Act, and General Plan Updates: Straightforward Answers to Some Frequently Asked Questions.'*

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Climate Change, the California Environmental Quality Act, and General Plan Updates: Straightforward Answers to Some Frequently Asked Questions California Attorney General's Office

At any given time in this State, well over one hundred California cities and counties are updating their general plans. These are complex, comprehensive, long-term planning documents that can be years in the making. Their preparation requires local governments to balance diverse and sometimes competing interests and, at the same time, comply with the Planning and Zoning Law and the California Environmental Quality Act (CEQA).

Local governments have decades of experience in applying state planning law and excellent resources to assist them – such as the "General Plan Guidelines" issued by The Governor's Office of Planning and Research (OPR).[1] They are also practiced in assessing whether general plans may have significant localized environmental effects, such as degradation of air quality, reductions in the water supply, or growth inducing impacts. The impact of climate change, however, has only fairly recently shown up on the CEQA radar.

The fact that climate change presents a new challenge under CEQA has not stopped local governments from taking action. A substantial number of cities and counties already are addressing climate change in their general plan updates and accompanying CEQA documents. These agencies understand the substantial environmental and administrative benefits of a programmatic approach to climate change. Addressing the problem at the programmatic level allows local governments to consider the "big picture" and – provided it's done right – allows for the streamlined review of individual projects.[2]

Guidance addressing CEQA, climate change, and general planning is emerging, for example, in the pending CEQA Guideline amendments,[3] comments and settlements by the Attorney General, and in the public discourse, for example, the 2008 series on CEQA and Global Warming organized by the Local Government Commission and sponsored by the Attorney General. In addition, the Attorney General's staff has met informally with officials and planners from numerous jurisdictions to discuss CEQA requirements and to learn from those who are leading the fight against global warming at the local level.

Still, local governments and their planners have questions. In this document, we attempt to answer some of the most frequently asked of those questions. We hope this document will be useful, and we encourage cities and counties to contact us with any additional questions, concerns, or comments.

- **Can a lead agency find that a general plan update's climate change-related impacts are too speculative, and therefore avoid determining whether the project's impacts are significant?**

  No. There is nothing speculative about climate change. It's well understood that (1) greenhouse gas (GHG) emissions increase atmospheric concentrations of GHGs; (2) increased GHG concentrations in the atmosphere exacerbate global warming; (3) a project that adds to the atmospheric load of GHGs adds to the problem.

  Making the significance determination plays a critical role in the CEQA process.[4] Where a project may have a significant effect on the environment, the lead agency must prepare an Environmental Impact Report (EIR).[5] Moreover, a finding of significance triggers the obligation to consider alternatives and to impose feasible mitigation.[6] For any project under CEQA, including a general plan update, a lead agency therefore has a fundamental obligation to determine whether the environmental effects of the project, including the project's contribution to global warming, are significant.

- **In determining the significance of a general plan's climate change-related effects, must a lead agency estimate GHG emissions?**

  Yes. As OPR's Technical Advisory states:

  > Lead agencies should make a good-faith effort, based on available information, to calculate, model, or estimate the amount of CO2 and other GHG emissions from a project, including the emissions associated with vehicular traffic, energy consumption, water usage and construction activities.[7]

  In the context of a general plan update, relevant emissions include those from government operations, as well as from the local community as a whole. Emissions sources include, for example, transportation, industrial facilities and equipment, residential and commercial development, agriculture, and land conversion.

  There are a number of resources available to assist local agencies in estimating their current and projected GHG emissions. For example, the California Air Resources Board (ARB) recently issued protocols for estimating emissions from local government operations, and the agency's protocol for estimating community-wide emissions is forthcoming.[8] OPR's Technical Advisory contains a list of modeling tools to estimate GHG emissions. Other sources of helpful information include the white paper issued by the California Air Pollution Control Officers Association (CAPCOA), "CEQA and Climate Change"[9] and the Attorney General's website,[10] both of which provide information on currently available models for calculating emissions. In addition, many cities and counties are working with the International Council for Local Environmental Initiatives (ICLEI)[11] and tapping into the expertise of this State's many colleges and universities.[12]

- **For climate change, what are the relevant "existing environmental conditions"?**

  The CEQA Guidelines define a significant effect on the environment as "a substantial adverse change in the physical conditions which exist in the area affected by the proposed project."[13]

  For local or regional air pollutants, existing physical conditions are often described in terms of air quality (how much pollutant is in the ambient air averaged over a given period of time), which is fairly directly tied to current emission levels in the relevant "area affected." The "area affected," in turn, often is defined by natural features that hold or trap the pollutant until it escapes or breaks down. So, for example, for particulate matter, a lead agency may describe existing physical conditions by discussing annual average PM10 levels, and high PM10 levels averaged over a 24-hour period, detected at various points in the air basin in the preceding years.

  With GHGs, we're dealing with a global pollutant. The "area affected" is both the atmosphere and every place that is affected by climate change, including not just the area immediately around the project, but the region and the State (and indeed the planet). The existing "physical conditions" that we care about are the current atmospheric concentrations of GHGs and the existing climate that reflects those concentrations.

  Unlike more localized, ambient air pollutants which dissipate or break down over a relatively short period of time (hours, days or weeks), GHGs accumulate in the atmosphere, persisting for decades and in some cases millennia. The overwhelming scientific consensus is that in order to avoid disruptive and potentially catastrophic climate change, then it's not enough simply to stabilize our annual GHG emissions. The science tells us that we must <u>immediately and substantially reduce</u> these emissions.

- **If a lead agency agrees to comply with AB 32 regulations when they become operative (in 2012), can the agency determine that the GHG-related impacts of its general plan will be less than significant?**

  <u>No.</u> CEQA is not a mechanism merely to ensure compliance with other laws, and, in addition, it does not allow agencies to defer mitigation to a later date. CEQA requires lead agencies to consider the significant environmental effects of their actions and to mitigate them today, if feasible.

  The decisions that we make today do matter. Putting off the problem will only increase the costs of any solution. Moreover, delay may put a solution out of reach at any price. The experts tell us that the later we put off taking real action to reduce our GHG emissions, the less likely we will be able to stabilize atmospheric concentrations at a level that will avoid dangerous climate change.

- **Since climate change is a global phenomenon, how can a lead agency determine whether the GHG emissions associated with its general plan are significant?**

  The question for the lead agency is whether the GHG emissions from the project – the general plan update – are considerable when viewed in connection with the GHG emissions from past projects, other current projects, and probable future projects.[14] The effects of GHG emissions from past projects and from current projects to date are reflected in current atmospheric concentrations of GHGs and current climate, and the effects of future emissions of GHGs, whether from current projects or existing projects, can be predicted based on models showing future atmospheric GHG concentrations under different emissions scenarios, and different resulting climate effects.

  A single local agency can't, of course, solve the climate problem. But that agency can do its fair share, making sure that the GHG emissions from projects in its jurisdiction and subject to its general plan are on an emissions trajectory that, if adopted on a larger scale, is consistent with avoiding dangerous climate change.

  Governor Schwarzenegger's Executive Order S-3-05, which commits California to reducing its GHG emissions to 1990 levels by 2020 and to eighty percent below 1990 levels by 2050, is grounded in the science that tells us what we must do to achieve our long-term climate stabilization objective. The Global Warming Solutions Act of 2006 (AB 32), which codifies the 2020 target and tasks ARB with developing a plan to achieve this target, is a necessary step toward stabilization.[15] Accordingly, the targets set in AB 32 and Executive Order S-3-05 can inform the CEQA analysis .

  One reasonable option for the lead agency is to create community-wide GHG emissions targets for the years governed by the general plan. The community-wide targets should align with an emissions trajectory that reflects aggressive GHG mitigation in the near term and California's interim (2020) [16] and long-term (2050) GHG emissions limits set forth in AB 32 and the Executive Order.

  To illustrate, we can imagine a hypothetical city that has grown in a manner roughly proportional to the state and is updating its general plan through 2035. The city had emissions of 1,000,000 million metric tons (MMT) in 1990 and 1,150,000 MMT in 2008. The city could set an emission reduction target for 2014 of 1,075,000 MMT, for 2020 of 1,000,000 MMT, and for 2035 of 600,000 MMT, with appropriate emission benchmarks in between. Under these circumstances, the city could in its discretion determine that an alternative that achieves these targets would have less than significant climate change impacts.

- **Is a lead agency required to disclose and analyze the full development allowed under the general plan?**

  Yes. The lead agency must disclose and analyze the full extent of the development allowed by the proposed amended general plan,[17] including associated GHG emissions.

This doesn't mean that the lead agency shouldn't discuss the range of development that is likely to occur as a practical matter, noting, for example, the probable effect of market forces. But the lead agency can't rely on the fact that full build out may not occur, or that its timing is uncertain, to avoid its obligation to disclose the impacts of the development that the general plan would permit. Any other approach would seriously underestimate the potential impact of the general plan update and is inconsistent with CEQA's purposes.

- **What types of alternatives should the lead agency consider?**

  A city or county should, if feasible, evaluate at least one alternative that would ensure that the community contributes to a lower-carbon future. Such an alternative might include one or more of the following options:

  - higher density development that focuses growth within existing urban areas;
  - policies and programs to facilitate and increase biking, walking, and public transportation and reduce vehicle miles traveled;
  - the creation of "complete neighborhoods" where local services, schools, and parks are within walking distance of residences;
  - incentives for mixed-use development;
  - in rural communities, creation of regional service centers to reduce vehicle miles traveled;
  - energy efficiency and renewable energy financing (see, e.g., AB 811)[18]
  - policies for preservation of agricultural and forested land serving as carbon sinks;
  - requirements and ordinances that mandate energy and water conservation and green building practices; and
  - requirements for carbon and nitrogen-efficient agricultural practices.

  Each local government must use its own good judgment to select the suite of measures that best serves that community.

- **Can a lead agency rely on policies and measures that simply "encourage" GHG efficiency and emissions reductions?**

  No. Mitigation measures must be "fully enforceable."[19] Adequate mitigation does not, for example, merely "encourage" or "support" carpools and transit options, green building practices, and development in urban centers. While a menu of hortatory GHG policies is positive, it does not count as adequate mitigation because there is no certainty that the policies will be implemented.

  There are many concrete mitigation measures appropriate for inclusion in a general plan and EIR that can be enforced as conditions of approval or through ordinances. Examples are described in a variety of sources, including the CAPCOA's white paper,[20] OPR's Technical Advisory,[21] and the mitigation list on the Attorney General's website.[22] Lead agencies should also consider consulting with other cities and counties that have recently completed general plan updates or are working on Climate Action Plans.[23]

- **Is a "Climate Action Plan" reasonable mitigation?**

  Yes. To allow for streamlined review of subsequent individual projects, we recommend that the Climate Action Plan include the following elements: an emissions inventory (to assist in developing appropriate emission targets and mitigation measures); emission targets that apply at reasonable intervals through the life of the plan; enforceable GHG control measures; monitoring and reporting (to ensure that targets are met); and mechanisms to allow for the revision of the plan, if necessary, to stay on target.[24]

  If a city or county intends to rely on a Climate Action Plan as a centerpiece of its mitigation strategy, it should prepare the Climate Action Plan at the same time as its general plan update and EIR. This is consistent with CEQA's mandate that a lead agency must conduct environmental review at the earliest stages in the planning process and that it not defer mitigation. In addition, we strongly urge agencies to incorporate any Climate Action Plans into their general plans to ensure that their provisions are applied to every relevant project.

- **Is a lead agency also required to analyze how future climate change may affect development under the general plan?**

  Yes. CEQA requires a lead agency to consider the effects of bringing people and development into an area that may present hazards. The CEQA Guidelines note the very relevant example that "an EIR on a subdivision astride an active fault line should identify as a significant effect the seismic hazard to future occupants of the subdivision."[25]

  Lead agencies should disclose any areas governed by the general plan that may be particularly affected by global warming, e.g.: coastal areas that may be subject to increased erosion, sea level rise, or flooding; areas adjacent to forested lands that may be at increased risk from wildfire; or communities that may suffer public health impacts caused or exacerbated by projected extreme heat events and increased temperatures. General plan policies should reflect these risks and minimize the hazards for current and future development.

Endnotes

[1]For a discussion of requirements under general planning law, see OPR's General Plan Guidelines (2003). OPR is in the process of updating these Guidelines. For more information, visit OPR's website at http://www.opr.ca.gov/index.php?a=planning/gpg.html.

[2]OPR has noted the environmental and administrative advantages of addressing GHG emissions at the plan level, rather than leaving the analysis to be done project-by-project. See OPR, Preliminary Draft CEQA Guideline Amendments, Introduction at p. 2

(Jan. 8, 2009), available at http://opr.ca.gov/download.php?dl=Workshop_Announcement.pdf.

[3] OPR issued its Preliminary Draft CEQA Guidelines Amendments on January 8, 2009. Pursuant to Health and Safety Code, § 21083.05 (SB 97), OPR must prepare its final proposed guidelines by July 1, 2009, and the Resources Agency must certify and adopt those guidelines by January 1, 2010.

[4]Cal. Code Regs., tit. 14 (hereinafter "CEQA Guidelines"), § 15064, subd. (a).

[5]CEQA Guidelines, § 15064, subd. (f)(1).

[6]CEQA Guidelines, § 15021, subd. (a).

[7]OPR, CEQA and Climate Change: Addressing Climate Change Through California Environmental Quality Act (CEQA) Review (June 2008), available at http://opr.ca.gov/ceqa/pdfs/june08-ceqa.pdf.

[8] ARB's protocols for estimating the emissions from local government operations are available at http://www.arb.ca.gov/cc/protocols/localgov/localgov.htm.

[9] CAPCOA, CEQA and Climate Change, Evaluating and Addressing Greenhouse Gas Emissions from Projects Subject to the California Environmental Quality Act (January 2008) (hereinafter, "CAPCOA white paper"), available at http://www.capcoa.org/.

[10] http://ag.ca.gov/globalwarming/ceqa/modeling_tools.php

[11] http://www.iclei-usa.org

[12] For example, U.C. Davis has made its modeling tool, UPlan, available at http://ice.ucdavis.edu/doc/uplan; San Diego School of Law's Energy Policy Initiatives Center has prepared a GHG emissions inventory report for San Diego County http://www.sandiego.edu/EPIC/news/frontnews.php?id=31; and Cal Poly, San Luis Obispo City and Regional Planning Department is in the process of preparing a Climate Action Plan for the City of Benicia, see http://www.beniciaclimateactionplan.com/files/about.html.

[13]CEQA Guidelines, § 15002, subd. (g).

[14] CEQA Guidelines, § 15064(h)(1).

[15]See ARB, Scoping Plan at pp. 117-120, available at http://www.arb.ca.gov/cc/scopingplan/document/psp.pdf. (ARB approved the Proposed Scoping Plan on December 11, 2008.)

[16]In the Scoping Plan, ARB encourages local governments to adopt emissions reduction goals for 2020 "that parallel the State commitment to reduce greenhouse gas emissions by approximately 15 percent from current levels . . . ." Scoping Plan at p. 27; see *id.* at Appendix C, p. C-50. For the State, 15 percent below current levels is approximately equivalent to 1990 levels. *Id.* at p. ES-1. Where a city or county has grown roughly at

the same rate as the State, its own 1990 emissions may be an appropriate 2020 benchmark. Moreover, since AB 32's 2020 target represents the State's *maximum* GHG emissions for 2020 (see Health & Safety Code, § 38505, subd. (n)), and since the 2050 target will require substantial changes in our carbon efficiency, local governments may consider whether they can set an even more aggressive target for 2020. See Scoping Plan, Appendix C, p. C-50 [noting that local governments that "meet or exceed" the equivalent of a 15 percent reduction in GHG emissions by 2020 should be recognized].

[17] *Christward Ministry v. Superior Court* (1986) 184 Cal.App.3d 180, 194 [EIR must consider future development permitted by general plan amendment]; see also CEQA Guidelines, §§ 15126 [impact from all phases of the project], 15358, subd. (a) [direct and indirect impacts].

[18] See the City of Palm Desert's Energy Independence Loan Program at http://www.ab811.org.

[19] Pub. Res. Code, § 21081.6, subd. (b); CEQA Guidelines, § 15091, subd. (d); see also *Federation of Hillside and Canyon Assocs.* (2000) 83 Cal.App.4th 1252, 1261 [general plan EIR defective where there was no substantial evidence that mitigation measures would "actually be implemented"].

[20]CAPCOA white paper at pp. 79-87 and Appendix B-1.

[21]OPR Technical Advisory, Attachment 3.

[22]See http://ag.ca.gov/globalwarming/pdf/GW_mitigation_measures.pdf [mitigation list];http://ag.ca.gov/globalwarming/pdf/green_building.pdf [list of local green building ordinances].

[23]See http://opr.ca.gov/ceqa/pdfs/City_and_County_Plans_Addressing_Climate_Change.pdf.

[24]See Scoping Plan, Appendix C, at p. C-49.

[25]CEQA Guidelines, § 15126.2, subd. (a).

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Reactive Organic Gas Emissions from Livestock Feed Contribute Significantly to Ozone Production in Central California

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The San Joaquin Valley (SJV) in California currently experiences some of the highest surface ozone (O_3) concentrations in the United States even though it has a population density that is an order of magnitude lower than many urban areas with similar ozone problems. Previously unrecognized agricultural emissions may explain why O_3 concentrations in the SJV have not responded to traditional emissions control programs. In the present study, the ozone formation potentials (OFP) of livestock feed emissions were measured on representative field samples using a transportable smog chamber. Seven feeds were considered: cereal silage (wheat grain and oat grain), alfalfa silage, corn silage, high moisture ground corn (HMGC), almond shells, almond hulls, and total mixed ration (TMR = 55% corn silage, 16% corn grain, 8% almond hulls, 7% hay, 7% bran + seeds, and 5% protein + vitamins + minerals). The measured short-term OFP for each gram of reactive organic gas (ROG) emissions from all livestock feed was 0.17−0.41 g-O_3 per g-ROG. For reference, OFP of exhaust from light duty gasoline powered cars under the same conditions is 0.69 ± 0.15 g-O_3 per g-ROG. Model calculations were able to reproduce the ozone formation from animal feeds indicating that the measured ROG compounds account for the observed ozone formation (i.e., ozone closure was achieved). Ethanol and other alcohol species accounted for more than 50% of the ozone formation for most types of feed. Aldehydes were also significant contributors for cereal silage, high moisture ground corn, and total mixed ration. Ozone production calculations based on feed consumption rates, ROG emissions rates, and OFP predict that animal feed emissions dominate the ROG contributions to ozone formation in the SJV with total production of 25 ± 10 t O_3 day^{-1}. The next most significant ROG source of ozone production in the SJV is estimated to be light duty vehicles with total production of 14.3 ± 1.4 t O_3 day^{-1}. The majority of the animal feed ozone formation is attributed to corn silage. Future work should be conducted to reduce the uncertainty of ROG emissions from animal feeds in the SJV and to include this significant source of ozone formation in regional airshed models.

1. Introduction

Ozone (O_3) is a persistent public health problem with serious economic consequences in the United States. In the years 2005−2007, more than 400 counties had 8 h average O_3 concentrations higher than 75 ppb (the most recent health-based National Ambient Air Quality Standard) (*1*). Three of six counties with the highest O_3 concentrations were located in California's San Joaquin Valley (SJV), while the remaining "top six" counties were located in Southern California (*2*). The severity of the O_3 problem in the SJV counties is puzzling given that they have a combined population of only 2.1 M compared to 14 M residents in the top Southern California counties. Higher temperatures, less summer cloud cover, and longer periods of stagnation in the SJV explain part of this trend, but even the most sophisticated computer models that account for all of these effects predict that O_3 concentrations in the SJV should be decreasing faster than currently observed in response to emissions control programs.

Ozone is produced by the photochemical reaction of oxides of nitrogen (NO_x) and reactive organic gases (ROGs). Lower ozone concentrations generally result from reductions in ROG emissions in urban areas. NO_x control is a more effective means to decrease ozone concentrations in regions where biogenic and other natural sources account for the majority of the ROG emissions. Photochemical model results based on current emissions inventories predict that NO_x control is a more efficient method for ozone reduction in the SJV, but that conclusion is subject to review as new ROG emissions sources are discovered. One possible cause for unexpected O_3 formation in the SJV is missing ROG emissions associated with the intensity of agricultural activities in the region. Almost 10% of the agricultural output for the entire United States comes from the SJV (*3*). The California Air Resources Board recently estimated that reactive organic gas (ROG) emissions from dairy cattle waste are the second largest source of O_3 formation in the SJV (with motor vehicle exhaust being the largest source) (*4*). Direct testing suggests that this initial estimate for dairy cattle waste is overstated since animal emissions do not contain ROGs with high ozone formation potential (OFP) (*5*, *6*). Nevertheless, the OFPs of many other agricultural ROGs have not yet been tested, making agricultural emissions a high priority for further analysis.

Recent studies have identified animal feeds as one possible ROG source of agricultural OFP (*7*, *8*). The ROG flux measured from silage and total mixed ration (TMR) was 2 orders of magnitude higher than comparable fluxes from animal waste (*7*). Chamber measurements confirm that animal feed ROG emissions are significantly higher than animal waste emissions and several of the animal feed ROG compounds have potentially high OFP (*8*). Neither of these previous studies directly quantified the OFP from animal feed or performed total ozone closure experiments, leaving the contribution of this source to regional ozone formation unknown.

The purpose of the present study is to directly measure the OFP of commonly used animal feeds and to estimate the importance of this ROG source for O_3 formation relative to other common ROG sources. A transportable smog chamber was used to measure OFP from seven feed types including one feed mixture under realistic agricultural conditions. Measured ROG emissions from feed placed into an envi-

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ronmental chamber were used to initialize model calculations of O_3 formation that were compared to measured values (ozone closure experiments). Finally, total emissions rates of ROGs from animal feeding operations were estimated for the SJV so that the importance of this source could be judged relative to other common ROG sources that contribute to O_3 production.

2. Materials and Methods

2.1. Field Experiments. The OFP of sources too complicated to reproduce in the laboratory can be measured directly in the field using transportable smog chambers (*5, 9*). Ozone formation is measured by introducing a source gas into a well mixed chamber that contains background NO_x and reactive organic gases (ROG) that represents conditions in the region of interest. The background NO_x and ROG produce ozone when it is exposed to ultraviolet (UV) radiation. The OFP for the target source is defined to be the additional ozone that is formed when emissions from that source are added to the background mixture. The one drawback to transportable chambers is that they are usually smaller than laboratory chambers. The reduced size limits experiments to shorter times and the larger surface to volume ratios require extra care when accounting for wall effects. The benefits of making ozone measurements directly from complex sources far outweigh these limitations.

In the present study, a mobile ozone chamber assay (MOChA) was used to directly measure OFP from livestock feeds. The MOChA consists of a 1 m^3 Teflon film reaction chamber housed within a wooden enclosure sitting on top of a modified trailer. The inner surface of the enclosure is covered with highly reflective aluminum sheeting, which helps to maximize UV irradiation of the reaction chamber. The UV irradiation is supplied by up to 26 UV lamps (model no. F40BL, Sylvania) with peak intensity at a wavelength of 350 nm. The lamps are mounted approximately 50 cm from the reaction chamber. The number of lamps was adjusted to produce ~50 ± 2 W/m^2 of UV output, which is typical for conditions in Central California during the summer months. The intensity of UV irradiation was measured before and after each experiment using a photometer (model no. PMA-2111, Solar Light Co. Inc., Glenside, PA).

During a typical experiment, the reaction chamber was filled with source air using a Teflon diaphragm pump. The target concentration of background NO_x was added from a high pressure cylinder as a 95% NO_2/5% NO mixture by volume. The background ROG used in the present study consisted of a 55 ± 1% ethene, 33 ± 1% *n*-hexane, and 12 ± 1% xylenes mixture by volume that was designed to simulate background ROG concentrations in the SJV during stagnation events. The composition of the background ROG was chosen to represent diluted urban plumes based on the "mini-surrogate" developed by Carter et al. (*10*). A grab canister sample (*11*) of the ROG concentrations was collected, the lights were turned on, and a three-hour ozone formation experiment was performed. Ozone, NO_x, relative humidity, and temperature measurements were made at regular intervals and logged to a computer. A second grab sample of ROG concentrations was collected at the end of the experiment, the lights were turned off, and the bag was evacuated and flushed using a clean air generator (model no. ZA-750−12, Perma Pure Inc., Toms River, NJ). Further details of the MOChA standard operating procedures and initial validation experiments are provided elsewhere (*5*).

Ozone formation experiments were performed on seven different types of feed obtained from a commercial local dairy. Those tested feeds included cereal silage (wheat grain and oat grain), alfalfa silage, corn silage, high moisture ground corn (HMGC), almond shells, almond hulls, and total mixed ration (TMR = 55% corn silage, 16% corn grain, 8% almond hulls, 7% hay, 7% bran+seeds, and 5% protein + vitamins + minerals on a as-fed basis). Alfalfa silage was tested under two conditions: <1 week of fermentation and ~1 month of fermentation.

Feed samples were collected from trench silos on the dairy farm and moved to the testing facility in large double wrapped plastic bags. For cereal, alfalfa, and corn silage, a section of the silage face was removed so that the entire feed sample was collected from the anaerobic region. Air was removed from the plastic bags and they were sealed for transportation to the UC Davis Department of Animal Science where experiments were conducted. The test chamber was a 4.4 × 2.8 × 10.5 m sealed room with mechanically controlled ventilation. A detailed description of this facility can be found elsewhere (*6*). Feed samples were weighed and then placed in a circular bin that set on the floor of the chamber. The circular bin ensured that each feed type had the same exposed surface area (2.63 m^2) during an experiment. The effective density of each of the feed types in kg per m^3 was: corn silage (300 ± 40), alfalfa silage (260 ± 30), cereal silage (300 ± 35), HMGC (640 ± 70), almond shells (150 ± 20), and almond hulls (160 ± 20). After six minutes (the air residence time in the chamber), MOChA air samples were drawn from the ventilation outlet of the testing room through a 10 m Teflon tube. Canister samples, DNPH-silica cartridges (model no. 037500, Waters Corp, MA), and sorbent tube (model no. 226−119, SKC Inc., Eighty-Four, PA) samples were also collected inside the testing facility for supplemental ROG analysis. DNPH cartridges were eluted with acetonitrile and analyzed using high performance liquid chromatography (HPLC), while sorbent tube and canister samples were analyzed using gas-chromatography mass-spectrometry (GC-MS) (*11–14*). The ozone formation of each feed type was measured under two background ROG conditions: with background ROG added to the system and without background ROG. Initial NO_x concentrations were 50 ± 5 ppb.

2.2. Model Calculations. Model calculations were used to perform ozone closure experiments and to estimate OFP under ROG/NO_x ratios other than those tested during experiments. Ozone closure experiments attempt to reconcile ozone measurements at the end of an experiment with ozone predictions made using only the ROG and NO_x concentrations measured at the beginning of an experiment. Extensive under-predictions of ozone formation would suggest the presence of unidentified ROG compounds with significant OFP (no such under-predictions were detected in the current study). Simulations were carried out using a modified version of the Caltech Atmospheric Chemistry Mechanism (CACM) (*15*). Modifications were made to CACM in order to accurately represent ethanol and acetaldehyde chemistry in rural conditions and to better simulate the spectrum of UV radiation emitted by the MOChA lamps (*5*). Model predictions for OFP were found to be in good agreement with previous OFP measurements for animal waste sources (*5, 9*). Likewise, in the present study model predictions are able to reproduce OFP for animal feed sources (see the Supporting Information (SI)).

3. Results and Discussion

A detailed list of the chemical species measured across all feed types and their lumped model category is provided in the SI. Alkanes (ALKL + ALKH), alkenes (OLEL + OLEH), and ketones (KETL + KETH) are lumped into two categories based on the number of carbon atoms in each molecule. Esters are lumped into one of the two ketone categories. Alcohols (ALCH) are represented with a single lumped category with the exception of explicit treatment for ethanol (ETOH). Acetaldehyde (ALD1) is also represented explicitly, while the rest of the aldehydes are grouped into two lumped categories representing higher molecular weight aldehydes (ALD2) and

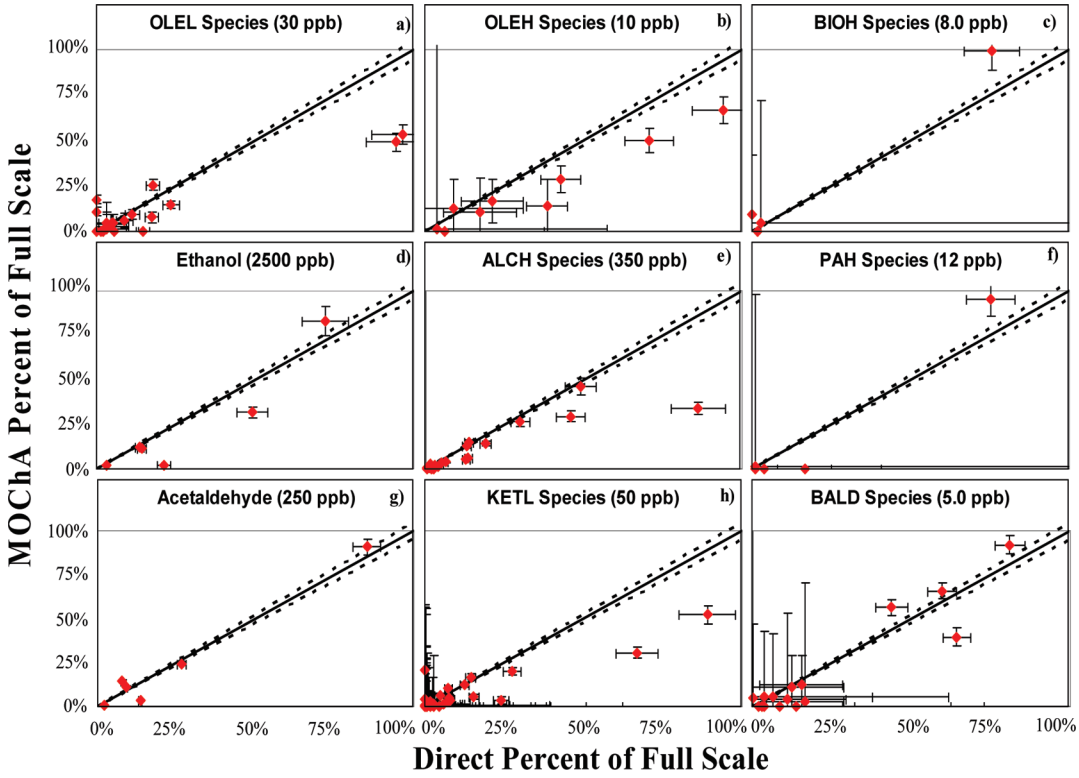

FIGURE 1. MOChA ROG canisters sample concentrations vs Direct ROG (from the test chamber) canister sample concentration for each lumped chemical species (concentrations in ppb). Note that each graph is from 0 to 100% of the maximum concentration, which is displayed in parentheses next to the species type.

cyclic aldehydes (BALD). Biogenics (BIOL + BIOH) and aromatic species (AROL + AROH) are lumped according to their SOA yield, whereas phenol (PHEN) is represented explicitly. A more detailed description of the CACM lumping scheme is provided elsewhere (*5, 15*), as are emissions rates for each of the chemical species (*8*).

Figure 1 depicts the differences between ROG species concentrations measured in the MOChA vs direct measurements in the feed testing facility. Each graph represents either an individual chemical species or a lumped chemical species category tracked by model calculations (see SI Table S1) with direct measurements of ROG on the *x*-axis and MOChA measurements of ROG on the *y*-axis. Regression analysis (see SI Table S2) was performed on MOChA vs direct measurements and the results show that those lumped species with average concentrations greater than 2 ppb had R^2 values above 0.84. The two species with the highest average concentration, ethanol (650 ppb) and acetaldehyde (60 ppb), had R^2 values of 0.91 and 0.98 respectively and the regression slope fell within one standard deviation of the 1:1 line (0.94 ± 0.27 and 1.04 ± 0.13, respectively). Four of the eight lumped categories with average concentrations above 2 ppb (ALCH, OLEL, OLEH, and KETL) had regression slopes <0.68 with 95% confidence intervals below the 1:1 line consistent with losses to surfaces in the ventilation ducts and sampling lines. The two lumped species right at the 2 ppb threshold (BIOH and PAH) had regression slopes >1.21 but closer inspection shows that this result was driven by a single data point in each case. The corresponding 95% confidence intervals for the regression slopes are therefore very broad. Likewise, there was significant scatter for lumped species measured at concentrations <2 ppb, which resulted in lower correlation coefficients and broader confidence intervals for the regression slopes. The lower detectable concentration of the ROG measurement method was 1 ppb which explains the scattered behavior of measurements approaching this limit.

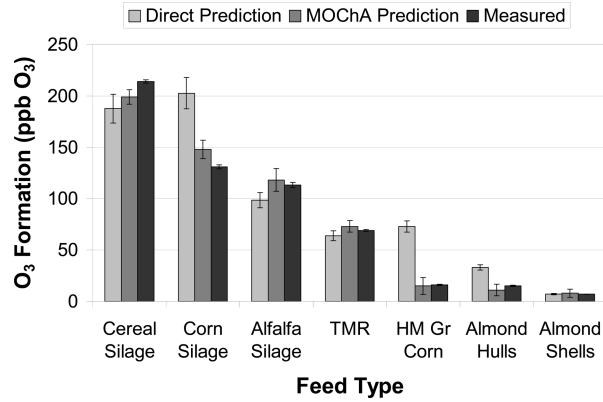

FIGURE 2. Ozone formation (ppb O_3) measured in each experiment vs model predictions using ROG samples from MOChA and Direct ROG samples from the feed testing facility.

Figure 2 illustrates the ozone formation (ppb-O_3) due to emissions from each animal feed vs the ozone formation predicted using CACM (ozone closure experiment). The figure depicts ozone formation under controlled conditions, where surface area of feed, ventilation rate in the chamber, and volume sampled remain constant across all feed types. By controlling these variables, the emissions from a feed type can be attributed to the actual flux from that feed. Simulations were conducted using the ROG profiles measured in the MOChA and the ROG profiles measured directly from the feed testing facility. For almost every feed type, the model predictions for ozone formation based on the MOChA ROG profiles are within uncertainty estimates to measured ozone formation in the MOChA. Ozone formation from corn silage, high moisture ground corn (HMGC), and almond hulls predicted using ROG profiles measured directly from the feed testing facility are higher than predictions based on

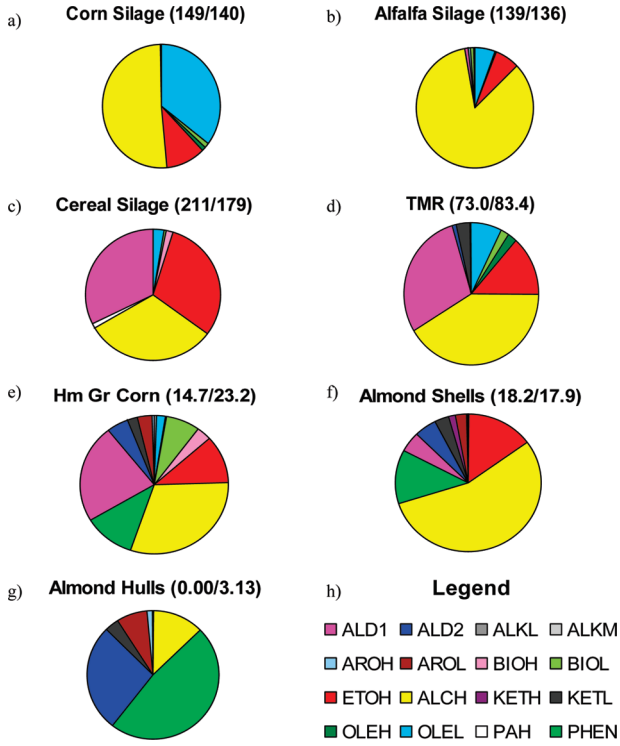

FIGURE 3. Contribution to total ozone formation from each lumped model species assuming additive behavior. Ozone formation associated with each species is calculated by removing that species from the ROG profile and observing the net reduction in ozone formation. The amount of ozone produced under the experimental conditions is listed after each subtitle (ppb O_3). The first value represents the measured total ozone formation, while the second value represents the predicted total O_3 formation using the sum from individual ROG subfractions. See the Supporting Information for an explanation of lumped model species codes.

MOChA ROG measurements. Concentrations of alcohol species were higher in the direct sample than the MOChA sample by a factor of 1.5, 5, and 10 for corn silage, almond hulls, and HMGC, respectively. Alcohol concentrations (ALCH + ETOH) account for roughly half of the ozone formation for these feed types. Multiplying the increased alcohol concentration by the expected ozone formation yields the difference in ozone formation between direct and MOChA samples for these three feed types (25% increase for corn silage, 300% for almond hulls, and 500% for HMGC). The influence of sampling line losses on these compounds must be considered when predicting the atmospheric ozone formation associated with these feeds.

Figure 3 illustrates the contribution that each lumped ROG category makes to ozone formation for each of the feeds. ROG contributions to ozone formation were calculated by removing the ROG from the feed profile and observing the reduction in predicted ozone production. This method assumes simple additive behavior (linear approximation) that does not completely describe the nonlinear photochemical system. The measured ozone formation and predicted ozone formation (sum of the individual ROG contributions) are displayed after the subtitle for each feed to convey the uncertainty introduced by the linear approximation. The relative error introduced by the linear approximation is <20% for feeds that produce >50 ppb O_3 under the experimental conditions (corn, alfalfa, cereal, TMR) with larger errors for feeds that produce <50 ppb of O_3 under the study conditions (HMGC, almond shells, almond hulls). Ethanol and especially larger alcohol species (ALCH) account for >50% of the ozone formation for most types of feed. Alkene species (OLEL) were

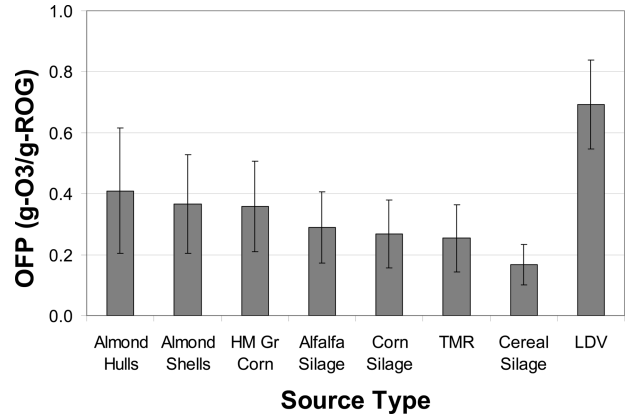

FIGURE 4. Calculated average O_3 formation potential (OFP) of the ROG emissions from animal feed sources and light duty gasoline-powered vehicles (LDV) expressed as g-O_3 produced per g-ROG emitted based on background NO_x and ROG concentrations. Uncertainty bars represent the range of conditions considered (see text).

significant contributors for corn silage and important in alfalfa silage and TMR. Acetaldehyde accounts for 25−30% of the ozone formation in cereal silage, TMR, and HMGC. Phenols account for significant ozone production for HMGC, almond shells, and almond hulls. Other important contributors to total ozone formation include the second lumped aldehyde category (ALD2), biogenic species, and aromatic species.

Model simulations were conducted to explore OFP of animal feeds under pollutant conditions expected in the SJV. Figure 4 displays the calculated ozone formation potential for feed in grams of ozone produced per gram of ROG emitted using the emissions measured in the current study. These values can be compared to the OFP of light duty gasoline-powered vehicle exhaust (LDV). The error bars in Figure 4 represent the range of conditions considered for each feed type, while the large bar represents the average between the estimates. The upper estimate represents urban concentrations in the SJV (NO_x = 75 ppb, ROG = 125 ppb), while the lower estimate represents rural conditions in the SJV (NO_x = 25 ppb, ROG = 62.5 ppb) (*2*). OFP is typically calculated using incremental reactivity, which compares the ozone formation of a reference mixture to the ozone formation of the reference mixture plus a small concentration of source ROG. Incremental reactivity can be defined for any point on an ozone isopleth, but at low NO_x and ROG conditions it is best to use the equal benefit incremental reactivity (EBIR), which is the point on the ozone isopleth where ROG and NO_x controls contribute equally to ozone reduction (*16*). Fortunately, the reference estimates for the SJV fall along this EBIR line for the NO_x conditions considered. The three silage feed types used in the experiments had OFP ranging from 0.17 to 0.29 g-O_3 per g-ROG. Total mixed ration, which contains both silage and other feeds, had the sixth highest OFP at 0.26 ± 0.11 g-O_3 per g-ROG. High moisture ground corn had the third highest OFP (0.36 ± 0.15 g-O_3 per g-ROG), almond shells had the second highest OFP (0.37 ± 0.16 g-O_3 per g-ROG), and almond hulls had the highest OFP (0.41 ± 0.21 g-O_3 per g-ROG). The OFP of LDV at EBIR conditions was calculated using CACM to be 0.69 ± 0.15 g-O_3 per g-ROG using published ROG emission estimates (*17*). These results demonstrate that under representative NO_x conditions, the OFP of feed sources are potentially important compared to LDV OFP.

Ozone formation potential quantifies the reactivity of each gram of ROG, but total emission estimates are needed to calculate total ozone formation within a region. Animal feed ROG emissions originate from storage silos and from feed placed in front of animals for their consumption. ROG

emission rates from the exposed face of storage silos and from feed placed in front of animals are calculated based on exposed feed surface area and measured flux rates (g ROG day^{-1} m^{-2}). SI Table S3 summarizes the flux emissions rates for different feeds inferred from test chamber measurements in the current study. Test chamber measurements were converted to flux rates using the following equation:

$$\text{flux} = \frac{CV}{\tau A} \quad (1)$$

where C is the measured concentration in the chamber, V is the chamber volume, τ is the time scale for air exchange in the room, and A is the surface area of exposed feed. Chamber measurements made at time $= \tau$ were still increasing to steady state values (achieved after time $= 3\tau$) and so the flux values are approximately 37% lower than the true initial emissions rates from the animal feeds. Continuous emissions flux measurements for corn silage made over a 24 h period indicate that steady state emissions decreases over time (*18*). A decrease of 37% from the initial emissions rate is achieved after approximately 4−5 h have passed. Hence, the emissions flux measurements are appropriate for an exposure time of 4−5 h. The corn silage emissions flux rates in the current study (1.66 ± 0.18 ROG g hr^{-1} m^{-2}) are in excellent agreement with direct flux rate measurements described by other investigators (1.8 ± 0.1 g ROG hr^{-1} m^{-2}) (*7*).

Total corn silage ROG emissions in the SJV were calculated assuming that almost all of the corn silage used in California is fed to dairy cattle and that most of the corn silage is kept in trench silos (not tower silos). The total daily feed consumption was estimated using statistics from the U.S. Department of Agriculture (*19*) (see SI Table S1).

ROG emissions from the exposed face of the trench silo (E_{face}) were calculated using the following equation:

$$E_{face} = \frac{M_{feed} A_{face} (\text{flux})}{\rho V_{pile}} \quad (2)$$

where M_{feed} is the total mass of silage feed consumed in the SJV each year ($1.0 \times 10^{10} \pm 5.0 \times 10^{8}$ kg) (*19*), ρ is the density of silage in the pile (300 ± 40 kg m^{-3}) (*20*), V_{pile} is the volume of a representative silage pile ($1.0 \times 10^{4} \pm 100$ m^3) (*20*), A_{face} is the representative area of the silage pile face (90 ± 4.5 m^2) (*20*), and flux is the ROG emissions flux appropriate for 4−5 h of exposure time (40 ± 2 g ROG day^{-1} m^{-2}) (measured this study).

Fugitive ROG emissions from corn silos ($E_{spoilage}$) were calculated assuming that all of the ROG contained in the spoiled silage is released to the atmosphere using the following equation:

$$E_{spoilage} = \frac{M_{spoil} \text{DM} f_{ETOH\_DM}}{f_{ETOH\_ROG}} \quad (3)$$

where M_{spoil} is the total amount of feed lost in the silo due to air spoilage (10% of total mass $= 1.0 \times 10^{9} \pm 5.0 \times 10^{7}$ kg yr^{-1}) (*21*), DM is the fraction of the silage that is dry matter (30%) (*22*), f_{EtOH_DM} is the ratio of ethanol to dry matter in the feed (1.2%) (*22*), and f_{EtOH_ROG} is the fraction of the ROG attributed to ethanol (EtOH) (55%) (*8*). This methodology predicts that fugitive ROG emissions can be calculated as 0.65% of the spoiled silage mass.

The ROG emission rate from feed placed in front of the animals (E_{manger}) was calculated assuming that the feed is available to the cows twenty-four hours a day using the equation:

$$E_{manger} = S_{cow} N_{cow} f_{silage} \text{flux} \quad (4)$$

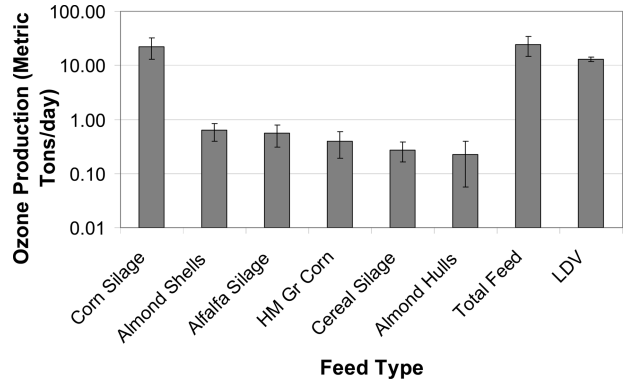

FIGURE 5. Total ozone production in metric tons per day for the various animal basic feed types vs light duty vehicles (LDV) in the SJV. Note that the *y*-axis is log scale. Calculations are based on OFP and total ROG emissions (see SI Table S1 for a summary of corn silage calculations).

where S_{cow} is the representative surface area of feed in front of each cow, N_{cow} is the number of cows in the SJV ($1.9 \times 10^{6} \pm 1.9 \times 10^{4}$) (*7*), f_{silage} is the fraction of the feed composed of silage (50%) (see previous discussion of TMR composition), and flux is the ROG emissions flux appropriate for 4−5 h of exposure time (40 ± 2 g ROG day^{-1} m^{-2}) (measured this study). The E_{manger} was calculated using measurements from a typical dairy in the SJV (1200 cows, two barns each housing 600 cows, total length of feed line is 750 m, and effective cross-sectional width of feed line is 2.2 m). The result gives the average exposed feed surface area of 1650 m^2 for 1200 cows or 2.7×10^{6} m^2 for 1.9 million cows in the SJV (*23*). Again, f_{silage} reduces the resulting surface area by half to account for approximately 50% corn silage used in TMR. All of the values needed to apply eqs 2−4 are summarized in SI Table S6 along with references for data sources.

The total ROG emissions from corn silage calculated using eqs 2−4 were 12.3 ± 1.9 t day^{-1} (storage face) + 18.4 ± 1.8 t day^{-1} (fugitive emission) + 53.1 ± 6.0 t day^{-1} (feed in front of animals) yielding a total emissions rate of 83.8 ± 6.6 t day^{-1}. Multiplying ROG emissions by the OFP of corn silage (0.27 ± 0.11 g-O_3 per g-ROG) gives total ozone production in the SJV as 23 ± 9.5 t day^{-1}. Similar calculations of ozone production from the other feed sources were performed and the result is summarized in Figure 5. The estimated ozone formation from LDVs is also displayed in Figure 5 using published emissions estimates for this source (*4*). Traditional emissions inventory estimates have identified LDVs as the largest anthropogenic ROG source of ozone production in the SJV. The present calculations suggest that ozone production from animal feed ROG (25 ± 10 t day^{-1}) is nearly two times larger than ozone production from LDV ROG (14.3 ± 1.4 t day^{-1}) in this heavily polluted region. Corn silage accounts for 93% of the feed ozone production in the SJV. The next most significant category of feed is alfalfa silage contributing 2% to the SJV total.

All of the calculations described above are preliminary. Further refinements are needed to account for meteorological variables such as temperature, wind speed, and humidity. The relative importance of NO_x vs ROG control on ozone formation in the SJV must also be considered. The natural approach to evaluate these factors is the application of a regional air quality model that includes the newly recognized animal feed ROG emissions and then perturbs the system to consider the effectiveness of NO_x vs ROG emissions controls. The preliminary calculations shown in the present study clearly indicate that animal feed emissions are a significant source of ozone precursors in the SJV at current NO_x levels. Ozone control strategies in the SJV currently focus on NO_x control because previous calculations (without animal feed

ROG emissions) predicted this to be the most efficient strategy. If some measure of ROG control is deemed to be worthwhile when these new emissions are recognized, then future research should study how ROG emissions can be reduced from these essential animal feeds.

Acknowledgments

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Supporting Information Available

Table S1 describes the assignment of individual ROG species to lumped CACM species, Table S2 summarizes regressions between MOChA vs Direct ROG measurements, Table S3 displays the emission flux rates for the various feed types in the test chamber, Table S4 lists the mass of feed used in chamber experiments, Table S5 lists the pH and total solids content of corn and alfalfa silage, Table S6 summarizes the data needed to calculate corn silage ROG emissions in the SJV, Figure S1 illustrates agreement between CACM predictions and MOChA measurements, Figure S2 illustrates calculated O_3 isopleths, Figure S3 illustrates the amount of each feed type used in California each year, Figure S4 displays measured concentrations of ROG species at or below the quantification threshold, and Figure S5 illustrates a picture of the MOChA apparatus. This material is available free of charge via the Internet at http://pubs.acs.org.

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CALIFORNIA CLIMATE ACTION NETWORK

BEST PRACTICES FRAMEWORK
VERSION 6.0

NEW BEST PRACTICES FRAMEWORK TO ASSIST LOCAL AGENCIES

About the Updated CCAN Best Practice Framework

The updated Best Practices Framework (Version 6.0) reflects additions based on CCAN's ongoing research into what cities and counties are doing to reduce greenhouse gas emissions, as well as feedback from earlier versions of the Best Practices Framework. Visit www.ca-ilg.org/ClimatePractices to view the Best Practices Framework online.

Climate Leadership Opportunity Areas
www.ca-ilg.org/ClimatePractices

1. Energy Efficiency and Conservation
2. Water and Wastewater Systems
3. Green Building
4. Waste Reduction and Recycling
5. Climate-Friendly Purchasing
6. Renewable Energy and Low-Carbon Fuels
7. Efficient Transportation
8. Land Use and Community Design
9. Storing and Offsetting Carbon Emissions
10. Promoting Community and Individual Action

Links to Climate Leadership Stories

The updated version of the Best Practices Framework includes references to over forty Climate Leadership Stories. Each story describes the experience of a California community's exemplary efforts to reduce greenhouse gases.

Where to Find More Resources

Additional resources to assist local agencies reduce greenhouse gas emissions, promote sustainability, and save money are available at www.ca-ilg.org/ClimateChange.

Share Your Agency's Best Practices

If your city or county has programs or policies to reduce greenhouse gas emissions (in agency operations or in the community as a whole) that are not covered in the Best Practices Framework, please let us know. Please send a brief description of the program or policy, along with contact information for follow up if needed. Emails may be sent to: ClimateChange@ca-ilg.org.

BEST PRACTICES FRAMEWORK
VERSION 6.0

THE FRAMEWORK SUPPORTS YOUR EFFORTS NOW

This Best Practices Framework offers suggestions for local action in ten Climate Leadership Opportunity Areas (*see right*), both in agency operations and the community at large. An agency can use specific best practice suggestions for stand-alone programs or as part of a broad-based climate action plan to reduce greenhouse gas emissions. The suggestions are designed to reflect the variation among cities and counties and offer a variety of options ranging from simple steps to more complex undertakings.

Climate Leadership Opportunity Areas
www.ca-ilg.org/ClimatePractices

1. Energy Efficiency and Conservation
2. Water and Wastewater Systems
3. Green Building
4. Waste Reduction and Recycling
5. Climate-Friendly Purchasing
6. Renewable Energy and Low-Carbon Fuels
7. Efficient Transportation
8. Land Use and Community Design
9. Storing and Offsetting Carbon Emissions
10. Promoting Community and Individual Action

YOU CAN START NOW

We encourage you to review the Framework and get started on those actions that make sense for your agency. Many ideas in the Framework can be implemented immediately, even if you don't have a climate action plan. For example, you can audit agency buildings and operations to find ways to save energy and money, such as by replacing lights, inefficient HVAC systems or water pumps. Buying climate-friendly products are another option. Check the Framework for ideas you haven't thought of – if it fits your agency or community, you can start today.

DEVELOP A BROAD-BASED CLIMATE ACTION PLAN

Strategies for reducing greenhouse gases often overlap more than one program area. For example, many practices that improve energy efficiency also can apply to green building and water conservation. Strategies to promote efficient transportation are related to land use and community design. You can use the Framework to help identify these overlaps and start developing a broad-based climate action plan for your community.

SEND US YOUR FEEDBACK

The Best Practices Framework is an evolving resource document. Over time, we will include new actions that reflect innovation at the local level. If your city or county has additional suggestions for best practices to share, please send them to us, along with any background information available. Email: climatechange@ca-ilg.org

If you would like to receive information about climate change resources and updates from CCAN, please visit www.ca-ilg.org/climatelistserve to be added to the CCAN listserve.

The California Climate Action Network provides information, tools and resources in support of local governments' efforts to reduce greenhouse gas emissions in their communities. The California Climate Action Network is a program of the Institute for Local Government, the non-profit research and education affiliate of the League of California Cities and the California State Association of Counties. Visit the California Climate Action Network Web site at www.ca-ilg.org/climatechange.

Energy Efficiency and Conservation

www.ca-ilg.org/energyefficiency

GOAL	BEST PRACTICE
Energy conservation and efficiency in agency buildings and equipment. *See also Green Building section for additional energy options.*	*Audit/evaluation* • Audit major agency buildings and facilities to quantify energy use and identify opportunities for energy savings through efficiency and conservation measures. • Conduct retro-commissioning studies of major agency building HVAC and lighting systems. • Benchmark energy use of major agency buildings. *Building retrofitting and retro-commissioning* • Develop an implementation schedule to implement no cost/low cost opportunities. • Develop implementation plan for capital intensive energy retrofits. • Develop implementation plan to achieve facility Energy Star rating of 60-75 or greater, where feasible. • Implement retro-commissioning improvements as recommended in studies. *Operations/protocols* • Establish energy efficiency protocols for building custodial and cleaning services. • Establish facility energy efficiency policy that provides employees with guidelines, instructions, and requirements for efficient use of the facility such as by turning lights and computers off, thermostat use, etc. • Implement off-peak scheduling of pumps, motors and other energy intensive machinery where feasible. • Incorporate energy management software or other methods to monitor energy use in agency buildings. *Standards/commissioning* • Develop commissioning and retro-commissioning standards for new and renovated buildings. • Develop and implement shading requirements for agency and community parking lots, buildings and other facilities to reduce the urban heat island effect. • Develop and implement a continuous commissioning plan. • Integrate energy efficiency, conservation, solar and other renewable energy technologies into new agency facilities. *Work with energy provider* • Work with energy provider to access utility's technical assistance and financial incentives.

Energy Efficiency and Conservation

www.ca-ilg.org/energyefficiency

GOAL	BEST PRACTICE
Reduce energy use for traffic signal and street lighting system.	• Replace incandescent traffic and crosswalk lights with energy-efficient light-emitting diodes (LEDs). • Replace incandescent and mercury vapor street and parking lot lights with energy efficient alternatives.
Reduce energy use by business and residents.	• Encourage community businesses to conduct energy audits. • Work with energy provider to encourage commercial sector to install energy efficient exterior lighting that is appropriate for the location and use, considering security versus decorative lighting. • Require energy audits and/or retrofits, such as at time of sale of commercial and residential properties. • Work with energy provider to promote use of financial incentives to assist residential and commercial customers improve energy efficiency. • Promote and reward energy efficiency efforts of local retail businesses. • Collaborate with local retail businesses to encourage residents to purchase energy efficient products. • Adopt an energy financing program, such as that available through AB 811 energy financing districts, to encourage energy efficiency retrofits in existing residential and commercial buildings.

Water and Wastewater Systems

www.ca-ilg.org/water

GOAL	BEST PRACTICE
Reduce energy use in water, irrigation, and waste water systems (either operated by agency or by another agency or private company). *See also Green Buildings section for additional options.*	• Audit agency's water and waste-water pumps and motors to identify most and least efficient equipment. • Develop and implement a motor/pump efficiency cycling schedule to use most efficient water or waste-water motors/pumps first and least efficient ones last. • Replace least efficient water/wastewater motors and pumps with more efficient units. • Work with agency or company that provides water and waste water service to implement an audit, cycling, and equipment replacement program for water and waste water pumps and motors. • Implement methane capture for energy production at wastewater treatment plants. • Use recycled water for agency facilities and operations, including parks and medians, where appropriate. • Retrofit existing agency buildings and facilities to meet standards for the LEED Standards Rating Systems for Existing Buildings (EB) or Commercial Interiors (CI). • Require dual plumbing for use of recycled water for new commercial and/or residential developments.
Reduce water use in agency operations and in the community. *See also Green Building section for additional options.*	*Agency operations* • Assess, maintain, and repair existing plumbing fixtures, pipes, and irrigation systems in all agency buildings and facilities to minimize water use, including building and parking lot landscaping, public rest rooms and parks, golf courses and other recreational facilities. • Upgrade and retrofit agency plumbing and irrigation systems with state-of-the-art water conserving technology. • Implement all feasible water efficiency strategies included in the Ahwahnee Water Principles for Resource Efficient Land Use in all agency parks, landscaping and in new developments. • Use compost and mulch in agency landscaping as a water conservation measure. *Community at large* • Adopt water efficiency principles similar to the Ahwahnee Water Principles for Resource Efficient Land Use for new and existing residential and commercial developments. • Implement water conservation and reclamation programs to reduce energy use associated with water delivery. • Require water efficiency audits at point of sale for commercial and residential properties. • Adopt retrofit program to encourage or require installation of water conservation measures in existing businesses and homes.

Water and Wastewater Systems www.ca-ilg.org/water	
GOAL	**BEST PRACTICE**
	• Encourage use of compost and mulch in private landscaping as a water conservation measure. • Partner with water provider to adopt water conservation measures.

Green Building

www.ca-ilg.org/greenbuilding

GOAL	BEST PRACTICE
Establish minimum levels of energy efficiency and green building standards for agency buildings and facilities. *See also Energy Efficiency and Conservation section for more options.*	• Require that agency buildings have a performance equivalent to an Energy Star rating of at least 60-75 (as described in the LEED-E3 reference guide), where feasible. • Require all new agency buildings and facilities to meet at least LEED Silver certification standards. • Require renovated agency buildings and facilities and those using agency funds or other financial support to meet at least LEED Silver certification standards.
Establish and implement minimum levels of energy efficiency and green building standards for commercial and residential buildings. *See also Energy Efficiency and Conservation section for more options.*	• Require new residential and commercial construction to exceed Title 24 energy efficiency standards to extent permitted by law. • Provide technical assistance, financial assistance, and other significant incentives to private development projects that meet or exceed LEED Silver certification standards for commercial buildings. *Examples (www.ca-ilg.org/GreenBuildingStories):* ° *Santa Cruz Tiered Green Building Standards* ° *West Hollywood Customized Green Standards* • Adopt and implement a local green building ordinance or program setting minimum standards of LEED Silver certification for new or renovated commercial, industrial, and high-rise residential building projects. *Example (www.ca-ilg.org/GreenBuildingStories):* ° *Richmond Tiered Building Standards* • Adopt and implement a local green building ordinance or program to require new or enlarged low-rise residential construction to meet minimum green building standards, such as Build It Green, California Green Builder, LEED, or a similar program. *Examples (www.ca-ilg.org/GreenBuildingStories):* ° *Fremont Residential Building Standards* ° *Morgan Hill Competitive Housing Allotment Process* ° *Richmond Tiered Building Standards* ° *San Mateo County Green Building Ordinance* ° *Santa Cruz Tiered Green Building Standards* ° *Santa Rosa Green Building Standards* ° *West Hollywood Customized Green Standards* ° *Windsor Green Building Program*

Green Building www.ca-ilg.org/greenbuilding	
GOAL	**BEST PRACTICE**
	• Provide technical assistance, financial assistance, and other significant incentives to private development projects that meet or exceed specified standards under green building programs such as Build It Green, California Green Builder, LEED, or a similar program. *Examples (www.ca-ilg.org/GreenBuildingStories):* ° *Huntington Beach Fee Waiver & Recognition Programs* ° *Riverside Green Builder Program* ° *West Hollywood Customized Green Standards* • Work with commercial developers to incorporate materials and furnishings made from recycled content. • Require verification by a certified third-party rater to ensure compliance with green building standards. • Train appropriate agency staff (such as planners, inspectors, and plan checkers) in green building standards and technologies to facilitate approval and inspection processes. • Require completion of a green building checklist, such as those included in the GreenPoint Rated or LEED programs, for all appropriate building permit applications. • Work with neighboring jurisdictions, where feasible, to adopt a region-wide green building standard.
Implement sustainable landscaping. *See also Water and Wastewater section for more options.*	• Develop and implement sustainable landscaping standards for public agency facilities to reduce water consumption. • Use compost and mulch in agency landscaping as a water conservation measure. Encourage use in private landscaping. • Develop and implement sustainable landscaping standards for new commercial construction and renovation to reduce water consumption. • Develop and implement sustainable landscaping standards for new residential construction and renovation to reduce water consumption.

Waste Reduction and Recycling

www.ca-ilg.org/wastereduction

GOAL	BEST PRACTICE
Enhance existing waste reduction and recycling activities at agency buildings and in the community.	• Institute a comprehensive waste reduction and recycling program in agency offices and facilities. • Institute a partnership with other public agency offices located within the jurisdiction for waste reduction and recycling at those facilities. • Adopt a partnership with local schools for waste reduction and recycling. • Increase opportunities for e-waste and hazardous waste recycling by residents and businesses. • Educate the community about "buy recycled" opportunities. • Evaluate current community recycling infrastructure relative to future population growth and waste generation. • Include provisions and incentives for new recycling infrastructure and facilities to accommodate growth, in land use planning and zoning. *Example (www.ca-ilg.org/CommercialRecyclingStories):* ° *Ojai Recycling Assessment District*
Implement source reduction, recycling and resource recovery programs for waste organic material. Produce compost, mulch, energy, and fuels from organic waste stream.	• Audit agency facilities to identify opportunities to increase material recovery and beneficial use of organic material. • Establish an organic material recovery program for green waste from agency parks and facility landscaping. • Establish a program to use the maximum amount as possible of organic waste generated within the jurisdiction to produce compost and/or biofuel, including use on agency parks and landscaping. • Use compost and mulch in agency landscaping as a water conservation measure. Encourage use in private landscaping. • Establish incentives for residents to participate in green waste recycling programs. • Adopt a restaurant food waste collection program or ordinance. • Approve siting of composting facility within jurisdiction.
Reduce office and commercial waste and increase recycling.	• Adopt a program or ordinance to encourage or require recycling at multi-family apartments. *Examples (www.ca-ilg.org/CommercialRecyclingStories):* ° *San Diego County Mandatory Recycling Ordinance* ° *Fresno Mandatory Recycling Ordinance & Tiered Rate Structure* ° *Kingsburg Solid Waste Ordinance* ° *Poway Solid Waste Ordinance & Tiered Fee Structure* • Implement a program to educate owners and residents of multi-family housing about recycling requirements and opportunities.

Waste Reduction and Recycling

www.ca-ilg.org/wastereduction

GOAL	BEST PRACTICE
	• Adopt a program or ordinance to require recycling in the commercial/industrial sectors. *Examples (www.ca-ilg.org/CommercialRecyclingStories):* ° *Sacramento Regional Business Recycling Ordinance* ° *San Diego County Mandatory Recycling Ordinance* ° *Chula Vista Clean Business Program* ° *Fresno Mandatory Recycling Ordinance & Tiered Rate Structure* ° *Irvine Tiered Franchise Fee Structure* ° *Kingsburg Solid Waste Ordinance* ° *Ojai Recycling Assessment District* ° *Poway Solid Waste Ordinance & Tiered Fee Structure* • Provide free bins to businesses to separate out cardboard and paper for solid waste sent to a mixed waste material recovery facility for processing. • Provide common area recycling services and storage bins (such as through an assessment district or other means) for businesses that lack storage space or access to recycling opportunities (such as in historic districts). • Adopt a program or ordinance to encourage or require waste audits and waste reduction plans for existing and/or new commercial developments. • Implement a program to educate businesses, their employees, and their customers about recycling requirements and opportunities. • Audit major waste generators and recommend strategies to reduce waste and increase recycling. *Examples (www.ca-ilg.org/CommercialRecyclingStories):* ° *San Diego Voluntary Audits For Hospitality Industry* ° *Irvine Onsite Waste Audits* • In partnership with the waste hauler(s) serving the commercial sector, institute a comprehensive waste reduction and recycling program with financial and other incentives, such as a tiered rate system that charges less for collecting recyclable materials than for collecting solid waste, to promote waste reduction and recycling for commercial/industrial waste generators. *Examples (www.ca-ilg.or/CommercialRecyclingStories):* ° *Arcadia Waste Hauling Requirements* ° *Chula Vista Clean Business Program*

Waste Reduction and Recycling

www.ca-ilg.org/wastereduction

GOAL	BEST PRACTICE
	° *Huntington Beach Material Recovery Facility & Cardboard Incentive Program* ° *Irvine Tiered Franchise Fee Structure* ° *Loomis Material Recovery Facility & Cardboard Incentive Program* ° *Ojai Recycling Assessment District* ° *Poway Solid Waste Ordinance & Tiered Fee Structure* • Partner with the California Department of Resources, Recycling, and Recovery to encourage businesses and residents to participate in CalMax (California Materials Exchange) or a similar program. • Require recycling at special events, such as through special event permit conditions. • Include information about recycling opportunities on agency's Web site.
Source reduction, recycling, and resource recovery programs for construction and demolition material.	• Require all agency demolition projects to incorporate de-construction and construction and demolition waste recycling or recovery practices. • Adopt a program or ordinance to reduce, reuse, and recycle community construction and demolition waste. • Adopt a "deconstruction" program or ordinance to salvage and reuse materials in all community remodeling projects. • Adopt and implement a policy to require use of rubberized asphalt concrete (RAC) for streets and roads. • Adopt and implement a policy to require use recycled asphalt pavement (RAP) for streets and roads. • Implement a policy to use RAP for commercial and community parking lots, where feasible. • Encourage schools and other public agencies to use RAP for parking lots, where feasible. • Establish a program or ordinance that results in 100 percent in-place recycling of asphalt concrete. • Establish a program or ordinance that results in recycling of 100 percent of all Portland cement and asphalt concrete.
Decrease carbon footprint of jurisdiction's waste and recycling collection system.	• Work with solid waste and recycling collection providers to calculate carbon footprint of collection system. • Work with solid waste and recycling collection providers to reduce collection system footprint.

Climate-Friendly Purchasing

www.ca-ilg.org/greenprocurement

GOAL	BEST PRACTICE
Commit to purchasing specific products and goods that are climate-friendly. *See also Waste Reduction and Recycling and Green Building sections.*	• Adopt and implement a procurement policy that establishes standards for climate-friendly products and requires agency purchases to meet such standards as: o New equipment meets Energy Star or comparable energy efficiency standards. o Computer purchases meet the highest feasible EPEAT certification level. o Office paper purchases (copy paper, printer paper, writing pads, stationery, envelopes, and business cards) contain a minimum specified percentage of post consumer recycled content. o Other paper purchases (paper towels, toilet paper, napkins, and similar items) contain a minimum percentage of post consumer recycled content. o Carpeting and other furnishings contain a minimum percentage of recycled content. o Plastic items (refuse and recycling receptacles, decking, parking lot barriers, furniture, etc.) contain recycled content. o Oil and oil-related products contain recycled content. o Products certified by either GreenSeal or EcoLogo, as long as they cost no more than an agency-determined percentage above the price of non-certified products. • Create an interdepartmental team to 1) promote policy implementation, 2) track policy adherence, and 3) suggest additional items to be included in the agency's climate-friendly purchasing program, including such tasks as: o Reviewing and analyzing current (baseline) purchasing by major product categories. o Prioritizing product categories in terms of greenhouse gas emissions implications and improvement potential. o Reviewing policies, procedures, organization/staffing for implementation barriers. o Developing multi-year implementation schedule based on priorities, difficulty, upcoming solicitations. o Reporting achievements under the policy to policy makers and the public annually.

Climate-Friendly Purchasing

www.ca-ilg.org/greenprocurement

GOAL	BEST PRACTICE
Purchase services that are climate-friendly.	• Require service providers to follow climate-friendly practices, or provide a preference in selecting and contracting with service providers to those that follow climate-friendly practices. • Provide incentives for the use of alternative fuel vehicles for agency contracts for services involving vehicles (buses, waste hauling and recycling, construction, etc.). • Ensure that the highest feasible percentage of annual expenditures for contract services is with companies registered with the California Climate Action Registry or its successor.
Give a preference to climate-friendly vendors.	• Provide a price preference to product vendors that follow climate-friendly practices, including use of recycled content materials, Energy Star and EPEAT materials and equipment, as well as alternative fuel vehicles. • Provide a price preference to product vendors that inventory and register their greenhouse gas emissions with the California Climate Action Registry or its successor and that report their verified greenhouse gas emissions within the jurisdiction.
Community education about climate-friendly procurement.	• Educate the public about climate-friendly procurement opportunities. • Work with the business community to educate them about climate-friendly procurement opportunities.

Renewable Energy and Low-Carbon Fuels

www.ca-ilg.org/renewable

GOAL	BEST PRACTICE
Promote use of fuel efficient and alternative fuel vehicles to reduce reliance on fossil fuels. *See also Efficient Transportation section*	*Agency operations* • Convert vehicles owned, leased, or operated by the agency to run on alternative fuels or other non-fossil fuel based technology that significantly reduces greenhouse gas emissions. • Install bicycle racks, showers, and other amenities at agency facilities to promote bicycle use by agency employees and visitors. *Community* • Allow public use of agency facilities that support use of alternate fuel vehicles, such as CNG facilities and electric vehicle charging stations.
Promote methane recovery programs and projects. *See also Waste Reduction and Recycling section.*	• For jurisdictions that own or operate one or more landfills, recover and use the maximum feasible amount of recoverable methane gas from the landfill to produce electricity, fuel co-generation facilities, and/or produce CNG for use in alternative fuel vehicles. • For jurisdictions that do not own or operate landfills, calculate the methane emissions associated with the disposal of waste generated within the community. • For jurisdictions that do not own or operate landfills, enter into partnerships or agreements with waste disposal agencies or companies to ensure that the maximum feasible amount of methane is recovered for waste-to-energy purposes. • Install digesters and other technologies at wastewater treatment facilities to produce methane and other bio-fuels.
Promote the use of renewable sources of energy.	• Install photovoltaic systems or other renewable sources of energy on agency facilities, or enter into power purchasing agreements to meet at least 10-25 percent of the electrical energy requirements of facilities owned, leased, or operated by the agency. • Adopt policy or program that offers incentives, such as streamlined permitting system or fee waivers, to encourage installation of photovoltaic systems on new or existing residential and commercial buildings. • Adopt an energy financing program, such as that available through AB 811 energy financing districts, to facilitate installation of renewable solar photovoltaic and hot water systems on existing residential and commercial buildings.

Efficient Transportation

www.ca-ilg.org/transportation

GOAL	BEST PRACTICE
Implement transportation planning processes that reduce automobile dependency.	• Update transportation models and surveys to capture data for and accurately reflect all modes of transportation. • Make reductions in vehicle-miles traveled (VMT) a high-priority criteria in evaluation of policy, program, and project alternatives. *Example (www.ca-ilg.org/ClimateTransportationStories):* ° *Central Petaluma Specific Plan* • Implement transportation planning procedures that consider demand management solutions equally with strategies to increase capacity. *Example (www.ca-ilg.org/ClimateTransportationStories):* ° *Riverbank General Plan* • Include all significant impacts (costs and benefits) in benefit-cost assessment of alternatives, including non-market or indirect impacts, such as improving mobility options or reducing air pollution and greenhouse gas emissions. • Collaborate with other local government agencies to share transportation-related information, coordinate planning goals and processes, and take advantage of opportunities to combine and leverage scarce resources.
Improve infrastructure and Transportation Systems Management (TSM). *See also Land Use and Community Design section.*	• Implement Intelligent Transportation Systems (ITS) for surveillance and traffic control, such as synchronized signals, transit and emergency signal priority, and other traffic flow management techniques, to improve traffic flow and reduce vehicle idling. *Example (www.ca-ilg.org/ClimateTransportationStories):* ° *Santa Clarita ITS System* • Implement programs to reduce "incident-based" traffic congestion, such as expedited clearing of accidents from major traffic arteries, airport traffic mitigation, etc. *Example (www.ca-ilg.org/ClimateTransportationStories):* ° *Tehama County* • Develop infrastructure improvements such as HOV/HOT lanes and dedicated bus rapid transit right-of-ways.
Reduce Idling.	• Adopt and implement a policy requiring limitations on idling for commercial vehicles, construction vehicles, buses and other similar vehicles, beyond state law, where feasible.

Efficient Transportation

www.ca-ilg.org/transportation

GOAL	BEST PRACTICE
Promote alternatives to single-occupant auto commuting. *See also Land Use and Community Design section.*	*Agency operations* • Provide agency employees with incentives to use alternatives to single-occupant auto commuting, such as parking cash-out, flexible schedules, transit incentives, bicycle facilities, ridesharing services and subsidies, and telecommuting. *Example (www.ca-ilg.org/ClimateTransportationStories):* ° *San Mateo County Commute Alternatives Program* • Incorporate a guaranteed ride home program as part of agency commuter trip reduction incentive programs. • Reduce greenhouse gas emissions from municipal fleet operations by purchasing or leasing high MPG, low carbon fuel or hybrid vehicles, or by using an external car sharing program in lieu of city/county fleet. *Community* • Work with major employers in the community to offer incentives and services to increase the use of alternatives to single-occupant auto commuting (voluntary commute trip reduction programs). • Encourage and facilitate the development of car-sharing, Dial-a-Ride (or similar flexible-route transit service), and other services that reduce the need to use a personal motor vehicle. *Example (www.ca-ilg.org/ClimateTransportationStories):* ° *La Mirada Dial-A-Ride Program* • Develop and implement voluntary agreements for commuter trip reduction programs for new commercial developments. • Provide parking preferences in public lots, garages, and on-street spaces for residents who rideshare or use low-carbon fuel vehicles. • Implement variable ("congestion") pricing and other pricing mechanisms for parking facilities, to provide incentives and discourage single-occupant-vehicle and peak travel. • Dedicate revenues from fees and tolls to promote alternative transportation modes. • Consider public health benefits of promoting use of transit and other alternatives to single-occupant vehicle travel as a means of reducing air pollution and greenhouse gases. *(www.ca-ilg.org/ClimateWhitepapers)*

Land Use and Community Design

www.ca-ilg.org/ClimateLandUse

GOAL	BEST PRACTICE
Create communities and neighborhoods that are attractive, safe, and convenient for walkers and bicyclists. *See also Efficient Transportation section.*	• Assess and report on pedestrian and bicycle conditions in existing communities and neighborhoods. • Develop a community-wide pedestrian and bicycle plan and capital program that maximizes the potential for residents to walk or bicycle within and between neighborhoods. *Example (www.ca-ilg.org/ClimateLandUseStories):* ° *Riverside Bicycle Master Plan* • Require new commercial developments to install bicycle parking facilities and other cyclist amenities at a level commensurate with the number of employees or square footage. • Adopt and implement a community-wide pedestrian and bicycle plan. • Provide bicycle access to transit services on major transit corridors and other routes that may attract bicyclists, such as routes serving schools and colleges. • Install traffic calming devices and other measures to reduce traffic speeds and volumes and increase the safety and feasibility of bicycling and walking. • Implement design standards that require streets and sidewalks to be designed for multi-modal mobility and access, including walking and bicycling, to ensure that new development is designed, sited and oriented to facilitate pedestrian, bicycle and other mobility and access. *Examples (www.ca-ilg.org/ClimateLandUseStories):* ° *San Diego "City of Villages" Strategy* ° *Central Petaluma Specific Plan (Efficient Transportation)*
Orient new development to capitalize on transit system investments and services. *See also Efficient Transportation section.*	• Provide incentives and remove zoning and other barriers to mixed-use and higher intensity development at transit nodes and along transit corridors (existing and planned). *Examples (www.ca-ilg.org/ClimateLandUseStories):* ° *Fremont Transit Oriented Development Overlay Zones* ° *Sacramento County General Plan Update* ° *Vista Downtown Specific Plan* • Require new development at transit nodes and along transit corridors to meet planning and design standards to generate, attract, and facilitate transit ridership as a condition of approval. • Integrate park-and-ride lots with multi-use facilities.

Land Use and Community Design

www.ca-ilg.org/ClimateLandUse

GOAL	BEST PRACTICE
Adopt policies that promote compact and efficient development in new and existing communities. *See also Efficient Transportation and Green Building sections.*	• Inventory infill development sites. Plan, zone, and provide incentives for new development and renovation of existing uses in identified infill areas. *Example (www.ca-ilg.org/ClimateLandUseStories):* ° *Sacramento County Corridor Plans* • Adopt and enforce land use ordinances and regulations that reduce greenhouse gas emissions. Examples include prioritizing mixed uses and infill development, and providing more transportation and housing choices. *Examples (www.ca-ilg.org/ClimateLandUseStories):* ° *Livermore Zoning Code Update* ° *Petaluma General Plan 2025* ° *San Diego "City of Villages" Strategy* ° *Vista Downtown Specific Plan* ° *Windsor Area Plans & Zoning Update* • Require new housing and mixed use developments be built to the LEED for Neighborhood Development (LEED-ND) standard or its equivalent. *Example (www.ca-ilg.org/ClimateLandUseStories):* ° *Chula Vista New Development Standards* • Provide expedited application processing for development projects that meet climate change response policies.
Incorporate greenhouse gas emissions considerations into the General Plan and environmental review process. *See also Efficient Transportation section.*	• Include a greenhouse gas reduction plan in the General Plan, or include within the General Plan a requirement for development and adoption of a greenhouse gas reduction plan. *Examples (www.ca-ilg.org/ClimateLandUseStories):* ° *Livermore Climate Change Element* ° *Petaluma General Plan 2025* • Analyze impact of greenhouse gas emissions from land use and transportation sectors in the EIR prepared in connection with general plan updates. • Amend local CEQA guidelines to explain how to treat analysis of greenhouse gas emissions, such as including thresholds of significance. [*NOTE: the California Air Pollution Control Officers Association has published recommendations at www.capcoa.org.]* • Analyze impacts of development projects on safety, availability, and use of alternative transportation in CEQA documents.

Land Use and Community Design

www.ca-ilg.org/ClimateLandUse

GOAL	BEST PRACTICE
Establish planning processes that encourage reducing greenhouse gas emissions. *See also Efficient Transportation section.*	• Develop and adopt a preferred "climate-friendly" land use and transportation scenario for future development to reduce vehicle miles traveled (VMT) through software tools such as the PLACE^{3}S system developed by the California Energy Commission. • Incorporate land use and transportation policies in the General Plan, capital improvement program and other planning and spending documents, codes and ordinances to reflect the preferred "climate-friendly" land use and transportation scenario. • Implement a regional blueprint or other long-range, regional planning process to assess the climate impacts of future growth and develop a preferred regional climate-friendly growth scenario. • Involve emergency responders early and consistently in development of growth plans. • Collaborate with other local government agencies to share land use and community design related information, coordinate planning goals and processes, and take advantage of opportunities to combine and leverage scarce resources. • Review zoning codes and development policies to identify changes that could improve implementation of "climate-friendly" land use and transportation policies. • Consider public health benefits of designing communities that encourage alternatives to single-occupant-vehicle travel, such as by being more bicycle and pedestrian friendly. *(www.ca-ilg.org/ClimateWhitepapers)*

Land Use and Community Design

www.ca-ilg.org/ClimateLandUse

GOAL	BEST PRACTICE
Increase transportation choices. *See also Efficient Transportation section.*	• Establish land use policies that support multimodal transportation systems and connection of modes to each other. *Examples (www.ca-ilg.org/ClimateLandUseStories):* ° *Central Petaluma Specific Plan* ° *San Diego "City of Villages" Strategy* • Require sidewalks in all new developments. • Plan and permit road networks of neighborhood-scaled streets (generally 2 or 4 lanes) with high levels of connectivity and short blocks. • Zone for concentrated activity centers around transit service. *Examples (www.ca-ilg.org/ClimateLandUseStories):* ° *Central Petaluma Specific Plan* ° *Vista Downtown Specific Plan* • Coordinate planning and project approval procedures to increase collaboration between land use and transportation planning staff. • Cluster freight facilities near ports, airports, and rail terminals. • Coordinate with regional efforts and neighboring jurisdictions to plan for and accommodate alternate modes.

Storing and Offsetting Carbon Emissions

www.ca-ilg.org/carbon

GOAL	BEST PRACTICE
Preserve and enhance forests, parks, street trees, open space, and other natural systems that act as carbon "sinks."	• Inventory existing trees on property owned or managed by the agency and implement a management system to preserve and enhance the existing urban forest. • Manage parks, open space, recreational facilities, and other natural areas owned or operated by the agency to ensure the long-term health and viability of trees and other vegetation. • Develop and implement a community-wide urban forestry management and reforestation program to significantly increase the carbon storage potential of trees and other vegetation in the community. • Steer new development away from open space and agricultural lands that provide natural carbon storage. • Partner with other agencies and non-profit organizations to protect natural lands in and adjacent to the community through acquisition, conservation easements, or other long-term mechanisms. • Consider public health benefits of increasing the availability of parks and other recreational opportunities. *(www.ca-ilg.org/ClimateWhitepapers)*
Promote local sustainable agriculture to reduce carbon emissions associated with food production, processing, and transport.	• Promote the purchase of local and organic produce through farmers markets and other measures. • Enact a local food purchase policy for agency food purchases. • Promote conservation tillage and other agricultural practices to retain carbon fixed in soils.
Offset carbon emissions through carbon credits or allowances.	• Audit agency-sponsored events and activities to determine greenhouse gas emissions associated with the event/activity. • Achieve carbon neutrality at agency-sponsored events and activities through conservation, efficiency, alternative transportation, and the purchase of third-party verified emission reductions to offset carbon emissions. • Achieve carbon neutrality for major agency operations through conservation, efficiency, alternative transportation, and the purchase of third-party verified emission reductions to offset carbon emissions. • Create incentives for community organizations and residents to reduce their carbon use including the purchase of third-party verified emission reductions. • Purchase and retire third-party verified emission reductions to offset community-wide carbon emissions.

Promoting Community and Individual Actions

www.ca-ilg.org/promoting

GOAL	BEST PRACTICE
Promote individual actions to reduce greenhouse gas emissions and conserve natural systems that store carbon.	• Survey businesses and residents to understand attitudes and behaviors related to climate change. • Develop and implement a community climate change education program that provides community members with basic information about climate change. *(www.ca-ilg.org/ClimateChangeandPublic)* *Examples (www.ca-ilg.org/ClimateCivicEngagementStories):* ° *Pasadena Public Outreach Efforts* ° *South Pasadena Green Living Expo* • Develop information and positive messages about activities individuals can take to reduce their own greenhouse gas emissions, such as reducing energy and water use, recycling, and using transit. • Identify the multiple benefits from actions to reduce greenhouse gas emissions, including environmental, community and financial benefits. • Include information on actions that individuals can take to address climate change in local agency mailings, websites, and other communications. *Example (www.ca-ilg.org/ClimateCivicEngagementStories):* ° *San Mateo County Outreach Efforts* • Develop a community climate change outreach and education program that enlists participation from schools, museums, service groups, business organizations (such as local Chambers of Commerce), neighborhood and homeowner associations, and other community partners. *Examples (www.ca-ilg.org/ClimateCivicEngagementStories):* ° *Green Pasadena Leadership Summit* ° *"San Carlos Green" Community Task Force* • Include climate change related projects as part of youth commission activities. *(www.ca-ilg.org/ClimateWhitepapers)* • Challenge community members to go on a "carbon diet" to promote individual action to reduce greenhouse gas emissions. • Provide programs and/or incentives to individuals, groups, and businesses that adopt practices that reduce their carbon footprint. Incentives can be financial or non-financial, such as official recognition of an individual's, group's, or business' efforts. *Examples (www.ca-ilg.org/ClimateCivicEngagementStories):* ° *Monterey County StepUp2Green Residential Certification Program* ° *Morgan Hill "Carbon Diet Club" Program*

Promoting Community and Individual Actions

www.ca-ilg.org/promoting

GOAL	BEST PRACTICE
Promote cooperation among agencies and communities to reduce greenhouse gas emissions and conserve natural systems that store carbon.	• Collaborate with other local government agencies to share information about climate change and best practices to reduce greenhouse gases. *Example (www.ca-ilg.org/ClimateCivicEngagementStories):* ° *San Mateo County Green Team* ° *Yolo County Leadership Summits* • Create an inter-agency local or regional climate action partnership and/or action plan with one or more sister agencies or neighboring jurisdictions. *Examples (www.ca-ilg.org/ClimateCivicEngagementStories):* ° *Yolo County Leadership Summits* ° *Manhattan Beach Environmental Task Force* • Initiate the regional action plan. • Participate in the development of a regional blueprint or other long-range planning process to assess the climate impacts of future growth and develop a preferred climate-friendly growth scenario. • Initiate a Community Climate Action Partnership with a Global Sister Agency.

Promoting Community and Individual Actions

www.ca-ilg.org/promoting

GOAL	BEST PRACTICE
Provide opportunities for public engagement that will support successful implementation of climate change actions.	• Organize and promote community dialogues that educate residents about climate change and its possible impacts on the community. *Examples (www.ca-ilg.org/ClimateCivicEngagementStories):* ° *Fremont Climate Change Workshop* ° *San Carlos Community Forums* • Include representatives of diverse communities of interest (such as renters, business owners, neighborhood leaders, immigrants, low income residents and youth) when developing climate change policies and programs. • Develop informational material for residents about climate change and opportunities for individual action to reduce greenhouse gas emissions. *Example (www.ca-ilg.org/ClimateCivicEngagementStories):* ° *San Mateo County Outreach Efforts* • Use public involvement processes to develop recommendations from residents and businesses about the city or county's climate change action plan and actions the agency is taking to respond to climate change, such as through green building, energy conservation, efficient transportation, and other actions. *Examples (www.ca-ilg.org/ClimateCivicEngagementStories):* ° *Monterey County StepUp2Green Residential Certification Program* ° *Fremont Youth Engagement Efforts* ° *Manhattan Beach Environmental Task Force* ° *Mountain View Sustainability Task Force* ° *San Carlos Citizens General Plan Advisory Committee* • Provide opportunities for interested residents to stay engaged after the initial planning to help monitor and assess ongoing efforts and recommend plan adaptations as needed. *Examples (www.ca-ilg.org/ClimateCivicEngagementStories):* ° *Green Mountain View Implementation Group* ° *Pasadena Resident Environmental Advisory Commission* ° *South Pasadena City Commissions* • Collaborate with local non-profit organizations to assist them in promoting activities that reduce greenhouse gas emissions. • Provide participants in agency-sponsored public engagement activities with easy to understand information to help them participate effectively.

Expert Report of William E. Powers, P.E.

Case name: Association of Irritated Residents vs. Fred Schakel Dairy et al

Case number: 1:05-CV-00707-OWW-SMS (E.D.Cal.)

1. I am a consulting professional mechanical engineer in private practice in San Diego, California. I am being paid $100 per hour for my consulting services in this case.

2. I have a Bachelor of Science in Mechanical Engineering degree from Duke University, and a Master of Public Health in Environmental Science degree from the University of North Carolina. My resume details my employment with the United States Environmental Protection Agency, with the Naval Energy & Environmental Support Activity, with ENSR Consulting & Engineering, and with Powers Engineering, and highlights individual project activities in which I have been involved, as well as my professional memberships, publications, awards and patent (Ex. BP 1; Powers Resume). I am a Registered Professional Mechanical Engineer in California, and have over 20 years of experience in air permitting, testing and monitoring; air pollution control equipment retrofit design/performance testing; and air emissions testing/criteria and hazardous air pollutants. Cases and testifying Ex. BP 2

3. I have evaluated the following documents in preparing this report:

- San Joaquin Valley Air Pollution Control District, *Air Pollution Control Officer's Determination of VOC Emission Factors for Dairies*, August 1, 2005.

- San Joaquin Unified APCD, *Final Draft Staff Report with Appendices for Proposed Rule 4570: Confined Animal Facilities*, May 18, 2006

- San Joaquin Valley Air Pollution Control District draft Authority to Construct – South Lakes Dairy, August 14, 2007.

- T.R. Card, P.E., C.E. Schmidt, PhD, *Dairy Air Emissions - Summary of Dairy Emission Estimation Procedures, prepared for California Air Resources Board*, May 2006.

- Frank Mitloehner, Ph.D., *Volatile Fatty Acids, Amine, Phenol, and Alcohol Emissions from Dairy Cows and Fresh Waste – Final Report*, prepared for California Air Resources Board, May 31, 2006.

- San Joaquin Valley Air Pollution Control District, *Final Draft Staff Report Proposed Rule 4570 (Confined Animal Facilities)*, June 15, 2006.

- San Joaquin Valley Unified Air Pollution Control District Rule 2201 (New and Modified Stationary Source Review Rule), as amended December 19, 2002.

- California Air Resources Board, *San Joaquin Valley Air Pollution Control District Program Review – Report of Findings and Recommendations*, October 2005.

- Gerald A. Emison, Director – EPA Office of Air Quality Planning and Standards, *Memorandum: Emissions from Landfills*, October 6, 1987. Attached as Ex BP 3.

- Lydia Wegman, Deputy Director – EPA Office of Air Quality Planning and Standards, *Memorandum: Consideration of Fugitive Emissions in Major Source Determinations*, March 8, 1994. Attached as Ex BP 4.

- John Seitz, Director – EPA Office of Air Quality Planning and Standards, *Memorandum: Classification of Emissions from Landfills for NSR Applicability Purposes*, October 21, 1994. Attached as Ex BP 5.

- Robert Kellam, Acting Director – EPA Information Transfer and Program Integration Division, Clarification of the definition of "regulated pollutant" for the purpose of title V applicability determinations with respect to open-pit mining operations, EPA letter to Pinal County (Arizona) Air Quality Control District, March 1, 1996. Attached as Ex BP 6.

- Thomas C. Curran, Director – EPA Information Transfer and Program Integration Division, *Memorandum: Interpretation of the Definition of Fugitive Emissions in Parts 70 and 71*, February 10, 1999. Attached as Ex BP 7.

- San Joaquin Valley Unified APCD, *VOC Cost Effectiveness for Dairy Digesters – Schakel Emission Calculations: Cost Effectiveness Calculations*, January 25, 2006 (Excel spreadsheet). Attached as Ex BP 8.

- University of Wisconsin Extension, *Greenhouse Barns for Dairy Housing*, published in Agricultural Engineers Digest, June 1997. Bates numbers 000744-000747. Attached as Ex BP 9.

- Red Top Jerseys Dairy Authority to Construct, BACT calculations, S-6831, -1050585. Attached as Ex BP 10.

- District Generic 800 Milk Cow Dairy BACT calculations. Attached as Ex BP 11.

- District Generic 3,600 Milk Cow Dairy BACT calculations. Attached as Ex BP 12.

- Western Dairy Design Associates 3,600 Milk Cow Dairy BACT calculations. Attached as Ex BP 13.

- South Lakes Dairy draft ATC, BACT calculations, S-662, -1055047. Attached as Ex BP 14.

- U.S.EPA, *Using Bioreactors to Control Air Pollution*, EPA-456/R-03-003 September 2003. Attached as Ex BP 15.

4. I was contracted by Center on Race, Poverty, and the Environment to: 1) calculate the VOC emission rate from the South Lakes Dairy, 2) determine if the VOC emission units at the South Lakes Dairy are subject to Best Available Control Technology (BACT) requirements, 3) determine if the VOC emission units are non-fugitive, 4) opine on whether the $5,000 per ton VOC BACT control cost-effectiveness ceiling used by the District is sufficient in a serious ozone non-attainment area; and 5) opine on what VOC BACT should be for the non-fugitive emission units at the South Lakes Dairy.

5. South Lakes Dairy is a freestall dairy located a few miles west of Pixley, California. South Lakes Dairy has requested an Authority to Construct (ATC) permit for its 5,832 milk cow (11,337 total head) dairy operation. South Lakes Dairy proposes to permit the dairy for the following herd composition: 5,832 Holstein milk cows; 875 dry cows; 2,046 heifers (15-24 months); 1,796 heifers (7-14 months); 788 heifers (3-6 months); and 0 calves (under 3 months).

6. I carried out a site visit/inspection of the South Lakes Dairy on April 18, 2007.

7. According to District Rule 2201, any emissions unit that has a Potential to Emit of more than 2 pounds per day (lb/day) is subject to Best Available Control Technology (BACT) requirements. The District defines Potential to Emit as "*the maximum capacity of an emissions unit to emit a pollutant under its physical and operational design*." Fugitive emissions are included in the Potential to Emit. The lb/day VOC Potential to Emit in this case is calculated by multiplying the District VOC emission factor in pounds per head per year (lb/head-yr) developed for each cow type (milking cow, dry cow, heifer 15-24 months, heifer 7-14 months, heifer 4-6 months, calf) by the number cows in each category and dividing by 365 days per year.

8. District Rule 2201 also requires VOC emission offsets if the post-project Stationary Source Potential to Emit (SSPE2) equals or exceeds 10 tons per year (tons per year) of VOC for the stationary source. The SSPE2 is the Potential to Emit VOC for the stationary source. The South Lakes Dairy facility is a stationary source. I calculated SSPE2 in two ways: a) by calculating and aggregating the Potential to Emit for each category of cow housed at the dairy, as in Table 2, and b) by aggregating the Potential to Emit of the emission units, as in Table 3.

9. Offsets are District-approved credits for emission reductions that can be purchased and used to excuse excess emissions over the 10-ton threshold.

10. In the case of the South Lakes Dairy Dairy, there are five emission units: milking center, cow feeding & housing, liquid manure handling (lagoons), solid manure handling, and land application.

11. The District VOC emission factors for the various dairy emission units and cow categories are provided in Table 1. These are the VOC emission factors used in the District's draft Authority to Construct (ATC) for the – South Lakes Dairy dated August 14, 2007.

Table 1. District Emission Factors for Freestall Dairy Emission Units and Cow Types

	Emissions Factor by Type of Cow (age) (lbs/hd/year)					
Emissions unit	milk cow	dry cow	14-24 mths	7-14 mths	4-6 mths	> 3 mths
Cow Housing and Feed	12.4	8.2	5.7	5.0	4.5	4.3
Milking Center	0.9	N/A	N/A	N/A	N/A	N/A
Liquid Manure Handling	2.7	1.4	1.0	0.9	0.8	0.7
Land Application	5.0	2.3	1.6	1.4	1.3	1.2
Total	21.0	11.9	8.3	7.2	6.6	6.2

12. Table 2 summarizes the SSPE2 for the South Lakes Dairy by cow type. District freestall dairy VOC emission factors are multiplied by the cow counts in the South Lakes Dairy draft ATC to calculate SSPE2. VOC emissions are given in lb/day, pounds per year (lb/yr), and tons/yr.

Table 2. Uncontrolled SSPE2 VOC Emissions by Cow Type Using ATC Capacity

Type of Cow	VOC Emission Factor (lb/head-yr)	# Cows	VOC (lb/day)	VOC (lb/yr)	VOC (ton/yr)
Milking Cow	21.0	5,832	335.5	122,472	61.2
Dry Cow	11.9	875	28.5	10,412	5.2
Heifer (15-24 months)	8.3	2,046	46.5	16,982	8.5
Heifer (7-14 months)	7.2	1,796	35.4	12,931	6.5

Heifer (4-6 months)	6.6	788	14.2	5,201	2.6
Calf (under 3 months)	6.2	0	0.0	0	0.0
Total VOC emissions:			460.1	167,998	84.0

I. All South Lakes Dairy Emission Units Trigger BACT

13. Table 3 summarizes the Potential to Emit for individual emission units (which add up to the SSPE2) at the South Lakes Dairy by emissions unit based on the cow counts provided in Table 1, column 2, multiplied by the corresponding emission factor derived from District documents.

Table 3: Uncontrolled VOC Potential to Emit by Emissions Unit Using Draft ATC Cow Counts

Permit Unit	VOC (lb/day)	VOC (ton/yr)
Milking Center	14.4	2.6
Cow Housing & Feed	284.1	51.8
Liquid Manure Handling - Lagoon	58.3	10.6
Solid Manure Handling	not available	not available
Liquid Manure Handling -Land Application	104.1	19.0
Sum of Potentials to Emit (equals SSPE2):	460.9[1]	84.0

14. Table 4 summarizes the Potential to Emit for individual emission units, excluding internal combustion engines, applying the VOC controls identified by the District as BACT in the draft ATC for South Lakes Dairy. It is important to note that what the District identifies as BACT for each emissions unit could also be considered the baseline operating condition of a typical uncontrolled dairy, and that the proposed BACT requirements are simply a list of standard operating procedures, or minor modifications to standard procedures, at a typical dairy. The VOC reductions assumed by the District in the draft ATC for each control measure are:

- Milking Parlor: feeding to NRC guidelines (5% reduction), flushing/spraying down milk parlor after each milking (16.7% reduction);
- Cow Housing: feeding to NRC guidelines (5% reduction), flushing corral lanes four times per day (18.2% reduction);
- Liquid Manure Handling: feeding to NRC guidelines (5% reduction), anaerobic treatment lagoon (40% reduction);

[1] The difference between the pound per day SSPE2 shown in Table 2 and Table 3, 460.1 pounds per day versus 460.9 pounds per day, is a rounding difference.

- Liquid Manure – Land Application: feeding to NRC guidelines (5% reduction), anaerobic treatment lagoon (40% reduction).

Table 4: Controlled VOC Potential to Emit by Emissions Unit Using Draft ATC Cow Counts

Permit Unit	VOC (lb/day)	VOC (ton/yr)
Milking Center	11.4	2.1
Cow Housing & Feed	220.7	40.3
Liquid Manure Handling - Lagoon	33.2	6.1
Solid Manure Handling	not available	not available
Liquid Manure Handling -Land Application	59.3	10.8
Sum of Potentials to Emit (equals SSPE2):	324.6	59.3

15. The District BACT threshold for VOC at each emission unit is 2 lb/day. The uncontrolled VOC Potential to Emit for each emissions unit as shown in Table 3 is: milking center 14.4 lb/day, cow housing and feed 284.1 lb/day, liquid manure handling 58.3 lb/day, and land application 104.1 lb/day. The controlled VOC Potential to Emit for each emissions unit as shown in Table 4 is: milking center 11.4 lb/day, cow housing and feed 220.7 lb/day, liquid manure handling 33.2 lb/day, and land application 59.3 lb/day. All of these emission units exceed the VOC BACT 2 lb/day threshold, whether assuming uncontrolled VOC Potential to Emit or the Potential to Emit following application of District-identified BACT control measures.

16. The District VOC offset threshold is 10 tons per year. The controlled SSPE2 VOC emissions from the South Lakes Dairy are 60.3 tons per year. Of this total, 59.3 tons per year are associated with milk parlor, cow housing, and liquid manure handling VOC emissions. One ton per year is associated with internal combustion engine VOC emissions. The annual VOC emissions of 60.3 tons per year are well above the District VOC threshold of 10 tons per year.

16. The May 2006 report prepared by Dr. Chuck Schmidt for the ARB shows considerably higher overall emissions for freestall dairies using Method 25.3, with VOC emissions ranging from 28 to 39 lb/head-yr versus the draft District estimate of 21 lb/head-year for milk cows. Dr. Schmidt did not measure VOC emissions from manure piles during the Method 25.3 test program. Dr. Schmidt recommends Method 25.3 as the most comprehensive VOC test method available for VOC emission measurement from dairy sources. Dr. Schmidt's Method 25.3

results suggest that the District's VOC emission factors significantly underestimate VOC emissions from freestall dairy sources.

17. Plaintiff expert Dr. David Parker measured VOC emissions from emission units at South Lakes Dairy and his report will be submitted concurrently with my expert report. I reserve the right to supplement my report with his data and calculations.

II. All Emission Units Except Corrals are Non-Fugitive Emission Units

18. The EPA's NSR regulations define "fugitive emissions" to mean "those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening" (see 40 CFR 51.165(a)(1)(x)). In general, where a facility is not subject to national standards requiring collection, the technical question of whether the emissions at a particular site could "reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening" is a factual determination to be made by the permitting authority, on a case-by-case basis.[2]

19. The EPA states that determining whether emissions could reasonably be collected (or if any emissions source could reasonably pass through a stack, etc.), "reasonableness" should be construed broadly. The existence of collection technology in use by other sources in the source category creates a presumption that collection is reasonable. Furthermore, in certain circumstances, the collection of emissions from a specific pollutant emitting activity can create a presumption that collection is reasonable for a similar pollutant-emitting activity, even if that activity is located within a different source category.

20. The EPA's approach to methane gas emissions from landfills provides an instructive case study on the classification of emissions as non-fugitive or fugitive. In 1987, EPA addressed whether landfill gas emissions should be considered as fugitive. The Agency explained that for landfills constructed or proposed to be constructed with gas collection systems, the collected landfill gas would not qualify as fugitive. Also, the Agency understood at the time that, with some exceptions, landfills were not constructed with such gas collection systems. The EPA explained that "[t]he preamble to the 1980 NSR regulations characterizes nonfugitive emissions as emissions which would ordinarily be collected and discharged through stacks or other functionally equivalent openings'" (see 45 FR 52693, Aug. 7, 1980). Based on the "understanding that landfills are not ordinarily constructed with gas collection systems," the Agency concluded

[2] John Seitz, Director – EPA Office of Air Quality Planning and Standards, *Memorandum: Classification of Emissions from Landfills for NSR Applicability Purposes*, October 21, 1994.

that "emissions from existing or proposed landfills without gas collection systems are to be considered fugitive emissions." The Agency also made clear, however, that the applicant's decision on whether to collect emissions is not the deciding factor. Rather, it is the reviewing authority that makes the decision regarding which emissions can reasonably be collected and therefore not considered fugitive.

21. EPA reached the conclusion that it is no longer appropriate to conclude generally that landfill gas could not reasonably be collected at a proposed landfill project that does not include a gas collection system. The fact that a proposed landfill project does not include a collection system in its proposed design is not determinative of whether emissions from a landfill are fugitive. EPA clarified that gas collection and mitigation technologies for landfill gas emissions had evolved significantly since 1987, use of such systems had become much more common, and that landfills were increasingly being constructed or retrofitted with gas collection systems for purposes of energy recovery and in order to comply with State and Federal regulatory requirements designed to address public health and welfare concerns.

22. In the case of landfills, EPA determined that the air pollution control authority should assume the use of a collection system which has been designed to maximize, to the greatest extent possible, the capture of air pollutants from the landfill in order to quantify the amount of landfill gas which could otherwise be collected at a proposed landfill for NSR applicability purposes

23. EPA also determined that the use of collection technology by other landfill sources, whether or not subject to EPA's proposed requirements or to State implementation plan or permit requirements, creates a presumption that collection of the emissions is reasonable at other similar sources.

24. EPA has also clarified that use of collection technology by certain sources in a source category creates a presumption that collection is reasonable for all such sources in that category. As a result, although the use of capture-and-control systems on various pieces of equipment would not necessarily dictate that emissions from all such equipment in that category should be treated as non-fugitive, the presumption would be that these emissions are non-fugitive.[3]

[3] Robert Kellam, Acting Director – EPA Information Transfer and Program Integration Division, Clarification of the definition of “regulated pollutant" for the purpose of title V applicability determinations with respect to open-pit mining operations, EPA letter to Pinal County (Arizona) Air Quality Control District, March 1, 1996.

25. EPA guidance states that permitting authorities should construe the term "reasonableness" broadly when determining whether emissions could reasonably be collected (or if any emissions source could reasonably pass through a stack, etc.), "reasonableness" should be construed broadly. The existence of collection technology in use by other sources in a source category creates a presumption that collection is reasonable. Furthermore, in certain circumstances, the collection of emissions from a specific pollutant emitting activity can create a presumption that collection is reasonable for a similar pollutant-emitting activity, even if that activity is located within a different source category.

26. EPA guidance also states that when a source does not actually collect its emissions, but there is a presumption that collection would be reasonable, a permitting authority could consider costs in determining whether this presumption is correct. However, when analyzing whether collection is reasonable for a particular source, the permitting authority should not focus solely on cost factors, nor should cost factors be given any more weight than other factors. Instead, the permitting authority should focus on determining whether a particular source is truly similar to the "similar sources" used to create the presumption. This determination can be made by looking at whether there are substantial differences in the technical or engineering characteristics of the sources.

27. VOC emissions from freestall barns is non-fugitive because these emissions can reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening. Totally enclosed barns are in common use in other parts of the country for dairy cows, and totally enclosed housing is used in the San Joaquin Valley for similar sources.

28. Greenhouse barns have been used in the United States since 1988 to house livestock.[4] The District recognizes that completely enclosed barns are available for dairy cows, stating: *"However, completely enclosed freestall barns are available. These included tunnel-ventilated freestall barns, which are fairly common in the southern and eastern parts of the United States, and greenhouse barns. Greenhouse barns use lightweight, galvanized steel tube frame to support one or two layers of commercial-grade plastic as covering."* [5]

29. Enclosed housing is already in common use in the District at similar confined animal facilities. As the District states in the Final Draft Staff Report for Rule 4570 – Confined Animal

[4] University of Wisconsin Extension, *Greenhouse Barns for Dairy Housing*, published in Agricultural Engineers Digest, June 1997. Bates numbers 000744-000747.

[5] South Lakes Dairy draft Authority to Construct, S-6622, -1055047, Dairy BACT analysis, p. 13.

Facilities: *"The animals* (hogs) *are typically housed in confinement buildings that are either totally enclosed or open-sided with curtains. Totally enclosed facilities are mechanically ventilated throughout the year."* [6]

30. VOC emissions from the lagoons associated liquid manure handling are non-fugitive because these emissions can reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening. Covered waste treatment lagoons (anaerobic digesters) the provide fuel to produce electricity in onsite generation equipment are in current use at a dozen dairies in California.[7]

31. VOC emissions from manure piles are non-fugitive because these emissions can reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening. The manure piles are currently covered with plastic sheets and secured with tires. Covering manure piles and venting it to a VOC control device would be a transfer of technology from the composting industry.[8] The District also identifies capture and control of VOC emissions from the manure piles as a Class Two control measure in final Rule 4570. By virtue of the District identifying capture and control measures for the manure piles, it is reasonable to conclude that the manure piles are a non-fugitive emission source.

32. VOC emissions from silage are non-fugitive because these emissions can reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening. Silage is currently covered with plastic sheets and secured with tires. Covering silage and venting it to a VOC control device would be a transfer of technology from the composting industry.[9] The District also identifies capture and control of VOC emissions from silage as a Class Two control measure in final Rule 4570. By virtue of the District identifying capture and control measures for silage, it is reasonable to conclude that silage is a non-fugitive emission source.

III. VOC BACT Control Cost-Effectiveness Threshold in San Joaquin Valley Unified APCD Is Too Low

33. The two reasons the District has put forward for not requiring end-of-pipe VOC controls as BACT on the cow housing and liquid manure processing emission units are: 1) exceeds

[6] San Joaquin Unified APCD, *Final Draft Staff Report with Appendices for Proposed Rule 4570: Confined Animal Facilities*, May 18, 2006, p. 12.
[7] San Joaquin Valley Unified APCD, *Initial Analysis of Potential for Dairy ERCs*, 2006, p. 3.
[8] San Joaquin Unified APCD, *Final Draft Staff Report with Appendices for Proposed Rule 4570: Confined Animal Facilities*, May 18, 2006, p. 23.
[9] San Joaquin Unified APCD, *Final Draft Staff Report with Appendices for Proposed Rule 4570: Confined Animal Facilities*, May 18, 2006, p. 23.

District VOC control cost-effectiveness threshold of $5,000 per ton, and 2) not in current use on the emissions unit in question in the District. The District was criticized by the ARB on these two points during the state agency's 2005 audit of District practices and procedures.[10] Excerpts on the ARB report on the District's BACT program review state (p. 23):

> *The District's BACT cost-effectiveness thresholds for ozone precursors have not been revised since 1989 and are substantially lower than other districts with similar or better air quality status (specifically the Bay Area AQMD, South Coast AQMD, Ventura County APCD, and San Diego County APCD).*
>
> *The District should review and update its BACT determinations to more accurately reflect cost-effectiveness thresholds used by other districts with similar air quality status. In this manner, control technologies that are considered technologically feasible and cost effective for a class or category of source will be more frequently achieved in practice, and therefore be required to be installed.*
>
> *The District uses only its own BACT Clearinghouse to make BACT determinations, unless there are classes and categories of equipment not contained in the Clearinghouse. Conducting a broader technology search would help District staff become more aware of technology advancements in other jurisdictions, encourage the advancement of emission controls, and promote consistency statewide.*
>
> *When determining whether a BACT control technology is achieved in practice for a given class or category of source, the District currently requires that the "type of business where the emissions units are utilized must be the same."*
>
> *CAPCOA/ARB Guidance on Achieved in Practice BACT Determinations does not include business type as part of the criteria for achieved-in-practice BACT determinations. ARB staff believes that business type, in itself, does not warrant establishment of a different class or category of source unless unique operational or technical issues justify alternative emission levels.*

34. The underscored phrases in the excerpts above explain why "end-of-pipe" solutions are considered expensive and not in current use by the District. The District VOC control cost-

[10] California Air Resources Board, *San Joaquin Valley Air Pollution Control District Program Review – Report of Findings and Recommendations*, October 2005.

effectiveness ceiling is low, $5,000/ton for VOC versus $17,500/ton or more in air districts of comparable air quality such as Ventura County. A comparison of air district BACT control cost-effectiveness levels is provided in Table 5. As a result, any significant investment in VOC control systems would be deemed an unreasonable economic imposition in the District, while a control investment more than three times greater would be considered reasonable in a nearby district like Ventura County.

Table 5. Comparison of BACT Levels in Selected California Air Districts[11,12]

District		NOx [per ton]	CO [per ton]	VOC [per ton]	PM10 [per ton]	SOx [per ton]
San Joaquin Valley		$9,700	$300	$5,000	$5,700	$3,900
Bay Area		$17,500	n/d	$17,500	$5,300	$18,300
South Coast		$18,300 ($19,059) [a]	$380 ($396) [a]	$19,400 ($20,204) [a]	$4,300 ($4,478) [a]	$9,700 ($10,102) [a]
Ventura		$18,000	$1,000	$18,000	$10,000	$10,000
San Diego,	Small source (<15 tpy)	$13,200	n/d	$7,480 [b]	n/d	n/d
	Large source (>15 tpy)	$18,000	n/d	$10,200 [b]	n/d	n/d

[a] District is proposing to update maximum cost-effectiveness criteria to these values.
[b] Proposed revision to the district's New Source Review rule would increase thresholds to $13,200 (small source) and $18,000 (large source).

35. The District also requires that only those technologies in use on the same type of business in the District are considered demonstrated in practice for that business type, even if the business type has no technical relevance to the applicability of the technology to the application.

36. Use of enclosed barns connected to biofilters is an example of this narrow categorization. The District has rejected enclosed barns vented to biofilters as BACT for VOC control of large CAF facilities because such a combination is too expensive and not in current use (on District dairies). As the ARB points-out, the District's definition of expensive is much lower than in comparable air districts in California, and the threshold test that a technology or mix of technologies (greenhouse barn + biofilter for example) must be in current use in the District to be considered "demonstrated in practice" is an overly restrictive BACT threshold requirement.

[11] Ibid, p. B-21.
[12] San Diego County Air Pollution Control District will increase the VOC BACT cost-effectiveness ceiling to $13,200/ton (small sources) and $18,000/ton (large sources) as a component of a revised San Diego County APCD NSR rule. The proposed revisions to the NSR rule are expected to be presented at public workshop in the first quarter of 2008 and to be adopted in the 2008 calendar year. Reference: B. Powers phone conversation with Stan Romelczyk, San Diego County APCD Engineering Division, December 17, 2007.

37. The ARB states that "*the combined effect of these BACT policies results in missed opportunities to install the best emission controls on new or modified equipment*," and recommends the District modify its approach to BACT as follows (p. 24):

- *The District should review and update its BACT determinations to reflect more accurately the cost-effectiveness thresholds used by other districts with similar air quality status.*
- *The District should also widen its BACT search to include BACT determinations from other sources. The District could include links to other available control technology databases (for example South Coast AQMD, ARB/CAPCOA, ARB DG Guidance) on its BACT Clearinghouse web site.*
- *The District should also reexamine its in-house procedures for updating its BACT Clearinghouse. The District should amend its Policy APR 1305, removing "type of business" as a criteria for determining whether a BACT control technology is achieved in practice for a given class or category of source.*
- *The District should update the interest rate used for BACT cost-effectiveness analyses to reflect current economic conditions.*

38. The next effect of incorporating these recommendations would be that one or more end-of-pipe VOC control systems would be required as BACT for non-fugitive emission units at South Lakes Dairy.

IV. BACT for Each Non-Fugitive Emissions Unit at South Lakes Dairy

39. Cow housing: A greenhouse barn and biofilter combination should be identified as BACT by the District for cow housing. The District does not include all the economic benefits of cow housing temperature control when calculating the VOC control cost effectiveness of an enclosed barn with temperature/humidity control using spray cooling and biofiltration to reduce VOC emissions. These benefits include: improved milk production in hot weather, less difficult to capture cows in heat to breed, and elimination of missed "heat cycle" due to thermal stress that can reduce herd conception rates by 10 to 20 percent. A required step in the BACT process is the determination of energy, environmental, and economic impacts, both positive and negative, of each control technology evaluated. Inclusion of all the economic benefits of minimizing milk cow exposure to heat stress appears to result in an overall economic benefit while reducing VOC emissions by 80 percent across the biofilter.

40. The District Rule 4570 Confined Animal Facilities Final Draft Staff Report explains how the housing of dairy cattle in barns or similar enclosures has been demonstrated to increase milk

production significantly by reducing environmental stress while concurrently providing a method for capturing and controlling VOC emissions.[13] As stated on p. 28:

"One alternative would be to enclose the animal housing and vent the exhausted air to a secondary control device such as a biofilter. Since all the animal waste and enteric emissions in the house would be controlled by venting the exhaust air through a biofilter, management practices requirements including, but not limited to, dietary manipulation, animal waste removal frequency, and animal waste additives may not be necessary to ensure VOC reductions. It may allow owner/operator more flexibility in managing their animals and their manure/litter. It may also result in fewer monitoring, recording, and testing requirements, since management practices inside the building may not be regulated. This option alone may achieve highest VOC reductions of all the management practices proposed combined. Furthermore, enclosing animals in buildings and venting the buildings to a biofilter may have benefits beyond air emissions. Depending on the ventilation rate through the house animals may breathe fresher and cleaner air since air may be cycled through the enclosure at a faster rate than it would be in a free stall or other housing with minimal or no mechanical ventilation. Dr. Terry Smith at Mississippi State University housed lactating Holsteins in a tunnel ventilated barn with misters and evaporative coolers and found an 1.8-2.7 kg/hd/day increase in milk production and 81% decrease in heat stress occurrences compared to animals housed in free stalls with fans and misters."

41. Despite the apparent win-win benefits of housing dairy cows in a building, Staff ultimately rejects this option stating, "*However, this would be considered beyond BACT due to the high cost and fact that it has not been achieved in practice at facilities similar in size to those defined as large CAFs by the ARB.*" As noted by Staff (p. 28) this mitigation measure would simplify compliance for dairies and lead to the highest VOC emission reduction achievable.

42. The District has calculated the VOC BACT control cost-effectiveness for a number of hypothetical and real dairies. See Table 6. The VOC control cost effectiveness calculated for these dairies has ranged from $5,837/ton (Red Top Jerseys Dairy) to $84,918/ton (South Lakes Dairy).

Table 6. Calculated VOC Control Cost-Effectiveness of Enclosed Barn with Biofilter

Dairy/	VOC	Difference	Cost of	Capital	Credit	Capture	Control	VOC

[13] San Joaquin Unified APCD, *Final Draft Staff Report with Appendices for Proposed Rule 4570: Confined Animal Facilities*, May 18, 2006, p. 28.

# milk cows	control cost	in cost – greenhouse barn vs. freestall basecase	biofilter	cost recovery basis – interest and term	for reduced milk cow heat stress	efficiency - enclosure	Efficiency - biofilter	reduction
	$	$	$		$/yr	%	%	tons/year
District Generic: 800	14,578	(24,000)	133,200[a]	10%, 10 years	0	85	80	3.4
District Generic: 3,600	14,388	471,000	1,294,000[b]	10%, 10 years	61,000	100	80	19.4
Dairy Partners Generic: 3,600	net positive cashflow	471,000	1,294,000[b]	6.5%, 15 years	562,000[d]	100	80	19.4
South Lakes: 5,832	84,918	0	15,761,450[c]	10%, 10 years	0	95	80	30.2
Red Top Jerseys: 7,200	5,857	0	1,245,000[a]	10%, 10 years	0	95	80	34.6

a. University of Minnesota Extension Service, *Biofilter Design Information*, 2004. $150 to 250 per 1,000 cfm for initial biofilter construction to treat air exhausted from a livestock building.

b. October 24, 2006 biofilter capital cost estimate developed by Western Dairy Design Associates, marketer of a greenhouse barn and biofilter package known as "Bio-Barn". The capital cost of the biofilter is approximately $300 per 1,000 cfm in the Western Dairy cost estimate.

c. This estimate prepared by the District is based on an EPA reference to the biofilter capital cost for a 210,000 cfm unit at a wastewater treatment plant in Louisiana. The estimated cost of the biofilter is $2,350 per 1,000 cfm. No explanation is provided by the District for substituting a biofilter cost estimate from an unrelated process with a much smaller flowrate for the University of Minnesota biofilter cost estimates developed specifically for livestock housing and used by the District in the BACT analysis performed for the Red Tops Jerseys Dairy ATC application.

d. The $562,000 per year figure is the net positive annual revenue increase for the dairy, and includes the capital and operating cost of the Bio-Barn as well as the productivity benefits of reduced heat stess.

43. In the Red Top Jerseys Dairy draft ATC, the District calculates a VOC control cost effectiveness for biofiltration of $5,857/ton. Red Top Jerseys Dairy projects a maximum of 7,200 milk cows. The annualized cost of the biofilter calculated by the District is $202,618 per year. The calculated VOC control cost effectiveness is just over the District's current VOC control cost- effectiveness ceiling of $5,000/ton.

44. In the South Lakes Dairy draft ATC, with a maximum of 5,832 milk cows, the District calculates an annualized cost for the biofilter of $2,565,103 per year based on an installed capital cost of $15,761,450. This is more than ten times the biofilter capital cost estimated by the District for the larger Red Top Jerseys Dairy. The result in the South Lakes Dairy case is a calculated VOC control cost-effectiveness for biofiltration of approximately $85,000 per ton.

The document the District cites for the spectacular increase in biofilter cost is the September 2003 EPA report titled “Using Bioreactors to Control Air Pollution.” The document evaluates the cost of biofilters up to 210,000 cubic feet per minute (cfm) flowrate. The document also states (p. 12):

> “*Resulting costs figures are all over the map, but cost per unit volume, appears to decrease as the airflow increases, as expected. . . There are many variations to biofilter design that range from very elaborate equipment and controls to a simple hole in the ground.*”

45. The District estimates the flow required for the biofilter at South Lakes Dairy at 6,707,000 cfm, more than thirty times greater than the largest flow evaluated in the EPA document. The District also makes no effort to determine how elaborate the biofilters analyzed in the EPA report actually are, or whether these biofilters are the type of biofilter that would be used to control VOC emissions from cow housing. The South Lakes Dairy permit writer is clearly aware of the University of Minnesota data that the District had relied on previously to estimate the cost of a biofilter for enclosed barns, as University of Minnesota reports are cited twice in the paragraph where the District introduces the EPA biofilter cost data (South Lakes Dairy BACT Analysis, pp. 21-22):

> *The cost estimate for a biofiltration system is taken from the United States EPA Report "Using Bioreactors to Control Air Pollution". The cost is largely dependent on the airflow rate that the filter must handle. According to University of Minnesota, biofilters used to treat ventilating air exhausted from a livestock building should be sized to treat the maximum ventilation rate, which is typically the warm weather rate. The EPA report gives a range of $2.35 - $37.06 per cfm for the initial construction of a biofilter. As shown above, the University of Minnesota's publication "Improving Mechanical Ventilation in Dairy Barns" gives the following summer ventilation rates for dairy cattle: mature cow - 1,000 cfm; heifer (12-24 mo.) - 180 cfm; heifer (2-12 mo.) - 130 cfm; and baby calves - 100 cfm.*

46. No effort is made by the District to explain why it has substituted the generic EPA biofilter cost, which is derived from a much smaller and unrelated source, for the biofilter capital cost estimates previously used by the District that were developed by the University of Minnesota specifically for livestock housing applications. The apparent purpose of using a generic EPA biofilter cost factor in the South Lakes Dairy BACT analysis conducted by the District was to produce a very high VOC control cost-effectiveness value for the biofilter option.

47. Western Dairy Design Associates has designed a greenhouse barn and biofilter package, the “Bio-Barn,” that it is currently marketing to the San Joaquin Valley dairy industry. Western Dairy Design Associates estimates the installed cost of the biofilter for a herd of 3,600 milk cows

and 500 dry cows, as an integral component of a temperature- and humidity-controlled greenhouse barn, at approximately $1,300,000.

48. The District has calculated a $14,388 per ton VOC cost-effectiveness for the Western Dairy Design Associates "Bio-Barn" for a hypothetical dairy with 3,600 milk cows. However, the calculation includes a very limited cost benefit for increased milk production attributed to heat stress reduction. However Western Dairy Design Associates calculates much greater cost benefits from heat stress reduction, which include 1) increased milk production, 2) improved milk quality, and 3) increased calving rates. The net effect of the heat stress reduction benefits calculated by Western Dairy Design Associates is a net positive cash flow of $561,000 per year for the hypothetical 3,600 milk cow dairy, in addition to the 80 percent reduction in VOC emissions across the biofilter. As the Western Dairy Design Associates representative states in an October 24, 2006 communication to the District, "*I am excited about this system as it will make money for the dairyman as it solves air quality challenges*."

49. Liquid Manure Handling - Lagoons: An anaerobic covered digester with an internal combustion engine-generator for electricity production and VOC control should be identified as BACT for the South Lakes Dairy. The District has calculated a $7,398 per ton VOC control cost-effectiveness for a covered anaerobic digester and engine-generator combination at the South Lakes Dairy.[14] However, the District uses a composite electricity sales rate of $0.1162 per kilowatt-hour (kWh) in the calculation. The $0.1162/kWh figure is a composite of the Southern California Edision, Pacific Gas & Electric (PG&E), Tulare Irrigation District, and Modesto Irrigation District rates. However, it is my understanding based on comments by the defendant's council during the April 18, 2007 site inspection that the South Lakes Dairy is in PG&E service territory. The electricity sales rate specific to PG&E that is identified in the District VOC control cost-effectiveness spreadsheet is $0.1577 per kWh. Using the PG&E electricity sales rate results in a net revenue benefit of $287,466 per year.[15] In other words, adding the covered digester and engine-generator at South Lakes Dairy will generate $287,466 per year of additional net revenue for the dairy.

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[14] San Joaquin Valley Unified APCD, *VOC Cost Effectiveness for Dairy Digesters – Schakel Emission Calculations: Cost Effectiveness Calculations*, January 25, 2006 (Excel spreadsheet).

[15] The District identifies revenue from electricity sales as $921,307 per year based on a composite electricity sales value of $0.1162/kWh. The cost of the control system is identified as $962,879 per year, resulting in a net cost to the operator of $41,572 per year. If the electricity sales value is the PG&E rate of $0.1577/kWh, the revenue from electricity sales is $1,250,345 per year. The cost of the control system remains $962,879 per year, resulting in a net revenue of $287,466 per year.

50. South Lakes Dairy has already proposed to install an anaerobic digester as BACT. The BACT analysis prepared by the District and included in the South Lakes Dairy draft ATC (Dairy BACT Analysis, p. 40):

> *The applicant has proposed to install an anaerobic digester if this technology is required by the final Dairy BACT Guideline. Since the applicant has proposed this option in accordance with the Settlement Agreement, a cost-effective analysis is not required. If an anaerobic digester is required in the final Dairy BACT Guideline, the applicant will be required to install the system in accordance with the timeframes and procedures established by the APCO in the final Dairy BACT Guideline.*

51. Manure piles: The manure piles are currently covered with liner-grade plastic and tires to maintain the plastic in place. BACT for this emission unit should be a pipe connection to maintain slight negative pressure under sheets. Collected VOCs would be directed to the air intake of the engine-generator burning digester gases or to the enclosed barn for treatment in the biofilter. Covering manure piles and venting it to a VOC control device would be a transfer of technology from the composting industry.[16]

52. Silage: The silage (feed) is currently covered with liner-grade plastic and tires to maintain the plastic in place. BACT for this emission unit should be a pipe connection to maintain slight negative pressure under sheets. Collected VOCs would be directed to the air intake of the engine-generator burning digester gases or to the enclosed barn for treatment in the biofilter. Covering silage and venting it to a VOC control device would be a transfer of technology from the composting industry.[17]

William E. Powers, P.E. Date: Dec. 17, 2007

William E. Powers, P.E.

[16] San Joaquin Unified APCD, *Final Draft Staff Report with Appendices for Proposed Rule 4570: Confined Animal Facilities,* May 18, 2006, p. 23.
[17] Ibid.

BILL POWERS, P.E.

PROFESSIONAL HISTORY

Powers Engineering, San Diego, CA 1994-
ENSR Consulting and Engineering, Camarillo, CA 1989-93
Naval Energy and Environmental Support Activity, Port Hueneme, CA 1982-87
U.S. Environmental Protection Agency, Research Triangle Park, NC 1980-81

EDUCATION

Master of Public Health – Environmental Sciences, University of North Carolina
Bachelor of Science – Mechanical Engineering, Duke University

PROFESSIONAL AFFILIATIONS

Registered Professional Mechanical Engineer, California (Certificate M24518)
American Society of Mechanical Engineers
Air & Waste Management Association

TECHNICAL SPECIALTIES

Twenty-two years of experience in:

- San Joaquin Valley air permitting and air emissions testing
- Combustion equipment permitting, testing and monitoring
- Title V air permitting of industrial sources
- Utility power plant air emission control and cooling system assessments
- RACT/BARCT/BACT evaluations
- Petroleum refinery air emission inventories

SAN JOAQUIN VALLEY AIR PERMITTING AND AIR EMISSIONS TESTING

Vanderham Dairy Air Emissions Calculations. Lead engineer to calculate potential to emit from volatile organic compound (VOC) emission sources at large dairy near Shafter, California.

Stationary Internal Combustion Engine Retrofit Control Evaluation - Western States Petroleum Association. Lead engineer for evaluation of retrofit nitrogen oxide (NO_x) control options available for the oil and gas production industry gas-fired ICE population in the San Joaquin Valley affected by proposed RACT and BARCT emission limits. Evaluation centered on lean-burn compressor engines under 500 bhp, and rich-burn constant and cyclically loaded (rod pump) engines under 200 bhp. Recommended retrofit NO_x control strategies included: air/fuel ratio adjustment for rod pump ICEs, Non-selective catalytic reduction (NSCR) for rich-burn, constant load ICEs, and "low emission" combustion modifications for lean burn ICEs.

Hospital Cogeneration Plant Gas Turbines – St. Agnes Medical Center, Fresno.
Project manager and lead engineer for preparation of air permit application and Best Available Control Technology (BACT) evaluation for hospital cogeneration plant installation. The BACT included the review of DLN combustors, catalytic combustors, high-temperature SCR and SCONO$_x$. DLN combustion followed by high temperature SCR was selected as the NO_x control system for this installation. The high temperature SCR is located upstream of the heat recovery steam generator (HRSG) to allow the diversion of exhaust gas around the HRSG without compromising the effectiveness of the NO_x control system.

Oil and Gas Production Field – Air Emissions Inventory and Air Modeling - Chevron. Project manager for oil and gas production field risk assessment for facility in Coalinga, California. Project included review and revision of the existing air toxics emission inventory, air dispersion modeling, and calculation of the acute

health risk, chronic non-carcinogenic risk and carcinogenic risk of facility operations. Results indicated that fugitive hydrogen sulfide (H_2S) emissions from facility operations posed a potential health risk at the facility fenceline.

Standardized Title V Permit Templates for Oil and Gas Production Industry - Western States Petroleum Association. Project manager and lead engineer to prepare Title V air permit "templates" for WSPA. The template approach was chosen by WSPA to minimize the administrative burden associated with listing permit conditions for a large number of similar devices located at the same oil and gas production facility. Templates are being developed for device types common to oil and gas production operations. Device types include: boilers, steam generators, process heaters, gas turbines, IC engines, fixed-roof storage tanks, fugitive components, flares, and cooling towers. These templates serve as the basic permit Title V applications prepared for oil and gas production operations in the San Joaquin Valley.

Air Toxics Testing of Natural Gas-Fired Engines - Western States Petroleum Association. Project manager for test plan/test program to measure volatile and semi-volatile organic air toxics compounds from fourteen gas-fired ICEs used in a variety of oil and gas production applications. Test data was utilized by oil and gas production facility owners throughout California to develop accurate ICE air toxics emission inventories.

Air Emissions Monitoring Evaluation of Oil and Gas Production Sources - Western States Petroleum Association. Lead engineer to identify differences in proposed enhanced compliance monitoring protocols and the current monitoring requirements for oil and gas production sources in the San Joaquin Valley. The device types evaluated included: steam generators, stationary ICEs, gas turbines, fugitives, fixed roof storage tanks, and thermally enhanced oil recovery (TEOR) well vents. Principal areas of difference included: more stringent Title V O&M requirements for parameter monitors (such as temperature, fuel flow, and O_2), and more extensive Title V recordkeeping requirements.

Air Toxics Testing of Oil and Gas Production Sources. Project manager and lead engineer for test plan/test program to determine volatile organic compound (VOC) removal efficiency of packed tower scrubber controlling sulfur dioxide emissions from a crude oil-fired steam generator. Ratfisch 55 VOC analyzers were used to measure the packed tower scrubber VOC removal efficiency. Tedlar bag samples were collected simultaneously to correlate BTX removal efficiency to VOC removal efficiency. This test was one of hundreds of air toxics tests performed during this test program for oil and gas production facilities from 1990 to 1992. The majority of the volatile air toxics analyses were performed at in-house laboratory. Project staff developed thorough familiarity with the applications and limitations of GC/MS, GC/PID, GC/FID, GC/ECD and GC/FPD. Tedlar bags, canisters, sorbent tubes and impingers were used during sampling, along with isokinetic tests methods for multiple metals and PAHs.

Air Toxics Emissions Inventory Plan. Lead engineer for the development of generic air toxics emission estimating techniques for oil and gas production equipment. This project was performed for the Western States Petroleum Association in response to the requirements of the California Air Toxics "Hot Spots" Act. The estimating techniques were developed for all point and fugitive oil and gas production sources of air toxics, and the specific air toxics associated with each source were identified.

Fugitive NMHC Emissions from TEOR Production Field. Project manager for the quantification of fugitive non-methane hydrocarbon (NMHC) emissions from a thermally enhanced oil recovery (TEOR) oil production field in Kern County, California. This program included direct measurement of NMHC concentrations in storage tank vapor headspace and the modification of available NMHC emission factors for NMHC-emitting devices in TEOR produced gas service, such as wellheads, vapor trunklines, heat exchangers, and compressors. Modification of the existing NMHC emission factors was necessary due to the high concentration of CO_2 and water vapor in TEOR produced gases.

Fugitive Air Emissions Testing of Oil and Gas Production Fields. Project manager for test plan/test program to determine VOC and air toxics emissions from oil storage tanks, wastewater storage tanks and produced gas lines. Test results were utilized to develop comprehensive air toxics emissions inventories for oil and gas production companies participating in the test program.

COMBUSTION EQUIPMENT PERMITTING, TESTING AND MONITORING

EPRI Gas Turbine Power Plant Permitting Documents – Co-Author.
Co-authored two Electric Power Research Institute (EPRI) gas turbine power plant siting documents. Responsibilities included chapter on state-of-the-art air emission control systems for simple-cycle and combined-cycle gas turbines, and authorship of sections on dry cooling and zero liquid discharge systems.

Air Permits for 50 MW Peaker Gas Turbines – Six Sites Throughout California.
Responsible for preparing all aspects of air permit applications for five 50 MW FT-8 simple-cycle turbine installations at sites around California in response to emergency request by California state government for additional peaking power. Units were designed to meet 2.0 ppm NO_x using standard temperature SCR and innovative dilution air system to maintain exhaust gas temperature within acceptable SCR range. Oxidation catalyst is also used to maintain CO below 6.0 ppm.

Kauai 27 MW Cogeneration Plant – Air Emission Control System Analysis. Project manager to evaluate technical feasibility of SCR for 27 MW naphtha-fired turbine with once-through heat recovery steam generator. Permit action was stalled due to questions of SCR feasibility. Extensive analysis of the performance of existing oil-fired turbines equipped with SCR, and bench-scale tests of SCR applied to naphtha-fired turbines, indicated that SCR would perform adequately. Urea was selected as the SCR reagent given the wide availability of urea on the island. Unit is first known application of urea-injected SCR on a naphtha-fired turbine.

Microturbines – Ronald Reagan Library, Ventura County, California.
Project manager and lead engineer or preparation of air permit applications for microturbines and standby boilers. The microturbines drive the heating and cooling system for the library. The microturbines are certified by the manufacturer to meet the 9 ppm NO_x emission limit for this equipment. Low-NO_x burners are BACT for the standby boilers.

Hospital Cogeneration Microturbines – South Coast Air Quality Management District.
Project manager and lead engineer for preparation of air permit application for three microturbines at hospital cogeneration plant installation. The draft Authority To Construct (ATC) for this project was obtained two weeks after submittal of the ATC application. 30-day public notification was required due to the proximity of the facility to nearby schools. The final ATC was issued two months after the application was submitted, including the 30-day public notification period.

Gas Turbine Cogeneration – South Coast Air Quality Management District. Project manager and lead engineer for preparation of air permit application for two 5.5 MW gas turbines in cogeneration configuration for county government center. The turbines will be equipped with selective catalytic reduction (SCR) and oxidation catalyst to comply with SCAQMD BACT requirements. Aqueous urea will be used as the SCR reagent to avoid trigger hazardous material storage requirements. A separate permit will be obtained for the NO_x and CO continuous emissions monitoring systems. The ATCs is pending.

Industrial Boilers – NO_x BACT Evaluation for San Diego County Boilers.
Project manager and lead engineer for preparation of Best Available Control Technology (BACT) evaluation for three industrial boilers to be located in San Diego County. The BACT included the review of low NO_x burners, FGR, SCR, and low temperature oxidation (LTO). State-of-the-art ultra low NO_x burners with a 9 ppm emissions guarantee were selected as NO_x BACT for these units.

Peaker Gas Turbines – Evaluation of NO_x Control Options for Installations in San Diego County.
Lead engineer for evaluation of NO_x control options available for 1970s vintage simple-cycle gas turbines proposed for peaker sites in San Diego County. Dry low-NO_x (DLN) combustors, catalytic combustors, high-temperature SCR, and NO_x absorption/conversion ($SCONO_x$) were evaluated for each candidate turbine make/model. High-temperature SCR was selected as the NOx control option to meet a 5 ppm NO_x emission requirement.

Industrial Cogeneration Plant Gas Turbines – Upgrade of Turbine Power Output.
Project manager and lead engineer for preparation of Best Available Control Technology (BACT) evaluation for proposed gas turbine upgrade. The BACT included the review of DLN combustors, catalytic combustors, high-, standard-, and low-temperature SCR, and $SCONO_x$. Successfully negotiated air permit that allowed facility to initially install DLN combustors and operate under a NO_x plantwide "cap." Within two major turbine overhauls, or approximately eight years, the NO_x emissions per turbine must be at or below the equivalent of 5 ppm. The 5 ppm NO_x target will be achieved through technological in-combustor NO_x control such as catalytic combustion, or SCR or SCR equivalent end-of-pipe NO_x control technologies if catalytic combustion is not available.

Gas Turbines – Modification of RATA Procedures for Time-Share CEM.
Project manager and lead engineer for the development of alternate CO continuous emission monitor (CEM) Relative Accuracy Test Audit (RATA) procedures for time-share CEM system serving three 7.9 MW turbines located in San Diego. Close interaction with San Diego APCD and EPA Region 9 engineers was required to receive approval for the alternate CO RATA standard. The time-share CEM passed the subsequent annual RATA without problems as a result of changes to some of the CEM hardware and the more flexible CO RATA standard.

Gas Turbines – Evaluation of NO_x Control Technology Performance. Lead engineer for performance review of dry low-NO_x combustors, catalytic combustors, high-, standard-, and low-temperature selective catalytic reduction (SCR), and NO_x absorption/conversion ($SCONO_x$). Major turbine manufacturers and major manufacturers of end-of-pipe NO_x control systems for gas turbines were contacted to determine current cost and performance of NO_x control systems. A comparison of 1993 to 1999 "$/kwh" and "$/ton" cost of these control systems was developed in the evaluation.

Gas Turbines – Evaluation of Proposed NO_x Control System to Achieve 3 ppm Limit.
Lead engineer for evaluation for proposed combined cycle gas turbine NO_x and CO control systems. Project was in litigation over contract terms, and there was concern that the GE Frame 7FA turbine could not meet the 3 ppm NO_x permit limit using a conventional combustor with water injection followed by SCR. Operations personnel at GE Frame 7FA installatins around the country were interviewed, along with principal SCR vendors, to corroborate that the installation could continuously meet the 3 ppm NO_x limit.

Gas Turbines – Title V "Presumptively Approvable" Compliance Assurance Monitoring Protocol.
Project manager and lead engineer for the development of a "presumptively approval" NO_x parametric emissions monitoring system (PEMS) protocol for industrial gas turbines. "Presumptively approvable" means that any gas turbine operator selecting this monitoring protocol can presume it is acceptable to the U.S. EPA. Close interaction with the gas turbine manufacturer's design engineering staff and the U.S. EPA Emissions Measurement Branch (Research Triangle Park, NC) was required to determine modifications necessary to the current PEMS to upgrade it to "presumptively approvable" status.

Environmental Due Diligence Review of Gas Turbine Sites – Mexico. Task leader to prepare regulatory compliance due diligence review of Mexican requirements for gas turbine power plants. Project involves eleven potential sites across Mexico, three of which are under construction. Scope involves identification of all environmental, energy sales, land use, and transportation corridor requirements for power projects in Mexico.

Coordinator of Mexican environmental subcontractors gathering on-site information for each site, and translator of Spanish supporting documentation to English.

Development of Air Emission Standards for Gas Turbines - Peru. Served as principal technical consultant to the Peruvian Ministry of Energy in Mines (MEM) for the development of air emission standards for Peruvian gas turbine power plants. All major gas turbine power plants in Peru are currently using water injection to increase turbine power output. Recommended that 42 ppm on natural gas and 65 ppm on diesel (corrected to 15% O_2) be established as the NO_x limit for existing gas turbine power plants. These limits reflect NO_x levels readily achievable using water injection at high load. Also recommended that new gas turbine sources be subject to a BACT review requirement.

Gas Turbines – Evaluation of NO_x, SO_2 and PM Emission Profiles. Performed a comparative evaluation of the NO_x, SO_2 and particulate (PM) emission profiles of principal utility-scale gas turbines for an independent power producer evaluating project opportunities in Latin America. All gas turbine models in the 40 MW to 240 MW range manufactured by General Electric, Westinghouse, Siemens and ABB were included in the evaluation.

Development of Air Emission Standards for Stationary ICEs - Peru. Served as principal technical consultant to the Peruvian Ministry of Energy in Mines (MEM) for the development of air emission standards for Peruvian stationary ICE power plants. Draft 1997 World Bank NO_x and particulate emission limits for stationary ICE power plants served as the basis for proposed MEM emission limits. A detailed review of ICE emissions data provided in PAMAs submitted to the MEM was performed to determine the level of effort that would be required by Peruvian industry to meet the proposed NO_x and particulate emission limits. The draft 1997 WB emission limits were revised to reflect reasonably achievable NO_x and particulate emission limits for ICEs currently in operation in Peru.

Ethanol Plant Dryer – Penn-Mar Ethanol, LLC. Lead engineer on Best Available Control Technology (BACT) evaluation for ethanol dryer. Dryer nitrogen oxide (NO_x) emission limit of 30 ppm determined to be BACT following exhaustive review of existing and pending ethanol plant air permits and discussions with principal dryer vendors.

TITLE V PERMIT APPLICATION/MONITORING PLAN EXPERIENCE

Title V Permit Application – San Diego County Industrial Facility. Project engineer tasked with preparing streamlined Title V operating permit for U.S. Navy facilities in San Diego. Principal emission units included chrome plating, lead furnaces, IC engines, solvent usage, aerospace coating and marine coating operations. For each device category in use at the facility, federal MACT requirements were integrated with District requirements in user friendly tables that summarized permit conditions and compliance status.

Title V Permit Application - Aluminum Rolling Mill. Project manager and lead engineer for Title V permit application prepared for largest aluminum rolling mill in the western U.S. Responsible for the overall direction of the permit application project, development of a monitoring plan for significant emission units, and development of a hazardous air pollutant (HAP) emissions inventory. The project involved extensive onsite data gathering, frequent interaction with the plant's technical and operating staff, and coordination with legal counsel and subcontractors. The permit application was completed on time and in budget.

POWER PLANT AIR EMISSION CONTROL ASSESSMENTS AND COOLING SYSTEM CONVERSIONS

Utility Boiler – Best Available NO_x Control System for 525 MW Coal-Fired Circulating Fluidized Bed Boiler Plant. Expert witness in dispute over whether 50 percent NO_x control using selective non-catalytic reduction (SNCR) constituted BACT for a proposed 525 MW circulating fluidized bed (CFB) boiler plant. Presented testimony that SNCR was capable of continuous NO_x reduction of greater than 70 percent on a CFB

unit and that tail-end selective catalytic reduction (SCR) was technically feasible and could achieve greater than 90 percent NO_x reduction.

Utility Boiler – Assessment of Air Cooling and Integrated Gasification/Combined Cycle for Proposed 500 MW Coal-Fired Plant. Provided expert testimony on the performance of air-cooling and IGCC relative to the conventional closed-cycle wet cooled, supercritical pulverized coal boiler proposed by the applicant. Steam Pro™ coal-fired power plant design software was used to model the proposed plant and evaluate the impacts on performance of air cooling and plume-abated wet cooling. Results indicated that a conservatively designed air-cooled condenser could maintain rated power output at the design ambient temperature of 90 ^{o}F. The IGCC comparative analysis indicated that unit reliability comparable to a conventional pulverized coal unit could be achieved by including a spare gasifier in the IGCC design, and that the slightly higher capital cost of IGCC was offset by greater thermal efficiency and reduced water demand and air emissions.

Utility Boilers – Retrofit of SCR and FGD to Existing Coal-Fired Units.
Expert witness in successful effort to compel an existing coal-fired power plant located in Massachusetts to meet an accelerated NO_x and SO_2 emission control system retrofit schedule. Plant owner argued the installation of advanced NO_x and SO_2 control systems would generate > 1 ton/year of ancillary emissions, such as sulfuric acid mist, and that under Massachusetts Dept. of Environmental Protection regulation ancillary emissions > 1 ton/year would require a BACT evaluation and a two-year extension to retrofit schedule. Successfully demonstrated that no ancillary emissions would be generated if the retrofit NO_x and SO_2 control systems were properly sized and optimized. Plant owner committed to accelerated compliance schedule in settlement agreement.

Utility Boilers – Retrofit of SCR to Existing Natural Gas-Fired Units.
Lead engineer in successful representation of interests of California coastal city to prevent weakening of an existing countywide utility boiler NO_x rule. Weakening of NO_x rule would have allowed a merchant utility boiler plant located in the city to operate without installing selective catalytic reduction (SCR) NO_x control systems. This project required numerous appearances before the county air pollution control hearing board to successfully defend the existing utility boiler NO_x rule.

Utility Boilers – Evaluation of Correlation Between Opacity and PM_{10} Emissions at Coal-Fired Plant.
Provided expert testimony on whether correlation existed between mass PM_{10} emissions and opacity during opacity excursions at large coal-fired boiler in Georgia. EPA and EPRI technical studies were reviewed to assess the correlation of opacity and mass emissions during opacity levels below and above 20 percent. A strong correlation between opacity and mass emissions was apparent at a sister plant at opacities less than 20 percent. The correlation suggests that the opacity monitor correlation underestimates mass emissions at opacities greater than 20 percent, but may continue to exhibit a good correlation for the component of mass emissions in the PM_{10} size range.

Utility Boilers – Conversion of Existing Once-Through Cooled Boilers to Closed-Cycle Wet Cooling.
Prepared conceptual design for conversion of Huntington Beach Generating Station Units 1&2 (430 MW) and Units 3&4 (430 MW) from once-through seawater cooling to wet cooling towers. Major design constraints were available land for location of retrofit wet towers if a desalination plant is also built at the site and whether reclaimed water is available for cooling use. Twelve (12) SPX Cooling Technologies Model F4910-5.3 plume-abated wet cells were used in each tower to achieve an approach temperature of 12 ^{o}F. Annual energy penalty of wet tower retrofit designs is approximately 1 percent. Secondary treated wastewater is available from ocean outfall discharging piping less than 2 miles away for onsite conversion to reclaimed water for use in the cooling towers. Seawater is also a viable option. The wet tower would have a slightly lower efficiency if seawater is used as the cooling medium instead of reclaimed water.

Utility Boilers – Conversion of Existing Once-Through Cooled Boilers to Wet Towers, Parallel Wet-Dry Cooling, or Dry Cooling. Provided expert testimony and preliminary design for the conversion of four natural gas and/or coal-fired utility boilers (Unit 4, 235 MW; Unit 3, 135 MW; Unit 2, 65 MW; and Unit 1,65 MW) from once-through river water cooling to wet cooling towers, parallel wet-dry cooling, and dry cooling. Major design constraints were available land for location of retrofit cooling systems and need to maintain maximum steam turbine backpressure at or below 5.5 inches mercury to match performance capabilities of existing equipment. SPX Cooling Technologies F-488 plume-abated wet cells with six feet of packing were used to achieve approach temperatures of 12 ^{o}F and 13 ^{o}F. Annual energy penalty of wet tower retrofit designs is approximately 1 percent. Parallel wet-dry or dry cooling was determined to be technically feasible for Unit 3 based on straightforward access to the Unit 3 surface condenser and available land adjacent to the boiler.

Utility Boiler – Assessment of Closed-Cycle Cooling Retrofit Cost for 1,200 MW Oil-Fired Plant. Prepared an assessment of the cost and technical feasibility of a closed-cycle wet tower retrofit for the 1,200 MW Roseton Generating Station. Determined that the cost to retrofit the Roseton plant with plume-abated closed-cycle wet cooling was well established based on cooling tower retrofit studies performed by the original owner (Central Hudson Gas & Electric Corp.) and subsequent regulatory agency critique of the cost estimate. Also determined that elimination of redundant and/or excessive budgetary line items in owners cost estimate brings the closed-cycle retrofit in line with expected costs for comparable new or retrofit plume-abated cooling tower applications.

Nuclear Power Plant – Assessment of Closed-Cycle Cooling Retrofit Cost for 2,000 MW Plant. Prepared an assessment of the cost and technical feasibility of a closed-cycle wet tower retrofit for the 2,000 MW Indian Point Generating Station. Determined that the most appropriate arrangement for the hilly site would be an inline plume-abated wet tower instead of the round tower configuration analyzed by the owner. Use of the inline configuration would allow placement of the towers at numerous sites on the property with little or need for blasting of bedrock, greatly reducing the cost of the retrofit. Also proposed an alternative circulating cooling water piping configuration to avoid the extensive downtime projected by the owner for modifications to the existing discharge channel.

Kentucky Coal-Fired Power Plant – Pulverized Coal vs IGCC. Expert witness in Sierra Club lawsuit against Peabody Coal Company's plan to construct a 1,500 MW pulverized-coal fired power plant in Kentucky. Presented case that Integrated Gasification Combined Cycle (IGCC) is a superior method for producing power from coal, from environmental and energy efficiency perspective, than the proposed pulverized-coal plant. Presented evidence that IGCC is technically feasible and cost competitive with pulverized coal.

1,000 MW Coastal Combined-Cycle Power Plant – Feasibility of Dry Cooling. Expert witness in on-going effort to require use of dry cooling on proposed 1,000 MW combined-cycle "repower" project at site of an existing 1,000 MW utility boiler plant. Project proponent argued that site was two small for properly sized air-cooled condenser (ACC) and that use of ACC would cause 12-month construction delay. Demonstrated that ACC could easily be located on the site by splitting total of up to 80 cells between two available locations at the site. Also demonstrated that an ACC optimized for low height and low noise would minimize or eliminate proponent claims of negative visual and noise impacts.

Power Plant Dry Cooling Symposium – Chair and Organizer. Chair and organizer of the first symposium held in the U.S. (May 2002) that focused exclusively on dry cooling technology for power plants. Sessions included basic principles of wet and dry cooling systems, performance capabilities of dry cooling systems, case studies of specific installations, and reasons why dry cooling is the predominant form of cooling specified in certain regions of North America (Massachusetts, Nevada, northern Mexico). All technical papers presented at the symposium are available at http://awmasandiego.org/SDC-2002/.

RACT/BARCT/BACT EVALUATIONS

BACT Evaluation of Wool Fiberglass Insulation Production Line. Project manager and lead engineer for BACT evaluation of a wool fiberglass insulation production facility. The BACT evaluation was performed as a component of a PSD permit application. The BACT evaluation included a detailed analysis of the available control options for forming, curing and cooling sections of the production line. Binder formulations, wet electrostatic precipitators, wet scrubbers, and thermal oxidizers were evaluated as potential PM_{10} and VOC control options. Low NO_x burner options and combustion control modifications were examined as potential NO_x control techniques for the curing oven burners. Recommendations included use of a proprietary binder formulation to achieve PM_{10} and VOC BACT, and use of low-NO_x burners in the curing ovens to achieve NO_x BACT. The PSD application is currently undergoing review by EPA Region 9.

RACT/BARCT Reverse Jet Scrubber/Fiberbed Mist Eliminator Retrofit Evaluation. Project manager and lead engineer on project to address the inability of existing wet electrostatic precipitators (ESPs) and atomized mist scrubbers to adequately remove low concentration submicron particulate from high volume recovery boiler exhaust gas at the Alaska Pulp Corporation mill in Sitka, AK. The project involved thorough on-site inspections of existing control equipment, detailed review of maintenance and performance records, and a detailed evaluation of potential replacement technologies. These technologies included a wide variety of scrubbing technologies where manufacturers claimed high removal efficiencies on submicron particulate in high humidity exhaust gas. Packed tower scrubbers, venturi scrubbers, reverse jet scrubbers, fiberbed mist eliminators and wet ESPs were evaluated. Final recommendations included replacement of atomized mist scrubber with reverse jet scrubber and upgrading of the existing wet ESPs. The paper describing this project was published in the May 1992 TAPPI Journal.

Aluminum Smelter RACT Evaluation - Prebake. Project manager and technical lead for CO and PM_{10} RACT evaluation for prebake facility. Retrofit control options for CO emissions from the anode bake furnace, potline dry scrubbers and the potroom roof vents were evaluated. PM_{10} emissions from the coke kiln, potline dry scrubbers, potroom roof vents, and miscellaneous potroom fugitive sources were addressed. Four CO control technologies were identified as technologically feasible for potline CO emissions: potline current efficiency improvement through the addition of underhung busswork and automated puncher/feeders, catalytic incineration, recuperative incineration and regenerative incineration. Current efficiency improvement was identified as probable CO RACT if onsite test program demonstrated the effectiveness of this approach. Five PM_{10} control technologies were identified as technologically feasible: increased potline hooding efficiency through redesign of shields, the addition of a dense-phase conveying system, increased potline air evacuation rate, wet scrubbing of roof vent emissions, and fabric filter control of roof vent emissions. The cost of these potential PM_{10} RACT controls exceeded regulatory guidelines for cost effectiveness, though testing of modified shield configurations and dense-phase conveying is being conducted under a separate regulatory compliance order.

RACT/BACT Testing/Evaluation of PM_{10} Mist Eliminators on Five-Stand Cold Mill. Project manager and lead engineer for fiberbed mist eliminator and mesh pad mist eliminator comparative pilot test program on mixed phase aerosol (PM_{10})/gaseous hydrocarbon emissions from aluminum high speed cold rolling mill. Utilized modified EPA Method 5 sampling train with portion of sample gas diverted (after particulate filter) to Ratfisch 55 VOC analyzer. This was done to permit simultaneous quantification of aerosol and gaseous hydrocarbon emissions in the exhaust gas. The mesh pad mist eliminator demonstrated good control of PM_{10} emissions, though test results indicated that the majority of captured PM_{10} evaporated in the mesh pad and was emitted as VOC.

Aluminum Remelt Furnace/Rolling Mill RACT Evaluations. Lead engineer for comprehensive CO and PM_{10} RACT evaluation for the largest aluminum sheet and plate rolling mill in western U.S. Significant sources of CO emissions from the facility included the remelt furnaces and the coater line. The potential CO RACT options for the remelt furnaces included: enhanced maintenance practices, preheating combustion air, installation of fully automated combustion controls, and energy efficiency modifications. The coater line was

equipped with an afterburner for VOC and CO destruction prior to the initiation of the RACT study. It was determined that the afterburner meets or exceeds RACT requirements for the coater line. Significant sources of PM_{10} emissions included the remelt furnaces and the 80-inch hot rolling mill. Chlorine fluxing in the melting and holding furnaces was identified as the principal source of PM_{10} emissions from the remelt furnaces. The facility is in the process of minimizing/eliminating fluxing in the melting furnaces, and exhaust gases generated in holding furnaces during fluxing will be ducted to a baghouse for PM_{10} control. These modifications are being performed under a separate compliance order, and were determined to exceed RACT requirements. A water-based emulsion coolant and inertial separators are currently in use on the 80-inch hot mill for PM_{10} control. Current practices were determined to meet/exceed PM_{10} RACT for the hot mill. Tray tower absorption/recovery systems were also evaluated to control PM_{10} emissions from the hot mill, though it was determined that the technical/cost feasibility of using this approach on an emulsion-based coolant had not yet been adequately demonstrated.

BARCT Low NO_x Burner Conversion – Industrial Boilers. Lead engineer for evaluation of low NO_x burner options for natural gas-fired industrial boilers. Also evaluated methanol and propane as stand-by fuels to replace existing diesel stand-by fuel system. Evaluated replacement of steam boilers with gas turbine co-generation system.

BACT Packed Tower Scrubber/Mist Eliminator Performance Evaluations. Project manager and lead engineer for Navy-wide plating shop air pollution control technology evaluation and emissions testing program. Mist eliminators and packed tower scrubbers controlling metal plating processes, which included hard chrome, nickel, copper, cadmium and precious metals plating, were extensively tested at three Navy plating shops. Chemical cleaning and stripping tanks, including hydrochloric acid, sulfuric acid, chromic acid and caustic, were also tested. The final product of this program was a military design specification for plating and chemical cleaning shop air pollution control systems. The hydrochloric acid mist sampling procedure developed during this program received a protected patent.

BACT Packed Tower Scrubber/UV Oxidation System Pilot Test Program. Technical advisor for pilot test program of packed tower scrubber/ultraviolet (UV) light VOC oxidation system controlling VOC emissions from microchip manufacturing facility in Los Angeles. The testing was sponsored in part by the SCAQMD's Innovative Technology Demonstration Program, to demonstrate this innovative control technology as BACT for microchip manufacturing operations. The target compounds were acetone, methylethylketone (MEK) and 1,1,1-trichloroethane, and compound concentrations ranged from 10-100 ppmv. The single stage packed tower scrubber consistently achieved greater than 90% removal efficiency on the target compounds. The residence time required in the UV oxidation system for effective oxidation of the target compounds proved significantly longer than the residence time predicted by the manufacturer.

BACT Pilot Testing of Venturi Scrubber on Gas/Aerosol VOC Emission Source. Technical advisor for project to evaluate venturi scrubber as BACT for mixed phase aerosol/gaseous hydrocarbon emissions from deep fat fryer. Venturi scrubber demonstrated high removal efficiency on aerosol, low efficiency on VOC emissions. A number of VOC tests indicated negative removal efficiency. This anomaly was traced to a high hydrocarbon concentration in the scrubber water. The pilot unit had been shipped directly to the jobsite from another test location by the manufacturer without any cleaning or inspection of the pilot unit.

Pulp Mill Recovery Boiler BACT Evaluation. Lead engineer for BACT analysis for control of SO_2, NO_x, CO, TNMHC, TRS and particulate emissions from the proposed addition of a new recovery furnace at a kraft pulp mill in Washington. A "top down" approach was used to evaluate potential control technologies for each of the pollutants considered in the evaluation.

Air Pollution Control Equipment Design Specification Development. Lead engineer for the development of detailed Navy design specifications for wet scrubbers and mist eliminators. Design specifications were based on field performance evaluations conducted at the Long Beach Naval Shipyard, Norfolk Naval Shipyard, and

Jacksonville Naval Air Station. This work was performed for the U.S. Navy to provide generic design specifications to assist naval facility engineering divisions with air pollution control equipment selection. Also served as project engineer for the development of Navy design specifications for ESPs and fabric filters.

CONTINUOUS EMISSION MONITOR (CEM) PROJECT EXPERIENCE

Process Heater CO and NO_x CEM Relative Accuracy Testing. Project manager and lead engineer for process heater CO and NO_x analyzer relative accuracy test program at petrochemical manufacturing facility. Objective of test program was to demonstrate that performance of onsite CO and NO_x CEMs was in compliance with U.S. EPA "Boiler and Industrial Furnace" hazardous waste co-firing regulations. A TECO Model 48 CO analyzer and a TECO Model 10 NO_x analyzer were utilized during the test program to provide $\pm$1 ppm measurement accuracy, and all test data was recorded by an automated data acquisition system. One of the two process heater CEM systems tested failed the initial test due to leaks in the gas conditioning system. Troubleshooting was performed using O_2 analyzers, and the leaking component was identified and replaced. This CEM system met all CEM relative accuracy requirements during the subsequent retest.

Performance Audit of NO_x and SO_2 CEMs at Coal-Fired Power Plant. Lead engineer on system audit and challenge gas performance audit of NO_x and SO_2 CEMs at a coal-fired power plant in southern Nevada. Dynamic and instrument calibration checks were performed on the CEMs. A detailed visual inspection of the CEM system, from the gas sampling probes at the stack to the CEM sample gas outlet tubing in the CEM trailer, was also conducted. The CEMs passed the dynamic and instrument calibration requirements specified in EPA's Performance Specification Test - 2 (NO_x and SO_2) alternative relative accuracy requirements.

PETROLEUM REFINERY AIR EMISSIONS INVENTORIES

Criteria and Air Toxic Pollutant Emissions Inventory for Proposed Refinery Modifications. Project manager and technical lead for development of baseline and future refinery air emissions inventories for process modifications required to produce oxygenated gasoline and desulfurized diesel fuel at a California refinery. State-of-the-art criteria and air toxic pollutant emissions inventories for refinery point, fugitive and mobile sources were developed. Point source emissions estimates were generated using onsite criteria pollutant test data, onsite air toxics test data, and the latest air toxics emission factors from the statewide refinery air toxics inventory database. The fugitive volatile organic compound (VOC) emissions inventories were developed using the refinery's most recent inspection and maintenance (I&M) monitoring program test data to develop site-specific component VOC emission rates. These VOC emission rates were combined with speciated air toxics test results for the principal refinery process streams to produce fugitive VOC air toxics emission rates. The environmental impact report (EIR) that utilized this emission inventory data was the first refinery "Clean Fuels" EIR approved in California.

Air Toxic Pollutant Emissions Inventory for Existing Refinery. Project manager and technical lead for air toxic pollutant emissions inventory at major California refinery. Emission factors were developed for refinery heaters, boilers, flares, sulfur recovery units, coker deheading, IC engines, storage tanks, process fugitives, and catalyst regeneration units. Onsite source test results were utilized to characterize emissions from refinery combustion devices. Where representative source test results were not available, AP-42 VOC emission factors were combined with available VOC air toxics speciation profiles to estimate VOC air toxic emission rates. A risk assessment based on this emissions inventory indicated a relatively low health risk associated with refinery operations. Benzene, 1,3-butadiene and PAHs were the principal health risk related pollutants emitted.

Air Toxics Testing of Refinery Combustion Sources. Project manager for comprehensive air toxics testing program at a major California refinery. Metals, Cr^{+6}, PAHs, H_2S and speciated VOC emissions were measured from refinery combustion sources. High temperature Cr^{+6} stack testing using the EPA Cr^{+6} test method was performed for the first time in California during this test program. Representatives from the California Air Resources Board source test team performed simultaneous testing using ARB Method 425 (Cr^{+6}) to compare the results of EPA and ARB Cr^{+6} test methodologies. The ARB approved the test results generated using the high temperature EPA Cr^{+6} test method.

Air Toxics Testing of Refinery Fugitive Sources. Project manager for test program to characterize air toxic fugitive VOC emissions from fifteen distinct process units at major California refinery. Gas, light liquid, and heavy liquid process streams were sampled. BTXE, 1,3-butadiene and propylene concentrations were quantified in gas samples, while BTXE, cresol and phenol concentrations were measured in liquid samples. Test results were combined with AP-42 fugitive VOC emission factors for valves, fittings, compressors, pumps and PRVs to calculate fugitive air toxics VOC emission rates.

AIR ENGINEERING/AIR TESTING PROJECT EXPERIENCE – GENERAL

Reverse Air Fabric Filter Retrofit Evaluation – Coal-Fired Boiler. Lead engineer for upgrade of reverse air fabric filters serving coal-fired industrial boilers. Fluorescent dye injected to pinpoint broken bags and damper leaks. Corrosion of pneumatic actuators serving reverse air valves and inadequate insulation identified as principal causes of degraded performance.

Pulse-Jet Fabric Filter Performance Evaluation – Gold Mine. Lead engineer on upgrade of pulse-jet fabric filter and associated exhaust ventilation system serving an ore-crushing facility at a gold mine. Fluorescent dye used to identify bag collar leaks, and modifications were made to pulse air cycle time and duration. This marginal source was in compliance at 20 percent of emission limit following completion of repair work.

Pulse-Jet Fabric Filter Retrofit - Gypsum Calciner. Lead engineer on upgrade of pulse-jet fabric filter controlling particulate emissions from a gypsum calciner. Recommendations included a modified bag clamping mechanism, modified hopper evacuation valve assembly, and changes to pulse air cycle time and pulse duration.

Wet Scrubber Retrofit – Plating Shop. Project engineer on retrofit evaluation of plating shop packed-bed wet scrubbers failing to meet performance guarantees during acceptance trials, due to excessive mist carryover. Recommendations included relocation of the mist eliminator (ME), substitution of the original chevron blade ME with a mesh pad ME, and use of higher density packing material to improve exhaust gas distribution. Wet scrubbers passed acceptance trials following completion of recommended modifications.

Electrostatic Precipitator (ESP) Retrofit Evaluation – MSW Boiler. Lead engineer for retrofit evaluation of single field ESP on a municipal solid waste (MSW) boiler. Recommendations included addition of automated power controller, inlet duct turning vanes, and improved collecting plate rapping system.

ESP Electric Coil Rapper Vibration Analysis Testing - Coal-Fired Boiler. Lead engineer for evaluation of ESP rapper effectiveness test program on three field ESP equipped with "magnetically induced gravity return" (MIGR) rappers. Accelerometers were placed in a grid pattern on ESP collecting plates to determine maximum instantaneous plate acceleration at a variety of rapper power setpoints. Testing showed that the rappers met performance specification requirements.

Aluminum Remelt Furnace Particulate Emissions Testing. Project manager and lead engineer for high temperature (1,600 ^{o}F) particulate sampling of a natural gas-fired remelt furnace at a major aluminum rolling mill. Objectives of test program were to: 1) determine if condensable particulate was present in stack gases, and 2) to validate the accuracy of the in-stack continuous opacity monitor (COM). Designed and constructed a customized high temperature (inconel) PM_{10}/Mtd 17 sampling assembly for test program. An onsite natural gas-fired boiler was also tested to provide comparative data for the condensable particulate portion of the test program. Test results showed that no significant levels of condensable particulate in the remelt furnace exhaust gas, and indicated that the remelt furnace and boiler had similar particulate emission rates. Test results also showed that the COM was accurate.

Aluminum Remelt Furnace CO and NO_x Testing. Project manager and lead engineer for continuous week-long testing of CO and NO_x emissions from aluminum remelt furnace. Objective of test program was to characterize CO and NO_x emissions from representative remelt furnace for use in the facility's criteria pollution emissions inventory. A TECO Model 48 CO analyzer and a TECO Model 10 NO_x analyzer were utilized

during the test program to provide ±1 ppm measurement accuracy, and all test data was recorded by an automated data acquisition system.

PUBLICATIONS

W.E. Powers, *"Peak and Annual Average Energy Efficiency Penalty of Optimized Air-Cooled Condenser on 515 MW Fossil Fuel-Fired Utility Boiler,"* presented at California Energy Commission/Electric Power Research Institute Advanced Cooling Technologies Symposium, Sacramento, California, June 2005.

W.E. Powers, R. Wydrum, P. Morris, *"Design and Performance of Optimized Air-Cooled Condenser at Crockett Cogeneration Plant,"* presented at EPA Symposium on Technologies for Protecting Aquatic Organisms from Cooling Water Intake Structures, Washington, DC, May 2003.

P. Pai, D. Niemi, W.E. Powers, *"A North American Anthropogenic Inventory of Mercury Emissions,"* to be presented at Air & Waste Management Association Annual Conference in Salt Lake City, UT, June 2000.

P.J. Blau and W.E. Powers, *"Control of Hazardous Air Emissions from Secondary Aluminum Casting Furnace Operations Through a Combination of: Upstream Pollution Prevention Measures, Process Modifications and End-of-Pipe Controls,"* presented at 1997 AWMA/EPA Emerging Solutions to VOC & Air Toxics Control Conference, San Diego, CA, February 1997.

W.E. Powers, et. al., *"Hazardous Air Pollutant Emission Inventory for Stationary Sources in Nogales, Sonora, Mexico ,"* presented at 1995 AWMA/EPA Emissions Inventory Specialty Conference, RTP, NC, October 1995.

W.E. Powers, *"Develop of a Parametric Emissions Monitoring System to Predict NO_x Emissions from Industrial Gas Turbines,"* presented at 1995 AWMA Golden West Chapter Air Pollution Control Specialty Conference, Ventura, California, March 1995.

W. E. Powers, et. al., *"Retrofit Control Options for Particulate Emissions from Magnesium Sulfite Recovery Boilers,"* presented at 1992 TAPPI Envr. Conference, April 1992. Published in *TAPPI Journal*, July 1992.

S. S. Parmar, M. Short, W. E. Powers, *"Determination of Total Gaseous Hydrocarbon Emissions from an Aluminum Rolling Mill Using Methods 25, 25A, and an Oxidation Technique,"* presented at U.S. EPA Measurement of Toxic and Related Air Pollutants Conference, May 1992.

N. Meeks, W. E. Powers, *"Air Toxics Emissions from Gas-Fired Internal Combustion Engines,"* presented at AIChE Summer Meeting, August 1990.

W. E. Powers, *"Air Pollution Control of Plating Shop Processes,"* presented at 7th AES/EPA Conference on Pollution Control in the Electroplating Industry, January 1986. Published in *Plating and Surface Finishing* magazine, July 1986.

AWARDS

Engineer of the Year, 1991 – ENSR Consulting and Engineering, Camarillo
Engineer of the Year, 1986 – Naval Energy and Environmental Support Activity, Port Hueneme
Productivity Excellence Award, 1985 – U. S. Department of Defense

PATENTS

Sedimentation Chamber for Sizing Acid Mist, Navy Case Number 70094

William E. Powers cases in the last four years include:

1. 2003 Salem Harbor, MA PC coal plant retrofit, SO2 to SO3 conversion across SCR (MADEP Application No. MBR-01-729-001, MADEP contact: Ed Bracyzk, (978) 661-7645)

2. 2003 Thoroughbred, KY PC coal plant – IGCC alternative (deposition attached)

3. 2004 Weston Unit 4, WI PC coal plant – IGCC alternative and dry cooling (initial testimony attached)

4. 2005 Danskammer, NY coal plant – conversion from once-through cooling to closed-cycle wet cooling (case reference NYDEC #3-3346-00011/00002, SPDES # NY-0006262)

5. 2005 Springfield, MO PC coal plant – BACT for NOx and SO2 control systems. Case reference: Springfield, MO coal plant: In the matter of Appeal of City Utilities of Springfield, MO Permit No. 12004-007, Project No. 2993-04-113 Linda Chipperfield, et al., Petitioners, vs. Missouri Department of Natural Resources, Respondent, City Utilities of Springfield, Intervenor-Respondent, Appeal No. 05-139PA

6. 2006 Greene Energy coal-fired CFB – BACT/LAER NOx control for CFB is SCR (see attached testimony and hearing transcript)

7. 2006 Spurlock 4 coal-fired CFB - BACT/LAER NOx control for CFB is SCR (see attached testimony and hearing transcript)

8. 2007 TXU (Texas) pulverized-coal fired power plant air permits – BACT should be IGCC

9. 2007 Vanderham Dairy – calculation of VOC potential to emit from dairy emission sources.

10. 2007 SME CFB case (Montana) - Before the Board of Environmental Review of the State of Montana, Case No. BER 2007-07-AQ (deposition transcript attached)

11. 2007 Plant Stuart (Ohio) NSR case – calculation of emissions increases cases by power plant equipment replacement projects.

12. 2007 Mountaineer IGCC project (West Virginia) – expert report on testimony of cost and alternatives to proposed coal-fired IGCC project.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

Oct 6 1987

MEMORANDUM

SUBJECT: Emissions from Landfills

FROM: Gerald A. Emison, Director Office of Air Quality Planning and Standards (MD-10)

TO: David P. Howekamp, Director Air Management Division, Region IX

This is in response to your September 1, 1987, memorandum requesting clarification regarding how landfill emissions should be considered for the purpose of determining nonattainment new source review (NSR) applicability under 40 CFR 51.18.

As you are aware, a landfill is subject to NSR if its potential to emit, excluding fugitive emissions, exceeds the 100 tons per year applicable major source cutoff for the pollutant for which the area is nonattainment. Fugitive emissions are defined in 40 CFR (j)(1)(ix) as ". . . those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening." Landfill emissions that could reasonably be collected and vented are therefore not considered fugitive emissions and must be included in calculating a source's potential to emit.

For various reasons (e.g., odor and public health concerns, local regulatory requirements, economic incentives), many landfills are constructed with gas collection systems. Collected landfill gas may be flared, vented to the atmosphere, or processed into useful energy end products such as high-Btu gas, steam, or electricity. In these cases, for either an existing or proposed landfill, it is clear that the collected landfill gas does not qualify as fugitive emissions and must be included in the source's potential to emit when calculating NSR applicability.

The preamble to the 1980 NSR regulations characterizes nonfugitive emissions as ". . . those emissions which would ordinarily be collected and discharged through stacks or other functionally equivalent openings." Although there are some exceptions, it is our understanding that landfills are not ordinarily constructed with gas collection systems. Therefore, emissions from existing or proposed landfills without gas collection systems are to be considered fugitive emissions and are not included in the NSR applicability determination. This does not mean that the applicant's decision on whether to collect emissions is the deciding factor; in fact, the reviewing authority makes the decision on which emissions would ordinarily be collected and which therefore are not considered fugitive emissions.

It should be noted that NSR applicability is pollutant specific. Therefore, where the landfill gas is flared or otherwise combusted or processed before release to the atmosphere, it is the pollutant released, which counts toward NSR applicability. As an example, landfill gas is composed mostly of volatile organic compounds, but when this gas is burned in a flare, it is the type and quantity of pollutants in the exhaust gas (e.g., nitrogen oxides and carbon monoxide) that are used in the NSR applicability determination.

If you have any questions regarding this matter, please contact Gary McCutchen, Chief, New Source Review Section, at FTS 629-5592.

cc: Chief, Air Branch
Regions I-X

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

MEMORANDUM

DATE: 01 SEP 1987

SUBJECT: Control of Emissions from Landfills

FROM: David P. Howekamp, Director Air Division

TO: Gerald Emison, Director Office of Air Quality Planning and Standards (MD-10)

On May 28, 1987, Region IX received an inquiry from Mr. Russ Baggerly regarding a proposed landfill in Ventura County, California (copy enclosed). Mr. Baggerly's concern, from an air quality point of view, is over significant fugitive emissions of reactive organic compounds from the site itself, and ROC and NOx from associated mobile sources and possible IC engines.

Our proposed response (enclosed) delineates the exclusion of fugitive emissions from NSR regulations. The critical question then becomes, what is the meaning of the definition of fugitive emissions stated in 40 CFR 51.18? As defined they are "those emissions which could not reasonably pass through a stack, chimney, vent or other functionally equivalent opening." If emissions from a landfill could feasibly be collected and passed through a gas recovery system, what criteria would be needed to then call it a reasonable option? Is it possible that such a landfill could be required to collect these emissions? This has not been done in the past. Please send us a written response providing guidance on this issue.

Enclosures

cc: G. McCutchen, RTP

22 May 1987

Mr. David P. Howekamp
Director - Air Management Division
United States Environmental Protection Agency
Region IX
215 Fremont Street
San Francisco, CA 94105

Dear Mr. Howekamp:

An interesting problem is about to surface here in Ventura County in regards to a possible major source. That source is a canyon landfill site currently in the process for environmental review through the Resource Management Agency of Ventura County.

Previous environmental review concerning this site was documented in the County Solid Waste Management Plan (CoSWMP). It was this document that originally divulged the fact that the Weldon Canyon landfill site, based upon the projected wastestream, would have the potential of emitting more than 100 TPY of ROC. Further study reveals that even after gas recovery mitigation the site will produce more than 100 TPY. This would of course make the project a Major Stationary Source according to 40 CFR Ch.1 Section 51.18 et seq..

The specific problems are these; 1. the district has never issued a permit for a landfill site as an area source. They have issued permits for the IC engines used for electrical generation on other sites for NOx, but landfill site fugitive emissions have never been permitted. 2. The incremental indirect emissions from mobile sources associated with this project may or may not be included in the total number of emissions attributed to this project. 3. The total emissions from the landfill site should be the Nox and ROC emissions from mobile, IC engine and all other sources added to the primary source that are the fugitive emissions from the site itself.

What I would like to know is how EPA views landfill sites, and the procedure for permitting such a source. Are all the emissions associated with the site accumulated into one figure for calculating the offsets required; e.g. incremental indirect (mobile) emissions, sludge drying ponds, leachate retention ponds, gas recovery wells, electrical generating engines, and the fugitive emissions from the landfill site itself. The possibility of emissions from all mitigation measures employed at the site should be included.

Thank you for your time and consideration concerning this item of some concern to the people of the Ojai Valley Airshed.

Respectfully,

Russ Baggerly
119 S. Poli Avenue
Meiners Oaks, CA 93023

March 8, 1994

MEMORANDUM

SUBJECT: Consideration of Fugitive Emissions in Major Source Determinations

FROM: Lydia Wegman, Deputy Director /s/
Office of Air Quality Planning and Standards (MD-10)

TO: Director, Air, Pesticides and Toxics Management Division, Regions I and IV
Director, Air and Waste Management Division, Region II
Director, Air, Radiation and Toxics Division, Region III
Director, Air and Radiation Division, Region V
Director, Air, Pesticides and Toxics Division, Region VI
Director, Air and Toxics Division, Regions VII, VII, IX, and X

This memorandum summarizes the Environmental Protection Agency's (EPA's) policy regarding the consideration of fugitive emissions for the purpose of determining whether a source is major under the Clean Air Act (Act). As explained below, EPA will revisit, in a future revision to the part 70 regulations ("Operating Permit Programs"), the requirement to consider fugitives from sources subject to national emission standard for hazardous air pollutants (NESHAP) and new source performance standards (NSPS) promulgated after August 7, 1980, when determining whether a source is major under section 302(j) of the Act. For the present time, State operating permits programs that do not require consideration of fugitives for these sources will be eligible for interim approval. States must require consideration of fugitives for purposes of determining whether a source is major under section 112, but need not require consideration of fugitives for purposes of the new major source definitions in part D of title I of the Act.

I. Background: Statutory and Regulatory Provisions Affected

A. Section 302(j) and Section 169(1)

The Act's primary definition of "major stationary source" and "major emitting facility" is found in section 302(j) in the general definitions portion of the Act. It reads:

> Except as otherwise provided, the terms "major stationary source" and "major emitting facility" mean any stationary facility or source of air pollutants which directly emits, or has the potential to emit, 100 tons per year (tpy) or more of any air pollutant (including any major emitting facility or source of fugitive emissions of any such pollutant, as determined by rule by the Administrator).

The section 302(j) definition was added to the Act in 1977. Another definition of "major emitting facility" was added in 1977 in section 169(1). It sets a higher 250 tpy threshold for certain source categories for purposes of part C preconstruction review.

B. Lower Threshold Definitions Added by the 1990 Amendments to the Act

The 1990 Amendments added nine new definitions of "major source" or "major stationary source." Seven of these definitions appear in part D of title I and expand the set of "major stationary sources" of volatile organic compounds, particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers (PM-10), and CO for nonattainment areas by lowering the tonnage threshold below the 100 tpy specified in section 302(j).[1]

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[1]These are, specifically: §182(c), "Serious Areas" for ozone nonattainment; §182(d), "Severe Areas" for ozone nonattainment; §182(e), "Extreme Areas" for ozone nonattainment; §182(b)(1)(A)(ii)(I), new source review in "moderate areas" for ozone nonattainment; §187(c), "Serious Areas" for carbon monoxide nonattainment; §184(b)(2), interstate ozone control; §189(b)(3), "Serious Areas" for PM-10 nonattainment.

The other two new definitions are found in section 112(a)(1) and title V.[2] Section 112 provides a definition of "major source" similar to the definition of "major stationary source" and "major emitting facility" in part D of title I only tailored to the new hazardous air pollutants (HAP) provisions. The title V definition incorporates by reference all of the other "major source" and "major stationary source" definitions.

C. "Major Source" Definitions in Part 70

The definition of "major source" in section 70.2 of the permits rule divides into three parts, corresponding to the section 112 definition, the section 302(j) definition, and the lower tpy thresholds in the title I nonattainment provisions, respectively. The second definition, corresponding to section 302(j), requires the counting of fugitive emissions only for certain listed source categories. The other two part 70 definitions are silent on the issue of when fugitive emissions must be considered.

The section 302(j) definition lists 27 categories of sources for which fugitive emissions must be considered in determining whether a source is major for purposes of section 302(j). The twenty-seventh category requires that fugitive emissions be considered for:

> All other stationary source categories regulated by a standard promulgated under section 111 or 112 of the Act, but only with respect to those air pollutants that have been regulated for that category.

For present purposes, this should be contrasted with the corresponding provisions in the prevention of significant deterioration (PSD) and new source review (NSR) regulations (see, e.g., 40 CFR §51.165(a)(1)(iv)(C)), which refer to:

> Any other stationary source category which, as of August 7, 1980, is being regulated under section 111 or 112 of the Act.

---

[2]Section 501(a)(1) provides: The term "major source" means any stationary source (or any group of stationary sources located within a contiguous area and under common control) that is either of the following: (a) a major source as defined in section 112, and (b) a major stationary source as defined in section 302 or part D of title I.

Regarding the first and third parts of the part 70 "major source" definition, the question of when fugitive emissions must be considered for applicability purposes was addressed directly in the response to comments document for the part 70 rulemaking. Section 3.5 of the response document states that the Act requires fugitives to be considered for purposes of determining whether a source is major under any of the part D or the section 112 definitions.

II. Summary of EPA Policy

In response to questions raised following promulgation of part 70, EPA has reconsidered the treatment of fugitives for purposes of making major source determinations. The EPA's decisions regarding the relevant provisions is summarized below in three parts.

A. Sources Subject to NSPS or NESHAP Standards Promulgated after August 7, 1980

The designation in the part 70 rules of sources subject to NSPS and NESHAP promulgated after August 7, 1980 as sources for which fugitives must be counted for purposes of major source determinations did not follow the procedural steps necessary for a proper rulemaking under section 302(j). As a result, EPA believes it would be inappropriate for the Agency to require States to count fugitives from these sources in making section 302(j) major source determinations. In the absence of a legally-sound Federal requirement, a State may choose to exercise its own legal authority to require that fugitives from sources subject to the post-1980 standards be considered in determining major source status under section 302(j). However, a State need not require that fugitives from these sources be so counted in order to obtain interim approval of its title V program.

The EPA intends to revisit this aspect of the rule in a revision to part 70 to occur sometime in 1994. The EPA believes that it may, in the mean time, grant interim approval to programs that do not require fugitives to be considered in determining the status of sources subject to post-1980 NSPS and NESHAP standards. However, until the rule is revised with respect to sources subject to the post-1980 standards, EPA may not grant full approval to a State program that does not include the post-1980 standards. Programs adhering to the language in the current rule will be eligible for full approval provided, as is the case for any element of part 70, the State has provided adequate legal authority for that element of its program.

Note that the policy articulated in section C below regarding the section 112 major source definition operates

independently of a State's decision to list the post-1980 NESHAP standards for purposes of determining whether a source is major under the section 302(j) definition. Therefore, in determining whether a source is major for section 112 purposes, a source must

consider fugitive emissions of HAP listed pursuant to section 112(b) regardless of whether the source is in a category designated through rulemaking under section 302(j).

B. Definitions of "Major Stationary Source" in Part D of Title I

The EPA has revised its interpretation of the Act from that stated in the response to comments document. The EPA now believes the Act does not require fugitives to be considered for purposes of determining major source status in these nonattainment areas, except as provided pursuant to rulemaking under section 302(j). State programs that follow this revised interpretation will be eligible for full approval, as will programs that follow the more inclusive policy articulated in the response to comments document, provided the more inclusive program is supported by adequate State law authority.

The legal rationale for this position is that nothing in the statute or the legislative history of the Part D definitions indicates an intent to depart from the section 302(j) requirement that rulemaking be done before fugitives are included for applicability purposes in nonattainment areas. To the contrary, the explicit reference in most of these Part D definitions back to section 302(j), and the fact that these provisions address a broad universe of sources emitting a particular pollutant or class of pollutants, suggests that the section 302(j) rulemaking requirement carries over to these definitions. It is therefore permissible to read the Act not to require the consideration of fugitive emissions for these purposes.

C. Definition of "Major Source" in Section 111

The EPA continues to believe the Act requires that fugitive emissions, to the extent quantifiable, must be considered in determining major source status for all section 112 purposes. This policy applies to a source of any of the section 112(b) listed pollutants whether or not the source in question is in a category listed pursuant to section 112(c). The EPA expects States to comply with this policy in their operating permits program submittals.

The section 112 "major source" definition is distinguishable legally from the Part D definitions in some important respects. Section 112 uses the term "major source" as opposed to "major stationary source," and legislative history indicates an intent to treat this definition as distinct from the section 302(j) "major stationary source" definition. Moreover, section 112 establishes a new regulatory program wherein Congress has narrowed the regulatory concern to specific pollutants at

specific source categories to be determined by EPA. All of this suggests that the section 302(j) rulemaking requirement does not apply in the context of section 112, and that fugitive emissions must therefore be included for purposes of determining whether a source is major under section 112.

D. Collocation of Sources

Questions have also been raised regarding the treatment of fugitive emissions where sources in categories listed pursuant to section 302(j) are collocated with sources that are not in any of the listed categories. The EPA intends to follow the policies established in implementation of the PSD and NSR programs. Only the fugitive emissions from the listed source are required to be counted for purposes of determining major source status. Where there is a collocated source that is not on the source category list and where the nonlisted source is the primary activity at the site, fugitive emissions would not need to be counted from the collocated, nonlisted source. The EPA will issue case examples to help clarify application of this principle in the near future.

For further information, please contact Kirt Cox, Operating Permits Policy Section, at (919) 541-5399, or Adan Schwartz, Office of General Counsel, at (202) 260-7632.

cc: Air Branch Chief, Regions I-X
Regional Counsel, Regions I-X
M. Winer
M. Miller
K. Stein

OAQPS:AQMD:PPB:OPPS:K.Cox/C.Bradsher(541-5399/MU)3/7/94.
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October 21, 1994

MEMORANDUM

SUBJECT: Classification of Emissions from Landfills for NSR Applicability Purposes

FROM: John S. Seitz, Director
Office of Air Quality Planning and Standards (MD-10)

TO: Director, Air, Pesticides and Toxics
Management Division, Regions I and IV
Director, Air and Waste Management Division,
Region II
Director, Air, Radiation and Toxics Division,
Region III
Director, Air and Radiation Division,
Region V
Director, Air, Pesticides and Toxics Division,
Region VI
Director, Air and Toxics Division,
Regions VII, VIII, IX and X

The EPA has recently received several inquiries regarding the treatment of emissions from landfills for purposes of major NSR applicability. The specific issue raised is whether the Agency still considers landfill gas emissions which are not collected to be fugitive for NSR applicability purposes.

The EPA's NSR regulations define "fugitive emissions" to mean "those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening" (40 CFR 51.165(a)(1)(x)). In general, where a facility is not subject to national standards requiring collection, the technical question of whether the emissions at a particular site could "reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening" is a factual determination to be made by the permitting authority, on a case-by-case basis.

In determining whether emissions could reasonably be collected (or if any emissions source could reasonably pass through a stack, etc.), "reasonableness" should be construed broadly. The existence of collection technology in use by other sources in the source category creates a presumption that collection is reasonable. Furthermore, in certain circumstances, the collection of emissions from a specific pollutant emitting activity can create a presumption that collection is reasonable for a similar pollutant-emitting activity, even if that activity is located within a different source category.

In 1987, EPA addressed whether landfill gas emissions should be considered as fugitive.[1] The Agency explained that for landfills constructed or proposed to be constructed with gas collection systems, the collected landfill gas would not qualify as fugitive. Also, the Agency understood at the time that, with some exceptions, landfills were not constructed with such gas collection systems. The EPA explained that "[t]he preamble to the 1980 NSR regulations characterizes nonfugitive emissions as emissions which would ordinarily be collected and discharged through stacks or other functionally equivalent openings'" (see 45 FR 52693, Aug. 7, 1980).[2] Based on the "understanding that landfills are not ordinarily constructed with gas collection systems," the Agency concluded that "emissions from existing or proposed landfills without gas collection systems are to be considered fugitive emissions." The Agency also made clear, however, that the applicant's decision on whether to collect emissions is not the deciding factor. Rather, it is the reviewing authority that makes the decision regarding which emissions can reasonably be collected and therefore not considered fugitive.

The EPA believes its 1987 interpretation of the 1980 preamble may have been misunderstood, and in any case that its factual conclusions at that time are now outdated. Continued misunderstanding or application of this outdated view could discourage those constructing new landfills from utilizing otherwise environmentally- or economically-desirable gas collection and mitigation measures in order to avoid major NSR applicability.

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[1]See memorandum entitled "Emissions from Landfills," from Gerald A. Emison, Director, Office of Air Quality Planning and Standards, to David P. Howekamp, Director, Air Management Division, Region IX, dated October 6, 1987 (attached). It is important to note that the interpretation contained in this memorandum was only applicable to landfills.

[2]In fact, the 1980 preamble language recognized the concern that sources could avoid NSR by calling emissions fugitives, even if the source could capture those emissions. The EPA's originally-proposed definition of fugitive emissions was changed in the final 1980 regulations to "ensure that sources will not discharge as fugitive emissions those emissions which would ordinarily be collected and discharged through stacks or other functionally equivalent openings, and will eliminate disincentives for the construction of ductwork and stacks for the collection of emissions." Id.

Specifically with regard to landfill gas emissions, gas collection and mitigation technologies have evolved significantly since 1987, and use of these systems has become much more common. Increasingly, landfills are constructed or retrofitted with gas collection systems for purposes of energy recovery and in order to comply with State and Federal regulatory requirements designed to address public health and welfare concerns. In addition, EPA has proposed performance standards for new landfills under section 111(b) of the Clean Air Act and has proposed guidelines for existing landfills under section 111(d) that, when promulgated, will require gas collection systems for existing and new landfills that are above a certain size and gas production level (see 56 FR 24468, May 30, 1991). Under these requirements, EPA estimates that between 500 and 700 medium and large landfills will have to collect and control landfill gas. The EPA believes this proposal created a presumption at that time that the proposed gas collection systems, at a minimum, are reasonable for landfills that would be subject to such control under the proposal.

Thus, EPA believes it is no longer appropriate to conclude generally that landfill gas could not reasonably be collected at a proposed landfill project that does not include a gas collection system. The fact that a proposed landfill project does not include a collection system in its proposed design is not determinative of whether emissions from a landfill are fugitive. To quantify the amount of landfill gas which could otherwise be collected at a proposed landfill for NSR applicability purposes, the air pollution control authority should assume the use of a collection system which has been designed to maximize, to the greatest extent possible, the capture of air pollutants from the landfill.

In summary, the use of collection technology by other landfill sources, whether or not subject to EPA's proposed requirements or to State implementation plan or permit requirements, creates a presumption that collection of the emissions is reasonable at other similar sources. If such a system can reasonably be designed to collect the landfill's gas emissions, then the emissions are not fugitive and should be considered in determining whether a major NSR permit is required.

Today's guidance is applicable to the construction of a new landfill or the expansion of an existing landfill beyond its currently-permitted capacity. To avoid any confusion regarding the applicability of major NSR to existing landfills, EPA does not plan to reconsider or recommend that States reconsider the major NSR status of any existing landfill based on the issues discussed in this memorandum. Also, nothing in this guidance voids or creates an exclusion from any otherwise applicable requirement under the Clean Air Act and the State implementation plan, including minor source review.

The Regional Offices should send this memorandum, including the attachment, to States within their jurisdiction. Questions concerning specific issues and cases should be directed to the appropriate Regional Office. Regional Office staff may contact Mr. David Solomon, Chief, New Source Review Section, at (919) 541-5375, if they have any questions.

Attachment

cc: Air Branch Chief, Regions I-X
NSR Contacts, Regions I-X and Headquarters

bcc: L. Wegman
S. Shaver
S. Hitte
E. Lillis
D. Solomon
Cindy Jacobs, OAP
Mark Najarian, MD-13
Susan Thorneloe, MD-63
Julie Domike, OECA

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK NC 27711

MAR - 1,1996

Mr. Donald P. Gabrielson
Pinal County Air Quality Control District
Post Office Box 987
Florence, Arizona 85232

Dear Mr. Gabrielson:

Thank you for your letter of October 25, 1995 to Lydia Wegman regarding a clarification of the definition of “regulated pollutant" for the purpose of title V applicability determinations with respect to open-pit mining operations.

Prior to addressing your questions, I would like to apologize for the delay in responding to your letter. It is my understanding that during a discussion with Joanna Swanson of my staff, you indicated that you were more interested in our addressing some of the fundamental issues underlying your questions than in receiving our response by any specified deadline. The issues which you raise in your letter have been reviewed and discussed by staff within the Office of Air Quality Planning and Standards (particularly with people in the new source review and operating permits programs), Region IX, the Office of General Counsel, and the Office of Enforcement and Compliance Assurance. These discussions have delayed our response, but have hopefully resulted in a letter which is more useful to you.

- Where should the analytical quantification of “regulated emissions" occur?

Under this general question, you raise a particular question relative to Lydia Wegman's October 16, 1995 memorandum entitled "Definition of Regulated Pollutant for Particulate Matter for Purposes of Title V." Specifically, you ask where the quantification of PM-10 (particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers) should occur for purposes of title V applicability.

As you know, a source is determined to be a major source under title V based on its potential to emit. The October 16, 1995 memorandum was intended to provide guidance on what pollutant to consider in determining title V applicability, not to change the procedure for calculating potential to emit.

Nevertheless, if actual emissions are used as the basis for determining the potential to emit for a source, then these emissions should be measured at the point where emissions are released.

- For regulatory purposes, which emissions are "fugitive?"

Under this topic, you ask for the proper interpretation of fugitive emissions in relation to Lydia Wegman's memorandum of March 8, 1994 entitled "Consideration of Fugitive Emissions in Major Source Determinations." You specifically ask whether “the fact that some sources have actually installed capture-and-control systems on various crusher, screen, and conveyor drop facilities necessarily dictate that emissions from all such facilities be treated as nonfugitive?" As noted in the October 21, 1994 memorandum from John Seitz, which you cite, entitled "Classification of Emissions from Landfills for NSR Applicability Purposes," the use of collection technology by certain sources in a source category creates a presumption that collection is reasonable for all such sources in that category. As a result, although the use of capture-and-control systems on various pieces of equipment would not necessarily dictate that emissions from all such equipment in that category should be treated as nonfugitive, the presumption would be that these emissions are nonfugitive.

- Do sources fairly characterized as falling within the "source category" to which a pre-August 7, 1980 new source performance standard (NSPS) applies, but which sources are "grandfathered" around the NSPS applicability provisions, also need to include "fugitive" emissions in making a major source determination?

Fugitive emissions are to be included in major source determinations if a facility or source falls within a source category which has been listed pursuant to section 302(j) of the Act. Whether a facility has been regulated as an affected facility, and/or whether it is modifying or under construction, does not determine whether its fugitive emissions are to be counted in determining whether the source as a whole is major under title V. Rather, if a facility or source falls within a source category which has been listed pursuant to section 302(j) of the Act, then all fugitive emissions of any "air pollutant" [as EPA defines the term for purposes of 302(g) of the Act] from that facility or source are to be included in a title V applicability determination.

In regard to the aggregation of unlisted sources of fugitive

emissions with listed sources of fugitive emissions for purposes of determining whether a source is a major source, please refer to Lydia Wegman's memorandum of June 2, 1995 entitled "EPA Reconsideration of Application of Collocation Rules to Unlisted Sources of Fugitive Emissions for Purposes of Title V Permitting." This memorandum states that EPA is currently reconsidering its application of the collocation language in 40 CFR, part 70 as it applies to unlisted sources of fugitive emissions. Due to this reconsideration, EPA's interpretation of the part 70 collocation language (as announced in the preamble of the May, 1991 proposed part 70 rule) is no longer binding with respect to unlisted sources of fugitive emissions.

Nevertheless, absent a binding interpretation from EPA, permitting authorities have discretion in interpreting what part 70's collocation language requires with respect to unlisted sources of fugitive emissions. For example, permitting authorities have discretion to include fugitive emissions from sources outside of a listed source category, that are collocated with the affected facility, when they are determining whether the source as a whole is major under title V. Moreover, it is important to note that EPA is not reconsidering or rescinding its interpretation of the collocation provisions of the new source review regulations with respect to unlisted sources of fugitive emissions.

- To the extent that merely falling within a source category subject to a pre-August 7, 1980 NSPS does not inherently require inclusion of all “fugitive” emissions in a major source determination, which "fugitive" emissions at a facility are rendered "regulated" as a result of the actual installation of new facilities affected by a pre-August 7, 1980 NSPS?

As described above, fugitive emissions from a facility or source are to be included in major source determinations if the facility or source falls within a source category which has been listed pursuant to section 302(j) of the Act. As a result, the specific questions you raise need to be answered according to whether the facilities or operations in question fall within a source category listed pursuant to section 302(j).

In addition to the above questions, it is my understanding that, based on discussions you have had with Joanna Swanson of my staff, one NSPS of concern for a source in your district is the NSPS for metallic mineral processing plants (40 CFR, part 60, subpart LL). The information which you provided to our office regarding this source has been forwarded to Keith Brown in the Office of Enforcement and Compliance Assurance, the office

responsible for NSPS applicability determinations. Mr. Brown will be contacting you in the near future; however, for future reference, Mr. Brown can be reached at (202) 564-7124.

I appreciate this opportunity to be of service and trust this information will be helpful to you. Please understand these responses are intended solely as guidance as to how EPA would interpret its regulations in your situation, and are based on the information you have provided to EPA.

Sincerely,

Robert G. Kellam
Acting Director
Information Transfer and Program
Integration Division

February 10, 1999

MEMORANDUM

SUBJECT: Interpretation of the Definition of Fugitive Emissions in Parts 70 and 71

FROM: Thomas C. Curran, Director /s/
Information Transfer and Program
Integration Division (MD-12)

TO: Judith M. Katz, Director
Air Protection Division, Region III (3AT00)

This is in response to your memorandum of August 8, 1997 and subsequent discussions regarding the definition of "fugitive emissions." Specifically, you asked how this definition applies to the emissions of volatile organic compounds (VOC) from the printing industry, whiskey warehouses, paint manufacturing facilities, and other similar sources for purposes of title V. The delay in getting back to you was principally due to extensive consultation as needed among the various Headquarters and Regional Offices and has resulted in more technically and legally supportable policy.

When counting emissions to determine if a source exceeds the major source thresholds under title V (parts 70 and 71), nonfugitive VOC emissions are always counted. Fugitive VOC emissions, however, are counted only in certain circumstances. Because of this, the determination of whether emissions are fugitive or nonfugitive can be critically important for major source determinations under title V.

The EPA defines "fugitive emissions" in the regulations promulgated under title V as "those emissions which could not reasonably pass through a stack, chimney, vent, or other functionally-equivalent opening" (see title 40 of the Code of Federal Regulations, sections 70.2 and 71.2). This definition is identical to the definition of "fugitive emissions" adopted by EPA in the regulations implementing the new source review (NSR)

program. Given this, the precedents established in the NSR program should be relied on in interpreting the definition of "fugitive emissions" for purposes of title V.

In 1987 and again in 1994, EPA issued guidance regarding the classification of emissions from landfills for NSR applicability purposes.[1] In these guidance memorandums, EPA made clear that emissions which *are actually collected* are not fugitive emissions. Thus, for example, when a source is subject to a national standard requiring collection of emissions, these emissions cannot be considered fugitive. Whether or not a source is subject to such a national standard, emissions which pass through a stack, chimney, vent, or other functionally-equivalent opening are not fugitive.

Where emissions are not actually collected at a particular site, the question of whether the emissions are fugitive or nonfugitive should be based on a factual, case-by-case determination made by the permitting authority. As noted in EPA's 1994 guidance,

> In determining whether emissions could reasonably be collected (or if any emissions source could reasonably pass through a stack, etc.), "reasonableness" should be construed broadly. The existence of collection technology in use by other sources in a source category creates a presumption that collection is reasonable. Furthermore, in certain circumstances, the collection of emissions from a specific pollutant emitting activity can create a presumption that collection is reasonable for a similar pollutant-emitting activity, even if that activity is located within a different source category.

Based on the above principles, EPA believes it appropriate to presume that VOC emissions from the printing industry and paint manufacturers could reasonably be collected and thus are

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[1] See memorandums entitled "Classification of Emissions from Landfills for NSR Applicability Purposes" from John S. Seitz, Office of Air Quality Planning and Standards, to Air Division Directors, Regions I-X, dated October 21, 1994, and "Emissions from Landfills" from Gerald A. Emison, Director, Office of Air Quality Planning and Standards, to David P. Howekamp, Director, Air Management Division, Region IX, dated October 6, 1987.

not fugitive. In addition, unless this presumption is rebutted by the source, such emissions should be counted in major source determinations.

We have reached this conclusion for printers and paint manufacturers because certain printers are subject to national standards and State implementation plan (SIP) requirements (e.g., reasonably achievable control technology, best available control technology, or lowest achievable emissions rate) requiring collection. Moreover, sources in both of these source categories commonly employ collection devices. The common use of collection technology by other printing and paint manufacturing sources creates a presumption that collection of emissions is reasonable at other similar sources.

In the case of whiskey warehouses, the presumption that emissions could reasonably be collected is less compelling and may warrant further consideration by States in consultation with the EPA Regional Offices. For example, we are not aware of any national standards or SIP requirements for the collection of VOC emissions from whiskey warehouses, and we believe it is uncommon for them to have voluntarily installed collection devices. On the other hand, EPA is aware of warehouses in other source categories that collect emissions and thus a presumption is created that whiskey warehouse emissions could reasonably be collected. In addition, in a factual determination for a whiskey warehouse in the State of Indiana, EPA Region V found, after careful review, that the emissions of the warehouse were not fugitive.

In addition, you ask whether costs should be a factor used to determine if emissions can be reasonably collected. Obviously, when emissions are actually collected, cost considerations are irrelevant to determine whether emissions are fugitive. On the other hand, when a source does not actually collect its emissions, but there is a presumption that collection would be reasonable, a permitting authority could consider costs in determining whether this presumption is correct. However, when analyzing whether collection is reasonable for a particular source, the permitting authority should not focus solely on cost factors, nor should cost factors be given any more weight than other factors. Instead, the permitting authority should focus on determining whether a particular source is truly similar to the "similar sources" used to create the presumption. This determination can be made by looking at whether there are substantial differences in the technical or engineering characteristics of the sources. In this stage of the analysis, a comparison of the costs of collecting emissions could be relevant

where it illustrates the underlying technical or engineering differences. Moreover, keep in mind that title V does not impose any requirements on subject sources to collect (or control) their emissions and that collection is only assumed for the purpose of determining title V applicability. Thus, no source will ever be required to incur the costs of installing, operating, or maintaining collection devices (or control devices) because of a presumption that its emissions are not fugitive or subsequently because it is found to be subject to title V.

The approach for interpreting the definition of fugitive emissions outlined in this memorandum is consistent with the approach used historically by Headquarters, as well as the majority of EPA Regions and States. We believe, therefore, that the impact of this memorandum will be limited, both in the number of sources for which reclassification of emissions from fugitive to nonfugitive may be required, and to a greater extent, in the number of sources subject to reclassification from minor to major source.

We recognize that this interpretation may present enforcement issues for an unknown (but presumably small) number of sources whose initial title V applicability determinations were overly broad with respect to which emissions they have interpreted as being fugitive. Therefore, EPA recommends that the following steps be taken. If the policies of an EPA Region or State for interpreting the definition of fugitive emissions are consistent with the policies described in this memorandum, then the EPA Region or State should continue to enforce its policies as it has in the past. However, if the policies of an EPA Region or State have not been as inclusive as the policies described in this memorandum, then major sources that have not applied for operating permits on the basis of these less-inclusive policies should be instructed to immediately notify the State and EPA Region in writing of their obligation to obtain a title V permit. Such sources should be instructed to prepare and submit permit applications to the appropriate permitting authority as expeditiously as possible.

The EPA will use its enforcement discretion in deciding whether or not to seek an enforcement action against sources for failure to obtain an operating permit. However, factors that may be considered in deciding whether to seek enforcement action against sources may include whether the sources relied on less inclusive policies of a State or EPA Region and whether the sources expeditiously submit permit applications after they become aware of the national policy described in this memorandum.

If you have any questions, please contact Steve Hitte at 919-541-0886 or Jeff Herring at 919-541-3195 of the Operating Permits Group.

cc: Director, Office of Ecosystem Protection, Region I
Director, Division of Environmental Planning and Protection, Region II
Director, Air, Pesticides, and Toxics Management Division, Region IV
Director, Air and Radiation Division, Region V
Director, Multimedia Planning and Permitting Division, Region VI
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OAQPS/ITPID/OGC/JHerring:pfinch:MD-12:541-5281:12/4/98
Herring\katz-fug.def

Ex. BP 8

011959

VOC Cost Effectiveness for Dairy Digesters

Emission Factor for Digester

Number of Milk Cows	**9,049**	**cows**
Open Anaerobic Lagoon Emission Factor	**2.7**	**lb VOC/cow/yr**
Total VOC Emissions	**24,432**	**lb VOC/year**
Total VOC Emissions per ton	**12.21615**	**tons VOC/year**

Power Deliver Service Rates

Name	Winter ($/kWh)	Summer ($/kWh)	Average ($/kWh)
SCE	0.1027	0.1580	0.13035
PG&E	0.1577	0.1577	0.1577
TID	0.0873	0.0934	0.09035
MID	0.0799	0.0931	0.0865
		Overall Average	***0.1162***

Annual Benefit = $ 1,018.13 per kW-yr

Annual Savings = $ 921,306.74 per year

Anaerobic Digester System w/ IC Engine Control Efficiency *46%*

VOC Reductions from Control Technology **11,239 lb VOC/year**

5.6 ton VOC/year

Annualized Cost of Control System

Present Cost of Control Equipment w/Installation	*$600/cow*	P	$	5,429,400.00	— where from?
Interest Rate	*10%*	I		*10%*	
Equipment Life	*10 years*	n		*10*	
Equivalent Annual Capital Cost	[P(i)(1+i)n]+[(1+i)n-1] =	A	$	**883,609.85**	**per year**

Ongoing Costs of Control System

Generator Size	*0.1 kW/cow*	G		904.9	per kW
Operational and Maintenance Costs	*$0.01/kWh*	C	$	9.05	per hour
Annual O&M	G*C =	A O&M	$	**79,269.24**	**per year**

Total Annual Cost of Control System = $ 962,879.09 per year

Net Cost of Control System = $ 41,572.35 per year

Control System Efficiency = $ 7,397.97 per ton >> $5,000 / ton

Greenhouse Barns for Dairy Housing

Agricultural Engineers Digest

Published by: MidWest Plan Service | October 1996 | Rev. June 1997 | Price $4.00

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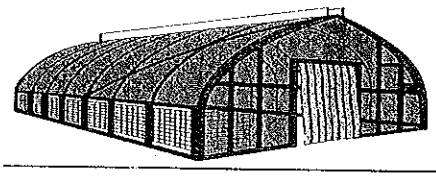
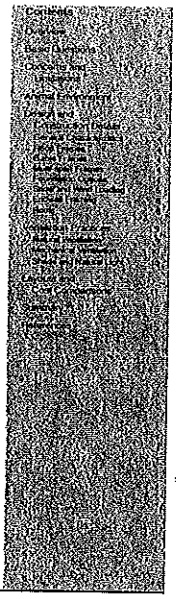
Greenhouse barns are receiving attention as housing for calves and cows. People using these structures often identify three main reasons for choosing this dairy housing option: the bright atmosphere the building provides; the improved health of the animals housed in these structures; a cost advantage over other forms of dairy housing. Whether these perceived advantages are real or not is a matter of some discussion. An objective analysis of the topic must include an evaluation of ventilation and cost issues.

To help producers and designers resolve some of the issues involved in using a greenhouse barn, this publication summarizes information about greenhouse barn design. It discusses economic factors that can be used to analyze design layouts and construction alternatives, and it compares the costs of greenhouse barns to the costs of conventional post frame structures to help determine if a greenhouse barn is suitable for a particular situation.





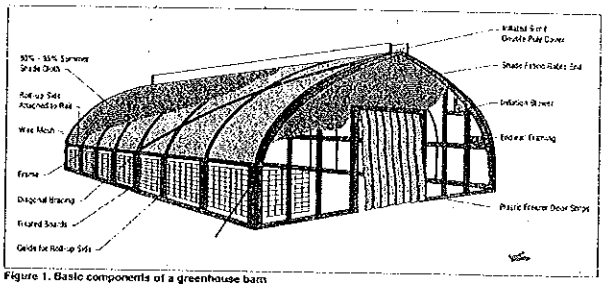


Figure 1. Basic components of a greenhouse barn

Overview

Greenhouse barns use a lightweight, galvanized steel tube frame to support one or two layers of a commercial-grade plastic film as a covering. The most common use for these structures is as heated chambers for growing plants. However, since about 1988 in the United States, earlier in Europe, greenhouse barns have been used for housing livestock. During the last five years particularly, interest in and use of these structures for dairy housing has increased significantly. Figure 1 shows the common components of greenhouse barns.

The increased interest in greenhouse barns as an alternative form of dairy housing has led to comparisons between greenhouse barns and conventional post frame barns.

In many ways, today's discussion and interest is similar to what dairy farmers faced when post frame barns first came into the market. Farmers wondered if post frame barns would replace two story barns. In fact, post frame barns did change the way animals were housed; post frame barns with freestall housing and a parlor replaced the conventional two-story, stone wall, timber frame, tie stall barn. At that time, post frame barns were considered to be relatively inexpensive compared to timber frame barns. Post frame barns were thought to be temporary structures but provided design flexibility that conventional timber frame barns could not offer.

Farmers today are asking: "Are greenhouse barns better than post frame barns?" and "Are greenhouse barns cheaper than post frame barns?" The answers to these questions are not clear cut and may depend on the type of comparison we make and on the objectivity and reasonableness of those comparisons.

Because using greenhouse barns as animal housing is a relatively new practice, little or no long-term research has been done on their suitability for this type of application, and questions have been raised about ventilation and about the durability of the construction materials. Many builders and engineers have extensive experience designing post frame barns for animal housing, but that level of experience is not yet available in designing greenhouse barns for dairy housing.

While the earliest plans and design criteria for greenhouses used for dairy housing have evolved to more fully developed designs, most of the information currently available comes from farmer experiences and comparisons in magazines and news articles. These experiences and case studies are valuable, but one person's success does not always translate into success at another operation. A greenhouse barn may be right for one operation but not for another.

Basic Questions

Producers thinking about building any kind of dairy housing need to answer questions like the following to determine if building the structure is indeed a good idea.

1. Does the design of the building make possible and convenient the use of optimal or preferred management practices for calves, dry cows, and milking cows?
2. Is the design conducive to providing for the animals' needs during all seasons in the climate of the area?
3. Is the design structurally sound and does it meet common tests of reliability and longevity?
4. Is the design cost effective?

Concerns and Limitations

In answering these questions for greenhouse structures used as dairy housing, the following concerns and possible limitations need to be considered.

- Greenhouse dairy barns do not appear to create an overriding economic advantage. The tables on pages 12 through 14 of this publication, based on estimates from three greenhouse suppliers in Wisconsin, indicate that the initial costs for greenhouse barns and post frame barns are about equal.
- When maintenance costs are included in a comparison between greenhouse and post frame barns, the greenhouse barn proves to be more expensive. Also, greenhouse barns may not have warranties, while post frame structures commonly have a minimum warranty of 30 years.
- Greenhouses used as dairy barns must be adequately ventilated; this includes the use of ridge and eave vents as well as side and endwall ventilation. Adding ridge vents to some greenhouse styles, particularly hoop or quonset styles, will be an extra cost item. If ventilation is inadequate, animals may be subjected to wide day-to-night variations in air temperature and humidity, which could adversely affect animal health.
- Hoop or quonset type structures without ridge vents may be difficult to ventilate naturally if longer than 75 feet.
- Natural ventilation with a greenhouse barn requires more careful management than with a conventional barn.
- The plastic covering of a greenhouse barn will need to be replaced every four to six years.
- In the summer, a greenhouse barn must be covered with shade cloth.
- The basic plastic cover along with all curtains and shade fabric must be protected from animals.
- Because the practice of using greenhouse barns as dairy housing is relatively new, little reliable data is available to help determine what designs will meet tests of longevity and reliability.
- Cold damp air will likely lead to excessive condensation during winter months, and so providing heat to dry damp resting places will not work if the ventilation is inadequate.
- The greenhouse frames must be able to resist corrosion, and they need to be sturdy enough to support pens, gates, and stall partitions.
- Snow and ice build up may be a problem in unheated greenhouse barns.
- Specially designed gutters are necessary between spans in multi-span buildings.
- Curtains in hoop or quonset type structures follow the curvature of the building when opened; this exposes the floor area to adverse weather.
- Greenhouses with sidewalls less than 8 feet high are probably not adequate for use as dairy barns.

Animal Environment

Perhaps the most crucial concerns about greenhouses used as dairy housing are the issue of animal environment and the related issue of proper ventilation.

The primary goal of the animal housing environment should be to protect the animals from the weather. In the summer, the building should provide shade and allow cross ventilation by wind pressure. In the winter, the housing should allow for moisture removal and draft control. When a greenhouse is used to provide an environment for animals, the design must consider that the transfucent plastic covering makes a greenhouse an effective passive solar collector. Although this is an asset in situations where solar heating is desired, this characteristic can be a serious liability in greenhouses used for dairy housing.

On a sunny day, radiation from the sun warms the air in a greenhouse. A natural tendency is to restrict ventilation to keep warmed air inside the structure. However, when the greenhouse is being used to house animals, restricting ventilation traps the moisture the animals produce along with the warm air. Because the air warmed by solar heating can absorb large amounts of moisture, air quality may not appear to be a problem, at least during the day (some odors may be noticeable).

At night the greenhouse barn acts in reverse from a radiation standpoint, losing heat to cold surroundings and the cold, clear, black sky. This cools the air in the barn, lowering its moisture-holding capacity substantially and causing relative humidity to rise. The result is cold, damp air and, most likely, excessive condensation. If adequate ventilation is not provided, animals will be subjected to wide day-to-night variations in air temperature and humidity, which could adversely affect animal health. In general, respiratory disease peaks in spring and fall when the daily minimum and maximum temperature fluctuations are at their greatest. The greenhouse effect may contribute to daily fluctuation.

Design and Construction Details

Design and construction criteria for greenhouse barns used as animal housing have not yet stood the test of time. Any design, however, must meet the animals' environmental needs and provide for proper ventilation. Additionally, the strength of the building materials used in the frames must be adequate, and the greenhouse frame must be designed and constructed to meet the snow and wind loads of a specific region. Also, frames must be straight and plumb because snow and wind loads applied to frames constructed out of plumb or off center may cause uneven loading of the entire structure thus risking failure.

Loads associated with the animals housed in the barn also must be considered in the design. The frames may be subjected to loads from supporting pens, gates, stall partitions, and any other features designed into the building to be used as animal housing. Animal pressure on the building frame and stallwork also must be considered in any design.

General Characteristics

Greenhouse frames are constructed primarily from 2- to 3-inch O.D. (Outside Diameter) round or square galvanized steel tubing. Aluminum also is used as a frame material. The thickness of the tubing used in greenhouse frames ranges from 16 to 12 gauge. (The lower the gauge number, the thicker the tubing.) Actual frame sizes depend on building width and frame spacing.

Frame widths for single span structures range from 18 to 36 feet. Building lengths range from 48 to 180 feet. Frames are spaced from 4 to 6 feet apart in single span buildings, and up to 8 to 10 feet apart in multi-span buildings. These frames support the roof and sidewall construction of the building. Galvanized steel tubing (¼-inch O.D. is used for purlins and bracing to span and brace between the frames along the length of the building.

Because of the corrosive nature of an animal housing environment, high quality galvanizing is crucial when greenhouse frames are used for dairy barns. Some manufacturers use hot dipped galvanizing, which produces excellent results. Other types of galvanizing, however, may not be suitable for use in animal environments. Check the quality and amount of galvanizing in the frame tubing, and determine what type of warranty is available from the supplier. Aluminum frames are an option with some suppliers.

One or two layers of plastic film are attached to the frame for the roof and sidewall covering. In many cases, curtain material is used for sidewall ventilation openings. Shade fabric is used for the roof, sidewall, and endwall ventilation openings. Sidewall heights vary depending on the frame type and how the building will be used. A minimum sidewall height of 8 feet is satisfactory for calf barns. For larger animals, 10- to 14- foot high sidewalls are recommended. Higher sidewall heights may be necessary for maneuvering equipment for cleaning and feeding.

Sidewall openings can be designed into the frame with roll up plastic curtains or with a curtain fabric package offered by the greenhouse supplier. Access through the sidewall is difficult to incorporate into the design of a greenhouse frame. Almost all access to the building is designed into the endwall of the building.

Curtains, plastic, and shade fabric need to be protected from animals to prevent damage. Wire cattle panels, plastic snow fencing, and high tensile wire fencing can be used. Stall partitions and penning may need to be set back from the walls to prevent animal pressure on the sidewalls.

Some frames include a vertical wall attached to a steel frame. In other designs, the hoop or bow starts immediately from the foundation. To increase sidewall height for these types of frames, the vertical sidewall height can be increased by attaching the hoop frame to a vertical wooden post frame or concrete sidewall 4 to 8 feet high. Figure 2 shows examples of typical greenhouse frames.

Hoop Frames

Many greenhouse suppliers sell hoop, round, or quonset frames. These frames commonly use 2-inch O.D. galvanized steel tubing. (See Figures 2a, b, and c.) These frames have a maximum height of approximately 11 feet in the center and 6 feet on the sidewalls. The frames are spaced 4 to 6 feet apart and have clear spans that range from 18 to 30 feet. Some manufacturers can span up to 40 feet with 3-inch O.D. tubing.

Round or quonset roof designs have a design limitation. When the sidewall curtain is raised, the rolled up sidewall may not allow the roof to shed water properly. The curtain moves horizontally towards the center of the barn; this opens part of the roof to rain, and stalls or alleys can get wet. Figure 3 shows how the drip line of the building roof moves toward the center of the barn when the side curtains are rolled up.

Gable Frames

Gable frames start with a straight sidewall pipe that supports an elevated bow frame. This allows a minimum 8-foot sidewall height. Gable frames commonly use 2-inch O.D. galvanized steel tubing. The frames are spaced 4 to 6 feet apart and have clear spans that range from 18 to 30 feet.

The shape of the bow may be semicircular or peaked. The shape of the bow allows either an open ridge or overshot ridge to be incorporated into the design. (See Figure 2d.) The straight sidewall can support adjustable curtains for ventilation openings. Straight sidewalls are preferable to curved walls for shedding rain and preventing snow melt water from entering the building.

Multi-span Frames

Buildings wider than about 30 feet require multiple frames to span the width. A building of this type is commonly called a gutter-connect frame in the greenhouse industry. (See Figures 2e and 2f.) In this type of construction, interior posts support the multiple frames. This creates a roof with peaks and valleys. The sidewall and interior post supports are 3-inch O.D. round or square tubing supported on concrete walls or piers.

The gutter of the frame must be made of aluminum or stainless steel pans to increase corrosion resistance. Structurally, gutters must be designed to withstand rain and snow loads, as well as loads from sliding snow. Sidewalls can be as high as 14 feet for ventilation purposes. To increase building rigidity, light steel trusses are usually incorporated into this design, allowing ridge openings to be placed at the peaks.

Foundation Options

The foundation of the greenhouse frame must be able to transfer the loads applied to the frame to the earth. Wind applies horizontal and uplift loads to the sidewall frame, while snow, rain, and the weight of the frame apply vertical loads downward to the sidewalls. The foundation anchors the building to the earth and must resist corrosion from contact with manure, moisture, and the soil. For this reason, ground stakes used as part of a foundation must have good quality galvanizing.

The fuel costs to operate the incinerator are calculated as follows:

2,261,070,000 Btu/hr x 1 MMBtu/10^6 Btu x 24 hr/day x 365 day/year x $9.70/MMBtu
= $192,127,640/year

VOC Emission Reductions for Thermal Incineration

The annual VOC Emission Reductions for the cow housing permit unit are calculated as follows:

[Number of cows] x [Jersey Cow Housing VOC EF (lb/cow-year)] x [Capture Efficiency] x [Thermal Incinerator Control Efficiency]

= [(7,200 Jersey milk cows) x (11.5 lb-VOC/milk cow-year) + (1,100 dry cows) x (6.6 lb-VOC/dry cow-year) + (200 heifers) x (4.9 lb-VOC/ cow-year)] x (0.95) x (0.98)
= 84,758 lb-VOC/year

Cost of VOC Emission Reductions

Cost of reductions = ($192,127,640/year)/((84,758 lb-VOC/year)(1 ton/2000 lb))
= **$4,533,558/ton of VOC reduced**

As shown above, the natural gas cost alone for thermal or catalytic incineration would cause the cost of the VOC reductions to be greater than the $5,000/ton cost effectiveness threshold of the District BACT policy. The equipment is therefore not cost effective and is being removed from consideration at this time.

Biofiltration:

Biofiltration is a method of reducing pollutants in which exhaust air that contains contaminants is blown through a media (e.g., soil, compost, wood chips) that supports a microbial population. The microbes utilize the pollutants such as VOCs and ammonia as nutrients and oxidize the compounds as they pass through the filter.

The following cost analysis demonstrates that the cost of biofiltration exceeds the District cost effective threshold. Biofiltration can control both VOC and ammonia emissions. Although, this technology can control both pollutants, a cost effective threshold has not been established for ammonia. Therefore, only achieved-in-practice options will be considered for ammonia at this time and a multi-pollutant cost effective analysis for VOC and ammonia will not be performed.

Cost of Biofiltration

The cost estimate for a biofiltration system is taken from the University of Minnesota Extension Service Biosystems and Agricultural Engineering Update "Biofilter Design Information".[25] The cost is largely dependent on the airflow rate that the filter must handle. The University of Minnesota publication states "Biofilters used to treat ventilating air exhausted from a livestock building should be sized to treat the maximum ventilation rate, which is typically the warm weather rate, of the building." The publication gives an estimate of $150 - $250 per 1,000 cfm for the initial construction of a biofilter and estimates annual operation and maintenance costs to be $5 - $15 per 1,000 cfm. As stated above, the maximum ventilation rate required for enclosed freestall barns is

1,000 cfm per cow. For more conservative calculations the required ventilation rate will be assumed to be 750 cfm per cow and heifers will not be included in the airflow calculation.

The maximum airflow rate entering the biofilter is calculated as follows:

(7,200 milk cows + 1,100 dry cows) x 750 cfm/cow = 6,225,000 cfm

Capital Cost

The cost of the biofilter includes the costs of the fans, media, ductwork, plenum, and labor. As stated above, the University of Minnesota publication gives a capital cost between $150 and $250 per 1,000 cfm. An average cost of $200 per 1,000 cfm will be assumed for this cost analysis.

The capital cost of the biofilter is calculated as follows:

$200/1,000 cfm x 6,225,000 cfm = $1,245,000

Pursuant to District Policy APR 1305, section X (11/09/99), the cost for the purchase of the biofilter will be spread over the expected life of the system using the capital recovery equation. Although, the biofilter media (e.g., soil, compost, wood chips) must be replaced after 3-5 years, this does not constitute a significant cost of the system. Therefore, the expected life of the system (fans, media, ductwork, plenum, etc) is estimated at 10 years. A 10% interest rate is assumed in the equation and the assumption will be made that the equipment has no salvage value at the end of the ten-year cycle.

$$A = [P \times i(I+1)^n]/[(I+1)^n-1]$$

Where: A = Annual Cost
P = Present Value
I = Interest Rate (10%)
N = Equipment Life (10 years)

$$A = [\$1,245,000 \times 0.1(1.1)^{10}]/[(1.1)^{10}-1]$$
$$= \mathbf{\$202,618/year}$$

VOC Emission Reductions for Biofiltration

The annual VOC Emission Reductions for the cow housing permit unit are calculated as follows:

[Number of cows] x [Jersey Cow Housing VOC EF (lb/cow-year)] x [Capture Efficiency] x [Biofilter Control Efficiency]

= [(7,200 Jersey milk cows) x (11.5 lb-VOC/milk cow-year) + (1,100 dry cows) x (6.6 lb-VOC/dry cow-year) + (200 heifers) x (4.9 lb-VOC/ cow-year)] x (0.95) x (0.80)
= **69,190 lb-VOC/year**

Cost of VOC Emission Reductions

Cost of reductions = ($202,618/year)/((69,190 lb-VOC/year)(1 ton/2000 lb))
= **$5,857/ton of VOC reduced**

As shown above, the capital cost alone for a biofilter would cause the cost of the VOC reductions to be greater than the $5,000/ton cost effectiveness threshold of the District BACT policy. Therefore, this option is not cost effective and is being removed from consideration at this time.

Feed and Manure Management Practices:

- **Concrete feed lanes and walkways**
- **Feed lanes and walkways flushed four times per day**
- **Animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.**
- **Refused feed removed from feed lanes on a daily basis to prevent decomposition.**

The applicant has proposed this option; therefore a cost-effective analysis is not required.

e. Step 5 - Select BACT

The facility is proposing freestall barns with concrete feed lanes and walkways; to flush the feed lanes and walkways four times per day; to feed all animals in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations; and to remove refused feed from feed lanes on a daily basis to prevent decomposition, which satisfies the BACT requirements.

3. BACT Analysis for NH_3 Emissions from the Cow Housing Permit Unit:

a. Step 1 - Identify all control technologies

A cost effectiveness threshold has not been established for ammonia. Therefore, only options that meet the District's definition of Achieved-in-Practice controls will be considered for ammonia at this time. (Although these options must meet the District definition of Achieved-in-Practice, pursuant to Section 5.2 of the Settlement Agreement (9/20/2004) between the District and Western United Dairyman and Alliance of Western Milk Producers Inc[1], the District will not deem any control options Achieved-in-Practice until after the Dairy BACT Guideline has been established.)

The following management practices have been identified as a possible control options for the NH_3 emissions from the cow housing permit unit and have been proposed by the applicant:

1) Feed and Manure Management Practices
   - Concrete feed lanes and walkways
   - Feed lanes and walkways flushed four times per day

Air District's Prelimnary Freestall Enclosure Cost Effective Analysis

Estimates based on Midwest Plan Services for Pole Barn and Green House 1997 values

Estimates based on University of Minnesota high range of costs for biofilter 2004 values

Adjusted 1997 values by 1.155 (consumer price index from Bureau of Labor for comparison of 1997 to 2004 dollar)

Numbers for building an 800 stall facility

Biofilter assumes 800 head at the facility

Component (incl. installation)	Green House	Pole Barn	Difference
Basic frame	$180,649.22	$289,038.75	-$108,389.53
Concrete scrape alley and curb	$83,376.56	$83,376.56	$0.00
10" sidewall curtain and controls	$88,935.00	$88,935.00	$0.00
12" end wall construction	$18,768.75	$18,768.75	$0.00
Freezer strips for doors	$8,662.50	$8,662.50	$0.00
Gates for doors	$2,887.50	$2,887.50	$0.00
Fronts	$22,233.75		$22,233.75
Brisket board	$12,506.48	$12,506.48	$0.00
Freestall partitions with neck rail and post	$137,156.25	$137,156.25	$0.00
Waterers	$21,656.25	$21,656.25	$0.00
Welded Wire Panels	$5,558.44	$0.00	$5,558.44
Shade fabric	$18,064.92	$0.00	$18,064.92
Repair costs (incl. fabric patching every 5 yrs-Multiplied by 2 for ten year costs)	$37,573.59	$0.00	$37,573.59
	$638,029.22	*$662,988.05*	-$24,958.83
Biofilter construction, media, ducts, fans-($150-250 per 1,000 cf) $200 avg	$117,500.00		$117,500.00
Biofilter operations-electricity, repair, plus assume media replacement every 5 yrs.($5-15) $10	$17,625.00		$17,625.00
Added fans capital	$15,720.43		$15,720.43
Added fans operating	$13,928.00		$13,928.00
Total Captital Costs	*$771,249.65*	*$662,988.05*	*$108,261.60*
Total Operating Costs	*$31,553.00*	*$0.00*	*$17,625.00*
Annualized Costs	$157,035.32	$107,868.16	$49,167.16
VOC Reduction (assume 85% of VOCs (Schmidt) from barn & 80% CE for biofilter)	3.37	0.00	3.37
Cost per ton		**$14,577.55**	

based on 12.4 lbs/hd/yr emission factor

Air District's Cost Analysis for Enclosed Freestalls Vented to a Bioreactor based on Western Dairy Design's Proposal

Number of Lactating Cows:	3,600	Lactating Cows
Number of Dry Cows:	500	Dry Cows
Total Lactating and Dry Cows:	4,100	

Barn Capital Cost

Standard Building with Fans	
Cost per sq. ft:	$4.68
Total sq. ft required:	306,897
Total Cost:	$1,436,279.36

Greenhouse Barn Building	
Cost per sq. ft:	$5.84
Total sq. ft required:	326,643
Building Cost:	$1,907,594.54
Biofilter Cost:	$1,293,856.00
Total Cost:	$3,201,450.54

Cost Difference: **$1,765,171.17**

Annualized Cost of Difference: **$287,273.48 per year**

Electricity Cost

Standard Building with Fans		
Electric hp Required:	105	
Electricity Cost	$0.12	per kw-hr
kW per hp:	0.746	
Fan Motor Efficiency:	75%	
Run Time (May-Sept):	45%	
Run Hours (May-Sept):	1652.4	hrs
Run Time (Oct - April):	0%	
Run Hours (May-Sept):	0	hrs
Total Run Hours:	1652.4	hrs
Total Cost:	$20,709.21	per year

Greenhouse Barn Building		
Electric hp Required:	210	
Electricity Cost	$0.12	per kw-hr
kW per hp:	0.746	
Fan Motor Efficiency:	75%	
Run Time (May-Sept):	45%	
Run Hours (May-Sept):	1652.4	hrs
Run Time (Oct - April):	25%	
Run Hours (May-Sept):	1272	hrs
Total Run Hours:	2924.4	hrs
Total Cost:	$73,301.88	per year

Cost Difference: **$52,592.67 per year**

Increased Milk Production

Increase in Production from Air-Conditioned Cows:	5.0%	
Gal. Milk per Lactating Cow per Day:	7 gal/cow-day	60.2 lb/cow-day
Milk Price (per cwt):	$12.50	
Heat Stress Period:	45 days	
lbs extra milk:	487620 lbs	
Income from Extra Milk:	**$60,952.50 per year**	

Cost of System	
$287,273.48	per year
+ $52,592.67	per year
- $60,952.50	per year
$278,913.65	**per year**

Emissions Reductions

Milk Cow VOC Emissions from Freestalls:	12.4	lb-VOC/cow-year
VOC emissions from all Milk Cows:	44,640	lb-VOC/year
Dry Cow VOC Emissions from Freestalls:	7.6	lb-VOC/cow-year
VOC emissions from all Dry Cows:	3,823	lb-VOC/year
VOC Emissions from Milk and Dry Cows:	48,463	lb-VOC/year
	24.2	ton-VOC/year
Bioreactor Control Efficiency:	80%	

Emission Reductions: **19.4 ton-VOC/year**

Cost of Emissions Reductions: **$14,388 per ton of VOC**

15 Year Cash Flow for Herd with **3600 Lactating Cows**
Version date: 26-Sep-05

15 year cash flow for a 3600 Cow Building:

Number of lactating cows:		3600	Lactating cows
Total cows at	14.00% dry cows	4104	Lactating cows & dry cows
Heat stress period:	55	days	
Cows per heat stress period:	578.77	cows	
Milk price:	$12.50		

	Size- width:	Size- length:	Total footage:	Cost per foot:	Total cost:
Standard building with fans-	128	2400	307,200	$4.68	$1,437,696
Tent building-	134	2440	326,960	$5.84	$1,909,446
Bio-filter system-					$1,293,856
Total Bio-Building-					$3,203,302
Cost difference:		**$1,765,606**			

Property Tax Schedule:	Std. Building Appreciates 2% per year:	New Value:	Tax at 1%:	Temperary Building Dep. 5% per year:	New Value:	Tax at 1%:
Value- year 1-	100%	$1,437,696.00	$14,377	95%	$1,813,974.08	$18,139.74
Value- year 2-	102%	$1,466,449.92	$14,664	90%	$1,718,501.76	$17,185.02
Value- year 3-	104%	$1,495,203.84	$14,952	85%	$1,623,029.44	$16,230.29
Value- year 4-	106%	$1,523,957.76	$15,240	80%	$1,527,557.12	$15,275.57
Value- year 5-	108%	$1,552,711.68	$15,527	75%	$1,432,084.80	$14,320.85
Value- year 6-	110%	$1,581,465.60	$15,815	70%	$1,336,612.48	$13,366.12
Value- year 7-	112%	$1,610,219.52	$16,102	65%	$1,241,140.16	$12,411.40
Value- year 8-	114%	$1,638,973.44	$16,390	60%	$1,145,667.84	$11,456.68
Value- year 9-	116%	$1,667,727.36	$16,677	55%	$1,050,195.52	$10,501.96
Value- year 10-	118%	$1,696,481.28	$16,965	50%	$954,723.20	$9,547.23
Value- year 11-	120%	$1,725,235.20	$17,252	45%	$859,250.88	$8,592.51
Value- year 12-	122%	$1,753,989.12	$17,540	40%	$763,778.56	$7,637.79
Value- year 13-	124%	$1,782,743.04	$17,827	35%	$668,306.24	$6,683.06
Value- year 14-	126%	$1,811,496.96	$18,115	30%	$572,833.92	$5,728.34
Value- year 15-	128%	$1,840,250.88	$18,403	25%	$477,361.60	$4,773.62
Value- year 16-	130%	$1,869,004.80	$18,690	20%	$381,889.28	$3,818.89
Potential tax savings:			$264,536			$175,669

First Year:	**End of period:**
$14,377	$264,536
$18,140	$175,669
-$3,763	**$88,867**

Production loss from cows at "Peak Production" during heat stress period:

Peak production over non cooled cows:		9	pounds higher than non cooled cows
Cooled lactating cows will have a higher peak production than none cooled cows.			
One lb of greater peak production equals 225 lbs per lactation.			
Number of cows in 60 day heat stress period:		578.77	lactating cows
Production loss:		11720.08	cwts
Revenue loss at	$12.50 per cwt:	**$146,501**	per year

Costs due to "Open Days" from reproduction stress:

Breeding stress months:	3	
Estimated extra breedings	1.5	per cow
Number of cows in period:	947	cows
Number of open days:	39,777	open days
Est cost of an open day:	$1.75	per cow per day
Total cost:	**$69,610**	per year

Costs due to milk butterfat reduction due to heat stress:

Heat stress period:	55	days	
Average production per day:	78	lbs per cow	9.070 gals per cow
% Reduction of butterfat due to stress:	0.12%		
Milk at non stressed cows:	3.60%		
Milk at stressed cows:	3.48%		
Production per stress period, no stress:	154,440	cwts	
Adj. to 3.5% butterfat milk:	158,853	cwts	
Adj. to 3.5% butterfat, heat stressed cows:	153,557	cwts	
Income from no stress cows:	$1,985,657		
Income from heat stress cows:	$1,919,469		
Income loss to butterfat per stress period:	**$66,189**		

Income Benefit From an Environmentally Controlled Building:

Production loss from heat stress period for whole herd:

Production loss per day:	6.45	lbs per cow	0.75 gallons per cow
Price per 100 weight:	$12.50		
Heat stress period:	55	days	

Number of Cows:	Pounds per day:	Ttl lbs per heat stress period:	Extra Income per yr:
3,600	23,220	1,277,100	**$159,638**

Income from improved calving interval:

Improvement of calving interval-days:		6
Current interval in days (months):	390	13.00
Days saved:	6	
Extra calves per year:	60.01	
Extra heifer calves per year:	30.01	

Cost to feed heifers per day:	$0.40
Feed cost per cwt:	$5.00
Other income, calves & heifers:	$0.42

Related milk production costs per cwt:

Labor	$1.17	Employee benefits	$0.06
Milk hauling	$0.39	Veterinary and breeding	$0.27
Supplies	$0.67	Testing and trimming	$0.07
Repairs and maintenance	$0.33	Hauling livestock	$0.03
Utilities	$0.21	Miscellaneous	$0.01
		Interest & rent expenses	$0.70

Total related milk production costs per cwt: $3.91

Replacement heifer retail value:	$2,000.00	
Est. Heifer milk production:	62.00	pounds per day

Est. cull rate at 30%

Income benefit:	Extra Calves Per year:	Increase In Heifers:	Extra Calf Feed costs:	Replacement Value:	Related Prod Costs per cwt:	Milk Income Value per yr:
Year 1:	30	30	$4,381	$0	$0	$0
Year 2:	30	60	$8,762	$0	$0	$0
Year 3:	30	90	$13,143	$60,014	$48,175	$70,930
Year 4:	30	120	$17,524	$60,014	$96,351	$141,859
Year 5:	54	174	$25,410	$60,014	$144,526	$212,789
Year 6:	66	210	$30,667	$60,014	$192,701	$283,718
Year 7:	78	258	$37,677	$108,026	$279,417	$411,391
Year 8:	100	328	$47,841	$132,032	$337,227	$496,507
Year 9:	114	388	$56,603	$156,038	$414,308	$609,994
Year 10:	133	455	$66,417	$199,248	$526,075	$774,551
Year 11:	161	538	$78,544	$228,055	$622,425	$916,410
Year 12:	185	623	$91,021	$266,464	$730,338	$1,075,292
Year 13:	212	736	$107,423	$322,157	$863,688	$1,271,625
Year 14:	245	867	$126,574	$370,169	$1,000,891	$1,473,632
Year 15:	279	1013	$147,911	$423,942	$1,181,260	$1,739,192
Total extra costs and income:			**$859,899**	**$2,446,188**	**$6,437,383**	**$9,477,890**

Power Bill to Vent Building:

Horse power required:	210
Electrical cost:	$0.12
Watts per hp @ 460 volts:	1.5935

		Hours per season:	Hours run time:
Run time summer:	45%	3720	1674
Run time winter:	25%	5040	1260
Total run time hours:			2934
Cost per year:	**$117,818**		

Net cost:	Costs:	Savings-extra income:	
First year:			
Extra building cost:	$1,765,606.40		
Tax savings:		-$3,763	
Energy costs:	$117,818		
Potential increase of milk income- whole herd:		$159,638	
Extra heifer feed costs:	$4,381		
Totals:	$1,883,424.69	$155,875	
Increased cash flow first year:		**-$1,727,550**	
End of 15 yr period:			
Extra building cost:	$1,765,606		One time cost
Tax savings:		$88,867	15 Yr savings
Energy costs:	$1,767,274		15 Yr savings
Prod. loss from cows at "Peak Prod" during heat stress period:		$2,197,514	15 Yr savings
Costs due to "Open Days" from reproduction stress:		$1,044,152	15 Yr savings
Costs due to milk butterfat reduction due to heat stress:		$992,829	15 Yr savings
Income Benefit From an Environmental Building- no heat stress:		$2,394,563	15 Yr savings
Extra heifer feed costs:	$859,899		
Replacement heifer value:		$2,446,188	
Extra milk production from heifers:		$9,477,890	
Related milk production costs per cwt:	$6,437,383		
Tax savings from additional depreciation:		$617,962	
Totals:	$10,830,162	$19,259,965	
Increased cash flow over 15 years:		**$8,429,802**	
Average increased cash flow per year:		**$561,987**	

Ex. BP 13

Sheraz Gill

From: Ramon Norman
Sent: Tuesday, October 24, 2006 6:52 AM
To: Sheraz Gill
Subject: FW: Financial Data

-----Original Message-----
From: David Avila [mailto:davidavila@dairydesigners.com]
Sent: Tuesday, September 27, 2005 5:37 PM
To: 'Ramon Norman'
Subject: Financial Data

Ramon;
The attachment is a spreadsheet comparing a 3600 lactating facility. The "building price" is for the "building". The concrete floors, freestalls and stanchions are basically the same. The difference in the buildings is a standard roof structure of today's design is one of a steel roofing system which blocks out natural light. The Bio-Barn system is going to be one of a vinyl fabric type building which block out more heat than a steel roof system and allows some natural light into the building. At the top portion of page one you will see the price of a standard building at an estimated $4.68 per square foot versus the Bio-Barn at $5.84. The cost for the Bio-Barn fans, misters, evaporation pads and the central Bio-Building is estimated at $1,293,856 making the "extra" cost for a Bio-System at $1,765,606.
The spread sheet is based on a 15 year period.
The next analysis is based on the fact that the vinyl building is considered to be temporary. The property tax systems devaluates temporary buildings at 5% per year where as the permanent structure evaluates a 5% per year. Period savings is $88,867.
The last analysis on page one is cooled cows produce more milk than non cooled cows based on "peak" production at 105 day into production after calving. The extra income is $146,501 per year.
The first analysis on page two is based on milking cows being harder to make pregnant doing and after a heat stress period. Savings is $69,610 per year.
The next section evaluates the revenue loss due to the lesser quality of milk produced during a heat stress period for the total herd. The savings is $66,189 per year.
The last section of page two is the production loss of the complete herd due to heat stress in the form of lost production of ¾ gallon of milk per day per cow. It is not unusual for a herd to drop a gallon or more! The savings is $159,638 per year.
Page three is the gain from reducing the "calving interval" due to the ease of breeding and conception of cooled cows. By only reducing a 390 day (365 being perfect) by 6 days (1.54%) there will be 1013 more heifer calves. The calculations consider feed costs, milk production costs as expenses offset by milk production income and cost savings not having to buy these cattle.
The last page calculates the cost of electricity for the fans. I did not consider the cost for electricity for an equal standard barn which would have approximately 105 horsepower. The estimated cost of power is $117,818.
The bottom portion compiles the revenue to show a 15 year profit of $8,429,802 above a standard building. The yearly average is $561,987. The payment on a loan for the initial investment of $1,765,606 at 6.5% interest at 15 year amortization is $184,563.89 per year.
I am excited about this system for it will make money for the dairyman as it solves air quality challenges.

Thank you, David Avila

VOC Emission Reductions for Thermal Incineration – Mature Cows

The annual VOC Emission Reductions for housing all animals in enclosed freestall barns and venting the barns to an incinerator are calculated as follows:

[Number of cows] x [Uncontrolled Cow Housing VOC EF (lb/cow-year)] x [Capture Efficiency] x [Thermal Incinerator Control Efficiency]

VOC Reductions for Enclosed Freestalls Vented to an Incinerator for Mature Cows									
Type of Cow	**# of cows**	**x**	**EF (lb/cow-yr)**	**x**	**Capture (%)**	**x**	**Control (%)**	**=**	**lb-VOC/yr**
Milk Cow	5,832	x	12.4	x	95%	x	98%	=	67,327
Dry Cow	875	x	8.2	x	95%	x	98%	=	6,680
							Total (lb-VOC/yr)		**74,007**

Cost of VOC Emission Reductions

Cost of reductions = ($31,856,730/year)/((74,007 lb-VOC/year)(1 ton/2000 lb))
= **$860,911/ton of VOC reduced**

As shown above, the natural gas cost alone for thermal or catalytic incineration for enclosed freestalls for only the mature cows (milk and dry cows) would cause the cost of the VOC reductions to be greater than the $5,000/ton cost effectiveness threshold of the District BACT policy. The equipment is therefore not cost effective and is being removed from consideration at this time.

Biofiltration:

Biofiltration is a method of reducing pollutants in which exhaust air that contains contaminants is blown through a media (e.g., soil, compost, wood chips) that supports a microbial population. The microbes utilize the pollutants such as VOCs and ammonia as nutrients and oxidize the compounds as they pass through the filter.

The following cost analysis demonstrates that the cost of biofiltration exceeds the District cost effective threshold. Biofiltration can control both VOC and ammonia emissions. Although, this technology can control both pollutants, a cost effective threshold has not been established for ammonia. Therefore, only achieved-in-practice options will be considered for ammonia at this time and a multi-pollutant cost effective analysis for VOC and ammonia will not be performed.

Cost of Biofiltration

The cost estimate for a biofiltration system is taken from the United States EPA Report "Using Bioreactors to Control Air Pollution".[34] The cost is largely dependent on the airflow rate that the filter must handle. According to University of Minnesota, Biofilters used to treat ventilating air exhausted from a livestock building should be sized to treat the maximum ventilation rate, which is typically the warm weather rate. The EPA report gives a range of $2.35 - $37.06 per cfm for the initial construction of a biofilter. As

[34] "Using Bioreactors to Control Air Pollution" EPA-456/R-03-003, The Clean Air Technology Center (CATC), U.S. Environmental Protection Agency (E143-03) (September 2003) http://www.epa.gov/ttn/catc/dir1/fbiorect.pdf

shown above, the University of Minnesota's publication "Improving Mechanical Ventilation in Dairy Barns" gives the following summer ventilation rates for dairy cattle[33]: mature cow - 1,000 cfm; heifer (12-24 mo.) – 180 cfm; heifer (2-12 mo.) – 130 cfm; and baby calves – 100 cfm.

The analysis below is for freestalls vented to a biofilter for the entire herd:

As discussed in the evaluation, after completion of the project, the dairy will have 5,832 milk cows; 875 dry cows; 2,046 heifers (15-24 months); 1,796 heifers (7-14 months); 788 heifers (3-6 months); and 0 calves (under 3 months). The milk cows will all be housed in freestalls with all of the remaining animals housed in open corrals. Enclosed freestalls will be evaluated as a housing alternative for all animals at this dairy.

The total maximum airflow entering the biofilter from the enclosed freestalls for these animals is calculated as follows:

Maximum Airflow Rate Entering a Biofilter for Entire Herd					
Type of Cow	**# of cows**	**x**	**cfm/cow**	**=**	**cfm**
Milk Cow	5,832	x	1,000	=	5,832,000
Dry Cow	875	x	1,000	=	875,000
Heifer (15-24 mo.)	2,046	x	180	=	368,280
Heifer (7-14 mo.)	1,796	x	130	=	233,480
Heifer (3-6 mo.)	788	x	130	=	102,440
Baby Calf (less than 3 mo.)	0	x	100	=	0
			Total CFM		**7,411,200**

Capital Cost – Entire Herd

The cost estimate for the biofilter includes the costs of the fans, media, plenum, engineering, and labor but does not include installation of the required ductwork. As stated above, the United States EPA Report gives a capital cost range of between $2.35 per cfm and $37.06 per cfm. In general, the lower cost per cfm is associated with a higher flow rate. To be conservative, the lowest cost in the report of $2.35 per cfm will be assumed in this cost analysis.

The capital cost of the biofilter is calculated as follows:

$2.35 cfm x 7,411,200 cfm = $17,416,320

Pursuant to District Policy APR 1305, section X (11/09/99), the cost for the purchase of the biofilter will be spread over the expected life of the system using the capital recovery equation. The biofilter media (e.g., soil, compost, wood chips) must be replaced after 3-5 years in order to remain effective. This is an additional cost that is not being considered in this cost analysis. Therefore, the expected life of the entire system (fans, media, plenum, etc) will be estimated at 10 years. A 10% interest rate is assumed in the equation and the assumption will be made that the equipment has no salvage value at the end of the ten-year cycle.

$A = [P \times i(I+1)^n]/[(I+1)^n-1]$

Where: A = Annual Cost
P = Present Value
I = Interest Rate (10%)
N = Equipment Life (10 years)

$A = [\$17,416,320 \times 0.1(1.1)^{10}]/[(1.1)^{10}-1]$
= **$2,834,426/year**

VOC Emission Reductions for Biofiltration – Entire Herd

The annual VOC Emission Reductions for enclosed freestalls vented to a biofilter are calculated as follows:

[Number of cows] x [Uncontrolled Cow Housing VOC EF (lb/cow-year)] x [Capture Efficiency] x [Biofilter Control Efficiency]

VOC Reductions for Enclosed Freestalls Vented to a Biofilter for Entire Herd									
Type of Cow	**# of cows**	**x**	**EF (lb/cow-yr)**	**x**	**Capture (%)**	**x**	**Control (%)**	**=**	**lb-VOC/yr**
Milk Cow	5,832	x	12.4	x	95%	x	80%	=	54,961
Dry Cow	875	x	8.2	x	95%	x	80%	=	5,453
Heifer (15-24 mo.)	2,046	x	5.7	x	95%	x	80%	=	8,863
Heifer (7-14 mo.)	1,796	x	5.0	x	95%	x	80%	=	6,825
Heifer (3-6 mo.)	788	x	4.5	x	95%	x	80%	=	2,695
Baby Calf (< 3 mo.)	0	x	4.3	x	95%	x	80%	=	0
							Total (lb-VOC/yr)		**78,797**

Cost of VOC Emission Reductions

Cost of reductions = ($2,834,426/year)/((78,797 lb-VOC/year)(1 ton/2000 lb))
= **$71,942/ton of VOC reduced**

As shown above, the capital cost alone for a biofilter for the entire herd, not including the cost of enclosing freestalls, would cause the cost of the VOC reductions to be greater than the $5,000/ton cost effectiveness threshold of the District BACT policy. Therefore, this option is not cost effective and is being removed from consideration at this time.

The analysis below is for freestalls vented to a biofilter for the only mature cows:

As discussed in the evaluation, after completion of the project, the dairy will have 5,832 milk cows; 875 dry cows. Enclosed freestalls vented to a biofilter will be evaluated as a housing alternative for the mature cows at this dairy.

The total maximum airflow entering the biofilter from the enclosed freestalls for the mature cows is calculated as follows:

Maximum Airflow Rate Entering a Biofilter for Entire Herd					
Type of Cow	**# of cows**	**x**	**cfm/cow**	**=**	**cfm**
Milk Cow	5,832	x	1,000	=	5,832,000
Dry Cow	875	x	1,000	=	875,000
			Total CFM		**6,707,000**

Capital Cost – Mature Cows

The cost estimate for the biofilter includes the costs of the fans, media, plenum, engineering, and labor but does not include installation of the required ductwork. As stated above, the United States EPA Report gives a capital cost range of between $2.35 per cfm and $37.06 per cfm. In general, the lower cost per cfm is associated with a higher flow rate. To be conservative, the lowest cost in the report of $2.35 per cfm will be assumed in this cost analysis.

The capital cost of the biofilter is calculated as follows:

$2.35 cfm x 6,707,000 cfm = $15,761,450

Pursuant to District Policy APR 1305, section X (11/09/99), the cost for the purchase of the biofilter will be spread over the expected life of the system using the capital recovery equation. The biofilter media (e.g., soil, compost, wood chips) must be replaced after 3-5 years in order to remain effective. This is an additional cost that is not being considered in this cost analysis. Therefore, the expected life of the entire system (fans, media, plenum, etc) will be estimated at 10 years. A 10% interest rate is assumed in the equation and the assumption will be made that the equipment has no salvage value at the end of the ten-year cycle.

$$A = [P \times i(I+1)^n]/[(I+1)^n-1]$$

Where: A = Annual Cost
P = Present Value
I = Interest Rate (10%)
N = Equipment Life (10 years)

$$A = [\$15,761,450 \times 0.1(1.1)^{10}]/[(1.1)^{10}-1]$$
$$= \mathbf{\$2,565,103/year}$$

VOC Emission Reductions for Biofiltration – Mature Cows

The annual VOC Emission Reductions for enclosed freestalls vented to a biofilter are calculated as follows:

[Number of cows] x [Uncontrolled Cow Housing VOC EF (lb/cow-year)] x [Capture Efficiency] x [Biofilter Control Efficiency]

VOC Reductions for Enclosed Freestalls Vented to a Biofilter for Mature Cows									
Type of Cow	# of cows	x	EF (lb/cow-yr)	x	Capture (%)	x	Control (%)	=	lb-VOC/yr
Milk Cow	5,832	x	12.4	x	95%	x	80%	=	54,961
Dry Cow	875	x	8.2	x	95%	x	80%	=	5,453
							Total (lb-VOC/yr)		**60,414**

Cost of VOC Emission Reductions

Cost of reductions = ($2,565,103/year)/((60,414 lb-VOC/year)(1 ton/2000 lb))
= **$84,918/ton of VOC reduced**

As shown above, the capital cost alone for a biofilter for the mature cows, not including the cost of enclosing freestalls, would cause the cost of the VOC reductions to be greater than the $5,000/ton cost effectiveness threshold of the District BACT policy. Therefore, this option is not cost effective and is being removed from consideration at this time.

Feed and Manure Management Practices:

- **Concrete feed lanes and walkways**
- **Feed lanes and walkways for milk cows and dry cows flushed four times per day & feed lanes and walkways for the remaining animals flushed at least four times per day (as proposed by applicant)**
- **All animals fed in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations.**
- **Uneaten feed removed from feed lanes on a daily basis or re-fed to prevent decomposition.**
- **All open corrals adequately sloped to promote drainage (minimum of 3% slope where the available space for each animal is 400 square feet or less and minimum of 1.5% where the available space for each animal is more than 400 square feet per animal).**
- **Weekly scraping of freestall exercise pens and open corrals using pull-type scraper in the morning hours except when prevented by wet conditions**

The applicant has proposed this option; therefore a cost-effective analysis is not required.

e. Step 5 - Select BACT

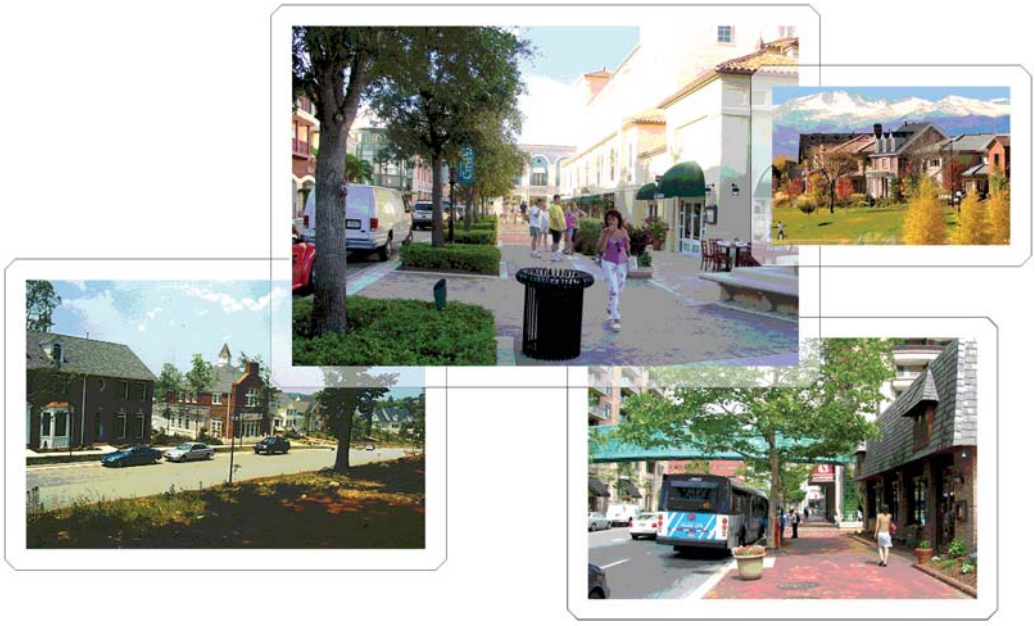
The facility is proposing concrete feed lanes and walkways; to flush the feed lanes and walkways for all cattle at the dairy four times per day; open corrals adequately sloped to promote drainage; to feed all animals in accordance with National Research Council (NRC) or other District-approved guidelines utilizing routine nutritional analysis for rations; to remove uneaten feed from feed lanes on a daily basis or re-feed it to animals to prevent decomposition; and to scrape open corrals and freestall exercise pens weekly with a pull-type scraper except during wet conditions.

Ex. BP 15

USING BIOREACTORS TO CONTROL AIR POLLUTION

Growing Cooler:

Evidence on Urban Development and Climate Change



Reid Ewing, Keith Bartholomew, Steve Winkelman,
Jerry Walters and Don Chen

with Barbara McCann and David Goldberg

Urban Land Institute

Smart Growth America
Better Choices For Our Communities

Center for Clean Air Policy
Dialogue. Insight. Solutions.

National Center for Smart Growth Research & Education

About ULI

The mission of the Urban Land Institute is to provide leadership in the responsible use of land and in creating and sustaining thriving communities worldwide. ULI is committed to

- Bringing together leaders from across the fields of real estate and land use policy to exchange best practices and serve community needs;
- Fostering collaboration within and beyond ULI's membership through mentoring, dialogue, and problem solving;
- Exploring issues of urbanization, conservation, regeneration, land use, capital formation, and sustainable development;
- Advancing land use policies and design practices that respect the uniqueness of both built and natural environments;
- Sharing knowledge through education, applied research, publishing, and electronic media; and
- Sustaining a diverse global network of local practice and advisory efforts that address current and future challenges.

Established in 1936, the Institute today has some 38,000 members in over 90 countries, representing the entire spectrum of the land use and development disciplines. ULI relies heavily on the experience of its members. It is through member involvement and information resources that ULI has been able to set standards of excellence in development practice. The Institute has long been recognized as one of the world's most respected and widely quoted sources of objective information on urban planning, growth, and development.

About the Authors

Reid Ewing is a research professor at the National Center for Smart Growth, University of Maryland; an associate editor of the Journal of the American Planning Association; a columnist for Planning magazine; and a fellow of the Urban Land Institute. Earlier in his career, he served two terms in the Arizona legislature, analyzed urban policy issues at the Congressional Budget Office, and lived and worked in Ghana and Iran.

Keith Bartholomew is an assistant professor of urban planning in the University of Utah's College of Architecture + Planning. An environmental lawyer, he worked for ten years as the staff attorney for 1000 Friends of Oregon, where he directed "Making the Land Use, Transportation, Air Quality Connection" (LUTRAQ), a nationally recognized research program examining the interactive effects of community development and travel behavior.

Steve Winkelman is director of the Transportation Program at the Center for Clean Air Policy (CCAP). He coordinated transportation analyses of climate change plans for New York and several other states, culminating in the CCAP Transportation Emissions Guidebook, which quantifies savings from 40 transportation policies. In February 2007 Steve launched a national discussion, "Linking Green-TEA and Climate Policy," to craft policy solutions that address travel demand.

Jerry Walters is a principal and chief technical officer with Fehr & Peers Associates, a California-based transportation planning and engineering firm. He directs integrated land use/transportation research and planning for public entities and real estate development interests throughout the United States and abroad.

Don Chen is the founder and executive director of Smart Growth America (SGA) and has worked for the Surface Transportation Policy Project, the World Resources Institute, and the Rocky Mountain Institute. He has been featured in numerous news programs and publications; has lectured in North America, Europe, Australia, and Asia; and has written for many magazines and journals, including "The Science of Smart Growth" for Scientific American.

Executive Summary

The phrase "you can't get there from here" has a new application. For climate stabilization, a commonly accepted target would require the United States to cut its carbon dioxide (CO_2) emissions by 60 to 80 percent as of 2050, relative to 1990 levels. Carbon dioxide levels have been increasing rapidly since 1990, and so would have to level off and decline even more rapidly to reach this target level by 2050. This publication demonstrates that the U.S. transportation sector cannot do its fair share to meet this target through vehicle and fuel technology alone. We have to find a way to sharply reduce the growth in vehicle miles driven across the nation's sprawling urban areas, reversing trends that go back decades.

This publication is based on an exhaustive review of existing research on the relationship between urban development, travel, and the CO_2 emitted by motor vehicles. It provides evidence on and insights into how much transportation-related CO_2 savings can be expected with compact development, how compact development is likely to be received by consumers, and what policy changes will make compact development possible. Several related issues are not fully examined in this publication. These include the energy savings from more efficient building types, the value of preserved forests as carbon sinks, and the effectiveness of pricing strategies—such as tolls, parking charges, and mileage-based fees—when used in conjunction with compact development and expanded transportation alternatives.

The term "compact development" does not imply high-rise or even uniformly high density, but rather higher average "blended" densities. Compact development also features a mix of land uses, development of strong population and employment centers, interconnection of streets, and the design of structures and spaces at a human scale.

The Basics

Scientific consensus now exists that greenhouse gas accumulations due to human activities are contributing to global warming with potentially catastrophic consequences (IPCC 2007). International and domestic climate policy discussions have gravitated toward the goal of limiting the temperature increase to 2°C to 3°C by cutting greenhouse gas emissions by 60 to 80 percent below 1990 levels by the year 2050. The primary greenhouse gas is carbon dioxide, and every gallon of gasoline burned produces about 20 pounds of CO2 emissions.

Driving Up CO_2 Emissions

The United States is the largest emitter worldwide of the greenhouses gases that cause global warming. Transportation accounts for a full third of CO_2 emissions in the United States, and that share is growing as others shrink in comparison, rising from 31 percent in 1990 to 33 percent today It is hard to envision a "solution" to the global warming crisis that does not involve slowing the growth of transportation CO_2 emissions in the United States.

The Three-Legged Stool Needed to Reduce CO_2 from Automobiles

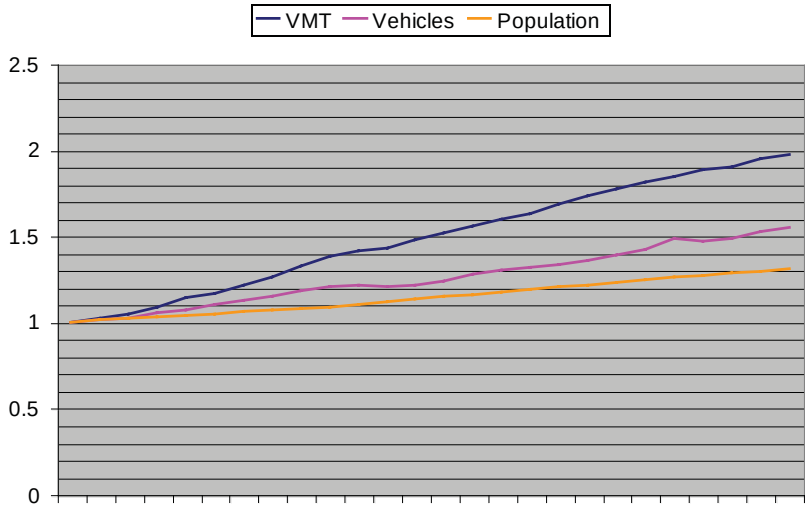
Transportation CO_2 reduction can be viewed as a three-legged stool, with one leg related to vehicle fuel efficiency, a second to the carbon content of the fuel itself, and a third to the amount of driving or vehicle miles traveled (VMT). Energy and climate policy initiatives at the federal and state levels have pinned their hopes almost exclusively on shoring up the first two legs of the stool, through the development of more efficient vehicles (such as hybrid cars) and lower-carbon fuels (such as biodiesel fuel). Yet a stool cannot stand on only two legs.

As the research compiled in this publication makes clear, technological improvement in vehicles and fuels are likely to be offset by continuing, robust growth in VMT. Since 1980, the number of miles Americans drive has grown three times faster than the U.S. population, and almost twice as fast as vehicle registrations (see Figure 0-1). Average automobile commute times in metropolitan areas have risen steadily over the decades, and many Americans now spend more time commuting than they do vacationing.

This raises some questions, which this report addresses. Why do we drive so much? Why is the total distance we drive growing so rapidly? And what can be done to alter this trend in a manner that is effective, fair, and economically acceptable?

Figure 0-1

Growth of VMT, Vehicle Registrations, and Population in the United States relative to 1980 Values



Source: FHWA 2005.

The growth in driving is due in large part to urban development, or what some refer to as the built environment. Americans drive so much because we have given ourselves little alternative. For 60 years, we have built homes ever farther from workplaces, created schools that are inaccessible except by motor vehicle, and isolated other destinations—such as shopping—from work and home. From World War II until very recently, nearly all new development has been planned and built on the assumption that people will use cars virtually every time they travel. As a larger and larger share of our built environment has become automobile dependent, car trips and distances have increased, and walking and public transit use have declined. Population growth has been responsible for only a quarter of the increase in vehicle miles driven over the last couple of decades. A larger share of the increase can be traced to the effects of a changing urban environment, namely to longer trips and people driving alone.

As with driving, land is being consumed for development at a rate almost three times faster than population growth. This expansive development has caused CO_2 emissions from cars to rise even as it has reduced the amount of forest land available to absorb CO_2.

How Growth in Driving Cancels Out Improved Vehicle Fuel Economy

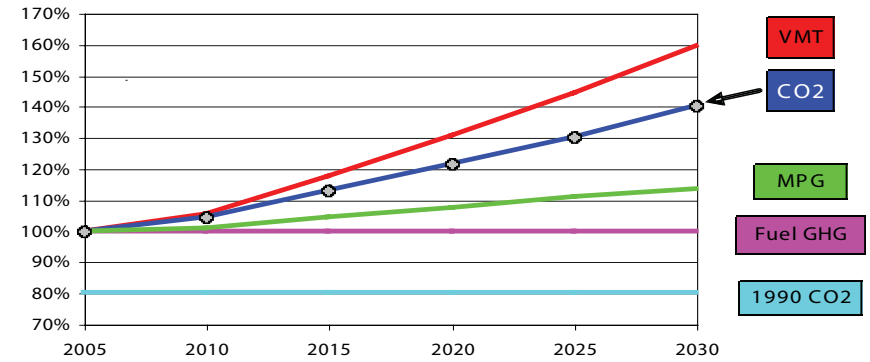
Carbon dioxide is more difficult to control through vehicle technology than are conventional air pollutants. Conventional pollutants can be reduced in automobile exhaust with sophisticated emission control systems (catalytic converters, on-board computers, and oxygen sensors). Carbon dioxide, meanwhile, is a direct outcome of burning fossil fuels; there is no practical way to remove or capture it from moving vehicles. At this point in time, the only way to reduce CO_2 emissions from vehicles is to burn less gasoline and diesel fuel.

An analysis by Steve Winkelman of the Center for Clean Air Policy, one of the coauthors of this publication,

finds that CO_2 emissions will continue to rise, despite technological advances, as the growth in driving overwhelms planned improvements in vehicle efficiency and fuel carbon content. The U.S. Department of Energy's Energy Information Administration (EIA) forecasts that driving will increase 59 percent between 2005 and 2030 (red line, Figure 0-2), outpacing the projected 23 percent increase in population. The EIA also forecasts a fleetwide fuel economy improvement of 12 percent within this time frame, primarily as a result of new federal fuel economy standards for light trucks (green line, Figure 0-2). Despite this improvement in efficiency, CO_2 emissions would grow by 41 percent (dark blue line, Figure 0-2).

Figure 0-2

Projected Growth in CO_2 Emissions from Cars and Light Trucks



Center for Clean Air Policy

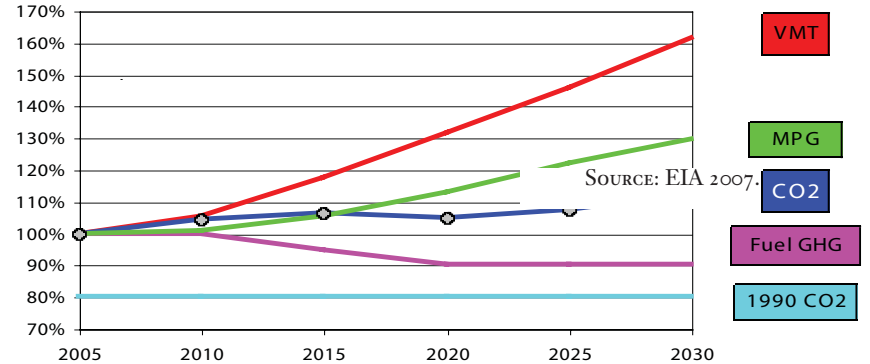
Source: EIA 2007.

U.S. fuel economy has been flat for almost 15 years, as the upward spiral of car weight and power has offset the more efficient technology. Federal and state efforts are underway to considerably boost vehicle efficiency and reduce greenhouse gas emissions. In June 2007, the U.S. Senate passed corporate average fuel economy (CAFE) standards that would increase new passenger vehicle fuel economy from the current 25 miles per gallon (mpg) to 35 mpg by 2020. (As of this writing, the House has not acted.). California plans to implement a low carbon standard for transportation fuels, specifically a 10 percent reduction in fuel carbon content by 2020.

Even if these more stringent standards for vehicles and fuels were to go into effect nationwide, transportation-related emissions would still far exceed target levels for stabilizing the global climate (see Figure 0-3). The rapid increase in driving would overwhelm both the increase in vehicle fuel economy (green line) and the lower carbon fuel content (purple line). In 2030, CO_2 emissions would be 12 percent above the 2005 level, and 40 percent above the 1990 level

Figure 0-3

Projected Growth in CO_2 Emissions from Cars and Light Trucks Assuming Stringent Nationwide Vehicle and Fuel Standards*



Source: EIA 2007.

Center for Clean Air Policy

Sources: VMT: EIA with 10% rebound MPG: US Senate, Fuels: C.

(turquoise line). For climate stabilization, the United States must bring the CO_2 level to 15 to 30 percent below 1990 levels by 2020 to keep in play a CO_2 reduction of 60 to 80 percent by 2050.

As the projections show, the United States cannot achieve such large reductions in transportation-related CO_2 emissions without sharply reducing the growth in miles driven.

Changing Development Patterns to Slow Global Warming

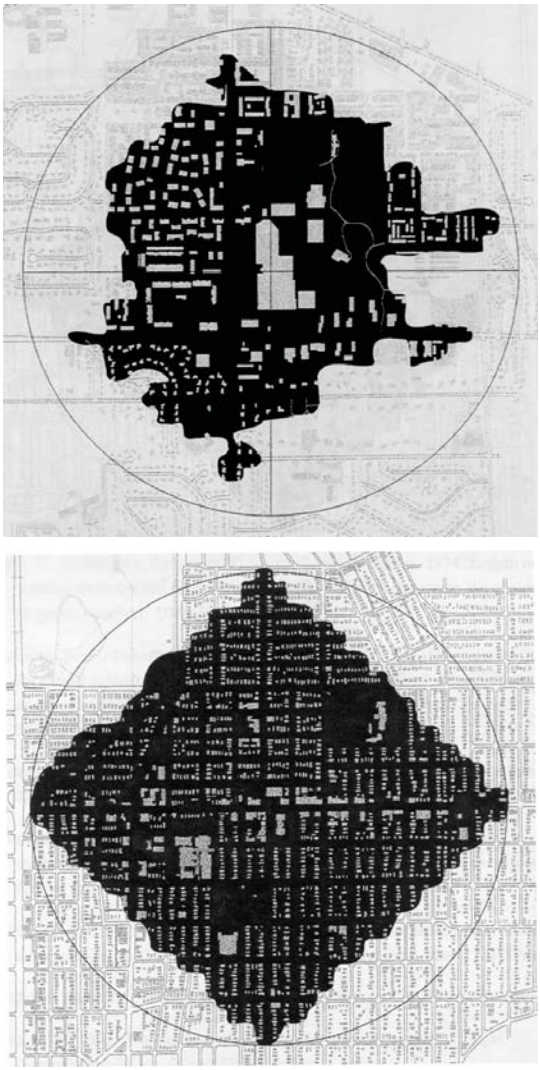
Recognizing the unsustainable growth in driving, the American Association of State Highway and Transportation Officials (AASHTO), representing state departments of transportation, is urging that the growth of vehicle miles driven be cut in half. How does a growing country—one with 300 million residents and another 100 million on the way by mid-century—slow the growth of vehicle miles driven? Aggressive measures certainly are available, including imposing ever stiffer fees and taxes on driving and parking or establishing no-drive zones or days. Some countries are experimenting with such measures. However, many in this country would view such steps as punitive, given the reality that most Americans do not have a viable alternative to driving. The body of research surveyed here shows that much of the rise in vehicle emissions can be curbed simply by growing in a way that will make it easier for Americans to drive less. In fact, the weight of the evidence shows that, with more compact development, people drive 20 to 40 percent less, at minimal or reduced cost, while reaping other fiscal and health benefits.

How Compact Development Helps Reduce the Need to Drive

Better community planning and more compact development help people live within walking or bicycling distance of some of the destinations they need to get to every day—work, shops, schools, and parks, as well as transit stops. If they choose to use a car, trips are short. Rather than building single-use subdivisions or office parks, communities can plan mixed-use developments that put housing within reach of these other destinations. The street network can be designed to interconnect, rather than end in culs-de-sac and funnel traffic onto overused arterial roads. Individual streets can be designed to be "complete," with safe and convenient places to walk, bicycle, and wait for the bus. Finally, by building more homes as condominiums, townhouses, or detached houses on smaller lots, and by building offices, stores and other destinations "up" rather than "out," communities can shorten distances between destinations. This makes neighborhood stores more economically viable, allows more frequent and convenient transit service, and helps shorten car trips.

Figure 0-4

Destinations within One-Quarter Mile of Center for Contrasting Street Networks in Seattle



Source: Moudon et al. 1997.

This type of development has seen a resurgence in recent years, and goes by many names, including "walkable communities," "new urbanist neighborhoods," and "transit-oriented developments" (TODs). "Infill" and "brownfield" developments put unused lots in urban areas to new uses, taking advantage of existing nearby destinations and infrastructure. Some "lifestyle centers" are now replacing single-use shopping malls with open-air shopping on connected streets with housing and office space as part of the new development. And many communities have rediscovered and revitalized their traditional town centers and downtowns, often adding more housing to the mix. These varied development types are collectively referred to in this publication as "compact development" or "smart growth."

How We Know that Compact Development Will Make a Difference: The Evidence

As these forms of development have become more common, planning researchers and practitioners have documented that residents of compact, mixed-use, transit-served communities do less driving. Studies have looked at the issue from varying angles, including:

- research that compares overall travel patterns among regions and neighborhoods of varying compactness and auto orientation;
- studies that follow the travel behavior of individual households in various settings; and
- models that simulate and compare the effects on travel of different future development scenarios at the regional and project levels.

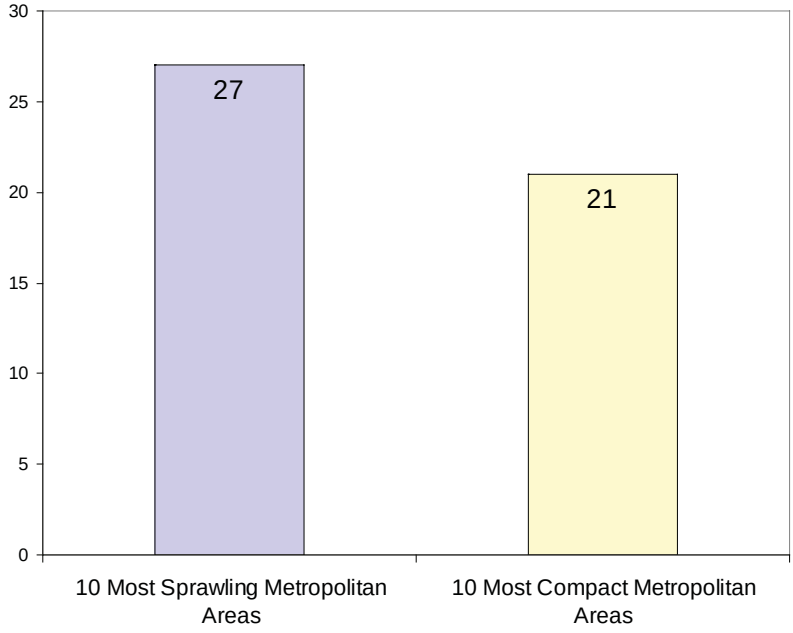
Regardless of the approach, researchers have found significant potential for compact development to reduce the miles that residents drive.

A comprehensive sprawl index developed by coauthor Reid Ewing of the National Center for Smart Growth at the University of Maryland ranked 83 of the largest metropolitan areas in the United States by their degree of sprawl, measuring density, mix of land uses, strength of activity centers, and connectedness of the street network (Ewing, Pendall, and Chen 2002, 2003). Even accounting for income and other socioeconomic differences, residents drove far less in the more compact regions. In highly sprawling Atlanta, vehicles racked up 34 miles each day for every person living in the region. Toward the other end of the scale, in Portland, Oregon, vehicles were driven fewer than 24 miles per person, per day.

This relationship holds up in studies that focus on the travel habits of individual households while measuring the environment surrounding their

Figure 0-5

Average Daily Vehicle Miles Traveled



Source: Ewing, Pendall, and Chen 2002, p. 18.

homes and/or workplaces. The link between urban development patterns and individual or household travel has become the most heavily researched subject in urban planning, with more than 100 rigorous empirical studies completed. These studies have been able to control for factors such as socioeconomic status, and can account for the fact that higher-income households tend to make more and longer trips than lower-income families.

One of the most comprehensive studies, conducted in King County, Washington, by Larry Frank of the University of British Columbia, found that residents of the most walkable neighborhoods drive 26 percent fewer miles per day than those living in the most sprawling areas. A meta-analysis of many of these types of studies finds that households living in developments with twice the density, diversity of uses, accessible destinations, and interconnected streets when compared to low-density sprawl drive about 33 percent less.

Many studies have been conducted by or in partnership with public health researchers interested in how the built environment can be better designed to encourage daily physical activity. These studies show that residents of communities designed to be walkable both drive fewer miles and also take more trips by foot and bicycle, which improves individual health. A recent literature review found that 17 of 20 studies, all dating from 2002 or later, have established statistically significant relationships between some aspect of the built environment and the risk of obesity.

Two other types of studies also find relationships between development patterns and driving: simulations that project the effect of various growth options for entire regions and simulations that predict the impact of individual development projects when sited and designed in different ways. In regional growth simulations, planners compare the effect of a metropolitan-wide business-as-usual scenario with more compact growth options. Coauthor Keith Bartholomew of the University of Utah analyzed 23 of these studies and found that compact scenarios averaged 8 percent fewer total miles driven than business-as-usual ones, with a maximum reduction of 31.7 percent (Bartholomew 2005, 2007). The better-performing scenarios were those with higher degrees of land use mixing, infill development, and population density, as well as a larger amount of expected growth. The travel models used in these studies would be expected to underestimate the impacts of site design, since most only crudely account for travel within neighborhoods and disregard walk and bike trips entirely.

Of the project-level studies, one of the best known evaluated the impact of building a very dense, mixed-use development at an abandoned steel mill site in the heart of Atlanta versus spreading the equivalent amount of commercial space and number of housing units in the prevailing patterns at three suburban locations. Analysis using transportation models enhanced by coauthor Jerry Walters of Fehr & Peers Associates (Walters, Ewing, and Allen 2000), and supplemented by the EPA's Smart Growth Index (to capture the effects of site design) found that the infill location would generate about 35 percent less driving and emissions than the comparison sites. The results were so compelling that the development was deemed a transportation control measure by the federal government for the purpose of helping to improve the region's air quality. The Atlantic Station project has become a highly successful reuse of central city industrial land.

What Smart Growth Would Look Like

How would this new focus on compact development change U.S. communities? Many more developments would look like the transit-oriented developments and new urbanist neighborhoods already going up in almost every city in the country, and these developments would start filling in vacant lots or failing strip shopping centers, or would revitalize older town centers, rather than replacing forests or farmland. Most developments would no longer be single-use subdivisions or office parks, but would mix shops, schools, and offices together with homes. They might feature ground-floor stores and offices with living space above, or townhomes within walking distance of a retail center. Most developments would be built to connect seamlessly with the external street network.

Jacoby Development Company

Atlantic Station today.

The density increases required to achieve the changes proposed in this publication would be moderate. Nelson's work shows that the average density of residential development in U.S. urban areas was about 7.6 units per acre in 2003. His predictions of shifting market demand indicate that all housing growth to 2025 could be accommodated by building condominiums, apartments, townhomes, and detached houses on small lots, while maintaining the current stock of houses on large lots. Under this scenario, while new developments would average a density of 13 units per acre, the average density of metropolitan areas overall would rise modestly, to about nine units per acre. Much of the change would result from stopping the sprawling development that has resulted in falling densities in many metropolitan areas.

Several publications provide a glimpse of what this future might look like. Images of compact development are available in This is Smart Growth (Smart Growth Network 2006) and Visualizing Density (Lincoln Institute of Land Policy 2007).

The Potential of Smart Growth

The potential of smart growth to curb the rise in greenhouse gas emissions will, of course, be limited by the amount of new development and redevelopment that takes place over the next few decades, and by the share of it that is compact in nature. There seems to be little question that a great deal of new building will take place as the U.S. population grows toward 400 million. According to the best available analysis, by Chris Nelson of Virginia Tech, 89 million new or replaced homes—and 190 billion square feet of new offices, institutions, stores, and other nonresidential buildings—will be constructed through 2050. If that is so, two-thirds of the development on the ground in 2050 will be built between now and then. Pursuing smart growth is a low-cost climate change strategy, because it involves shifting investments that have to be made anyway.

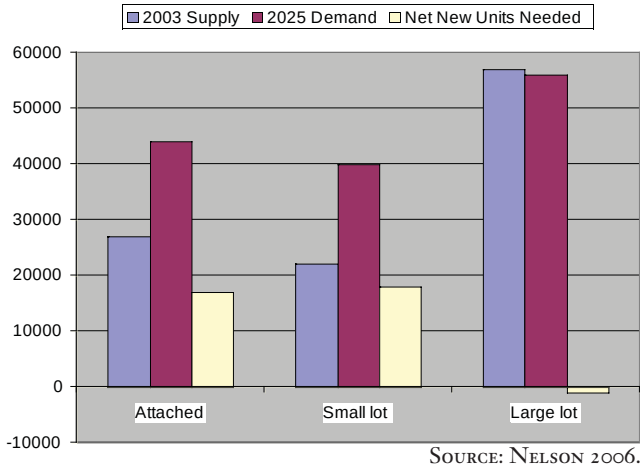
Smart Growth Meets Growing Market Demand for Choice

There is no doubt that moving away from a fossil fuel–based economy will require many difficult changes. Fortunately, smart growth is a change that many Americans will embrace. Evidence abounds that Americans are demanding more choices in where and how they live—and that changing demographics will accelerate that demand.

While prevailing zoning and development practices typically make sprawling development easier to build, developers who make the effort to create compact communities are encountering a responsive public. In 2003, for the first time in the country's history, the sales prices per square foot for attached housing—that is, condominiums and townhouses—was higher than that of detached housing units. The real estate analysis firm Robert Charles Lesser & Co. has conducted a dozen consumer preference surveys in suburban and urban locations[1] for a variety of builders to help them develop new projects. The surveys have found that in every location examined, about one-third of respondents prefer smart growth housing products and communities. Other studies by the National Association of Homebuilders, the National Association of Realtors, the Fannie Mae Foundation, high-production builders, and other researchers have corroborated these results—some estimating even greater demand for smart growth housing products. When smart growth also offers shorter commutes, it appeals to another one-quarter of the market, because many people are willing to trade lot or house size for shorter commutes.

Figure 0-6

2003 Housing Supply versus 2025 Housing Demand



Source: Nelson 2006.

Because the demand is greater than the current supply, the price-per-square foot values of houses in mixed-use neighborhoods show price premiums ranging from 40 to 100 percent, compared to houses in nearby single-use subdivisions, according to a study by Chris Leinberger of the Brookings Institution.

This market demand is only expected to grow over the next several decades, as the share of households with children shrinks and those made up of older Americans grows with the retiring of baby boomers. Households without children will account for close to 90 percent of new housing demand, and single-person households will account for a one-third. Nelson projects that the demand for attached and small-lot housing will exceed the current supply by 35 million units (71 percent), while the demand for large-lot housing will actually be less than the current supply.

[1] These locations include Albuquerque, Atlanta, Boise, Charlotte, Chattanooga, Denver, Orlando, Phoenix, Provo, Savannah, and Tampa.

Total Estimated VMT Reduction and Total Climate Impact

When viewed in total, the evidence on land use and driving shows that compact development will reduce the need to drive between 20 and 40 percent, as compared with development on the outer suburban edge with isolated homes, workplaces, and other destinations. It is realistic to assume a 30 percent cut in VMT with compact development.

Making reasonable assumptions about growth rates, the market share of compact development, and the relationship between CO_2 reduction and VMT reduction, smart growth could, by itself, reduce total transportation-related CO_2 emissions from current trends by 7 to 10 percent as of 2050. This reduction is achievable with land-use changes alone. It does not include additional reductions from complementary measures, such as higher fuel prices and carbon taxes, peak-period road tolls, pay-as-you drive insurance, paid parking, and other policies designed to make drivers pay more of the full social costs of auto use.

This estimate also does not include the energy saved in buildings with compact development, or the CO_2-absorbing capacity of forests preserved by compact development. Whatever the total savings, it is important to remember that land use changes provide a permanent climate benefit that would compound over time. The second 50 years of smart growth would build on the base reduction from the first 50 years, and so on into the future. More immediate strategies, such as gas tax increases, do not have this degree of permanence.

The authors calculate that shifting 60 percent of new growth to compact patterns would save 85 million metric tons of CO_2 annually by 2030. The savings over that period equate to a 28 percent increase in federal vehicle efficiency standards by 2020 (to 32 mpg), comparable to proposals now being debated in Congress. It would be as if the fleetwide efficiency for new vehicles had risen to 32 mpg by 2020. Every resident of a compact neighborhood would provide the environmental benefit expected from, say, driving one of today's efficient hybrid cars. That effect would be compounded, of course, if that person also drove such an efficient car whenever he or she chose to make a vehicle trip. Smart growth would become an important "third leg" in the transportation sector's fight against global warming, along with more efficient vehicles and lower-carbon fuels.

A Climate-Sparing Strategy with Multiple Payoffs

Addressing climate change through smart growth is an attractive strategy because, in addition to being in line with market demand, compact development provides many other benefits and will cost the economy little or nothing. Research has documented that compact development helps preserve farmland and open space, protect water quality, and improve health by providing more opportunities for physical activity.

Studies also have confirmed that compact development saves taxpayers money, particularly by reducing the costs of infrastructure such as roads and water and sewer lines. For example, the Envision Utah scenario planning process resulted in the selection of a compact growth plan that will **save** the region about **$4.5** billion in infrastructure spending over a continuation of sprawling development.

Finally, unlike **hydrogen**-fueled **vehicles and cellulosic** ethanol, which **get a lot of** attention in the climate-change debate, the "technology" of compact, walkable communities exists today, as it has in one form or another for thousands of years. We can begin using this technology in the service of a cooler planet right now.

Policy Implications

In most metropolitan areas, compact development faces an uneven playing field. Local land development codes encourage auto-oriented development. Public spending supports development at the **metropolitan** fringe more than in already developed areas. Transportation policies remain focused on accommodating the automobile rather than alternatives.

The key to substantial GHG reductions is to get all policies, funding, incentives, practices, rules, codes, and regulations pointing in the same direction to create the right conditions for smart growth. Innovative policies often are in direct conflict with the conventional paradigm that produces automobile dependence.

Here, we three major policy initiatives at the federal level that would benefit states, metro regions, cities and towns in their efforts to meet the growing demand for compact development. These initiatives, as well as potential actions on the part of state and local governments, discussed more fully in Chapter 7 of *Growing Cooler*.

Federal Actions

Require Transportation Conformity for Greenhouse Gases. Federal climate change legislation should require regional transportation plans to pass a conformity test for CO_2 emissions, similar to those for other criteria pollutants. The Supreme Court ruling in Massachusetts v. EPA established the formal authority to consider greenhouse gases under the Clean Air Act, and a transportation planning conformity requirement would be an obvious way for the EPA to exercise this authority to produce tangible results.

Enact "Green-TEA" Transportation Legislation that Reduces GHGs. The Intermodal Surface Transportation Efficiency Act of 1991 (known as ISTEA) represented a revolutionary break from past highway bills with its greater emphasis on alternatives to the automobile, community involvement, environmental goals, and coordinated planning. The next surface transportation bill could bring yet another paradigm shift; it could further address environmental performance, climate protection, and green development. We refer to this opportunity as "Green-TEA."

Provide Funding Directly to Metropolitan Planning Organizations (MPOs). Metropolitan areas contain more than 80 percent of the nation's population and 85 percent of its economic output. Investment by state departments of transportation in metropolitan areas lags far behind these percentages. The issue is not just the amount of funding; it is also the authority to decide how the money is spent. What is necessary to remedy the long history of structural and institutional causes of these inequities is a new system of allocating federal transportation funds directly to metropolitan areas. The amount of allocation should be closer to the proportion of an MPO's population and economic activity compared to other MPOs and non-MPO areas in the same state.

LAND USE AND COMMUNITY CHARACTER ELEMENT

3 LAND USE AND COMMUNITY CHARACTER ELEMENT

This element seeks to preserve and foster the rural character of the County. The County has challenged itself to determine how small its communities can remain and yet still be sustainable in terms of infrastructure, balanced in terms of housing and jobs, and healthy in terms of quality of life and community services. Each existing rural town was examined in this manner and a modest amount of growth has been proposed for some areas. This element also establishes goals for regional collaboration and equity, green building standards, sustainable community design and net community benefits from new growth. Growth boundaries have been established for every community and each of the four cities.

A. Introduction

1. Context

From a land use perspective, this General Plan continues the County's strong focus on protecting our agricultural and open space resources, commodities and identity; resisting urbanization; and directing growth into the existing incorporated cities and towns. For the past 50 years, these policies have been tremendously successful. Over 93 percent of the County remains in farmland and open space, despite intense development pressures from both the Sacramento and Bay Area metropolitan areas. Although Yolo County is 39th in size among the 58 California counties, as of 2006 it ranked 23rd in total crop value. In particular, the County continues to be among the State leaders in tomato, hay, honeydew, and organic crop production, and has a rapidly growing wine grape industry. The management of growth has been equally successful. The cities and towns in the County house 93 percent of the population, but account for less than 6 percent of the total area. As a result, Yolo County has retained and strengthened its identity as a place of small and modest urban areas, vast open lands and innovative government.

As Yolo County looks ahead to the next 20 years, these issues will become even more important to ensure sustainable communities, a reliable food supply and a healthy environment. However, this vision needs to expand to address new challenges. First, the small unincorporated towns require significant new investment in basic infrastructure and amenities to serve existing populations and revitalize existing commercial areas. Second, the local economy needs to diversify beyond its reliance on agriculture, to provide a more stable job market and increase government revenue streams. Third, the County and local special districts need to improve the cost-effectiveness of service delivery. Fourth, Yolo County needs to adopt development standards and designs that account for and help to reduce future climate change. Consequently, this General Plan embraces the following strategies:

1. Modest managed growth within specified existing unincorporated communities, where accompanied by improvements to existing infrastructure and services, as well as by suitable new infrastructure and services.
2. Opportunities for revenue-producing and job-producing agricultural, industrial and commercial growth in limited locations and along key transportation corridors.
3. Thresholds that allow for effective and efficient provision of services, consistent with rural values and expectations.
4. New emphasis on community and neighborhood design requirements that reflect "smart growth" principles and complement the character of existing developed areas.

2. Contents

This element addresses land use issues throughout Yolo County including:

1. Range and balance of land uses (Goal LU-1)
2. Agricultural preservation[1] (Goal LU-2)
3. Growth management (Goal LU-3)
4. Delta land use and resource management (Goal LU-4)
5. Equitable land use decisions (Goal LU-5)
6. Intra-County coordination (Goal LU-6)
7. Regional coordination (Goal LU-7)

This element addresses community character issues throughout Yolo County including:

1. Preservation of rural character (Goal CC-1)
2. Community planning (Goal CC-2)
3. Planned growth (Goal CC-3
4. Project design (Goal CC-4)

This element contains the following sections: Introduction, Regulatory Framework, Policy Framework and Implementation Program. Within the Policy Framework and Implementation Program sections, policies and actions related to climate change are denoted with the symbol "🌍".

3. Background Information

The 1983 General Plan included 75 separate land use designations for the unincorporated county. Table LU-1 (1983 Yolo County General Plan Land Use Designations and Acreages) is provided at the end of this Element and identifies acreages assigned to each of these designations in the prior General Plan and groups them by category.

Table LU-2 (1983 Yolo County General Plan Land Use Designations by Community Area) provides a breakdown of planned land uses under the prior General Plan, grouped by land use type and community area.

[1] Also addressed in greater detail in the Agriculture and Economic Development Element.

TABLE LU-2 **1983 YOLO COUNTY GENERAL PLAN LAND USE DESIGNATIONS BY COMMUNITY AREA**

	Residential[a]	Jobs and Services[b]	Agriculture and Open Space	Totals
Community Areas				
Capay Valley[c]	70.5	1,010.7	102,730.0	103,811.2
Clarksburg	101.4	141.3	34,703.3	34,946.1
Dunnigan	408.0	280.1	3,179.5	3,867.6
Esparto	355.9	226.4	2,900.3	3,482.6
Knights Landing	104.4	240.0	3.1	347.6
Madison	26.9	23.7	30.3	80.9
Monument Hills	1,258.6	85.3	252.0	1,595.9
Yolo	76.8	34.1	2.0	112.9
Zamora	14.3	2.5	6.5	23.3
Subtotals	*2,416.8*	*2,044.1*	*143,807.0*	*148,268.0*
Other Areas				
Davis Area[e]	615.2	479.4	4,353.1	5,447.7
Outlying[d]	123.0	490.0	1,521.7	2,134.7
West Sac Area	0	0	0	0
Winters[f]	33.6	33.1	0	66.7
Woodland Area[g]	48.2	513.9	508.5	1,070.6
Subtotals	*820.0*	*1,516.4*	*6,383.3*	*8,719.7*
Remaining Unincorporated	0	8,160.2	456,077.1	464,237.3
Acreage Totals	**3,236.8**	**11,720.7**	**606,267.4[h]**	**621,224.0[i]**

Notes: Units are in acres.
[a] Residential = Residential Rural, Residential Low, Residential Medium and Residential High.
[b] Jobs and Services = Commercial General, Commercial Local, Industrial, Public and Quasi-Public, Mixed, Parks and Recreation and Other.
[c] Includes land uses in the towns of Capay, Guinda, Rumsey and Tribal lands.
[d] Cache Creek Open Space, County Airport and Elkhorn.
[e] Covell/Pole Line Road, Binning Farms, North Davis Meadows, Patwin Road, Jury Industrial, UC Davis, Royal Oaks MHP, Willow Bank, El Macero and Chiles Road.
[f] El Rio Villa and Putah Creek Recreational Vehicle Park.
[g] Spreckels, North Woodland, Willow Oak and East Woodland.
[h] As allowed under the existing General Plan and based on past trends. General Plan buildout is assumed to include approximately 1,610 farm dwellings and approximately 520 acres of agricultural industrial or agricultural commercial development on Agricultural land.
[i] Minor differences in total due to rounding.
Source: 1983 Yolo County General Plan.

Table LU-3 (Summary of General Plan Land Use Designations and Acreages Countywide) provides countywide background information showing the current General Plan land use buildout for each of the four cities, with the 1983 General Plan land use buildout for the County unincorporated area.

TABLE LU-3 **SUMMARY OF GENERAL PLAN LAND USE DESIGNATIONS AND ACREAGES COUNTYWIDE (AS OF 2007)**

	Incorporated Area (Current)						Unincorp.		
Land Use Categories	Davis	W. Sac	Winters	Woodland	Incorp. Subtotal	%	Area (1983)	Acreage Total	%
Open Space	299	2,185	104	754	3,342	10.3	2,722	6,064	1.0
Agriculture	0	0	0	0	0	0.0	603,544	603,544	92.3
Recreation	402	322	45	252	1,021	3.2	1,121	2,142	0.3
Residential	3,940	4,316	770	4,169	13,195	40.8	3,237	16,432	2.5
Commercial	493	633	122	727	1,975	6.1	406	2,381	0.4
Industrial	433	2,656	75	2,281	5,445	16.8	1,195	6,640	1.0
Public	548	730	370	1,329	2,977	9.4	694	3,671	0.6
Mixed Use	11	889	50	0	950	2.9	145	1,095	0.2
Other	229	2,992	93	106	3,420	10.6	8,160	11,580	1.8
Subtotals	**6,355**	**14,723**	**1,629**	**9,618**	**32,325**	**100%**	**621,224**	**653,549**	**100%**

Notes: Units are in acres.
Source: City Planning Directors and 1983 Yolo County General Plan.

B. Regulatory Framework

1. State General Plan Requirements

State law (Section 65302a of the Government Code) mandates that the land use element contain the following key topics:

- Proposed general distribution, location and extent of land uses.
- Population density and building intensity by land use.
- Areas subject to flooding, including annual review of those areas.
- A designated land use category for timberland production.
- A consideration of the impact of new growth on land adjacent to military facilities and underlying military airspace.

State law (Section 65302.4 of the Government Code) also allows land use elements to address urban form and design including:

- Differentiating between neighborhoods, districts and corridors.
- Providing for a mixture of land uses and housing types within neighborhoods, districts and corridors.
- Providing specific measures for regulating relationships between buildings and between buildings and outdoor public areas including streets.

State law provides that the County can address these items in any format and is required to address them only to the extent that they are relevant in the County. Section 65301a of the Government Code indicates that the General Plan may be adopted in any format deemed appropriate or convenient by the Board of Supervisors, including the combining of elements. Section 65301c goes on to clarify that the County is required to address each of these items only to the extent that the subject of the element exists in the planning area.

In light of this, Yolo County has addressed all of the above items within this element, with the following exceptions:

- Flooding: Areas subject to flooding from a major (100 or 200-year) event and the requirement for annual review are addressed in the Health and Safety Element. Localized flood issues and storm drainage are addressed in the Public Facilities and Services Element.
- Timber Harvesting: A land use category for timberland production is not provided as the County has no timberland production areas.
- Military Facilities: The impact of new growth on military readiness activities is not addressed as the only military facility in the County, the McClellan/Davis Telecommunication Site, has been declared surplus by the Army and is now closed. Discussion regarding this facility and plans to convert it to a County open space facility are addressed in the Conservation and Open Space Element
- Land Use Planning Boundaries: All lands within the Yolo County boundary are within the Yolo County General Plan Area. However, the County does not have jurisdiction over the following, even though they are within the County boundary: federal lands, State lands, University of California land, tribal trust land, incorporated cities, and, in many cases, lands owned by special districts such as school districts.

2. Land Use Designations

The land use designations listed below are utilized in this General Plan. Table LU-4 (Land Use Designations) is provided at the end of this Element and identifies the allowed uses, densities and intensities for each proposed new land use designation.

- Open Space (OS)
- Agriculture (AG)
- Parks and Recreation (PR)
- Residential Rural (RR)

- Residential Low (RL)
- Residential Medium (RM)
- Residential High (RH)
- Commercial General (CG)
- Commercial Local (CL)
- Industrial (IN)
- Public and Quasi-Public (PQ)
- Specific Plan (SP)
- Specific Plan Overlay (SPO)
- Delta Protection Overlay (DPO)
- Natural Heritage Overlay (NHO)
- Agricultural District Overlay (ADO)
- Mineral Resource Overlay (MRO)
- Tribal Trust Overlay (TTO)

These base land uses consolidate and replace land use designations used in the 1983 General Plan and in many cases consolidate and replace designations used in various area plans. Table LU-1 identifies how the prior 1983 land use designations correspond to the new proposed land use designations. The 1983 combining designations are replaced with the overlay designations defined in this table.

3. Land Use Maps and Tables

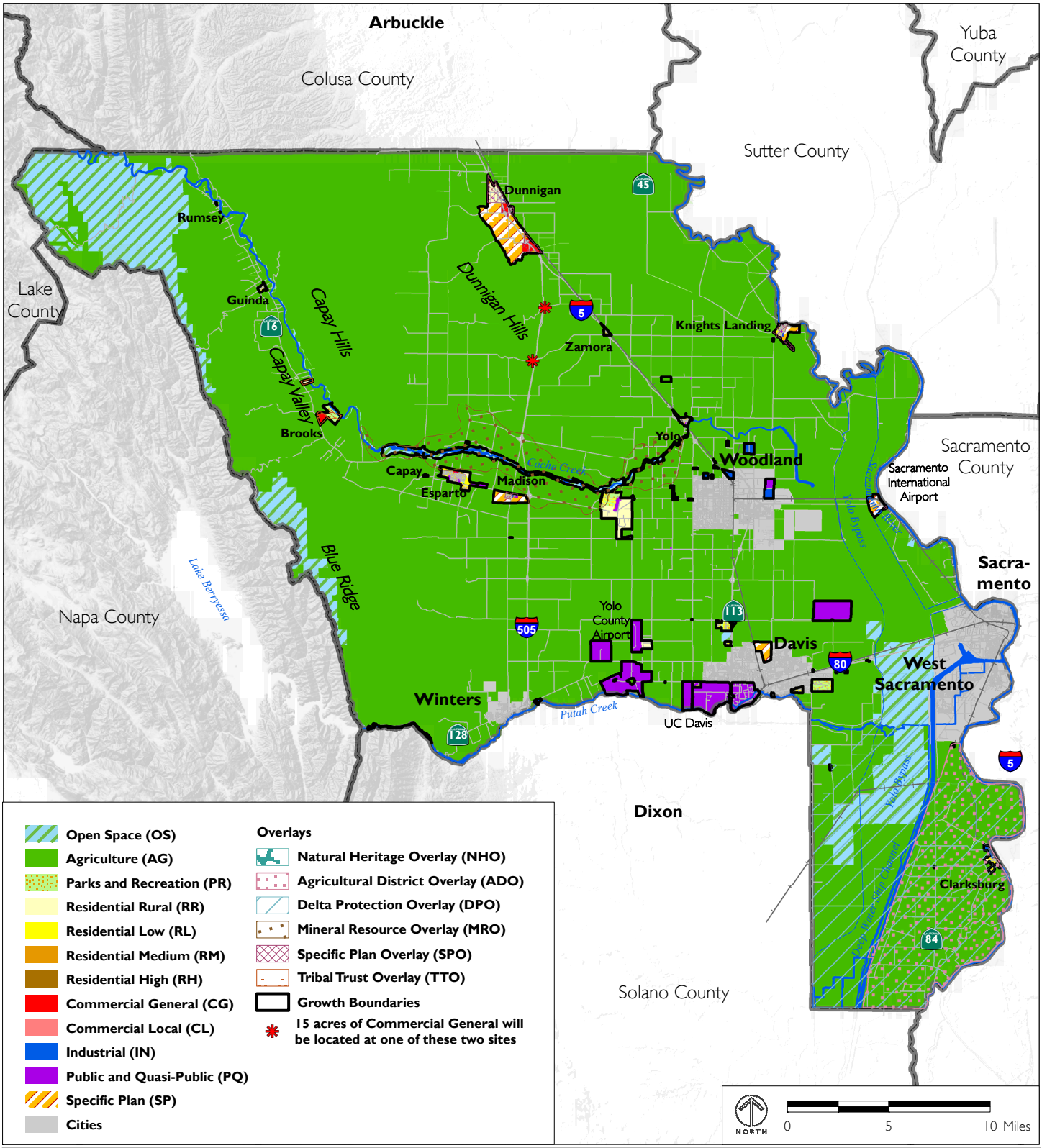
Figure LU-1A is the Land Use Diagram for Yolo County. Figures LU-1B through LU-1G show each community in the County and are found at the end of the Element. This figure depicts the assignment of land use designations to all land within the County. Interpretive guidance and administrative procedures to assist with utilization of this figure are provided in Chapter 1.0 (Introduction and Administration) of this General Plan. Table LU-5 (2030 Yolo County General Plan Land Use Designations and Acreages) provides acreages assigned to each land use designation in this General Plan.

4. Spheres of Influence

This General Plan includes lands that are in unincorporated Yolo County but fall within the "spheres of influence" (SOIs) of the four incorporated cities. Every city in California has an SOI, although in some cases it is coterminous with the city's corporate boundaries. Figure LU-1.1 provides the Spheres of Influence for each of the four Yolo County cities.

SOIs are adopted by the Local Agency Formation Commission (LAFCO) in each County. County LAFCOs were created by the State in 1963 to coordinate logical changes in local governmental boundaries in order to promote efficient provision of services, prevent urban sprawl and preserve agriculture and open space. Each LAFCO is responsible for adopting a sphere of influence for each city and special district in its County to represent "the probable physical boundaries and service area," as required by California Government Code Section 56076.[2]

[2] State of California General Plan Guidelines, Governor's Office of Planning and Research, 2003, page 10.



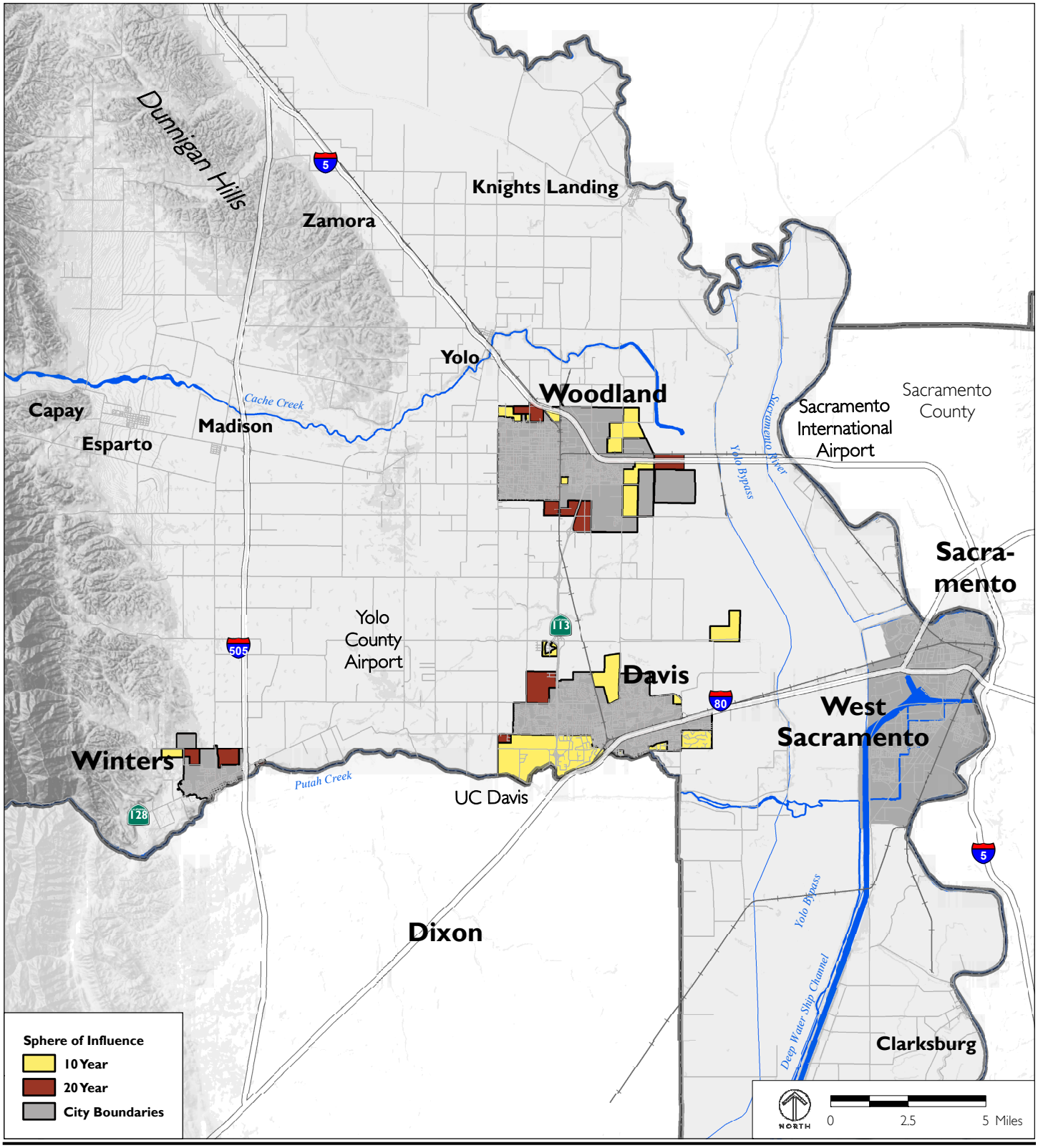
Source: Yolo County GIS, 2009.

FIGURE LU-1A

GENERAL PLAN LAND USE MAP

TABLE LU-5 **2030 YOLO COUNTY GENERAL PLAN LAND USE DESIGNATIONS AND ACREAGES**

Land Use Designation	Acreage
Open Space	51,445
Agriculture	544,909
Parks and Recreation	890
Residential Rural	1,783
Residential Low	1,163
Residential Medium	162
Residential High	28
Commercial General	529
Commercial Local	118
Industrial	658
Public and Quasi-Public	7,334
Specific Plan	3,606
Subtotal	*612,635*
Incorporated Cities	32,325
Rights-of-Way	8,589
County Total	**653,549**
Specific Plan Areas	
Covell Specific Plan	384
Dunnigan Specific Plan	2,254
Elkhorn Specific Plan	344
Knights Landing Specific Plan	212
Madison Specific Plan	413
Specific Plan Area Total	*3,606*
Overlays	
Tribal Trust Overlay	483
Mineral Resource Overlay	18,452
Clarksburg Agricultural Overlay	35,171
Delta Protection Overlay	73,053
Dunnigan Specific Plan Overlay	927
Elkhorn Specific Plan Overlay	5
Knights Landing Specific Plan Overlay	224
Madison Specific Plan Overlay	100



Source: Yolo County GIS, 2009.

FIGURE LU-1.1

SPHERE OF INFLUENCE BOUNDARIES

Many cities choose to designate land uses within their SOI areas on their General Plan Land Use Designation Map in order to express desired municipal land uses for those areas. The General Plans for West Sacramento, Davis, Woodland and Winters include land use designations for lands outside of their city limits, but inside their respective SOIs. Because these lands are legally under the County's jurisdiction, they are also included in the Yolo County General Plan and given land use designations in this General Plan. The designation in the County General Plan of lands within the SOI may differ from the designations shown in the City General Plan. Until SOI areas are annexed into a city's boundaries, the controlling land use designations for purposes of development are those of the County.

5. Growth Boundaries

This General Plan includes identified growth boundaries for all community and other outlying areas of the unincorporated County. These growth boundaries are shown in Figures LU-2A through LU-1H and defined as a boundary around the outer perimeter of each area of non-agriculturally designated land within the County. For the incorporated cities, the SOI boundaries are identified as the growth boundary for that City.

6. Relationship to the Yolo County Zoning Code

Title 8 (Land Development and Zoning) of the Yolo County Code contains the primary land development regulations of the County, including the Zoning Code. These regulations implement the General Plan and must be consistent. Inconsistencies between the two documents must be resolved in favor of the General Plan. The Zoning Code will be revised to bring it into conformance with this General Plan.

The Zoning Code, in particular, contains further refinements of the land use designations established in the General Plan, in the form of land use zones. Table LU-6 provides a matrix that correlates the land use zones of the existing Zoning Code with the land use designations of this General Plan update.

7. Land Use and Resources Management Plan for the Primary Zone of the Delta

The Land Use and Resources Management Plan for the Primary Zone of the Delta (LURMP) was developed in response to the Delta Protection Act of 1992, by the State Delta Protection Commission. The plan was adopted by the State in 1995 for the purpose of providing direction to local jurisdictions in the Delta region on land use decisions. The Plan addresses the environment, utilities and infrastructure, land use, agriculture, water, recreation and access, levees and boater safety. The General Plans for all jurisdictions within the Delta primary zone, including portions of Yolo County, are required to be consistent with this plan. The LURMP was adopted by the County as a General Plan amendment on March 18, 1997 by Resolution No. 97-34. The State is currently engaged in a process to update this plan. Upon completion, the County will be required to review this General Plan for consistency and make amendments as necessary.

TABLE LU-6 **ZONING/GENERAL PLAN CONSISTENCY**

General Plan Land Use Designation	General Plan Symbol	Zone Designation	Zone Symbol
Residential Land Use Designations			
Residential Rural	RR	Residential Rural Agricultural Mobile Home Combining	RRA -MHF
Residential Low	RL	Residential Suburban Residential One-Family Mobile Home Combining	RS R1 -MHF
Residential Medium	RM	Residential One-Family or Duplex Mobile Home Combining Multiple Family Residential	R2 -MHF R-3
Residential High	RH	Apartment Professional Mobile Home Combining	R4 -MHF
Commercial Land Use Designations			
Commercial Local	CL	Neighborhood Commercial Community Commercial Waterfront	C-1 C-2 WF
Commercial General	CG	General Commercial Highway Services Commercial Recreational Vehicle Park Combining	C-3 C-H -RVP
Industrial Land Use Designations			
Industrial	IN	Limited Industrial Light Industrial Heavy Industrial	M-L M-1 M-2
Other Land Use Designations			
Agriculture	AG	Agricultural Preserve Agricultural Exclusive Agricultural General Agricultural Industry Watershed Combining Mobile Home Combining Special Sand and Gravel Combining	A-P A-E A-1 AGI -W -MHF -SG
Open Space	OS	Open Space Public Open Space Watershed Combining	OS POS -W
Parks and Recreation	PR	Parks and Recreation Public Open Space	PR POS
Public/Quasi-Public	PQ	Airport Special Height Combining	AV -H
Specific Plan	SP	Agricultural Preserve Agricultural Exclusive Agricultural General Agricultural Industry Watershed Combining Mobile Home Combining Special Sand and Gravel Combining Planned Development No. 45	A-P A-E A-1 AGI -W -MHF -SG PD-45

TABLE LU-6 **ZONING/GENERAL PLAN CONSISTENCY** (CONTINUED)

General Plan Land Use Designation	General Plan Symbol	Zone Designation	Zone Symbol
Overlay Land Use Designations			
Natural Heritage Overlay	NHO	Agricultural Preserve	A-P
		Agricultural Exclusive	A-E
		Agricultural General	A-1
		Agricultural Industry	AGI
		Open Space	OS
		Public Open Space	POS
		Watershed Combining	-W
		Mobile Home Combining	-MHF
Agricultural District Overlay	ADO	Agricultural Preserve	A-P
		Agricultural Exclusive	A-E
		Agricultural General	A-1
		Agricultural Industry	AGI
		Watershed Combining	-W
		Mobile Home Combining	-MHF
		Special Sand and Gravel Combining	-SG
Delta Protection Overlay	DPO	Various	Various
Mineral Resource Overlay	MRO	Sand and Gravel Reserve Combining	-SGR
Specific Plan Overlay	SPO	Various	Various
Tribal Trust Overlay	TTO	Various	Various

Note: The following zone overlays may be combined with any residential, commercial, industrial, or agriculture land use designation:

-B Special Building Site Combining
-R Special Review Combining
-PD Planned Development Combining

C. Policy Framework

1. Land Use Policies

GOAL LU-1	**<u>Range and Balance of Land Uses</u>. Maintain an appropriate range and balance of land uses to maintain the variety of activities necessary for a diverse, healthy and sustainable society.**

Policy LU-1.1 Assign the following range of land use designations throughout the County, as presented in detail in Table LU-4 (Land Use Designations):

Open Space (OS) includes public open space lands, major natural water bodies, agricultural buffer areas, and habitat. The primary land use is characterized by "passive" and/or very low-intensity management, as distinguished from AG or PR land use designations, which involve more intense management of the land. Detention basins are allowed as an ancillary use when designed with naturalized features and native landscaping, compatible with the open space primary use.

Agriculture (AG) includes the full range of cultivated agriculture, such as row crops, orchards, vineyards, dryland farming, livestock grazing, forest products, horticulture, floriculture, apiaries, confined animal facilities and equestrian facilities. It also includes agricultural industrial uses (e.g. agricultural research, processing and storage; supply; service; crop dusting; agricultural chemical and equipment sales; surface mining; etc.) as well as agricultural commercial uses (e.g. roadside stands, "Yolo Stores," wineries, farm-based tourism (e.g. u-pick, dude ranches, lodging), horseshows, rodeos, crop-based seasonal events, ancillary restaurants and/or stores) serving rural areas. Agriculture also includes farmworker housing, surface mining, and incidental habitat.

Parks and Recreation (PR) includes developed (or "active") park facilities, such as regional, community and neighborhood parks, tot lots, sports fields, and public pools. Also may include agricultural buffer areas. Detention basins are allowed as an ancillary use when designed with recreational or sports features.

Residential Rural (RR) includes large lot rural homes with primarily detached single-family units, although attached and/or detached second units or duplexes are allowed. Density range: 1du/5ac to <1 du/ac.

Residential Low (RL) includes traditional neighborhoods with primarily detached single-family units, although attached and/or detached second units or duplexes are allowed. Triplexes and four-plexes allowed when designed to be compatible with adjoining single-family homes. Small compatible neighborhood serving retail and office allowed as ancillary use. Density range: 1 du/ac to <10 du/ac.

Residential Medium (RM) includes dense neighborhoods with primarily attached single family and multi-family units, although detached single-family units are allowed. Small compatible neighborhood serving retail and office allowed as ancillary use. Density range: 10 du/ac to <20 du/ac.

Residential High (RH) includes apartments, condominiums, townhouses and other attached multi-family units. Small compatible neighborhood serving retail and office allowed as ancillary use. Density range: ≥20 du/ac.

Commercial General (CG) includes regional and highway-serving retail, offices, service retail and agricultural commercial uses. Research and development is allowed where offices and service support uses are the primary use (accounting for more than 50 percent of the total square footage). There is no limit on the amount of ground floor square footage. Upper floor and accessory attached residential uses are allowed.

Commercial Local (CL) includes a range of goods and services to meet the everyday needs of residents within a community, such as retail, offices, service uses and agricultural commercial uses. There is a limit of 40,000 square feet allowed on the ground floor for any one user. Upper floor and ancillary attached residential uses are allowed.

Industrial (IN) includes the full range of light to heavy industrial/ manufacturing, including agricultural industrial uses (e.g. storage facilities, contractor's yards, corporation yards, dismantling, etc.). Research and development, including biotechnology, is allowed where manufacturing is the primary use (accounting for more than 50 percent of the total square footage).

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Public and Quasi-Public (PQ) includes public/governmental offices, places of worship, schools, libraries, and other community and/or civic uses. Also includes public airports, including related visitor services, and infrastructure including wastewater treatment facilities, municipal wells, landfills, and stormwater detention basins. May include agricultural buffer areas.

Specific Plan (SP) allows uses in the AG designation to continue temporarily until such time as the Specific Plan has been adopted, or the land use designation is otherwise amended. Ultimate land uses must be consistent with the adopted Specific Plan. Capital intensive agricultural uses are discouraged in lands designated Specific Plan so as not to preclude later planned uses.

Natural Heritage Overlay (NHO) applies to focused conservation areas identified in the Yolo Natural Heritage Program. Allowed land uses are limited to those consistent with the adopted Yolo Natural Heritage Program.

Agricultural District Overlay (ADO) applies to designated agricultural districts. Land uses consistent with the base designation and the district specifications are allowed.

Delta Protection Overlay (DPO) applies to the State designated "primary zone" of the Sacramento-San Joaquin Delta, as defined in the Delta Protection Act. Land uses consistent with the base designation and the Delta Protection Commission's Land Use and Resource Management Plan are allowed.

Mineral Resource Overlay (MRO) applies to State designated mineral resource zones (MRZ-2) containing critical geological deposits needed for economic use, as well as existing mining operations.

Specific Plan Overlay (SPO) applies to existing and planned areas of development typically adjacent to identified Specific Plan designated land. Land uses consistent with the existing land use designation are allowed until a Specific Plan has been adopted, at which point the Specific Plan takes precedence.

Tribal Trust Overlay (TTO) applies to tribal trust lands held by the federal government for recognized tribal governments.

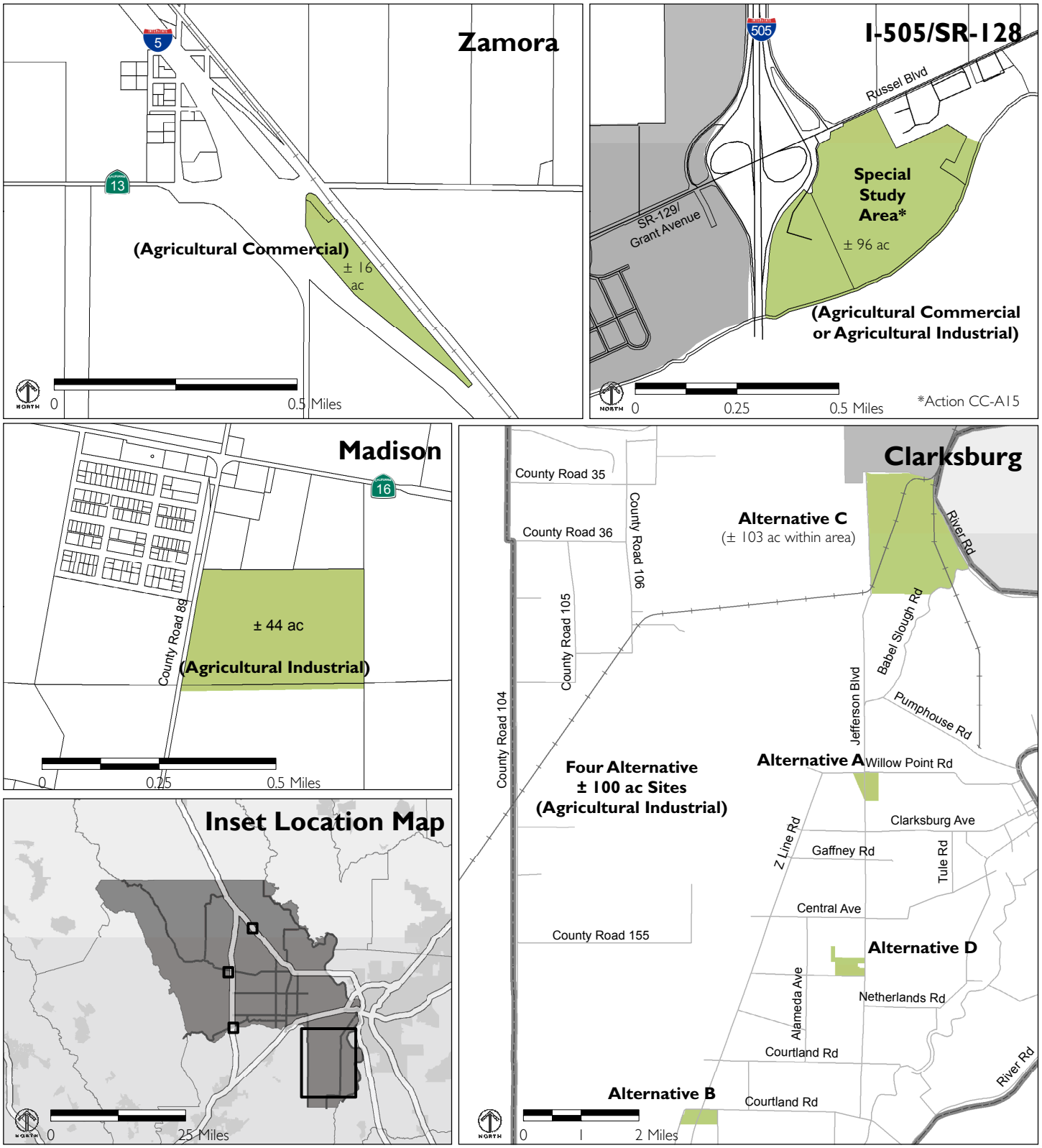
Policy LU-1.2 Figure LU-1, as it may be amended from time to time, is the Land Use Diagram for Yolo County.

Policy LU-1.3 The residential density ranges identified in Policy LU-1.1 are increased over the ranges in the prior (1983) General Plan and therefore allow for an increased yield of units on vacant or underutilized land throughout the County. In the communities of Dunnigan (+608 units), Esparto (-69 units), Knights Landing (+420 units), and Madison (+108 units) this has been determined to be an acceptable outcome. In all other instances where this could occur, it is the intent of the County to hold the number of units to no more than would have originally been allowed.

GOAL LU-2 **Agricultural Preservation. Preserve farm land and expand opportunities for related business and infrastructure to ensure a strong local agricultural economy. (See the Agriculture and Economic Development Element for a more comprehensive treatment of this issue.)**

Policy LU-2.1 The intent of this policy is to protect existing farm operations from impacts related to the encroachment of urban uses. The expertise of the County Agricultural Commissioner shall be used in applying this policy. Urban development shall bear the primary burden of this policy. Ensure that development will not have a significant adverse effect on the economic viability or constrain the lawful practices of adjoining or nearby agricultural operations, except for land within the Sphere of Influence (SOI) around a city of within the growth boundary of an unincorporated community. New urban (non-agricultural) development should be setback a minimum of 300 feet from adjoining agricultural land where possible, but special circumstances can be considered by the decision-making body. Except as noted below where no buffer is required, in no case shall the buffer be reduced to less than 100 feet. The buffer area shall generally be designated Open Space (OS), but may also be designated Public and Quasi-Public (PQ) or Parks and Recreation (PR) based on applicable circumstances. Agricultural buffers are not required for planned urban growth elsewhere within a growth boundary because the agricultural-urban interface will be temporary until full build-out occurs. (DEIR MM AG-4)

Policy LU-2.2 Allow additional agricultural commercial and agricultural industrial land uses in any designated agricultural area, where appropriate, depending on site characteristics and project specifics. Agricultural commercial and/or agricultural industrial development is anticipated as shown in Table LU-7 (Anticipated Agricultural Commercial and/or Agricultural Industrial Growth) and in Figure LU-2 (New Targeted Future Agricultural Commercial and Agricultural Industrial Sites).



Agricultural Sites

Source: Yolo County GIS, 2009.

FIGURE LU-2

TARGETED FUTURE AGRICULTURAL COMMERCIAL AND AGRICULTURAL INDUSTRIAL SITES

TABLE LU-7 **ANTICIPATED AGRICULTURAL COMMERCIAL AND/OR AGRICULTURAL INDUSTRIAL GROWTH**

Town	Existing Developed Acres[a]	Assumed Future Under 83 GP (Acres)	New Targeted Future Sites (Acres)	Other New Added Future (Acres)	Total
Clarksburg[b]	0	0	103.0	0	103.0
Madison[c]	0	0	44.0	0	44.0
Zamora[d]	0	0	16.0	0	16.0
I-505/SR 128[e]	0	0	96.0	0	96.0
Unincorporated County	324.0	520.0		75.0	919.0
Total	**324.0**	**520.0**	**259.0**	**75.0**	**1,178.0**

Notes: In acres.
[a] Very gross estimate based on data from Assessor's Office for agricultural preserves as modified by Planning staff to account for other facilities outside of agricultural preserves. This number is presumed to be significantly underestimated.
[b] ~~Three~~Four alternative agricultural industrial sites.
[c] Agricultural industrial site.
[d] Agricultural commercial site.
[e] Agricultural industrial or agricultural commercial site.

Manage agricultural parcels of less than 20 acres, including antiquated subdivisions where appropriate, to create compatibility with surrounding agricultural uses to the greatest extent possible, including: 1) discourage residential development; 2) encourage lot mergers to achieve larger parcel sizes; 3) encourage clustering of units either within parcels or near existing homes on adjoining parcels to preserve farmland and natural resources; 4) encourage transfers of development rights to areas where additional farm dwellings are desired (e.g. organic farms that are labor intensive); 5) encourage deed restrictions, site design and development themes that support the agricultural use of the land; and 6) aggressively limit the impact of residential development where it does occur.

Policy LU-2.3 Prohibit the division of land in an agricultural area if the division is for non-agricultural purposes and/or if the result of the division will be parcels that are infeasible for farming. Projects related to clustering and/or transfers of development rights are considered to be compatible with agriculture.

Policy LU-2.4 Vigorously conserve, preserve, and enhance the productivity of the agricultural lands in areas outside of adopted community growth boundaries and outside of city SOIs.

Policy LU-2.5 Where planned growth would occur on lands under Williamson Act contract, ensure that development is phased to avoid the need for contract cancellation, where feasible. (DEIR MM AG-2)

Policy LU-2.6 Encourage interim agricultural production on farmland designated for future development, prior to the start of construction, to reduce the potential for pest vectors, weeds, and fire hazards

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GOAL LU-3 **Growth Management. Manage growth to preserve and enhance Yolo County's agriculture, environment, rural setting and small town character.**

Policy LU-3.1 Direct all of the County's residential growth to designated areas within the cities and within the growth boundaries of existing unincorporated communities, as depicted on the Land Use Diagram in Figure LU-1, with the exception of individual farm dwellings (houses allowed on agricultural land), other allowed units (e.g. second units, ancillary dwellings, houses allowed in mixed-use commercial areas, etc.) and housing allowed on existing residentially designated land.

Policy LU-3.2 With the exception of allowed ancillary residential units (e.g. second units, houses allowed in mixed-use commercial areas, etc.), residential growth within the growth boundaries is allowed as follows, subject to all required County approvals. (See Table LU-8, Allowed Residential Growth.)

Policy LU-3.3 Allow commercial and industrial growth (not including agricultural commercial or agricultural industrial) as shown in Table LU-9 (Allowed Commercial and Industrial Growth), subject to all required County approvals. Within the areas designated for commercial and industrial land uses, where appropriate, the County shall target the following:

A. Biotechnology facilities development, including development of "high tech" research and development campuses, as well as regional office, business park and light manufacturing nodes.
B. Research and development space to serve private businesses that result from UC Davis research activities.
C. Highway-oriented and regional commercial development, particularly along Interstate 5 and Interstate 505 and specialized retail to serve regional populations.

TABLE LU-8 **ALLOWED RESIDENTIAL GROWTH (IN UNITS)**

Town	Existing Units[a]	Buildout Under 1983 GP[b]	New Added Units[c]	Total Allowed Units[d]
Capay	576	53	0	629
Clarksburg	177	22	0	199
Dunnigan	340	173	8,108	8,621[i]
Esparto	905	985	521	2,411
Knights Landing	380	993	420	1,793[i]
Madison	137	83	1,413	1,633[i]
Monument Hills	583	25	0	608
Yolo	155	56	0	211
Zamora	14	14	0	28
Remaining Unincorporated	3,996[e]	1,610[f]	322	5,928
Total	**7,263**[g]	**4,014**	**10,462**[h]	**22,061**

[a] Yolo County Planning and Public Works Department estimates of existing "on-the-ground" units based on County address data for 2007.
[b] Based on vacant residentially designated land at allowed yields.
[c] Communities/locations where additional residential growth (beyond that allowed under the 1983 General Plan) is allowed under the 2030 General Plan.
[d] Sum of existing on-the-ground units + buildout allowed under 1983 General Plan + added new units under this General Plan update.
[e] Difference between DOF unit total and numbers for each community.
[f] This does not represent potential "full" buildout but rather a projection of the number of future farm dwellings through 2030 based on past trends. Assumes an average of 70 farm dwellings annually over 23 years.
[g] California Department of Finance, 2007.
[h] Total includes all 7,500 units in Dunnigan Specific Plan area and includes additional units that would be allowed per residential density range increases in Dunnigan (608 units), Knights Landing (354+66=420 units), Madison (108 units – 30 units from land use change on Reyes 3 acs), and Esparto (loss of 69 units). Also includes 322 farm dwellings countywide assumed with 20 percent density bonus for Agricultural TDR Program (see Action AG-A25).
[i] Includes acreage from Specific Plan development capacities.

TABLE LU-9 **ALLOWED COMMERCIAL AND INDUSTRIAL GROWTH (IN ACRES)**

Town	Existing Developed Acres[a]	Remaining Under 1983 GP[b]	New Added Acres[c]	Total Designated Acres[e,g]
Capay Valley	4.0	12.5	115.1	131.6
Clarksburg	134.0	3.0	0.3	137.3
Dunnigan	26.2	250.0	546.2	822.4[h]
Esparto	6.0	123.3	-69.3 [f]	60.0
Knights Landing	11.0	103.4	-54.0	60.4[h]
Madison	19.0	4.7	134.0	157.7[h]
Monument Hills	6.0[g]	16.0[g]	2.7	24.7[g]
Yolo	26.0	8.1	11.8	45.9
Zamora	1.0	0.9	12.9	14.8
Elkhorn Property	1.8	0	346.5	348.3[h]
County Airport	66.0[e]	236.0[e]	0	302.0[e]
I-505/CR14 or 12A	0	0	15.1	15.1
Spreckels Property	87.0	4.0	51.6	142.6
Covell/Pole Line	0	383.7[h]	0	383.7[h,i]
Remaining Unincorporated	43.3	385.4	-91.4	337.3
Total	**431.3**	**1531.0**	**1021.5**	**2,983.8**

[a] Yolo County Planning and Public Works Department estimates of existing "on-the-ground" commercial and industrial land uses based on County address data for 2007.
[b] Vacant commercially designated or industrially designated land.
[c] Communities/locations where additional commercial or industrial growth (beyond that allowed under the 1983 General Plan) is allowed under the 2030 General Plan update. Does not include agricultural commercial and/or agricultural industrial acreage (see Table LU-7).
[d] Sum of existing developed industrial and commercial acres + vacant industrial and commercial acreage under the 1983 General Plan + added new acreage under this General Plan update. See exception for airport property in footnote "e" and "g" below.
[e] The County airport is designated "airport" under the 1983 General Plan which is a PQ designation under the 2030 General Plan. However, the non-runway portions of this facility function similar to an industrial or commercial land use. Therefore the non-runway acreage (302.0 acres) has been included here.
[f] Primarily 79-acre industrial site south of SR-16 converted to other mixed uses.
[g] The Watts-Woodland airport in Monument Hills is designated "airport" under the 1983 General Plan which is a PQ designation under the 2030 General Plan. However, the non-runway portions of this facility function similar to an industrial or commercial land use. Therefore the non-runway acreage (22.0 acres) has been included here.
[h] Includes acreage from Specific Plan development capacities.
[i] Industrial and commercial acreages to be determined through the specific plan process and subsequent CEQA review.

Policy LU-3.4 Locate and design services and infrastructure to only serve existing and planned land uses. Actions that will induce growth beyond planned levels are prohibited.

Policy LU-3.5 Avoid or minimize conflicts and/or incompatibilities between land uses.

Policy LU-3.6 Maintain the compatibility of surrounding land uses and development, so as not to impede the existing and planned operation of public airports, landfills and related facilities and community sewage treatment facilities.

Policy LU-3.7 Prohibit the designation of new urban development in places with one or more of the following characteristics:

- Areas without adequate emergency services and utility capacity and where there are no capital improvement plans to pay for and construct new facilities that can accommodate the proposed development.
- Areas where there are significant hazards and where there are no plans to adequately mitigate the risk (e.g. floodplains, high fire hazard areas, unstable soils, known seismic faults, etc.).
- Areas where there are significant natural resources (e.g. groundwater recharge, wildlife habitat, mineral or timber resources, scenic areas, etc.).
- Areas not contiguous to existing urban development.

Policy LU-3.8 The intent of allowing residences in the agricultural areas is to provide dwellings for those directly involved in on-site farming activity, including farm employees, the landowners and their immediate families. All such dwellings shall be encouraged to locate on lands least suited for agricultural use and/or in “clustered” configurations to minimize the conversion of agricultural lands to any other uses.

Policy LU-3.9 Prohibit the creation of a ring of rural residential development around existing growth boundaries.

Policy LU-3.10 Conservations easements located within community growth boundaries will not be accepted for mitigation purposes.

GOAL LU-4	**Delta Land Use and Resource Management. Within the Delta Primary Zone, ensure the compatibility of land uses and decision-making with applicable policies of the Land Use and Resource Management Plan of the Delta Protection Commission.**

Policy LU-4.1 Recognize the unique land use constraints and interests of the Delta area.

Policy LU-4.2 Continue active involvement with State and regional efforts to establish policy, regulation and management for the Delta, to promote the economic and social sustainability of the town of Clarksburg, the viability of the Agricultural District, the habitat needs of the Yolo Natural Heritage Program and the water resources needed for the success of each of these efforts.

GOAL LU-5	**Equitable Land Use Decisions. Ensure inclusion, fair treatment and equitable outcomes in local land use decisions and regulations.**

Policy LU-5.1 Balance land use decisions and land use burdens countywide so that there is not a disproportionate impact to any one group of residents because of age, culture, ethnicity, gender, race, socio-economic status, or other arbitrary factor.

Policy LU-5.2 Allow for meaningful participation in the planning process by affected and interested groups or individuals.

Policy LU-5.3 Employ strategies to overcome linguistic, institutional, cultural, economic and historic barriers to effective public participation in the planning process.

Policy LU-5.4 Use existing community-based organizations, where available, to involve the public in the planning process.

Policy LU-5.5 Ensure that public facilities, services and amenities are distributed equitably and in locations that enhance the quality of life for the broadest number of county residents.

Policy LU-5.6 Assist existing communities to obtain the services, support and infrastructure needed to thrive and be successful.

Policy LU-5.7 Support the Community Advisory Committees to ensure direct, local input on land use issues and on project applications.

Policy LU-5.8 Ensure that respect for and protection of private property rights is balanced with all other factors considered by the County in making land use decisions.

GOAL LU-6 **Intra-County Coordination. Ensure inclusion, fair treatment and equitable outcomes for the County in land use planning matters involving other local government entities.**

Policy LU-6.1 Continue to develop strong working relationships and effective inter-governmental review procedures with the Rumsey Band of Wintun Indians regarding their landholdings and interests, including the Cache Creek Casino Resort, to achieve the best possible outcomes consistent with the General Plan.

Policy LU-6.2 Coordinate with the University of California at Davis regarding the Long Range Development Plan (LRDP), campus facilities, housing, off-campus agricultural and open space property and joint venture development with the private sector to achieve the best possible outcomes consistent with the General Plan.

Policy LU-6.3 Coordinate with community college districts and tribal colleges within Yolo County regarding their long-term development plans for campus facilities and property, to achieve the best possible outcomes consistent with the General Plan.

Policy LU-6.4 Negotiate with each of the cities to achieve mutually beneficial outcomes related to, among other things: planning within spheres of influence; development impact fees for funding of regional parks and open space, regional roadways, government services that benefit the entire County (including incorporated areas), "replacement" funding for revenues foregone to protect agriculture and rural character, water resources, and flood protection.

Policy LU-6.5 Encourage schools and other special districts to locate new schools and other appropriate service facilities within the growth boundaries of the unincorporated communities.

Policy LU-6.6 Encourage independent special districts to locate offices and other facilities (where appropriate) within the downtown areas of the communities being served.

Policy LU-6.7 Revenue sharing agreements, redevelopment pass-through agreements and development impact fees shall provide for sufficient revenues to cover County revenue losses and costs.

Policy LU-6.8 Negotiate annexation agreements with each city to ensure revenue neutrality and account for and fully reimburse the County for maintenance and operation of all relevant programs and services.

Policy LU-6.9 Require that development agreements, tribal agreements, memoranda of understanding and other similar arrangements add community value by securing "net" public benefits over and above CEQA mitigation requirements and conditions of approval.

Policy LU-6.10 Coordinate with other jurisdictions to create projects that result in mutually beneficial revenue generating land uses that result in fiscal benefits to the County and to its partners.

Policy LU-6.11 Coordinate with the City of Davis to explore mutual opportunities regarding the following projects:

a) Special needs housing, including housing for seniors in the area north of Covell Boulevard and west of State Route 113.

b) Land uses that complement UC Davis, the University Retirement Community, Sutter-Davis Hospital and other nearby social services in the area north of Covell Boulevard and west of State Route 113.

c) Alternatives for the Binning Estates project, including the clustering of residential units and increased densities.

d) Extension of water and sewer infrastructure to the Binning Farms community.

e) Life science, biotechnology and related research uses.

f) The possibility of commercial and mixed uses at Covell Boulevard/Pole Line Road and the possibility of coordinated planning with the Hunt Wesson site.

Policy LU-6.12 Coordinate with and encourage the Rumsey Band of Wintun Indians to prepare, adopt, and implement a long-range tribal general plan for tribal trust land and meet or exceed a vehicle miles traveled (VMT) threshold of 44 miles generated per household per weekday. (DEIR MM LU-4g)

Policy LU-6.13 Coordinate with and encourage the federal government for D-Q University and the University of California Regents for UC Davis to provide for a mix of uses on their land that would achieve a jobs/housing balance and meet or exceed a vehicle miles traveled (VMT) threshold of 44 miles generated per household per weekday. (DEIR MM LU-4h)

GOAL LU-7	**Regional Coordination. Ensure inclusion, fair treatment and equitable outcomes for the County and its residents in regional land use planning efforts.**

Policy LU-7.1 Seek recognition, reimbursement and reward for foregone revenues and opportunities associated with the active preservation of agriculture, open space and important natural resources.

Policy LU-7.2 Support and participate in countywide, regional and other multi-agency planning efforts related to housing, tourism, air quality, open space, green infrastructure, recreation, agriculture, habitat conservation, energy, emergency preparedness and flood protection.

Policy LU-7.3 Coordinate with other stakeholder agencies and entities to continue local and regional planning efforts to preserve agriculture, open space and natural resources while meeting housing needs, basic infrastructure and service levels, County economic development goals and County fiscal objectives.

Policy LU-7.4 Work with SACOG and its other member jurisdictions to develop a mutually-acceptable plan for open space conservation, habitat protection and mitigation banking, to ensure that Yolo County is appropriately compensated when its land is used to achieve region-wide environmental benefits.

Policy LU-7.5 Support efforts to adopt a regional tax measure that would fund agricultural and open space acquisition, protection and maintenance.

Policy LU-7.6 Coordinate with Napa, Lake, Colusa, Sutter, Sacramento and Solano Counties to mitigate the impacts of development in these jurisdictions on Yolo County.

Policy LU-7.7 Pursue full funding of in-lieu tax payments for all state-owned public lands.

Policy LU-7.8 Work with federal, State, and local agencies, and other interests to as part of a public-private partnership to develop and pursue site facilities that benefit and expand training opportunities for forensic sciences.

2. Community Character Policies

GOAL CC-1	**Preservation of Rural Character. Ensure that the rural character of the County is protected and enhanced, including the unique and distinct character of the unincorporated communities.**

Policy CC-1.1 Encourage private landowners of both residential and commercial properties to maintain their property in a way that contributes to the attractive appearance of Yolo County, while recognizing that many of the land uses in the County, including agriculture and light industry, require a variety of on-site structures, equipment, machinery and vehicles in order to operate effectively.

Policy CC-1.2 Preserve and enhance the rural landscape as an important scenic feature of the County.

Policy CC-1.3 Protect the rural night sky as an important scenic feature to the greatest feasible extent where lighting is needed.

Policy CC-1.4 Identify and preserve, where possible, landmarks and icons which contribute to the identity and character of the rural areas.

Policy CC-1.5 Significant site features, such as trees, water courses, rock outcroppings, historic structures and scenic views shall be used to guide site planning and design in new development. Where possible, these features shall become focal points of the development.

Policy CC-1.6 New freestanding off-site advertising along rural roads shall be limited. Existing non-conforming advertising shall be eliminated whenever possible.

Policy CC-1.7 Reinforce the growth boundaries for each community through appropriate mechanisms including greenbelts, buffers, conservation easements and other community separators.

Policy CC-1.8 Screen visually obtrusive activities and facilities such as infrastructure and utility facilities, storage yards, outdoor parking and display areas, along highways, freeways, roads and trails.

Policy CC-1.9 In communities, place both new and existing line utilities and telecommunications infrastructure underground where feasible. Where underground utilities are not feasible, minimize the aesthetic impact by co-locating new improvements within existing lines and facilities where possible.

Policy CC-1.10 Protect existing ridgelines and hillsides from visually incompatible development.

Policy CC-1.11 Require the development of open space corridors, bicycle paths and trails integrating waterways, scenic areas and County parks where appropriate, in collaboration with affected land owners as a part of

project approval. The intent is to connect each community and city and other special places and corridors, throughout the County.

Policy CC-1.12 Preserve and enhance the scenic quality of the County's rural roadway system. Prohibit projects and activities that would obscure, detract from, or negatively affect the quality of views from designated scenic roadways or scenic highways.

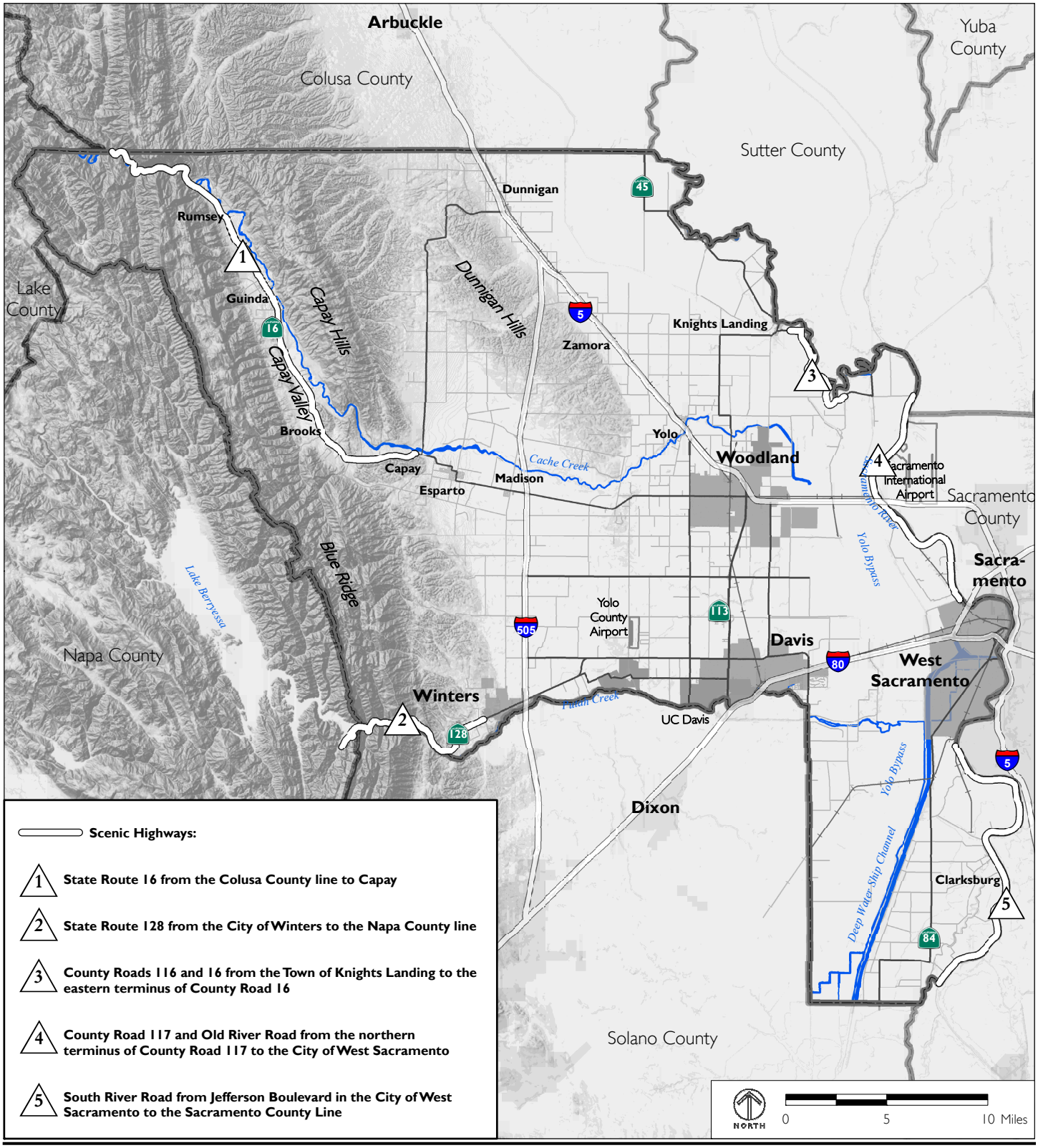
Policy CC-1.13 The following routes are designated as local scenic roadways, as shown in Figure LU-3 (Scenic Highways):

- State Route 16 (Colusa County line to Capay)
- State Route 128 (Winters to Napa County line)
- County Roads 116 and 116B (Knights Landing to eastern terminus of County Road 16)
- County Roads 16 and 117 and Old River Road (County Road 107 to West Sacramento)
- South River Road (West Sacramento City Limits to Sacramento County line)

Policy CC-1.14 Designate other scenic roadways or routes where appropriate using the following criteria: the roadway or route traverses a scenic corridor, water feature, open space area or other interesting or unique areas, both urban and rural and may include bikeways, hiking and riding trails and pedestrian ways.

Policy CC-1.15 The following features shall be protected and preserved along designated scenic roadways and routes, except where there are health and safety concerns:

- Trees and other natural or unique vegetation
- Landforms and natural or unique features
- Views and vistas
- Historic structures (where feasible), including buildings, bridges and signs



Source: Yolo County GIS, 2009.

FIGURE LU-3

SCENIC HIGHWAYS

Policy CC-1.16 The following features shall be stringently regulated along designated scenic roadways and routes with the intent of preserving and protecting the scenic qualities of the roadway or route:

- Signage
- Architectural design of adjoining structures
- Construction, repair and maintenance operations
- Landscaping
- Litter control
- Water quality
- Power poles, towers, above-ground wire lines, wind power and solar power devices and antennae

Policy CC-1.17 Existing trees and vegetation and natural landforms along scenic roadways and routes shall be retained to the greatest feasible extent. Landscaping shall be required to enhance scenic qualities and/or screen unsightly views and shall emphasize the use of native plants and habitat restoration to the extent possible. Removal of trees, particularly those with scenic and/or historic value, shall be generally prohibited along the roadway or route.

Policy CC-1.18 Electric towers, solar power facilities, wind power facilities, communication transmission facilities and/or above ground lines shall be avoided along scenic roadways and routes, to the maximum feasible extent.

Policy CC-1.19 Unscreened outdoor storage of industrial and commercial parts and materials, salvage or junk, dismantled vehicles, used or new vehicle sales or, building materials for sale and similar materials, uses and things along designated scenic roadways and routes shall be prohibited.

GOAL CC-2 **<u>Community Planning</u>. Protect, enhance and redevelop existing communities.**

Policy CC-2.1 Require planned growth to pay the full cost of new development, as well as, to the greatest feasible extent, benefit residents in each existing community through efforts that, among other things, result in basic urban services and community sustainability.

Policy CC-2.2 Ensure that the appropriate base level of rural services and infrastructure for existing development in each community is required in connection with new development.

Policy CC-2.3 Include open space corridors and trails throughout each community to provide off-street bicycle and pedestrian access, as well as connections to intra-county corridors and trails.

Policy CC-2.4 Emphasize the unincorporated communities as retail, service and employment centers for local residents, as well as residents of surrounding rural (agricultural) areas. Where appropriate, include economic development in the unincorporated communities that serves intra-county and regional tourism.

Policy CC-2.5 Plan future land uses within communities so that more dense/intense uses are located within the downtown area and/or at neighborhood centers, transitioning to less dense/intense uses at the growth boundary edge. There is no intent to create or allow a ring of "transitional" rural residential development outside the growth boundaries.

Policy CC-2.6 Encourage infill development and the appropriate redevelopment of vacant and underutilized properties within existing unincorporated communities and prioritize infill projects over development on land at the planned community edge.

Policy CC-2.7 Provide for higher density housing and mixed-use development in the downtown areas of the unincorporated communities to support commercial uses, create more pedestrian travel, extend activity into the evening, increase the variety of housing opportunities to include affordable and special needs housing, enhance safety, reduce traffic and support regular, frequent fixed-route transit service.

Policy CC-2.8 Encourage a range of commercial, civic and cultural uses in the downtown areas of the unincorporated communities to encourage pedestrian travel, extend activity into the evening hours and create activities that involve all ages and groups. This shall include a diversity of retail uses within downtown areas, including retail shops that serve daily household needs, essential services and tourism, such as a bank or post office, lodging, restaurants and entertainment.

Policy CC-2.9 Locate County offices and other civic facilities in the downtown area of the unincorporated communities, whenever possible.

Policy CC-2.10 Strive to achieve a minimum jobs/housing balance of 1.2 jobs for every dwelling unit on average within each unincorporated community, to the greatest extent feasible. (DEIR MM LU-4a)

Policy CC-2.11 Strive to achieve a match between the prices of dwelling units and the salaries of the jobs provided within each unincorporated community, to the greatest extent feasible. (DEIR MM LU-4b)

Policy CC-2.12 Strive to create an average yield community-wide of 16 jobs per acre for industrial, commercial and other job-generating land uses.

Policy CC-2.13 Require 5 acres of turn-key neighborhood parks for every 1,000 people within each unincorporated community, proximate to residential neighborhoods. Ensure that the provisions of neighborhood parks is phased concurrently with residential growth in the specific plan and community plan areas to meet and maintain this threshold. (DEIR MM PUB-3a)

Policy CC-2.14 Encourage local hiring and buying practices within local communities and within the County as a whole, including County operations, where legally and economically feasible.

Policy CC-2.15 Develop all services, parks, buffers and infrastructure within identified community growth boundaries. Mitigation lands for the loss of agricultural land and wildlife habitat are the only component of community development that are allowed to be located outside of the growth boundaries.

Policy CC-2.16 Require the following sustainable design standards as appropriate for projects located within the growth boundaries of the unincorporated communities:

A. Imaginative and comprehensive planning that seeks to make best use of existing community features and fully integrate new development.

B. Compact and cohesive communities that promote walking, bicycling and public transit.

C. Well defined neighborhoods served by parks, schools, greenbelts and trails.

D. The fiscal impacts of development projects shall be revenue neutral or positive in terms of impacts to the County General Fund. Appropriate exceptions for socially beneficial projects such as affordable housing, parks, etc. may be allowed.

E. Distinct neighborhood focal points such as a park and/or school and/or small neighborhood-serving retail site.

F. Narrow streets lined with evenly-spaced trees of the same or alternating species forming a shade canopy.

G. Vertical curbs and sidewalks separated from the street by landscaping.

H. Street lighting and trail lighting, as appropriate, at a scale appropriate for pedestrians and bicycles.

I. Maximum block lengths of 600 feet.

J. Schools within walking distance of a majority of the homes served.

K. A wide range of housing types, densities, sizes and affordability.

L. Where housing is not near the downtown area, allow small neighborhood commercial nodes that provide retail and small office opportunities for neighborhood residents with the goal of accommodating routine daily needs within walking distance of most residents.

M. Incorporate a grid street network that provides safe and efficient travel for all modes throughout the community with multiple connections to exterior routes.

N. Orient the grid pattern of new streets to align north/south and east/west, to give a sense of place and direction in new community areas, as well as to maximize solar access.

O. Downtown streets shall have parking on both sides.

P. Downtown areas shall have one or more civic nodes such as a central park, town square, fountain plaza, etc.

Q. Homes that do not back onto roads, parks, schools, greenbelts, trails, or water bodies. Instead, homes that front on these features shall access by way of single-loaded streets or other designs to improve public aesthetics and neighborhood security.

R. Development regulations and design standards shall emphasize healthy community design and safe neighborhoods.

S. Avoid noise walls to the greatest possible extent.

T. Entry features shall be provided at all main community entrances and exits and shall announce the community by name.

U. Except for parking provided onsite for individual residential lots, parking shall be located to the rear of the facility being served and screened from public view. Parking shall be landscaped to achieve a minimum of 50 percent shading.

V. Development and incorporation of community art and activities.

W. Encourage specific land uses and designs that support community diversity.

X. Protect and preserve to the greatest feasible extent creeks, riparian areas and other biological values within or adjoining an area.

Y. Incorporate low-water use appliances, drought tolerant landscaping and other water efficient features.

Z. Provide convenient and secure bicycle parking in downtown areas.

AA. To the greatest possible extent, avoid cul-de-sacs that create barriers for pedestrian and bicycle access to adjacent areas.

BB. Include recharging stations, preferred parking, and other incentives for alternative energy vehicles.

CC. Limit the amount of turf in yards for new residential developments to a maximum of 25 percent of the yard area.

DD. Require the installation of low output sprinklers, such as drip, soaker hoses, and microspray in new residential development whenever possible.

EE. Use recycling systems for chillers and cooling towers.

FF. Demonstrate adherence to LEED Neighborhood Design Standards or the equivalent, for new development, including Specific Plans.

GG. Demonstrate consistency with the County's Greenhouse Gas Emissions Reduction/Climate Action Plan(s), upon adoption.

HH. Provide multiple connections for all modes through the community and with existing and planned development so that individual development projects are integrated with the surrounding communities. (DEIR MM LU-1a)

GOAL CC-3	**Planned Development. Ensure that new growth addresses the challenges and opportunities unique to each community.**

Policy CC-3.1 Require that a Specific Plan be prepared for the entire area within the growth boundary for the communities of Dunnigan, Knights Landing and Madison, to replace each of the existing Area General Plans, as shown in Figure LU-4. The growth allowed in Elkhorn shall also require a Specific Plan. See Table LU-10 for a summary of allowed growth within the four Specific Plan areas.

Update the Area General Plans for Capay Valley, Clarksburg, Esparto and Monument Hills in the form of new or updated Area Community Plans or Specific Plans. Prepare an area community plan for Yolo/Zamora.

Reconsider and rebalance the land use designations in Esparto in an effort to attain a jobs/housing ratio of 1.2 during preparation of the new or updated Area/Community Plan or Specific Plan for Esparto. (DEIR MM LU-1c)

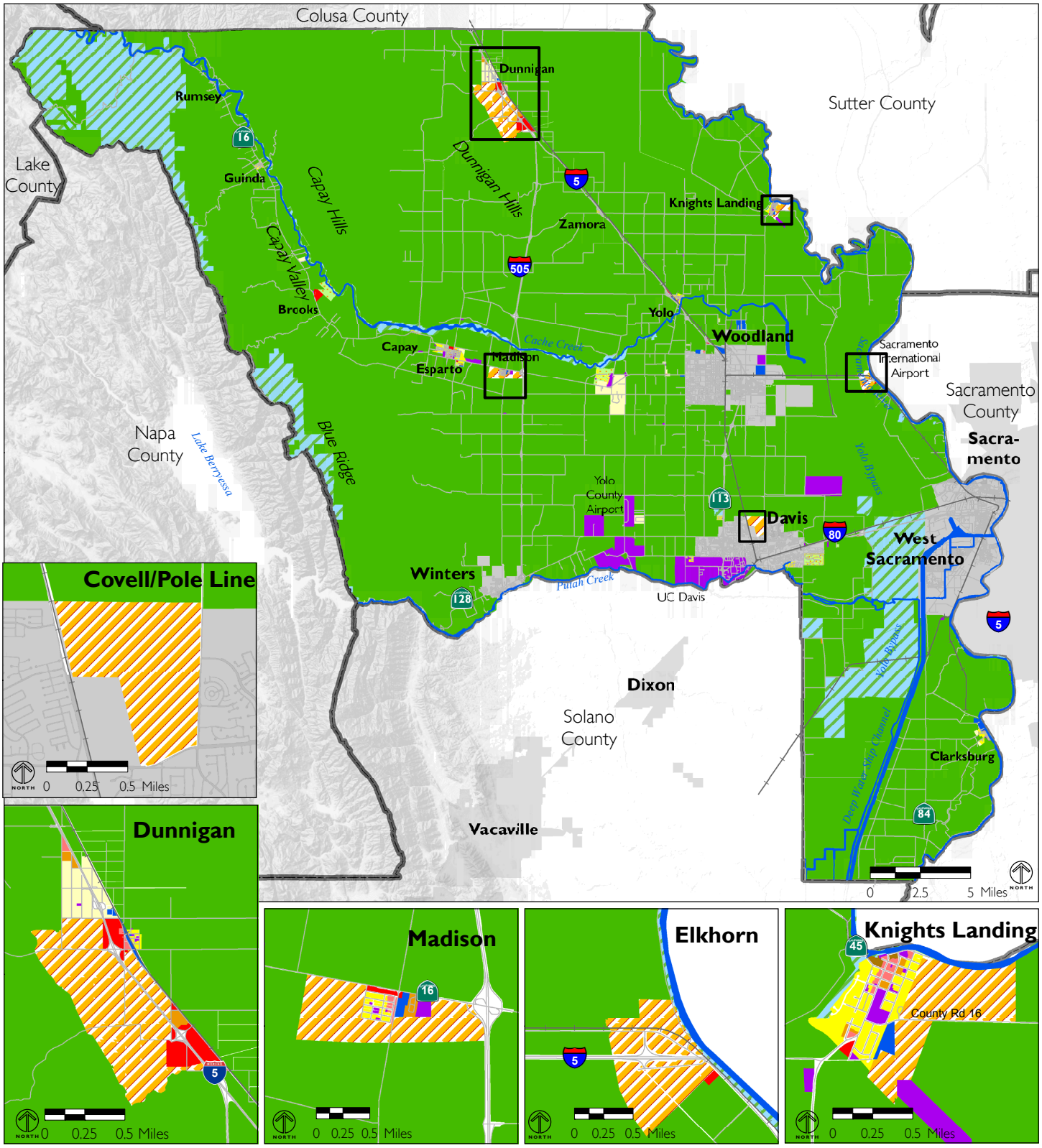
Prepare a Specific Plan for the Covell/Pole Line Road property. (DEIR MM LU-2a)

During the planning process, require that target land uses and development capacities identified for the Specific Plan areas be modified to ensure that the community park threshold of 5 acres/1,000 population is met. (DEIR MM LU-2a)

Table LU-10, Summary of Specific Plan Development Capacities (in acres)

Commercial General	513 acres	
Commercial Local	40 acres	
Industrial	750res	
Subtotal Job Producing	1,03acres	
Agriculture (Commercial)	44 acres	
Residential Rural	371 acres	74 to 370 units
Residential Low	716 acres	716 to 7,157 units
Residential Medium	189 acres	1,890 to 3,779 units
Residential High	56 acres	1,120 to over 2,240 units
Subtotal Residential	1,332 acres	9635 units (maximum by policy)
Parks and Recreation	157 acres	
Open Space	376 acres	
Public and Quasi-Public	394 acres	
Total Specific Plan Area	**3,606 acres**	

Policy CC-3.2 Ensure the consistency of Specific Plans with the County General Plan. Project specific goals and policies for new development will be established in the Specific Plan, as well as design standards that address the character of the existing community.



Specific Plan (SP)
Cities

Source: Yolo County GIS, 2009.

FIGURE LU-4

SPECIFIC PLANS

Policy CC-3.3 Ensure that jobs are created concurrent with housing to the greatest feasible extent. Include requirements to ensure a reasonable ongoing balance between housing and jobs by phase. Strive to match overall wages to home prices.

For areas within Specific Plans the amount of land designated for residential and job generating uses shall be evaluated during the Specific Plan process, and land uses ~~may~~must be "re-balanced" within each ~~by~~ phase ~~if necessary~~ in order to achieve a jobs/housing balance of 1.2 jobs per household. A jobs/housing monitoring program shall be established as part of each Specific Plan for its planning area. The jobs/housing relationship (balance, phasing, and match) for each Specific Plan area shall be monitored by phase. If, at the end of any phase, the required jobs/housing relationships are not achieved, ~~one land use sector is out of balance with another,~~ the County shall require~~take~~ immediate and effective actions to be taken by the developer to ensure that the required jobs/housing relationship is achieved as a part of any subsequent phase. Such actions may include, but are not limited to, the following: changes in the amounts of land uses in remaining phases; financial/regulatory incentives to accelerate the development of underdeveloped land uses; smaller phases; limitations of permits for overdeveloped land uses; and/or other actions as may be required. (DEIR MM LU-4c)

Policy CC-3.4 Encourage developers to show significant net benefit to the community, after accounting for all mandated capital and operational costs, including but not limited to the items listed in Table LU-11 (Community Planning Guidelines) to provide minimum quality of life services and sustainability standards.

Policy CC-3.5 In addition to Table LU-11, achieve the following within the Dunnigan Specific Plan growth boundary:

A. Ensure the creation of a centrally located downtown area through the community planning process.

B. Locate housing away from Interstate 5 and connect new residential neighborhoods to the Hardwood Subdivision. Smaller lots and higher densities shall be located on the valley floor, while larger lots and lower densities shall be located in the poorer hill soils. Schools should be centrally located.

C. Concentrate commercial and industrial uses between Interstate 5 and County Road 99W.

D. Continue to concentrate new commercial trucking uses at the County Road 8 and Interstate 5 interchange.

TABLE LU-11 **COMMUNITY PLANNING GUIDELINES**

	Dunnigan	Knights Landing	Madison
General Plan land use designation	Specific Plan	Specific Plan	Specific Plan
Proposed range of new residential development	Buildout of 173 planned units + up to 8,108 new units	Buildout of 993 planned units and up to 420 new units	Buildout of 83 planned units + up to 1,413 new units
Proposed new commercial /industrial development	Buildout of 250 planned acres + 450 new acres	Buildout of 103 planned acres	Buildout of 5 planned acres + 131 new acres
"Specific Plan" acreage	2,254 new acres	212 infill acres	413 new acres
Target average residential density	8 units/acre	8 units/acre	8 units/acre
Target average jobs density	16 jobs/acre	16 jobs/acre	16 jobs/acre
Minimum "quality of life" services	5 ac. park/1,000 pop.	5 ac. park/1,000 pop.	5 ac. park/1,000 pop.
	New library	Expand/replace library	Library, grocery store, and basic medical exist nearby in Esparto
	Grocery stores	Grocery store	
	Basic medical	Basic medical	
	K-12 schools	Retain elementary school	New elementary school
	Professional fire department	Professional fire department	Professional fire department
	Sheriff's services	Sheriff's services	Sheriff's services
Minimum "sustainability" standards for infrastructure	Municipal water system serving entire town	Upgraded water system for commercial fire flow to entire town	Upgraded water system serving entire town
	Tertiary sewer system serving entire town	Upgraded sewer system for entire town	Upgraded sewer system for entire town
	Municipal storm drainage system serving entire town	Municipal storm drainage system serving entire town	Municipal storm drainage system serving entire town
	Provide minimum 200-year flood protection for affected areas of town	Provide minimum 100-year flood protection for entire town	Provide minimum 100-year flood protection for entire town

E. Plan future land uses to direct the majority of new trips onto the County Road 6/Interstate 5 interchange, instead of the County Road 8/Interstate 5 interchange. This works to buffer the interchange of Interstates 5 and 505, keeps dense and intense land uses close to the existing downtown and makes the most efficient use of transportation infrastructure funds, since the County Road 6 interchange will require improvements regardless of the mix of land uses planned for Dunnigan.

F. Avoid biological impacts to sensitive species and habitats, to the greatest feasible extent and fully mitigated where they occur, particularly inside designated critical habitat for the California tiger salamander.

G. Preserve the Tehama-Colusa Canal as Dunnigan's western boundary and as an important source of future water. Plan for development outside of the federal-designated critical habitat for the California tiger salamander, located to the northwest. Maintain Bird Creek as Dunnigan's southern boundary and as an important riparian habitat and open space area. Maintain the County Road 99W (railroad tracks) as the eastern boundary, with the exception of Old Town.

H. Develop an internal road system that directs local trips to local roadways, rather than the freeways, to the greatest practical extent. Plan for multi-modal access between the communities separated by I-5. (DEIR MM LU-1b)

I. Reserve locations for future rail stations to promote rail connectivity to other cities.

J. Establish a total greenhouse gas emissions objective for all new development in Dunnigan, along with the specific, enforceable actions necessary to achieve the objective.

K. Ensure convenient transit service between Dunnigan and other urban areas, provided through appropriate community-based funding.

L. As part of the specific plan process, establish and implement construction criteria, infrastructure standards, landscaping requirements, etc. to limit water use under normal conditions to a specified daily maximum. Use that threshold for purposes of sizing the community water system. (DEIR MM UTIL-1a)

M. The need for intersection, ramp interchange improvements, or mainline improvements on the State Highway System shall be identified within the EIR for the Dunnigan Specific Plan.

N. Strive to develop new planned areas from existing neighborhoods outward in a contiguous manner.

Policy CC-3.6 The following development capacities shall guide development of the Dunnigan Specific Plan (these numbers are illustrative):

- 2,254 total acres
- 450 acres of job producing commercial and industrial land uses
  - 212 acres CG (4,961 new jobs assumed)
  - 30 acres CL (690 new jobs assumed)
  - 208 acres IN (2,167 new jobs assumed)
- 1,136 acres of residential uses in various densities allowing for 5,000 to 7,500 new units
  - 371 acres RR (range of 74 to 370 units [typical 148])
  - 593 acres RL (range of 593 to 5,929 units [typical 4,151])
  - 133 acres RM (range of 1,330 to 2,659 units [typical 1,995])
  - 39 acres RH (range of 780 to 1,560 or more units [typical 975]) (120 new jobs assumed)
  - Potential range 2,777 to 10,518 or more units [typical 7269]; General Plan established minimum 5,000 units and maximum 7,500 units by policy.
- 344 acres of parks and open space uses
  - 115 acres PR
  - 229 acres OS
- 324 acres PQ (433 new jobs assumed)

Policy CC-3.7 In addition to Table LU-11, achieve the following within the Knights Landing Specific Plan growth boundary:

A. Ensure that the downtown area remains the community's primary commercial center.

B. Develop specific and detailed analysis regarding how existing planned residential and commercial growth would impact key issues, including: 1) the loss of farmland; 2) levee stability and flood protection; and 3) traffic impacts to State Highway 113 and local roads.

C. 100-year flood protection for all development within the growth boundary.

D. Emphasize the use of waterfront land for public access and amenities, as well as tourism and entertainment-related commercial activities. These areas shall be highlighted in the

Specific Plan with separate development design standards and economic development investment.

E. Encourage the Knights Landing CSD to explore the availability of Sacramento River water as an alternative source of municipal water. (DEIR MM UTIL-2b)

Policy CC-3.8 The following development capacities shall guide development of the Knights Landing Specific Plan (these numbers are illustrative)(see Figure LU-5, Knights Landing Conceptual Sketch):

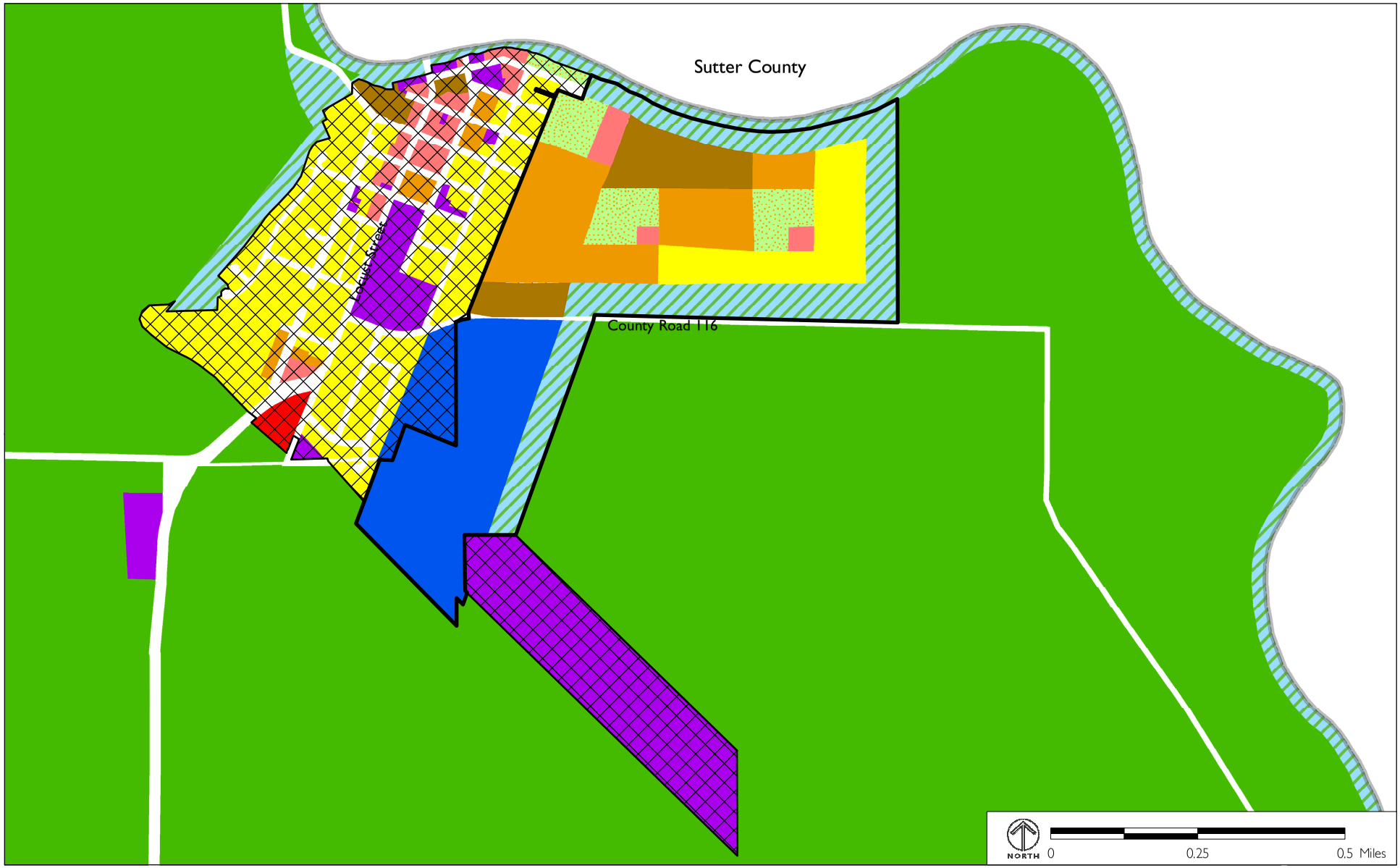
- 212 total acres
- 38 acres of job producing commercial and industrial land uses
  - 10 acres CL (assumes 230 existing jobs, no new jobs)
  - 28 acres IN (assumes 292 existing jobs, no new jobs)
- 71 acres of residential uses in various densities allowing for 393 to 800 new units
  - 43 acres RL (range of 43 to 429 units [typical 301])
  - 21 acres RM (range of 210 to 419 units [typical 315])
  - 7 acres RH (range of 140 to 280 or more units [typical 175] (no new jobs assumed)
  - Potential range 393 to 1,062 or more units [typical 791]; General Plan established minimum 393 units [per designations] and maximum 800 units by policy
- 103 acres of parks and open space uses
  - 22 acres PR
  - 81 acres OS

Policy CC-3.9 In addition to Table LU-11, achieve the following within the Madison Specific Plan growth boundary:

A. Policies to ensure the creation of a downtown area will be required.

B. The sewer ponds shall be moved and improved.

C. Workforce housing shall be the focus of the residential development.



Open Space (OS)
Agriculture (AG)
Parks and Recreation (PR)
Residential Low (RL)
Residential Medium (RM)
Residential High (RH)
Commercial General (CG)
Commercial Local (CL)
Industrial (IN)
Public and Quasi-Public (PQ)
Specific Plan Overlay (SPO)
Specific Plan Boundary

Source: Yolo County GIS 2009.

FIGURE LU-5

KNIGHTS LANDING CONCEPTUAL SKETCH

D. Storm drainage impacts affecting the entire growth area shall be resolved. To address some of the existing needs in the community, infrastructure (drainage, sewer and water) services and facilities could benefit from a cooperative arrangement between the Madison and Esparto County Service Districts. Additional infrastructure improvements are to be gained through development agreements with recommended highway commercial development.

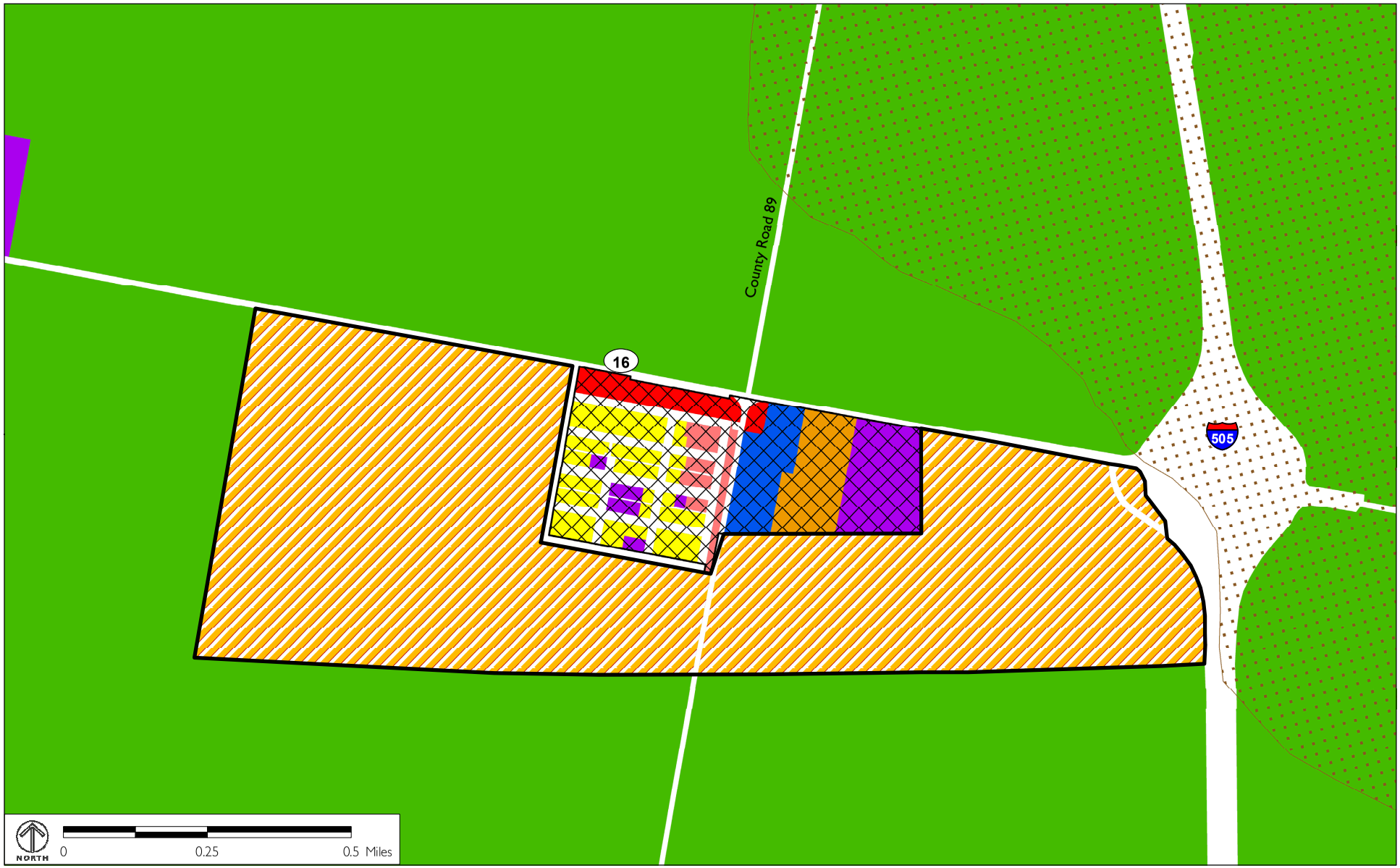
F. Existing conditions in this community are not acceptable. New development shall not proceed until, at minimum, the items in Table LU-11 have been addressed (or are reasonably expected to be addressed by the time such development is completed).

G. The need for intersection and roadway improvements on State Route 16 between Madison and I-505 shall be identified as part of the Madison Specific Plan consistent with the policy thresholds of the Draft General Plan. (DEIR MM CI-6b)

H. Encourage the Madison CSD to explore the availability of Cache Creek water via the Flood Control District as an alternative source of municipal water. (DEIR MM UTIL-2b)

Policy CC-3.10 The following development capacities shall guide development of the Madison Specific Plan (these numbers are illustrative)(see Figure LU-6, Madison New Growth Conceptual Sketch):

- 413 total acres
- 131 acres CG (assumes 3,065 new jobs)
- 44 acres AG identified for agricultural industrial land uses (no new jobs assumed)
- 125 acres of residential uses in various densities allowing for up to 1,335 new units
  - 80 acres RL (range of 80 to 799 units [typical 560])
  - 35 acres RM (range of 350 to 699 units [typical 525])
  - 10 acres RH (range of 200 to 400 or more [typical 250]) (no new jobs assumed)
  - Potential range of 630 to 1,898 or more units [typical 1,335]; General Plan established minimum 630 units [per designations] and maximum 1,335 units by policy.
- 63 acres of parks and open space uses
  - 20 acres PR
  - 43 acres OS
- 50 acres PQ (20 new jobs assumed)



Agriculture (AG)
Residential Low (RL)
Residential Medium (RM)
Commercial General (CG)
Commercial Local (CL)
Industrial (IN)
Public and Quasi-Public (PQ)
Specific Plan (SP)
Mineral Resource Overlay (MRO)
Specific Plan Overlay (SPO)
Specific Plan Boundary

Source: Yolo County GIS 2009.

FIGURE LU-6

MADISON NEW GROWTH CONCEPTUAL SKETCH

Policy CC-3.11 Achieve the following within the Elkhorn Specific Plan growth boundaries:

A. The goal for this location is a regional conference center and hotel facility, with appropriate general commercial development and industrial research and development uses, capitalizing on the existing natural amenities and riverfront.

B. The Specific Plan shall emphasize aesthetic standards that recognize the importance of this site as the "visual gateway" to Yolo County along Interstate 5.

C. The property shall be required to build out from north to south. New construction and/or development shall be consistent with this General Plan, including but not limited to: satisfaction of levels of service for public services and facilities, protection of biological resources, protection against unreasonable geotechnical risk and/or exposure to hazards, exposure to noise, fiscally beneficial to the general fund, net public benefit, sustainable design, architectural excellence, jobs/housing balance and match, flood protection, water supply, sewer/septic service and protection of significant visual and/or aesthetic features.

D. Transit to move workers, customers, and visitors to and from the site shall be a key consideration in the preparation of the Specific Plan.

E. Modify and amend the Elkhorn Specific Plan to accommodate high density residential development to provide workforce housing. The inclusion of residential development is intended to achieve a jobs/housing balance and reduce the vehicle miles traveled (VMT) of the Elkhorn Specific Plan area. The precise number of units shall be determined through the specific plan process and shall be analyzed for environmental impact in the specific plan EIR.

F. The need for freeway ramp improvements on Interstate 5 at County Road 22 shall be identified as part of the Elkhorn Specific Plan consistent with the policy thresholds of the Draft General Plan. (DEIR MM LU-4d)

G. Consider the applicability of Table LU-11.

Policy CC-3.12 The following development capacities shall guide development of the Elkhorn Specific Plan (these numbers are illustrative)(see Figure LU-7, Elkhorn Specific Plan Conceptual Sketch):

- 343 total acres
- 300 acres of job producing commercial and industrial land uses

- 170 acres CG (4,095 new jobs assumed)
- 130 acres IN (1,354 new jobs assumed)

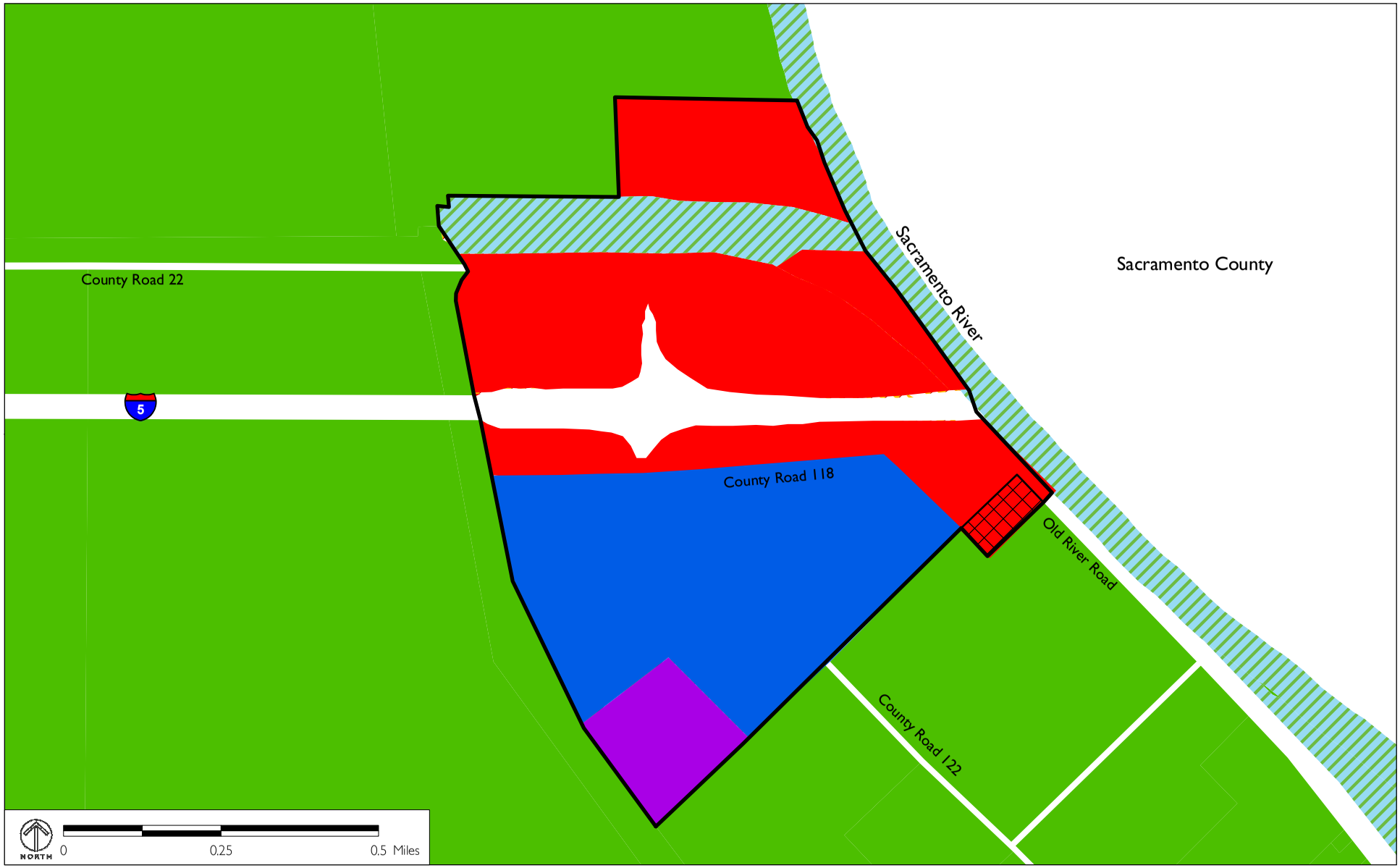
- RH uses for upper story units (range of units to be determined through the Specific Plan)
- 23 acres OS uses
- 20 acres PQ (no new jobs assumed)

Policy CC-3.13 The following development capacities shall guide development of the new Esparto mixed-use area located south of State Route 16 and east of County Road 86A (these numbers are illustrative~~approximate~~): (DEIR MM LU-1c)

- 79 total acres
- 6 acres CG (assumes 96 new commercial jobs)
- 8 acres IN (assumes 112 new industrial jobs)
- 32 acres of residential uses in various densities allowing for up to 590 new units:
  - 11 acres RM (range of 200 to 300 units [typical 250])
  - 3 acres RH (60 to 80 or more units [typical 70];
  - 18 acres RL (range of 17 to 169 units [typical 119])
  - Potential range 277 to 549 or more units. General Plan established maximum 590 units by policy.
- 17 acres OS (200-foot agricultural buffer on east, west, and south, assuming remainder of required buffer is provided off-site)
- 4 to 8 acres PR (depending on the number of homes)
- 8 acres roads

The mixed use area shall accomplish the following:

a. Contribute to achieving a jobs/housing match within the immediate region, including the Cache Creek Casino Resort.
b. Prohibit commercial land uses that compete with the downtown.
c. Improve Willow Slough, along the eastern boundary of the project area, to reduce flooding.
d. Provide restricted senior housing, workforce housing for the Cache Creek Casino Resort, and/or very-low or extremely-low income housing.
e. Create a signature entry for the town of Esparto, as the "visual gateway" to the Capay Valley.



Open Space (OS)
Agriculture (AG)
Commercial General (CG)*
Industrial (IN)
Public and Quasi-Public (PQ)
Specific Plan Overlay (SPO)
Specific Plan Boundary

*Note: Upper story residential is permitted per Policy CC-3.11.

Source: Yolo County GIS 2009.

FIGURE LU-7

ELKHORN SPECIFIC PLAN CONCEPTUAL SKETCH

f. Provide a safe and effective pedestrian/bicycle crossing for State Route 16 to move people from the project area to the rest of the community.

g. Ensure the Residential Medium (RM) area immediately north and west of the Industrial (IN) area be used for workforce housing.

Policy CC-3.14 There are ~~two~~four alternative identified sites for location of a future winery-related agricultural industrial facility in Clarksburg (see Figure LU-2). Only one site is intended for the described development. The project is intended to complement the Old Sugar Mill and to assist in establishing a successful critical mass of grape processing facilities to support emerging wineries.

Policy CC-3.15 There are two alternative identified sites for location of highway commercial or agricultural commercial uses at Interstate 505 and County Road 14 or Interstate 505 and County Road 12A. Only one is intended for the described development.

Policy CC-3.16 Encourage the development of life sciences, biotechnology and related research uses in appropriate commercial and industrial areas located along highway corridors throughout the county.

Policy CC-3.17 Establish benefit assessment districts, where appropriate, to fund community infrastructure and services.

Policy CC-3.18 Coordinate with Community Service Districts (CSDs) to ensure that new development will have access to quality infrastructure and services.

Policy CC-3.19 Require buffers between new residential development and Interstates 5, 80, and 505 to protect residents from impacts related to air quality, noise, and other incompatibilities. See Action CO-106.

Policy CC-3.20 Development of the Covell Specific Plan land uses, development capacities, other guidance for the specific plan (including Policy LU-6.11f), and applicable community planning guidelines per Table LU-11 shall occur pursuant to a subsequent public planning and environmental review process.

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GOAL CC-4	**Project Design. Require project design that incorporates "smart growth" planning principles and "green" building standards that reflect the County's commitment to sustainable development (see also Goal CO-7).**

Policy CC-4.1 Reduce dependence upon fossil fuels, extracted underground metals, minerals and other non-renewable resources by:

- Requiring projects to take advantage of shade, prevailing winds, landscaping and sun screens to reduce energy use.
- Encouraging projects to use regenerative energy heating and cooling source alternatives to fossil fuels.
- Encouraging projects to select building materials that require less energy-intensive production methods and long-distance transport, in compliance with Leadership in Energy and Environmental Design (LEED) or equivalent standards.

Policy CC-4.2 Reduce dependence upon chemicals and unnatural substances through encouraging:

- Use of chemical-free and toxic-free building materials.
- Landscape design standards that minimize the use of pesticides and herbicides.

Policy CC-4.3 Reduce activities that encroach upon nature, through:

- Reuse of existing buildings and sites for development.
- Compact and clustered residential development, including reduced minimum lot sizes.
- Reduction or elimination of impervious paving materials.
- Development patterns that respect natural systems such as watersheds and wildlife corridors.

Policy CC-4.4 Encourage all new construction to be zero net energy by combining building energy efficiency design features with on-site clean distributed generation so as to result in no net purchases from the electricity or gas grid.

Policy CC-4.5 Encourage individual and community-based wind and solar energy systems (micro-grids).

Policy CC-4.6 Encourage all new residences to exceed Title 24 energy standards by at least 15 percent, and encourage all new commercial buildings to exceed Title 24 by at least 20 percent.

Policy CC-4.7 Require energy efficient design for all buildings.

Policy CC-4.8 Require measures to minimize “heat islands” by requiring light-colored and reflective roofing materials and paint; “green” roofs; light colored

roads and parking lots; extensive numbers of shade trees in parking lots; and shade trees and/or overhangs on the south and west sides of new or renovated buildings.

Policy CC-4.9 Encourage construction and other heavy equipment vehicles (e.g. mining, agriculture, etc.) to use retrofit emission control devices.

Policy CC-4.10 Require project design to demonstrate adherence to sustainable and neo-traditional design as described in the Ahwahnee Principles and as provided in the SACOG Blueprint, including any amendments or successor documents thereto.

Policy CC-4.11 Site specific information shall be required for each application, subject to site conditions and available technical information, as determined by the County lead department, in order to enable informed decision-making and ensure consistency with the General Plan and with the assumptions of the General Plan EIR. Technical information and surveys requested may include, but not be limited to, the following: air quality and/or greenhouse gas emissions calculations, agricultural resource assessment/agricultural and evaluation and site assessment (LESA), biological resources assessment, cultural resources assessment, fiscal impact analysis, flood risk analysis, hydrology and water quality analysis, geotechnical/soils study, land use compatibility analysis, noise analysis, Phase One environmental site assessment, sewer capacity and service analysis, storm drainage capacity and service analysis, title report, traffic and circulation study, visual simulation and lighting study, and water supply assessment.

When a technical study is required, it must cover the entire acreage upon which development is being proposed including any off-site improvements (e.g. wells; pumps; force mains; new roads; dirt borrow sites; etc.) that may be necessary. Technical studies must meet CEQA standards and the standards in the applicable industry. As necessary, the technical studies shall include recommendations that are to be implemented as part of the project. (DEIR MM LU-2b)

Policy CC-4.12 Require "green" design, construction and operation including:

A. Site planning sensitive to the natural environment.

B. Efficiency in resource use (including energy, water, raw materials and land).

C. Building reuse and adaptive reuse.

D. Selection of materials and products based on their life-cycle environmental impacts.

E. Use of materials and products with recycled content.

F. Use of materials provided from within the region.

G. Recycling of construction and demolition waste.

H. Reduction in the use of toxic and harmful substances in the manufacturing of materials and during construction.

I. Use of passive and active solar strategies and efficient heating and cooling technologies.

K. Reduction in water use for buildings and landscaping.

L. Light pollution reduction to protect "dark skies."

M. Improvements to interior and exterior environments leading to increased health, comfort and productivity.

N. Facility maintenance and operational practices that reduce or eliminate harmful effects on people and the natural environment during occupancy.

O. Water reuse systems

P. Other systems to capture energy sources that would otherwise be wasted.

Policy CC-4.13 Moved to CO-7.11.

Policy CC-4.14 Enhance public safety through implementation of Crime Prevention Through Environmental Design (CPTED) strategies. These include designing the placement of activities and physical features, such as buildings, entrances and exits, corridors, fences, pavement, signs, lighting and landscaping, in such a way as to clearly define public and private space, maximize visibility, control access and circulation and foster positive social interaction.

Policy CC-4.15 Reflect a human scale in architecture that is sensitive, compatible and distinctive to both the site and the community.

Policy CC-4.16 Encourage "visitability" accommodations in new residential development.

Policy CC-4.17 Avoid the repetition of residential facades/designs within subdivisions and abrupt changes in facades between adjoining developments.

Policy CC-4.18 Front exterior living spaces of a usable size (e.g. front porches, large front-facing windows, balconies, etc.) are highly desirable.

Policy CC-4.19 Within community areas, houses shall front on the street.

Policy CC-4.20 Discourage garage-forward and/or garage-dominated residential design.

Policy CC-4.21 Discourage gated and/or walled communities.

Policy CC-4.22 Encourage and promote multi-story and mixed-use buildings within the downtown areas of the unincorporated communities.

Policy CC-4.23 Except for approved plazas, seating areas and entry nooks, buildings in downtown areas shall have zero front setbacks and on-site parking shall be to the rear of the lot.

Policy CC-4.24 Usable public open spaces shall be included in new private commercial development, such as plazas, interior courtyards connected by pathways and outdoor seating areas.

Policy CC-4.25 Incorporate art into the public open spaces of both public and private developments.

Policy CC-4.26 Locate and design civic buildings as significant structures that help anchor and provide focus to the downtown area, with a character that fosters community identity and pride.

Policy CC-4.27 Downtown architecture shall have a pedestrian scale, with varied and articulated facades. Entries must be oriented to the sidewalk. Front facades shall include numerous windows and covered arcades.

Policy CC-4.28 Design highway service commercial uses at identified rural interchanges to preserve surrounding agriculture, rural character, scenic quality and the natural environment.

Policy CC-4.29 Provide appropriate buffers or barriers between incompatible residential and non-residential uses. The last-built use shall be responsible for design and construction (and/or other related costs) of the buffer/barrier.

Policy CC-4.30 Non-residential corner lots in the downtown and other “gateway” settings shall receive special design treatment which may include enhanced landscaping, entry features that establish community identity, fountains, plazas, enhanced pedestrian furniture (bench and arbor) or similar features. Corner residential lots are encouraged to have duplex or other multi-family units with entries on each street face.

Policy CC-4.31 Encourage clustering of allowed residential units to protect resources and/or improve efficiency of services.

Policy CC-4.32 Require the use of regionally native drought-tolerant plants for landscaping where appropriate.

Policy CC-4.33 Encourage mixed uses on vacant and underutilized land designated for development, particularly ancillary residential units and childcare facilities.

Policy CC-4.34 Encourage mixed use development in commercial areas in order to create ancillary residential opportunities, particularly in the upper floors of multi-story buildings.

Policy CC-4.35 Encourage the location of ancillary employee services (including childcare, restaurants, banking facilities and convenience markets) at employment centers, for the purpose of reducing midday vehicle trips.

Policy CC-4.36 Encourage the use of private roads within new development.

Policy CC-4.37 Where an agricultural industrial project or an agricultural commercial project is allowed adjoining an existing residential neighborhood, an appropriate buffer shall be provided. Any project intended for the site at Interstate 505 and State Route 128 shall include a buffer for the adjoining existing El Rio Villa project and shall proceed only if it will result in a net fiscal benefit to the County.

Policy CC-4.38 Each community shall have a "town center" where the public has access to meeting and event space (e.g., school, library, fire department, community center, social organization, etc.).

D. Implementation Program

Action CC-A1 Update the County Zoning Code to reflect appropriate zoning consistent with each land use designation and to establish appropriate new zone categories and regulations to implement the goals, policies and actions of this General Plan. The update shall include development of a form-based zoning code. (Policy LU-1.1, Policy LU-2.3, Policy LU-2.5, Policy LU-3.1, Policy LU-3.2, Policy LU-3.3, Policy LU-3.9, Policy CC-2.7, Policy CC-2.16)
Responsibility: Planning and Public Works Department
Timeframe: 2009/2011

Action CC-A2 Continue to implement the County Development Agreement ordinance which requires net gains from new development. (Policy LU-6.7, Policy LU-6.8, Policy LU-6.9, Policy LU-6.10, Policy CC-2.1, Policy CC-2.2)
Responsibility: Planning and Public Works Department

Timeframe: 2009/2010

Action CC-A3 Complete a market study to determine how the County can capitalize on specific locations where revenue-generating uses might best fit and how the County can better position itself relative to competing jurisdictions. (Policy LU-3.3, Policy LU-4.2, Policy LU-6.4, Policy LU-6.10, Policy LU-6.11, Policy LU-7.3)
Responsibility: County Administrator's Office
Timeframe: 2010/2011

Action CC-A4 Engage in regular discussions and collaboration with each of the cities regarding policies, projects and opportunities of mutual interest. (Policy LU-3.8, Policy LU-6.4, Policy LU-6.8, Policy LU-6.10, Policy LU-6.11)
Responsibility: County Administrator's Office
Timeframe: Ongoing

Action LU-A5 Annually review revenue sharing agreements, redevelopment pass-through agreements, annexation agreements, development agreements, tribal agreements and other existing agreements to ensure that they accurately respond to changing County circumstances. (Policy LU-3.8, Policy LU-6.4, Policy LU-6.7, Policy LU-6.8, Policy LU-6.9, Policy LU-6.10, Policy LU-6.11)
Responsibility: County Administrator's Office
Timeframe: Annually

Action CC-A6 Seek executed cooperative agreements with adjoining jurisdictions on issues of mutual importance. (Policy LU-7.1, Policy LU-7.2, Policy LU-7.3, Policy LU-7.4, Policy LU-7.5, Policy LU-7.6)
Responsibility: County Administrator's Office
Timeframe: 2009/2010

Action CC-A7 Establish formal buffers between cities and between communities. Create a plan to establish buffer areas between cities and between unincorporated communities within which conservation easements could be directed to reinforce community separation and keep each town distinct and unique. (Policy CC-1.7)
Responsibility: Planning and Public Works Department
Timeframe: Ongoing

Action CC-A8 Develop Specific Plan guidelines including requirements for contents, minimum standards and development regulations. (Policy CC-2.16, Policy CC-3.1, Policy CC-3.2, Policy CC-3.5, Policy CC-3.11)
Responsibility: Planning and Public Works Department
Timeframe: 2009/2010

Action CC-A9 Prepare and implement design guidelines and minimum design requirements (standards) that ensure sustainable and attractive growth. (Policies CC-2.16, and CC-4.1 through CC-4.36)
Responsibility: Planning and Public Works Department
Timeframe: 2010/2011

Action CC-A10 Deleted.

Action CC-A11 Adopt a "Green Building Program" to promote green building standards. Require energy efficient appliances and equipment in all new development. (Policy CC-4.13, Policy CC-4.14)
Responsibility: Planning and Public Works Department
Timeframe: 2011/2012

Action CC-A12 Seek voter approval of an intra-county and/or regional fee or tax for the preservation of agricultural, habitat, or open space land in Yolo County. (Policy LU-6.4, Policy LU-7.1, Policy LU-7.3, Policy LU-7.4, Policy LU-7.5, Policy LU-7.6)
Responsibility: County Administrator's Office, Parks and Resources Department
Timeframe: 2010/2011

Action CC-A13 Recommend one of the alternative Clarksburg sites to be zoned Agricultural-Industrial. (Policy CC-3.14)
Responsibility: Planning and Public Works Department, County Administrator's Office
Timeframe: 2009/2010

Action CC-A14 Based on an economic analysis, recommend one of the alternative Interstate 505 sites (County Road 14 or County Road 12A) to be zoned Highway Commercial. (Policy CC-3.15)
Responsibility: County Administrator's Office, Planning and Public Works Department
Timeframe: 2009/2010

Action CC-A15 Collaborate with the City of Winters to explore revenue producing uses and opportunities for the "special study area" (see Figure LU-2) identified for agricultural industrial and/or agricultural commercial uses at Interstate 505 and State Route 128. (Policy LU-2.2)
Responsibility: County Administrator's Office, Planning and Public Works Department
Timeframe: 2010/2011

Action CC-A16 Establish a countywide system of consistent "comment" areas for each of the existing Citizens Advisory Committees, to ensure that all discretionary projects are forwarded to the appropriate Advisory Committee. (Policy LU-5.7)
Responsibility: Planning and Public Works Department
Timeframe: 2009/2010

Action CC A16.1 Prepare the Covell/Pole Line Specific Plan. (Policy CC-3.1, Policy CC-3.20)
Responsibility: Planning and Public Works Department
Timeframe: 2009/2015

Action CC-A17 Prepare the Dunnigan Specific Plan which will supersede the 1996 Dunnigan General Plan. (Policy CC-3.1, Policy CC-3.5, Policy CC-3.6)
Responsibility: Planning and Public Works Department
Timeframe: 2009/2015

Action CC-A18 Prepare Knights Landing Specific Plan, which will supersede the 1999 Knights Landing General Plan. (Policy CC-3.1, Policy CC-3.9)
Responsibility: Planning and Public Works Department
Timeframe: 2009/2015

Action CC-A19 Prepare Madison Specific Plan, which will supersede the 1974 Madison General Plan. (Policy CC-3.1, Policy CC-3.9, Policy CC-3.10)
Responsibility: Planning and Public Works Department
Timeframe: 2009/2015

Action CC-A20 Prepare the Elkhorn Specific Plan. (Policy CC-3.1, Policy CC-3.11, Policy CC-3.12)
Responsibility: Planning and Public Works Department
Timeframe: 2009/2015

Action CC-A21 Prepare the Yolo-Zamora Community Plan. (Policy LU-3.1)
Responsibility: Planning and Public Works Department
Timeframe: 2015/2016

Action CC-A22 Update other long range plans to ensure consistency with General Plan. Develop a priority order, work plan, schedule and budget for each. (Policy CC-3.1, Policy CC-3.2, Policy CC-3.4)
Responsibility: Planning and Public Works Department
Timeframe: 2016/2017

Action CC-A23 Establish intra-county impact fees for funding of regional parks and open space, regional roadways and other government services that

benefit all County residents. (Policy LU-6.4, Policy LU-7.2, Policy LU-7.4)
Responsibility: County Administrator's Office
Timeframe: 2011/2012

Action CC-A24 Evaluate parking standards to minimize land devoted to parking. (Policy CC-4.3, Policy CC-4.13)
Responsibility: Planning and Public Works Department
Timeframe: 2010/2011

Action CC-A25 Coordinate with Caltrans regarding alternative uses for the Interstate 505 rest stop near Dunnigan, should that facility be relocated or closed. (Policy LU-7.3, Policy CC-3.5)
Responsibility: Planning and Public Works Department
Timeframe: ongoing

Action CC-A26 Update the County Zoning Code to prohibit the location of new homes on or near the top of ridgelines, where they would adversely affect nearby views. (Policy CC-1.10)
Responsibility: Planning and Public Works Department
Timeframe: 2010/2011

Action CC-A27 Create financial incentives programs to encourage the remodel of older homes to reduce energy use and incorporate "green" building materials. (Policy CC-4.13)
Responsibility: County Administrator's Office, Planning and Public Works Department
Timeframe: 2011/2012

Action CC-A28 Orient the grid pattern of new streets to align north/south and east/west, to give a sense of place and direction in new community areas, as well as to maximize solar access. (Policy CC-4.13)
Responsibility: Planning and Public Works Department
Timeframe: Ongoing

Action CC-A29 Develop and enforce bike parking standards and design criteria for all land uses identified in zoning code, including number of spaces, location and type of facilities. (Policy CC-2.16)
Responsibility: Planning and Public Works Department
Timeframe: 2009/2010

Action CC-A30 Amend the County Code to remove the Williamson Act as a basis for the Agricultural Preserve Zone. (Policy LU-2.5)
Responsibility: Planning and Public Works Department
Timeframe: 2009/2010

Action CC-A31 Amend the County Code to incorporate "smart growth" planning principles and design guidelines that emphasize compact, walkable neighborhoods, open space, alternative transportation, public safety, sustainable design, and sensitivity to natural resources. (Policy CC-4.3, Policy CC-4.11, Policy CC-4.15)
Responsibility: Planning and Public Works Department
Timeframe: 2010/2011

Action CC-A32 Allow for rolled curbs in Rural Residential designated areas. (Policy CC-2.16)
Responsibility: Planning and Public Works Department
Timeframe: 2009/2010

Action CC-A33 Reduce permitting requirements and costs for projects that incorporate green design features and construction. (Policy CC-4.12)
Responsibility: Planning and Public Works Department
Timeframe: 2009/2010

Action CC-A34 The discretionary review of development proposals shall evaluate and address impacts on the rural landscapes and views. This review shall also evaluate the potential for land use incompatibilities and require incorporation of design features to reduce potential impacts, to the greatest extent feasible. (DEIR MM LU-2c) (Policies CC-1.1 through CC-1.19)
Responsibility: Planning and Public Works Department
Timeframe: 2009/2010

Action CC-A35 Identify and provide incentives for infill over peripheral development. (Policy CC-2.6)
Responsibility: Planning and Public Works Department
Timeframe: 2010/2011

Action CC-A36 Pursue designation of the state of State Route 16 as a scenic highway. (Policy CC-1.14)
Responsibility: Planning and Public Works Department
Timeframe: 2012/2013

TABLE LU-1 **1983 YOLO COUNTY GENERAL PLAN LAND USE DESIGNATIONS AND ACREAGES**

Row #	1983 General Plan (GP)[a] Land Use Designations[b]	Acreage[f]
OPEN SPACE (OS)		
1	Open Space (OS)[c] (83 GP)	2,653.6
2	Public Open Spaces (PO) (83 GP)	0
3	Public Open Spaces (POS) (83 GP; Capay Valley)	2.6
4	Public Open Space (PO1) (83 GP)	0
5	Public Open Space (PO2) (83 GP)	7.2
6	Agricultural Buffer/Setbacks from Major Roads (Esparto)	0
7	Agricultural/Urban Buffer (Knights Landing)	0
8	Major Waterways (Knights Landing)[c]	58.9
9	Riverbed and Riparian (Capay)	0
10	Chaparral and Woodland (Capay)	0
	Subtotal	*2,722.3*
AGRICULTURE (AG)		
11	Agricultural (AG)[c] (83 GP)	503,130.2
12	Agricultural Exclusive (AE) (83 GP)	0
13	A-1 (Capay Valley)	0
14	A-P (Capay Valley)	0
15	Agricultural Intensive (AG-IN) (Capay Valley)	11,209.3
16	Agricultural General Foothills (AG-G-F) (Capay Valley)	9,746.7
17	Agricultural-Related Industrial (Dunnigan)	0
18	Agricultural/Residential, Low Density (Woodland)	239.2
19	Agricultural/Residential, Medium Density (Woodland)	94.6
20	Watershed (Capay Valley)	79,081.8
21	Residential, Low Density (10 ac min) (RL10) (83 GP; Clarksburg)	42.4
	Subtotal	*603,544.2*
PARKS and RECREATION (PR)		
22	Recreation (R) (Dunnigan)	679.0
23	Parks and Recreation (PR) (83 GP; Capay Valley; Clarksburg)	442.4
24	Parks/Schools/Agricultural Buffer (Esparto)	0
	Subtotal	*1,121.4*
RESIDENTIAL		
Residential Rural (RR)		
25	Rural Residential Agricultural (RRA) (83 GP)	0
26	Rural Residential (Woodland)	1,178.8
27	Residential, Very Low Density (VLR) (1du/net ac) (Dunnigan)	332.0
28	Very Low Density Residential (1-3 du/gross ac) (Esparto)	34.4
29	Residential, Very Low Density (83 GP – Plainfield)	123.0
	Subtotal	*1,668.2*
Residential Low (RL)		
30	Suburban Residential (RS) (83 GP)	139.0
31	Residential, Low Density (Dunnigan) (RL) (83 GP)	0
32	Residential Low Density (R-L) (1-3 du/ac) (Capay Valley; Clarksburg)	70.5
33	Residential Low Density—Public Open Space (RL-PO1) (Clarksburg)	0
34	Residential, Low Density (1-4 du/ac) (Dunnigan) (RL2) (83 GP)	0
35	Residential, Low Density (1-5 du/ac) (Dunnigan) (RL1) (83 GP)	0
36	Low Density Residential (RL-1) (Clarksburg)	19.7
37	Residential Low Density (RL) (≤ 6 du/net ac) (83 GP)	598.0
38	Residential Low Density (RL) (6 du/net ac average) (Knights Landing)	88.6
39	Residential Low Density (RL) (4-10 du/net ac) (Esparto)	426.5

TABLE LU-1 **1983 YOLO COUNTY GENERAL PLAN LAND USE DESIGNATIONS AND ACREAGES** (CONTINUED)

Row #	1983 General Plan (GP)[a] Land Use Designations[b]	Acreage[f]
	Subtotal	*1,342.3*
Residential Medium (RM)		
40	Residential, Medium Density (RM) (10 to 19 du/net ac) (83 GP)	92.0
41	Residential Medium (RM) (Clarksburg)	19.6
42	Residential Medium Density (RM) (12du/net ac) (Dunnigan; Knights Landing)	84.2
43	Residential Medium Density (5-8 du/ac) (Esparto) (RM1) (83 GP)	0
44	Residential Medium Density (5-10 du/ac) (Esparto) (RM1) (83 GP)	0
45	Mobile Home Park (MHP) (8 du/net ac) (83 GP)	0
	Subtotal	*195.8*
Residential High (RH)		
46	Residential, High Density (RH) (20+ du/net ac) (83 GP)	30.6
47	Residential, High Density Historic (RHH) (83 GP)	0
	Subtotal	*30.6*
	Residential Subtotal	**3,236.9**
COMMERCIAL		
Commercial General (CG)		
48	Highway Service Commercial (HSC) (83 GP)	115.0
49	Truck-Related Highway Commercial (Dunnigan)	148.1
	Subtotal	*263.1*
Commercial Local (CL)		
50	Commercial (C) (83 GP; Capay; Madison)	62.7
51	Commercial, Low Density (LC) (83 GP; Dunnigan)	22.6
52	Neighborhood Commercial (NC) (83 GP; Knights Landing; Woodland)	8.2
53	Local Commercial (Dunnigan; Esparto)	0
54	Community Commercial (Knights Landing)	0
55	General Commercial (GC) (83 GP; Esparto)	14.5
56	Central Business District (CBD) (83 GP)	0
57	Downtown Mixed Use (Esparto)	34.6
58	Commercial Multi-Family Planned Development (C-RH/PD) (83 GP)	0
	Subtotal	*142.6*
	Commercial Subtotal	**405.7**
INDUSTRIAL (IN)		
59	Industrial (I) (83 GP)	709.1[e]
60	Light Industrial (Li) (83 GP)	9.9
61	Industrial Limited (Davis)	383.7
62	Industrial, Planned Development, Type 1 (I-PD-1) (83 GP)	0
63	Industrial, Planned Development, Type 2 (I-PD-2) (83 GP)	0
64	Industrial/Residential (Woodland)	23.8
65	Master Plan (MP) (Clarksburg)	16.5
66	Employment Reserve (Knights Landing)	51.6
	Subtotal	*1,194.6*
PUBLIC and QUASI-PUBLIC (PQ)		
67	Public and Quasi-Public (PQP) (83 GP)	101.6
68	Public (Esparto)	0
69	Public Semi Public (Capay Valley)	0
70	Public Facility (Knights Landing)	33.7
71	School (S) (Capay Valley)	0
72	Airport (Monument Hills)	558.4
	Subtotal	*693.7*

TABLE LU-1 **1983 YOLO COUNTY GENERAL PLAN LAND USE DESIGNATIONS AND ACREAGES** (CONTINUED)

Row #	1983 General Plan (GP)[a] Land Use Designations[b]	Acreage[f]
SPECIFIC PLAN (SP)		
73	Mixed Use (MU) (83 GP)	0
74	Multiple Use (Knights Landing)	145.0[d]
75	Specific Plan (SP) (Clarksburg)	0
	Subtotal	*145.0*
OTHER		
76	Roadways, Railroads, Highways	8,160.2
	Subtotal	*8,160.2*
UNINCORPORATED TOTAL		
77	**GRAND TOTAL**	**621,224.0**

Notes: The 1983 General Plan established the following "combining" designations, however, there is no acreage assigned to these overlay categories: Flood Plain (FP) (Capay Valley), Planned Development (PD) (83 GP), Water Related Uses (W) (83 GP), Recreational Vehicle Park (RVP) (83 GP), Other (x/x, Phased, xx/xx, x+x, etc) (83 GP), Waterfront Commercial/Recreation (Knights Landing).

[a] Text in parentheses indicates 1903 General Plan area or Community General Plan.

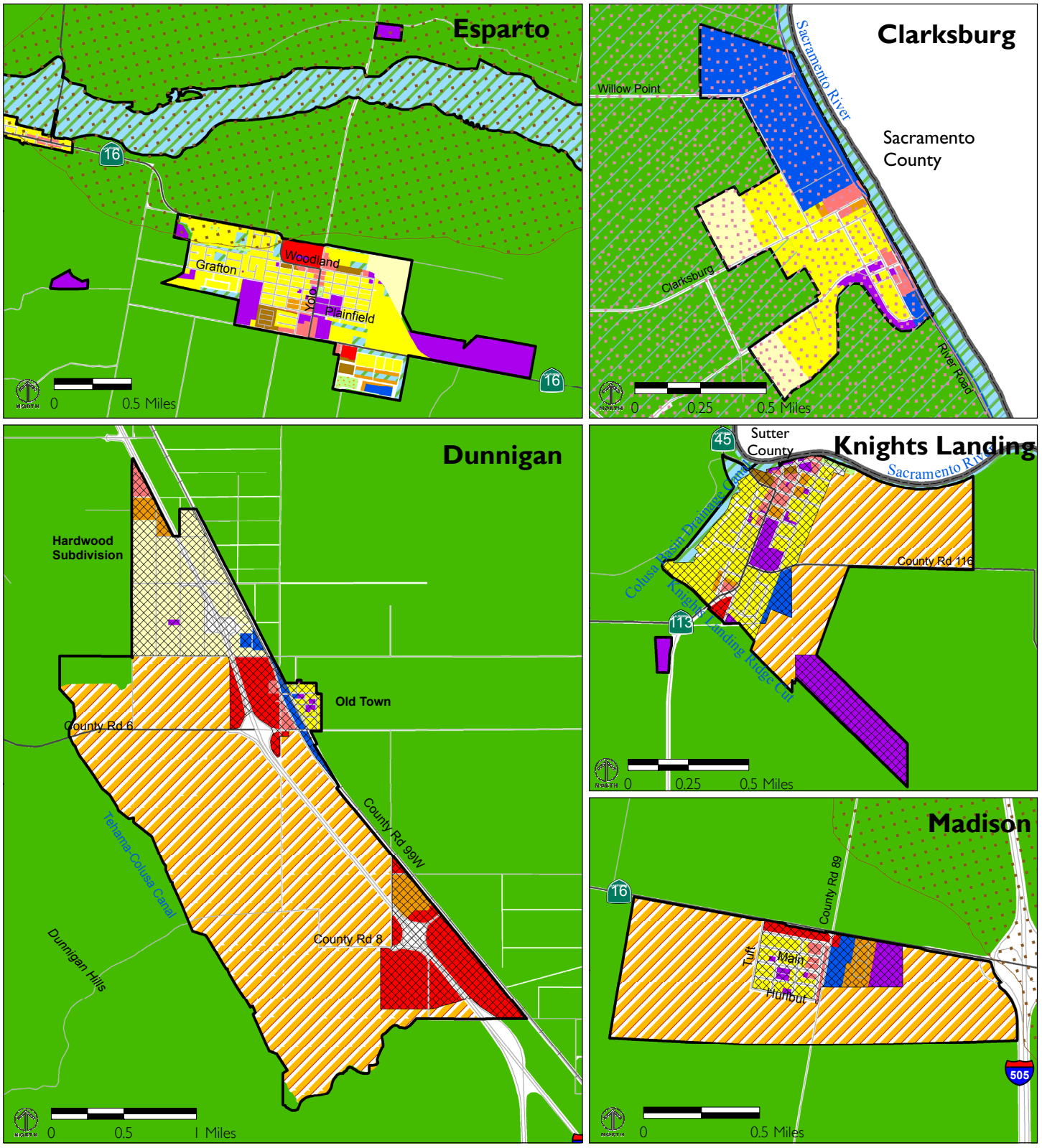
[b] Land use categories from 1983 General Plan (page 25c and d) and adopted community and area General Plans (text and diagrams), as amended.

[c] Sacramento River, Cache Creek, Putah Creek and Yolo Bypass acreage fall within these designations.

[d] This acreage is consistent with application information provided by the landowner. The County GIS parcelized database shows the acreage total as 147.0.

[e] This acreage includes 105.4 acres for the Clarksburg Old Sugar Mill site which is consistent with application information provided by the landowner for the Old Sugar Mill Specific Plan. The County GIS parcelized database shows the acreage total as 103.7. The previous "Specific Plan" designation (see category 76) was voided by final action of the State Delta Protection Commission on May 22, 2008.

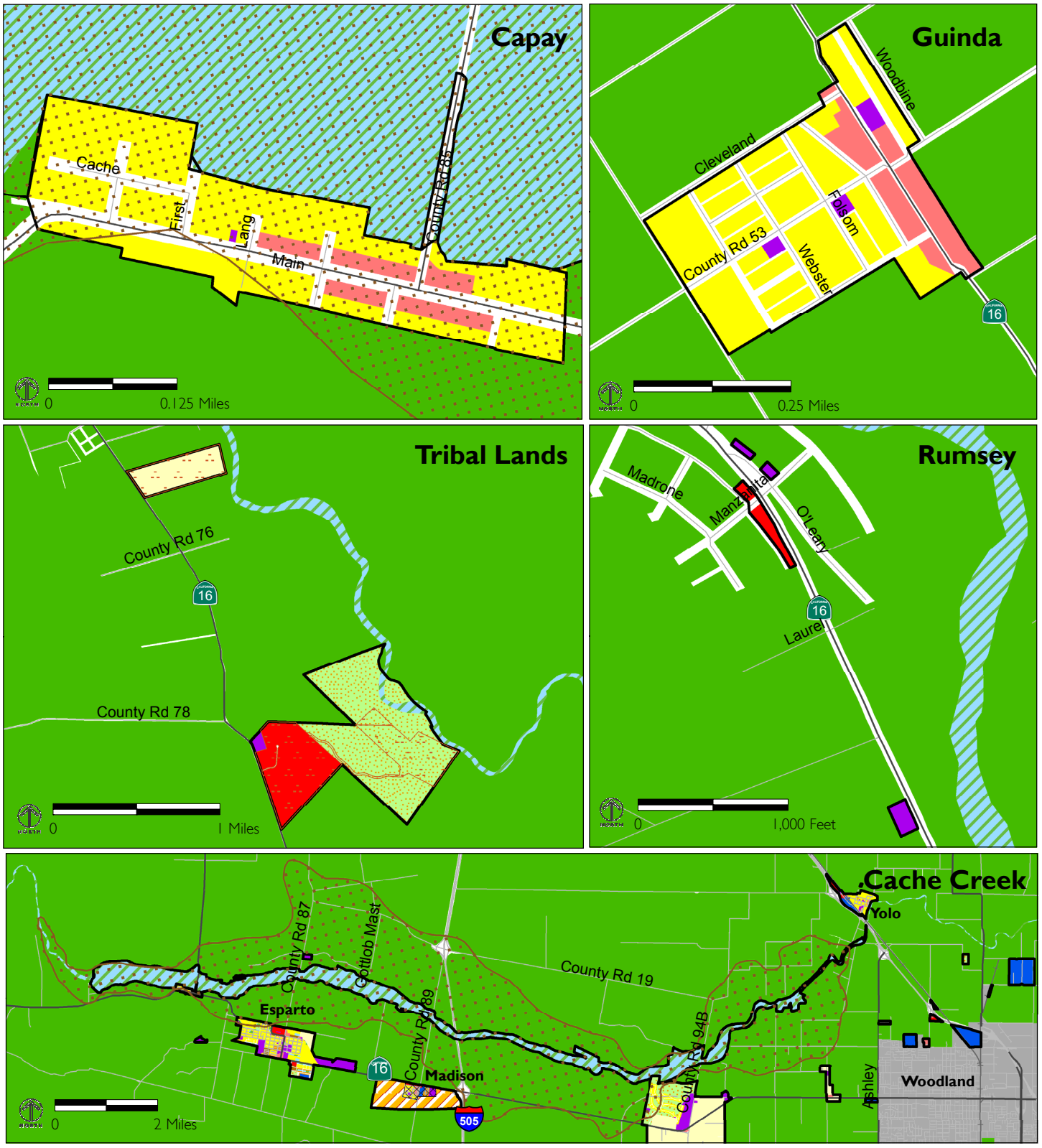
[f] Rows 1 through 75 (with the exceptions noted above) are consistent with the County GIS parcelized database. Row 76 equates to the difference between the parcelized total acreage and the non-parcelized total acreage for the unincorporated area. Row 77 exceeds the GIS non-parcelized total for the unincorporated area by 9 acres. This is because the West Sacramento non-parcelized total acreage in the County GIS system exceeds the City's own database total by 11 acres and the Winters non-parcelized total acreage in the County GIS system was 2 acres lower that the City's own database total for a net difference of +9 acres. The data was adjusted to match the City data.



Source: Yolo County GIS, 2009.

FIGURE LU-1B

GENERAL PLAN LAND USE MAP

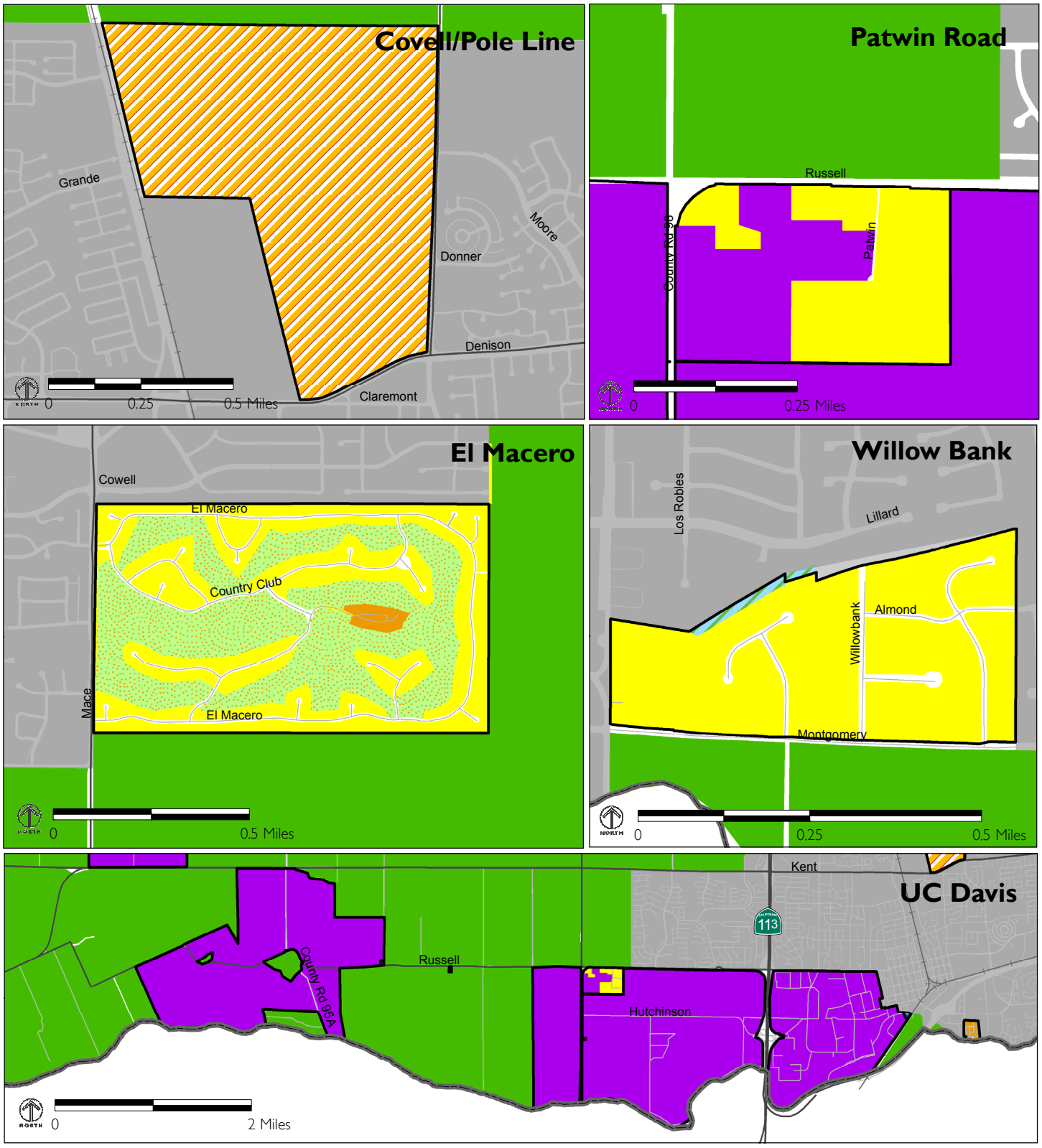


- Open Space (OS)
- Agriculture (AG)
- Parks and Recreation (PR)
- Residential Rural (RR)
- Residential Low (RL)
- Residential Medium (RM)
- Residential High (RH)
- Commercial General (CG)
- Commercial Local (CL)
- Industrial (IN)
- Public and Quasi-Public (PQ)
- Specific Plan (SP)
- Cities
- Tribal Trust Overlay (TTO)
- Mineral Resource Overlay (MRO)
- Specific Plan Overlay (SPO)
- Growth Boundaries

Source: Yolo County GIS, 2009.

FIGURE LU-1C

GENERAL PLAN LAND USE MAP

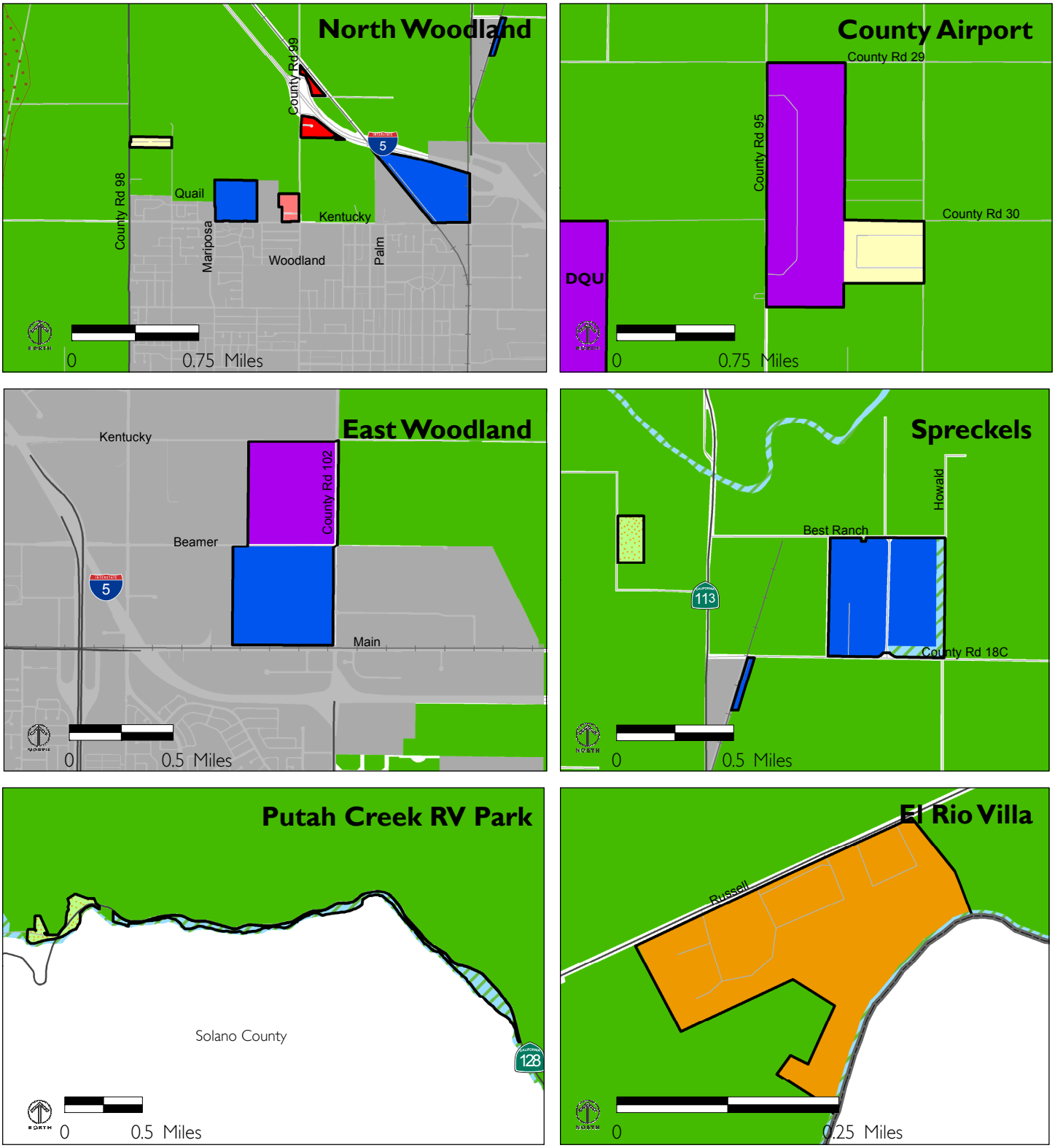


- Open Space (OS)
- Agriculture (AG)
- Parks and Recreation (PR)
- Residential Rural (RR)
- Residential Low (RL)
- Residential Medium (RM)
- Industrial (IN)
- Public and Quasi-Public (PQ)
- Cities
- Growth Boundaries

Source: Yolo County GIS, 2009.

FIGURE LU-1D

GENERAL PLAN LAND USE MAP

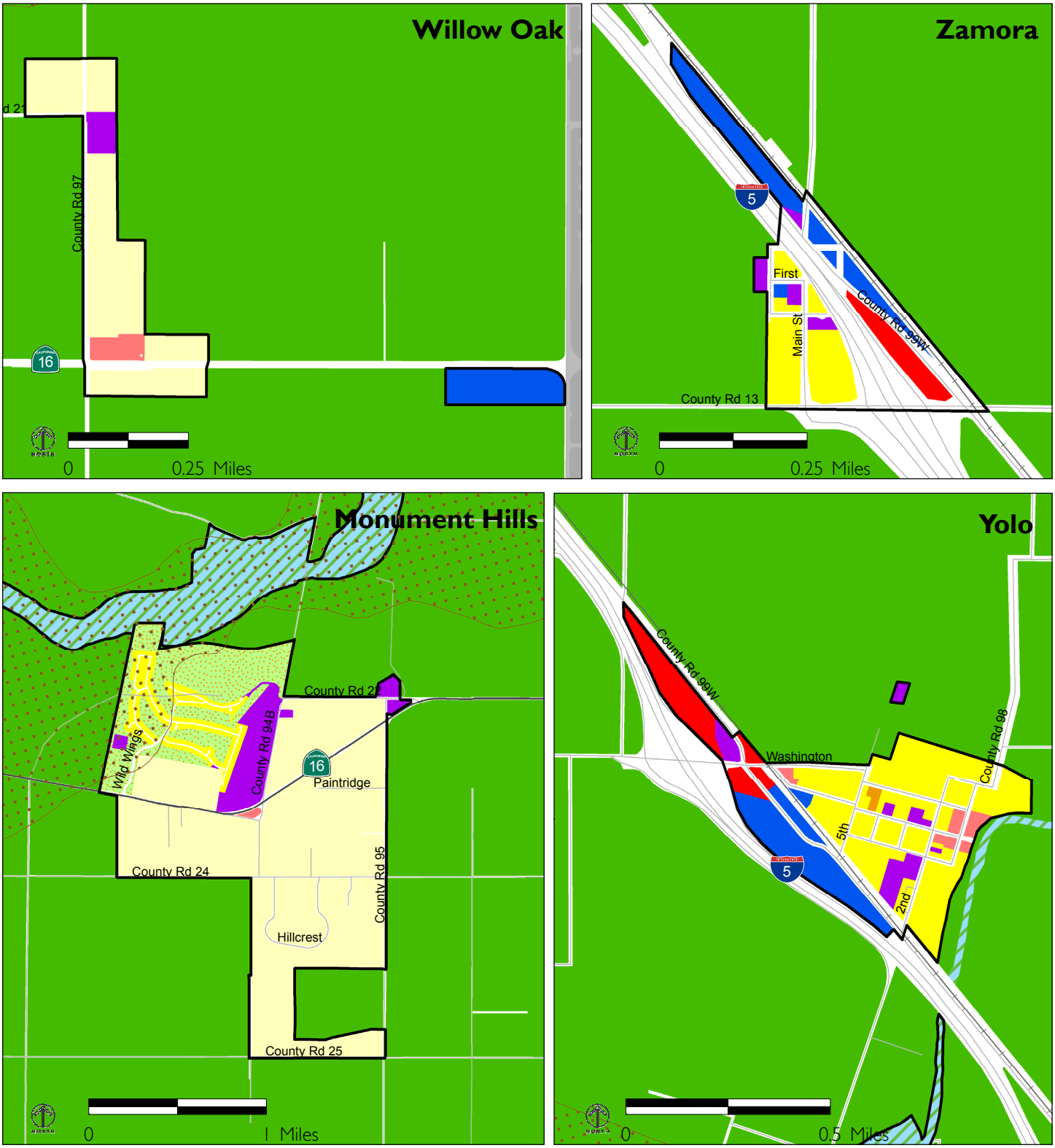


- Open Space (OS)
- Agriculture (AG)
- Parks and Recreation (PR)
- Residential Rural (RR)
- Residential Medium (RM)
- Commercial General (CG)
- Commercial Local (CL)
- Industrial (IN)
- Public and Quasi-Public (PQ)
- Cities
- Growth Boundaries

Source: Yolo County GIS, 2009.

FIGURE LU-1E

GENERAL PLAN LAND USE MAP

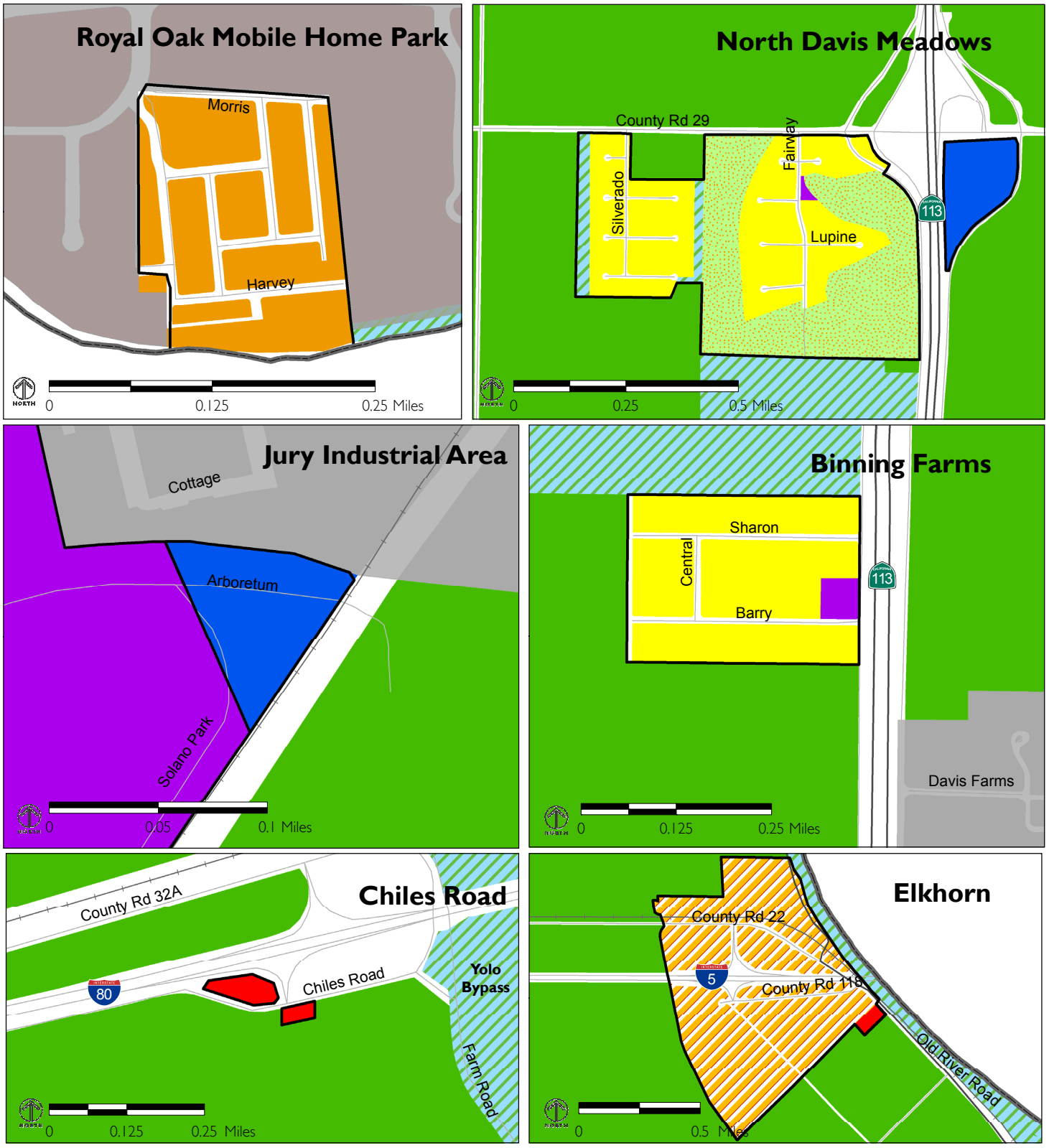


- Open Space (OS)
- Agriculture (AG)
- Parks and Recreation (PR)
- Residential Rural (RR)
- Residential Low (RL)
- Residential Medium (RM)
- Commercial General (CG)
- Commercial Local (CL)
- Industrial (IN)
- Public and Quasi-Public (PQ)
- Mineral Resource Overlay (MRO)
- Growth Boundaries

Source: Yolo County GIS, 2009

FIGURE LU-1F

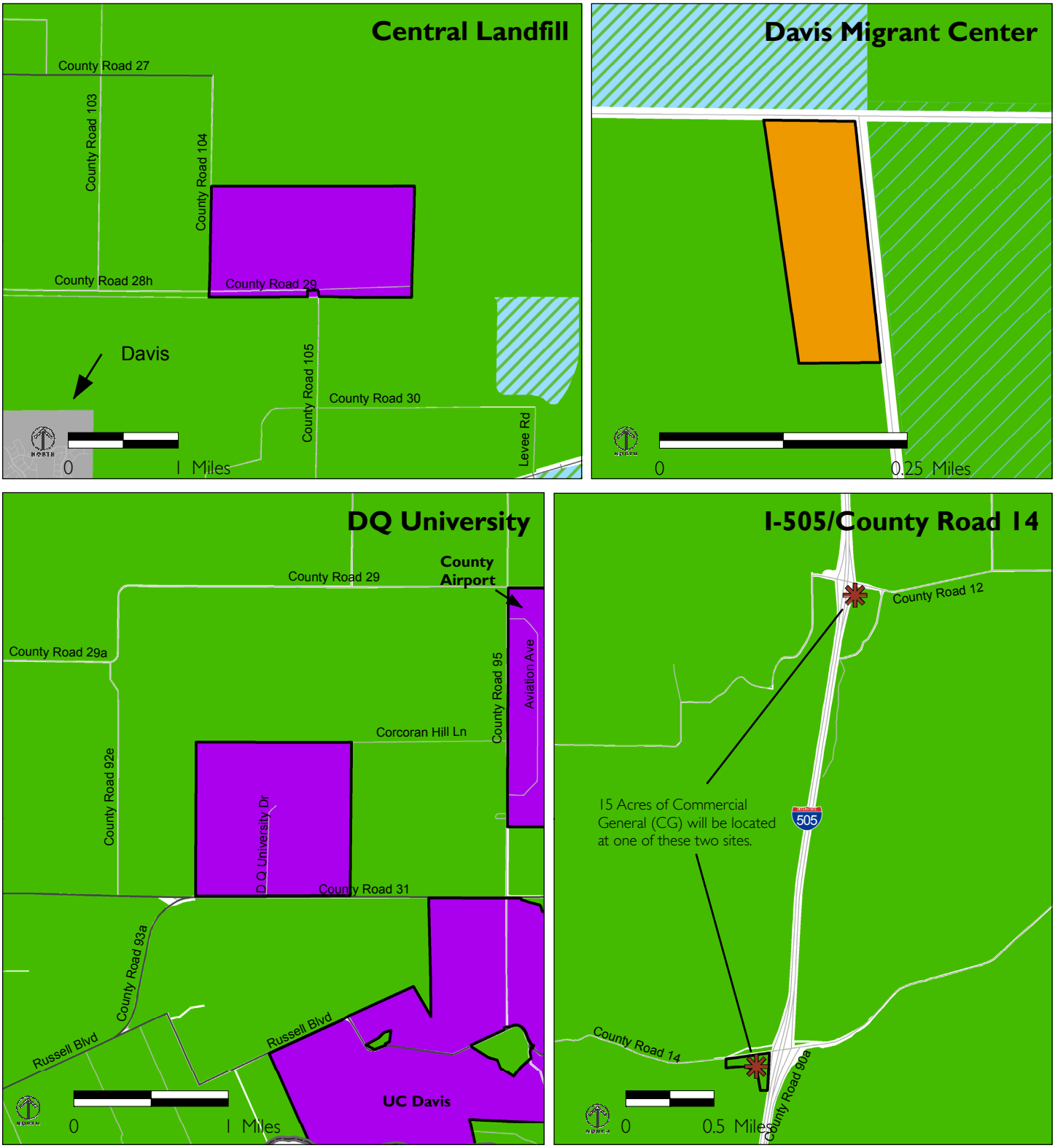
GENERAL PLAN LAND USE MAP



Source: Yolo County GIS, 2009.

FIGURE LU-1G

GENERAL PLAN LAND USE MAP



Source: Yolo County GIS, 2009.

FIGURE LU-1H

GENERAL PLAN LAND USE MAP

TABLE LU-4 **LAND USE DESIGNATIONS**

Land Use Designation (XX)	Allowed Uses	Residential Density	Persons Per Acre[a]	FAR[b] Maximum	Maximum Impervious Surface
Open Space (OS)	Public open space lands, major natural water bodies, agricultural buffer areas, and habitat. Characterized by "passive" and/or very low management uses as the primary land use, as distinguished from AG or PR land use designations which involve more intense management of the land. Detention basins allowed as ancillary use if designed with naturalized features and native landscaping, compatible with the open space primary use.	One caretaker unit.	<0.1	0.001	>0.01%
Agriculture (AG)	Full range of cultivated agriculture such as row crops, orchards, vineyards, dryland farming, livestock grazing, forest products, confined animal facilities, and equestrian facilities. Agricultural industrial – agricultural research, processing and storage; crop dusting. Agricultural commercial – roadside stands, "Yolo Stores", wineries, farm-based tourism (e.g. u-pick, dude ranch, lodging), horse shows, rodeos, crop-based seasonal events; agricultural chemical and equipment sales. Pre-existing isolated restaurants and/or stores (e.g. old stage stops and cross-roads) serving rural areas. Farmworker housing. Surface mining. Incidental habitat.	Two farm dwellings per legal parcel.	<0.1	0.1[c]	20%[c]
Parks and Recreation (PR)	Developed ("active park") facilities. Regional, community and neighborhood parks, tot lots, sports fields and public pools. Agricultural buffer areas. Detention basins allowed as ancillary use when designed with recreational or sports features.	Regional community parks and campgrounds are allowed one caretaker unit. No allowed residential uses for community or neighborhood parks and similar facilities.	<0.05	0.025	10%
Residential Rural (RR)	Large lot rural living. Detached single-family units. Attached and/or detached second unit or duplex allowed.	1 du/5ac to < 1 du/ac. Assume 1du/2.5ac typical yield.	Range: 0.6 to 2.5 Typical: 0.9	See zoning	See zoning.
Residential Low (RL)	Traditional neighborhood living. Detached single-family units. Attached and/or detached second unit or duplex allowed. Triplexes and four-plexes allowed when designed to be compatible with adjoining single-family homes. Small compatible neighborhood serving retail and office allowed as ancillary use.	1 du/ac to <10 du/ac. ~~Assume 7du/ac typical yield.~~	Range: 2.8 to 27.7 Typical: 19.6	See zoning	See zoning
Residential Medium (RM)	Dense urban living. Detached and attached single family and multi-family units. Small compatible neighborhood serving retail and office allowed as ancillary use	10 du/ac to <20 du/ac. Assume 15 du/ac typical yield.	Range: 28 to 55.7 Typical: 42.0	See zoning	See zoning

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Land Use Designation (XX)	Allowed Uses	Residential Density	Persons Per Acre[a]	FAR[b] Maximum	Maximum Impervious Surface
Residential High (RH)	Apartments and condominiums. Attached multi-family units. Small compatible neighborhood serving retail and office allowed as ancillary use	≥ 20 du/ac. Assume 25 du/ac typical yield.	>56 Typical: 70.0	See zoning	See zoning
Commercial General (CG)	Regional- and highway-serving retail, office and service. Regional- and highway-serving agricultural commercial allowed. No limit on floor plate (ground floor square footage). Research and Development with offices and service support as primary use (more than 50 percent of total square footage). Upper floor and accessory residential uses allowed.	Upper floor residential and ancillary attached residential at any density.	Range: 0 to 44.8 Avg. 22.4	0.5 for commercial 1.0 for mixed use with residential	85%
Commercial Local (CL)	Local-serving retail, office and service uses. Local-serving agricultural commercial allowed. Range of goods and services to meet everyday needs of residents within a community. Restricted to small floor plate users (less than 40,000 square feet ground floor). Upper floor and ancillary residential uses allowed.	Upper floor residential and ancillary attached residential at any density.	Range: 0 to 44.8 Avg. 22.4	1.0 for commercial 2.0 for mixed use with residential	90%
Industrial (IN)	Full range of light to heavy industrial/ manufacturing uses. Agricultural industrial allowed. Research and Development and biotechnology with manufacturing as primary use (more than 50 percent of total square footage). Storage facilities, contractor's yards, corporation yards, dismantling, etc.	One caretaker unit per operation.	<0.5	0.5	90%
Public and Quasi-Public (PQ)	Public/governmental offices, places of worship, schools, libraries and other civic uses. Public airports (including related visitor services). Infrastructure including wastewater treatment facilities, municipal wells, landfills, and storm water detention basins. Agricultural buffer areas.	None.	0	0.5	80%
Specific Plan (SP)	Interim land uses (until SP is in place) limited to those uses allowed in the AG designation. Ultimate land uses must be consistent with adopted SP. This designation limits development to AG uses until such time as a SP is processed and approved by the County, or the land use designation is otherwise amended. Land designated SP is discouraged from more capital intensive agricultural uses in favor of later planned uses.	Interim -- two farm dwellings per legal parcel. Ultimate -- as specified in the Specific Plan.	<0.1	Per the Specific Plan, using designations above as maximums.	Per the Specific Plan, using designations above as maximums.
Natural Heritage Overlay (NHO)	Applies to focused conservation areas identified in the Yolo Natural Heritage Program.	As allowed under the base designation and adopted Yolo Natural Heritage Program.	--	--	--
Agricultural District Overlay (ADO)	Applies to designated agricultural districts. Land uses consistent with the base designation and the district specifications are allowed.	As defined for each district.	--	--	--

Land Use Designation (XX)	Allowed Uses	Residential Density	Persons Per Acre[a]	FAR[b] Maximum	Maximum Impervious Surface
Delta Protection Overlay (DPO)	Applies to the State designated "primary zone" of the Sacramento-San Joaquin Delta, as defined in the Delta Protection Act. Land uses consistent with the base designation and the Delta Protection Commission's Land Use and Resource Management Plan are allowed.	As allowed under the base designation and applicable Delta Land Use and Resource Management Plan.	--	--	--
Mineral Resource Overlay (MRO)	Applies to State designated mineral resources (MRZ-2) and existing mining operations.	As allowed under the base designation.	--	--	--
Specific Plan Overlay (SPO)	Applies to existing and planned areas of development, typically adjacent to identified SP designated land. Land uses consistent with the base designation are allowed until a SP is in place at which point the SP will direct the land uses. This overlay designation preserves the base (underlying) land use designation until such time as the SP is adopted.	As allowed under the base designation.	--	--	--
Tribal Trust Overlay (TTO)[d]	Applies to tribal trust lands held by the federal government in favor of recognized tribal governments.	As defined by the sovereign government and/or appropriate applicable documents or agreements. The County does not have jurisdiction over these lands absent an applicable agreement with the federal government and/or sovereign entity.	--	--	--

Note: Densities are net of major water bodies, freeways and arterials.

[a] Persons per household is calculated assuming 2.8 persons per household.

[b] Floor area ratio.

[c] For Agricultural Industrial see IN. For Agricultural Commercial see CG.

[d] The County exercises no development or zoning control over properties designated as tribal trust lands in the General Plan. These properties are under the sole jurisdiction and control of the Rumsey Band of Wintun Indians of California. The Tribal Trust Overlay designation applies to properties within the County that are held in trust by federal agencies for the benefit of an Indian tribe. These lands can have important economic and environmental relationships to both the County and area residents. However, properties with this designation may not be subject to County planning, zoning and building regulations. Cooperative efforts between the County and local tribal governments are important to ensuring that areawide issues are appropriately addressed to the benefit of all local residents.