APPENDIX P.
CO-POLLUTANT EMISSIONS ASSESSMENT

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I. INTRODUCTION

A. Purpose of Assessment

Assembly Bill 32 (AB 32, Nuñez, Chapter 488, Statutes of 2006) requires the Air Resources Board (ARB or Board), to the extent feasible, and in furtherance of achieving the statewide greenhouse gas (GHG) emission limits, to consider the potential for direct, indirect, and cumulative emissions impacts, including any localized impacts; prevent increases in criteria and toxic air pollutants; and maximize additional environmental and economic benefits. Although the cap-and-trade regulation is specifically aimed at reducing GHGs, technology improvements and enhanced energy efficiency can also reduce criteria and toxic air pollutants (co-pollutants) associated with GHG emissions as a co-benefit. Reductions in co-pollutants will have positive health benefits and assist in meeting health-based air quality standards. The AB 32 *Climate Change Scoping Plan* estimated statewide co-pollutant reductions from the combination of measures in the plan. This assessment focuses on the potential for direct, indirect, and cumulative emissions impacts of the proposed cap-and-trade regulation. It is designed to evaluate the potential co-pollutant benefits from the rule, scenarios that might lead to potential increases in co-pollutants, and cumulative emissions impacts on communities already adversely affected by air pollution.

The assessment focuses on the potential criteria and toxic pollutant emissions impacts from the industrial and electricity generation sources covered by the program. The assessment does not include criteria pollutant and toxic emissions reductions that the cap-and-trade program is expected to provide from transportation fuels and commercial and residential gas use in addition to those likely to occur at industrial and electricity generation facilities.

Designing the emissions assessment proved to be challenging, given the nature and complexity of a cap-and-trade rule. The inherent flexibility provided by cap-and-trade makes it difficult to predict the specific changes that may result at an individual facility, and in turn how those changes may impact cumulative emissions within a particular community. Because of the market-based design of the program, compliance decisions are expected to reflect the relative cost of compliance options. However, other business and operational considerations, such as overall economic growth and demand for their products, will also influence the choices made by regulated entities. For this reason, this assessment uses a case study approach to look at potential emissions impacts at a community level. Although staff's analysis indicates that emissions increases as a result of the cap-and-trade program are unlikely, the case studies are designed as a hypothetical bounding exercise to look at both the best-case and worst-case emissions scenarios to characterize the bounds of potential outcomes and cumulative impacts.

Any evaluation of potential impacts must consider the programs that are already in place to address criteria and toxic air pollutants. California's air quality program leads the nation in terms of stringency of required emission controls. This includes local air district permitting programs for stationary sources, ARB's comprehensive control programs for mobile sources, goods movement, and diesel risk reduction, and the air toxics identification and risk assessment process. The cap-and-trade regulation will not affect the stringency of these programs. Rather, sources regulated by the cap-and-trade program must continue to operate within these existing requirements, and as such, the cap-and-trade program provides an additional mechanism to ensure continued air quality improvement.

California's air pollution control programs for criteria and toxic pollutants will continue to significantly reduce emissions and health risk into the future. Reductions in co-pollutants that occur as a result of AB 32 complement the benefits of California's existing air quality programs. Reducing emissions from combustion sources is at the core of California's program to meet air quality standards for ozone and fine particles, and is also central to the AB 32 Scoping Plan for meeting the 2020 GHG emissions target. California's climate and criteria pollutant programs are complementary, and the AB 32 regulations that ARB is adopting will provide benefits that will be incorporated into future air quality plans for ozone and fine particles.

The potential for cumulative impacts in communities already adversely impacted by air pollution is included as a specific consideration in the statute, but AB 32 does not define "cumulative emissions impacts" or "communities already impacted by air pollution." Most urban areas in California are affected by air pollution on a regional basis, and as a result, all have air quality programs and plans in place that are designed to provide for compliance with air quality standards. Transportation and industrial air pollution sources are also concentrated in urban areas, which can contribute to cumulative emissions impacts on a localized level. Rural areas downwind of urban centers also experience poor air quality due to the transport of air pollution, and are adversely impacted by air pollution. Each of these situations is considered in this assessment, to the extent feasible, with special attention to the potential for localized impacts in communities experiencing the greatest air pollution impacts.

The emissions assessment is designed to meet statutory requirements to evaluate the potential emissions impacts of the proposed cap-and-trade rule, and complements the Health Impact Assessment (HIA) being conducted by the California Department of Public Health (CDPH). To supplement ARB's emissions assessment, the HIA evaluates potential health impacts other than air pollution effects and explores other issues such as health disparities among communities and potential uses of revenue generated by the program to further improve public health in California. CDPH recently presented its work plan to the California Climate Action Team Public Health Work Group. Broader considerations related to community health status, air pollution exposures, and vulnerable populations are expected to be part of a public decision-making process on the use of revenues generated by the program. Taken together, the

ARB emissions assessment and the HIA provide information on the broad implementation of the cap-and-trade program.

This emissions assessment analyzes a range of potential compliance options for industrial and electricity generation sources in the cap-and-trade program. Most compliance approaches are expected to result in reductions in co-pollutants through increased efficiency and decreased combustion of fossil fuels. However, the regulation affords entities flexibility to choose the most cost-effective strategies to reduce emissions, so the potential for some compliance actions to result in increased co-pollutant emissions at some facilities cannot be entirely discounted.[1] For this reason, continued monitoring and review will be necessary to identify situations where increases in criteria pollutants and toxics might occur, and to allow the appropriate agencies to take the needed steps to address them. Many of the mechanisms are already in place to do so: stationary source control and permitting programs, toxics control and risk assessment requirements, and air monitoring for ozone, particulate matter smaller than 2.5 microns ($PM_{2.5}$), and toxics.

Although staff believe that the potential for emissions increases attributable to the proposed rule is very unlikely, ARB is committed to monitoring the implementation of the cap-and-trade regulation to identify and to address any situations where the program has caused an increase in criteria pollutant or toxic emissions. At least once each compliance period, ARB will use information collected through the mandatory reporting regulation, the cap-and-trade regulation, the industrial efficiency audit, and other sources of information to evaluate how individual facilities are complying with the regulation. The cap-and-trade program is another layer of review and opportunity for data gathering, decision-making, and agency and public vigilance to ensure that any potential increases are identified and addressed.

B. Proposed Cap-and-Trade Regulation

In developing the AB 32 Scoping Plan, ARB was directed to identify and make recommendations on GHG emissions-reduction measures, including market-based mechanisms. AB 32 also specifically states that ARB may adopt a regulation that establishes a system of market-based “declining annual aggregate emission limits” (i.e., a declining emissions cap) for sources or categories of sources that emit greenhouse gases. The primary goal is to

[1] Not all emissions increases at facilities covered by the cap-and-trade program will result from the program itself. The cap-and-trade program will place a new regulatory requirement and a new cost on GHG emissions from all covered facilities, so that the program provides an incentive to decrease (or to minimize increases in) GHG emissions and any related emissions of criteria or toxic emissions. While the program provides flexibility that could allow increased production due to economic growth, such increases would not be caused by the cap-and-trade program. Staff believes that only in very limited circumstances would a localized emissions increase be the actual result of the incentives created by the cap-and-trade program – e.g. shifting of production within a company from an inefficient facility with higher compliance costs to a more efficient facility that results in higher emissions at the more efficient facility.

provide a firm limit on aggregate emissions of GHGs, which complements other regulations. AB 32 directs ARB to adopt GHG-reduction regulations by January 1, 2011.

The concept of the cap-and-trade program is to reduce GHG emissions through a declining emissions cap, while allowing compliance flexibility. As the program cap declines over time, emissions are reduced. The compliance flexibility mechanisms are important for keeping program costs down, while achieving the environmental goal.

Under the cap-and-trade regulation, ARB would issue a limited number of allowances to emit equivalent to the program's emission cap. Emission caps are not applied to individual facilities, but to the program as a whole. Trading of allowances provides flexibility for regulated entities. For example, a facility might choose to reduce its emissions and sell any excess allowances in the marketplace, providing an incentive for investing in cost-effective emissions reductions. If a facility has excess allowances, it could also save them for future use through provisions for banking of allowances.

In addition to trading, the proposed rule would allow use of offsets to satisfy a small portion of the compliance obligation. The structure of the rule ensures rigorous emissions accounting and that regulated entities have an enforceable obligation to hold allowances or offsets equivalent to their emissions. The number of available allowances drops over time to match the declining cap specified in the rule.

An allowance is a "tradable authorization to emit up to one metric ton of carbon dioxide equivalent (CO_2e)." A regulated entity may obtain allowances in four ways:

- ARB may issue the facility or energy provider allowances.
- Allowances could be bought at an ARB auction.
- Allowances could be purchased from other regulated entities.
- Allowances could be purchased on the open market.

The proposed rule limits the quantity of offsets that can be used for compliance. An offset is a credit that represents a reduction, avoidance, or sequestration of carbon dioxide or other GHG emission resulting from an activity that is not covered by the cap. An offset credit must be able to be measured, quantified, and verified. This credit could then be sold and used by a facility as part of its compliance strategy subject to the limitations in the rule. The proposed rulemaking includes four types of offsets that would be eligible for use as a compliance mechanism. They address forest management, urban forestry, manure management, and ozone depleting substance destruction. Additional offset types will be considered as accounting protocols are developed. The initial four offset protocols apply to the United States.

To show compliance, a facility would turn in allowances or offsets equivalent to its annual GHG emissions for the defined compliance period. A facility could decrease, maintain, or increase its GHG emissions as long as it surrenders the required allowances or offsets. How a business chooses to comply with the program, and its use of allowances and offsets, will affect the distribution of potential health impacts in California. However, it is important to note that cap-and-trade facilities are subject to existing local air quality regulations, rules, and permit requirements established under State law and the federal Clean Air Act to control criteria and toxic air pollutants.

If California links its cap-and-trade program through a future regulatory action to jurisdictions within the Western Climate Initiative (WCI), which includes several Western states and some Canadian provinces, a facility could purchase allowances issued by any WCI member state. California could also decide in the future to link its cap-and-trade program to other trading programs, such as the Regional Greenhouse Gas Initiative, the European Union Emissions Trading System, and the Midwestern Greenhouse Gas Reduction Accord.

The potential impacts of a cap-and-trade system depend on how individual facilities comply with the regulation. The following are example scenarios:

- <u>Maintain Current Emissions</u>: A facility could continue emitting GHGs at the same rate, and surrender allowances and offsets equivalent to its emissions. As described above, these allowances could be given to an entity by ARB, bought at an auction or in the open market, saved from the previous compliance period, or purchased from another entity. If a California facility purchases allowances from another entity, that entity could be located anywhere in California or in a jurisdiction with a cap-and-trade system linked to California, such as WCI. A facility could potentially use purchased offset credits for 8 percent of the compliance obligation.

- <u>Reduce Emissions On-site</u>: If cost-effective and feasible, a facility may reduce GHG emissions on-site, which would decrease the amount of allowances or offsets required to comply. The facility would then acquire allowances or offsets for the remaining GHG emissions.

- <u>Increase Greenhouse Gas Emissions</u>: If a facility increased its GHGs as a result of increased economic activity, additional allowances or offsets would be needed. However, local air district air quality permits and other air quality requirements would control any co-pollutant increases.

The above scenarios illustrate the nature of cap-and-trade programs and potential compliance options. Because of the market-based design of the program, compliance decisions are expected to reflect the relative cost of compliance options. However, other business and operational considerations will influence the choices made by regulated entities. For this reason, this assessment uses a case study approach to look at potential emissions impacts at a community level. The case studies are designed as a hypothetical bounding exercise to look at both the best-case and worst-case emissions scenarios.

C. Overview of Assessment

This assessment focuses on the potential cumulative emissions impacts of the proposed cap-and-trade regulation within four community case studies. It is designed to evaluate the potential for co-pollutant benefits from the rule, scenarios that might lead to potential increases in co-pollutants, and cumulative emissions impacts on communities already adversely impacted by air pollution.

The assessment focuses on California industrial and electricity generation facilities, and does not address the broader impact of including transportation fuels and transportation and natural gas fuel providers under the cap. The trading of allowances and use of offsets are the primary market-based compliance mechanisms discussed.

Any evaluation of potential impacts must consider the programs that are already in place to address criteria and toxic air pollutants. California's air quality program leads the nation in terms of stringency of required emission controls. This includes local air district permitting programs for stationary sources, ARB's comprehensive control programs for mobile sources, goods movement, and diesel risk reduction, and the air toxics identification and risk assessment process. The cap-and-trade regulation will not affect the stringency of these programs. Rather, the cap-and-trade program must operate within these existing requirements, and as such, they provide an additional mechanism to ensure continued air quality improvement.

California's air pollution control programs for criteria and toxic pollutants will continue to significantly reduce emissions and health risk into the future. Reductions in co-pollutants that occur as a result of AB 32 complement the benefits of California's existing air quality programs. Reducing emissions from combustion sources is at the core of California's program to meet air quality standards for ozone and fine particles, and also the AB 32 Scoping Plan for meeting the 2020 greenhouse gas emissions target. California's climate and criteria pollutant programs are complementary, and the AB 32 regulations that ARB is adopting will provide benefits that will be incorporated into future air quality plans for ozone and fine particles.

Designing the cumulative emissions assessment proved to be challenging, given the nature and complexity of a cap-and-trade rule. The inherent flexibility provided by the cap-and-trade concept makes it difficult to predict the specific changes that may result at an individual facility, and in turn, how those changes may impact cumulative emissions within a particular community. However it is possible to characterize the bounds of potential outcomes and cumulative impacts, and that characterization provides the core of this emissions assessment.

The potential for localized impacts in communities already adversely impacted by air pollution is included as a specific consideration in the statute, but AB 32 does not define "cumulative emissions impacts" or "communities already impacted by air pollution." Most urban areas in California are affected by air pollution on a regional basis, and as a result, all have air quality programs and plans in place that are designed to provide compliance with one or more air quality standards. Transportation and industrial air pollution sources are also concentrated in urban areas, which can contribute to cumulative emissions impacts on a localized level. Rural areas downwind of urban centers also experience poor air quality due to the transport of air pollution, and are adversely impacted by air pollution. Each of these situations is considered in this assessment to the extent possible, with special attention to the potential for localized impacts in communities experiencing the greatest air pollution impacts.

1. Methods for Identifying Cumulatively Impacted Communities

In 2005, ARB sponsored a research project on an environmental justice screening method that combines indicators of current air pollution risk with social and health vulnerability. The final report for this work is entitled: *Air Pollution and Environmental Justice: Integrating Indicators of Cumulative Impact and Socio-Economic Vulnerability into Regulatory Decision-Making*. The final report was reviewed by the ARB Research Screening Committee.

This screening approach is a visual mapping tool and scoring procedure that examines cumulative impacts in neighborhoods. The screening approach incorporates a number of indicators of cumulative impacts, reflecting research on air pollution, public health, and environmental justice. It incorporates indicators for three categories of potential impact and vulnerability: air pollution exposures and health risk, social and health vulnerability, and proximity between hazardous and sensitive land uses.

To identify communities for the case studies, ARB consulted with the Environmental Justice Advisory Committee (EJAC) and other environmental stakeholders. These groups recommended that multiple communities be evaluated. Staff also considered availability of data, concentration of facilities that would be subject to cap-and-trade, and regional diversity. As a result, this assessment looks at four cumulatively impacted communities: Wilmington, Oildale/Bakersfield, Richmond, and Apple Valley/Oro Grande. Wilmington is identified as a cumulatively impacted community by the mapping tool described in *Air Pollution and Environmental Justice: Integrating Indicators of Cumulative Impact and Socio-Economic Vulnerability into Regulatory Decision-Making.* At this time, that mapping tool is available only for the Los Angeles region. ARB is in the process of evaluating how to expand the availability of this screening approach statewide. The other three communities are also identified as cumulatively impacted by a similar screening tool developed by ARB staff. While the ARB staff-developed tool does not include all the factors used in the research contract tool, if the latter were available statewide, it is expected that it would identify the same three communities as appropriate case studies.

In addition to requiring an assessment of the emissions impact, AB 32 requires the Board, where applicable and feasible, to direct investment toward the most disadvantaged communities. With respect to the cap-and-trade rule, this relates to the use of allowance value. This emissions assessment does not address the distribution of revenues, which is an implementation issue that deserves serious consideration and a broad-based public discussion. Identification of disadvantaged communities must be part of that discussion, including the possible use of the mapping tool described in *Air Pollution and Environmental Justice: Integrating Indicators of Cumulative Impact and Socio-Economic Vulnerability into Regulatory Decision-Making.*

As part of the California Environmental Protection Agency, ARB also works with the Office of Environmental Health Hazard Assessment (OEHHA) on methods to assess cumulative emissions impacts. OEHHA has released a draft report which discusses the scientific foundation for cumulative impacts assessment, including the role of socioeconomic status, exposure disparities, environmental effects, public health effects, and biological vulnerabilities. OEHHA's proposed conceptual framework for screening for cumulative impacts includes each of these factors. While no specific methodology is proposed, identification of these key elements is an important recognition of the general types of considerations that should be included in assessing cumulative impacts.

A potential use of such a screening exercise is to distinguish between communities with higher impacts and those with lower impacts. The OEHHA screening concept would not provide a comprehensive assessment of cumulative impacts in a community or determine the cause of health outcomes in a community. However, a screening method can provide an important first step in the health risk assessment process and help prioritize government agency actions.

2. Method for Assessing Cumulative Emissions Impacts

This assessment addresses potential direct, indirect, and cumulative emissions impacts in the context of both emission and air pollution exposure trends. Some air pollutant emissions directly impact health while others chemically react in the atmosphere to form pollutants of health concern. Ambient air monitoring data provide empirical information on recent trends in exposure to air pollution for both direct air pollutants and those formed in the atmosphere.

Determining the potential impact of the cap-and-trade regulation on cumulative emissions requires looking at how various industrial sectors and individual facilities may move to comply with the program, and then evaluating that response in the context of all emissions from all sources—first at the regional level, and then at the local level. This assessment takes a stepwise approach to doing this, with each chapter providing information used by ARB staff to conduct the subsequent analyses.

Chapter II sets out in detail California's regulatory programs governing smog-forming, fine particulate, and toxics emissions from stationary sources. Any specific changes made at a facility in response to the cap-and-trade regulation must be in compliance with this framework, which includes regulatory programs, permit systems, risk assessment, and more. Section II.C summarizes the major programs that will reduce emissions from cars, trucks, and other mobile sources between now and 2020. The end of Chapter II describes cumulative emissions today statewide, as well as recent air quality. Maps are presented that show how air quality varies within the State, to provide context for the community case studies.

Chapter III presents future emissions in 2020. Section III.A describes the expected emissions reductions that will take place at the regional level as a result of the existing control programs. In Section III.B, the contribution of the capped sources to the regional cumulative emissions totals in 2020 is identified. This shows that absent the cap-and-trade rule, capped industrial and electricity generation sources are forecasted to be less than 10 percent of cumulative emissions from all sources. The percentage varies by region and pollutant.

Finally, Chapter IV looks at the potential impact of the cap-and-trade regulation on co-pollutant emissions. The chapter begins with a general description of how the cap-and-trade industrial and electricity generation sectors may respond to rule requirements, how other GHG programs apply to the sectors, and how the existing co-pollutant control requirements described in Chapter II overlay.

The focus of the remainder of Chapter IV is on four community case studies. Each community assessment includes descriptions of current air quality exposure and trends, existing co-pollutant emissions and control programs, and an evaluation of the potential for cumulative emissions impacts in 2020 from the implementation of cap-and-trade.

Because of the compliance flexibility provided by the cap-and-trade regulation, it was not possible to identify facility-specific changes that might occur within each community. Instead, three basic hypothetical bounding scenarios were used to assess potential cumulative emissions impacts. Those bounding scenarios are: (1) a bounding co-benefit scenario, where all covered industrial and electricity generation facilities reduce their GHG emissions within the community, (2) a bounding dis-benefit scenario, where all covered facilities increase their emissions, and (3) a second dis-benefit scenario, where a new facility is built in the community.

ARB staff believes that scenarios two and three are very unlikely to result from the cap-and-trade regulation. Many factors influence a decision to expand production or build a new facility, and the cap-and-trade program itself imposes a new requirement on facilities—the need to procure allowances and offsets to accommodate GHG emissions—in addition to the strict permitting requirements already in effect for criteria pollutants and toxic air contaminants. Under scenario two, every facility would need to purchase allowances and offsets to accommodate any growth. We believe it is more likely that a few facilities may increase production, while others would decrease. Similarly, we do not believe that compliance with the cap-and-trade regulation will cause the siting of new facilities assumed in scenario three, though the regulation would not prevent it. Nevertheless, both scenarios are useful as hypothetical bounding analyses.

D. Next Steps

The emissions assessment in this document fulfills the requirement of AB 32 that, as part of adopting the cap-and-trade rule, ARB considers potential emissions impacts, including localized impacts; designs a program to prevent any increase in emissions; and maximizes additional environmental and economic benefits. Although staff believes that the potential for emissions increases attributable to the proposed rule is very unlikely, ARB is committed to monitoring the implementation of the cap-and-trade regulation to identify and to address any situations where the program has caused an increase in criteria pollutant or toxic emissions. At least once each compliance period, ARB will use information collected through the mandatory reporting regulation, the cap-and-trade regulation, the industrial efficiency audit, and other sources of information to evaluate how individual facilities are complying with the regulation. The cap-and-trade program is another layer of review and opportunity for data gathering, decision-making, and agency and public vigilance to ensure that any potential increases are identified and addressed.

II. CALIFORNIA'S CRITERIA POLLUTANT AND TOXICS REGULATORY PROGRAM

The federal, state, and local governments all share responsibility for reducing air pollution. ARB is California's lead air agency and controls emissions from mobile sources, fuels, and consumer products, as well as air toxics. California's 35 air pollution control districts (air districts, or districts) control emissions from stationary sources and small businesses at the local level. At the federal level, the U.S. Environmental Protection Agency (U.S. EPA) has oversight of State programs. In addition, U.S. EPA has established emission standards for mobile sources such as ships, trains, and airplanes.

The responsibility for controlling emissions of criteria pollutants and toxics from stationary sources of air pollution rests with the air districts. The air districts generally do this through a combination of prohibitory rules that set emissions limits that vary by facility type; operating permits that specify equipment use and other operating parameters for a facility to limit emissions; and a New Source Review (NSR) program designed to accommodate industrial growth while mitigating environmental impacts.

There are two criteria pollutants of most widespread health concern in California—ozone and fine particulate matter ($PM_{2.5}$). The health risk from diesel particulate matter is the largest air toxics risk, both regionally and at locations such as ports and rail yards. ARB actions are lowering these health risks, and substantial new emissions reductions in both criteria pollutants and diesel particulate matter will occur between now and 2020.

Ozone, a major component of "smog," is not directly emitted as a pollutant, but is formed in the atmosphere when reactive organic gases (ROG) and oxides of nitrogen (NOx) emissions react in the presence of sunlight over time. Ozone concentrations often occur downwind of the emission sources, which contributes to the regional nature of ozone air pollution.

$PM_{2.5}$ is a mixture of pollutants generated by a variety of sources. $PM_{2.5}$ can either be emitted directly into the air in forms such as soot and smoke, or it can be formed in the atmosphere from the reactions of pollutants including NOx, oxides of sulfur (SOx), ROG, and ammonia. While the impacts of directly emitted $PM_{2.5}$ may be seen near sources of air pollution, $PM_{2.5}$ that is formed in the atmosphere has a regional impact similar to ozone.

California's mature air quality program leads the nation in terms of stringency of required emission controls, not only for mobile sources but also for stationary sources. The cap-and-trade regulation will not affect the stringency of these programs. Reducing emissions from combustion sources is at the core of California's program to meet air quality standards for ozone and $PM_{2.5}$, and also the AB 32 Scoping Plan for meeting the 2020 greenhouse gas emissions target.

California’s climate and criteria pollutant programs are complementary, and the AB 32 regulations ARB is adopting will provide benefits that will be incorporated into future air quality plans for ozone and $PM_{2.5}$.

A. Stationary Source Regulatory Framework

1. Air District Prohibitory Rules

Each of California’s air districts has rules governing existing stationary sources. These are known as prohibitory rules. They include requirements for emission limits, testing, recordkeeping, and reporting. Prohibitory rules may be facility-specific (limiting the maximum level of a particular pollutant at a particular type of facility), or they may address specific equipment, such as turbines, boilers, or internal combustion engines found at many types of facilities.

Prohibitory rule emission limitations reflect established emission control technologies that can be feasibly added to existing sources. The most stringent of these technologies are referred to as Best Available Retrofit Control Technology (BARCT) which is a requirement of State law. These California requirements are overlaid on federal requirements for air districts in nonattainment areas to implement Reasonably Available Control Technology (RACT) at large stationary sources. In general, BARCT requirements are typically more stringent than their RACT counterparts, but neither is as stringent as Best Available Control Technology (BACT), which applies at large new or modified facilities. BACT is described further in the section on NSR, a program designed to mitigate emissions increases due to growth.

Prohibitory rules are adopted by district boards in public hearings. Rule development is a lengthy process that typically takes from one to two years and involves workshops and other opportunities for public participation. The requirements of prohibitory rules vary by district, as does their stringency. Stringency of a rule depends on factors such as applicability of the rule and exemptions; control levels or control equipment specified; and effective dates of requirements. District rules are typically submitted to U.S. EPA for inclusion in the State Implementation Plan (SIP) for nonattainment areas. Upon approval by U.S. EPA, the rules become federally enforceable.

2. South Coast Regional Clean Air Incentives Market (RECLAIM)

The effort to impose incremental rule changes on thousands of stationary sources under South Coast air district permits was time consuming and costly. Therefore, in the early 1990s, the South Coast developed the RECLAIM program, California’s first air pollution cap-and-trade regulation. The program provides industry with flexibility to decide how to reduce emissions and advance pollution control technologies without the constraints of command and control.

RECLAIM encompasses most of the highest-emitting stationary facilities in the South Coast Air Basin for NOx and SOx. Facilities participating in RECLAIM have annual emission allocations that decline over time. The benefits of this innovative program include lower costs and greater flexibility, as well as secured emissions reductions with better emission monitoring. Because facilities can trade emissions below their cap, or purchase credits if needed, credits have monetary value, and the emissions are now part of the regular course of business for RECLAIM facilities.

3. New Source Review

In addition to district prohibitory rules that apply to existing sources, there are rules that apply to new or modified stationary sources. These rules represent a NSR program and are required by both federal and California law.

Within a region, NSR assures that new emissions from new and modified factories, industrial boilers, and power plants do not slow progress toward cleaner air. In areas with clean air, especially pristine areas like national parks, NSR assures that new emissions do not significantly worsen air quality. The technology provisions of NSR also provide assurance that any large new or modified industrial source will be as clean as possible, and that advances in pollution control occur concurrently with industrial expansion.

New Source Review applies to “major” facilities as well as “major modifications” to existing facilities. The definition of “major” varies by air district and depends on the severity of each district’s nonattainment classification. The worse the air quality, the lower the facility’s total emissions need be for it to be considered “major.”

New Source Review requirements are applied in a two-step process. First, any new equipment at a facility subject to this program must meet BACT control levels. This step ensures that new equipment being installed is as low-emitting as is considered technologically feasible. Next, if the change in emissions from the new equipment causes overall facility-wide emissions to exceed a threshold—the worse the air quality where the equipment is being constructed, the lower the threshold—all new emissions must be offset. This can be accomplished either by reducing emissions by the same amount elsewhere in the same facility, or by purchasing emissions reduction credits (ERCs), which are previously reduced emissions, often from other facilities. Together, the BACT and offset provisions of NSR are designed to allow an area to move toward attainment of the ambient air quality standards while still allowing industrial growth.

When BACT is required, owners of facilities must ensure that the equipment they are installing will not emit air pollutants at levels greater than equipment at similar new facilities. These limits are at least as stringent as the air district’s prohibitory rules. To identify BACT for a specific stationary facility, air district staff conducts a comprehensive evaluation that includes obtaining test results or similar proof that the emission levels have been achieved in practice. District staff also conducts a broad search (even internationally, at times) for technologies that have been demonstrated through testing on similar types of stationary sources to reduce emissions to the lowest levels.

Offsets are emissions reductions generally obtained from existing sources located in the vicinity of a proposed source to mitigate the emissions increase from the new source or modification. To be used as mitigation, offsets must meet certain criteria. The emissions reductions must be surplus to any federal, state, or local laws or regulations, and must be real, enforceable, quantifiable, and permanent. California's offset requirements, reflected in district rules, generally apply to more permitting actions than federal offset requirements and are often triggered at lower-emitting facilities.

The most common method of creating ERCs is to control or curtail the emissions from an existing stationary source. Control of emissions is generally from the application of emissions control technology beyond that which is required by any regulation or rule. Curtailment could be from a change in operating hours of a source, or through the shutdown of a source. Another method of creating ERCs is to reduce emissions from mobile sources beyond what is required or from the reductions in emissions from agricultural operations; for example, from curtailing field burning of agricultural wastes or from using agricultural water pumps equipped with cleaner engines. Credits must be generated pursuant to district rules and regulations, and must be reviewed and certified by the district.

Typically, when ERCs are used for offsets, a larger quantity of ERCs must be secured than are being added to the air by the project. The higher a district's nonattainment classification (such as marginal, moderate, serious, severe, or extreme), the higher the ratio between ERCs needed and emissions being offset. This relationship is termed the *offset ratio.*

If an applicant obtains emission offsets outside the areas described above, or if one type of pollutant is offset against another type, the applicant must show through modeling that these offsets will result in a net benefit to air quality. Modeling combines the emission rates from the facility with identified meteorological conditions to assess the source's air quality impacts. The emissions reduction from these offsets must improve the air quality in the area affected by the emissions from the source.

The NSR program in the South Coast is not replaced by RECLAIM. Best Available Control Technology is determined on a case-by-case basis based on the lowest emission rates achieved in practice for the same type of equipment. Additionally, increases in emissions must be offset to the full extent. But under RECLAIM, new or modified equipment would only need to provide offsets at a one-to-one ratio prior to the start of operation—a lower ratio than otherwise required in the South Coast air district under the prohibitory rules.

The stringency of emission controls required by NSR and prohibitory rules is not static, but is ever-advancing. Of the two programs, the technology-forcing requirements of BACT evolve more rapidly and eventually result in more stringent prohibitory rules and lower BARCT emission levels. As BACT technologies become more widely used for new stationary sources, air districts can then update their prohibitory rules to reflect these newer technology levels that are being achieved in practice.

For example, low-NOx burners used in natural gas-fueled boilers that emitted NOx at 30 parts per million levels were previously considered BACT, but later were considered BARCT. Since then, BACT has advanced significantly, and BARCT in many districts has dropped to levels as low as 5 parts per million for some boiler sizes.

4. Air Pollution Permits

The purpose of air pollution permits is to provide specific parameters under which a facility must operate so as to meet its obligations under prohibitory rules, NSR, and in the case of the South Coast air district, RECLAIM. The primary benefit to the public is that air permits limit the amount of air pollution allowed at a stationary source. Permits are issued by air districts to govern the emissions from regulated stationary sources. Permitting practices vary considerably between districts. Depending on its size, a facility may have many permits, although some districts issue one permit for an entire facility.

Air quality permits are legally binding documents that include enforceable conditions with which the facility owner or operator must comply. Permit conditions include specific requirements for facilities to operate pollution control equipment, limit pollution emissions, and report violations. They specify what construction is allowed, what emission limits must be met, and often how the source can be operated. Permits may also contain conditions to make sure that the source is built to match parameters in the application that the permit agency relied on in their analysis. For example, the permit may specify stack heights that the permit agency used in their analysis of the source. To assure that sources follow the permit requirements, permits also contain monitoring, recordkeeping, and reporting requirements.

There are two types of permits: construction permits (or authority to construct permits) and operating permits. Construction permits are required for all new stationary sources and all existing stationary sources that are adding new emissions units or modifying existing emissions units. Operating permits are required for all major stationary sources and some minor sources of air pollution. Local agencies also require operating permits for minor sources. One type of operating permit is a Title V permit, which is a single federal operating permit for each large source that lists all federal permit conditions. A Title V permit also requires that the source report its compliance status with respect to permit conditions to the agency that issued the permit and to U.S. EPA.

Permits specify the maximum potential to emit air pollutants for each permitted unit at a facility. This level of emissions is based on the maximum expected throughput or use of a piece of equipment or process. Ideally, actual emissions are lower than permitted levels. The difference in emissions between permitted levels and actual levels is termed *headroom*. Facilities need some headroom in their permits to account for the cyclical and seasonal nature of business operations. Emissions from peaker power plants, for instance, may vary considerably from one year to the next, so the maximum permitted levels for these facilities may significantly exceed actually emitted levels in a given year. These facilities typically run during periods of high electrical demand, such as in the summer months. Need for electricity from peaker plants is affected by temperatures, as well as the amount of rainfall and snowfall received earlier that year.

The amount of headroom at facilities can indicate the extent to which a facility could increase emissions without triggering requirements of NSR. However, at many air districts such a comparison of permitted and actual emissions is only meaningful at the equipment level and not at the facility level. At these districts, each unit of permitted equipment has a maximum permitted emission limit and its unique headroom. If the facility owner modifies that equipment or its operation such that actual emissions would exceed permitted levels, NSR would apply. In other words, for a large facility such as a refinery, which could have hundreds of permits, NSR provisions could kick in well before, and probably many times before, total facility emissions exceeded the sum of emissions allowed from all permits.

For example, a facility that wanted to increase its production significantly could choose to install new equipment, increase throughput in existing equipment, or do both. Even if some permit conditions at the facility allowed for large increases in production, other more restrictive conditions on individual pieces of equipment would likely prove more constraining. A choice by the facility’s owner to add new equipment would trigger the requirements of NSR. Further increasing the use of existing equipment could soon bump up against permitted levels for that equipment, also triggering NSR.

The amount of time it takes to get a permit varies according to many factors, including what type of permit it is, its complexity, who the permitting authority is, how controversial the project is, and whether the permit is appealed after issuance. The time frame for NSR permits issued by State and local air pollution control agencies varies, and is often specified in local regulations. In California, State law requires agencies to issue NSR permits within 180 days.

All Title V permits, and district rules addressing permitting of large sources, require a public comment period during which anyone can submit written comments on the proposed permits. Permit applications and permits are available to the public. In many cases, any member of the public may request a public hearing to discuss issuance of a particular permit. In addition, the public may petition U.S. EPA to object to the issuance of a Title V permit.

A source that violates one or more enforceable permit condition(s) is subject to an enforcement action including, but not limited to, penalties and corrective action. Enforcement actions can be initiated by the local permitting authority, U.S. EPA, or in many cases as a result of public complaints.

B. Air Toxics Programs

California's air toxics program began in 1983 with the adoption of the Toxic Air Contaminant Identification and Control Act. The air toxics program has indentified almost 200 substances which are hazardous to the people of California, and the list continues to grow. Among those listed are asbestos, perchloroethylene, and diesel particulate matter (diesel PM). Of these, about nine air pollutants emitted in California pose the greatest regional cancer risk.

The highest risk comes from particulate matter from diesel-fueled engines (diesel PM). In addition to diesel PM, benzene and 1,3-butadiene are also significant contributors to overall ambient public health risk in California. The other six toxic air contaminants posing the greatest ambient risk are acetaldehyde, hexavalent chromium, *para*-dichlorobenzene, formaldehyde, methylene chloride, and perchloroethylene.

ARB has a comprehensive process to prioritize the development of control measures for toxic air contaminants posing the greatest risk. This ongoing review ensures that ARB's resources are focused on control activities that most benefit public health. Statewide, diesel PM contributes approximately 80 percent of the known risk from air toxics today and is the most common airborne toxic that Californians breathe. Because of this significant risk, ARB has adopted a diesel risk reduction plan and multiple regulations to implement the plan.

For the remaining high priority air toxics, ARB has adopted 17 airborne toxic control measures that reduce the health impacts from both mobile and stationary sources. These measures include reducing chromium emissions from decorative chrome plating facilities, reducing benzene from retail gasoline service stations, prohibiting the sale and use of automotive coatings containing hexavalent chromium or cadmium, and prohibiting the use of asbestos-containing rock on unpaved roads. These air toxic control measures require stringent controls and in some cases, complete elimination of the use of the toxic air pollutants. For air toxic control measures that apply to stationary sources, the districts typically adopt the State control measure into their own rules.

Control measures that reduce toxic air contaminants adopted by ARB have resulted in significant reductions of toxic emissions. Since the early 1990s, the estimated cancer risk from toxic air pollutants, measured statewide, has been reduced by 60 percent ,even though California has had significant growth.

1. Hot Spots Act

In addition to these statewide airborne toxic control measures, there are also reporting and risk reduction requirements that apply to existing facilities under the Air Toxics “Hot Spots” Information and Assessment Act (AB 2588, Connelly, Chapter 1252, Statutes of 1987, also known as the Hot Spots Act). The goal of the Hot Spots Act is to collect emissions data, identify facilities having localized impacts, ascertain health risks, and develop plans to reduce risk. High-priority facilities must develop a Health Risk Assessment (HRA). Thresholds for priority facilities are determined by air districts, and consider the potency, toxicity, quantity, and volume of hazardous materials released, as well as proximity of facilities to potential sensitive receptors. Criteria for these thresholds were developed by the California Air Pollution Control Officers Association in consultation with the Office of Environmental Health and Hazard Assessment. The HRA provides an evaluation of the potential for adverse health effects that can result from public exposure to toxic emissions emitted by the facility. An HRA addresses three categories of health impacts: acute health effects from inhalation only, chronic non-cancer health effects, and cancer risks from multiple means of exposure. Facilities that are determined to present a significant risk must develop a plan to implement measures to reduce that risk.

2. Local Air District Regulations

Local air districts have primary jurisdiction over stationary sources and are responsible for permitting equipment and sources at facilities that generate air toxics. Districts also review and approve permits for new or expanding facilities that emit air toxics. This review includes an estimate of the impacts likely to occur from changes in operations at the facility. Districts can work with facilities during permitting so that the facility uses less toxic materials and less toxic processes in order to reduce emissions of air toxics. These actions taken by existing and new facilities help reduce the levels of air toxics emitted from facilities in order to protect public health.

Districts also conduct frequent inspections of facilities where air toxics are known to be released. These inspections help to ensure that facilities are meeting their district permitting requirements, and that their emissions control devices are being maintained and operated properly. Inspections are an important part of district activities to reduce health impacts from air toxics.

C. Clean Vehicle and Diesel Risk Reduction Programs

1. Criteria Emissions Control Program

California has dramatically tightened emission standards for on-road and off-road mobile sources and the fuels that power them. California’s emission control program for on-road motor vehicles is the strongest in the world. New cars are now 99 percent cleaner than their uncontrolled counterparts. Trucks are now 90 percent cleaner, and will be 98 percent cleaner by 2010.

ARB rules adopted as part of the Diesel Emission Reduction Program and Goods Movement Program are primarily toxics control measures, but also achieve significant criteria emissions reductions. Therefore, those programs are treated as criteria emission control programs in this chapter.

Working in concert with the U.S. EPA, standards for goods movement sources have also been tightened dramatically. By requiring low-sulfur fuel, SOx emissions from ship auxiliary engines will be cut 96 percent by 2010. New locomotive engines are now 50–60 percent cleaner. Harbor craft emission standards were cut roughly in half. New cargo handling equipment will be 95 percent cleaner by 2011.

California has also drastically lowered emission standards for off-road sources, from lawn and garden equipment, to recreational vehicles and boats, to construction equipment and other large off-road sources. From 2010 through 2014 these new off-road sources will be manufactured with 80–98 percent fewer emissions than their uncontrolled counterparts.

ARB has worked closely with U.S. EPA to regulate large diesel, gasoline, and liquid petroleum gas equipment—where authority is split between California and the federal government—and by 2014, new large off-road equipment will be 98 percent cleaner. ARB has also made great strides in reducing emissions from the smaller engines under State control, like those used in lawn mowers, jet skis, recreational vehicles, and boats. From 2010 to 2015, these new off-road sources will be manufactured with 82–90 percent fewer emissions than their uncontrolled counterparts.

Adopted regulations have made significant strides in reducing emissions from those mobile sources already in use—the legacy fleet—by keeping existing vehicles cleaner longer, getting cleaner technology on older vehicles and equipment, and replacing older, dirtier vehicles and equipment with cleaner ones. Whereas new engine emissions have been regulated for a long time, most of the in-use control programs have just begun to evolve and have an impact.

Many programs and rules are currently in place to reduce emissions from the mobile source legacy fleets. The Smog Check Program ensures that passenger vehicles stay clean as they age, and on-board diagnostic systems identify smog control problems. Heavy-duty truck inspection programs help control smoke emissions and detect emission control mal-maintenance and tampering.

ARB has adopted well over 20 in-use regulations in the last eight years. ARB's landmark in-use regulations adopted in 2007 and 2008 will accelerate replacement of higher-emitting heavy-duty trucks, buses, and construction equipment. In-use regulations have required use of cleaner fuels, greatly reducing emissions from ships and harbor craft. ARB has adopted public and private fleet rules that require local governments and private companies to incorporate the cleanest vehicles and equipment into their fleets. In-use testing procedures and verification requirements for in-use emission control technology have been strengthened. In addition, other operational and emission control technology requirements that help reduce emissions from existing vehicle and equipment have been put into place.

Incentive programs have worked hand-in-hand with in-use regulations, providing added emissions benefits. California is currently investing up to $140 million per year to clean up older, higher-emitting sources through the Carl Moyer Program. The Smog Check Breathe Easier Campaign pays motorists $1,000 to permanently retire their high-polluting vehicles. And local governments use special vehicle registration fees to fund projects that further reduce emissions from motor vehicles.

In 2007 the Board adopted a new statewide strategy for reducing emissions that contribute to high ozone and $PM_{2.5}$ levels. The 2007 State Strategy, together with local control strategies, is designed to allow California to meet the U.S. EPA's national ambient air quality standards for ozone and $PM_{2.5}$. As of April, 2010, ARB had adopted twelve regulations to reduce criteria pollutant emissions and fulfill commitments made in the 2007 State Strategy. The adopted rules are shown in Table II-1.

The SIP and Statewide Strategy are focused on areas with pollution levels that exceed national air quality standards for ozone and $PM_{2.5}$. However, most of the control measures adopted pursuant to the Statewide Strategy will reduce emissions and improve air quality throughout the State. These controls also fulfill commitments made in ARB's Diesel Risk Reduction Plan (September 2000) and Goods Movement Emission Reduction Plan (April 2006) and help all areas make progress toward attaining California's more protective ambient air quality standards.

Table II-1: Rules Adopted Pursuant to the 2007 State Strategy

ARB Rules	Adoption Date
Enhanced Vapor Recovery for Above Ground Storage Tanks	June 2007
Modifications to Reformulated Gasoline Program – Phase 3	June 2007
Cleaner In-use Off-Road Equipment	July 2007
Light-Duty Vehicle Catalyst Replacement	October 2007
Clean Up Existing Harbor Craft	November 2007
Port Truck Modernization	December 2007/ December 2008
Ship Auxiliary Engines (Cold Ironing)	December 2007
Consumer Products	June 2008/ November 2008
Clean Fuel Requirements for Ship Main Engines	July 2008
Portable Outdoor Marine Tanks Evaporative Emission Standards (partial)	September 2008
Large Spark-Ignited Engines, Rule Amendment	November 2008
Cleaner In-Use Heavy-Duty Trucks	December 2008

2. Diesel Risk Reduction Plan

In September 2000, ARB adopted an aggressive plan to require cleaner diesel fuel and cleaner diesel engines and vehicles. The Diesel Risk Reduction Plan targets reductions of diesel emissions from year-2000 levels by 75 percent by 2010 and 85 percent by 2020. Since the adoption of the Diesel Risk Reduction Plan, some of the strategies in place today that are reducing diesel PM include:

- **Cleaner diesel fuel.** The sulfur level in California diesel fuel was lowered to less than 15 parts per million in July 2006. ARB's fuel regulation applies to on-road, off-road, and stationary engines, while the federal low sulfur diesel rule applies only to on-road vehicles.

- **Cleaner new diesel engines.** In 2001, ARB adopted new PM and NOx emission standards to clean up new on-road diesel engines that power big-rig trucks, trash trucks, delivery vans, and other large vehicles. The new PM standard is a 90 percent reduction from the existing PM standard. U.S. EPA has also set new standards that would reduce the emissions from off-road engines to levels similar to the on-road engines by the middle of the next decade.

- **Cleaner in-use diesel engines.** ARB has adopted regulations aimed at reducing PM and other pollutants from in-use diesel engines through engine replacement; retrofit with a verified diesel emission control system to the existing engine; vehicle replacement with an alternative-fueled vehicle or a vehicle with a new, cleaner diesel engine; and operational modifications, including reduced operating time or reduced idling.

3. Goods Movement Program

Air pollution from international trade and all goods movement in California is a major public health concern at both regional and community levels. Goods movement is now the dominant contributor to transportation emissions in the State. In April 2006, ARB approved the *Emission Reduction Plan for Ports and Goods Movement* in California to reduce the emissions and health risk in communities near ports, rail yards, and high-traffic corridors. The plan will reduce emissions of diesel PM, the NOx and SOx that contribute to fine particles, and, to a lesser extent, the ROG that mixes with NOx in the atmosphere to form regional ozone. The plan envisions emissions reductions at each step in the goods movement path—from ship to shore, to truck or locomotive, to the final destination. Plan goals for each of the following emission source types are described in Table II-2.

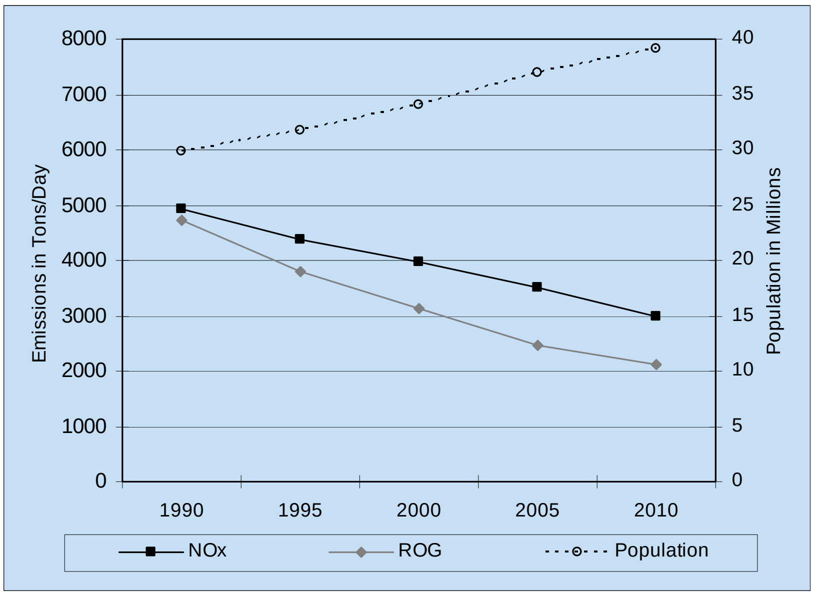
Table II-2: Goods Movement Program Control Targets for 2020

Source	Control Target (Percent Reduction)
Ships	▪ Diesel PM – 50% ▪ SOx – 80%
Trucks	▪ Diesel PM – 67% ▪ NOx – 67%
Locomotives	▪ Diesel PM – 80% ▪ NOx – 80%
Harbor Craft	▪ Diesel PM – 70% ▪ NOx – 70%
Cargo Handling Equipment	▪ Diesel PM – 95% ▪ NOx – 80%

D. Emissions

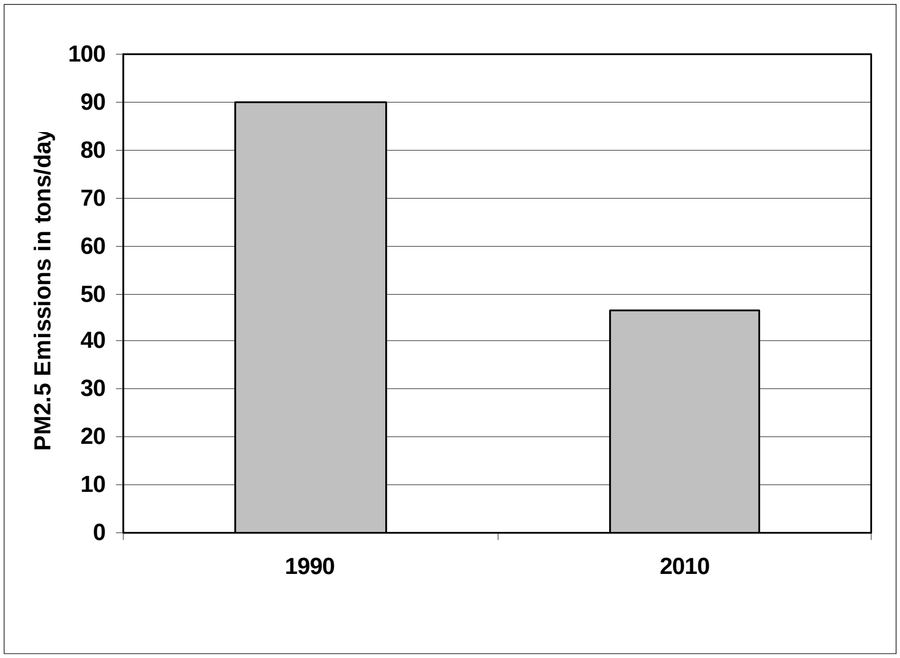
Due to the combined efforts of State and local control programs, emissions have declined dramatically since 1990 despite substantial growth in the State's population. As shown in Figure II-1, NOx and ROG emissions, which are precursors to ozone, have dropped 40 and 55 percent, respectively, statewide. Control programs aimed at mobile sources have played a significant role in these trends.

Figure II-1: Statewide Ozone Precursor Emission Trends



$PM_{2.5}$ emissions from mobile sources have also decreased significantly since 1990. Figure II-2 highlights the statewide reductions in $PM_{2.5}$ emissions from on-road mobile sources. Emissions have decreased by approximately 50 percent. Much of the emphasis on reducing emissions of fine particulates came as a result of ARB's identification of diesel particulate matter as a toxic air contaminant in 1998.

Figure II-2: Statewide On-Road Mobile Source $PM_{2.5}$ Emission Trends



Similarly, air toxic emissions are also being reduced over time, including an approximately 60 percent drop in emissions of perchloroethylene, benzene, and hexavalent chromium, and an approximately 25 percent drop in emissions of 1,3-butadiene and methylene chloride during the past decade. These downward trends in emissions of air toxics are expected to continue.

E. Air Quality

As a result of the emissions reductions described above, California has made significant progress in reducing public exposure to unhealthy levels of air pollution, and concentrations are now significantly lower than they were 20 years ago. However, at the same time, the targets for defining clean air have become more stringent. As a result, despite continuing improvements in air quality, more areas violate the new standards. Changes to the national ozone standards provide an illustration of this situation.

To keep pace with the current science, U.S. EPA periodically reviews the National Ambient Air Quality Standards and revises them as needed to reflect the most recent health information. U.S. EPA initially established the federal ozone standard as a 1-hour standard to protect against short-term exposure impacts. In the late 1990s, the 1-hour standard was replaced with an 8-hour standard, to protect against long-term exposure impacts. More recent health studies show the need for an even more health-protective standard, and U.S. EPA is currently considering an even lower level for the 8-hour standard.

Table II-3 shows how various areas of California compare under the original 1-hour and current 8-hour national ozone standards in 1990 and 2009. In 1990, only one major urban area met the national one-hour ozone standard (Monterey). By 2009, five additional areas came into compliance, including the San Francisco Bay Area, San Diego, and Ventura. However, several of these areas, including San Diego and Ventura, do not meet the more stringent 8-hour ozone standard. Despite the changes in the standard, today more than two-thirds of the State's population live in areas where ozone air quality meets the 8-hour standard. This percentage has increased steadily over the years; in 1990 less than a third of the State's population lived in areas that met the standard. These clean areas include the coastal portion of the South Coast and the northern portion of the San Joaquin Valley.

Table II-3: Compliance with Federal Ozone Air Quality Standards in California's Major Urban Areas

AREA	***1-Hour Ozone Standard (0.12 ppm)***		***8-Hour Ozone Standard (0.08 ppm)***	
	Area Met Standard in 1990	***Area Met Standard in 2009***	***Area Met Standard in 1990***	***Area Met Standard in 2009***
Monterey Bay Area	✓	✓	✓	✓
Sacramento Metro Area				
San Diego		✓		
San Francisco Bay Area		✓		✓
San Joaquin Valley				
San Luis Obispo County*		✓		✓
Santa Barbara County		✓		✓
South Coast				
Ventura County		✓		

PPM = parts per million

* *Available data show no violation of standard at San Luis Obispo sites, but the current high concentration site was not yet operating. Therefore, is very likely the area violated both standards in 1990.*

Figures II-3 and II-4 below provide another perspective on regional differences in air quality in California. The maps rank ozone and $PM_{2.5}$ concentrations across the State by census tract. Census tracts with the highest 10 percent of concentrations on a statewide basis are shown in black. The $PM_{2.5}$ map depicts the annual average concentrations between 2004 and 2006. The ozone map reflects the sum of incremental ozone concentrations above the State 8-hour standard of 0.070 parts per million (ppm) over the same period. As such, it is an indicator of both the severity and frequency of elevated ozone levels. Although further work is under way to improve these maps with the most recent data, they provide a general representation of relative air quality patterns.

As seen in the maps, the highest levels for both pollutants occur in portions of the South Coast and the San Joaquin Valley. High ozone is also found in downwind areas affected by transport such as the Mojave Desert. In contrast, coastal regions and upper areas of Northern California generally fall in the cleanest 50 percent.

Figure II-3: Comparison of Regional Ozone Concentrations 2004–2006

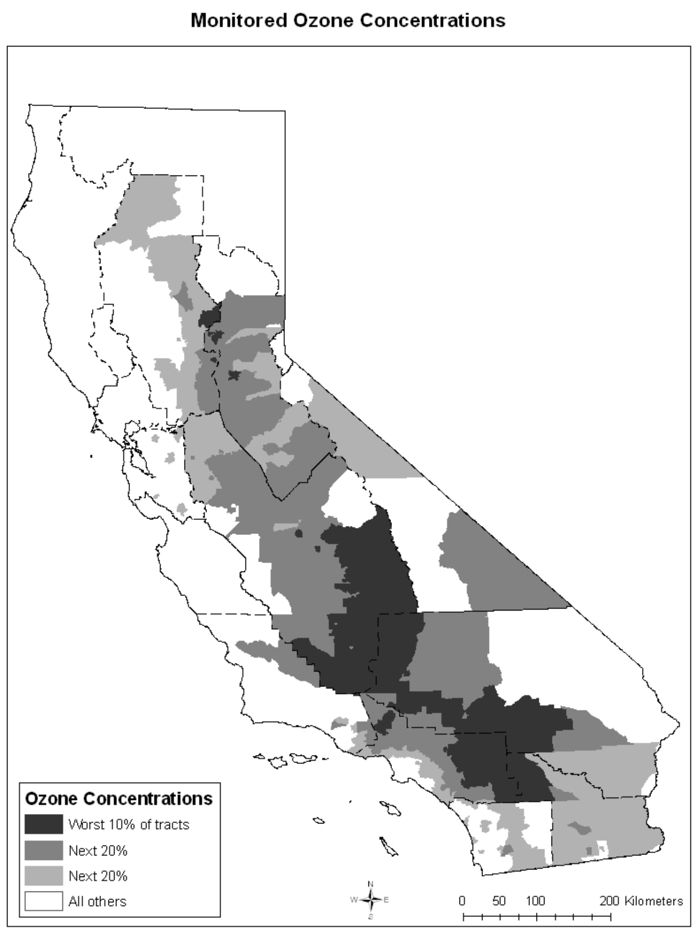
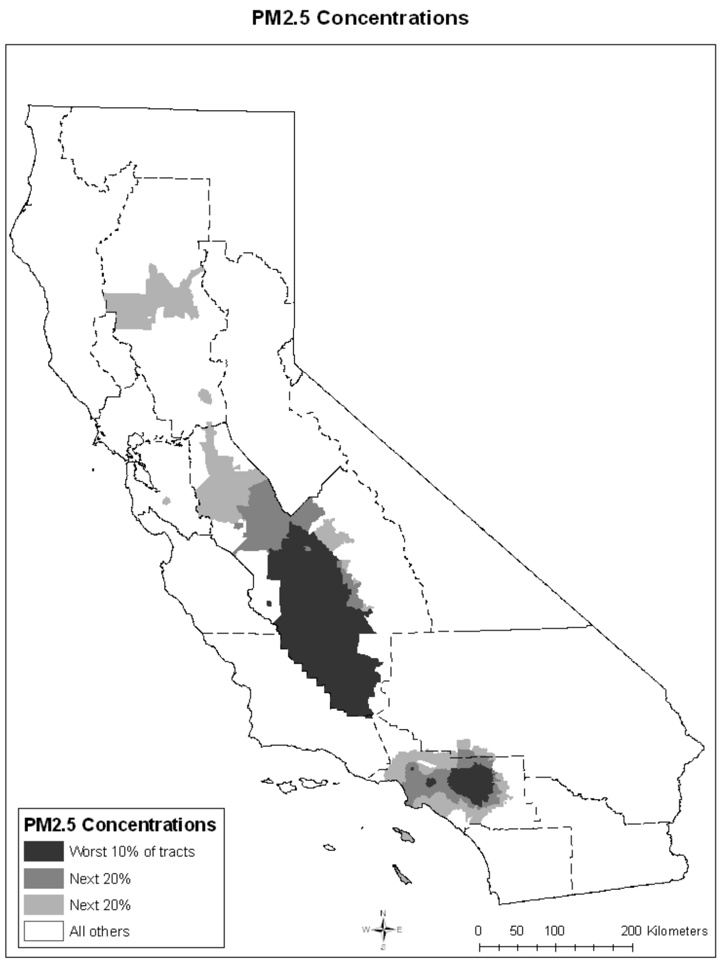


Figure II-4: Comparison of Regional $PM_{2.5}$ Concentrations 2004–2006



1. Ozone Trends

California's highest ozone concentrations are now close to half of what they were in 1990. In the South Coast, concentrations have decreased approximately 35 percent since 1990, and today nearly half (45 percent) the population (more than 6 million people) live in areas where ozone air quality meets the federal standard. Other portions of the South Coast also show substantial improvement. The areas—and population—experiencing the highest ozone levels have decreased in size dramatically, and South Coast residents experience those elevated levels on fewer days. Since 1990, the annual number of days that exceed the federal ozone standard have been cut nearly in half. Generally, the greatest improvements have occurred in areas that had the largest number of unhealthy days in 1990.

Air quality in California's inland areas continues to remain a significant challenge, and progress in the San Joaquin Valley has been slower than in other parts of California. However, although concentrations in the San Joaquin Valley have seen only a modest decrease, the frequency of exposure to unhealthy air has decreased significantly since 1990, with the average number of days exceeding the federal 8-hour ozone standard declining by 22 percent. And, although the 8-hour design value has come down slowly, the areas—and population—experiencing the highest ozone levels have decreased in size dramatically and Valley residents experience those elevated levels on fewer days.

In the San Francisco Bay Area ozone concentrations were only slightly higher than the federal standard in 1990 and have decreased approximately 11 percent since then. Ozone concentrations in the Bay Area are now below the federal standard.

2. $PM_{2.5}$ Trends

While $PM_{2.5}$ concentrations have only been measured for approximately ten years, significant progress has already occurred in this short time period. Annual average $PM_{2.5}$ concentrations have declined by at least 20 percent since 2002 throughout much of California. Similar progress has been seen in reducing daily (24-hour) concentrations. As with ozone, some of the most significant progress has occurred in the coastal areas.

In the South Coast, both annual average and daily $PM_{2.5}$ concentrations have decreased by 30 to 50 percent since 2001. In addition, the number of days above the federal 24-hour $PM_{2.5}$ standard has decreased over 80 percent, dropping from 120 days in 2001 to less than 20 days today.

The Bay Area met the federal annual average $PM_{2.5}$ standard in 2001, and $PM_{2.5}$ concentrations have decreased nearly 30 percent since then. Daily concentrations are only slightly above the federal standard and occur in only a small region in the East Bay.

We continue to face significant challenges to improving $PM_{2.5}$ levels in the San Joaquin Valley. Nevertheless, annual average concentrations have decreased approximately 10 percent since 2001, and the most recent year's data shows that values continue to decrease. While the Bakersfield region in the southern Valley experiences the highest levels of $PM_{2.5}$, other monitors throughout the San Joaquin Valley are reaching values at or near the federal standard.

3. Toxic Air Contaminant Trends

ARB maintains a statewide air quality monitoring network for toxic air contaminants that currently includes 17 monitoring stations measuring ambient concentrations of over 60 substances. Nine individual air toxics, including diesel PM, account for the majority of the potential health risk in California. Exposure to diesel PM is the largest health concern, accounting for approximately 80 percent of the statewide risk. Unlike other air toxics, there is currently no method for directly monitoring diesel PM concentrations in the ambient air. However, diesel PM concentrations can be estimated from levels of other co-pollutants such as NOx and elemental carbon. Over the last 20 years, concentrations of these indicators have decreased substantially.

As a result of controls on motor vehicles, fuels, stationary sources, and consumer products, the public's exposure to other air toxics has also decreased dramatically. Between the early 1990s and today, the decrease in statewide average health risk ranged from approximately 20 percent for formaldehyde to approximately 90 percent for perchloroethylene. Air toxics associated with motor vehicles and their fuels such as 1,3-butadiene and benzene have also seen significant decreases of 80 to 85 percent as a result of ARB's mobile source control program. In aggregate, the estimated cancer risk from air toxics has been reduced by approximately 60 percent since the early 1990s.

It is important to note, however, that the routine air toxics monitoring network is designed to reflect regional exposures. Although ongoing control programs have been effective in reducing regional levels, there may still be situations of localized toxics exposure due to proximity to individual facilities. Specialized monitoring studies are often needed to better characterize these localized impacts, which often have very steep gradients that drop off quickly farther from the source. Thus, conducting monitoring to capture these gradients is generally resource intensive.

An example of one such study is the ARB work conducted in Barrio Logan. Barrio Logan is a small community of approximately 5,000 people located in San Diego County. The community contains a mix of sources including chrome platers and autobody shops interspersed among homes. Initial monitoring detected hexavalent chromium concentrations approximately 175 times higher than the statewide average in the vicinity of two chrome plating facilities. In response, a short-term intensive monitoring study was conducted to better identify the source of these highly elevated levels. During the approximately six month study, over 600 samples were collected, more than is collected annually across the statewide network. The study was able to identify the specific facility and operations causing the high levels, but also found that impacts dropped off quickly with distance from the facility. As a result of the study, the facility was shut down and levels of hexavalent chromium declined significantly. This study illustrates the complexity of methods needed to assess how proximity to a source of air pollution emissions impacts public exposure and health.

III. CONTINUING CRITERIA AND TOXIC EMISSION TRENDS

This chapter looks at future emission trends as a result of existing regulatory programs apart from the cap-and-trade regulation in three air basins; South Coast, San Joaquin Valley, and San Francisco Bay Area. Next, the chapter focuses on the relative contribution of stationary source emissions and emissions from industrial and electricity generation facilities subject to cap-and-trade, which are a subset of stationary sources.

The emission estimates used here are based on recently updated inventories for key source categories, including heavy-duty trucks, off-road and construction equipment, and ships. The 2008 emission estimates for major categories also reflect the impacts of the recession. These estimates assume that by 2020, activity will have returned to pre-recession levels.

The Board will soon consider adjustments to the In-Use Off-Road Equipment and In-Use Heavy-Duty Truck rules designed to reduce the cost of compliance for these recession-affected industries. These adjustments are not reflected in Table III-1. The adjustments are important to give relief to the recession-affected industries; but are not expected to significantly change the overall downward arc of diesel PM emissions over time.

A. Anticipated Emission Trends

California's comprehensive air quality program has resulted in reduced emissions of air pollutants and, consequently, improved air quality. Chapter II presents air quality improvements in various regions of the State. This section highlights anticipated criteria emissions trends between 2008 and 2020 for three air pollutants or their precursors: NOx, $PM_{2.5}$, and ROG.

Tables III-1 through III-3 show trends in the three areas. As a result of their federal nonattainment status for ozone and $PM_{2.5}$, and to comply with the Clean Air Act, the South Coast and San Joaquin Valley have a greater need for emissions reductions than the Bay Area. While the State control program produces a similar level of reductions in all areas of the State, local control programs differ in stringency according to attainment requirements.

The tables show the criteria emissions for each area by source category. *Stationary* refers to large, non-mobile sources such as power plants, refineries, and manufacturing facilities. Emissions from stationary sources in this inventory are adjusted for future growth at the aggregated regional level using a number of indicators, including population and economic indices. The community level analysis in Chapter IV does not include this regional emissions growth because it is not possible to specifically identify where new facilities would be located, or the extent to which specific facilities could vary operations based on the regional level data.

Area sources are those non-mobile sources of pollution that are not large enough to be tracked individually, but when added together over a larger area can represent a large quantity of pollution. Examples of area sources are: fireplaces, consumer goods, paving and roofing materials, pesticides, road dust, and fertilizers.

Mobile sources of criteria pollutants are divided into four categories. *Passenger vehicles* include cars, minivans, and light-duty trucks. *Heavy-duty vehicles* are all other vehicles, such as large trucks and buses. Many, but not all, heavy-duty vehicles use diesel fuel. *Off-road* refers to most other mobile sources, such as agricultural and construction equipment, forklifts, and recreational boats, and vehicles. The *marine* category includes ships and port-related harbor craft, such as tug boats.

Table III-1: NOx Emissions by Air Basin (tons per day)
Annual Average

Source Category	South Coast		SJV		Bay Area	
	2008	**2020**	**2008**	**2020**	**2008**	**2020**
Stationary	61	51	63	57	54	60
Area	24	21	11	11	20	21
Passenger Vehicles	147	62	44	19	80	31
Heavy-Duty Vehicles	264	116	199	69	121	52
Off-Road	162	117	92	52	94	75
Marine	64	76	1	1	71	78
Total	723	444	409	209	440	318
Percent Reduction 2008–2020	**–**	**39%**	**–**	**49%**	**–**	**28%**

SJV = San Joaquin Valley

As mentioned previously, NOx is a precursor to both ozone and $PM_{2.5}$ formation. Because of its contribution to both pollutants, the reduction of NOx emissions has been a focus of our criteria pollutant strategy. The table above (Table III-1) shows that California's efforts to reduce NOx emissions through stationary and mobile source rules will result in reductions in NOx of 28 percent to nearly 50 percent in the three air basins between 2008 and 2020.

The table also shows that mobile source emissions are the primary contributors to NOx emissions in each of the three areas. Of the mobile sources, heavy-duty vehicles are currently the largest contributor in all three air basins. In the Bay Area, off-road engines are the largest single contributor in 2020.

Table III -2: $PM_{2.5}$ Emissions by Air Basin (tons per day)
Annual Average

Source Category	**South Coast**		**SJV**		**Bay Area**	
	2008	**2020**	**2008**	**2020**	**2008**	**2020**
Stationary	13	14	14	15	12	13
Area	48	47	47	45	62	64
Passenger Vehicles	8	11	2	3	4	4
Heavy-Duty Vehicles	8	2	7	2	4	1
Off-Road	9	8	6	5	5	4
Marine	4	2	0	0	2	1
Total	91	84	75	70	89	88
Percent Reduction 2008–2020	**–**	**9%**	**–**	**7%**	**–**	**1%**

SJV = San Joaquin Valley

Fine particulate pollution results from emissions of directly emitted $PM_{2.5}$ as well as reactions of NOx and SOx in the atmosphere. Diesel particulate matter is a portion of directly emitted $PM_{2.5}$ and is also a toxic air pollutant. Diesel particulate emissions reductions translate to reduced toxic air pollutant exposures and reduced cancer risk, and have been a focus of emissions-reduction efforts. Table III-2 above shows that California's efforts to reduce directly emitted $PM_{2.5}$ emissions will result in reductions in $PM_{2.5}$ emissions of 7 to 9 percent in the South Coast and San Joaquin Valley and 1 percent in the Bay Area. In all three air basins area sources such as open burning, cooking, and dust from unpaved roads and open areas are the largest contributors. In 2008, directly emitted $PM_{2.5}$ emissions from stationary sources are 14 percent of the South Coast $PM_{2.5}$ inventory. In the San Joaquin Valley and the Bay Area, stationary sources are 19 percent and 13 percent of the inventory, respectively.

Table III -3: ROG Emissions by Air Basin (tons per day)
Annual Average

Source Category	**South Coast**		**SJV**		**Bay Area**	
	2008	**2020**	**2008**	**2020**	**2008**	**2020**
Stationary	104	117	122	138	79	87
Area	135	147	131	138	87	94
Passenger Vehicles	161	89	53	30	88	43
Heavy-Duty Vehicles	36	19	22	10	15	7
Off-Road	138	108	47	44	63	48
Marine	3	4	0	0	3	4
Total	577	484	375	359	335	283
Percent Reduction 2008–2020	**–**	**16%**	**–**	**4%**	**–**	**15%**

ROG is also a precursor to ozone formation. Table III-3 above shows that California's efforts to reduce ROG emissions through mobile source rules will result in reductions in ROG of 4 to 16 percent in the three air basins between 2008 and 2020.

Table III-3 also shows that mobile source emissions are the primary contributors to ROG emissions in the South Coast and Bay Area. Whereas heavy-duty vehicles are a large contributor to NOx emissions from mobile sources, their role in contributing to ROG emissions is much smaller compared to that of passenger vehicles and off-road engines. Also, unlike NOx emissions, the ROG emissions from off-road engines have a large contribution from recreational boat evaporative and exhaust emissions.

Emissions of ROG from area sources are mainly consumer products emissions, a source category that will not be affected by the cap-and-trade regulation. Although regulated, consumer product use increases with population growth, resulting in higher emission totals for the category in 2020.

1. Oxides of Sulfur

Although California has met ambient air quality standards for sulfur dioxide for decades, efforts to control emissions of this pollutant are ongoing and retain their importance. Like oxides of nitrogen, SOx emissions contribute to formation of $PM_{2.5}$ in the atmosphere, although to a lesser degree. Monitoring sites in the South Coast and San Joaquin Valley that register the highest levels of $PM_{2.5}$ record about three times the amount of ammonium nitrate (formed from NOx) as they do ammonium sulfate (formed from SOx). Unlike NOx, SOx emissions do not contribute to formation of ozone. For these reasons, control programs designed to reduce ozone and $PM_{2.5}$ levels to attainment levels rely to a much greater extent on NOx reductions than on SOx.

Nevertheless, a number of control programs have addressed SOx. As SOx is emitted primarily from combustion of fuels, emission control efforts have focused largely on reducing the content of sulfur in fuels. Over the years, ARB has adopted a number of cutting-edge regulations setting sulfur content specifications for fuels used in a variety of equipment, including commercial trucks, construction equipment, farm tractors, locomotives, and marine vessels. As a result, SOx emissions have dropped statewide by 45 percent since 1990. In 2008, the largest sources of sulfur dioxide are marine vessels and petroleum refineries.

B. Emissions Profiles for Facilities Subject to Cap-and-Trade

There are approximately 300 facilities that are expected to be subject to cap-and-trade. These include electric generating facilities and cogeneration facilities, petroleum refineries, cement plants, hydrogen plants, and general stationary combustion (large energy-intensive industrial facilities such as manufacturing and food processing). These are the categories that are used for the mandatory reporting requirement adopted in December 2007.

While cap-and-trade industrial and electricity generation facilities are an important part of the State's greenhouse gas emissions, Table III-4 below shows that these facilities represent a very small percentage of the State's criteria pollutant emissions. Although cap-and-trade facilities emit approximately one-third of the NOx emissions from stationary sources in the three air basins, stationary sources represent a relatively small fraction of the overall inventories for the regions.

Table III -4: Capped Facilities' Criteria Pollutant Emissions by Facility Sector Statewide 2008 Emissions – Annual Average (tons/day)

Sector	NOx	ROG	$PM_{2.5}$
Petroleum Refinery	29.2	18.8	6.1
Hydrogen Plant	2.5	1.7	0.6
Cogeneration Facility	5.6	0.4	2.3
Cement Manufacturing Facilities	48.1	0.6	7.8
Electricity Generation	17.6	2.1	4.4
General Stationary Combustion	44.7	10.2	6.8
Other	0.4	0.2	0.0
Total emissions from capped facilities	148.1	34.0	28.0
Total emissions from all sources	3219.7	2214.5	677.5
Capped facilities' contribution to total statewide emissions	**5%**	**2%**	**4%**

The following sections provide an overview of the nature of each cap-and-trade industrial sector.

1. Petroleum Refineries

California petroleum refineries process crude oil into transportation fuels, lubricants, asphalt, petroleum feedstocks, and other products through a series of energy-intensive distillation, cracking, and reforming processes. The 20 refineries in California subject to cap-and-trade reported emissions of 35 million metric tons of $MMTCO_2e$ in 2008. The vast majority of the GHG emissions resulting from petroleum refining are in the form of carbon dioxide. Much of the fuel consumed in a petroleum refinery is derived from the crude oil itself. Refinery fuel gas is generated during the refining process and subsequently recovered and used as a fuel. Because petroleum refining requires large inputs of thermal energy, heat recovery and cogeneration of electricity can significantly improve refinery energy efficiency and reduce GHG emissions. Thus it is not surprising that 12 California petroleum refineries have installed cogeneration facilities that transform thermal energy into electricity to power processes at the refinery and, in some cases, supply their excess power to the grid.

2. Hydrogen Plants

Nearly all of the hydrogen consumed in the United States is used for petroleum and chemical refining, as a reducing agent for metal ores, or for processing foods. There are six merchant (stand-alone) hydrogen plants in California. In 2008 these facilities reported annual emissions of 2.22 million metric tons of greenhouse gases. All six of these plants will be subject to cap-and-trade.

3. Cogeneration

Cogeneration, commonly referred to as *combined heat and power (CHP),* is the practice of operating a boiler to produce steam both to generate electricity and to warm buildings or provide heat for industrial processes. Utilizing heat and power from the same steam is an energy-efficient design that can be cost-effective in many situations. Combined heat and power produces electricity and heat with up to 40 percent less fuel required to produce the electricity and heat separately.

CHP facilities exist in varying sizes and configurations. There are several large stand-alone CHP facilities that sell steam to neighboring businesses. These facilities may generate electricity for local use during non-peak electricity demand periods. When electricity demand is high, electricity production is increased to meet peak demands, and these CHP facilities operate as peaker power plants that deliver electricity to the grid. Large cogeneration accounted for about 15 percent of peak electricity demand in California in 2007. Combined heat and power systems generally exist at or adjacent to petroleum refineries, where they provide electricity, heat, and steam.

There are more than 900 CHP plants in California. Most CHP plants are too small to be subject to the cap-and trade regulation. There are 58 stand-alone CHP plants with capacity greater than 1 megawatt that reported emissions under the Mandatory Greenhouse Gas Emissions Reporting Rule in 2006. Those plants emitted an estimated 12 million metric tons of greenhouse gases. The key source of GHG emissions in cogeneration is combustion of fossil fuels and, to a much lesser extent, biomass fuels to generate thermal energy and electric power. Forty-four of these facilities will be subject to cap-and-trade.

4. Cement Manufacturing Facilities

Cement manufacturing facilities prepare, combine, and process ingredient materials to produce cement. Currently, there are 11 cement manufacturing facilities in California. The slowed economy has substantially lowered demand and production in recent years. Of the 11 manufacturing facilities in the State, three are operating at severely reduced levels of production. Ten of these facilities will be subject to cap-and-trade. The key sources of GHG emissions in the manufacturing of cement are process emissions from the kiln and emissions from the combustion of coal and other fossil fuels used to heat the kiln. For every ton of cement manufactured, approximately one ton of GHGs are produced.

In 2006, cement manufacturing facilities in California emitted approximately 11 million metric tons of greenhouse gases. In 2008, cement emissions decreased to an estimated 8.7 million metric tons of GHGs, presumably a reflection of decreased demand and production resulting from the slowed economy.

5. Electricity Generation

The bulk of electricity generated in California originates from three primary sources: gas-fueled power plants, nuclear power plants, and hydroelectric power plants. Electricity from renewable sources including solar, wind, and geothermal sources provide increasing contributions to the electricity supply but still represent a small portion of the total electrical generation. The electricity sector in California is subject to numerous energy-efficiency and conservation regulations, notably California Public Utilities Commission and U.S. Public Utilities Commission tariffs; SB 1368, signed in 2006, which establishes emission performance standards; the Renewable Portfolio Standard (an AB 32 complementary policy); and the Renewable Electricity Standard. The Renewable Electricity Standard, approved by ARB at its hearing in September 2010, requires that 33 percent of California-generated electricity originate from renewable sources by 2020.

Currently in California, there are 195 facilities that report GHG emissions under the electricity generation source category, 17 of which also report cogeneration as a secondary sector. In 2006, the 195 electricity generating facilities emitted approximately 51 million metric tons of greenhouse gases, 86 percent of which are attributed to electricity generating facilities, 13 percent of which are biomass-related, and 2 percent of which came from geothermal processes. Ninety-three of these facilities will be subject to cap-and-trade.

The key source of GHG emissions in electricity generation is combustion of fossil fuels or, to a lesser extent, biomass fuels to power electricity generating equipment. Some geothermal power plants also emit process GHG from the release of naturally occurring GHG dissolved in the geothermal steam. Geothermal facilities account for approximately 970,000 metric tons of GHGs emitted in California. Biomass emissions are not subject to the proposed cap-and-trade regulation.

6. General Stationary Combustion

This category includes diverse manufacturing and process facilities such as food processing, glass container manufacture, oil and gas production, and minerals processing. There are 138 of these facilities in California that are subject to cap-and-trade. In 2008, these facilities reported annual emissions of 18.8 million metric tons of greenhouse gases.

C. Contribution of Capped Facilities to Nonattainment in Key Areas

Figure III-1 shows the locations of the various types of capped facilities in California. The colored areas represent the 15 air basins in California. The highest percent (31 percent) of the approximately 300 facilities subject to cap-and-trade are in the San Joaquin Valley (98 facilities). Seventy-one cap-and-trade facilities are in the South Coast, 45 are in the Bay Area, and the rest are scattered throughout the State. Refineries are concentrated in the South Coast and Bay Area. Six of the 10 cement plants are in the Mojave Desert area.

Figure III-1

Facilities Subject to Cap-and-Trade by Air Basin

Source: ARB's Mandatory Greenhouse Gas Reporting - 2008 Facility Reporting. CARB 8/5/2010

Tables III-5 through III-7 show the percent contribution of cap-and-trade facilities to the emissions in three air basins: the South Coast, the San Joaquin Valley, and the Bay Area. The cap-and-trade facilities represent less than 10 percent of the criteria air pollutant emissions in each air basin.

Today, mobile sources make up about 85 percent of the total statewide NOx emissions. Stationary sources account for only 8 to 16 percent of the NOx emissions in the South Coast, San Joaquin Valley, and Bay Area. Facilities subject to cap-and-trade are only a portion of those stationary sources.

In both the South Coast and the Bay Area, the petroleum refinery sector accounts for over half of the emissions from cap-and-trade facilities. In contrast, the San Joaquin Valley is home to a large number of food processing facilities, some of which operate seasonally, glass plants, and oil field operations. These facilities are in the general stationary combustion sector.

Table III-5: Capped Facilities' Criteria Pollutant Emissions by Facility Sector South Coast Air Basin 2008 Emissions – Annual Average(tons/day)

Sector	NOx	ROG	$PM_{2.5}$
Petroleum Refinery	12.7	7.3	3.4
Hydrogen Plant	2.4	1.7	0.5
Cogeneration Facility	0.3	0.1	0.1
Cement Manufacturing Facilities	1.7	0.0	0.2
Electricity Generation	2.2	0.8	1.2
General Stationary Combustion	4.0	2.5	0.7
Other	0.0	0.0	0.0
Total emissions from capped facilities	23.3	12.3	6.1
Total emissions from all sources	717	577	65
Capped facilities' contribution to total emissions	**3.2%**	**2.1%**	**9.4%**

Table III-6: Capped Facilities' Criteria Pollutant Emissions by Facility Sector San Joaquin Valley Air Basin 2008 Emissions – Annual Average (tons/day)

Sector	NOx	ROG	$PM_{2.5}$
Petroleum Refinery	0.4	1.2	0.3
Hydrogen Plant	0.0	0.0	0.0
Cogeneration Facility	2.1	0.1	0.3
Cement Manufacturing Facilities	0.0	0.0	0.0
Electricity Generation	2.9	0.1	0.7
General Stationary Combustion	16.0	2.8	3.2
Other	0.0	0.0	0.0
Total emissions from capped facilities	21.4	4.1	4.5
Total emissions from all sources	407	375	48
Capped facilities' contribution to total emissions	**5.3%**	**1.1%**	**9.4%**

Table III-7: Capped Facilities' Criteria Pollutant Emissions by Facility Sector
Bay Area Air Basin 2008 Emissions – Annual Average(tons/day)

Sector	NOx	ROG	$PM_{2.5}$
Petroleum Refinery	16.0	10.3	2.4
Hydrogen Plant	0.0	0.0	0.0
Cogeneration Facility	1.0	0.1	0.2
Cement Manufacturing Facilities	5.1	0.1	0.1
Electricity Generation	2.5	0.3	0.5
General Stationary Combustion	3.6	1.7	0.7
Other	0.3	0.2	0.0
Total emissions from capped facilities	28.6	12.6	3.9
Total emissions from all sources	437	334	56
Capped facilities' contribution to total emissions	**6.5%**	**3.8%**	**7.0%**

IV. ANALYSIS OF RULE IMPACTS

The proposed cap-and-trade regulation is just one of the many measures in California's AB 32 Scoping Plan that will result in reduced greenhouse gas emissions from fuel combustion, and that will also provide reductions in criteria and toxic pollutants. Cleaner vehicles and fuels, more energy efficiency in commercial and residential buildings, increased use of renewable energy sources, reductions in vehicle travel, and pricing carbon through a cap-and-trade program are all part of a comprehensive program that will reduce both GHGs and conventional air pollutants. While the cap-and-trade rule in aggregate is designed to reduce GHG emissions, on a local basis there could be the potential for both co-pollutant benefits, as well as dis-benefits.

The co-pollutant benefits of these GHG reduction strategies will play an increasingly important role post-2020 as California continues to grow and health-based air quality standards become more stringent. Further reductions in combustion-related criteria pollutants are needed to meet the current federal ozone standard by 2023, with additional emissions-reduction obligations expected by 2030 to address the potential tightening of the standard by U.S. EPA.

While ARB's regulations to reduce GHGs are applied statewide, the co-pollutant benefits will vary among regions depending upon the nature of the existing and future air pollution sources. Ozone and $PM_{2.5}$ are primarily regional air pollutants, and are regulated under the Clean Air Act on a regional basis. However, localized impacts from individual air pollution sources or clusters of sources can result in disproportionate air pollution exposures. In addition, some populations are more vulnerable to air pollution which can result in differential health impacts from air pollution. ARB continues to sponsor research to better understand the nature of the special health vulnerabilities of the young, elderly, and those with existing health problems, as well as the role of socioeconomic status.

Methods to assess community impacts and vulnerabilities are being improved over time as more studies and data become available. The case studies in this assessment focus on co-pollutant emissions changes that might be associated with the proposed cap-and-trade regulation. In the case of stationary sources of air pollution, air districts are responsible for preparing inventories of current criteria pollutant emissions, adopting local regulations for these sources, and projecting future emissions. ARB regulates and prepares emissions inventories for most other air pollution sources. The current and projected emissions inventories used in the community case studies rely on the latest available ARB and air district information.

In this assessment, ARB staff has looked broadly at the potential criteria pollutant co-benefits from the proposed cap-and-trade regulation, and also at the potential for increases in criteria or toxic pollutants that would be attributable to the cap-and-trade regulation. The AB 32 Scoping Plan discusses the potential statewide co-benefits of California's GHG reduction activities. As ARB has adopted other regulatory measures, the potential for co-pollutants benefits has been assessed to the extent possible. Assessment of local and regional impacts of this proposed regulation is challenging because it is designed to reduce aggregate rather than facility-specific GHG emissions, and to be linked to cap-and-trade programs outside California. As such, it is difficult to predict what actions individual facilities may take to comply with the rule. The approach taken to evaluate potential co-pollutant impacts is necessarily more hypothetical in nature, with general scenarios that bound the possible range of impacts.

A. Potential for Co-Pollutant Reductions

The proposed cap-and-trade regulation is designed to reduce GHGs by setting a declining emissions cap that applies to the aggregate emissions of regulated entities. Individual facilities are not subject to an emissions cap. This type of program has the advantage of providing facilities flexibility to determine the most cost-effective way to meet emissions-reduction targets. The ability to comply using allowances to emit that can be purchased from other entities and some reductions generated offsite can help reduce the overall cost of meeting California's 2020 greenhouse gas emission target. Chapter I of this report describes the proposed rule and the AB 32 requirement to consider emissions impacts and potential co-pollutant benefits of regulations with market-based mechanisms.

On a statewide basis, the proposed cap-and-trade regulation is expected to help reduce criteria and toxic pollutants from in-state combustion. The 2008 Scoping Plan for AB 32 estimated co-pollutant reductions from the combination of measures in the plan based on emissions forecasts at that time. ARB staff has updated those projected benefits to reflect new economic forecasts and other new data. Given the need for substantial new emissions reductions to meet federal air quality standards, any co-pollutant benefits are especially important for the South Coast and the San Joaquin Valley. As ARB and air districts prepare the next round of air quality plans, the co-benefits of investments in improved energy efficiency and other actions to meet California's GHG reduction target will be incorporated.

This assessment focuses on the industrial and electricity generation facilities subject to the cap-and-trade regulation. Based on the most recent recession-adjusted inventories, on average the cap-and-trade industrial and electricity generation sources will need to reduce their GHG emissions by 4 percent to meet the 2020 cap in aggregate. Total GHG emissions under baseline conditions in 2020 are estimated to be 507 $MMTCO_2e$. GHG emissions from the capped sectors are approximately 409 $MMTCO_2e$ of the baseline. Reductions needed to meet the cap of 334 $MMTCO_2e$ will come in part through complementary measures from the Scoping Plan. After reductions from those measures, the cap-and-trade regulation is estimated to reduce at least 18 $MMTCO_2e$, representing a 4 percent reduction from capped sector emissions ARB staff assumed that criteria pollutant emissions would be reduced proportionate to reductions in greenhouse gases. Therefore, in the community case studies in this assessment, ARB staff has estimated a maximum 4 percent reduction in criteria pollutant emissions in 2020 from industrial and electricity generation facilities. This benefit is calculated as a reduction based on the forecast criteria pollutant emissions for these facilities without the rule.

In the public meetings held to discuss the scope of this assessment, a number of stakeholders expressed interest in an analysis that would characterize the criteria pollutant impacts of various design elements of a cap-and-trade program. The questions focused on the potential benefits of limiting trading and use of offsets in certain communities.

As a sensitivity analysis, ARB staff has developed a hypothetical scenario that is intended to represent the maximum potential for co-pollutant benefits in a local community. The scenario assumes that all facilities in the community subject to cap-and-trade would reduce their combustion emissions by 4 percent. Emissions reductions within each community that will result from California's regulatory programs for criteria pollutants provide the baseline for evaluating the impacts of this scenario. This baseline reflects what would occur in the absence of cap-and-trade, or if all GHG reductions were achieved outside the community. These two situations bound the most likely impact of the regulation.

B. Potential for Co-Pollutant Increases

AB 32 directs ARB to prevent, to the extent feasible, any increase in emissions of criteria or toxic pollutants as a result of the use of market-based mechanisms to reduce GHG emissions (HSC §38570 (b)(2)). This portion of the assessment looks at the potential for increases in co-pollutant emissions that would be attributable to the proposed cap-and-trade regulation. As noted above, while the regulation would result in an overall decrease in criteria pollutants statewide, ARB staff evaluated the potential for emissions increases at the community level.

In this analysis, it is necessary to distinguish between any potential emissions impacts of other GHG regulations such as the Renewable Electricity Standard and the Low Carbon Fuel Standard, and any impacts of the proposed cap-and-trade regulation. Also, the impacts of other factors such as economic and population growth or other regulatory requirements need to be taken into account. Emissions increases that would otherwise occur independent of the cap-and-trade regulation are not attributed to the rule.

For example, as a result of the need to meet other requirements or market demands, some facility types may move to more efficient ways of operation, or switch to use of less carbon-intensive fuels, such as biomass and other renewable energy sources. Production could also increase at facilities that are the most fuel-efficient, to offset decreases in production at other less-efficient facilities.

ARB staff did not find scenarios for emissions increases that would be clearly attributable to the cap-and-trade regulation. However, for the purpose of a bounding exercise, staff explored two additional scenarios on the impacts of general growth in each of the four community case studies. Similar to the co-benefit scenario, these are hypothetical in nature since specific facility responses are unknown. However, the two growth scenarios serve as likely upper bounds for characterizing the possible impacts of general growth within the communities. The scenarios assume either increased production at existing facilities, or the construction of a hypothetical new facility in the community.

It is important to remember that, as described in Chapter II, all these facilities are subject to an existing regulatory program with strict requirements regarding emissions increases, expansions, and the construction and operation of new facilities. Any options chosen by facilities to meet the cap-and-trade requirements must be done in the context of these already existing regulations. New or expanding facilities are currently subject to requirements to ensure the use of the best available control technology when built and significantly modified, as well as strict district permitting requirements.

The following sections provide an overview of how each cap-and-trade industrial and electricity generation sector is expected to respond to mandates to reduce GHG emissions, and the extent to which any changes could be attributable to the cap-and-trade regulation.

1. General Stationary Combustion

This greenhouse gas sector contains a wide variety of source types including food processing, glass container manufacturers, oil and gas production facilities, and mineral processors. As such, it is not possible to identify a specific type of response to the cap-and-trade regulation. However, in general, the combination of placing a price on carbon and setting a declining cap should incentivize facilities to invest in more-efficient processes and equipment. Recognizing the need to better understand the opportunities to reduce both GHG and co-pollutant emissions from large stationary sources, ARB adopted the Energy Efficiency and Co-benefits Assessment of Large Industrial Facilities Regulation in July 2010. This regulation requires the largest stationary sources of GHGs to provide information on the energy-efficiency improvement opportunities that are available, and to quantify the associated emissions reductions for GHGs and co-pollutants. Information gathered from the implementation of this regulation will be a valuable resource in identifying emissions-reduction opportunities, as well as what criteria and toxic pollutant reductions might be realized. It will also help California's largest stationary sources of GHG emissions consider potential co-benefits when deciding on actions to comply with programs like cap-and-trade. By 2012, ARB staff will be able to better evaluate and quantify opportunities to pursue co-pollutant emissions reductions from facilities subject to the cap-and-trade rule.

2. Refineries

California's petroleum refineries will have the same choices as other industrial facilities included under the cap. They may opt to reduce emissions on-site to meet their regulatory requirements under this program or may choose to continue operations by purchasing allowances or offsets outside the communities in which they are located. However, ARB staff expects that production changes to this sector that occur will not be as a result of cap-and-trade, but rather, due to other regulatory drivers described below.

Even without the overlay of cap-and-trade, recently adopted federal and State programs have mandated that low-carbon fuels such as biofuels become a greater portion of transportation fuels. Congress adopted in 2005, and strengthened in 2007, a renewable fuels standard. The renewable fuels standard requires that 36 billion gallons of biofuels be sold annually by 2022, of which 21 billion gallons must be "advanced" lower-carbon biofuels, and the other 15 billion gallons can be corn ethanol. In April 2009, ARB adopted the Low Carbon Fuel Standard (LCFS) as part of its AB 32 greenhouse gas measures. The LCFS establishes performance standards that fuel producers and importers must meet each year beginning in 2011 to spur the steady introduction of lower-carbon fuels. A gasoline and a diesel standard are set to achieve an average 10 percent reduction in the carbon intensity of the statewide mix of transportation fuels by 2020.

As a result of the federal renewable fuels standard and the California LCFS, ARB staff anticipates a significant increase in the demand for biofuels. Currently, most biofuels (at present, primarily corn ethanol with small volumes of biodiesel and sugar cane ethanol) are imported from outside California. However, over time, the increased demand for biofuels may result in new biofuel refineries being built in California. As part of the analysis for the LCFS, staff determined that new biorefineries could be located throughout the State near local feedstocks, including municipal solid waste, agricultural and forestry waste, and waste oils. Any new biorefineries would not be a result of the cap-and-trade regulation, but rather the LCFS and the federal renewable fuels standard.

ARB staff does anticipate that biofuels will displace some portion of petroleum-based transportation fuel demand in the State as a result of the federal renewable fuels standard and the California LCFS. Due to increasing worldwide demand for petroleum, however, ARB staff expects that California's petroleum refineries would continue operating at capacity. The anticipated displaced demand for petroleum could result initially in a potential decrease in imported petroleum blendstocks, and nearer 2020 as more California petroleum demand is displaced, California refineries would be expected to export a portion of their products to other states and countries.

Therefore, through 2020 staff believes it is very unlikely that new petroleum refineries will be built or throughput at current refineries will be increased. To reduce their net GHG emissions, rather than reducing throughput, a more likely scenario would be for installation of cogeneration projects at refineries, in order to operate more efficiently.

Most hydrogen plants are within refineries or are built adjacent to refineries and provide hydrogen to those facilities. There are several programs that will increase the demand for new hydrogen production plants associated with refineries and to provide transportation fuel. These programs include: State funding through the California Hydrogen Highway program; Assembly Bill 118 (AB 118, Nuñez, Chapter 750, Statutes of 2007) funding for alternative and renewable fuels; zero-emission vehicle credits to vehicle manufacturers; and the LCFS, which gives credits for hydrogen fuel cells. The cap-and-trade regulation alone therefore would not result in an additional demand for hydrogen plants.

3. Cogeneration

It is difficult to project whether, or the extent to which, implementation of the cap-and-trade regulation will result in a shift from fossil fuel use to cogeneration facilities, also known as combined heat and power (CHP). Pricing carbon fuels through a program such as a cap-and-trade regulation would encourage the development of clean, efficient CHP facilities.

However, one possible scenario for increasing power generation would be the installation of CHP at a refinery for purposes of providing excess power back to the grid. The installation of new CHP at a facility solely for that purpose may increase local criteria air pollutant emissions if no other changes at the facility occur. However, a more likely scenario, which could be due in part to the cap-and-trade regulation, would be a CHP installation that decreases total facility-wide criteria pollutants if the heat from the CHP turbine is used to replace existing boilers that are not as efficient and clean as the new CHP installation. CHP can provide a higher overall energy efficiency at a facility, and may allow the facility to be less susceptible to grid power outages and the associated emissions from such unplanned shutdowns. Additionally, any increases in the use of CHP facilities would also be dependent on policies set by the California Public Utilities Commission, which establishes tariffs and other mechanisms that make the installation and operation of CHP facilities cost-effective.

4. Cement Manufacturing Facilities

Coal is the predominant fuel used in cement kilns, though biomass is also used to a lesser extent. The cap-and-trade regulation would increase the cost of using coal, and may spur interest in using more biomass, for which the facility would not have to turn in allowances. Putting a price on carbon could also provide an economic incentive to replace some of the coal used at cement kilns with waste tires, a portion of which are considered biomass. To evaluate the potential emissions impact of this type of fuel switching, ARB staff looked at permits for three cement kilns in the Oro Grande community in the southwest Mojave Desert. Two of the cement plants are authorized to burn tires as a partial substitute for coal in their cement kilns. The third plant currently does not have authorization in its Title V permit to burn tires.

In looking at the two plants that had permits to burn tires, one facility burned 900,000 tires in 2008. Under their existing permit, the facility could burn up to 7.5 million tires; about 8.9 times more than they currently consume. The other plant burned 2.2 million tires in 2008. Under their existing permit, the facility could burn up to 4.5 million tires; about 2.2 times more than are currently consumed. The existing Title V permit for this facility also allows the operator to increase tire heat input fractions from the authorized 22 percent to 70 percent upon submittal of source test results and a risk assessment and district approval. Such approval would allow the facility to increase tire combustion rates by 7.0 times more than are currently consumed, or up to about 15 million tires per year. Emissions testing of an increased use of tires in the range of 15 to 25 percent found that NOx emissions decreased slightly, while particulate matter emissions remained roughly the same. Thus, the current information indicates that an increased use of tires at California's cement kilns would not significantly change NOx and $PM_{2.5}$ emissions based on the limited testing conducted to date. This testing also indicated that emissions of toxic compounds remained generally constant with the exception of cadmium, which increased. The "Hot Spots" program requires facilities to measure and quantify releases of air toxics. The facility is then required to evaluate the risk from those emissions, notify the public of significant risks, and reduce those risks. ARB is also required to track and prepare a report annually on toxic emissions from use of tires as fuels.

An additional consideration in switching to tires are proposed federal requirements that would require the removal of steel belts from tires prior to using them as fuel, potentially increasing processing costs. The likelihood of cement kilns increasing their use of tires in their kilns would also be somewhat tempered by possible mitigations required for increased truck traffic to deliver the tires to the plant. However, due to ARB regulations, in 2020 most trucks will be required to be equipped with the cleanest 2010 engines as well as diesel particulate traps. These trucks would likely be lower-emitting than the emissions from locomotives, which are currently used to transport coal to many tire facilities.

5. Electricity Generation

The electricity sector is subject to multiple drivers over the next decade. For example, significant funds are currently being invested in energy-efficiency programs, and coastal power plants are being updated to eliminate once-through-cooling to protect marine life. Also, ARB recently adopted a requirement to supply 33 percent of retail electricity sales from renewable resources by 2020. Modeling performed for ARB's Renewable Electricity Standard (RES) regulation indicates that the 33 percent renewables requirement will reduce GHGs by displacing fossil fuel generation in the West. Because renewable generation produces less criteria and toxics emissions per unit of electricity output than the fossil fuel generation it will displace, the 33 percent renewables requirement is expected to provide an air quality benefit by reducing statewide emissions of criteria and toxic pollutants. However, the variable nature of certain renewables, such as wind and solar, may lessen these benefits and could contribute to localized impacts due to their variable nature and the need to back up the technologies with fossil generation to meet peak demand. Even so, the 33 percent requirement is expected to result in an overall net air quality benefit to the State.

On top of these programs, the cap-and-trade regulation would impose a price on the carbon-based fuels used by traditional power plants. Natural gas is the leading fuel for power plants in California, while many power plants that import electricity into California are powered by coal, which has twice the GHG emissions as natural gas. Consequently, a cap-and-trade regulation could increase the operation of power plants within California as out-of-state coal power is replaced by in-state natural gas generation. Any regulation that seeks to reduce carbon from the electricity that California uses, whether a cap-and-trade regulation, a carbon fee, or direct regulations, would provide similar incentives to shift from coal to natural gas. Many other external factors, such as transportation costs, pipeline capacity, demand by a growing population, and other environmental programs, affect decisions on whether to increase operation of existing power plants, build new power plants, or the potential location of these power plants. While cap-and-trade will be one more consideration, ARB staff expects that these market, economic, and infrastructure factors will continue to drive such decisions.

6. Biomass for Electricity Generation

The proposed cap-and-trade regulation would not require allowances to be submitted for GHG emissions from biomass combustion. This could provide an incentive for increased use of biomass as a fuel source. In addition, the Governor's Executive Order number S-06-06 sets a goal for increased use of biomass for electricity generation. ARB's RES staff report analyzed the possibility of increased biomass use for electricity generation—considering both the cost required to purchase NOx offsets, the difficulty in obtaining permits, and the costs associated with operating these facilities—and concluded the number of new facilities may be limited.

Biomass facilities may face high transport costs depending on the proximity of the biomass fuel feedstock to the generating facility. Facility developers would weigh these costs against any incentives provided by producing power from a facility not covered by the cap-and-trade regulation. And, as mentioned in the biorefining discussion earlier, biomass generating facilities may have to compete for feedstock fuel with biorefineries. The RES analysis predicted that an increase of the current electricity portfolio from the current program of 20 percent renewable fuels to the proposed standard of 33 percent renewables will result in a less than 1 percent increase in the use of biomass to generate electricity. The RES staff report concluded that while there could be an increase in demand for biomass-generated electricity, the cost of offsets needed to build the facilities in California could make it unlikely that new facilities will be built in California. Given these costs, it is very unlikely that the cap-and-trade regulation will result in additional biomass plants in California beyond what will result from the Governor's Executive Order and the RES.

7. Residential Heating

In rural parts of California, some residents rely on wood burning to heat their homes in the winter. If a cap-and-trade regulation (or other GHG regulatory system) increases the cost of propane (often the only other option in rural areas), more homeowners may opt for biomass, e.g., wood burning, to heat their homes. It should be noted that this is predominantly a concern in rural areas without natural gas service. Because of health and nuisance impacts, even some rural areas have adopted programs that require the replacement of older woodstoves with U.S. EPA-compliant stoves that are more efficient and significantly reduce fine particulate emissions.

Almost all urbanized areas of California have strict limits on fireplace and woodstove use because of the health impacts of the fine particulate emissions associated with wood burning. Currently, the San Joaquin Valley Air Pollution Control District, Sacramento Metropolitan Air Quality Management District (AQMD), and Bay Area AQMD have mandatory curtailment programs in place that prohibit residents from burning when atmospheric conditions are predicted to result in high particulate matter concentrations and increased heath impacts. The South Coast air district will begin a mandatory curtailment program in 2011. A number of other air districts have voluntary programs discouraging wood burning on high $PM_{2.5}$ days, including Butte County, Placer County, and Yolo-Solano. Due to the stringency of these air district programs, any potential increases in residential wood burning would be expected to have no effect on compliance with the 24-hour federal air quality standard for fine particulate matter.

C. Community Case Studies

The previous sections discussed the impact of a cap-and-trade rule broadly on the major industrial sectors. AB 32 includes requirements for measures with market-based compliance mechanisms to consider the potential for cumulative emissions impacts from these mechanisms, including localized impacts in communities that are already adversely impacted by air pollution (HSC §38570 (b)(1)). For major pollutants like ozone and $PM_{2.5}$, it is important to ensure that any actions taken through a cap-and-trade rule do not hinder progress toward attainment of air quality standards established to protect public health. With that as a framework, this section focuses on four communities and explores hypothetical situations that might result from the implementation of a cap-and-trade rule at a local level.

The choice of communities captures the diverse nature of California's air quality problems, as well as a range of sources that would be subject to the cap-and-trade regulation. The boundary of each assessment area captures the most highly impacted communities. Because community-level exposure reflects impacts from both local and regional emission sources, the size of each assessment area was selected to encompass a representative sampling of cap-and-trade sources that could potentially impact the local community. The size also represents a balance between reflecting broader regional-scale impacts versus smaller facility-specific impacts. The four communities are:

- **Wilmington and Richmond**: These two cities are part of larger metropolitan areas in Southern and Northern California. They are located among a nexus of major transportation corridors, large refineries and other industrial and electricity generation facilities, and busy international ports. The concentration of emission sources contribute to air quality problems in the local community, as well as in downwind areas. Both Wilmington and Richmond have a large number of industrial and electricity generation facilities that would be subject to the cap-and-trade regulation.

- **Bakersfield/Oildale**: This region of the Central Valley has a mix of sources ranging from agricultural operations to widely dispersed stationary sources. The area also has a significant amount of mobile source emissions, resulting from its location along the two interstate highways connecting Northern and Southern California. The Bakersfield region has one of the most severe air quality problems in the nation. The Bakersfield/Oildale area contains a diverse array of industrial and electricity generation facilities that would be subject to the cap-and-trade regulation.

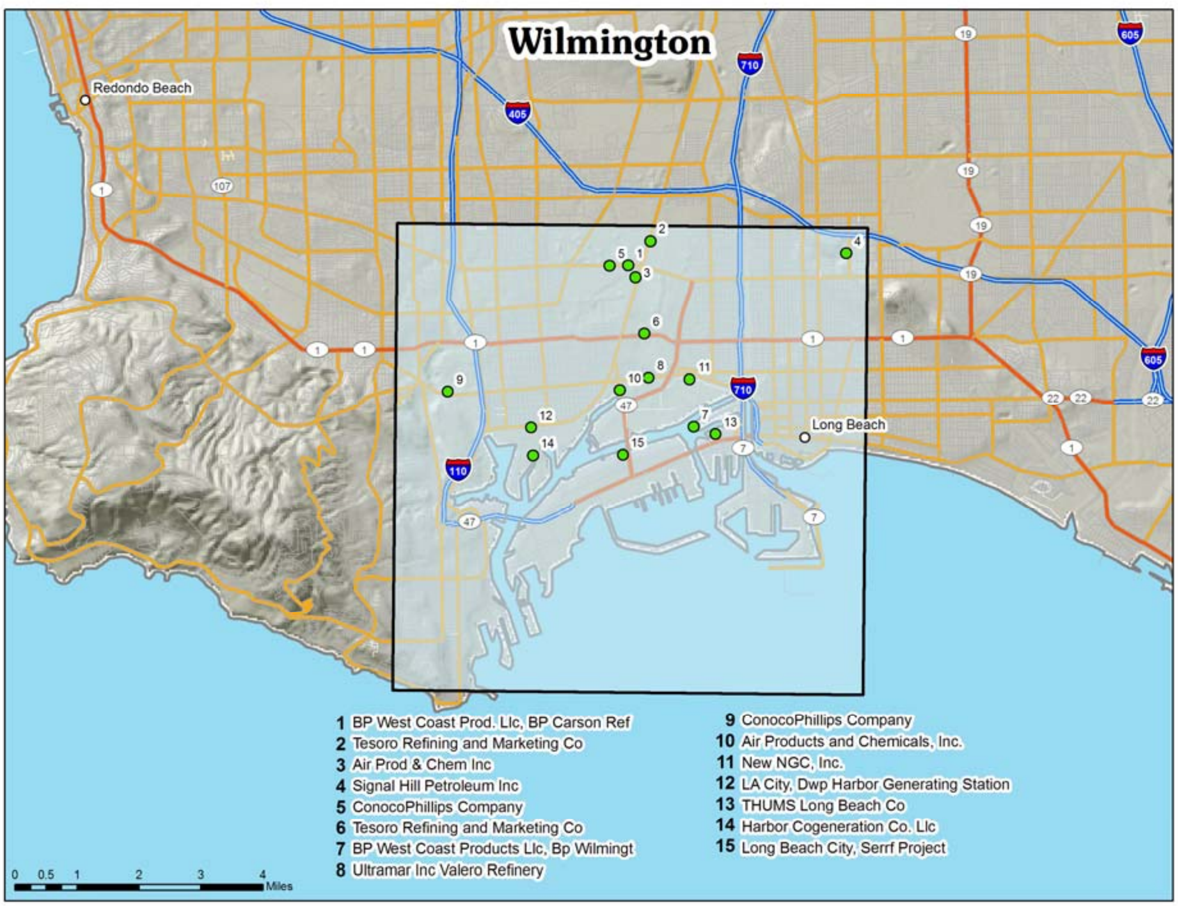
- **Oro Grande**: This community is located in the high Mojave Desert and includes the moderately sized towns of Hesperia and Victorville. Local air pollution sources are primarily mineral extraction and related commercial activities. This area has a small number of sources that would be subject to the cap-and-trade regulation, with a focus on cement manufacturing. The local air quality problem is primarily due to the community's proximity to the South Coast, which transports substantial air pollution into the Mojave Desert.

The purpose of the community assessments is to describe current air quality exposure and trends relative to the health-based air quality standards, characterize existing co-pollutant emissions, and evaluate the potential for cumulative emissions impacts in 2020 from the implementation of cap-and-trade. As noted above, each community has a unique mix of sources that would be subject to the cap-and-trade regulation. Air quality experienced by community residents is influenced by regional emissions and air quality levels, as well as an additional overlay from local sources. Therefore the assessment for each community begins with an overview of air quality and emissions on a regional basis, and then focuses on the nature of the local air quality problem and the local sources, including industrial and electricity generation facilities expected to be subject to the cap-and-trade regulation. It is difficult to predict how individual facilities within a given community may respond to the cap-and-trade regulation. However, staff examined hypothetical bounding scenarios in each community based on the nature of the sources in that community and the possible responses for each cap-and-trade sector, as discussed in Section B of this chapter.

1. Wilmington Assessment

Wilmington is a suburb of Los Angeles with a racially and ethnically diverse population of about 53,000 (refer to Figure IV-1). Located between the Port of Los Angeles and the Port of Long Beach, the Wilmington area includes a diverse range of stationary and mobile source emissions. About 40 percent of all ship container traffic entering the United States moves through the two ports, making them, in combination, the fifth busiest container port in the world. These shipping activities result in large amounts of diesel and fugitive emissions from bulk transport operations. In addition to port-related activities, Wilmington and the surrounding area is home to rail yards, major transportation corridors, oil refineries, and power plants, as well as other industrial and commercial operations. Approximately 300,000 people live within the emissions assessment area.

Figure IV-1: Wilmington Assessment Area



A total of 15 industrial and electricity generation facilities in the Wilmington area would be subject to the cap-and-trade regulation. The following sections describe air quality and emissions in the Wilmington area and the traditional emissions control programs currently in place. The last section provides a discussion of potential emissions changes that could occur under the cap-and-trade regulation.

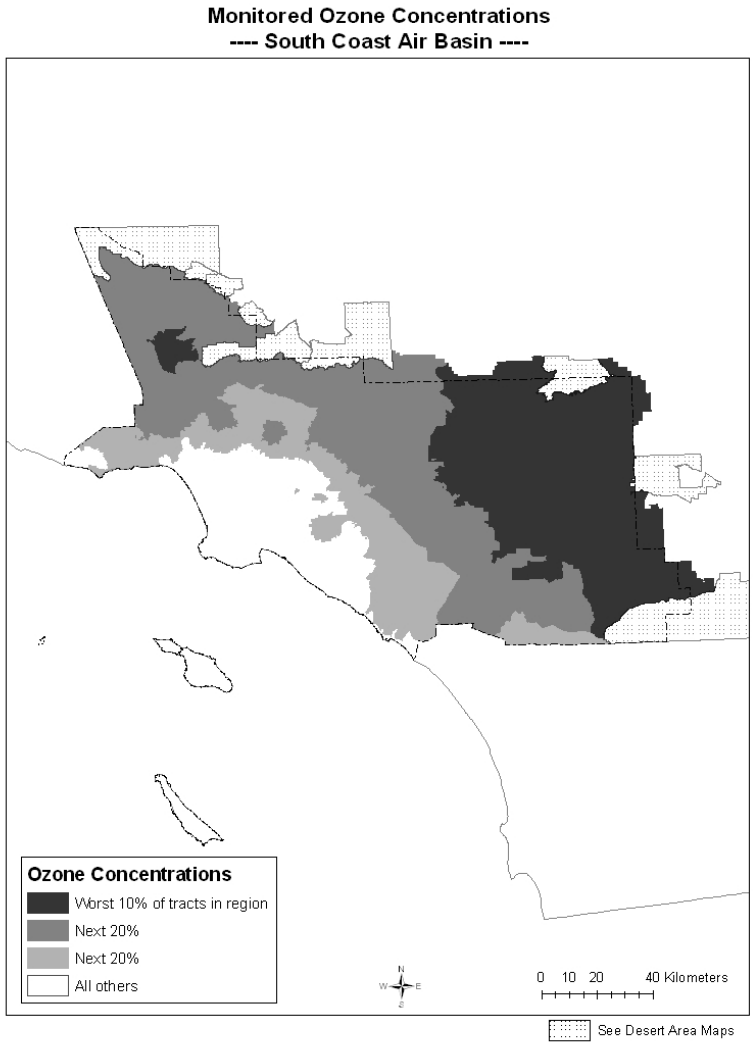
Air Quality

The Wilmington area is located in the South Coast Air Quality Management District (District). The District maintains a comprehensive air quality monitoring network to characterize air quality conditions throughout the region. Although there are no long-term monitors in Wilmington, data collected at the nearby Long Beach monitoring site are suitable for characterizing air quality in this community. Based on this monitoring, as well as the mix of sources in the Wilmington area, the pollutants of greatest concern are ozone, nitrogen dioxide (NO_2), $PM_{2.5}$, and toxic air contaminants, including diesel PM. As described below, emissions control programs implemented by the State and by the District have been effective in reducing ambient concentrations of all pollutants in the Wilmington area.

Ozone

Ozone air quality in the South Coast region ranges from attainment of the national standard to some of the highest concentrations in the nation. Figure IV-2, below, displays a relative ranking of ozone concentrations by census tract within the South Coast. The ozone levels shown reflect a measure of both the frequency and severity of concentrations above the State 8-hour ozone standard of 0.070 parts per million (ppm) between 2004 and 2006. Census tracts with the 10 percent highest ozone concentrations within the South Coast are shown in black. Because census tracts are not uniform in size, tracts with the top 10 percent of ozone concentrations may not represent 10 percent of the land area of the region. Although further work is under way to improve this mapping using the most recent data available, it provides a general depiction of the variability in ozone levels throughout the region. Overall, the highest ozone concentrations are found in the inland areas located north and east of the urban core.

Figure IV-2 : Census Tract Ozone Concentration Map



However, because the map depicts a relative ranking within the South Coast, it does not necessarily reflect compliance with the federal ozone standard of 0.080 ppm. Currently, concentrations at all sites in Orange County are below or very close to the level of the standard, as are concentrations at sites located in the coastal portion of Los Angeles County. Concentrations at these sites range from 1 percent above the standard at Mission Viejo, to 27 percent below the standard at Long Beach. In contrast, concentrations in the San Fernando Valley and San Gabriel Valley are still relatively high. Although these areas once had the highest concentrations in the South Coast region, ozone air quality has improved dramatically over the last several decades. The worst ozone air quality is now found in the far eastern portion of the South Coast, where concentrations are about 40 percent above the standard and the standard is exceeded on about one-third of the days each year. However, the inland areas have made more than half the progress needed to meet the standard since 1990. As concentrations have declined, the size of the areas with good air quality has increased, while the size of the areas with poor air quality has decreased.

In contrast to the inland portions of the South Coast, ozone concentrations in the Wilmington area are very low. Although there are no long-term ozone monitoring sites in Wilmington, there is a long-term site in Long Beach, approximately four miles northeast of the Los Angeles-Long Beach port complex. More recent ozone data are also available from ongoing monitoring at six sites within the port complex area. Comparisons of ozone data collected at these various sites with the data collected at Long Beach show good agreement. As a result, the Long Beach ozone data provide a good indication of ozone concentrations in the Wilmington area.

Ozone concentrations at Long Beach have shown a steady decline over the years and have not violated the current national 8-hour standard since the late 1980s. Concentrations have decreased 30 percent since then and continue to meet the current standard. However, U.S. EPA is reconsidering the level of the standard and is expected to reduce the national 8-hour ozone standard from its current level of 0.08 ppm to a level somewhere between 0.060 ppm and 0.070 ppm. In 2009, the ozone value used to evaluate compliance with the national standard was 0.061 ppm at Long Beach, far below the level of the current standard. Concentrations will continue to meet, or exceed by only the slightest amount, any new standard that U.S. EPA adopts. In addition, as ARB and the District continue to implement programs that further reduce ozone-forming emissions throughout the region, ozone air quality will continue to improve throughout the South Coast.

Nitrogen Dioxide

Compared with the national NO_2 standards, concentrations throughout the South Coast are relatively low, and all areas meet both the national 1-hour standard of 100 parts per billion (ppb) and national annual standard of 53 ppb. As with ozone, NO_2 data from Long Beach provide a good indication of concentrations in the Wilmington area. Preliminary NO_2 data collected at the port sites show similar levels. Both the 1-hour and annual NO_2 concentrations at Long Beach, as well as for the South Coast as a whole, have shown a steady decline over the years. One-hour concentrations have decreased 60 percent since 1990 and have met the national 1-hour standard for the last five years, with a current level of 78 ppb. Annual concentrations at Long Beach have met the national standard for more than 20 years, with a current concentration of 21 ppb.

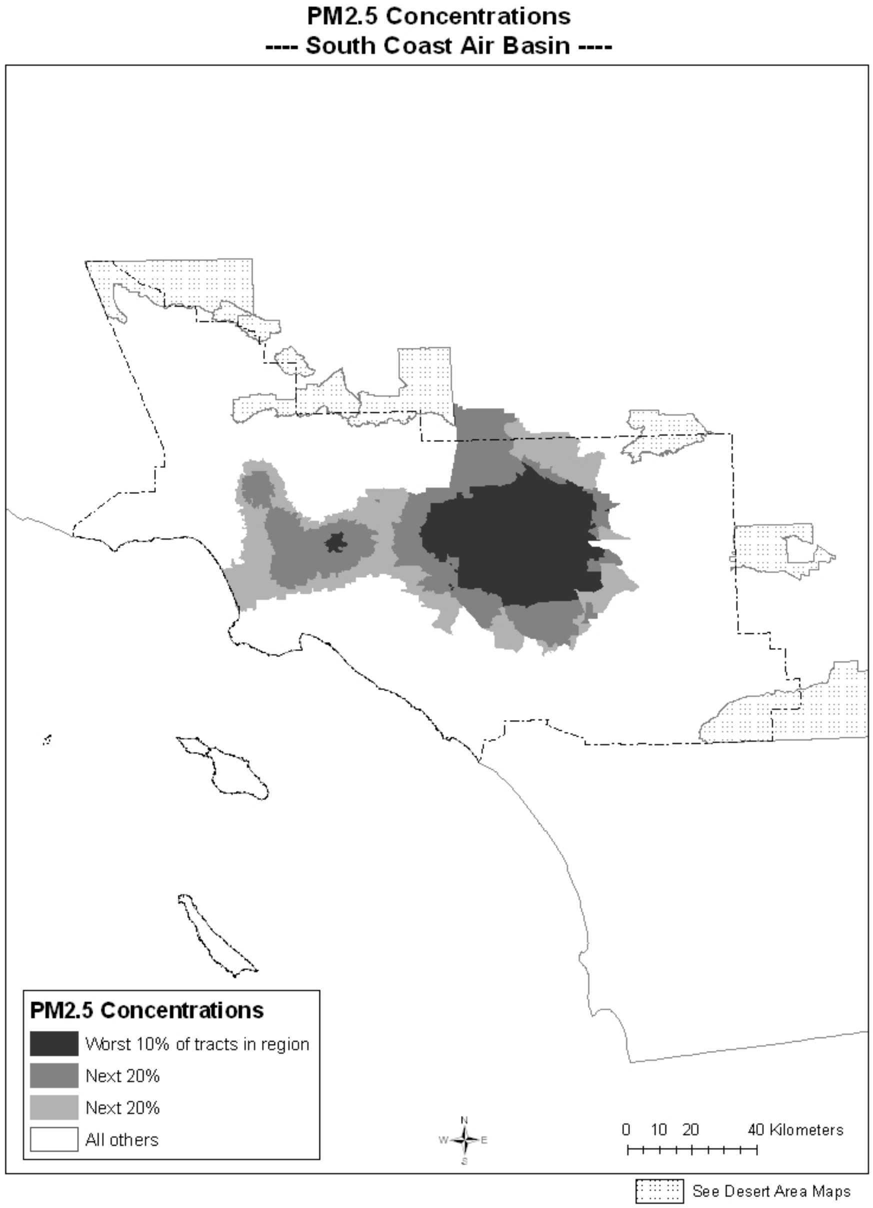
While all community-wide monitors show compliance with the national NO_2 standards, these monitors are not sited near roadways, where the highest concentrations are expected to occur. Recognizing this, U.S. EPA recently adopted near-roadway monitoring requirements. These requirements will be implemented by January 2013. Given the nature of the major emissions sources, the highest NO_2 concentrations should occur in the urban core, near the most heavily travelled roadways. The District will establish four new near-roadway sites to meet this new requirement.

Fine Particulate Matter

Similar to ozone, $PM_{2.5}$ concentrations vary throughout the South Coast, with some areas at or below the level of the federal $PM_{2.5}$ standards. Figure IV-3 below displays a relative ranking of $PM_{2.5}$ concentrations by census tract within the South Coast. The $PM_{2.5}$ levels shown reflect annual average $PM_{2.5}$ concentrations between 2004 and 2006 using a composite network of several different types of particulate monitors. Census tracts with the 10 percent highest $PM_{2.5}$ concentrations within the South Coast are shown in black. Although further work is under way to improve this mapping using the most recent data available, it provides a general depiction of the variability in $PM_{2.5}$ levels throughout the region. Overall, the highest $PM_{2.5}$ concentrations are found in areas located in the eastern portion of the region in Riverside and San Bernardino Counties.

As with ozone, because the map depicts a relative ranking within the South Coast, it does not necessarily reflect compliance with the federal $PM_{2.5}$ annual standard. Currently, concentrations at monitoring sites in Orange County and the more coastal portions of Los Angeles County are relatively low, ranging from just below the standard at Azusa and Burbank, to nearly 30 percent below the standard at Mission Viejo. Areas further inland are generally above the standard, with maximum concentrations at Mira Loma 25 percent above the standard. However, $PM_{2.5}$ concentrations throughout the South Coast have decreased significantly over the years, dropping more than 50 percent between 2002 and 2009 at peak sites. As ARB continues to implement programs to further reduce $PM_{2.5}$ and its precursors, $PM_{2.5}$ air quality will continue to improve, along the coast, as well as inland.

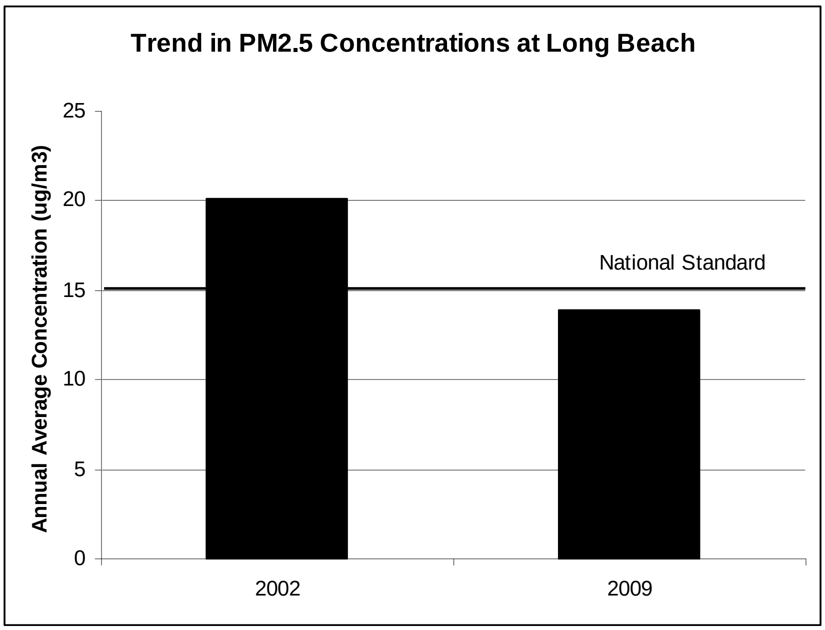
Figure IV-3 : Census Tract $PM_{2.5}$ Concentration Map



As mentioned above, $PM_{2.5}$ concentrations in the coastal areas, including Wilmington, are relatively low. There is no long-term $PM_{2.5}$ data record for Wilmington, but $PM_{2.5}$ measurements are available from Long Beach and from a special study conducted by the Port of Los Angeles. Although $PM_{2.5}$ concentrations at Long Beach are generally higher than those measured in the port area, they still provide a good indication of $PM_{2.5}$ concentrations in Wilmington.

$PM_{2.5}$ concentrations at Long Beach show a steady decline over the years, as shown in Figure IV-4. While annual average $PM_{2.5}$ concentrations were 5 micrograms per cubic meter ($\mu g/m^3$) above the annual standard of 15 $\mu g/m^3$ in 2002, they have since decreased 30 percent. Today, concentrations are just under 14 $\mu g/m^3$ and now meet the standard. Daily (24-hour) concentrations are close to meeting the national 24-hour standard of 35 $\mu g/m^3$. Recent data from the port monitoring show concentrations below both national $PM_{2.5}$ standards. Emissions control measures included in the recent $PM_{2.5}$ SIP, as well as programs aimed at reducing ozone and diesel PM, will help in further reducing exposure to $PM_{2.5}$ in the Wilmington area and throughout the South Coast.

Figure IV-4: Long Beach $PM_{2.5}$ Air Quality Trends



$PM_{2.5}$ data are sometimes further analyzed for individual components to provide additional insight about the types of sources contributing to ambient concentrations. Although long-term component-level data are not available in Wilmington, data are available for a site in downtown Los Angeles. These data indicate that decreases in all of the major components have contributed to the general downward trend in $PM_{2.5}$ concentrations. Ammonium nitrate is the largest single constituent, comprising approximately 35 percent of the $PM_{2.5}$ mass, with organic and elemental carbon comprising another 30 percent. Between 2002 and 2009, concentrations of these major species decreased significantly, reflecting efforts to control NOx and $PM_{2.5}$ from diesel and other mobile sources. Ammonium sulfate levels, while a smaller percentage of $PM_{2.5}$, have also decreased, largely due to efforts to control SOx from shipping and port-related sources.

Diesel PM and Other Toxic Air Contaminants

Given the amount of transportation-related activity in the Los Angeles and Long Beach port areas, there is a significant potential for high diesel PM concentrations. Diesel PM is considered a toxic air contaminant. Exposure to diesel PM poses a potential cancer risk, as well as contributing to $PM_{2.5}$ levels, with its associated risk for premature mortality. Although other air toxics are also present in the air, diesel PM comprises by far, the highest risk potential. Unlike the other pollutants, there is currently no method for monitoring diesel PM concentrations in the ambient air. However, cancer risk can be estimated from other parameters, such as measured levels of elemental carbon and emissions. Several recent studies conducted by ARB and the District provide information about diesel PM risk in the Wilmington area. Although the studies used different data and had different objectives, they all found high levels of risk.

Specifically, a 2006 ARB study looked at the health impacts associated with PM emissions from diesel-fueled engines operating within the ports, including ships. Estimated diesel PM concentrations were used to estimate the increased risk of developing lung cancer, as well as other health impacts, including premature death. Another ARB study measured elemental carbon at two elementary schools in Wilmington as part of the Children's Environmental Health Program. Finally, the District conducted several intensive monitoring efforts focused on communities, including Wilmington, suspected of being affected by high levels of toxic air contaminants. These efforts also included updates of emissions inventories and modeled estimates of concentrations used to estimate cancer risk.

Results from all three studies concluded that pollutant levels measured in the Wilmington area were associated with high levels of potential cancer risk. Overall, the District study, which is the most comprehensive of the three studies described above, estimated a potential risk of 1,200 to 1,900 excess lifetime cancer cases per one million people in the Wilmington community due to air pollution (excess cancer risk is the increased possibility that an individual will develop cancer when exposed to a given contaminant level over a 70-year period). The potential risk in the Wilmington area is not substantially different from the risk in some other portions of the Los Angeles urbanized area. The District study results also indicated that diesel PM accounts for approximately 85 percent of excess cancer risk in the Wilmington area.

Since 2005, ARB's Goods Movement Program has been successful in reducing diesel PM at California ports. Monitoring data collected at the ports near Wilmington show up to 45 percent reductions from 2005 to 2009 in elemental carbon, a surrogate for diesel PM. These reductions are also reflected in the $PM_{2.5}$ concentrations, since diesel PM is an important constituent of fine particulate matter. As ARB and the District implement more stringent emissions controls, the impact of diesel PM will continue to decrease.

In addition to diesel PM, other air toxics present in the ambient air in the Wilmington area also pose measurable risk. Of the nearly 200 air toxics ARB has identified, eight pose the greatest remaining potential for risk throughout the State. These eight toxics are acetaldehyde, benzene, 1,3-butadiene, formaldehyde, hexavalent chromium, methylene chloride, *para*-dichlorobenzene, and perchloroethylene. ARB maintains a network of air toxics monitoring sites located throughout California. Although there is no monitor in the Wilmington assessment area, toxics data are collected at Long Beach.

Data collected at Long Beach show dramatic reductions over the last two decades for these remaining eight high-risk air toxics. Overall, the cancer risk from these compounds has dropped 80 percent between 1990 and 2009. Two compounds, benzene and 1,3-butadiene, account for more than three-quarters of the overall reduction. California's statewide motor vehicle emissions control programs are largely responsible for these reductions, as benzene and 1,3-butadiene are generally associated with motor vehicles and their fuels. Overall, cancer risk at the Long Beach site tends to be lower than measured at other toxics monitors in the South Coast region.

Emissions

Emissions of ROG, NOx, and $PM_{2.5}$ are the major contributors to ozone and $PM_{2.5}$ levels in the Wilmington area. While SOx emissions also contribute to the formation of secondary $PM_{2.5}$, SOx is a much smaller contributor to $PM_{2.5}$ as compared to secondary $PM_{2.5}$ from NOx in California. The bulk of emissions generated in the South Coast come from sources located in Los Angeles County. Countywide estimates show steep declines in both ROG and NOx emissions between 1990 and 2010 as a result of State and District control programs. Overall, ROG emissions in Los Angeles County decreased more than 70 percent and NOx emissions more than 50 percent over the 20-year period. Similarly, $PM_{2.5}$ emissions showed a nearly 30 percent reduction from 1990 to 2010.

Looking more specifically at the Wilmington area, this industrialized region contains a high concentration of emission sources. These emissions can be characterized by a few broad categories. Stationary sources are industrial facilities that can be identified by name and specific location. They include facilities such as power plants, refineries, and manufacturing plants. Area sources include widely distributed sources, such as gas stations, consumer products, yard care equipment, and construction and demolition activities. In contrast, mobile sources move around. On-road mobile sources include vehicles that travel on local roadways, such as light-duty passenger cars, trucks, and motorcycles, as well as heavy-duty diesel trucks and buses. Off-road mobile sources include sources such as cargo-handling equipment, forklifts, cranes, and locomotives. Because of the importance of port activities, the inventory for the Wilmington assessment area also includes "marine" sources. This is another subset of the general mobile source category, and includes ship emissions from travel on the open ocean, maneuvering within the harbor, and while docked.

Overall, as shown in Table IV-1, approximately 50 percent of NOx emissions in the local Wilmington emissions inventory are generated by mobile sources. The remaining NOx emissions come primarily from stationary sources and marine sources. In contrast, most of the $PM_{2.5}$ emissions come from industrial facilities and marine-related activities. Area sources and motor vehicles contribute the bulk of ROG emissions in the local area.

Table IV-1: 2008 Wilmington Area Emissions by Source Type (tons/day)

	NOx	$PM_{2.5}$	ROG
Stationary	**10.1**	**2.2**	**5.5**
Capped	9.5	2.0	3.8
Non-Capped	0.6	0.2	1.8
Area	**3.2**	**0.7**	**5.1**
Mobile	**28.3**	**1.5**	**6.8**
Light Duty On-Road	2.1	0.1	2.3
Heavy Duty On-Road	6.8	0.2	0.9
Off-Road	7.1	0.3	3.0
Marine	12.3	0.9	0.6
Total*	**41.6**	**4.3**	**17.4**

Sum of individual categories may not equal total because of rounding.

Fifteen industrial and electricity generation facilities located in the Wilmington area would be subject to the cap-and-trade regulation (Table IV-2). The locations of these facilities are shown in Figure IV-1. Virtually all stationary source emissions in the local area come from these sources. Overall, the cap-and-trade sources comprise approximately 23 percent of the total NOx emissions in the community, 47 percent of the $PM_{2.5}$, and 22 percent of the ROG. As shown in Table IV-2, the local facilities include refineries, general stationary combustion sources, cogeneration facilities, and electric generating facilities.

Table IV-2: Wilmington Area Facilities That Would Be Subject to Cap-and-Trade

Facility Name	***GHG Reporting Sector***
Air Products and Chemicals, Inc. - Carson	Hydrogen Plant / Cogeneration Facility
New NGC, Inc.	General Stationary Combustion
Long Beach City, SERRF Project	General Stationary Combustion / Electricity Generation
Air Products and Chemicals, Inc. - Wilmington	Hydrogen Plant/ Cogeneration Facility
Signal Hill Petroleum Inc.	General Stationary Combustion / Electricity Generation
Thums Long Beach Co.	Cogeneration Facility
BP West Coast Products LLC - Carson	Petroleum Refinery
BP West Coast Products LLC - Wilmington	General Stationary Combustion / Electricity Generation
Tesoro Refining and Marketing Co. - Carson	Petroleum Refinery
Harbor Cogeneration Co., LLC	Electricity Generation
Ultramar Inc.	Petroleum Refinery
L.A. City, DWP Harbor Generating Station	Electricity Generation
ConocoPhillips Company - Carson	Petroleum Refinery
ConocoPhillips Company - Wilmington	Petroleum Refinery
Tesoro Refining and Marketing Co. - Wilmington	Petroleum Refinery

Refineries account for the majority of emissions from the sources that would be subject to the cap-and-trade regulation in the Wilmington area. The refineries produce gasoline, jet fuel, diesel fuels, petroleum coke, and fuel oil, with the majority of the crude oil that feeds the refineries brought in from terminals at the ports. These refiners supply most of the petroleum products used in Southern California, as well as in Nevada and Arizona.

Petroleum refining is an energy-intensive process and refineries are among some of the largest NOx emitters in the State. The production of fuels includes initial distillation or separation of crude oil into light and heavy components. This is generally followed by cracking or conversion of these components into new hydrocarbons. Both of these processes require high temperature furnaces which produce combustion emissions. The final stage includes the blending and purification to meet specific requirements for different grades of fuels. Non-combustion-related emissions occur due to fugitive releases from the array of piping that transports the oil between processes, as well from tank farms which are used to store the various products. The southeast portion of Los Angeles County, which includes the Wilmington area, is home to all of the region's petroleum refineries.

In addition to criteria pollutant emissions, the fifteen facilities subject to the cap-and-trade regulation also emit toxic air contaminants. Air toxics emitted by refineries include benzene, toluene, xylenes, and hexane. As discussed in Chapter II, these facilities are required to report their emissions under the "Hot Spots" Information and Assessment Act. Facilities whose emissions and risk potential exceed a certain threshold must prepare a Health Risk Assessment (HRA). The HRA further evaluates potential health risks and specifies appropriate mitigation measures. Criteria for these thresholds were developed by the California Air Pollution Control Officers Association in consultation with the Office of Environmental Health and Hazard Assessment. Eight of the facilities in the Wilmington area have conducted an HRA, as shown in Table IV-3.

Table IV-3: Cap-and-Trade Program Facilities with Health Risk Assessments

Facility Name
Long Beach City, SERRF Project
Tesoro Marketing and Refining Co. - Wilmington
BP West Coast Products - Carson
BP West Coast Products - Wilmington
Ultramar Inc.
L.A. City, DWP Harbor Generating Station
ConocoPhillips Company - Wilmington
ConocoPhillips Company - Carson

None of these facilities pose a cancer risk of more than 10 excess cancer cases per million people. Routine air monitoring and several air monitoring studies conducted in Crockett (San Francisco Bay Area) and Wilmington have not identified significant health risks specifically associated with refineries. However, these studies did not measure diesel PM, as no accepted method currently exists, and there are many toxic air pollutants that do not have quantifiable health risk values.

In 2002, ARB published a report on the results of the State and local air district air monitoring done near oil refineries. The purpose of this evaluation was to try to determine how refinery-related emissions might affect nearby communities. This inventory of air monitoring activities included 10 ambient air monitoring stations located near refineries in Crockett and 4 stations near refineries in Wilmington. These monitoring results did not identify significant increased health risks associated with the petroleum refineries. In 2002–2003, ARB conducted additional monitoring studies in communities downwind of refineries in Crockett and Wilmington that showed similar results.

Existing Control Programs

The longstanding control programs discussed in Chapter II have reduced emissions throughout the South Coast and are reflected in air quality improvements to date. However, more needs to be done to bring all areas of the region into attainment. Under the federal Clean Air Act, all states, including California, are required to develop State Implementation Plans (SIPs) that provide for attaining the national standards. The most recent SIP for the South Coast was submitted in 2007 and addresses the national ozone and $PM_{2.5}$ standards. Given the magnitude of the problem in parts of the South Coast, significant emissions reductions will be needed to meet the national standards. The SIP relies heavily on NOx reductions as the most effective strategy to meet these standards. Overall, the strategy requires a 76 percent reduction in NOx emissions and a 22 percent reduction in ROG emissions from 2006 levels to attain the ozone and $PM_{2.5}$ standards throughout the South Coast region. Photochemical modeling analyses show these reductions will provide for attaining the national annual $PM_{2.5}$ standard by 2015 and the national ozone standard by 2024, as required by the federal Clean Air Act.

Statewide emission control programs will provide most of the reductions needed to attain the national standards. The statewide strategy builds on existing programs, as well as looking forward to the implementation of new and innovative technologies. Programs that will provide the greatest direct benefit to the Wilmington area include the following:

- Control measures to further reduce emissions from new trucks, cars, and consumer products,
- Measures to require existing trucks and off-road vehicles and equipment to reduce emissions through add-on controls, and
- Incentive programs to reduce NOx, $PM_{2.5}$, and diesel PM emissions in port areas.

While aimed at reducing the highest concentrations in the region, these emissions-reduction measures will also improve air quality throughout the South Coast, including the Wilmington area.

In addition to the measures outlined above, District rules will supplement the statewide strategy. For years, the District has required some of the most advanced technology to control emissions from industrial facilities located in the South Coast region. As part of this objective, the District implemented the Regional Clean Air Incentives Market, or RECLAIM, in 1993. RECLAIM sets an emissions cap and declining balance for many of the largest NOx- and SOx-emitting facilities. The program includes over 350 participants in its NOx market and about 40 participants in its SOx market. Although the District has excluded power producers from the RECLAIM program since 2001, participating facilities include a wide range of facilities, from glass melters to facilities using industrial boilers. The RECLAIM program does not include ROG emissions because of concerns that potential increases in ROG emissions at a facility would cause community impacts from air toxic contaminants.

NOx and SOx allocation allowances were issued to RECLAIM facilities based on their historical activity levels and applicable emission-control levels specified in the subsumed rules or in the South Coast Air Quality Management Plan. Facilities within the RECLAIM program have the option of complying with their allocation allowance either by reducing their emissions or by purchasing RECLAIM Trading Credits (RTC) from other facilities.

Although facilities were issued NOx allocations based on historic levels when the RECLAIM program began, these allocations are reduced to 2003 District control levels over time. Different industries have different rates of reduction, based on the rules and District Air Quality Management Plan control measures for that industry that were replaced by RECLAIM. From the beginning, power plants and refineries comprised a significant share of the market.

With the energy crisis of 1999 and the high demand for electricity, RECLAIM participants experienced a sharp and sudden increase in the price of NOx RECLAIM trading credits resulting from a much higher than normal need for credits by power-producing facilities. To lower and stabilize RTC prices arising from the trading spikes, the District adopted RECLAIM rule amendments in 2003 and 2004. These changes had the effect of increasing credit supply and reducing demand by restricting the ability of the power producers in the RECLAIM program to purchase RTCs owned by other participants in the market.

State law requires that all market-based incentive programs, such as RECLAIM, be equivalent to or better than the command-and-control programs they displace. This requirement applies to emissions reductions, as well as cost, both at adoption and on an ongoing basis. State law also requires that such programs not impede attainment of the California's more stringent ambient air quality standards. The standard for judging overall equivalency is a comparison of the market-based program's requirements with the emissions reductions that could be achieved by applying BARCT to the same sources.

State law further requires the South Coast, as an "extreme" nonattainment area for the State ozone air quality standard, to include in its air quality plan all feasible measures that can be implemented within 10 years of the adoption date of its most recent plan. Finally, under State law, the District is specifically required to mandate the use of BARCT for existing power plants (power producers), if ARB determines it is necessary to carry out the District's air quality plan.

A number of additional State and local control programs also address toxic air contaminants from sources in the Wilmington area. Reduction of diesel PM has been an important focus due to the presence of the ports and activities associated with the movement of goods to and from the ports. ARB's Goods Movement Plan is comprehensively reducing emissions and associated health risk in communities near ports, rail yards, and high-traffic corridors. For example, particulate matter emissions from drayage trucks will be reduced by 85 percent. Other regulations will reduce cancer risk from commercial harbor craft and cargo handling equipment by 60 and 80 percent, respectively.

Assessment of Potential Cap-and-Trade Regulation Impacts

Emissions Inventory Development

To assess the potential localized emissions impacts of the cap-and-trade regulation, ARB worked closely with District staff to prepare an updated emissions inventory for the Wilmington assessment area. This 2008 inventory reflects adopted air pollution control measures, plus measures included in the 2007 SIP to meet national air quality standards. The inventory includes estimates for all source types and was updated to reflect the economic downturn. Emissions estimates were also developed for 2020. ARB assumed there would be no change to industrial facility emissions between 2008 and 2020 in the Wilmington area because it is not possible to specifically identify where new facilities would be located or the extent to which facilities might vary operations. However, in all likelihood, emissions from industrial facilities would be lower in 2020 than they currently are with the implementation of new District control measures and declining RECLAIM caps.

Methodology for 2020 Scenarios

Given the flexibility provided by the cap-and-trade regulation, it is not feasible to predict how individual facilities within each community will respond to the requirements of the regulation. As discussed earlier in Section IV.B, market forces, other GHG emissions-reduction efforts, and existing co-pollutant regulatory programs will all influence emissions at individual facilities. Instead, ARB developed three hypothetical bounding scenarios to assess potential cumulative emissions impacts in 2020.

The emissions reductions that that will result from ongoing regulatory programs to reduce co-pollutants between 2008 and 2020 provide the baseline for evaluating the impacts of each scenario. This baseline reflects what would occur in the absence of cap-and-trade, or if all GHG reductions were achieved outside the community. The first scenario explores the potential co-benefits of limiting trading and the use of offsets within a community. The baseline (no change) and the first scenario bound the most likely impact of implementation of the regulation. Although staff concluded that it is not possible to attribute possible co-pollutant increases specifically to the cap-and-trade regulation, for the purpose of a bounding exercise staff examined the potential impacts of general facility growth through two additional scenarios.

ARB staff believes that scenarios two and three are very unlikely to result from the cap-and-trade regulation. Many factors influence a decision to expand production or build a new facility, and the cap-and-trade program itself imposes a new requirement on facilities—the need to procure allowances and offsets to accommodate GHG emissions—in addition to the strict permitting requirements already in effect for criteria pollutants and toxic air contaminants. Under scenario two, every facility would need to purchase allowances and offsets to accommodate any growth. We believe it is more likely that a few facilities may increase production, while others would decrease. Similarly, we do not believe that compliance with the cap-and-trade regulation will cause the siting of new facilities assumed in scenario three, though the regulation would not prevent it. Nevertheless, both scenarios are useful as hypothetical bounding analyses.

The first scenario assumes as a hypothetical upper bound that GHG emissions reductions occur at each of the 15 local industrial and electricity generation facilities in the Wilmington area. As discussed in section IV.B, on average, the cap-and-trade industrial and electricity generation sources will need to reduce their GHG emissions by 4 percent to meet the 2020 cap.[2] Therefore, staff assumed a commensurate 4 percent reduction would occur in combustion-related NOx, $PM_{2.5}$, and ROG from these facilities. These additional reductions would further enhance the cumulative emissions reductions from ongoing programs.

The second scenario represents a hypothetical emissions increase of 4 percent at each of the 15 cap-and-trade facilities in the Wilmington area. While this

[2] Total GHG emissions under baseline conditions in 2020 are estimated to be 507 $MMTCO_2e$. GHG emissions from the capped sectors are approximately 409 $MMTCO_2e$ of the baseline. Reductions needed to meet the cap of 334 $MMTCO_2e$ will come in part through complementary measures from the Scoping Plan. After reductions from those measures, the cap-and-trade regulation is estimated to reduce at least 18 MMTCO2e, representing a 4 percent reduction from capped sector emissions.

scenario provides a hypothetical upper bound of aggregate facility growth in the community, staff believes it is an unlikely situation given the current regulatory structure. As described in Chapter II, each individual unit of permitted equipment has a maximum permitted emission limit. Large facilities such as those covered under cap-and-trade often have hundreds of individual permits. If the facility owner modified that equipment or its operation such that actual emissions would exceed the permitted levels, New Source Review (NSR) and its requirements to implement Best Available Control Technology (BACT) would apply. This is a comprehensive and lengthy process that is subject to public review. The extensive requirements of this permitting process effectively limit the potential for significant emissions increases at a given facility.

In addition, under this scenario, every facility would need to purchase allowances and offsets to accommodate any growth. While there could be growth at a few facilities within a community, as some facilities move to more efficient ways of operation or switch to use of less carbon-intensive fuels, it is very unlikely that emissions would increase at every facility. Much more likely is a situation where a few facilities may increase production, while others would decrease. Nevertheless, staff evaluated the impact of an increase of 4 percent at every facility to represent a potential maximum community-level impact.

Finally, the third scenario evaluated the hypothetical construction of a new facility within the community. A combined heat and power generation facility was selected because petroleum refining is the largest cap-and-trade emissions sector in the Wilmington area. As discussed earlier in Section IV.B of this chapter, one possible response to reduce GHG emissions at refineries would be installation of a combined heat and power unit. This would have the dual benefit of providing a more-efficient heat source for refinery processes, while allowing excess power to be sold back to the grid. Table IV-4, below, provides an estimate of criteria pollutant emissions from a hypothetical 85 megawatt (MW) combined heat and power unit. It is important to remember that under California's existing regulatory structure, the construction of a new facility would be subject to the strict NSR permitting requirements described in Chapter II. This would include requirements to implement BACT, as well as to offset the emissions regionally.

Table IV-4: Estimated Criteria Pollutant Emissions Hypothetical Combined Heat and Power Facility (85 MW Capacity)

	Emissions (tons per day)		
	NO_X	ROG	$PM_{2.5}$
Operating Emissions	0.11	0.05	0.12

The scenario analysis focuses on the industrial and electricity generation facilities covered by the cap-and-trade regulation, and does not address the additional reductions that will likely occur when transportation fuels and commercial and residential natural gas are also included under the cap.

Analysis of Potential Impacts

Under the baseline existing control program, including rules adopted in the 2007 SIP to meet national air quality standards, the Wilmington area will realize further NOx, $PM_{2.5}$, and ROG emissions reductions in 2020. The reductions will come primarily from mobile sources, including light- and heavy-duty vehicles and from port-related activities such as ships maneuvering and anchoring within the port area and equipment used to load and unload ships. As shown in Table IV-5, these ongoing emissions reductions result in a 23 percent reduction in NOx, a 24 percent reduction in $PM_{2.5}$, and a 4 percent reduction in ROG emissions from 2008 levels.

The first scenario assumes that all the emissions reductions needed from the cap-and-trade regulation are implemented locally at the 15 industrial and electricity generation facilities in the Wilmington area, realizing a further 4 percent reduction in combustion-related co-pollutant emissions. Because emissions from the cap-and-trade facilities comprise only a small portion of the overall inventory, these reductions translate into less than a 4 percent decrease in the total inventory for the Wilmington area. In aggregate, full implementation of the cap-and-trade regulation by industrial and electricity generation sources locally would result in an additional 1 percent enhancement in localized NOx and $PM_{2.5}$ reductions, and a small enhancement of less than 1 percent in ROG reductions. While not quantified here, combustion-generated toxic air contaminants would also likely decrease.

Table IV-5: Percent of Emissions Reductions Between 2008 and 2020 Wilmington Area[1]

	NOx	$PM_{2.5}$	ROG
BASELINE Emission Reductions from Existing Controls and No Emission Reductions at Cap-and-Trade Industrial and Electricity Generation Facilities	**23%**	**24%**	**4%**
SCENARIO 1 Emission Reductions from Existing Controls and Emission Reductions at all Cap-and-Trade Industrial and Electricity Generation Facilities	**24%**	**25%**	**4%**
SCENARIO 2 Emission Reductions from Existing Controls and Emission Increases at all Cap-and-Trade Industrial and Electricity Generation Facilities	**22%**	**22%**	**3%**
SCENARIO 3 Emission Reductions from Existing Controls and Addition of New Facility	**23%**	**20%**	**4%**

Numbers are rounded to nearest percentage
[1] These tables include the combined emissions from mobile, area, and stationary sources. The industrial and electricity generation facilities covered by the proposed cap-and-trade regulation represent only a portion of these emissions. The emissions impacts of the scenarios do not include the additional emissions reductions that will likely occur when transportation fuels and commercial and residential natural gas are included in the cap. The emissions reductions from transportation fuels and commercial and residential natural gas would affect each of these scenarios equally.

As described previously, while ARB staff did not find situations where emissions increases were clearly attributable to implementation of cap-and-trade, the second scenario evaluated the potential general impact of an emissions increase of 4 percent at every cap-and-trade facility in the community region. This hypothetical upper-bound increase in emissions would slightly reduce the benefits of the ongoing control program, with a 2 percent reduction in $PM_{2.5}$ benefits, and a 1 percent reduction in NOx and ROG benefits. However, cumulative emissions in the Wilmington area would still be lower in 2020, as compared to 2008.

Scenario 3 explored the potential emission impacts of construction of a new combined heat and power unit at an existing refinery. Based on typical emissions from similar units, the addition of a hypothetical new unit in the community would slightly reduce the benefits of the ongoing control program, with a 4 percent reduction in $PM_{2.5}$ benefits, and a very small reduction that is less than 1 percent in NOx and ROG benefits. Overall, cumulative emissions in the Wilmington area would still be lower in 2020, as compared to 2008.

There is also the potential for increases in toxic air contaminants under scenarios 2 and 3. Toxics emissions are typically reflected in $PM_{2.5}$ and ROG emission estimates, thus efforts to control ROG and $PM_{2.5}$ also help address toxic air contaminants broadly within the community. In addition, the requirements of the "Hot Spots" Information and Assessment Act are designed to assess and mitigate more localized, facility-specific impacts. As described earlier in this section, should emissions of toxics increase such that they exceed the screening threshold, the facility would be required to conduct a Health Risk Assessment. Facilities with emissions that are determined to present a significant risk would then be required to implement measures to reduce that risk.

These scenarios focus on the compliance responses of the industrial sources covered by the cap-and-trade regulation. In 2015, transportation fuels and commercial and residential natural gas will be included in the cap, likely reducing emissions from those sources. Because the reductions associated with transportation fuel and commercial and residential natural gas would be the same for each of the scenarios, ARB chose to focus the analysis on industrial sources. The inclusion of the emissions reductions from transportation fuel and commercial and residential natural gas would likely increase the total co-pollutant benefits of the cap-and-trade regulation.

In all scenarios it is difficult to predict the actual air quality impacts within the local community of any change in emissions. Combustion emissions are often vented through tall stacks. The heat generated by the combustion process can further increase the height of the emissions plume. Refineries in the Wilmington area have plumes than can reach a height of hundreds of meters. As a result, emissions from a large stack may not reach the surface until some distance downwind. In addition, due to dispersion and the time needed for chemical reactions to form regional pollutants such as ozone and secondary particulate matter, the maximum air quality impact may occur well downwind of a facility. In contrast, emissions of toxic air contaminants may have a more localized impact.

Air quality modeling is a standard tool for relating emissions to estimated air quality impacts. However, detailed information is required by the models to quantify the impacts. This information includes specificity on locations and types of emission sources, stack heights, timing of emissions, emission rates, and for point sources, information to characterize the point of release. Due to the ambiguity associated with determining how each individual facility will comply with cap-and-trade, it is impossible to characterize the timing and location of any emissions changes at this time. This makes use of modeling to characterize the air quality impact of potential changes in emissions infeasible.

Health assessments of the impact of air quality changes on human health require estimates of the change in $PM_{2.5}$, ozone, and other air pollutants for an exposed population. The health impact depends on the air pollutant type and ambient concentration, location and duration of exposure, and characteristics of the exposed population, including total residents, age, and baseline incident rates for various death and disease types where a quantitative relationship has been established with an air pollutant. Health assessments in California have been limited to pollution sources where $PM_{2.5}$, ozone, and air toxic exposures can be estimated using measured air quality data as a surrogate for a widely distributed source (e.g., trucks) or with the use of air quality models (e.g., ports and rail yards). However, there is no unique air quality surrogate for the large industrial sources covered by the cap-and-trade regulation to distinguish them from smaller industrial sources or other types of combustion sources. Nor, as discussed above, was it feasible to conduct air quality modeling. Due to this lack of information on the concentration, location, and duration of air pollutant exposures, it was not possible to conduct a health assessment

Summary

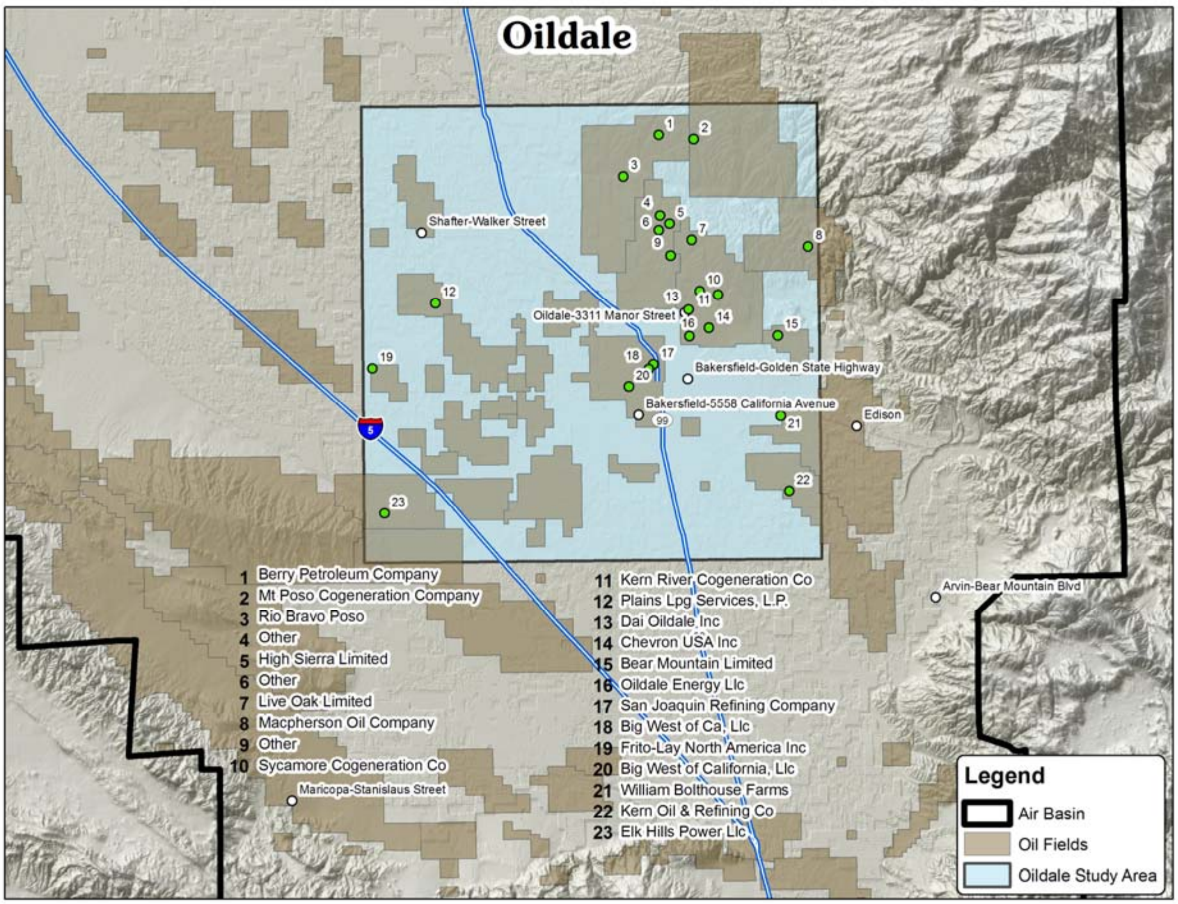
In summary, air quality is improving throughout the Wilmington area. The assessment area meets both the federal annual $PM_{2.5}$ and 8-hour ozone standards and the area is very close to meeting the daily $PM_{2.5}$ standard. California's ongoing co-pollutant emissions control programs will ensure that cumulative emissions will continue to decrease through 2020 in the Wilmington area, with associated health improvements from improved air quality.
While the cap-and-trade regulation allows for flexibility in how facilities comply, staff looked at several scenarios that bound the possibilities, including the construction of a new facility. If emissions reductions due to implementation of the cap-and-trade regulation occur locally at the 15 facilities in Wilmington, there could be some small additional co-benefits from the reduction of combustion-related criteria pollutants. While emissions increases directly attributable to the cap-and-trade regulation are considered very unlikely, potential emissions increases that might occur in general are also expected to be small within the context of the larger cumulative emissions reductions that will be occurring as a result of California's extensive emissions control programs.

Although staff believe that the potential for emissions increases attributable to the proposed rule is very unlikely, ARB is committed to monitoring the implementation of the cap-and-trade regulation to identify and to address any situations where the program has caused an increase in criteria pollutant or toxic emissions. At least once each compliance period, ARB will use information collected through the mandatory reporting regulation, the cap-and-trade regulation, the industrial efficiency audit, and other sources of information to evaluate how individual facilities are complying with the regulation. The cap-and-trade program is another layer of review and opportunity for data gathering, decision-making, and agency and public vigilance to ensure any potential increases are identified and addressed.

2. Oildale-Bakersfield Assessment

The Oildale/Bakersfield area (Bakersfield area) is located in the central portion of Kern County in the San Joaquin Valley Air Basin. It includes not only Oildale, but much of the Bakersfield urban area and the town of Shafter as well (refer to Figure IV-5).

Figure IV-5: Bakersfield Assessment Area



Overall, about 425,000 people live in this area. In addition to significant mobile source emissions from trucks and passenger cars traveling along Highway 99 and Interstate 5, the Bakersfield area is adjacent to a number of oil fields, including two of the largest in California. The Kern River Oil Field to the east and northeast of Oildale has more than 9,000 active wells. It ranks second only to the Midway-Sunset Oil Field in southwestern Kern County. Other sizeable fields in the Bakersfield area include the Kern Front and Poso Creek oil fields north of Oildale and the smaller Fruitvale Oil Field to the southwest. In addition to the oil-related activities, the Bakersfield assessment area also contains a number of cogeneration facilities.

A total of 23 industrial and electricity generation facilities in the Bakersfield area would be subject to the cap-and-trade regulation. These facilities represent a mix of different types of operations. The following sections describe air quality and emissions in the assessment area and the traditional emissions-control programs currently in place. The final section provides a discussion of the emission changes that could occur under the cap-and-trade regulation.

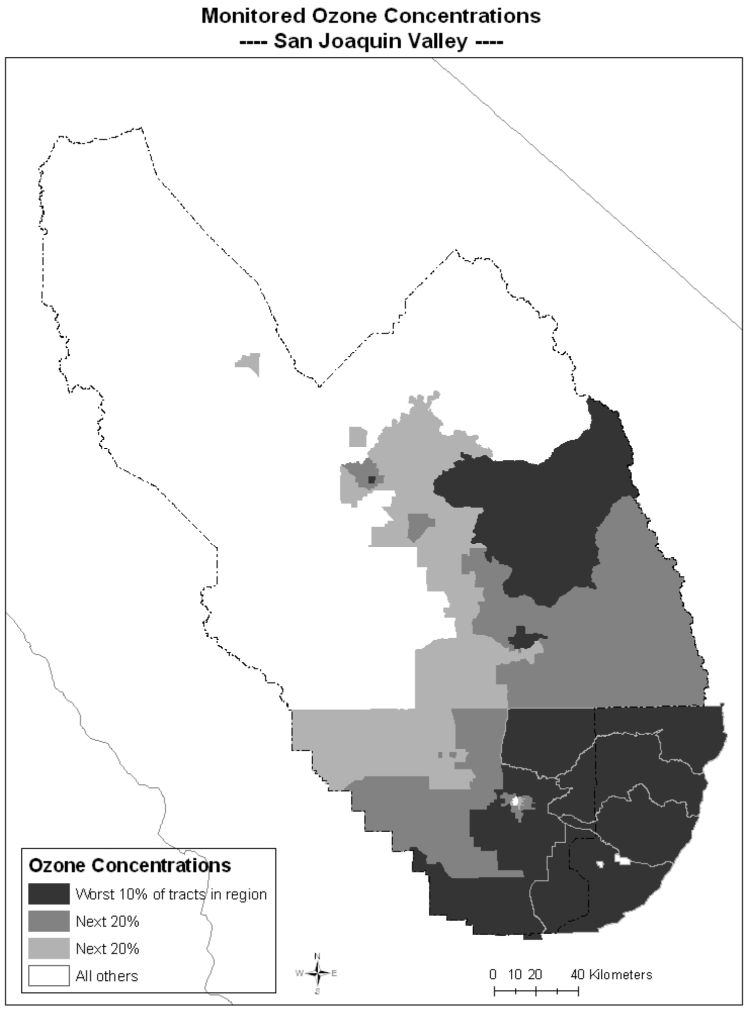
Air Quality

The Bakersfield area is located in San Joaquin Valley (Valley) and falls under the jurisdiction of the San Joaquin Valley Air Pollution Control District (District). The District maintains a comprehensive air quality monitoring network to characterize air quality conditions throughout the region. Based on this monitoring, as well as the mix of sources in the Bakersfield area, the pollutants of greatest concern are ozone, NO_2, $PM_{2.5}$, and toxic air contaminants, which include diesel PM. There are five monitors in the assessment area—one in Oildale, one in Shafter, and three in Bakersfield. Ozone concentrations are measured at Oildale, Shafter, and two of the Bakersfield sites, while $PM_{2.5}$ is measured only at the three Bakersfield sites. As described below, emissions-control programs implemented by the State and by the District have been effective in reducing ambient concentrations of all pollutants in the Bakersfield area.

Ozone

The San Joaquin Valley has one of the most severe ozone problems in the nation. Figure IV-6 shows a relative ranking of ozone concentrations by census tract within the Valley. The mapped ozone levels reflect both the frequency and severity of concentrations above the level of the State 8-hour standard of 0.070 parts per million (ppm), based on data collected during 2004 through 2006. Census tracts with the highest 10 percent of ozone concentrations are shown in black. Because census tracts are not uniform in size, tracts with the top 10 percent of ozone concentrations may not represent 10 percent of the land area of the region. Although work to improve the mapping using more recent data is continuing, Figure IV-6 provides a general indication of the variation in ozone levels across the San Joaquin Valley. Overall, the highest ozone concentrations are found in the extreme south and eastern portions of the Valley, which are affected by emissions and pollutants transported from the upwind urban core areas.

Figure IV-6 : Census Tract Ozone Concentration Map

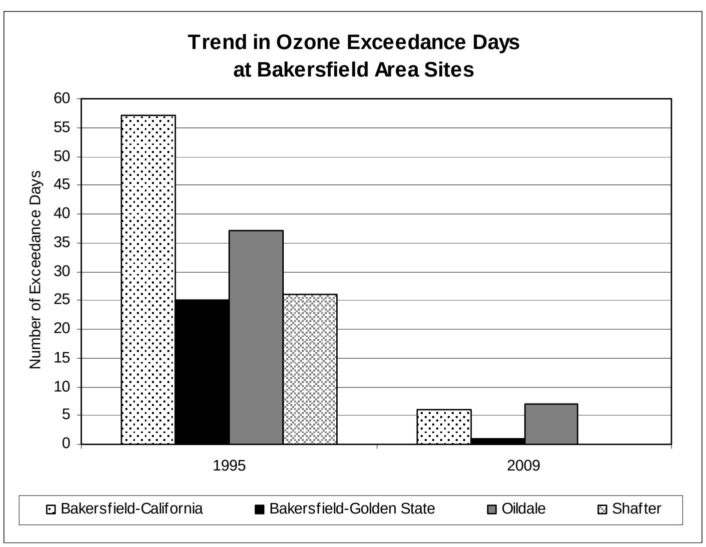


However, because the map in Figure IV-6 shows a relative ranking of concentrations within the San Joaquin Valley, it does not necessarily reflect compliance with the current federal 8-hour ozone standard of 0.80 ppm. Currently, four of the six sites in Madera, Merced, San Joaquin, and Stanislaus counties meet the national 8-hour ozone standard, with concentrations up to 12 percent below the level of the standard. Concentrations at the remaining two sites are little more than 5 percent above the level of the standard. Concentrations at sites in Fresno and Kern counties tend to be higher than in the northern San Joaquin Valley, although several Kern County sites meet or almost meet the standard. The most persistent and challenging problems are found in the far eastern and southern portions of the Valley, where upwind emissions and pollutants tend to be transported and then trapped by the surrounding mountains. The high temperatures and stagnant air movement in these areas tend to exacerbate the overall problem. Concentrations in these areas are 40 to 50 percent above the standard.

As mentioned previously, four San Joaquin Valley ozone monitors are located within the Bakersfield assessment area—one in Oildale, one in Shafter, and two in the Bakersfield urban area. The Bakersfield area has long been in nonattainment for the national ozone standards. However, air quality has improved over the years. The overall pattern of improvement in the Bakersfield area is similar at all four sites, with all showing modest improvement—on the order of 10 to 15 percent—since the early- to mid-1990s. Reductions in this area have not been as substantial as in other parts of California, and three of the four monitors still violate the national 8-hour standard. In 2009, ozone concentrations comparable with the national standard of 0.08 ppm ranged from 0.085 ppm at Shafter to 0.093 ppm at Oildale. In contrast, ozone concentrations were below the level of the standard at the Bakersfield-Golden State Highway site.

The decrease in the number of days with concentrations above the national standard has been more dramatic than the decreases in concentration. Looking at the number of exceedance days provides another estimate of the frequency of exposure to high concentrations. As shown in Figure IV-7, individual sites in the Bakersfield area show drops of nearly 80 to more than 95 percent between 1995 and 2009 (1995 is used as the start year to provide a consistent basis for comparing the various sites; data are not available for some sites prior to the mid-1990s). Note that there were no exceedance days at Shafter during 2009.

Figure IV-7: Trend in Number of 8-Hour Ozone Exceedance Days at Bakersfield Area Sites



As sites in the Bakersfield area move closer to attaining the national standard, a tough challenge still exists. Currently, Arvin, in southern Kern County has the highest ozone concentrations in the Valley, with a value of 0.105 ppm, compared with the standard of 0.08 ppm. Further reducing emissions in the Bakersfield area is critical not only to improving ozone air quality in the local area, but in the downwind areas, as well.

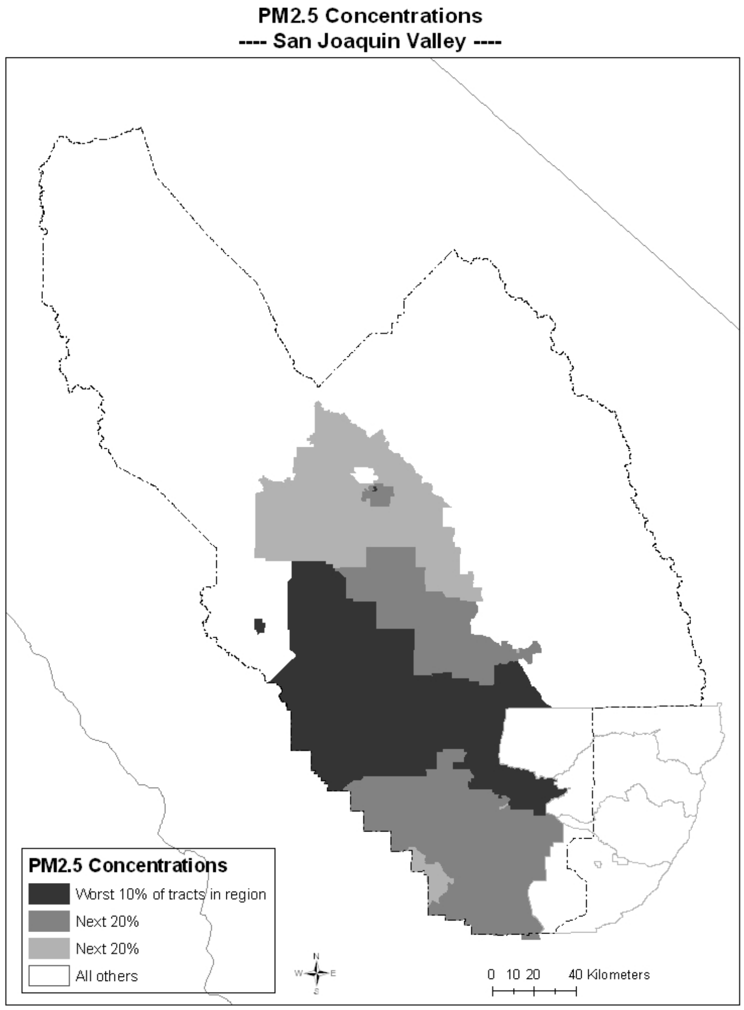
Nitrogen Dioxide

Compared with the national NO_2 standards, concentrations at the three NO_2 monitoring sites in the Bakersfield area are relatively low, and concentrations at all sites meet both the national 1-hour standard of 100 parts per billion (ppb) as well as the national annual standard of 53 ppb. Although these communitywide monitors show compliance with the national standards, they are not sited near roadways, where the highest concentrations are expected to occur. Recognizing this, U.S. EPA recently adopted near-roadway monitoring requirements that will start in January 2013. A total of four near-roadway sites will be deployed in the San Joaquin Valley, with one of them located in the Bakersfield area. As mentioned above, concentrations measured at the near-roadway sites may be higher than those measured at the current communitywide sites.

Fine Particulate Matter

Fine particulate matter, or $PM_{2.5}$, is another pollutant of concern in the Bakersfield area. Overall, $PM_{2.5}$ concentrations are highest in the southern portion of the San Joaquin Valley, where stagnant winter weather conditions, in combination with the surrounding terrain, can trap pollutants for extended periods of time. A relative ranking of $PM_{2.5}$ concentrations within the Valley is illustrated in Figure IV-8. The concentrations reflect annual average $PM_{2.5}$ concentrations by census tract, based on 2004 through 2006 data and using a composite of data from several different types of monitors. Census tracts having the highest 10 percent of $PM_{2.5}$ concentrations are shaded in black. Work is continuing to improve this mapping based on more current data. However, the data in Figure IV-8 still provide a reasonable description of the variability in $PM_{2.5}$ levels in the Valley.

Figure IV-8 : Census Tract $PM_{2.5}$ Concentration Map



Similar to ozone, the map in Figure IV-8 shows only a relative ranking of $PM_{2.5}$ concentrations within the San Joaquin Valley and therefore does not give any indication of how the concentrations compare with the national standard. $PM_{2.5}$ measurements in the southern Valley are among the highest in the nation, ranging from about 30 to 50 percent above the level of the national annual $PM_{2.5}$ standard of 15 µg/m^3. Similarly, 24-hour concentrations in this area are about twice the level of the national 24-hour $PM_{2.5}$ standard of 35 µg/m^3. In contrast, concentrations in the northern portion of the Valley are all below the level of the annual standard.

Three $PM_{2.5}$ monitoring sites are located in the Bakersfield study area. Current annual average concentrations range from 19.3 µg/m^3 to 22.6 µg/m^3 and are the highest values measured in the San Joaquin Valley. Although still well above the standard, annual $PM_{2.5}$ concentrations decreased 5 to 15 percent between 2002 and 2009 at the three monitoring sites in the assessment area. There has been a slightly greater improvement in 24-hour $PM_{2.5}$ concentrations—between 10 and 25 percent reduction since 2002. As ARB continues to implement programs to further reduce directly emitted $PM_{2.5}$ and $PM_{2.5}$ precursor emissions, $PM_{2.5}$ air quality will continue to improve throughout the San Joaquin Valley.

$PM_{2.5}$ data are sometimes further analyzed for individual components to provide additional insight about the types of sources contributing to ambient concentrations. $PM_{2.5}$ chemical component data are available from one of the Bakersfield sites. Ammonium nitrate is the largest single component, accounting for about 45 percent of the total $PM_{2.5}$ mass, with organic and elemental carbon comprising another 30 percent. Between 2002 and 2009, decreases were seen primarily in organic and elemental carbon, reflecting implementation of the District's stringent residential wood burning curtailment program, as well as efforts to reduce diesel PM.

Diesel PM and Other Toxic Air Contaminants

Diesel PM, considered a toxic air contaminant, is emitted by various stationary and mobile sources throughout the San Joaquin Valley. Exposure to diesel PM poses a potential cancer risk, as well as contributing to $PM_{2.5}$ levels with its associated risk for premature mortality. Although other air toxics are also present in the air, diesel PM comprises, by far, the highest risk potential. Unlike other pollutants, there is currently no method for monitoring diesel PM concentrations in the ambient air. However, ambient concentrations and associated cancer risk can be estimated from measurements of other co-pollutants. Based on an ARB staff methodology using NOx concentrations as an indicator of diesel PM, the population-weighted average diesel PM concentration in the San Joaquin Valley is estimated to be 1.2 $\mu g/m^3$, while the population-weighted value for Kern County is 1.4 $\mu g/m^3$. These levels translate to an excess cancer risk between 360 and 420 per million over a 70-year lifetime. As ARB and the District continue implementation of more stringent emission controls, the impact of diesel PM will decrease. These reductions will also be reflected in ambient $PM_{2.5}$ concentrations, since diesel PM is an important constituent of $PM_{2.5}$.

Diesel PM is not the only air toxic of concern in the Bakersfield area. Although ARB has identified close to 200 air toxics, eight pose the greatest remaining risk in California. The eight compounds include acetaldehyde, benzene, 1,3-butadiene, formaldehyde, hexavalent chromium, methylene chloride, *para*-dichlorobenzene, and perchloroethylene. Since the early 1990s, ARB has operated two toxics monitoring sites in the Bakersfield urban area, and the overall risk numbers for the Bakersfield sites are comparable to those for the other site in the San Joaquin Valley, which is located in the Fresno urban area.

Monitoring data for the eight air toxics other than diesel PM show an overall drop of 75 percent in excess cancer risk at the Bakersfield sites between 1990 and 2009. Ninety percent of the overall decrease is attributable to reductions in benzene and 1,3-butadiene. These two compounds are generally associated with motor vehicles and their fuels. California's statewide motor vehicle emissions control programs have been and will continue to be instrumental in reducing the cancer risk from these air toxics.

Emissions

Emissions of ROG, NOx, and $PM_{2.5}$ are the major contributors to ozone and $PM_{2.5}$ levels in the Bakersfield area. While SOx emissions also contribute to the formation of secondary $PM_{2.5}$, SOx is a much smaller contributor to $PM_{2.5}$, as compared to secondary $PM_{2.5}$ from NOx in California. Since 1990, the San Joaquin Valley has seen a significant decrease in the emissions of these pollutants—a 36 percent decrease in NOx, a 42 percent decrease in ROG, and a 17 percent decrease in $PM_{2.5}$. Current estimates show that overall, about a quarter of the Valley's total NOx and ROG emissions come from sources in Kern County.

The Bakersfield assessment area comprises a relatively urbanized portion of the Valley and contains a variety of emissions sources. The sources contributing to emissions in the Bakersfield area can be divided into three general categories—stationary sources, area sources, and mobile sources. *Stationary sources* are industrial facilities that can be identified by name and specific location. These include facilities such as refineries, cogeneration facilities, and manufacturing plants. *Area sources* include widely distributed sources such as gas stations, residential fireplaces, consumer products, farming operations, and construction and demolition activities. In contrast to these, *mobile sources* move around. They can be further subdivided into on-road motor vehicles and off-road motor vehicles. On-road motor vehicles include vehicles that travel on local roads and freeways, such as light- and medium-duty passenger cars, passenger trucks, and motorcycles, as well as heavy-duty vehicles like diesel trucks and buses. Off-road mobile sources include equipment such as tractors, harvesters, cranes, and locomotives.

As shown in Table IV-6, emissions from mobile sources, particularly on-road motor vehicles, dominate the local NOx, $PM_{2.5}$, and ROG inventories. Together, light-/medium-duty vehicles and heavy-duty vehicles account for two-thirds to three-fourths of the local inventories for each of these pollutants.

Table IV-6: 2008 Bakersfield Area Emissions by Source Type (tons/day)

	NOx	$PM_{2.5}$	ROG
Stationary	**3.3**	**1.2**	**2.8**
Capped	2.7	0.7	1.3
Non-Capped	0.7	0.5	1.5
Area	**3.0**	**2.6**	**21.4**
Mobile	**27.2**	**1.1**	**9.0**
Light Duty On-Road	3.5	0.2	4.2
Heavy Duty On-Road	15.9	0.6	1.8
Off-Road	7.8	0.3	3.0
Total*	**33.5**	**4.9**	**33.2**

Sum of individual categories may not equal total because of rounding.

There are a number of industrial and electricity generation facilities located throughout the San Joaquin Valley that would be directly subject to the cap-and-trade regulation. A number of these facilities are concentrated in Kern County, and in the Bakersfield area, in particular. Table IV-7 provides a list of facilities in the Bakersfield area that would be subject to the cap-and-trade regulation, and the map in Figure IV-5 shows their location. More than half of the 23 affected facilities in the Bakersfield area are cogeneration facilities, four are refineries, and the remaining facilities are related to the extraction of fossil fuels, electricity generation, and food processing.

Overall, these 23 facilities account for 50 percent or more of the total stationary source NOx, $PM_{2.5}$, and ROG emissions in the local Bakersfield area. While the affected facilities together account for significant amounts of the overall emissions, the majority of emissions for each pollutant type come from only seven of the facilities that would be subject to the cap-and-trade regulation. These facilities generally comprise cogeneration activities and petroleum refinery operations.

Petroleum refining is an energy-intensive process, and refineries are among some of the largest NOx emitters in the State. The production of fuels includes initial distillation or separation of crude oil into light and heavy components. This is generally followed by cracking or conversion of these components into new hydrocarbons. Both of these processes require high-temperature furnaces that produce combustion emissions. The final stage includes the blending and purification to meet specific requirements for different grades of fuels. Non-combustion-related emissions occur due to fugitive releases from the array of piping that transports the oil between processes, as well from tank farms, which are used to store the various products.

Kern County is well known for its petroleum resources and production, and it has been a major oil producer since the early 1900s. As oil recovery became more difficult, Kern County became a pioneer in the field of thermally enhanced oil recovery, the process whereby heavy oil is heated, usually by steam or hot water injection, making it more fluid and easier to pump from the ground. Because the process requires power in the oil fields, cogeneration developed rapidly to fill the need.

Table IV-7: Bakersfield Area Facilities that Would Be Subject to Cap-and-Trade

Facility Name	***GHG Reporting Sector***
Big West Of California, LLC	Petroleum Refinery
Big West Of California, LLC	Petroleum Refinery
San Joaquin Refining Company	Petroleum Refinery
Kern Oil & Refining Co.	Petroleum Refinery
Plains LPG Services, L.P.	General Stationary Combustion
Oildale Energy LLC	Cogeneration Facility
Kern River Cogeneration Co.	Cogeneration Facility
Mt. Poso Cogeneration Company	Cogeneration Facility
Live Oak Limited	Cogeneration Facility
William Bolthouse Farms	General Stationary Combustion
Sycamore Cogeneration Co.	Cogeneration Facility
Dai Oildale Inc.	Cogeneration Facility
Rio Bravo Poso	Electricity Generation / Cogeneration Facility
High Sierra Limited	Cogeneration Facility
Double C Limited	Cogeneration Facility
Kern Front Limited	Cogeneration Facility
Chevron USA Inc.	General Stationary Combustion / Cogeneration Facility
Badger Creek Limited	Cogeneration Facility
Macpherson Oil Company	General Stationary Combustion
Bear Mountain Limited	Cogeneration Facility
Frito-Lay North America Inc	General Stationary Combustion / Cogeneration Facility
Elk Hills Power LLC	Electricity Generation
Berry Petroleum Company	General Stationary Combustion

In addition to criteria pollutant emissions, the 23 facilities subject to the cap-and-trade regulation also emit toxic air contaminants. Air toxics emitted from refining and co-generation include benzene, hexane, toluene, and xylenes. As discussed in Chapter II, these facilities are required to report their emissions under the "Hot Spots" Information and Assessment Act. Facilities whose emissions and risk potential exceed a certain threshold must prepare a Health Risk Assessment

(HRA). The HRA further evaluates potential health risks and specifies appropriate mitigation measures. Criteria for these thresholds were developed by the California Air Pollution Control Officers Association in consultation with the Office of Environmental Health and Hazard Assessment. Ten of the facilities in the Bakersfield area have conducted an HRA, as shown in Table IV-8. None of these facilities pose a cancer risk of more than ten excess cancer cases per million people.

Table IV-8: Cap-and-Trade Program Facilities with Health Risk Assessments

Facility Name
San Joaquin Refining
Kern Oil & Refining
Rio Bravo Poso
Big West of California LLC
William Bolthouse Farms
Sycamore Cogeneration Co.
Kern River Cogeneration Co.
Mt. Poso Cogeneration Co.
Macpherson Oil Company
Elk Hills Power

Existing Control Programs

The longstanding control programs described in Chapter II have reduced emissions throughout the Valley, as reflected in air quality improvements. Although air quality has improved over time, much more needs to be done in order to bring all parts of the Valley into attainment. Under the federal Clean Air Act, California developed a statewide emissions-reduction strategy that will provide a significant portion of the emissions reductions needed to attain the national standards. In addition, the District has adopted a plan that provides the remaining reductions needed for attainment. Together, these comprise the SIP for the entire San Joaquin Valley.

The SIP relies heavily on NOx reductions as the most efficient and effective strategy for attaining both the national ozone and $PM_{2.5}$ standards. Overall, the

SIP calls for a 75 percent reduction in NOx emissions and a 25 percent reduction in ROG emissions in the Valley from 2006 levels. Photochemical modeling analyses show that these reductions will provide for attaining the national annual $PM_{2.5}$ standard by 2015 and the national ozone standard by 2024, as required by the federal Clean Air Act.

In addition to future statewide control measures, the District has a longstanding local control program aimed at reducing emissions from stationary sources. San Joaquin Valley air district regulations for stationary gas turbines (Rule 4703), for boilers, heaters, and steam generators (Rules 4305, 4306 and 4320), or for stationary internal combustion engines (Rule 4702) apply to combustion sources at most of the facilities in the Oildale assessment area that would be capped. These prohibitory rules set emission limits that are among the most stringent in the State. In addition, the District has Best Available Control Technology (BACT) requirements in place for both new and modified sources as part of its New Source Review program. Finally, in an effort to accelerate attainment, the District has implemented a "Fast Track" action plan focused on expediting the adoption of regulations at the State and federal levels; pursuing increased funding for local programs and encouraging the development and implementation of innovative emissions-control measures.

Assessment of Potential Cap-and-Trade Regulation Impacts

Emissions Inventory Development

To assess the potential localized emissions impacts of the cap-and-trade regulation, ARB worked closely with District staff to prepare an updated emissions inventory for the Bakersfield assessment area. This 2008 inventory reflects adopted air pollution control measures, plus measures included in the 2007 SIP to meet national air quality standards. The inventory includes estimates for all source types and was updated to reflect the economic downturn. Emissions estimates were also developed for 2020. ARB assumed there would be no change to industrial facility emissions between 2008 and 2020 in the Bakersfield area because it is not possible to specifically identify where new facilities would be located or the extent to which facilities might vary operations. However, in all likelihood, emissions from industrial facilities would be lower in 2020 than they currently are with the implementation of new control measures from ongoing control programs.

Methodology for 2020 Scenarios

Given the flexibility provided by the cap-and-trade regulation, it is not feasible to predict how individual facilities within each community will respond to the requirements of the regulation. As discussed earlier in Section IV.B, market forces, other GHG emissions-reduction efforts, and existing co-pollutant regulatory programs will all influence emissions at individual facilities. Instead, ARB developed three hypothetical bounding scenarios to assess potential cumulative emissions impacts in 2020.

The emissions reductions that that will result from ongoing regulatory programs to reduce co-pollutants between 2008 and 2020 provide the baseline for evaluating the impacts of each scenario. This baseline reflects what would occur in the absence of cap-and-trade, or if all GHG reductions were achieved outside the community. The first scenario explores the potential co-benefits of limiting trading and the use of offsets within a community. The baseline (no change) and the first scenario bound the most likely impact of implementation of the regulation. Although staff concluded that it is not possible to attribute possible co-pollutant increases specifically to the cap-and-trade regulation, for the purpose of a bounding exercise staff examined the potential impacts of general facility growth through two additional scenarios.

ARB staff believes that scenarios two and three are very unlikely to result from the cap-and-trade regulation. Many factors influence a decision to expand production or build a new facility, and the cap-and-trade program itself imposes a new requirement on facilities—the need to procure allowances and offsets to accommodate GHG emissions—in addition to the strict permitting requirements already in effect for criteria pollutants and toxic air contaminants. Under scenario two, every facility would need to purchase allowances and offsets to accommodate any growth. We believe it is more likely that a few facilities may increase production, while others would decrease. Similarly, we do not believe that compliance with the cap-and-trade regulation will cause the siting of new facilities assumed in scenario three, though the regulation would not prevent it. Nevertheless, both scenarios are useful as hypothetical bounding analyses.

The first scenario assumes as a hypothetical upper bound that GHG emissions reductions occur at each of the 23 local industrial and electricity generation facilities in the Bakersfield area. As discussed in Section IV.B, on average, the cap-and-trade industrial and electricity generation sources will need to reduce their GHG emissions by 4 percent to meet the 2020 cap.[3] Therefore, staff assumed a commensurate 4 percent reduction would occur in combustion related NOx, $PM_{2.5}$, and ROG from these facilities. These additional reductions would further enhance the cumulative emissions reductions from ongoing programs.

The second scenario represents a hypothetical emissions increase of 4 percent at each of the 23 cap-and-trade facilities in the Bakersfield area. While this scenario provides an expected upper bound of aggregate facility growth in the community, staff believes it is an unlikely situation given the current regulatory

[3] Total GHG emissions under baseline conditions in 2020 are estimated to be 507 $MMTCO_2e$. GHG emissions from the capped sectors are approximately 409 $MMTCO_2e$ of the baseline. Reductions needed to meet the cap of 334 $MMTCO_2e$ will come in part through complementary measures from the Scoping Plan. After reductions from those measures, the cap-and-trade regulation is estimated to reduce at least 18 $MMTCO_2e$, representing a 4 percent reduction from capped sector emissions.

structure. As described in Chapter II, each individual unit of permitted equipment has a maximum permitted emission limit. Large facilities such as those covered under cap-and-trade often have hundreds of individual permits. If the facility owner modified that equipment or its operation such that actual emissions would exceed the permitted levels, New Source Review (NSR) and its requirements to implement Best Available Control Technology (BACT) would apply. This is a comprehensive and lengthy process that is subject to public review. The extensive requirements of this permitting process effectively limit the potential for significant emissions increases at a given facility.

In addition, under this scenario, every facility would need to purchase allowances and offsets to accommodate any growth. While there could be growth at a few facilities within a community, as some facilities move to more efficient ways of operation or switch to use of less carbon-intensive fuels, it is very unlikely that emissions would increase at every facility. Much more likely is a situation where a few facilities may increase production, while others would decrease. Nevertheless, staff evaluated the impact of an increase of 4 percent at every facility to represent a potential maximum community-level impact.

Finally, the third scenario evaluated the hypothetical construction of a new biorefinery within the Bakersfield area. As discussed earlier in Section IV.B of this chapter, the Low Carbon Fuel Standard and the federal renewable fuels standard have mandated that biofuels become a greater portion of transportation fuels in order to reduce GHG emissions. Agricultural activities in the San Joaquin Valley generate materials that could be used to fuel a biorefinery. Table IV-9, below, provides an estimate of criteria pollutant emissions from a hypothetical biofuel refinery with 50 million gallons per year capacity. It is important to remember that under California's existing regulatory structure, the construction of a new facility would be subject to the strict NSR permitting requirements described in Chapter II. This would include requirements to implement BACT, as well as to offset the emissions regionally. There is also the potential for increased truck traffic to deliver biomass to the plant. However, due to ARB regulations, in 2020 most trucks will be required to be equipped with the cleanest 2010 engines, as well as diesel particulate traps.

Table IV-9: Estimated Criteria Pollutant Emissions
Hypothetical Biofuel Refining Facility
(50 million gallons/year capacity)

	Emissions (tons per day)		
	NO_X	ROG	PM_{10}
Cellulosic Ethanol Facility	0.26	0.69	0.27

The scenario analysis focuses on the industrial and electricity generation facilities covered by the cap-and-trade regulation, and does not address the additional reductions that will likely occur when transportation fuels and commercial and residential natural gas are also included under the cap.

Analysis of Potential Impacts

Under the existing baseline control program, including rules adopted in the 2007 SIP to meet national air quality standards, the Bakersfield area would still realize NOx, $PM_{2.5}$, and ROG emissions reductions in 2020. The reductions will come primarily from on-road and off-road motor vehicles. As shown in Table IV-10, these ongoing emissions reductions result in a 44 percent reduction in NOx and an 11 percent reduction in both $PM_{2.5}$ and ROG emissions from 2008 levels.

The first scenario assumes that all the emissions reductions needed from the cap-and-trade regulation are implemented locally at the 23 industrial and electricity generation facilities in the Bakersfield area, realizing a further 4 percent reduction in co-pollutant emissions. Because emissions from the cap-and-trade facilities comprise only a small portion of the overall inventory, these reductions translate into less than a 4 percent decrease in the total inventory for the Bakersfield area. In aggregate, full implementation of the cap-and-trade regulation by industrial and electricity generation sources locally would result in an additional 1 percent enhancement in localized NOx reductions, and a small, less than 1 percent, enhancement in localized $PM_{2.5}$ and ROG reductions. While not quantified here, combustion-generated toxic air contaminants would also likely decrease.

Table IV-10: Percent Emissions Reductions Between 2008 and 2020: Bakersfield Area[1]

	NOx	$PM_{2.5}$	ROG
BASELINE Emission Reductions from Existing Controls and No Emission Reductions from Cap-and-Trade Industrial and Electricity Generation Facilities	**44%**	**11%**	**11%**
SCENARIO 1 Emission Reductions from Existing Controls and Emission Reductions at all Cap-and-Trade Industrial and Electricity Generation Facilities	**45%**	**11%**	**11%**
SCENARIO 2 Emissions Reductions from Existing Controls and Emission Increases at all Cap-and-Trade Industrial and Electricity Generation Facilities	**44%**	**10%**	**11%**
SCENARIO 3 Emissions Reductions from Existing Controls and Addition of New Facility	**44%**	**7%**	**9%**

Numbers are rounded to nearest percentage

[1] These tables include the combined emissions from mobile, area, and stationary sources. The industrial and electricity generation facilities covered by the proposed cap-and-trade regulation represent only a portion of these emissions. The emissions impacts of the scenarios do not include the additional emissions reductions that will likely occur when transportation fuels and commercial and residential natural gas are included in the cap. The emissions reductions from transportation fuels and commercial and residential natural gas would affect each of these scenarios equally.

As described previously, while ARB staff did not find situations where emissions increases were clearly attributable to implementation of cap-and-trade, the second scenario evaluated the potential general impact of an emissions increase of 4 percent at every cap-and-trade industrial and electricity generation facility in the assessment area. This hypothetical upper-bound increase in emissions would slightly reduce the overall benefits of the ongoing control program, with a 1 percent reduction in $PM_{2.5}$ benefits, and a very small reduction that is less than 1 percent in NOx and ROG benefits. However, cumulative emissions in the Bakersfield area would still be lower in 2020, as compared with 2008.

Scenario three explored the potential emission impacts of constructing a new biofuel refining facility. Based on typical emissions from similar facilities, the addition of a hypothetical new facility in the Bakersfield area would slightly reduce the benefits of the ongoing control program, with a 4 percent reduction in $PM_{2.5}$ benefits, 2 percent reduction in ROG benefits, and a small reduction that is less than 1 percent in NOx benefits. However, overall, cumulative emissions in the Bakersfield area would still be lower in 2020, when compared with 2008.

There is also the potential for increases in toxic air contaminants under scenarios 2 and 3. Toxics emissions are typically reflected in $PM_{2.5}$ and ROG emission estimates. Thus, efforts to control ROG and $PM_{2.5}$ also help address toxic air contaminants, broadly within the community. In addition, the requirements of the "Hot Spots" Information and Assessment Act are designed to assess and mitigate more localized, facility-specific impacts. As described in earlier in this section, should emissions of toxics increase such that they exceed the screening threshold, the facility would be required to conduct an HRA. Facilities with emissions that are determined to present a significant risk would then be required to implement measures to reduce that risk.

These scenarios focus on the compliance responses of the industrial sources covered by the cap-and-trade regulation. In 2015, transportation fuels and commercial and residential natural gas will be included in the cap, likely reducing emissions from those sources. Because the reductions associated with transportation fuel and commercial and residential natural gas would be the same for each of the scenarios, ARB chose to focus the analysis on industrial sources. The inclusion of the emissions reductions from transportation fuel and commercial and residential natural gas would likely increase the total co-pollutant benefits of the cap-and-trade regulation.

In all scenarios described above, it is difficult to predict the actual air quality impacts within the local community resulting from any change in emissions. Combustion emissions are often vented through tall stacks. The heat generated by the combustion process can further increase the height of the emissions plume. Refineries can often have stacks that are hundreds of meters tall. As a result, emissions from a large stack may not reach the surface until some distance downwind. In addition, because of dispersion and the time needed for chemical reactions to form regional pollutants such as ozone and secondary particulate matter, the maximum air quality impact may occur well downwind of a facility. In contrast, emissions of toxic air contaminants may have a more localized impact.

Air quality modeling is a standard tool for relating emissions to estimated air quality impacts. However, detailed information is required by the models to quantify the impacts. This information includes specificity on the locations and types of emission sources, stack heights, timing of emissions, emission rates, and for point sources, information to characterize the point of release. Due to the ambiguity associated with determining how each individual facility will comply with cap-and-trade, it is impossible to characterize the timing and location of any emissions changes at this time. This makes the use of modeling to characterize the air quality impact of potential changes in emissions infeasible.

Health assessments of the impact of air quality changes on human health require estimates of the change in $PM_{2.5}$, ozone, and other air pollutants for an exposed population. The health impact depends on the air pollutant type and ambient concentration, location and duration of exposure, and characteristics of the exposed population, including total residents, age, and baseline incident rates for various death and disease types where a quantitative relationship has been established with an air pollutant. Health assessments in California have been limited to pollution sources where $PM_{2.5}$, ozone, and air toxic exposures can be estimated using measured air quality data as a surrogate for a widely distributed source (e.g., trucks) or with the use of air quality models (e.g., ports and rail yards). However, there is no unique air quality surrogate for the large industrial sources covered by the cap-and-trade regulation to distinguish them from smaller industrial sources or other types of combustion sources. Nor, as discussed above, was it feasible to conduct air quality modeling. Due to this lack of information on the concentration, location, and duration of air pollutant exposures, it was not possible to conduct a health assessment

Summary

In summary, air quality is improving throughout the Bakersfield area, and the assessment area is making progress toward meeting the federal $PM_{2.5}$ and 8-hour ozone standards. California's ongoing co-pollutant emissions control programs will ensure that cumulative emissions will continue to decrease through 2020 in the Bakersfield area, with associated health improvements from improved air quality.

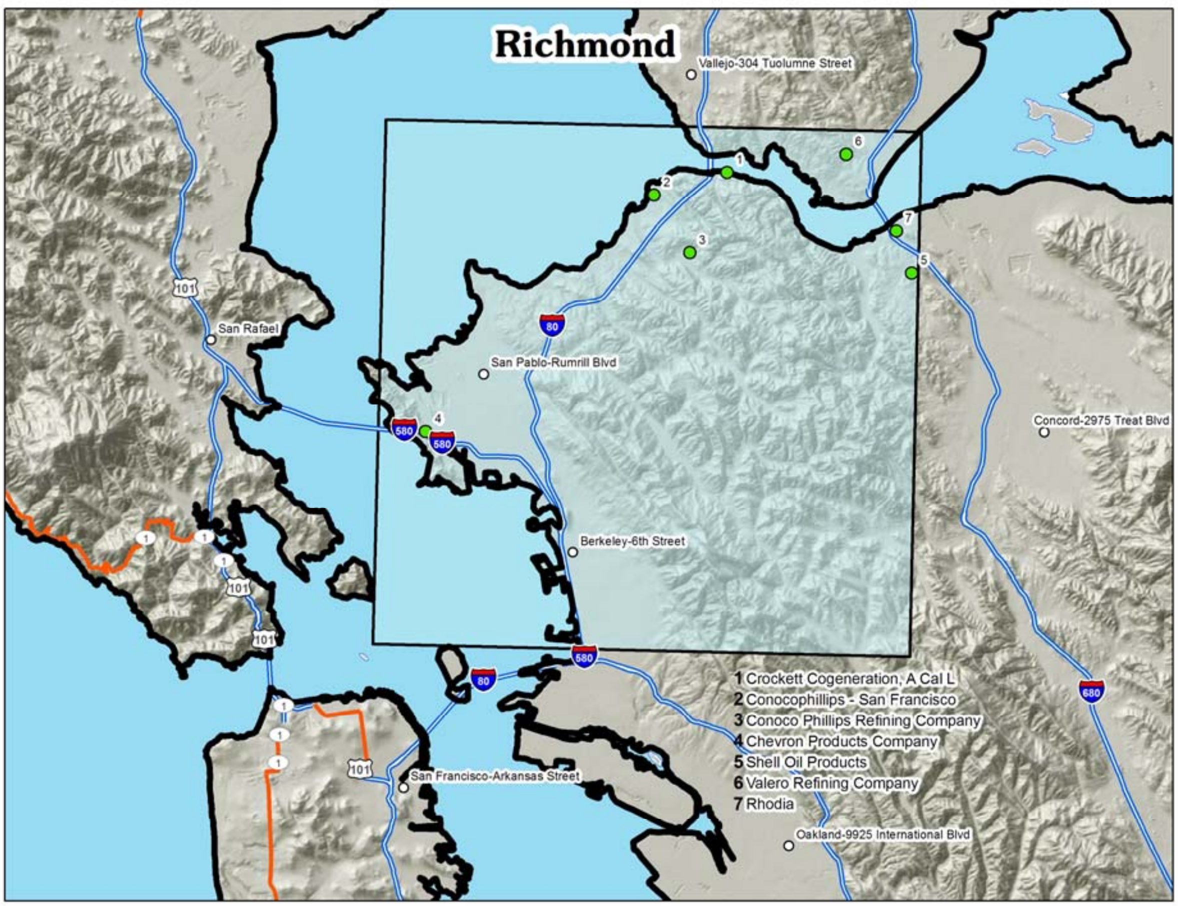
While the cap-and-trade regulation allows for flexibility in how facilities comply, staff looked at several scenarios that bound the possibilities, including the construction of a new facility. If emissions reductions due to implementing the cap-and-trade regulation occur locally at the 23 facilities in the assessment area, there could be some small additional co-benefits from the reduction of combustion-related criteria pollutants. While emissions increases directly attributable to the cap-and-trade regulation are considered very unlikely, potential emissions increases that might occur in general are also expected to be small within the context of the larger cumulative emissions reductions that will be occurring as a result of California's extensive emissions control programs.

Although staff believe that the potential for emissions increases attributable to the proposed rule is very unlikely, ARB is committed to monitoring the implementation of the cap-and-trade regulation to identify and to address any situations where the program has caused an increase in criteria pollutant or toxic emissions. At least once each compliance period, ARB will use information collected through the mandatory reporting regulation, the cap-and-trade regulation, the industrial efficiency audit, and other sources of information to evaluate how individual facilities are complying with the regulation. The cap-and-trade program is another layer of review and opportunity for data gathering, decision-making, and agency and public vigilance to ensure any potential increases are identified and addressed.

3. Richmond Assessment

The Richmond area, located on both the San Pablo and San Francisco Bays, encompasses portions of Contra Costa, Alameda, and Solano Counties, and includes portions of the cities of Richmond, El Cerrito, Berkeley, Emeryville, Benicia, and Alameda (refer to Figure IV-9). The area is home to a racially and ethnically diverse population of approximately 500,000 people and contains a wide range of stationary and mobile source emissions. These sources include the Port of Richmond and the Richmond Rail Yard, which produce diesel and fugitive emissions from bulk transport operations. In addition the Richmond area is home to oil refineries, power plants, and major transportation corridors, as well as other industrial and commercial operations.

Figure IV-9: Richmond Assessment Area



A total of seven industrial and electricity generation facilities in the Richmond area would be subject to a cap-and-trade program. The following sections describe air quality and emissions in the Richmond area and the traditional emissions control programs currently in place. The last section provides a discussion of potential emission changes that could occur under the cap-and-trade regulation.

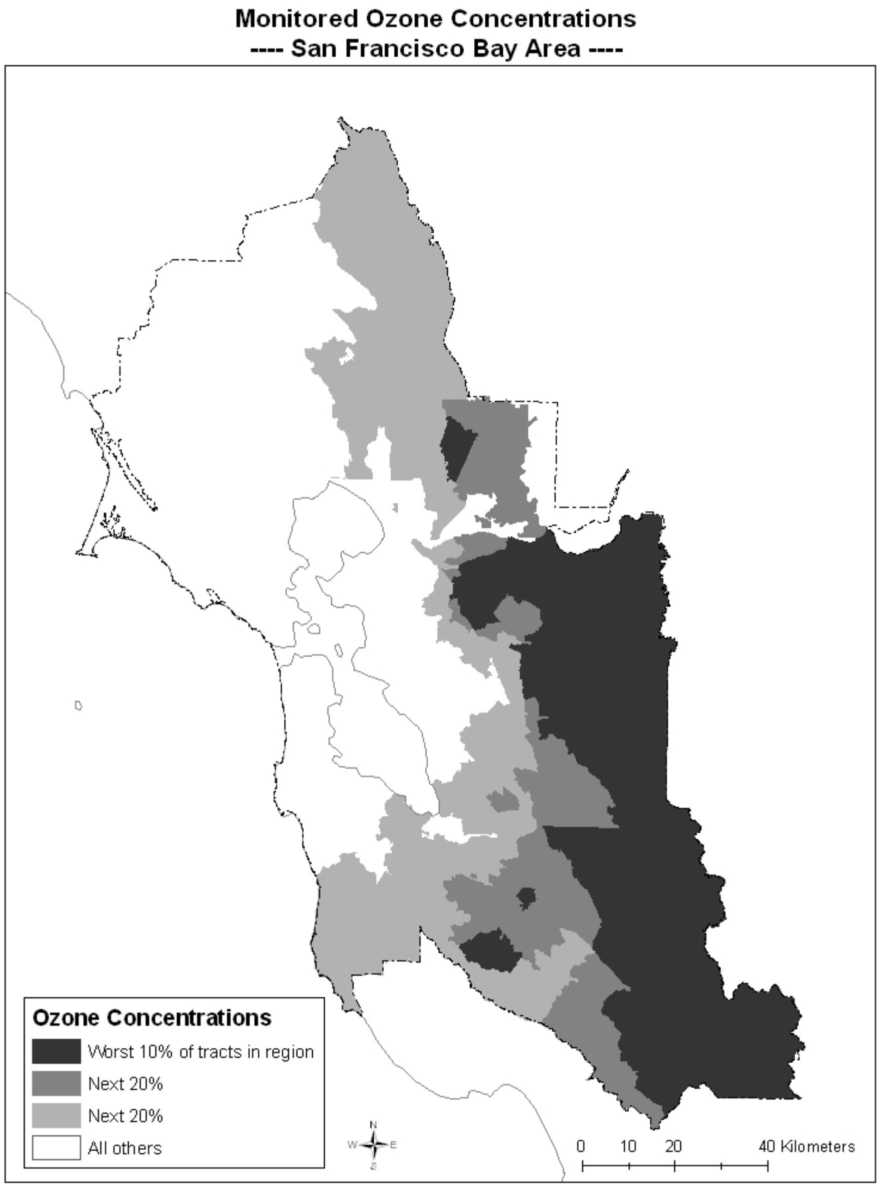
Air Quality

The Richmond area is located in the Bay Area Air Quality Management District (District). The District maintains a comprehensive air quality monitoring network to characterize air quality conditions throughout the region. Based on this monitoring and the mix of sources in the Richmond area, the pollutants of greatest concern are ozone, $PM_{2.5}$, and toxics, including diesel PM. There is one monitor in the assessment area, at San Pablo. Other monitors operating just outside the area include San Francisco to the west, Vallejo to the north, and Oakland to the south. Ozone concentrations are measured at all sites, with $PM_{2.5}$ measured at sites outside the assessment area. As described below, emissions-control programs implemented by the State and by the District have been effective in reducing ambient concentrations of all pollutants in the Richmond area.

Ozone

Ozone air quality throughout the San Francisco Bay Area (Bay Area) is generally good. Its coastal location, with cool temperatures and frequent sea breezes, prevents the build-up of high ozone concentrations. Figure IV-10, below, displays a relative ranking of ozone concentrations by census tract within the San Francisco Bay Area. The ozone levels shown reflect a measure of both the frequency and severity of concentrations above the State 8-hour ozone standard of 0.070 parts per million (ppm) between 2004 and 2006. Census tracts with the 10 percent highest ozone concentrations within the Bay Area are shown in black. Because census tracts are not uniform in size, tracts with the top 10 percent of ozone concentrations may not represent 10 percent of the land area of the region. Although further work is under way to improve this mapping using the most recent data available, it provides a general depiction of the variability in ozone levels throughout the region. Overall, the highest ozone concentrations are found in the inland areas located east of the urban core, along the western slope of the Coastal Range. These inland areas tend to have the higher temperatures and more stagnant conditions that favor ozone formation.

Figure IV-9 : Census Tract Ozone Concentration Map



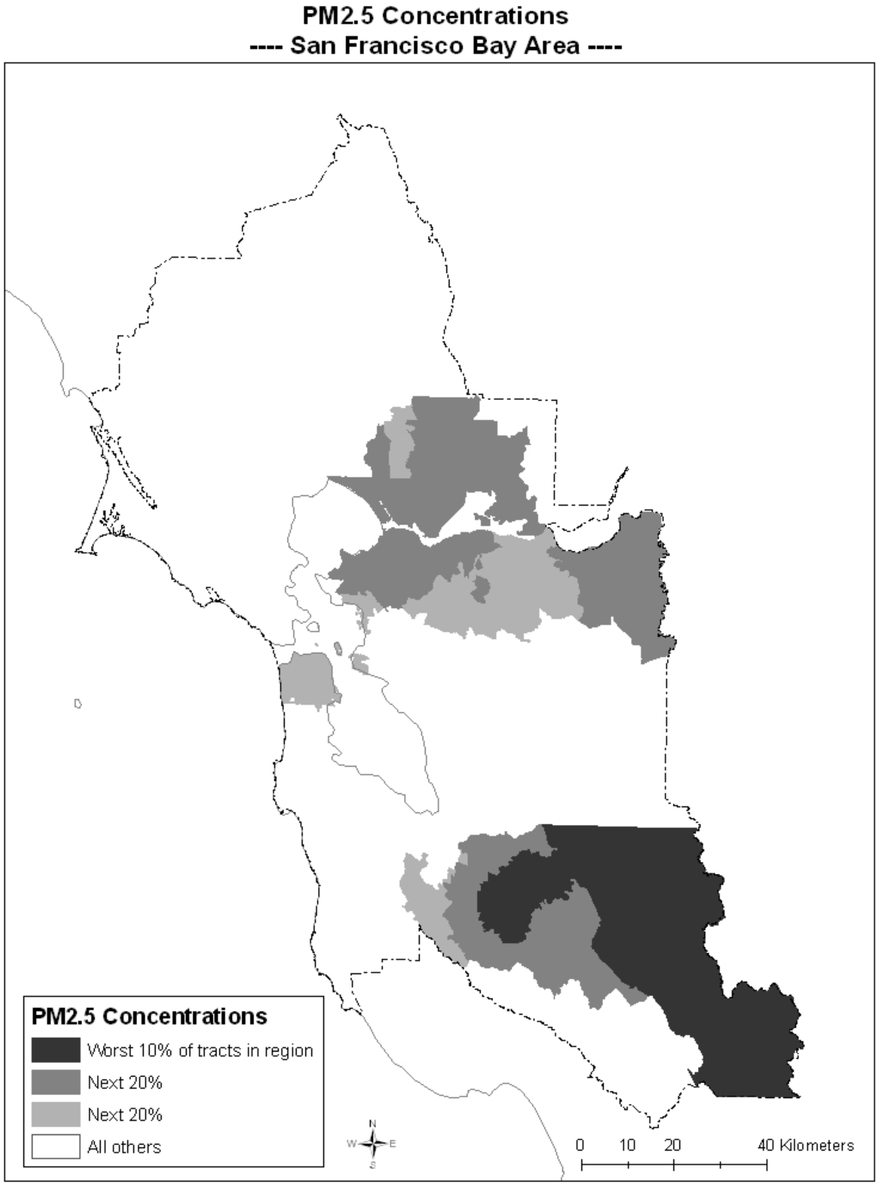
However, because the map depicts a relative ranking within the Bay Area, it does not necessarily reflect compliance with the federal ozone standard of 0.080 ppm. Overall, concentrations have decreased since 1990, and all sites in the Bay Area now attain the national 8-hour standard, with concentrations ranging from a little more than 5 percent below the standard in inland areas to more than 40 percent below the standard along the coast.

Current ozone levels at Richmond/San Pablo and Oakland are 0.048 ppm and 0.049 ppm, respectively—well below the level of the national standard. Although these concentrations meet the national standard, emissions from this area contribute to ozone elsewhere in the Bay Area. While maximum levels inland reached 0.078 ppm, they are still below the level of the current standard. However, U.S. EPA is reconsidering the level of the standard and is expected to reduce the national 8-hour standard from its current level of 0.08 ppm to a level somewhere between 0.070 ppm and 0.060 ppm. While some inland portions of the Bay Area will likely violate the new standard, because the Richmond study area is exceptionally clean, it would easily attain a revised ozone standard, even if U.S. EPA sets it at the lowest level being considered.

Fine Particulate Matter

Similar to ozone, $PM_{2.5}$ concentrations vary throughout the Bay Area, with many areas at or below the level of the federal $PM_{2.5}$ standards. Figure IV-11 below displays a relative ranking of $PM_{2.5}$ concentrations by census tract within the Bay Area. The $PM_{2.5}$ levels shown reflect annual average $PM_{2.5}$ concentrations between 2004 and 2006 using a composite network of several different types of particulate monitors. Census tracts with the 10 percent highest $PM_{2.5}$ concentrations within the Bay Area are shown in black. Although further work is under way to improve this mapping using the most recent data available, it provides a general depiction of the variability in $PM_{2.5}$ levels throughout the region. Overall, the highest annual average $PM_{2.5}$ concentrations are found in areas located in the southeastern portion of the region.

Figure IV-11 :Census Tract $PM_{2.5}$ Concentration Map



Similar to ozone, the map in Figure IV-11 shows only a relative ranking of $PM_{2.5}$ concentrations within the Bay Area and does not necessarily give any indication of how the concentrations compare with the national annual standard. The Bay Area currently meets the annual $PM_{2.5}$ standard of 15 µg/m^3, with concentrations ranging from 15 percent to more than 45 percent below the standard. Although the Bay Area is designated as nonattainment for the national daily (24-hour) $PM_{2.5}$ standard of 35 µg/m^3, both annual average and daily $PM_{2.5}$ concentrations throughout the Bay Area have decreased approximately 30 percent since 2002. As a result, as of 2009, only one monitoring site, in

Vallejo, to the north of the Richmond assessment area, records concentrations above the daily standard, with a concentration of 36 µg/m^3. As ARB continues to implement programs to further reduce $PM_{2.5}$ and its precursors, $PM_{2.5}$ air quality will continue to improve in the Bay Area, along the coast, as well as inland.

Just outside the Richmond assessment area to the southwest, $PM_{2.5}$ data are also collected at the San Francisco monitoring site. Concentrations are low, and meet both the national annual and daily standards, with current estimated levels of 9.4 µg/m^3 and 29 µg/m^3 respectively. The San Francisco monitoring site has met the annual standard since monitoring began, and has met the daily standard since 2005.

$PM_{2.5}$ data are sometimes further analyzed for individual components to provide additional insight about the types of sources contributing to ambient concentrations. Although long-term component-level data are not available in the Richmond study area, data are available for a site in San Jose. These data indicates that decreases in all of the major components have contributed to the general downward trend in $PM_{2.5}$ concentrations. Organic and elemental carbon are the single largest constituents, comprising approximately half of the $PM_{2.5}$ mass, with ammonium nitrate another 25 percent. Between 2002 and 2009, concentrations of these major species decreased significantly, reflecting efforts to control NOx and $PM_{2.5}$ from diesel and other mobile sources, as well as the introduction of the Bay Area's wood burning control program in 2008. Ammonium sulfate levels, while a smaller percentage of $PM_{2.5}$ mass, have also decreased, largely due to efforts to control SOx from shipping and port-related sources.

Diesel PM and Other Toxic Air Contaminants

Given the amount of transportation-related activity in the Richmond area port, rail yard, and refinery areas, there is a significant potential for high diesel PM concentrations. Diesel PM is considered a toxic air contaminant. Exposure to diesel PM poses a potential cancer risk, as well as contributing to $PM_{2.5}$ levels, with its associated risk for premature mortality. Although other air toxics are also present in the air, diesel PM comprises, by far, the highest risk potential. Unlike the other pollutants, there is currently no method for monitoring diesel PM concentrations in the ambient air. However, cancer risk can be estimated from other parameters, such as measured levels of other co-pollutants and emissions.

Although there are no ambient monitoring studies conducted specifically in the Richmond area, ARB conducted a health risk assessment for the nearby Oakland Rail Yard in 2008. The Oakland assessment concluded that although public health risks associated with diesel PM emissions at the rail yard remain high, they are geographically limited. Maximum increased potential cancer risk, over 250 chances per million, occurs in a small area within a half mile of the eastern edge of the rail yard across the interstate. This additional risk due to the rail yard decreases to approximately 50 chances per million within two miles.

Current and proposed controls, due to ARB's Goods Movement Program, will significantly decrease these risks by 2020. This decrease takes into account the emissions reductions achieved with the recent regulatory and incentive programs to reduce health risk from diesel engines and equipment.

In addition to diesel PM, there are other air toxics present in the ambient air in the Richmond area that pose a measurable risk. Of the nearly 200 air toxics ARB has identified, eight pose the greatest remaining potential for risk throughout the State. These eight are acetaldehyde, benzene, 1,3-butadiene, formaldehyde, hexavalent chromium, methylene chloride, *para*-dichlorobenzene, and perchloroethylene. ARB maintains a network of toxics monitoring sites located throughout California, including a monitoring site at San Francisco, southwest of the Richmond assessment area and a monitor in Fremont to the south of the study area.

Data collected at these sites show dramatic reductions over the last two decades for these remaining eight high-risk air toxics. Overall, the cancer risk from these compounds has dropped 76 percent between 1991 and 2009. Two compounds, benzene and 1,3-butadiene, account for more than three-quarters of the overall reduction. California's statewide motor vehicle emissions control programs are largely responsible for these reductions, as benzene and 1,3-butadiene are generally associated with motor vehicles and their fuels.

Emissions

Emissions of NOx, ROG, and $PM_{2.5}$ are the major contributors to ozone and $PM_{2.5}$ levels in the Richmond area. While SOx emissions also contribute to the formation of secondary $PM_{2.5}$, SOx is a much smaller contributor to $PM_{2.5}$, as compared to secondary $PM_{2.5}$ from NOx in California. Fully half of the emissions generated in the District come from sources located in Alameda, Contra Costa, and San Francisco Counties, with the majority of these in Contra Costa and Alameda. Overall, District-wide ROG emissions have decreased more than 50 percent and NOx emissions more than 40 percent over the 20-year period from 1990 through 2010. In contrast to these decreases, estimates show a slight increase in $PM_{2.5}$ emissions, starting in the late 1990s. The increase has been driven primarily by a steady increase in marine-related mobile source emissions. Although $PM_{2.5}$ emissions are increasing, ambient $PM_{2.5}$ concentrations continue to drop, despite the increase.

Looking more specifically at the Richmond study area, this industrialized region contains a high concentration of emissions sources. These emissions can be characterized by a few broad categories. Stationary sources are industrial facilities that can be identified by name and specific location. They include facilities such as power plants, refineries, and manufacturing plants. Area sources include widely distributed sources, such as gas stations, consumer products, yard care equipment, and construction and demolition activities. In contrast, mobile sources move around. On-road mobile sources include vehicles that travel on local roadways, such as light-duty passenger cars, trucks, and motorcycles, as well as heavy-duty diesel trucks and buses. Off-road mobile sources include sources such as cargo-handling equipment, forklifts, cranes, and locomotives. Because of the importance of port activities, the emissions inventory for the Richmond assessment area also includes "marine" sources. This is another subset of the general mobile source category, and includes ship emissions from travel on the open ocean, maneuvering within the harbor, and while docked.

Overall, as shown in Table IV-11, more than half of the NOx emissions in the Richmond area come from mobile sources. Of the remainder, nearly 40 percent come from stationary sources. Approximately 70 percent of the $PM_{2.5}$ emissions come from stationary and area sources, while approximately 70 percent of the ROG emissions come from area and mobile sources. Altogether, this diverse collection of emissions sources contributes to the overall air quality—both in the local area and downwind.

Table IV-11: 2008 Richmond Area Emissions by Source Type (tons/day)

	NOx	$PM_{2.5}$	ROG
Stationary	**14.3**	**2.7**	**8.8**
Capped	13.4	2.3	7.2
Non-Capped	0.8	0.4	1.5
Area	**2.5**	**3.3**	**7.5**
Mobile	**21.0**	**0.8**	**11.6**
Light Duty On-Road	6.3	0.3	6.9
Heavy Duty On-Road	9.5	0.3	1.2
Off-Road	3.8	0.2	3.4
Marine	1.4	<0.1	0.1
Total	**37.7**	**6.8**	**27.8**

Sum of individual categories may not equal total because of rounding.

Seven industrial and electricity generation sources located in the Richmond study area would be subject to the cap-and-trade regulation (Table IV-12). The locations of these facilities are shown in Figure IV-9. Virtually all combustion-related stationary source emissions in the local area come from these sources. Overall, the cap-and-trade sources comprise approximately 36 percent of the total NOx emissions in the community, 34 percent of the $PM_{2.5}$ emissions, and 26 percent of the ROG emissions. As shown in Table IV-12, the local facilities include petroleum refineries, cogeneration facilities, and electrical power generators. Refineries account for the major share of emissions from the capped sources.

Table IV-12: Richmond Area Facilities that Would Be Subject to Cap-and-Trade

Facility Name	*GHG Reporting Sector*
Chevron Products Company	Petroleum Refinery / Hydrogen Plant / Cogeneration Facility
Conoco Phillips - San Francisco	General Stationary Combustion / Cogeneration Facility
Conoco Phillips Refining Company	Petroleum Refinery / Hydrogen Plant / Cogeneration Facility
Crockett Cogeneration Project, LP	Cogeneration Facility
Rhodia	General Stationary Combustion / Cogeneration Facility
Shell Oil Products	Petroleum Refinery / Hydrogen Plant / Cogeneration Facility
Valero Refining Company	Petroleum Refinery / Hydrogen Plant / Cogeneration Facility

Petroleum refineries include processes used to produce gasoline, kerosene, fuel oils, lubricants, asphalt, and other products. Petroleum refining is an energy-intensive process, and refineries are among some of the largest NOx emitters in the State. The production of fuels includes initial distillation or separation of crude oil into light and heavy components. This is generally followed by cracking or conversion of these components into new hydrocarbons. Both of these processes require high-temperature furnaces that produce combustion emissions. The final stage includes the blending and purification to meet specific requirements for different grades of fuels. Non-combustion-related emissions occur due to fugitive releases from the array of piping that transports the oil between processes, as well from tank farms, which are used to store the various products.

Of the six petroleum refineries in the District, the four located within the Richmond study are among the largest refineries in California (based on barrels per day). Cogeneration facilities, which generally exist at, or adjacent to, petroleum refineries providing electricity, heat, and steam, contribute most of the remaining emissions from the sources subject to the cap-and-trade regulation.

In addition to criteria pollutant emissions, the seven facilities subject to the cap-and-trade regulation also emit toxic air contaminants. Air toxics emitted from refining and cogeneration include benzene, hexane, toluene, and xylenes. As discussed in Chapter II, these facilities are required to report their emissions under the “Hot Spots” Information and Assessment Act. Facilities whose emissions and risk potential exceed a certain threshold must prepare a Health Risk Assessment (HRA). The HRA further evaluates potential health risks and specifies appropriate mitigation measures. Criteria for these thresholds were developed by the California Air Pollution Control Officers Association in consultation with the Office of Environmental Health and Hazard Assessment.

Three of the facilities in the Richmond area—Chevron, Valero, and Shell—have conducted an HRA. None of the facilities in the Richmond area pose a cancer risk of more than ten excess cancer cases per million people. Routine air monitoring and several air monitoring studies conducted in Crockett (San Francisco Bay Area) and Wilmington have not identified significant health risks specifically associated with refineries. However, these studies did not measure diesel PM, as no accepted method currently exists, and there are many toxic air pollutants that do not have quantifiable health risk values.

In 2002, ARB published a report on the results of the state and local air district air monitoring done near oil refineries. The purpose of this evaluation was to try to determine how refinery-related emissions might affect nearby communities. This inventory of air monitoring activities included 10 ambient air monitoring stations located near refineries in Crockett and four stations near refineries in Wilmington. These monitoring results did not identify significant increased health risks associated with the petroleum refineries. In 2002–2003, ARB conducted additional monitoring studies in communities downwind of refineries in Crockett and Wilmington that showed similar results.

Existing Control Programs

The longstanding control programs discussed in Chapter II have reduced emissions throughout the Bay Area and are reflected in air quality improvements to date. However, more needs to be done to bring all areas of the region into attainment. Under the federal Clean Air Act, all states, including California, are required to develop State Implementation Plans (SIPs) that provide for attaining the national standards. The District is officially listed as being in non-attainment for the 8-hour ozone standard, but is currently below the level of the standard. Submission of an 8-hr ozone SIP is not anticipated, as existing emissions-control programs, both State- and District-wide, will enable the District and the Richmond study area to maintain and even reduce ozone from current low levels. Although a $PM_{2.5}$ SIP is not due until 2012, the District has already begun implementation of local control measures, such as their stringent residential wood burning program, to reduce emissions of fine particulates.

Statewide emissions-control programs will provide most of the ongoing emissions reductions. The statewide strategy builds on existing programs, as well as looking forward to the implementation of new and innovative technologies. Programs that will provide the greatest direct benefit to the Richmond area include the following:

- Control measures to further reduce emissions from <u>new</u> trucks, cars, and consumer products.

- Measures to require existing trucks and off-road vehicles and equipment to reduce emissions through add-on controls.

- Incentive programs to reduce NOx, $PM_{2.5}$, and diesel PM emissions in port areas.

In addition to the measures outlined above, the District adopted the Bay Area 2010 Clean Air Plan (Plan) on September 15, 2010. This Plan, which reviews and recommends guidelines for multiple pollutants, including an update of the Bay Area 2005 Ozone Strategy, proposes control amendments that would affect the sources also subject to the cap-and-trade regulation.

The District has Best Available Control Technology (BACT) requirements in place for both new and modified sources as part of its New Source Review program. In addition, the District's Regulation 9 specifically addresses and limits the emissions of inorganic gaseous pollutants from sources subject to the cap-and-trade regulation, such as power plants; steam generators; glass melting furnaces; electrical power generating boilers; and boilers, generators, and heaters in petroleum refineries. Local plans for specific emission sources, such as the Port of Oakland's Maritime Air Quality Improvement Plan and the Port of Richmond's Clean Air Action Plan, will supplement the statewide strategy and District plans, leading to even greater air quality improvements.

A number of additional State and local control programs also address toxic air contaminants from sources in the Richmond area. Reduction of diesel PM has been an important focus due to the presence of the ports and activities associated with the movement of goods to and from the ports. ARB's Goods Movement Plan is comprehensively reducing emissions and associated health risk in communities near ports, rail yards, and high-traffic corridors. For example, particulate matter emissions from drayage trucks will be reduced by 85 percent. Other regulations will reduce cancer risk from commercial harbor craft and cargo handling equipment by 60 and 80 percent, respectively.

Assessment of Potential Cap-and-Trade Regulation Impacts

Emissions Inventory Development

To assess the potential localized emissions impacts of the cap-and-trade regulation, ARB worked closely with District staff to prepare an updated emissions inventory for the local Richmond assessment area. This 2008 inventory reflects adopted air pollution control measures. The inventory includes estimates for all source types and was updated to reflect the economic downturn. Emissions estimates were also developed for 2020. ARB assumed there would be no change to industrial facility emissions between 2008 and 2020 in the Richmond area because it is not possible to specifically identify where new facilities would be located or the extent to which facilities might vary operations. However, in all likelihood, emissions from industrial facilities would be lower in

2020 than they currently are with the implementation of new District control measures.

Methodology for 2020 Scenarios

Given the flexibility provided by the cap-and-trade regulation, it is not feasible to predict how individual facilities within each community will respond to the requirements of the regulation. As discussed earlier in Section IV.B, market forces, other GHG emissions-reduction efforts, and existing co-pollutant regulatory programs will all influence emissions at individual facilities. Instead, ARB developed three hypothetical bounding scenarios to assess potential cumulative emissions impacts in 2020.

The emissions reductions that that will result from ongoing regulatory programs to reduce co-pollutants between 2008 and 2020 provide the baseline for evaluating the impacts of each scenario. This baseline reflects what would occur in the absence of cap-and-trade, or if all GHG reductions were achieved outside the community. The first scenario explores the potential co-benefits of limiting trading and the use of offsets within a community. The baseline (no change) and the first scenario bound the most likely impact of implementation of the regulation. Although staff concluded that it is not possible to attribute possible co-pollutant increases specifically to the cap-and-trade regulation, for the purpose of a bounding exercise staff examined the potential impacts of general facility growth through two additional scenarios.

ARB staff believes that scenarios two and three are very unlikely to result from the cap-and-trade regulation. Many factors influence a decision to expand production or build a new facility, and the cap-and-trade program itself imposes a new requirement on facilities—the need to procure allowances and offsets to accommodate GHG emissions—in addition to the strict permitting requirements already in effect for criteria pollutants and toxic air contaminants. Under scenario two, every facility would need to purchase allowances and offsets to accommodate any growth. We believe it is more likely that a few facilities may increase production, while others would decrease. Similarly, we do not believe that compliance with the cap-and-trade regulation will cause the siting of new facilities assumed in scenario three, though the regulation would not prevent it. Nevertheless, both scenarios are useful as hypothetical bounding analyses.

The first scenario assumes as a hypothetical upper bound that GHG emissions reductions occur at each of the seven local industrial and electricity generation facilities in the Richmond area. As discussed in Section IV.B, on average, the cap-and-trade industrial and electricity generation sources will need to reduce their GHG emissions by 4 percent to meet the 2020 cap.[4] Therefore, staff assumed a commensurate 4 percent reduction would occur in combustion-related NOx, $PM_{2.5}$, and ROG from these facilities. These additional reductions would further enhance the cumulative emissions reductions from ongoing programs.

The second scenario represents a hypothetical emissions increase of 4 percent at each of the seven cap-and-trade facilities in the Richmond area. While this scenario provides a hypothetical upper bound of aggregate facility growth in the community, staff believes it is an unlikely situation given the current regulatory structure. As described in Chapter II, each individual unit of permitted equipment has a maximum permitted emission limit. Large facilities such as those covered under cap-and-trade often have hundreds of individual permits. If a facility owner modified that equipment or its operation such that actual emissions would exceed the permitted levels, New Source Review (NSR) and its requirements to implement Best Available Control Technology (BACT) would apply. This is a comprehensive and lengthy process that is subject to public review. The extensive requirements of this permitting process effectively limit the potential for significant emissions increases at a given facility.

In addition, under this scenario, every facility would need to purchase allowances and offsets to accommodate any growth. While there could be growth at a few facilities within a community, as some facilities move to more efficient ways of operation or switch to use of less carbon-intensive fuels, it is very unlikely that emissions would increase at every facility. Much more likely is a situation where a few facilities may increase production, while others would decrease. Nevertheless, staff evaluated the impact of an increase of 4 percent at every facility to represent a potential maximum community-level impact.

Finally, the third scenario evaluated the hypothetical construction of a new facility within the community. A combined heat and power generation facility was selected because petroleum refining is the largest cap-and-trade emissions sector in the Richmond area. As discussed earlier in section IV.B of this chapter, one possible response to reduce GHG emissions at refineries would be to install a combined heat and power unit. This would have the dual benefit of providing a more efficient heat source for refinery processes, while allowing excess power to be sold back to the grid. Table IV-13, below, provides an estimate of criteria pollutant emissions from a hypothetical 85 megawatt (MW) combined heat and power unit. It is important to remember that under California's existing regulatory structure, the construction of a new facility would be subject to the strict NSR

[4] Total GHG emissions under baseline conditions in 2020 are estimated to be 507 $MMTCO_2e$. GHG emissions from the capped sectors are approximately 409 $MMTCO_2e$ of the baseline. Reductions needed to meet the cap of 334 $MMTCO_2e$ will come in part through complementary measures from the Scoping Plan. After reductions from those measures, the cap-and-trade regulation is estimated to reduce at least 18 $MMTCO_2e$, representing a 4 percent reduction from capped sector emissions.

permitting requirements described in Chapter II. This would include requirements to implement BACT, as well as to offset the emissions regionally.

Table IV-13: Estimated Criteria Pollutant Emissions Hypothetical Combined Heat and Power Facility (85 MW Capacity)

	Emissions (tons per day)		
	NO_X	**ROG**	**$PM_{2.5}$**
Operating Emissions	0.11	0.05	0.12

The scenario analysis focuses on the industrial and electricity generation facilities covered by the cap-and-trade regulation, and does not address the additional reductions that will likely occur when transportation fuels and commercial and residential natural gas are also included under the cap.

Analysis of Impacts

Under the existing baseline control program, including rules adopted in the 2007 SIP to meet national air quality standards, the Richmond area will realize further NOx and ROG emissions reductions in 2020. The reductions will come primarily from on-road motor vehicle and off-road mobile sources, including light- and heavy-duty vehicles. These ongoing emissions reductions are summarized in Table IV-14, and they reflect a 25 percent reduction in NOx and ROG emissions from 2008 levels. In contrast, the Richmond study area would see a slight increase of 1 percent in $PM_{2.5}$ (reflected as negative numbers in Table IV-14), resulting from projected increases in area source emissions such as commercial cooking and residential fuel use which are linked to population growth.

The first scenario assumes that all the emissions reductions needed from the cap-and-trade regulation are implemented locally at the seven industrial and electricity generation facilities in the Richmond area, realizing a further 4 percent reduction in co-pollutant emissions. Because emissions from the cap-and-trade facilities comprise only a small portion of the overall inventory, these reductions translate into less than a 4 percent decrease in the total inventory for the Richmond area. In aggregate, full implementation of the cap-and-trade regulation by industrial and electricity generation sources locally would result in an additional 2 percent enhancement in localized NOx reductions, a 1 percent reduction in $PM_{2.5}$, and a small enhancement, less than 1 percent, in localized ROG reductions. While not quantified here, combustion-generated toxic air contaminants would also likely decrease.

Table IV-14: Percent of Emissions Reductions Between 2008 and 2020: Richmond Area[1]

	NOx	$PM_{2.5}$	ROG
BASELINE Emission Reductions from Existing Controls and No Emission Reductions at Cap-and-Trade Industrial and Electricity Generation Facilities	**28%**	**-1%**	**16%**
SCENARIO 1 Emissions Reductions from Existing Controls and Emission Reductions at all Cap-and-Trade Industrial and Electricity Generation Facilities	**30%**	**0%**	**16%**
SCENARIO 2 Emission Reductions from Existing Controls and Emission Increases at all Cap-and-Trade Industrial and Electricity Generation Facilities	**27%**	**-2%**	**14%**
SCENARIO 3 Emission Reductions from Existing Controls and Addition of New Facility	**28%**	**-2%**	**16%**

Numbers are rounded to nearest percentage

[1] These tables include the combined emissions from mobile, area, and stationary sources. The industrial and electricity generation facilities covered by the proposed cap-and-trade regulation represent only a portion of these emissions. The emissions impacts of the scenarios do not include the additional emissions reductions that will likely occur when transportation fuels and commercial and residential natural gas are included in the cap. The emissions reductions from transportation fuels and commercial and residential natural gas would affect each of these scenarios equally.

As described previously, while ARB staff did not find situations where emissions increases were clearly attributable to implementation of cap-and-trade, the second scenario evaluated the potential general impact of an emissions increase of 4 percent at every cap-and-trade industrial and electricity generation facility in the community region. This hypothetical upper-bound increase in emissions would slightly reduce the overall benefits of the ongoing control program, with a 2 percent reduction in ROG benefits, a 1 percent reduction in NOx benefits, and an additional 1 percent increase in $PM_{2.5}$. However, cumulative emissions of NOx and ROG in the Richmond area would still be lower in 2020, as compared to 2008.

Scenario three explored the potential emission impacts of construction of a new combined heat and power unit at an existing refinery. Based on typical emissions from similar units, the addition of a hypothetical new unit in the community would slightly reduce the benefits of the ongoing control program, with a very small reduction that is less than 1 percent in NOx and ROG benefits, and an additional 1 percent increase in $PM_{2.5}$ emissions. Overall, cumulative emissions for NOx and ROG in the Richmond area would still be lower in 2020, as compared to 2008.

There is also the potential for increases in toxic air contaminants under scenarios 2 and 3. Toxics emissions are typically reflected in $PM_{2.5}$ and ROG emission estimates, thus efforts to control ROG and $PM_{2.5}$ also help address toxic air contaminants broadly within the community. In addition, the requirements of the "Hot Spots" Information and Assessment Act are designed to assess and mitigate more localized, facility-specific impacts. As described earlier in this section, should emissions of toxics increase such that they exceed the screening threshold, the facility would be required to conduct an HRA. Facilities with emissions that are determined to present a significant risk would then be required to implement measures to reduce that risk.

These scenarios focus on the compliance responses of the industrial sources covered by the cap-and-trade regulation. In 2015, transportation fuels and commercial and residential natural gas will be included in the cap, likely reducing emissions from those sources. Because the reductions associated with transportation fuel and commercial and residential natural gas would be the same for each of the scenarios, ARB chose to focus the analysis on industrial sources. The inclusion of the emissions reductions from transportation fuel and commercial and residential natural gas would likely increase the total co-pollutant benefits of the cap-and-trade regulation.

In all scenarios it is difficult to predict the actual air quality impacts within the local community of any change in emissions. Combustion emissions are often vented through tall stacks. The heat generated by the combustion process can further increase the height of the emissions plume. Refineries often have stacks that are several hundreds of feet tall. As a result, emissions from a large stack of this size may not reach the surface until some distance downwind. In addition, due to dispersion and the time needed for chemical reactions to form regional pollutants such as ozone and secondary particulate matter, the maximum air quality impact may occur well downwind of a facility. In contrast, emissions of toxic air contaminants may have a more localized impact.

Air quality modeling is a standard tool for relating emissions to estimated air quality impacts. However, detailed information is required by the models to quantify the impacts. This information includes specificity on locations and types of emission sources, stack heights, timing of emissions, emission rates, and for point sources, information to characterize the point of release. Due to the ambiguity associated with determining how each individual facility will comply with cap-and-trade, it is impossible to characterize the timing and location of any emissions changes at this time. This makes use of modeling to characterize the air quality impact of potential changes in emissions infeasible.

Health assessments of the impact of air quality changes on human health require estimates of the change in $PM_{2.5}$, ozone, and other air pollutants for an exposed population. The health impact depends on the air pollutant type and ambient concentration, location and duration of exposure, and characteristics of the exposed population, including total residents, age, and baseline incident rates for various death and disease types where a quantitative relationship has been established with an air pollutant. Health assessments in California have been limited to pollution sources where $PM_{2.5}$, ozone, and air toxic exposures can be estimated using measured air quality data as a surrogate for a widely distributed source (e.g., trucks) or with the use of air quality models (e.g., ports and rail yards). However, there is no unique air quality surrogate for the large industrial sources covered by the cap-and-trade regulation to distinguish them from smaller industrial sources or other types of combustion sources. Nor, as discussed above, was it feasible to conduct air quality modeling. Due to this lack of information on the concentration, location, and duration of air pollutant exposures, it was not possible to conduct a health assessment.

Summary

In summary, air quality is improving throughout the Richmond area. The assessment area meets both federal $PM_{2.5}$ and 8-hour ozone standards. California's ongoing co-pollutant emissions control programs will ensure that cumulative emissions will continue to decrease through 2020 in the Richmond area, with associated health improvements from improved air quality.

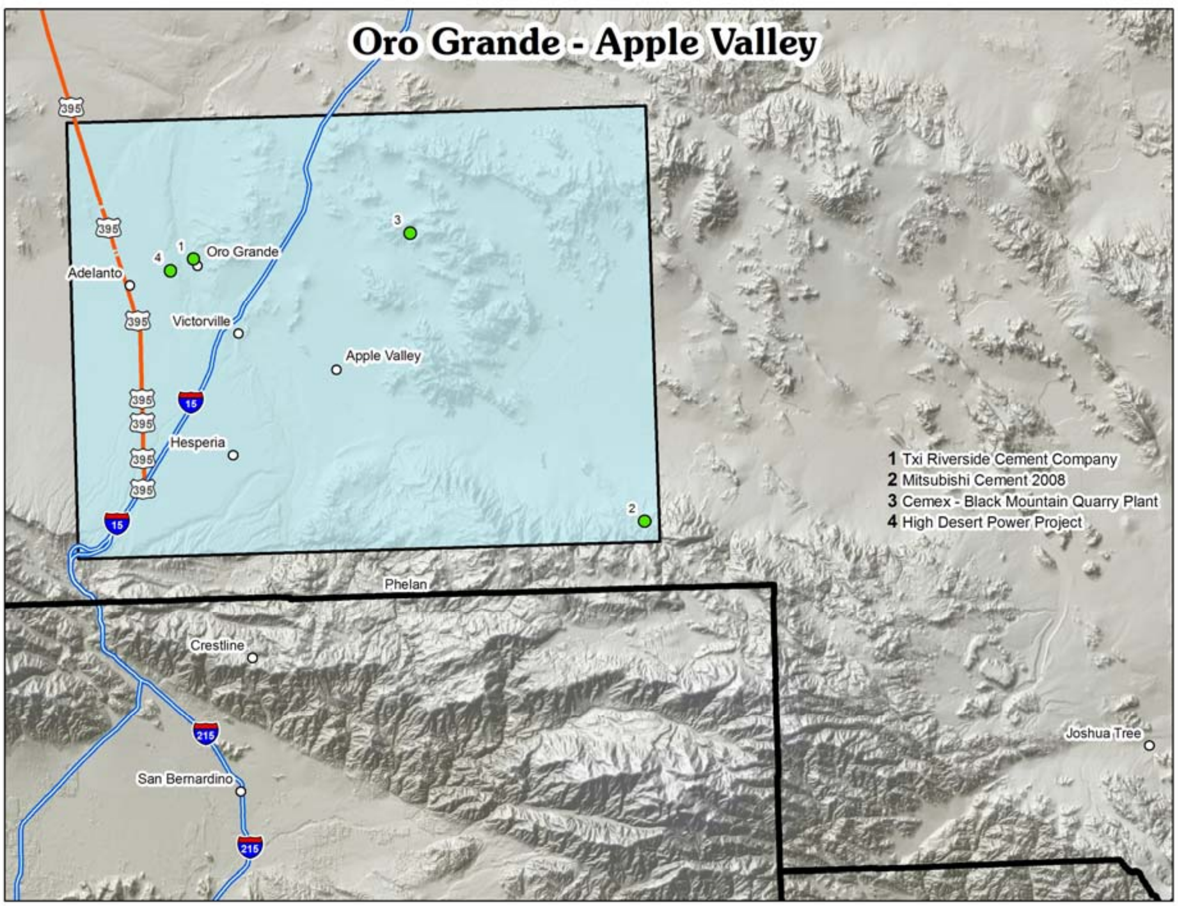
While the cap-and-trade regulation allows for flexibility in how facilities comply, staff looked at several scenarios that bound the possibilities, including the construction of a new facility. If emissions reductions due to implementation of the cap-and-trade regulation occur locally at the seven facilities in Richmond, there could be some small additional co-benefits from the reduction of combustion-related criteria pollutants. While emissions increases directly attributable to the cap-and-trade regulation are considered very unlikely, potential emissions increases that might occur in general are also expected to be small within the context of the larger cumulative emissions reductions that will be occurring as a result of California's extensive emissions control programs.

Although staff believe that the potential for emissions increases attributable to the proposed rule is very unlikely, ARB is committed to monitoring the implementation of the cap-and-trade regulation to identify and to address any situations where the program has caused an increase in criteria pollutant or toxic emissions. At least once each compliance period, ARB will use information collected through the mandatory reporting regulation, the cap-and-trade regulation, the industrial efficiency audit, and other sources of information to evaluate how individual facilities are complying with the regulation. The cap-and-trade program is another layer of review and opportunity for data gathering, decision-making, and agency and public vigilance to ensure any potential increases are identified and addressed.

4. Apple Valley/Oro Grande Assessment

The Apple Valley/Oro Grande area (hereafter called the *Oro Grande area*) is an economically and racially diverse area located in the Mojave Desert's Victor Valley. With the town of Oro Grande in the northwest, Apple Valley in the center, and Lucerne Valley in the southeast of the assessment area, this high desert region also includes the towns of Victorville, Hesperia, and Adelanto. About 230,000 people live in this portion of the Mojave Desert (refer to Figure IV-12).

Figure IV-12: Oro Grande / Apple Valley Assessment Area



Although the Oro Grande area is more sparsely populated than the South Coast region to the south, the desert communities have grown over the last several decades as bedroom communities of the South Coast. Interstate 15 and Highway 395 act as thoroughfares, carrying significant amounts of commuter and truck traffic in and out of the Mojave Desert region.

Communities in the Oro Grande area originally developed around the railroads. With the railroad came trading posts, mining towns, and an influx of people. During this same time period, huge deposits of silica and lime were discovered, leading to the development of non-metallic mining and a thriving cement industry. Overall, four industrial and electricity generation facilities in the Oro Grande area would be subject to the cap-and-trade regulation. The following sections describe air quality and emissions in the Oro Grande area and the traditional emissions control programs currently in place. The last section provides a discussion of potential emissions changes that could occur under the cap-and-trade regulation.

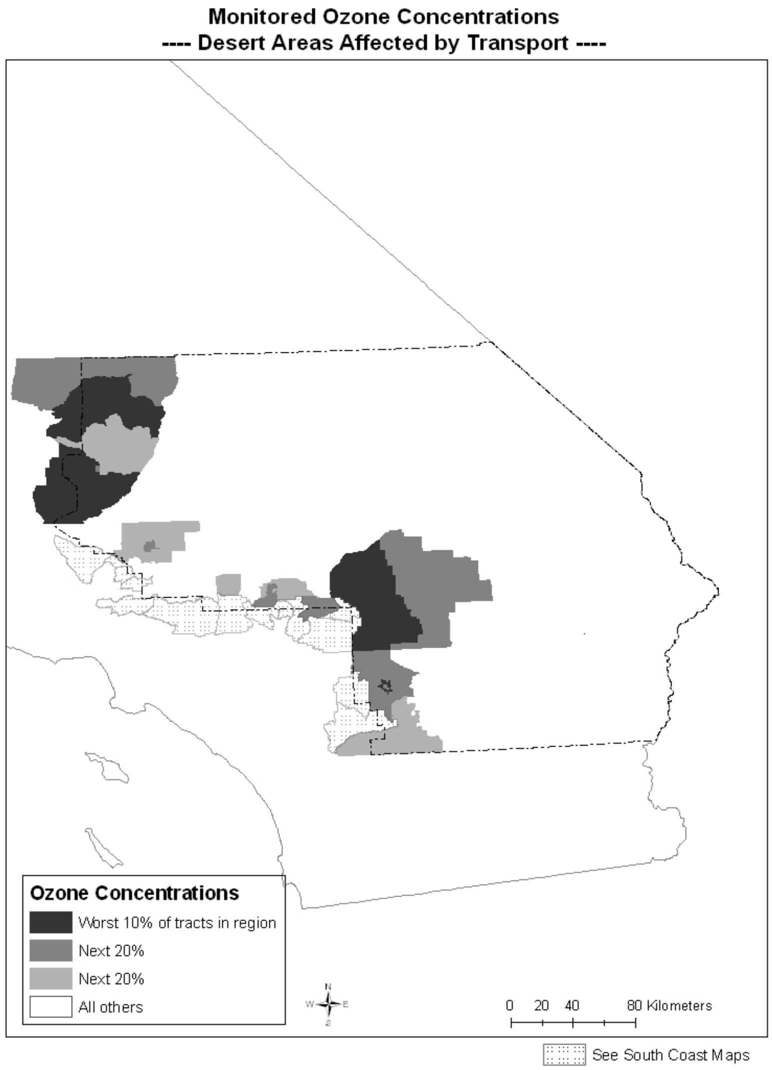
Air Quality Levels

The Oro Grande area falls under the jurisdiction of the Mojave Desert Air Quality Management District (District). The District maintains a comprehensive air quality monitoring network to characterize air quality conditions throughout the region. Based on this monitoring, as well as the mix of sources in the Oro Grande area, the pollutants of greatest concern are ozone and $PM_{2.5}$. There are two monitors in the Oro Grande assessment area—one in Victorville and the other in Hesperia. Ozone concentrations are measured at both sites, while $PM_{2.5}$ is measured only at Victorville. Air quality trends for these sites show that as emissions have decreased over the years, air quality has improved.

Ozone

Overall, ozone levels in the Mojave Desert region are lower than those in the neighboring air districts of the South Coast and San Joaquin Valley. Figure IV-13 shows a relative ranking of ozone concentrations by census tract within the Mojave Desert region. The rankings reflect a measure of both the frequency and severity of ozone concentrations above the level of the State 8-hour ozone standard of 0.070 ppm, based on data from 2004 to 2006. Census tracts with the highest 10 percent of ozone concentrations within the Mojave Desert are shown in black. Because census tracts are not uniform in size, tracts with the top 10 percent of ozone concentrations may not represent 10 percent of the land area within the region. Although additional work is under way to improve the mapping using more recent data, the 2004 to 2006 data provide a reasonable illustration of the general variability in ozone levels throughout the region. In general, the highest levels are found in the western portion of the Mojave Desert, located downwind of the South Coast and San Joaquin Valley, where the transport impact is greatest.

Figure IV-13 : Census Tract Ozone Concentration Map



Because the map depicts a relative ranking within the Mojave Desert, it does not necessarily reflect compliance with the federal ozone standard of 0.080 ppm. Overall, concentrations at all sites in the Mojave Desert are less than 20 percent above the level of the national standard, and several sites are very close to meeting or already meet the standard. Within the Mojave Desert region as a whole, the highest ozone concentrations occur in those areas just east of the South Coast, with the highest levels, 0.100 ppm, recorded at Joshua Tree National Monument. As one moves further away from the South Coast, concentrations generally decrease.

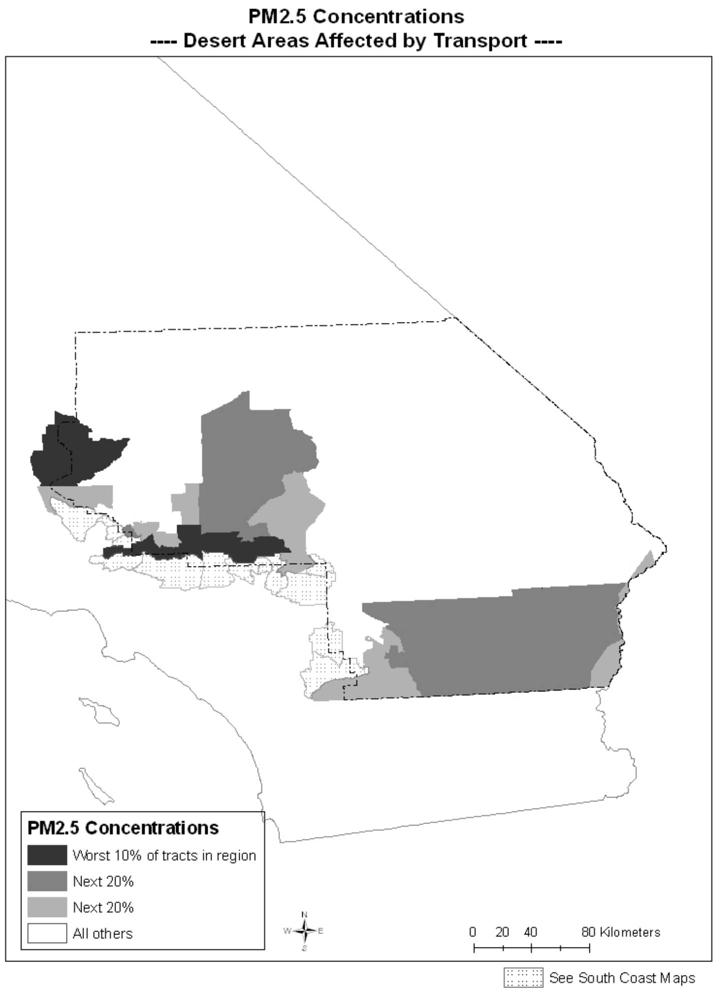
As concentrations have shown a steady decline in the South Coast over the last 20 years, trends in ozone air quality in the Mojave Desert have paralleled this improvement. Moreover, as ozone air quality continues to improve, the size of the areas with good air quality increases, while the size of the areas with poor air quality decreases.

Currently, there are two ozone monitoring sites in the Oro Grande assessment area: Hesperia and Victorville. Concentrations measured at both these sites decreased 30 to 35 percent between 1990 and 2009. The change in the number of days each year with concentrations above the level of the standard is even greater, with a 70 percent decrease over the last 20 years at both locations. In 2009, the value used to evaluate compliance with the national 8-hour standard was 0.097 ppm at Hesperia and 0.087 ppm at Victorville. As a result of the ongoing improvements, the northern portions of the Oro Grande area are getting close to attaining the current national ozone standard. However, U.S. EPA is reconsidering the level of the standard and is expected to reduce the national 8-hour standard from its current level of 0.08 ppm to a level somewhere between 0.070 and 0.060 ppm.

Fine Particulate Matter

In contrast to ozone, $PM_{2.5}$ concentrations throughout the Mojave Desert region are very low. Figure IV-14 shows a relative ranking of $PM_{2.5}$ concentrations by census tract within the Mojave Desert region. The $PM_{2.5}$ levels reflect annual average concentrations measured between 2004 and 2006 using a composite network of several different types of particulate matter monitors. Census tracts with the highest 10 percent of $PM_{2.5}$ concentrations are shown in black. While work is under way to improve this mapping using more recent data, the map in Figure IV-14 is a reasonable illustration of the general variability in $PM_{2.5}$ levels throughout the desert region. Similar to ozone, the highest $PM_{2.5}$ concentrations are found in the more urbanized portions of the Mojave Desert that are located closest to the South Coast and San Joaquin Valley regions.

Figure IV-14 :Census Tract $PM_{2.5}$ Concentration Map



Similar to ozone, Figure IV-14 shows a relative ranking of $PM_{2.5}$ concentrations within the Mojave Desert and therefore it does not reflect compliance with the federal annual $PM_{2.5}$ standard. $PM_{2.5}$ concentrations throughout the Mojave Desert region are well below the national $PM_{2.5}$ standards, and the area has been in compliance with the standards since 2002. Current annual concentrations are 40 to 60 percent below the level of the national annual standard of 15 $\mu g/m^3$. Daily concentrations are also well below the national 24-hour standard of 35 $\mu g/m^3$.

Victorville is the only monitoring site located within the Oro Grande assessment area. Over time, the 24-hour concentrations at Victorville show a drop of about 35 percent, and the annual concentrations show a drop of about 27 percent. Current levels are estimated to be 17 $\mu g/m^3$ and 9.1 $\mu g/m^3$, respectively. Because concentrations are so low in this region, no data on the chemical components of $PM_{2.5}$ are collected.

Emissions

Emissions of ROG, NOx, and $PM_{2.5}$ are the major contributors to ozone and $PM_{2.5}$ levels in the Oro Grande region. While SOx emissions also contribute to the formation of secondary $PM_{2.5}$, overall $PM_{2.5}$ levels in this region are very low, and SOx is a much smaller contributor to $PM_{2.5}$, as compared to secondary $PM_{2.5}$ from NOx in California. When looking at emissions, it is also important to remember that ozone air quality in the Mojave Desert, including the Oro Grande area, is significantly affected by emissions transported from the South Coast region. South Coast emission levels range from 5 times more NOx to 12 times more ROG than emission levels in Oro Grande. While these are sizeable differences, South Coast emissions have decreased dramatically over the years. Between 1990 and 2010, South Coast ROG emissions dropped nearly 70 percent and NOx emissions nearly 50 percent. During this same time period, emissions in the Mojave Desert portion of San Bernardino County, where the Oro Grande area is located, also decreased, with a 40 percent drop in ROG emissions and a 29 percent drop in NOx emissions.

Because the Oro Grande area is not densely populated or highly industrialized, local emissions are divided among relatively few sources. Similar to the other assessment areas, emissions come from several major source types: stationary sources, mobile sources, and area-wide sources. *Stationary sources* are industrial facilities that can be identified by name and specific location. They include facilities such as cement plants, power generation facilities, and manufacturing operations. In contrast, *mobile sources* move around. Mobile sources can be further subdivided into on-road and off-road mobile sources. *On-road* mobile sources generally comprise the motor vehicles that travel on local roadways, such as light- and medium-duty passenger cars, trucks, and motorcycles, as well as heavy-duty diesel trucks and buses. *Off-road* mobile sources include equipment such as forklifts, cranes, locomotives, and aircraft. Finally, the local emissions inventory includes *area-wide* sources. These include widely distributed sources, such as gas stations, consumer products, yard care equipment, and construction and demolition activities.

The local emissions inventory developed for the Oro Grande assessment area is summarized in Table IV-15. As shown in the table, more than half of the local NOx and $PM_{2.5}$ emissions are generated by the four industrial and electricity generation facilities that would be subject to the cap-and-trade regulation. The bulk of these emissions are generated by the local cement plants (refer to Figure IV-12 for facility locations). In contrast, more than half of the local ROG emissions come from area-wide and mobile sources.

Table IV-15: 2008 Oro Grande Area Emissions by Source Type (tons/day)

	NOx	$PM_{2.5}$	ROG
Stationary	**25.1**	**6.5**	**1.5**
Capped	24.8	6.1	0.5
Non-Capped	0.3	0.4	1.0
Area	**2.5**	**2.4**	**3.4**
Mobile	**15.2**	**0.8**	**6.4**
Light Duty On-Road	3.0	0.1	2.9
Heavy Duty On-Road	8.9	0.3	0.8
Off-Road (minus Locomotive)	0.5	0.3	2.4
Locomotive	2.8	0.1	0.3
Total*	**42.8**	**9.7**	**11.2**

Sum of individual categories may not equal total because of rounding.

Three of the Oro Grande area facilities that would be subject to the cap-and-trade regulation are Portland cement plants (refer to Table IV-16). Portland cement manufacturing is very energy-intensive and cement plants are among the largest NOx emitters in the State. During the manufacturing process, a mixture of raw materials such as limestone, clay, sand, and iron ore are ground and heated in a rotary kiln. The resulting product, called clinker, is cooled, ground, and then mixed with a small amount of gypsum to produce concrete. The burning of fuels and the heating of the raw materials generate pollutant combustion emissions. Non-combustion-related emissions occur during the grinding, cooling, and materials-handling steps of the manufacturing process. In addition to the emissions from the cement production process itself, there are also affiliated emissions due to trucking and rail activities, which provide the fuel and raw materials to the facilities.

Table IV-16: Oro Grande Facilities that Would Be Subject to Cap-and-Trade

Facility Name	***GHG Reporting Sector***
Cemex-Black Mountain Quarry Plant	Cement Plant
TXI Riverside Cement Company	Cement Plant / Cogeneration Facility
Mitsubishi Cement	Cement Plant
High Desert Power Project	Electricity Generation

In total, there are eleven cement plants in California—three in Northern California and eight in Southern California. The three facilities located in the Oro Grande area rank among the top five in the State (2009 Almanac of Air Quality and Emissions). The primary fuel source for these cement kilns is coal. However, under existing permits, two of the cement plants in the Oro Grande area are authorized to burn tires in their cement kilns as a partial substitute for coal. It is possible that under the cap-and-trade regulation some cement facilities might increase their use of tires as a fuel source. Under their existing permits, the two facilities in Oro Grande could increase their tire use from two to nine times the current levels.

Based on emissions tests, it appears that on average, NOx emissions decrease slightly with partial substitution of tires for coal, while PM emissions remain roughly the same. The level of tire substitution in these tests ranged between 15 and 25 percent. Thus, based on the limited testing to date, it does not appear that fuel switching would significantly change NOx or PM emissions levels. There is the potential for increased truck traffic to deliver the tires to the plant. However, due to ARB regulations, in 2020 most trucks will be required to be equipped with the cleanest 2010 engines as well as diesel particulate traps. These trucks would likely be lower emitting than the emissions from locomotives that are currently used to transport coal to many tire facilities.

In addition to criteria pollutant emissions, the four facilities subject to the cap-and-trade regulation also emit toxic air contaminants. Air toxics emitted from cement plants include chromium, mercury, benzene, toluene, acetaldehyde, formaldehyde, and dioxins and furans. As discussed in Chapter II, these facilities are required to report their emissions under the “Hot Spots” Information and Assessment Act. Facilities whose emissions and risk potential exceed a certain threshold must prepare an HRA. The HRA further evaluates potential health risks and specifies appropriate mitigation measures. Criteria for these thresholds were developed by the California Air Pollution Control Officers Association in consultation with the Office of Environmental Health and Hazard Assessment. None of the four facilities in the Oro Grande area exceeded the threshold to require an HRA, and none pose a cancer risk of more than ten excess cancer cases per million people.

The emissions testing described above also looked at toxic air contaminants. Emissions of toxic compounds remained generally constant, with the exception of cadmium, which increased. The “Hot Spots” program described above is designed to evaluate and address the impacts of any increases in toxic emissions. The ARB is also required to track and prepare a report annually on toxic emissions from use of tires as fuels.

Existing Control Programs

The longstanding control programs described in Chapter II have been effective in reducing emissions throughout California, including the Oro Grande area. These emissions reductions translate into air quality improvements to date. However, more needs to be done to bring all areas of the region into attainment. Under the federal Clean Air Act, California has developed a State Implementation Plan, or SIP, that provides for attaining the national standards. The most recent SIP for the Mojave Desert region, which includes the Oro Grande area, addresses the national ozone standard, for which a portion of the Mojave Desert (including the Oro Grande area) is designated as being in nonattainment.

The statewide SIP provides for emissions reductions not only in the Oro Grande area, but throughout the Mojave Desert region and the South Coast as well. The South Coast reductions will be critical to ozone air quality in the Oro Grande area because the South Coast emissions levels are so much higher, and they contribute substantially to ozone throughout the Mojave Desert via transport. Photochemical ozone modeling completed by the South Coast Air Quality Management District and ARB indicate that the Mojave Desert nonattainment area would be in attainment if not for the influence of pollutants and emissions transported from upwind regions. Within the South Coast, the SIP relies heavily on NOx reductions as the most effective strategy. Overall, it requires a 76 percent reduction in NOx emissions and a 22 percent reduction in ROG emissions from 2006 levels. Modeling analyses show these emissions reductions will provide for attaining the national ozone standard in the Oro Grande area by the June 2017 deadline.

In addition to the reductions outlined above, the Mojave District has established rules for stationary sources in the local area. All of the facilities that would be subject to the cap-and-trade regulation, with the exception of Mitsubishi Cement, were constructed or modified during the last ten years. For example, under a 2008 agreement with U.S. EPA, the TXI Riverside Cement Company reduced emissions by replacing seven 50-year old short dry kilns with a single state-of-the-art kiln that complies with Best Available Control Technology (BACT) requirements. The new kiln will produce 1,500 fewer tons of NOx each year.

These facilities were subject to BACT emission limits when permitted, which represent the cleanest technology in use in the industry at the time of permitting. Although the Mojave District enforces source-specific rules to limit emissions from these facilities, the emission limits required in operating permits are substantially more restrictive that the rule requirements.

In contrast to these three facilities, the Mitsubishi Cement facility is regulated by the Mojave District's Rule 1161 (Portland Cement Kilns) and other prohibitory rules controlling NOx and PM_{10} emissions. Source test and continuous stack monitoring data indicate that this facility, like the other BACT-limited facilities, operates at a fraction of emission limits prescribed in generic prohibitory rules.

A number of additional State control programs address toxic air contaminants from cement facilities and their associated operations. The ARB has adopted an airborne toxics control measure to limit hexavalent chrome emissions from cooling towers. Diesel PM is also a concern due to emissions from the transportation of fuel to the cement plants via rail and trucking. Implementation of ARB's Diesel Risk Reduction Plan is comprehensively addressing these diesel PM emissions.

In addition to State and local rules, U.S. EPA recently amended two rules that apply to Portland cement manufacturing. The new U.S. EPA rules will significantly reduce mercury and other toxic air contaminant emissions, as well as NOx, sulfur dioxide (SO2), and particulate matter emissions that contribute to ozone and $PM_{2.5}$. The rules apply both to large and small, new and existing, cement kilns, with existing kilns required to comply in 2013. When fully implemented, U.S. EPA estimates a 92 percent reduction in both mercury and particulate matter emissions, an 83 percent reduction in total hydrocarbon emissions, and a 5 percent reduction in NOx emissions from affected cement kilns.

Assessment of Potential Cap-and-Trade Regulation Impacts

Emissions Inventory Development

To assess the potential localized emissions impacts of the cap-and-trade regulation, ARB worked closely with District staff to prepare an updated emissions inventory for the Oro Grande assessment area. This 2008 inventory reflects adopted air pollution control measures, plus measures included in the 2007 SIP to meet national air quality standards. The inventory includes estimates for all source types and was updated to reflect the economic downturn. Emissions estimates were also developed for 2020. ARB assumed there would be no change to industrial facility emissions between 2008 and 2020 in the Oro Grande area because it is not possible to specifically identify where new facilities would be located or the extent to which facilities might vary operations. However, in all likelihood, emissions from industrial facilities would be lower in 2020 than they currently are with the implementation of new control measures, such as U.S. EPA's Maximum Achievable Control Technology (MACT) standard.

Methodology for 2020 Scenarios

Given the flexibility provided by the cap-and-trade regulation, it is not feasible to predict how individual facilities within each community will respond to the requirements of the regulation. As discussed earlier in Section IV.B, market forces, other GHG emissions-reduction efforts, and existing co-pollutant regulatory programs will all influence emissions at individual facilities. Instead, ARB developed three hypothetical bounding scenarios to assess potential cumulative emissions impacts in 2020.

The emissions reductions that that will result from ongoing regulatory programs to reduce co-pollutants between 2008 and 2020 provide the baseline for evaluating the impacts of each scenario. This baseline reflects what would occur in the absence of cap-and-trade, or if all GHG reductions were achieved outside the community. The first scenario explores the potential co-benefits of limiting trading and the use of offsets within a community. The baseline (no change) and the first scenario bound the most likely impact of implementation of the regulation. Although staff concluded that it is not possible to attribute possible co-pollutant increases specifically to the cap-and-trade regulation, for the purpose of a bounding exercise staff examined the potential impacts of general facility growth through two additional scenarios.

ARB staff believes that scenarios two and three are very unlikely to result from the cap-and-trade regulation. Many factors influence a decision to expand production or build a new facility, and the cap-and-trade program itself imposes a new requirement on facilities—the need to procure allowances and offsets to accommodate GHG emissions—in addition to the strict permitting requirements already in effect for criteria pollutants and toxic air contaminants. Under scenario two, every facility would need to purchase allowances and offsets to accommodate any growth. We believe it is more likely that a few facilities may increase production, while others would decrease. Similarly, we do not believe that compliance with the cap-and-trade regulation will cause the siting of new facilities assumed in scenario three, though the regulation would not prevent it. Nevertheless, both scenarios are useful as hypothetical bounding analyses.

The first scenario assumes as a hypothetical upper bound that GHG emissions reductions occur at each of the four local industrial and electricity generation facilities in the Oro Grande area. As discussed in section IV.B, on average, the cap-and-trade industrial and electricity generation sources will need to reduce their GHG emissions by 4 percent to meet the 2020 cap.[5] Therefore, staff assumed a commensurate 4 percent reduction would occur in combustion-related NOx, $PM_{2.5}$, and ROG from these facilities. These additional reductions would further enhance the cumulative emissions reductions from ongoing programs.

The second scenario represents a hypothetical emissions increase of 4 percent at each of the four cap-and-trade facilities in the Oro Grande area. While this scenario provides a hypothetical upper bound of aggregate facility growth in the community, staff believes it is an unlikely situation given the current regulatory structure. As described in Chapter II, each individual unit of permitted equipment has a maximum permitted emission limit. Large facilities such as those covered under cap-and-trade often have hundreds of individual permits. If the facility owner modified that equipment or its operation such that actual emissions would

[5] Total GHG emissions under baseline conditions in 2020 are estimated to be 507 $MMTCO_2e$. GHG emissions from the capped sectors are approximately 409 $MMTCO_2e$ of the baseline. Reductions needed to meet the cap of 334 $MMTCO_2e$ will come in part through complementary measures from the Scoping Plan. After reductions from those measures, the cap-and-trade regulation is estimated to reduce at least 18 $MMTCO_2e$, representing a 4 percent reduction from capped sector emissions.

exceed the permitted levels, New Source Review (NSR) and its requirements to implement Best Available Control Technology (BACT) would apply. This is a comprehensive and lengthy process that is subject to public review. The extensive requirements of this permitting process effectively limit the potential for significant emissions increases at a given facility.

In addition, under this scenario, every facility would need to purchase allowances and offsets to accommodate any growth. While there could be growth at a few facilities within a community, as some facility types move to more efficient ways of operation or switch to the use of less carbon-intensive fuels, it is very unlikely that emissions would increase at every facility. Much more likely is a situation where a few facilities may increase production, while others would decrease. Nevertheless, staff evaluated the impact of an increase of 4 percent at every facility, in order to represent a potential maximum community-level impact.

Finally, the third scenario evaluated the hypothetical construction of a new natural gas power plant. As discussed earlier, due to requirements of the Renewable Energy Standard and other initiatives, there may be an increase in natural-gas-fueled power generation, as compared to more carbon-intensive coal, in order to reduce GHG emissions. Given that the Oro Grande area already contains one small power facility, ARB staff evaluated the potential emissions from an additional natural gas facility. Table IV-17, below, provides an estimate of criteria pollutant emissions from a hypothetical 500 megawatt (MW) combined-cycle natural gas power plant. It is important to remember that under California's existing regulatory structure, the construction of a new facility would be subject to the strict NSR permitting requirement described in Chapter II. This would include requirements to implement BACT, as well as to offset the emissions regionally.

Table IV-17: Estimated Criteria Pollutant Emissions Hypothetical Combined-Cycle Natural Gas Baseload Power Plant (500 MW Capacity)

	Emissions (tons per day)		
	NO_X	**ROG**	**PM_{10}**
Operating Emissions	0.31	0.11	0.27

The scenario analysis focuses on the industrial and electricity generation facilities covered by the cap-and-trade regulation, and does not address the additional reductions that will likely occur when transportation fuels and commercial and residential natural gas are also included under the cap.

Analysis of Potential Impacts

Under the existing baseline control program, including rules adopted in the 2007 SIP to meet national air quality standards, the Oro Grande area would still realize

NOx, $PM_{2.5}$, and ROG emissions reductions in 2020. The reductions will come primarily from on-road and off-road motor vehicles. As shown in Table IV-18, these ongoing emissions reductions result in a 16 percent reduction in NOx, 2 percent reduction in $PM_{2.5}$, and 3 percent reduction in ROG emissions from 2008 levels.

The first scenario assumes that all the emissions reductions needed from the cap-and-trade regulation are implemented locally at the four industrial and electricity generation facilities in the Oro Grande area, realizing a further 4 percent reduction in co-pollutant emissions. Because emissions from the cap-and-trade facilities comprise only a small portion of the overall inventory, these reductions translate into less than a 4 percent decrease in the total inventory for the Oro Grande area. In aggregate, full implementation of the cap-and-trade regulation by industrial and electricity generation sources locally would result in an additional 3 percent enhancement in localized NOx benefits, and an additional 1 percent enhancement in both the $PM_{2.5}$ and ROG benefits (Table IV-18). While not quantified here, combustion-generated toxic air contaminants would also likely decrease.

Table IV-18: Percent Emissions Reductions Between 2008 and 2020: Oro Grande Area[1]

	NOx	$PM_{2.5}$	ROG
BASELINE Emission Reductions from Existing Controls and No Emission Reductions at Cap-and-Trade Industrial and Electricity Generation Facilities	**16%**	**2%**	**3%**
SCENARIO 1 Emissions Reductions from Existing Controls and Emission Reduction at all Cap-and-Trade Industrial and Electricity Generation Facilities	**19%**	**3%**	**4%**
SCENARIO 2 Emission Reductions from Existing Controls and Emission Increases at all Cap-and-Trade Industrial and Electricity Generation Facilities	**14%**	**0%**	**3%**
SCENARIO 3 Emissions Reductions from Existing Controls and Addition of New Facility	**16%**	**-1%**	**3%**

Numbers are rounded to nearest percentage

[1] These tables include the combined emissions from mobile, area, and stationary sources. The industrial and electricity generation facilities covered by the proposed cap-and-trade regulation represent only a portion of these emissions. The emissions impacts of the scenarios do not include the additional emissions reductions that will likely occur when transportation fuels and commercial and residential natural gas are included in the cap. The emissions reductions from transportation fuels and commercial and residential natural gas would affect each of these scenarios equally.

As described previously, while ARB staff did not find situations where emissions increases were clearly attributable to implementation of cap-and-trade, the second scenario evaluated the potential general impact of an emissions increase of 4 percent at every cap-and-trade industrial and electricity generation facility in the community region. This hypothetical upper-bound increase in emissions would slightly reduce the overall benefits of the ongoing control program, with a 2 percent reduction in both NOx and $PM_{2.5}$ benefits, and a small reduction, less than 1 percent, in ROG benefits. However, cumulative emissions in the Oro Grande area would still be lower in 2020, as compared to 2008 for both NOx and ROG, while $PM_{2.5}$ emissions would remain constant.

Scenario three explored the potential emission impacts of constructing a new natural gas power plant in the local area. Based on typical emissions from similar facilities, the addition of a hypothetical new facility would slightly reduce the overall benefits of the ongoing control program, with a small reduction, less than 1 percent, in NOx and ROG benefits, and a 1 percent increase in $PM_{2.5}$. Overall, cumulative emissions in the Oro Grande area would still be lower in

2020, as compared to 2008 for both NOx and ROG ,while $PM_{2.5}$ emissions would increase slightly.

There is also the potential for increases in toxic air contaminants under scenarios 2 and 3. Toxics emissions are typically reflected in $PM_{2.5}$ and ROG emission estimates. Thus, efforts to control ROG and $PM_{2.5}$ also help address toxic air contaminants, broadly within the community. In addition, the requirements of the "Hot Spots" Information and Assessment Act are designed to assess and mitigate more localized, facility-specific impacts. As described earlier in this section, should emissions of toxic air contaminants increase such that they exceed the screening threshold, the facility would be required to conduct an HRA. Facilities with emissions that are determined to present a significant risk would then be required to implement measures to reduce that risk.

These scenarios focus on the compliance responses of the industrial sources covered by the cap-and-trade regulation. In 2015, transportation fuels and commercial and residential natural gas will be included in the cap, likely reducing emissions from those sources. Because the reductions associated with transportation fuel and commercial and residential natural gas would be the same for each of the scenarios, ARB chose to focus the analysis on industrial sources. The inclusion of the emissions reductions from transportation fuel and commercial and residential natural gas would likely increase the total co-pollutant benefits of the cap-and-trade regulation.

In all scenarios it is difficult to predict the actual air quality impacts within the local community resulting from any change in emissions. Combustion emissions are often vented through stacks. The heat generated by the combustion process can further increase the height of the emissions plume. Cement plants have stacks that are generally less than 100 meters; thus, the plume may reach the ground relatively nearby. However, because of dispersion and the time needed for chemical reactions to form regional pollutants such as ozone and secondary particulate matter, the maximum air quality impact for these pollutants may occur well downwind of a facility. In contrast, emissions of toxic air contaminants may have a more localized impact.

Air quality modeling is a standard tool for relating emissions to estimated air quality impacts. However, detailed information is required by the models to quantify the impacts. This information includes specificity on the locations and types of emission sources, stack heights, timing of emissions, emission rates, and for point sources, information to characterize the point of release. Due to the ambiguity associated with determining how each individual facility will comply with cap-and-trade, it is impossible to characterize the timing and location of any emissions changes at this time. This makes the use of modeling to characterize the air quality impact of potential changes in emissions infeasible.
Health assessments of the impact of air quality changes on human health require estimates of the change in $PM_{2.5}$, ozone, and other air pollutants for an exposed

population. The health impact depends on the air pollutant type and ambient concentration, location and duration of exposure, and characteristics of the exposed population, including total residents, age, and baseline incident rates for various death and disease types where a quantitative relationship has been established with an air pollutant. Health assessments in California have been limited to pollution sources where $PM_{2.5}$, ozone, and air toxic exposures can be estimated using measured air quality data as a surrogate for a widely distributed source (e.g., trucks) or with the use of air quality models (e.g., ports and rail yards). However, there is no unique air quality surrogate for the large industrial sources covered by the cap-and-trade regulation to distinguish them from smaller industrial sources or other types of combustion sources. Nor, as discussed above, was it feasible to conduct air quality modeling. Due to this lack of information on the concentration, location, and duration of air pollutant exposures, it was not possible to conduct a health assessment

Summary

In summary, air quality is improving throughout the Oro Grande area. The assessment area meets the federal $PM_{2.5}$ standards and shows continued progress toward meeting the federal ozone standard. California's ongoing co-pollutant emissions control programs will ensure that cumulative emissions will continue to decrease through 2020 in the Oro Grande area, with associated health improvements from improved air quality.

While the cap-and-trade regulation allows for flexibility in how facilities comply, staff looked at several scenarios that bound the possibilities, including the construction of a new facility. If emissions reductions due to implemention of the cap-and-trade regulation occur locally at the four facilities in the assessment area, there could be some small additional co-benefits from the reduction of combustion-related criteria pollutants. While emissions increases directly attributable to the cap-and-trade regulation are considered very unlikely, potential emissions increases that might occur in general are also expected to be small within the context of the larger cumulative emissions reductions that will be occurring as a result of California's extensive emissions control programs.

Although staff believe that the potential for emissions increases attributable to the proposed rule is very unlikely, ARB is committed to monitoring the implementation of the cap-and-trade regulation to identify and to address any situations where the program has caused an increase in criteria pollutant or toxic emissions. At least once each compliance period, ARB will use information collected through the mandatory reporting regulation, the cap-and-trade regulation, the industrial efficiency audit, and other sources of information to evaluate how individual facilities are complying with the regulation. The cap-and-trade program is another layer of review and opportunity for data gathering, decision-making, and agency and public vigilance to ensure any potential increases are identified and addressed.

V. CONCLUSION

Because of California's comprehensive control programs, air quality has improved significantly throughout the State, with commensurate reductions in adverse health impacts. These improvements will continue through 2020 as ARB continues to adopt and implement regulations to meet State and federal air quality standards, reduce toxic risk, and diminish California's climate change emissions.

This analysis demonstrates that California's existing programs to meet federal air quality standards will provide the majority of emissions reductions in each community, with further NOx reductions ranging from approximately 15 to 45 percent by 2020. Staff's analysis further indicates that the cap-and-trade regulation is expected to have a beneficial affect on emissions. In the communities evaluated, the cap-and-trade regulation has the potential to provide small additional NOx reductions in the range of 1 to 3 percent if all greenhouse gas reductions were implemented locally. The assessment does not include criteria pollutant and toxic emissions reductions that the cap-and-trade program is expected to provide from transportation fuels and commercial and residential gas use, in addition to those likely to occur at industrial and electricity generation facilities.

Due to the inherent flexibility of the cap-and-trade regulation, as well as the overlay of other complementary GHG reduction measures, it is difficult to predict the decisions that individual facilities may make in any given community. However, based on the available data, current law and policies that control industrial and electricity generating sources of air pollution, and expected compliance responses, ARB believes that emissions increases at the statewide, regional, or local level due to the regulation are not likely. The cap-and-trade program will provide an incentive for covered facilities to decrease GHG emissions and any related emissions of criteria and toxic pollutants.

Market forces, consumer demand, co-pollutant regulatory programs, other GHG emissions-reduction programs—especially the Low Carbon Fuel Standard and the Renewable Electricity Standard—and other forces will all affect individual facility co-pollutant emissions. Although ARB staff do not predict that the cap-and-trade regulation will result in emissions increases, staff did examine the potential impacts of facility growth, for any reason, within each community on cumulative emissions. In the context of total community emissions, these increases would be very small. For example, a representative change in NOx emissions as analyzed with a growth-bounding scenario would reduce the expected 15 to 45 percent reduction by 2020 by 2 percent or less.

Because of the uncertainty in compliance choices that industries may make, staff believes that continued monitoring and review of how facilities choose to comply, particularly in light of the information provided by ARB's Industrial Source Audit regulation is critical. Many of the mechanisms are already in place to address potential emissions increases. They include stationary source control and permitting programs, toxics control and risk assessment requirements, and air monitoring for smog, particulate matter, and toxics. AB 32 programs, including the cap-and-trade program, are another layer of review and opportunity for data gathering, decision-making, and agency and public vigilance to ensure facility specific dis-benefits are identified and addressed.