

# 1. BACKGROUND

## General SIP Requirements

California's 2007 State Implementation Plans (SIPs) are a combination of State and local air quality planning documents that must show how California will meet federal the 8-hour ozone standard statewide. The San Joaquin Valley, South Coast Air Basin, Sacramento region, San Diego, Ventura, and a number of air districts downwind of urban areas are nonattainment for the ozone standard. Ozone SIPs must be submitted to U.S. EPA by June 15, 2007.

This document is the State's emission reduction strategy for sources of pollution under State and federal authority (State Strategy), and, for every local region not meeting federal standards, a demonstration of how attainment of the 8-hour ozone standard will be achieved.

In addition to ozone SIPs, the South Coast and San Joaquin Valley must prepare PM2.5 SIPs for submittal to U.S. EPA by April 5, 2008. For the South Coast Air Basin, the South Coast Air Quality Management District is developing a PM2.5 SIP in parallel with the ozone SIP. The San Joaquin Valley PM2.5 SIP is on track to be submitted in 2008.

The 2007/2008 ozone and PM2.5 SIPs are another step in the air quality planning process that over the years has helped define new actions to improve California's air quality. ARB has adopted a series of regulations over the past 10 years to implement measures in the 1994 ozone SIP, as well as additional new ARB measures identified in the 2003 SIP update. New mobile source regulations, reformulated gasoline, and multiple consumer products regulations envisioned in these SIPs have been adopted and are being implemented today. And, while California has serious air quality challenges ahead, it is important to recognize the progress made as a result of California's landmark air pollution control programs. With that experience and history of success, we need to continue to do more. ARB staff recognizes the importance of the new State measures and are proposing a full slate of new measures for development and consideration by the Board.

## National Air Quality Standards

The U.S. EPA adopts standards for ambient (outdoor) air pollutants designed to protect public health. Extensive studies on the health effects of air pollution worldwide have confirmed the importance of continuing to reduce people's exposure to air pollution. U.S. EPA is required to review its air quality standards every five years.

In July 1997, the federal government announced new national ambient air quality standards (NAAQS) for the pollutants ozone and particulate matter (PM). The new standards provide more protection from the harmful health effects of these pollutants. The ozone standard was revised to protect against longer pollutant exposure periods by requiring that ozone concentrations not exceed specified levels over an 8-hour period instead of a 1-hour period. A new particulate matter standard was added to protect against the smaller inhalable particles, less than two and a half microns in diameter (PM<sub>2.5</sub>). Air quality standards have become more stringent over time as new studies have shown adverse health effects at lower levels. The standards below are the current benchmark for federal SIP requirements. U.S. EPA is currently reviewing the adequacy of the current 8-hour standard. And in December 2006, U.S. EPA adopted a more stringent 24-hour PM<sub>2.5</sub> standard of 35 micrograms per cubic meter. This will likely mean that several new areas will be required to prepare a plan to attain the newer standard. Initial State recommendations for nonattainment areas are due in late 2007, with final nonattainment areas determined by U.S. EPA in early 2010. Plans for the revised 24-hour standard will be due in 2013, with attainment dates to be determined after U.S. EPA issues transition guidance.

### Ozone Standard

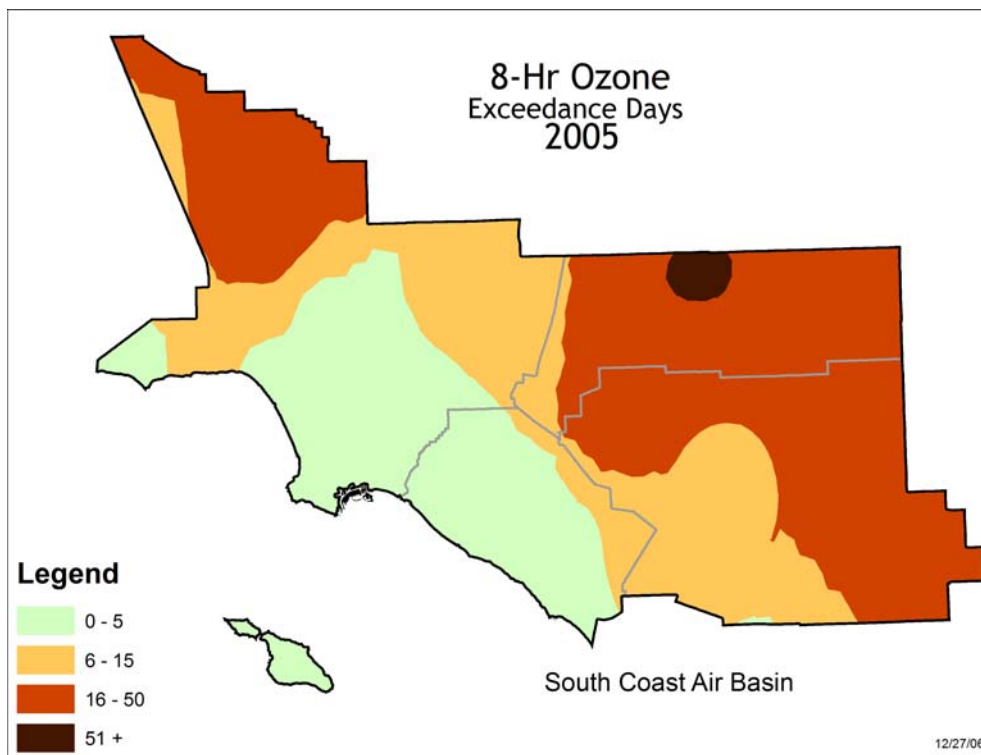
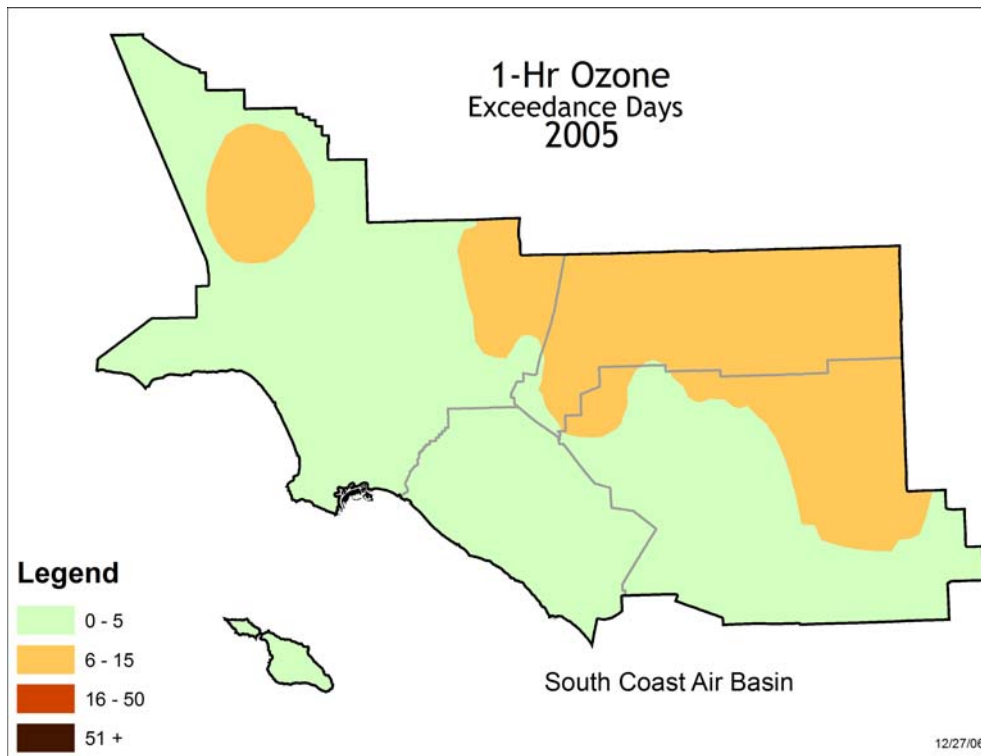
**0.08 parts per million for 8 hours**, not to be exceeded, based on the fourth highest concentration averaged over three years.

### PM 2.5 Standards

**65 micrograms per cubic meter for 24 hours**, not to be exceeded, based on the 98<sup>th</sup> percentile concentration averaged over three years, *and* **15 micrograms per cubic meter annual average** (arithmetic mean) averaged over three years.

How much more stringent is the 8-hour ozone standard than the 1-hour ozone standard? The two maps on the following page illustrate a dramatic difference in exceedance days (number of days that violated the standard) for the 1-hour standard versus the 8-hour standard in the South Coast air basin in 2005. While many areas of California continue to be in violation of federal air quality standards, real air quality progress has been made, as we will illustrate later. The clean air bar simply continues to be raised as we learn more about the health effects of air pollution.

### Comparison of 1-Hr Ozone Standard and More Stringent 8-Hr Ozone Standard in the South Coast Air Basin



## **Health Effects of Ozone and PM2.5**

### **Ozone**

The formation and health impacts of ozone are very well studied. Ozone is a highly reactive gas that forms in the atmosphere through complex reactions between chemicals directly emitted from motor vehicles, industrial plants, consumer products and many other sources. It forms in greater quantities on hot, sunny, calm days making the summer season the key exposure period.

Considerable research over the past 35 years has investigated how people respond to inhaling ozone. These studies have consistently shown that inhalation of ozone can lead to inflammation and irritation of the tissues lining the human airways. This causes the muscle cells in the airways to spasm and contract, thus reducing the amount of air that can be inhaled. Symptoms and responses to ozone exposure vary widely, even when the amount inhaled and length of exposure is the same. Typical symptoms include cough, chest tightness, and increased asthma symptoms. Ozone in sufficient doses can also increase the permeability (“leakiness”) of lung cells, making them more susceptible to damage from environmental toxins and infection.

Medical studies of large populations have found that ozone exposure is associated with an increase in hospital admissions and emergency room visits, particularly for lung problems such as asthma and chronic obstructive pulmonary disease. Several studies have also associated ozone exposure with increased premature mortality in elderly people with chronic diseases of the lungs and circulatory system.

People who exercise or work outdoors are at greater risk of experiencing adverse health effects from ozone exposure because they inhale more ozone. Current evidence has linked the onset of asthma to exposure to elevated levels of ozone in exercising children. Children and adolescents are at increased risk because they are more likely to spend time outdoors engaged in vigorous activities than adults and because they inhale more ozone per pound of body weight.

### **PM2.5**

Particulate matter (PM) air pollution is also well studied. Particulate matter pollution is a complex mixture that consists of dry solid fragments, solid cores with liquid coatings, and small droplets of liquid. PM can be directly emitted into the air in forms such as dust and soot. It can also be formed in the atmosphere from the reaction of various gases. Particulate matter is less than 10 microns in diameter (a micron is one-millionth of a meter) and is called PM10. Even smaller particles, those 2.5 microns or less in diameter, are called “fine particles” or PM2.5, and are the target of this SIP. PM2.5 is a component of PM10.

Extensive research has shown that PM can be inhaled into the deep portions of the lungs. Some inhaled particles are exhaled again, but others deposit in the lungs, which can lead to inflammation in both the lungs and the circulatory system. PM<sub>2.5</sub> poses an increased health risk because it can penetrate deeper into the lungs and may also enter the bloodstream.

Population-based studies in hundreds of cities around the world have demonstrated a strong link between elevated particulate matter levels and premature death in people with pre-existing heart or lung disease. The two most important of these studies were performed in many cities in the United States, and have been ongoing for over 15 years. Both of these studies found a strong relationship between long-term PM exposure and premature death.

Scientists have observed higher rates of hospitalization, emergency room visits and doctor's visits for respiratory illnesses or heart disease during times of high PM concentrations. During these periods of high PM levels, scientists also observed the worsening of both asthma symptoms and acute and chronic bronchitis, and reductions in various measures of lung function.

The elderly and people with heart and/or lung diseases are particularly at risk of experiencing adverse effects from PM exposure. Studies have also shown that children may be particularly vulnerable to PM effects. There is evidence from the 10-year Children's Health Study funded by the ARB that in communities with high levels of PM children's lungs develop more slowly and that at maturity they tend to have lower lung capacity than children who grow up in communities with lower levels of PM. Just as with ozone, children and infants may also be more at risk of experiencing adverse effects from PM because they inhale more air per pound of body weight than do adults, they breathe faster, and have smaller body sizes. In addition, there is some evidence that children's immature immune systems may cause them to be more susceptible to PM than adults.

### **Nonattainment Areas and Air Quality Trends**

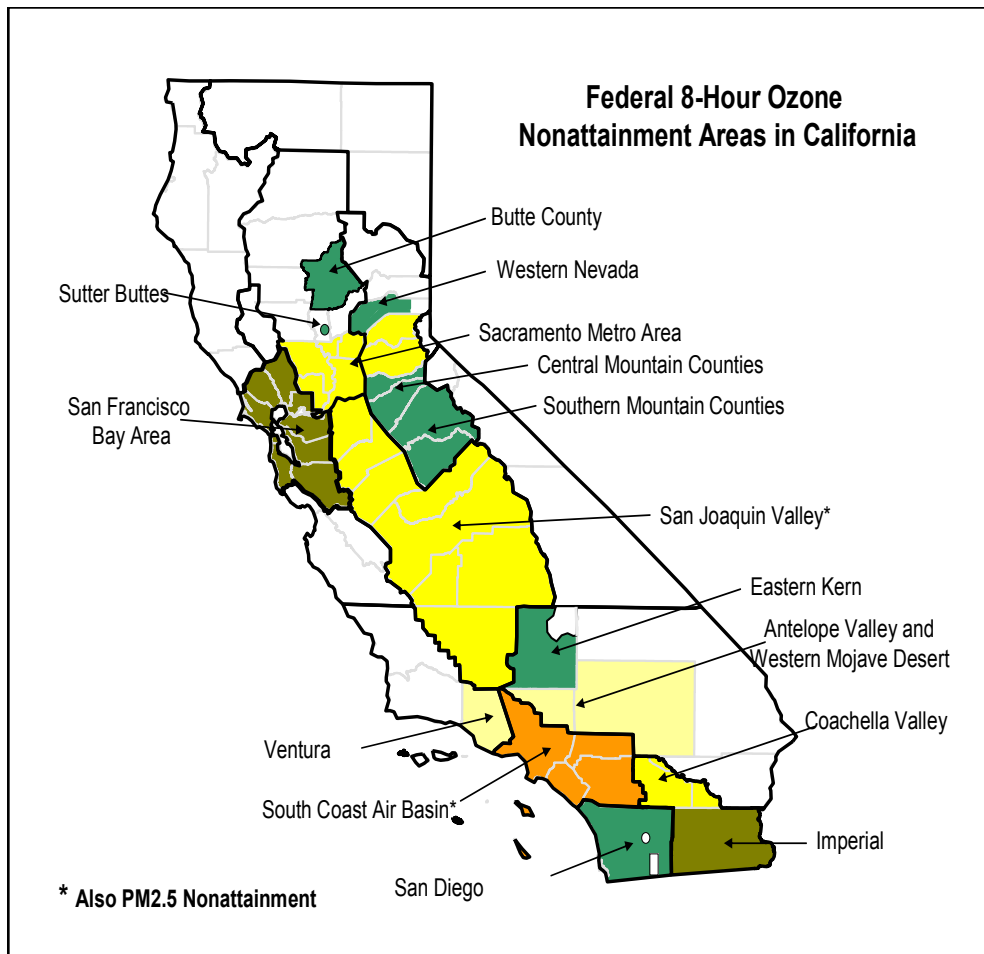
Geographic areas that exceed a federal air quality standard are called nonattainment areas. A comprehensive network of monitoring stations throughout California measures air quality and provides the data necessary to determine whether an area meets or exceeds federal ozone and PM<sub>2.5</sub> air quality standards.<sup>1</sup>

Compliance with the federal ozone and PM<sub>2.5</sub> standards is based on pollutant concentrations, measured at a comprehensive network of monitoring stations throughout California, averaged over three years. These three-year averages are called *design values*. Air quality monitoring in the years 2001 through 2003

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<sup>1</sup> More about California's air quality monitoring network can be found on ARB's website at: <http://www.arb.ca.gov/aaqm/aaqm.htm>

was used by U.S. EPA to designate 15 areas in California as nonattainment for the federal 8-hour ozone standard. The San Joaquin Valley and South Coast Air Basin are also nonattainment for PM2.5.



A specific year's design value is averaged over three years. For example, the design value for the year 2001 reflects the averages for the years 1999, 2000, and 2001. Ozone design values are an average of the fourth highest concentrations for each of the last three years. Design values for the PM2.5 annual average reflect annual average (arithmetic mean) concentrations averaged over the last three years. The PM2.5 24-hour design values reflect the 98<sup>th</sup> percentile concentrations averaged over the last three years.

For the ozone standard, areas are classified based on the severity of the problem. In descending order in terms of magnitude of the problem, the classifications are *extreme*, *severe*, *serious*, *moderate*, and *marginal*. The Clean Air Act provides more time to meet the standard based on the severity of the problem. Based on its classification an area is given an attainment deadline. A special designation, called *basic*, refers to nonattainment areas governed under a separate set of requirements in the Clean Air Act. For PM2.5, U.S. EPA simply designated the South Coast and San Joaquin Valley as nonattainment without

application of the classification scheme used for PM10. This results in an attainment deadline of 2015.

Ozone Nonattainment Area	Nonattainment Designation (Current / Anticipated)	Attainment Year (Current / Anticipated)
South Coast Air Basin	Severe / Extreme	2021 / 2024
San Joaquin Valley	Serious / Extreme	2013 / 2024
Coachella Valley	Serious / Severe	2013 / 2019
Sacramento Region	Serious / Severe	2013 / 2019
Antelope Valley and Western Mojave Desert	Moderate / Severe	2010 / 2019 or 2021
Ventura County	Moderate / Serious	2010 / 2013 or 2019
Imperial County	Marginal	2007
San Francisco Bay Area	Marginal	2007

The above table lists the marginal through extreme nonattainment areas for the federal 8-hour ozone standard, while the table to the right lists the areas with the special basic ozone nonattainment designation. The Clean Air Act allows changing of nonattainment designations and the extension of the attainment deadline if the State believes a change is needed after analyzing the nature of the ozone problem and challenges to meet the standard. So the above table includes the current attainment designations, as well as designation changes that may be needed based on regional analyses.

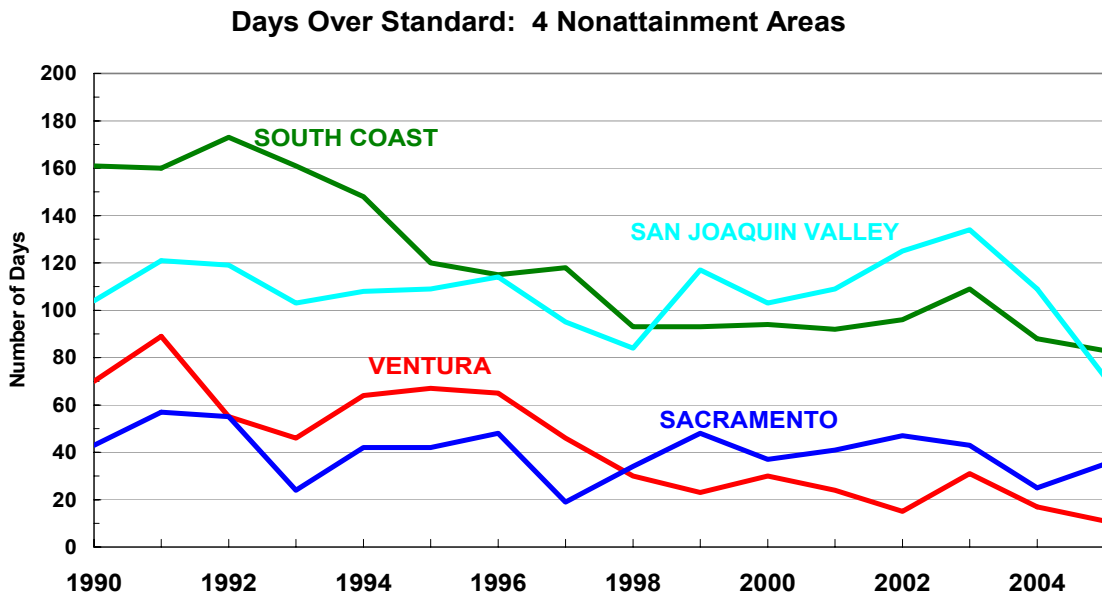
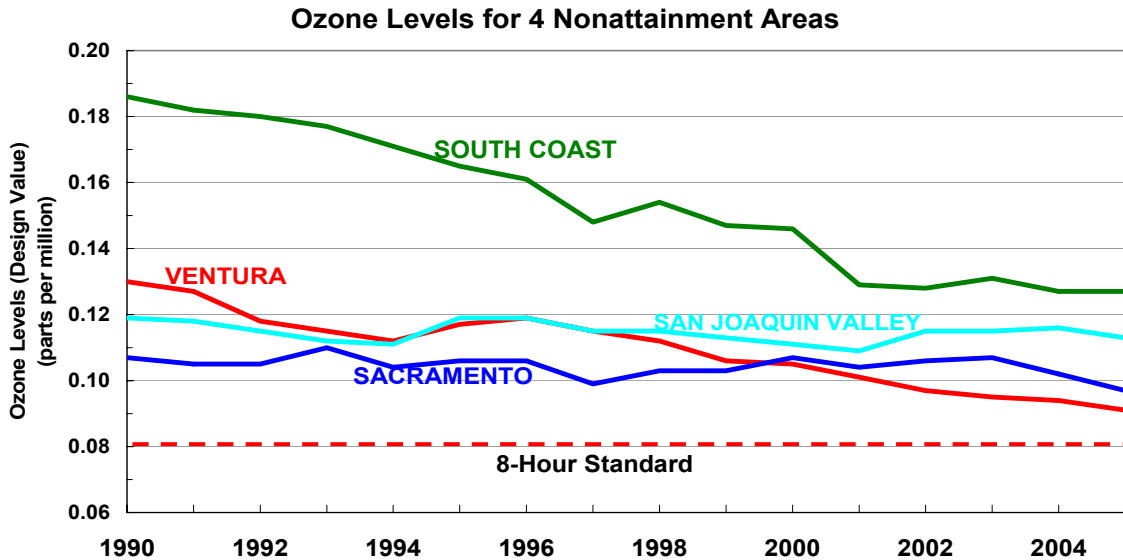
Basic Ozone Nonattainment Areas Attainment Year 2009-2014
Butte County
Central Mountain Counties
Eastern Kern County
San Diego County
Southern Mountain Counties
Sutter Buttes
Western Nevada County

For this set of SIPs, U.S. EPA has provided guidance on how to interpret the attainment deadline as it relates to attainment demonstrations. The question arises because the deadlines are mid-year. The ozone attainment deadline is June 15 and the PM2.5 deadline is April 5 of the attainment year. To address the issue, U.S. EPA guidance calls for the analysis of attainment to be done for the year prior to the actual attainment year. So in this document we will be showing emission reduction targets and emissions for the year prior to the attainment year. For example, if the attainment year is 2024, we will be showing emission reduction targets and emissions for the year 2023.

### Ozone Trends

A snapshot of four ozone nonattainment areas on the next page shows ozone levels (design values) relative to the federal standard and number of days over the standard since 1990. The ozone levels chart gives a sense of recent progress toward meeting the standard as well as how far we still have to go. The San Joaquin Valley and the South Coast have the most days exceeding the

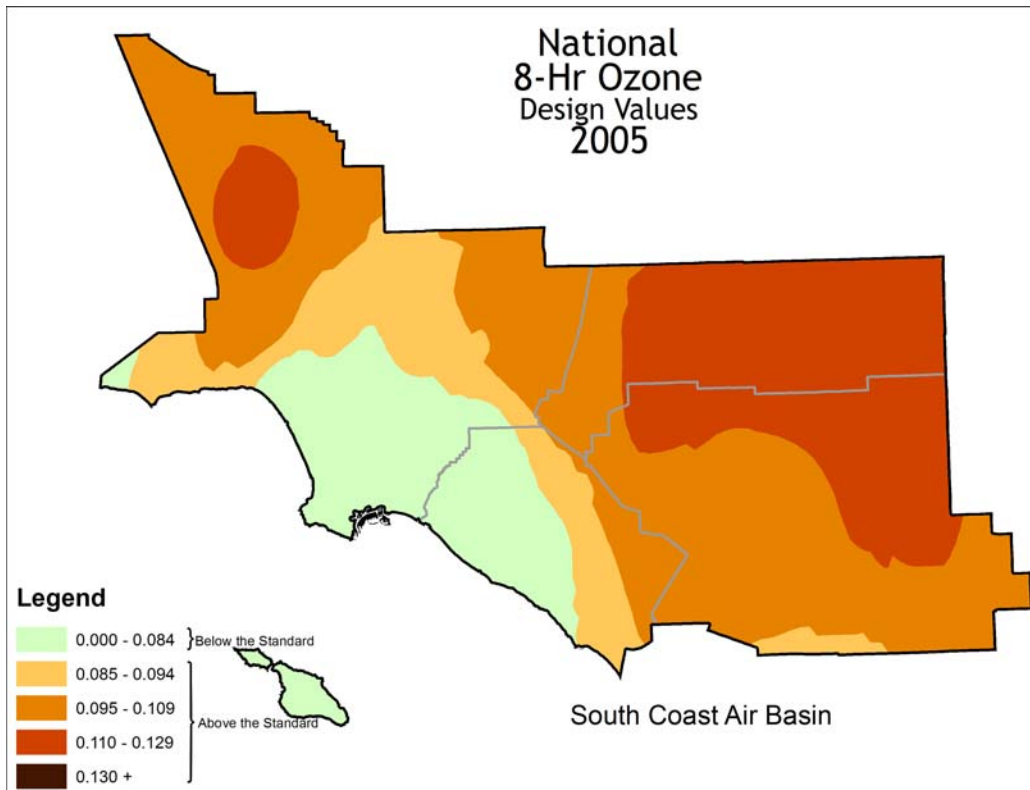
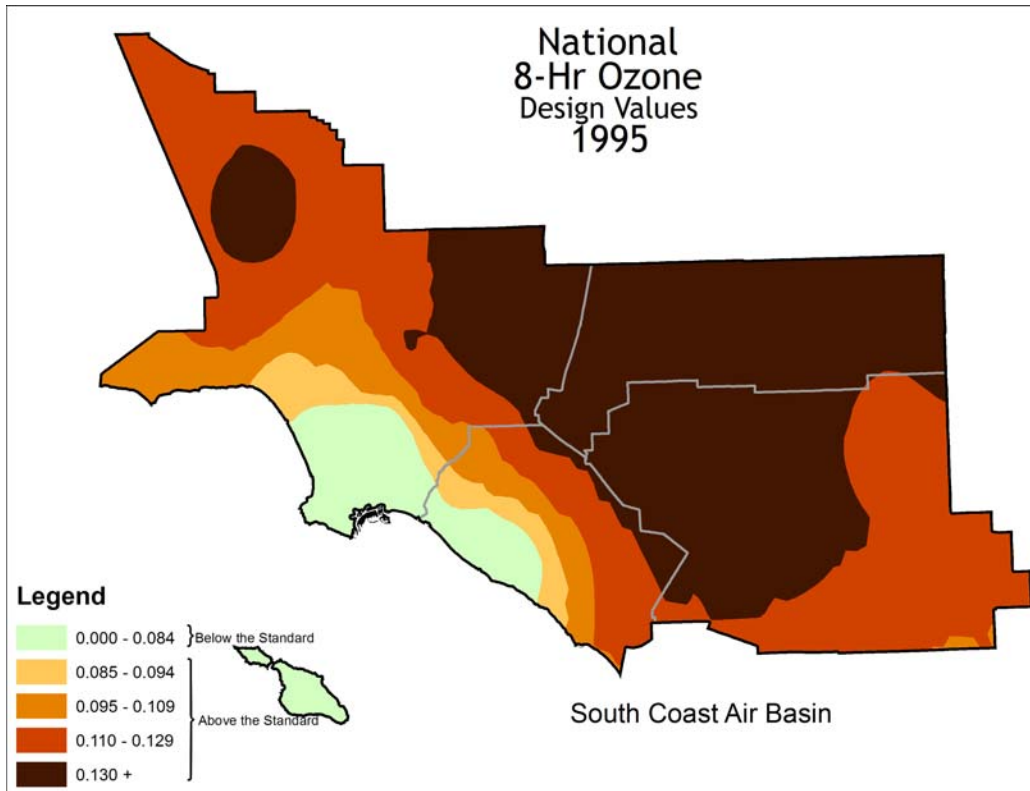
standard and the South Coast has the highest design values. In general, ozone trends show the greatest improvement in coastal areas like San Diego and Ventura.



South Coast's ozone concentrations have been cut by about a third since 1990, but the region's design value is still 50 percent over the level of the standard and progress has slowed in recent years. Fifteen years ago, the highest values were widespread throughout the basin. Now, the number of communities within the basin experiencing the highest values is substantially smaller. The maps below show this progression of air quality progress.

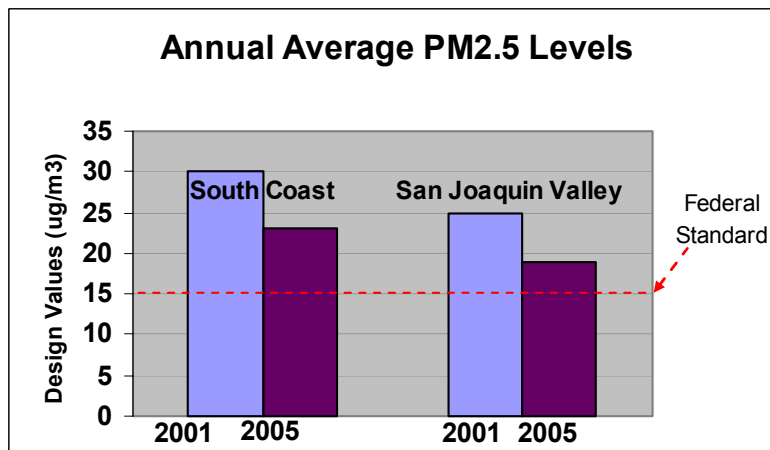
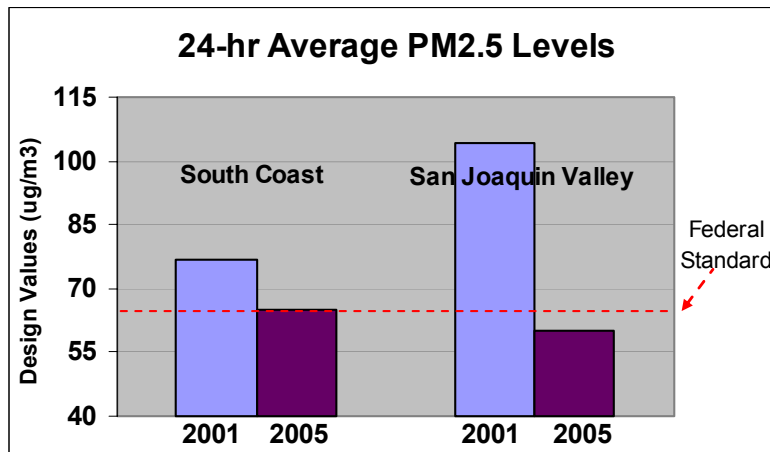


### Ozone Air Quality Comparison – South Coast 1995 to 2005



## PM2.5 Trends

Both the South Coast and San Joaquin Valley are showing good progress toward PM2.5 attainment. As of 2005, both regions are meeting the 24-hour standard. In addition, annual average PM2.5 design values have declined by 25 percent since 2001. In terms of the remaining challenge, the South Coast levels are still about 50 percent above the standard, and the San Joaquin Valley levels are about 25 percent above the standard.



## Development of State Strategy

In developing our proposed statewide emission reduction strategy, ARB staff worked closely with air districts on attainment demonstrations for ozone for each area and on a PM2.5 attainment demonstration for the South Coast. In that process, emissions inventories are developed and air quality models are used to establish a region's "carrying capacity" and to calculate the additional emission reductions needed for attainment.

The emission reduction targets serve three purposes. First, they provide an indication of how far the existing control program will take each region toward

attainment and if additional reductions from new measures are needed. Second, they indicate how much time a region may need to reach the standards and if a classification change to a later attainment date is likely needed. And third, they provide a benchmark for designing new emission reduction measures.

The magnitude of the attainment challenges in the South Coast and San Joaquin Valley, as shown in the next chapter, are the drivers for ARB staff's proposed statewide strategy. The new SIP measures are also needed for the Sacramento region, the Coachella Valley, and the Antelope Valley and Western Mojave Desert nonattainment area. California's other ozone nonattainment areas, including San Diego and Ventura, are projected to attain by their assigned deadline based on the benefits of previously adopted SIP measures.

Given the severity of the ozone problems in the South Coast and San Joaquin Valley, both regions have indicated in their draft air quality plans that they will be requesting a reclassification to extreme with attainment deadlines of 2024. The 2015 PM<sub>2.5</sub> deadline and the South Coast PM<sub>2.5</sub> carrying capacity framed staff's analysis of new near-term measures. The other key driver for developing new SIP strategies is to reach ozone attainment in both regions as quickly as possible.

Chapter 2 will summarize the process of determining the emission reduction targets and show those targets for the South Coast and San Joaquin Valley. The process consists of developing an emissions inventory and performing data analyses and air quality modeling based on that inventory to establish the emissions limits that ensure air quality standards are met.

### **Air Pollution Transport**

Air pollution transport, by definition is quite simple – air movements carry pollutants from one area to another. In reality, air pollution transport is a very complex phenomenon. It is three-dimensional and can occur at ground level or aloft in upper air levels. With modeling for the State being split into two modeling domains – one for Northern and Central California and one for Southern California – transport relationships between air districts within these large domains are implicitly captured within the models. This is the mechanism ARB uses in its oversight role to ensure transport impacts on downwind areas are addressed for purposes of both State and federal air quality standards. In terms of attainment demonstrations, inputs to the modeling for a downwind area include forecasted emission reductions in upwind areas. This way the attainment demonstration takes into account the shared responsibility for reducing emissions in regions where air pollution transport can at times be significant.

## **Other Programs**

In addition to SIPs, ARB has multiple plans and programs to reduce air pollution throughout California. Emission reduction strategies from many of these programs are taken into account in the ozone and PM2.5 SIPs.

### **ARB Goods Movement Plan**

The Emission Reduction Plan for Ports and Goods Movement in California, approved by ARB in April 2006, is one of the main contributors of new measures necessary to meet federal air quality standards. Most goods that move within and through California do so by truck. Ships are the largest source of SOx emissions in the State. Heavy-duty trucks are the largest statewide source of NOx emissions. These air pollution realities make it impossible to tackle the PM2.5 challenge without addressing goods movement emissions. Likewise, emission reduction targets for ozone will not be met without reducing emissions related to goods movement.

The strategies included in the goods movement emission reduction plan target ships and trucks, as well as the other three main sources of goods movement emissions: harbor craft, cargo handling equipment, and locomotives. By 2020, these strategies will cut statewide goods movement emissions of NOx by 63 percent, SOx emissions by 78 percent, and will also reduce the statewide health risk from goods movement-related diesel particulate matter 85 percent.

Work on many of the strategies in the goods movement emission reduction plan is underway and serves as the starting point for near-term actions to meet the emission reduction targets for the SIPs. These strategies will provide essential new emission reductions needed for regional attainment, while they reduce the air pollution-related health risk for those who live near our ports, railyards, distribution centers, and other goods movement facilities.

### **ARB Diesel Risk Reduction Plan**

An important source of directly emitted PM2.5 is diesel exhaust. The particulate matter from diesel-fueled engines (diesel PM) has been singled out as a particularly harmful pollutant and identified as a toxic air contaminant by the Air Resources Board in 1998. Nearly 70 percent of the known cancer risk caused by air toxics is attributed to diesel PM. In 2000, ARB adopted a plan to reduce diesel PM emissions 85 percent by 2020, and has since adopted a number of regulatory measures to reduce diesel PM emissions statewide. Additional measures are under development. Diesel PM control measures in the plan are reducing both direct diesel PM and NOx emissions through a combination of engine retrofits and replacements. Upcoming mobile source fleet measures to reduce diesel PM and NOx emissions are a critical part of the new SIP strategy as well the Diesel Risk Reduction Plan.

## **Environmental Justice**

The SIPs consist of strategies designed to bring a region's air quality into compliance with federal standards. SIPs must be designed to ensure air quality standards throughout the entire region, so achieving air quality standards provides public health benefits to every community. This makes SIP implementation important to meeting ARB's community health and environmental justice goals. As part of our environmental justice program, ARB has initiated air quality studies in several communities and continues to focus resources on mobile source enforcement in environmental justice communities. ARB's Air Quality and Land Use Handbook, approved by ARB in May 2005, provides guidance to help improve local land use decisions that can negatively impact public health at the community level.

ARB's SIP strategies have a significant nexus to community health due to the emphasis on cleaning up the legacy fleets of diesel engines. Much of the large equipment and vehicles that help construct our buildings and highways and move our goods are not well controlled and have very long lives. Adopting rules to clean up these fleets will have an immediate and significant effect on the communities where these sources are concentrated.

## **Regional Haze**

The same particulate air pollutants that affect public health also extinguish and scatter light, thereby obscuring visibility. The federal Clean Air Act set the far-reaching goal of achieving natural visibility conditions by 2064 in the nation's most treasured parks and wilderness areas. Of the 156 designated areas, 29 are in California, managed by the National Park Service and the U.S. Forest Service. Therefore California is working in concert with fourteen other western states to reduce controllable emissions of particulates so that regional haze is reduced in the western region of the country. In 1999, the U.S. Environmental Protection Agency published rules to guide the preparation of Regional Haze State Implementation Plans to reduce regional haze.

ARB is currently preparing the first regional haze plan for the entire State, for transmittal to EPA by the December 17, 2007 deadline. General trends in California since the 1990s show that emission controls are improving visibility in our parks and wilderness areas. The regional haze plan will show how these controls constitute reasonable progress along the path to natural visibility. In 2012, ARB will conduct a mid-course review of measured visibility changes and analyze how emission reductions implemented to achieve the 8-hour ozone and the PM<sub>2.5</sub> standards will move the State further along the path to natural visibility in the future.

## **Climate Change**

ARB's implementation of the Global Warming Solutions Act of 2006 (AB 32) is a major new effort just underway. These activities, including future rulemaking, will occur on a parallel but separate track as we proceed with implementation of our SIP strategies. The statutory requirements and timelines are different, so it is not appropriate to include potential co-benefits of greenhouse gas strategies in SIP documents at this point. However, as greenhouse gas reduction measures are developed and adopted, ARB staff will do the necessary technical work to determine the impact on ozone and PM2.5 precursor pollutants.

## 2. TECHNICAL FOUNDATION

### Emissions Inventory Overview

Developing attainment strategies requires an understanding of the sources of pollution, the quantities emitted, their geographical distribution, and how air pollution controls and growth will impact future emission levels. There are multiple types of emission inventories used in air quality programs including annual averages, seasonal, and day-specific modeling inventories. SIPs rely on region specific inventories that may differ from the statewide picture. In the regulatory development process emission inventories are typically refined since inventory data is a key input for cost-effectiveness evaluations. This is an important inventory improvement mechanism, and ARB staff incorporates these updates into the statewide inventory.

The emissions inventory serves three principal roles in the SIP process:

- It provides a primary input to the modeling necessary to determine the emission reductions needed for attainment;
- It supplies comprehensive emissions information for the development of emission reduction strategies;
- And after the SIP is approved, it is used to track progress of the emission reduction commitments outlined in the plan.

California is a diverse State with many sources of air pollution. ARB, in cooperation with local air districts, maintains a statewide emissions inventory. The inventory is constructed based on four major emission categories:

- Stationary Sources -- generally industrial facilities, which can be identified by a name and location.
- Areawide Sources -- either small individual sources, such as residential fireplaces, or widely distributed sources that cannot be tied to a single location, such as consumer products and dust from unpaved roads.
- On-Road Mobile Sources -- includes on-road cars, trucks, buses, etc.
- Off-Road Mobile Sources -- includes off-road vehicles such as boats, off-road recreational vehicles, aircraft, trains, ships, industrial and construction equipment, farm equipment, and other equipment.

The statewide emissions inventory developed by ARB and the local air districts includes all the main sources of emissions – all of the many on-road and off-road mobile sources and all the various stationary and areawide sources. Estimating the amount of emissions statewide and in each region is done by summing the emissions from each source. The statewide inventory for the 2007 SIP development uses ARB's November 2006 on-road motor vehicle model (EMFAC) and ARB's off-road mobile source model. Stationary source emissions are

provided by local air districts. The regional SIP inventories are discussed in Chapter 5, Regional SIP Summaries.

### **Precursor Pollutants**

Air pollutants that react to form ozone and PM<sub>2.5</sub> in the air are called precursor pollutants. For ozone, the main precursor pollutants are nitrogen oxides (NO<sub>x</sub>) and reactive organic gases (ROG). There are four main precursors of PM<sub>2.5</sub>: NO<sub>x</sub>, ROG, sulfur oxides (SO<sub>x</sub>) and ammonia (NH<sub>3</sub>). PM<sub>2.5</sub> can also be directly emitted into the atmosphere (direct PM<sub>2.5</sub>) in various forms that include smoke from fires, dust from paved and unpaved roads, and particle emissions from the burning of fossil fuels.

PM<sub>2.5</sub> pollution is a complex mixture and air quality modeling is used to assess the relative effectiveness of reducing each precursor pollutant as well as directly emitted PM<sub>2.5</sub>. Current data analysis and air quality modeling indicates that two of the four precursors, NO<sub>x</sub> and SO<sub>x</sub>, are significant in reducing PM<sub>2.5</sub> concentrations in the South Coast, and that the PM<sub>2.5</sub> emission control strategy would be served best by focusing on reducing emissions of these two precursor pollutants. There is also a small PM<sub>2.5</sub> benefit from ROG emission reductions, but benefits from ammonia emission reductions were found to be insignificant. Reducing direct PM<sub>2.5</sub> is also an effective strategy according to recent modeling.

**NO<sub>x</sub>.** Nitrogen oxide emissions are produced by the combustion of fuels in engines, furnaces, or fires. Today mobile sources make up about 85 percent of the total statewide NO<sub>x</sub> emissions. This percentage decreases over time as motor vehicle fleets become cleaner. Emissions from less clean sources like locomotives, ships, and aircraft continue to grow. Stationary sources of NO<sub>x</sub> include combustion processes in industries such as manufacturing, food processing, electric utilities, and petroleum refining. Areawide sources of NO<sub>x</sub>, which include waste burning and residential fuel combustion, contribute a smaller portion of total NO<sub>x</sub> emissions. Air quality science indicates that reductions of NO<sub>x</sub> are more beneficial than reductions of other pollutants to help meet both ozone and PM<sub>2.5</sub> standards, and therefore NO<sub>x</sub> is a major focus of the State Strategy.

**ROG.** Reactive organic gases result primarily from incomplete fuel combustion and the evaporation of chemical solvents and fuels. Stationary sources of ROG include processes that use solvents such as dry cleaning, degreasing, and coating operations. Today mobile sources are the largest ROG emissions category. However, other ROG categories become relatively more important over time. Areawide ROG sources which grow directly with population begin to dominate in the future so that by 2020 consumer products is the largest source category.



**SOx.** Sulfur oxide emissions are dominated by the mobile source category of ships and commercial boats. Evaporative losses from petroleum refining (a stationary source) are another significant source of SOx. The other sources that make up 5 percent or more of the SOx inventory are locomotives and mining and cement manufacturing.

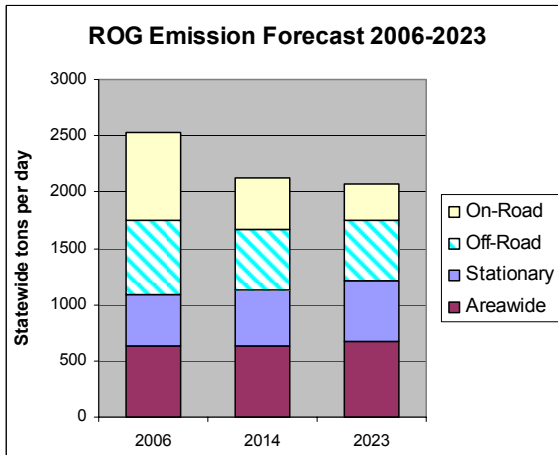
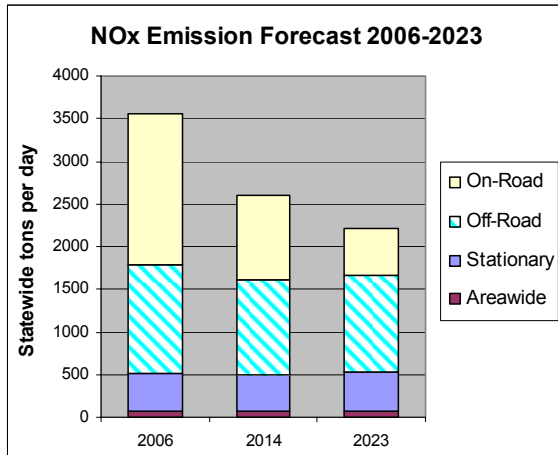
**Direct PM2.5.** Directly emitted PM2.5 comes mainly in the form of smoke, soot, and dust particles. Major sources include managed burning and agricultural burning; dust generated by vehicles traveling on paved and unpaved roads, residential fireplaces, cooking and fuel combustion; and particle emissions from diesel-fueled engines on trucks, ships, and construction equipment. While soot from diesel engines is not a major portion of the entire direct PM2.5 emissions inventory, it is a major health concern, as it is a toxic air contaminant that can cause premature death.

### **Forecasting Future Emissions**

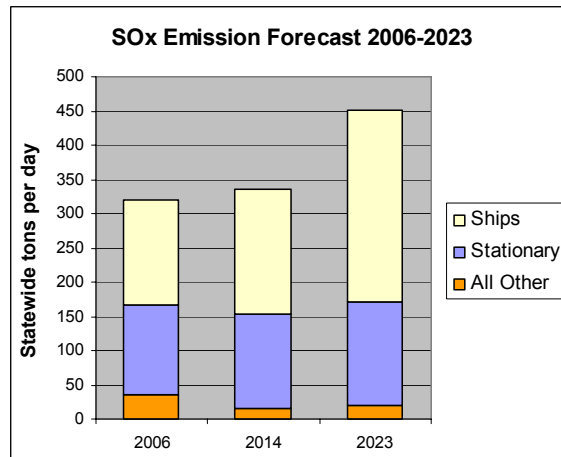
Estimates of projected future emissions depend on two independent variables: growth and control. Different methods are used to estimate the future growth of emission sources based on their type. And future emission controls are incorporated into the projected emissions for each source category based on when the controls are implemented, how much the controls reduce emissions, and how many units (vehicles, consumer products, etc.) are affected.

The charts on the next page show the change in total projected statewide emissions for NOx, ROG, and SOx from 2006 to 2023 and the relative emissions change in each of these emission source categories. They reflect projected growth in each category combined with the benefits of the existing control program (those emission controls adopted prior to 2007). For example, SOx emissions as a category continue to grow due to ship emission increases. This makes ship SOx emissions a high priority for control in the new SIP strategy. NOx and ROG emissions are decreasing as a result of existing control programs despite substantial growth in population, travel, and the economy.

ARB uses two computer models to simulate and forecast emissions for on- and off-road sources. For cars, sport utility vehicles, minivans, and trucks, ARB used EMFAC2007. For off-road vehicles and equipment, ARB used OFFROAD2007. Both models were released for public use in November 2006 after a multi-year development process. As required by federal guidance, EMFAC2007 uses the latest fleet information for vehicles age and population. The data is developed from the California Department of Motor Vehicle registration data through 2005. For SIP purposes, as required by State law, vehicle activity is based on local transportation agency projections, or California Department of Transportation data, if local data are not available.



Note: "Off-Road" includes trains, planes, and ships, as well as all other off-road vehicles and equipment.



### Top Emission Sources

While the top emission categories are mobile sources in all California's nonattainment areas, there is variability in the relative contribution of different sources by region. This makes the overall statewide emission reduction strategy more challenging and will affect the priorities of local control plans. For example, controlling the emissions from ocean-going vessels will have a tremendous impact on SOx emissions in the South Coast and therefore is essential to that region's PM2.5 control plan. Reducing SOx from ships has much less consequence in the San Joaquin Valley, so increased NOx reductions from combustion sources will become even more important for the Valley's PM2.5 control strategy. The tables on the next two pages show the top emission sources of both NOx and ROG in the South Coast and the San Joaquin Valley.

Here are some things we have learned by analyzing the emissions inventory for these two areas:

- South Coast NOx emissions are significantly impacted by goods movement, with the ships, trains, trucks, and off-road equipment that move goods contributing about 30 percent of all South Coast NOx emissions. Aircraft NOx emissions are also increasing.
- The impact of goods movement in the San Joaquin Valley is felt mostly by the emissions contribution of heavy-duty trucks, which are projected to remain the largest NOx emitter through 2023.
- Emissions of NOx from manufacturing and industrial sources in the San Joaquin Valley become increasingly significant as emissions from mobile sources decline in the future.
- The large population in the South Coast is the main reason why consumer product emissions are projected to become the number one ROG emissions source by 2014.
- San Joaquin Valley ROG emissions are significantly impacted by agricultural sources such as livestock waste.
- The existing emission control program will cut heavy-duty truck NOx emissions about 70 percent in the San Joaquin Valley and South Coast by 2023, but they need to be cut even more by new strategies to attain ozone and PM2.5 standards.
- Mobile sources under federal and international jurisdiction (like ships, locomotives, and aircraft) contribute an increasingly greater proportion of total emissions, especially NOx, in future years as emission increases due to growth overwhelm the existing control program, while emissions of mobile sources under State jurisdiction decrease due to stringent controls.

**South Coast Air Basin – Top Sources of NOx**  
Summer emissions, tons per day

<b>Source Category</b>	<b>2006</b>	<b>2014</b>	<b>2023</b>
HEAVY DUTY DIESEL TRUCKS	259	140	73
PASSENGER VEHICLES	204	101	53
OFF-ROAD EQUIPMENT (CONSTRUCTION AND MINING)	120	81	41
OFF-ROAD EQUIPMENT (COMMERCIAL, INDUSTRIAL)	87	53	35
SHIPS AND COMMERCIAL BOATS	75	87	116
GASOLINE-FUELED COMMERCIAL TRUCKS	36	24	17
LOCOMOTIVES	31	23	28
RESIDENTIAL FUEL COMBUSTION	18	16	14
MANUFACTURING & INDUSTRIAL (BOILERS, ENGINES)	17	15	15
SERVICE AND COMMERCIAL (BOILERS, ENGINES)	16	12	11
RECREATIONAL BOATS	16	17	18
AIRCRAFT	16	22	29
<b>TOTAL OF TOP CATEGORIES</b>	<b>896</b>	<b>589</b>	<b>450</b>
<b>TOTAL</b>	<b>971</b>	<b>650</b>	<b>505</b>
<b>TOP CATEGORIES PERCENT OF TOTAL</b>	<b>92%</b>	<b>91%</b>	<b>89%</b>

**San Joaquin Valley – Top Sources of NOx**  
Summer emissions, tons per day

<b>Source Category</b>	<b>2006</b>	<b>2014</b>	<b>2023</b>
HEAVY DUTY DIESEL TRUCKS	285	155	75
FARM EQUIPMENT (COMBINES AND TRACTORS)	60	37	17
PASSENGER VEHICLES	58	31	16
MANUFACTURING & INDUSTRIAL (BOILERS, ENGINES)	39	44	48
OFF-ROAD EQUIPMENT (CONSTRUCTION AND MINING)	34	22	12
OFF-ROAD EQUIPMENT (COMMERCIAL, INDUSTRIAL)	34	23	15
LOCOMOTIVES	22	21	22
AGRICULTURAL IRRIGATION PUMPS	16	7	5
OIL AND GAS PRODUCTION (COMBUSTION)	11	10	10
COGENERATION (ELECTRICITY GENERATION AND HEAT RECOVERY)	9	7	8
GASOLINE-FUELED COMMERCIAL TRUCKS	9	7	6
FOOD AND AGRICULTURE (CROP PROCESSING AND WINERIES)	9	9	9
GLASS AND RELATED PRODUCTS	8	9	11
<b>TOTAL OF TOP CATEGORIES</b>	<b>595</b>	<b>381</b>	<b>253</b>
<b>TOTAL</b>	<b>650</b>	<b>425</b>	<b>300</b>
<b>TOP CATEGORIES PERCENT OF TOTAL</b>	<b>92%</b>	<b>90%</b>	<b>84%</b>

Note: Emissions do not include impact of State Strategy proposed new measures.

**South Coast Air Basin – Top Sources of ROG**  
Summer emissions, tons per day

<b>Source Category</b>	<b>2006</b>	<b>2014</b>	<b>2023</b>
PASSENGER VEHICLES	207	112	76
CONSUMER PRODUCTS	101	103	110
RECREATIONAL BOATS	64	53	51
OFF-ROAD EQUIPMENT (LAWN AND GARDEN)	52	40	38
ARCHITECTURAL COATINGS (PAINTS AND THINNERS)	31	29	31
OFF-ROAD EQUIPMENT (COMMERCIAL, INDUSTRIAL)	28	15	12
PETROLEUM MARKETING (GASOLINE EVAPORATIVE LOSSES)	27	28	31
COATINGS (PAINTS AND THINNERS - NON ARCHITECTURAL)	27	25	28
GASOLINE-FUELED COMMERCIAL TRUCKS	24	13	8
GAS CANS	21	10	7
OFF-ROAD EQUIPMENT (CONSTRUCTION AND MINING)	20	12	8
<b>TOTAL OF TOP CATEGORIES</b>	<b>600</b>	<b>441</b>	<b>399</b>
<b>TOTAL</b>	<b>732</b>	<b>567</b>	<b>534</b>
<b>TOP CATEGORIES PERCENT OF TOTAL</b>	<b>82%</b>	<b>78%</b>	<b>75%</b>

**San Joaquin Valley – Top Sources of ROG**  
Summer emissions, tons per day

<b>Source Category</b>	<b>2006</b>	<b>2014</b>	<b>2023</b>
PASSENGER VEHICLES	62	37	24
WASTE DISPOSAL/COMPOSTING	57	72	80
LIVESTOCK WASTE (DAIRY CATTLE)	40	33	41
OIL AND GAS PRODUCTION (EVAPORATIVE LOSSES/FLARING)	28	26	23
CONSUMER PRODUCTS	24	26	30
PESTICIDES	22	20	20
HEAVY DUTY DIESEL TRUCKS	20	13	8
RECREATIONAL BOATS	20	17	17
FOOD AND AGRICULTURE (CROP PROCESSING AND WINERIES)	13	12	13
ARCHITECTURAL COATINGS (PAINTS AND THINNERS)	11	12	13
OFF-ROAD EQUIPMENT (COMMERCIAL, INDUSTRIAL)	10	6	4
FARM EQUIPMENT (COMBINES AND TRACTORS)	10	5	3
<b>TOTAL OF TOP CATEGORIES</b>	<b>317</b>	<b>279</b>	<b>277</b>
<b>TOTAL</b>	<b>452</b>	<b>410</b>	<b>414</b>
<b>TOP CATEGORIES PERCENT OF TOTAL</b>	<b>70%</b>	<b>68%</b>	<b>67%</b>

Note: Emissions do not include impact of State Strategy proposed new measures.

## **Setting the Emission Reduction Targets**

U.S. EPA rules require the use of air quality modeling to set emission reduction targets. Modeling is also helpful in guiding the selection of the most effective pollutants to control. To set ozone emission reduction targets, air quality modeling has been conducted separately for two overarching areas. One area is Northern and Central California, encompassing the San Joaquin and Sacramento Valleys, the Bay Area and the Sierra Nevada Mountains. ARB staff has been doing this modeling. The other area is Southern California, including the South Coast Air Basin, Ventura County, Imperial County, and the Mojave Desert area. The South Coast air district has been doing this modeling. The South Coast air district has also been performing the air quality modeling to set its PM<sub>2.5</sub> target.

### **Weight of Evidence Analysis**

A Weight of Evidence analysis provides a set of complementary analyses that supplements the SIP-required modeling. These analyses can include consideration of measured air quality, emissions, and meteorological data, evaluation of other air quality indicators, and additional air quality modeling. A Weight of Evidence approach looks at the entirety of the information at hand to provide a more informed basis for the attainment strategy. While all analysis methods have inherent strengths and weaknesses, examining an air quality problem in a variety of ways increases the confidence one has in the results. This approach also provides a better understanding of the overall problem and the level and mix of emissions controls needed for attainment.

The discussion in Chapter 4 about South Coast PM<sub>2.5</sub> pollution is a weight of evidence approach. More detailed weight of evidence analysis will be included in ARB staff reports on the local air district plans and in the local plans themselves.

### **South Coast Ozone Emission Reduction Targets**

Under State law the South Coast air district is responsible for setting carrying capacities for the South Coast Air Basin. While the carrying capacities result in large emission reduction targets for both NO<sub>x</sub> and ROG, the South Coast modeling indicates that NO<sub>x</sub> reductions are more effective at reducing ozone in the long run, although ROG reductions are still needed to maximize progress. In fact, the air district modified the South Coast Air Basin carrying capacity in its February 2007 draft air plan, relying even more heavily on NO<sub>x</sub> reductions than in its earlier estimates.

The emission reduction targets based on the February 2007 carrying capacities are presented below.

**Draft South Coast Ozone Emission Reduction Targets**

(tons per day)	<b>NOx</b>	<b>ROG</b>
2006 Emissions Inventory	972	732
Carrying Capacity	114	420
<b>Emission Reduction Target</b>	<b>858</b>	<b>312</b>

It will be important to revisit the relative carrying capacities in subsequent SIPs to factor in inventory improvement, updated modeling, and control measure development.

**South Coast PM2.5 Emission Reduction Targets**

As discussed previously, unlike ozone, PM2.5 consists of many different components. These components can vary by location and season, with both local and regional scale contributions. This complexity and variability presents a unique challenge in modeling for attaining the annual standard, and introduces a higher level of uncertainty in the results. In addition, while there is a long history and body of experience for ozone model application, air quality modeling for PM2.5 is relatively more recent, and it has not been applied as extensively. ARB will continue to work with air districts on efforts to refine PM2.5 modeling techniques.

**Draft South Coast PM2.5 Emission Reduction Targets**

(tons per day)	<b>NOx</b>	<b>ROG</b>	<b>SOx</b>	<b>Direct PM2.5</b>
2006 Emissions Inventory	972	732	63	101
Carrying Capacity	443	469	19	88
<b>Emission Reduction Target</b>	<b>529</b>	<b>263</b>	<b>44</b>	<b>13</b>

**San Joaquin Valley Emission Reduction Targets**

ARB staff has been using photochemical models for Northern and Central California developed as part of the multi-million dollar Central California Air Quality Study. This modeling continues to confirm that NOx is the key to long term attainment in the San Joaquin Valley. (This is also true for the Sacramento Valley and the rural regions downwind.) ROG looks beneficial especially in the near term for maximum progress and to supplement NOx reductions long term.

The ozone emission reduction targets for San Joaquin Valley are shown in the following table. The ROG carrying capacity is implicit, based on the much larger benefit of NOx reductions demonstrated by the modeling.

**San Joaquin Valley Ozone Emission Reduction Targets**

(tons per day)	<b>NOx</b>	<b>ROG</b>
2006 Emissions Inventory	650	454
Carrying Capacity	160	342
<b>Emission Reduction Target</b>	<b>490</b>	<b>112</b>

San Joaquin Valley PM2.5 modeling is underway and carrying capacities and emission reduction targets will be developed later in 2007 for a PM2.5 plan that is due to U.S. EPA in April 2008.



### **3. ARB's 2007 SIP STATE STRATEGY**

The State Strategy maps out how to achieve the emission reductions necessary to meet federal air quality standards. The two main emission reduction components of the State Strategy are the adopted SIP measures and proposed new measures. The adopted SIP measures include those adopted through 2006. Proposed new measures include those to be adopted after 2006.

Responsibility for implementing emission reduction measures is shared between the agencies with primary responsibility for controlling air pollution in California: the Air Resources Board, 35 local air pollution control and air quality management districts, and the U.S. Environmental Protection Agency. However, given the current status of statewide emissions, ARB has the lion's share of responsibility, followed by U.S. EPA.

#### **Agency Roles in SIP Measure Development**

##### **Local Measures**

Local air districts are primarily responsible for controlling emissions from stationary and areawide sources (with the exception of consumer products) through rules and permitting programs. Examples include industrial sources like factories, refineries, and power plants; commercial sources like gas stations, dry cleaners, and paint spray booth operations; residential sources like fireplaces, water heaters, and house paints; and miscellaneous non-mobile sources like emergency generators. Districts also inspect and test fuel vapor recovery systems to check that such systems are operating as certified.

##### **State Measures**

ARB is responsible for controlling emissions from mobile sources (except where federal law preempts ARB's authority) and consumer products, developing fuel specifications, establishing gasoline vapor recovery standards and certifying vapor recovery systems, providing technical support to the districts, and overseeing local district compliance with State and federal law. The Department of Pesticide Regulation is responsible for control of agricultural, commercial and structural pesticides, while the Bureau of Automotive Repair runs the State's Smog Check programs to identify and repair polluting cars.

##### **Federal Measures**

U.S. EPA has the authority to control emissions from mobile sources, including sources all or partly under exclusive federal jurisdiction (like interstate trucks, some farm and construction equipment, aircraft, marine vessels, and locomotives based in this country). U.S. EPA also has oversight authority for state air programs as they relate to the federal Clean Air Act. International organizations develop standards for aircraft and marine vessels that operate outside the U.S.

Federal agencies have the lead role in representing the U.S. in the process of developing international standards.

### **Adopted SIP Measures**

Many measures already adopted by local, State and federal agencies are currently reducing emissions. Many will do so at an accelerated rate in the future. Some adopted measures are scheduled to go into effect years hence. Adopted SIP measures will have a very significant impact on emissions and air quality between now and the target dates (attainment years) in the areas of the State that do not meet federal ozone and PM2.5 air quality standards.

Adopted SIP measures have been developed over the years through the combined efforts of air pollution regulators – with a foundation of ARB’s mobile source and fuels programs, complementary national actions for pollution sources under federal authority, and local air district programs for industrial and commercial sources -- as well as transportation plans that integrate transit and other alternatives to solo vehicle travel. ARB has adopted 46 emission-reducing control measures since the approval of the 1994 1-hour ozone SIP. These measures, shown on the table on Page 38 entitled “Air Resources Board SIP Control Measures (1994-2006),” comprise the bulk of the benefits of the adopted measures.

### **Mobile Sources**

#### **Cleaner Engines and Fuels**

California has dramatically tightened emission standards for on-road and off-road mobile sources and the fuels that power them. The table below shows how significantly the adopted measures have controlled emissions from new engines for the major categories of mobile sources.

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.

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. And new cargo handling equipment will be 95 percent cleaner by 2011.

## Impact of Existing Standards and Emission Limits

Source	Controlled Since	Level of Control*
<b>ON-ROAD</b>		
Passenger Cars	1961	<b>99% in 2006 (ROG + NOx)</b>
Trucks and Buses	1988	<b>90% by 2007, 98% by 2010 (NOx) 98% by 2007 (PM)</b>
Motorcycles	1975	<b>88% by 2008 (ROG + NOx)</b>
<b>GOODS MOVEMENT</b>		
Ship Auxiliary Engines (fuel)	2000	<b>96% (SOx), 83% (PM) by 2010</b>
Locomotives	1973	<b>60% in 2005 (ROG+NOx)</b>
Harbor Craft	2004	<b>50% in 2004 (NOx)</b>
Cargo Handling Equipment	2005	<b>95% by 2011-2012 (ROG+NOx, PM)</b>
<b>OFF-ROAD SOURCES</b>		
Large Off-Road Equipment	1996	<b>98% by 2015 (ROG + NOx)</b>
Personal Water Craft	1990	<b>88% by 2010 (ROG)</b>
Recreational Boats	1990	<b>89% by 2010 (ROG)</b>
Lawn & Garden Equipment	1990	<b>82-90% by 2010 (ROG)</b>
<b>AREAWIDE SOURCES</b>		
Consumer Products	1989	<b>50 categories controlled 50% (ROG)</b>

\* Level of emissions control compared to uncontrolled source.

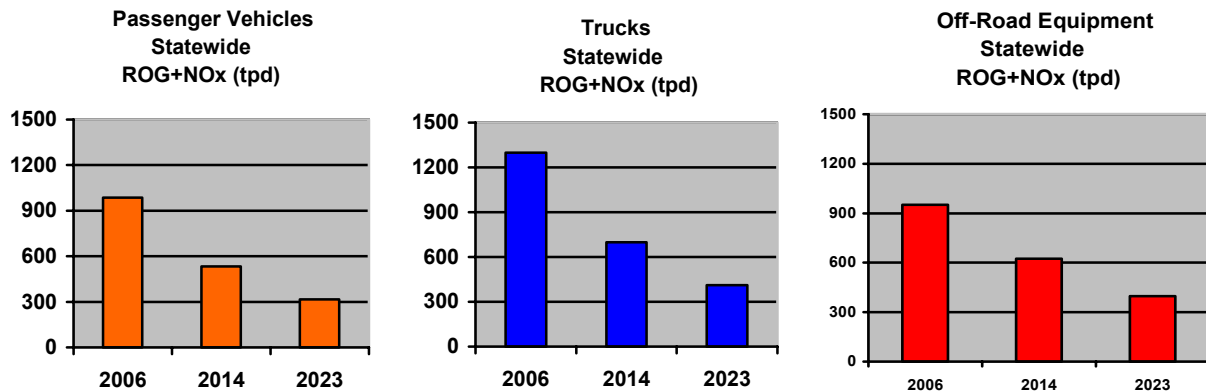
California has also drastically lowered standards for off-road sources, from lawn and garden equipment, to recreational vehicles and boats, to construction equipment and other large off-road sources. From 2010 through 2014, these new off-road sources will be manufactured with 80-98 percent fewer emissions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

### Air Resources Board SIP Control Measures (1994-2006)

Air Resources Board Action	Date	Air Resources Board Action	Date
In-Use Diesel Agricultural Engine Requirements	2006	California ZEV Requirement Update	2003
Consumer Product Lower Emission Limits	2006	Heavy-Duty Gas Truck Emission Standards	2002
Zero Emission Bus Rule Amendments	2006	Heavy-Duty Diesel Truck Emission Standards	2001
Off-Highway Recreational Vehicle Regulation Amendments	2006	Inboard and Sterndrive Marine Engine Emission Standards	2001
Forklifts and Other Spark-Ignition Equipment Regulation	2006	Architectural Coatings Suggested Control Measure	2000
Border Truck Inspection Program Protocol Improvements	2006	Urban Transit Bus Fleet Rule	2000
Ship Auxiliary Engine Cleaner Fuel Requirements	2005	Off-Road Diesel Equipment Emission Standards	2000
Diesel Cargo Handling Equipment Rule	2005	Reformulated Gas MTBE Phase Out	1999
Public and Utility Diesel Truck Fleet Rule	2005	Consumer Product Emission Limits	1999
Heavy-Duty Sleeper Truck Idling Limits	2005	Portable Fuel Can Regulation	1999
Portable Fuel Container Requirements	2005	Marine Pleasurecraft Emission Standards	1998
Transit Bus Rule Additions		Low-Emission Vehicle Program (LEV II) Exhaust Standards	1998
Off-Road Diesel Engine Tier 4 Standards	2004	Large Off-Road Gas/LPG Engine Emission Standards	1998
Harbor Craft and Locomotive Clean Diesel Fuel Requirement	2004	Cleaner Burning Gasoline Rule Improvements	1998
Idling Limits for Trucks	2004	On-Road Heavy-Duty Truck Exhaust Emission Standards	1998
Consumer Products Rule	2004	Light-Duty Vehicle Off-Cycle Emission Controls	1997
Chip Reflash to Detect Truck Emission Control System Failure	2004	Consumer Product Emission Limits	1997
Transportation Refrigeration Unit Rule	2004	Locomotive Memorandum of Agreement for the South Coast	1997
Portable Diesel Engine Emission Standards	2004	Medium- and Heavy-Duty Gas Truck Emission Standards	1995
Stationary Diesel Engine Regulation	2004	Aerosol Coatings Regulation	1995
Solid Waste Collection Vehicle Regulation	2003	Large Off-Road Diesel Statement of Principles	1996
Lawn and Garden Equipment Emission Standards	2003	Medium- and Heavy-Duty Gasoline Trucks	1995
Low Sulfur Diesel Fuel Regulation	2003	Off-Road Recreational Vehicles Regulation	1994

The charts below clearly illustrate the benefits of adopted SIP measures to reduce emissions from mobile sources. The downward emission trends are dramatic given California's projected growth in population, vehicle travel, and goods movement activities. But because on-road and off-road mobile sources together account for so much of the State's inventory of ozone and PM2.5 forming emissions, further reductions in mobile source emissions are essential if air quality standards are to be realized.



### Cleaning Up the Legacy Fleet

Adopted SIP measures 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. We still have a lot of work to do to clean up the legacy fleet. That is why the majority of new measures in the State Strategy are in-use measures.

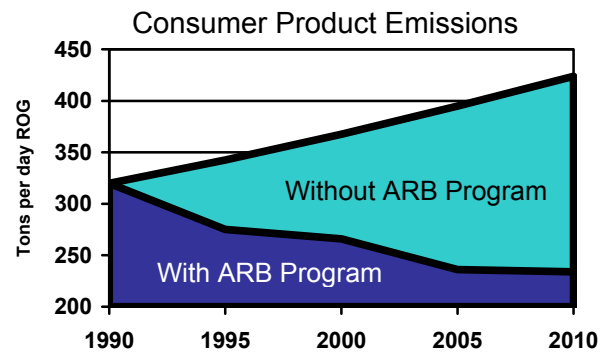
Many programs and rules are currently in place to reduce emissions from the mobile source legacy fleets. The Smog Check Program ensures that passenger vehicles stay clean as they age and on-board diagnostic systems identify smog control problems. Heavy-duty truck inspection programs help control smoke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

ARB has adopted 20 in-use regulations in the last five years. In-use regulations have required use of cleaner fuels, greatly reducing emissions from ships and harbor craft. Excessive truck and bus idling has been restricted. 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. And 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.

### Consumer Products

ARB has adopted standards to limit emissions from nearly 50 consumer product categories (such as hair sprays, deodorants, and cleaning compounds), as well as over 35 architectural coatings and aerosol paints categories. The Board has adopted and implemented voluntary provisions to offer greater compliance flexibility to consumer product manufacturers while retaining the air quality benefits. Without these actions, ROG emissions from these products would be roughly 60 percent greater in 2010. But, as you can see from the above chart, the impact of population growth begins to counter the benefits of adopted measures – more controls are needed.



### Local Rules and Programs

#### Stationary and Area Sources

Local air districts are primarily responsible for controlling emissions from stationary and areawide sources, with the exception of consumer products, through regulations and permits. Stationary sources include industrial sources like factories and power plants, commercial sources like gas stations and dry cleaners, and residential sources such as fireplaces and water heaters. Areawide sources are diffuse sources of emissions that are spread over a wide area, such as paints and pesticides.

Local air districts help reduce emissions through limits on emissions from new sources (the New Source Review program) and technology-based requirements for existing sources, called Best Available Retrofit Control Technology and Reasonably Available Control Technology requirements. Air districts adopt and enforce rules governing these sources of emissions.

Businesses in California are subject to the most stringent air quality rules in the country. Local air districts have adopted a number of innovative rules and programs over the years to help reduce emissions. For example, South Coast's innovative program, RECLAIM, provides market incentives for companies to use the cleanest possible technologies. And the San Joaquin Valley has adopted a

first-of-its-kind indirect source rule that ensures that new developments bear their fair share of the pollution burden. ARB has suggested over 50 control strategies for stationary sources that many local air districts have adopted.

The proposed local air district measures for each nonattainment area are listed, described, and quantified in the attainment plans for each area. The local measures, coupled with the State Strategy measures, must provide the necessary emission reductions to meet the federal standards.

### Transportation and Land Use Planning

In California, local governments are responsible for transportation and land use planning, and transportation plans are an important part of the SIP. Federal law requires a metropolitan region's transportation plan to be complementary to and conform with the region's air quality plan. Transportation and land use strategies can help to reduce the rate of growth in vehicle travel and traffic congestion, which helps reduce the growth in vehicle emissions. All the major metropolitan regions in California have approved plans emphasizing land use strategies that complement their transit and transportation systems and bring more people closer to more destinations. These strategies will help curb emissions by reducing trip distances and increasing use of public transit, carpooling, walking, and biking.

### **ARB's Proposed New SIP Measures**

If emission reductions from the adopted measures are not enough to attain the federal standards, sufficient emission reductions from new strategies must be achieved in order to meet the emission reduction target.

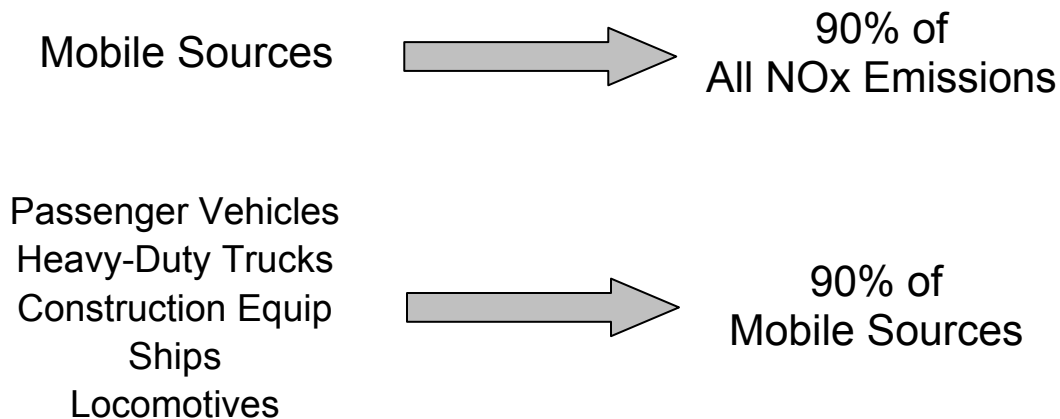
ARB staff is proposing a comprehensive and far reaching set of new measures to achieve emission reductions needed to address California's most challenging ozone and PM<sub>2.5</sub> problems. These measures are designed to make maximum progress toward the federal 8-hour ozone standard in the South Coast and the San Joaquin Valley. The measures include aggressive near-term NO<sub>x</sub> and SO<sub>x</sub> emission reduction goals, reflecting the nature and scope of the PM<sub>2.5</sub> problem in these regions. To achieve the emission reductions needed for both ozone and PM<sub>2.5</sub>, the State Strategy proposes new near-term actions that can be completed by 2010 or soon thereafter.

### **Focus of Proposed New Measures**

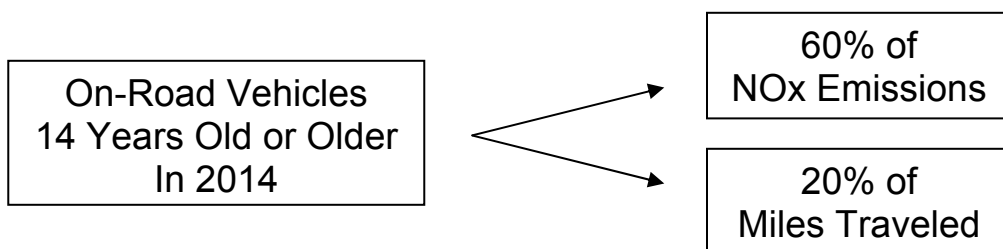
Mobile sources are the largest contributor to PM<sub>2.5</sub> and ozone-forming emissions. Air quality science indicates that reductions of NO<sub>x</sub> are more beneficial than reductions of other pollutant precursors to help reduce levels of both ozone and PM<sub>2.5</sub>. The simple conclusion is that mobile source NO<sub>x</sub> reductions must be a main objective of the State Strategy. And since the State and federal government have almost exclusive authority over mobile source

emissions, they also have the bulk of the responsibility for implementing the State Strategy.

Mobile sources currently produce about 90 percent of all NOx emissions in the South Coast. About 90 percent of mobile source NOx emissions are produced by five major sources – passenger vehicles, heavy-duty diesel trucks, large off-road equipment, and two goods movement-related sources -- ships, and locomotives. Reducing NOx emissions from these five major sources is therefore the key to meeting the objective of the State Strategy.



More than any other pollution control effort, ARB's mobile source program has moved the State's nonattainment areas closer to meeting federal air quality standards. The majority of emission reductions from adopted SIP measures comes from emission standards for new on-road and off-road mobile sources and fuels. But as new engines have become cleaner and cleaner, the emissions contribution from older vehicles has been growing to the extent that it will soon make up the majority of mobile source emissions. For example, all on-road vehicles 14 years old or older will produce almost 60 percent of total on-road NOx emissions by 2014 but just 20 percent of total miles traveled. That is why



the majority of proposed new measures in the State Strategy are in-use measures – programs to help clean up the legacy fleet of older, dirtier vehicles and equipment. We simply cannot wait for the natural turnover of older vehicles (1-5 percent annual turnover depending on vehicle or equipment type) being replaced with newer ones.



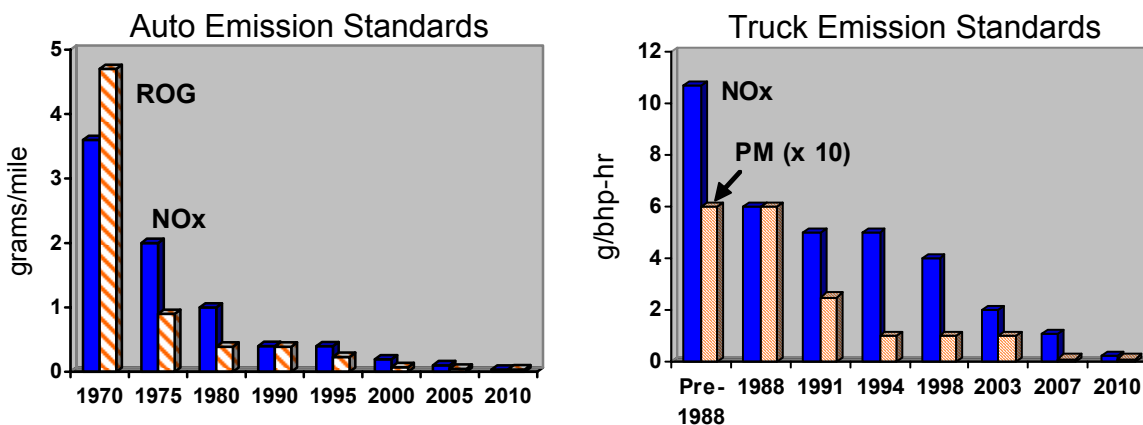
While action on the proposed in-use measures will be completed by 2010, their implementation will extend past 2010 and through 2014 to 2020. Longer-term actions will center on the final increment needed to attain the standard in the areas with the worst ozone pollution.

### Passenger Vehicles and Heavy-Duty Trucks

Despite statewide growth in vehicle travel of 35 percent over the last 15 years, total car and truck emissions (ROG+NOx) have decreased almost 50 percent.

California has led the way in adopting stringent regulations for passenger vehicles. Compared to uncontrolled vehicles, cars are now 99 percent cleaner. A new 1965 car produced about 2,000 pounds of ozone-forming ROG emissions during 100,000 miles of driving. California's low-emission standards, coupled with reformulated gasoline, have cut that to less than 50 pounds for the average new car today. By 2010, California's standards will further reduce ROG emissions from the average new 2010 car to approximately 10 pounds.

ARB's first diesel engine regulations went into effect in 1988. Significant gains began with the introduction of California Clean Diesel fuel in 1993. U.S. EPA and ARB worked together to develop and adopt the next phases of on-road diesel engine control, with cleaner fuel in 2006 and even cleaner engines in 2007 that will reduce per-truck particulate matter emissions by another 90 percent. By 2010, new trucks will be 98 percent cleaner than new pre-1988 models, providing needed NOx reductions.



As new cars and trucks become cleaner, the emissions contribution from older vehicles has been growing to the extent that it will soon make up the majority of mobile source emissions. Thus, California's emission control program has also had to focus on cleaning up those vehicles already in use – the "legacy" or "in-use" fleet.

California's Smog Check Program is the cornerstone of the passenger vehicle in-use strategy, currently keeping over 400 tons of smog-forming gases from entering the air statewide each day. Passenger vehicles are also required to

have software incorporated into their on-board computers to detect emission control system malfunctions as they occur. ARB's heavy-duty vehicle inspection program and periodic smoke inspection program reduce emissions from the legacy truck fleet. Trucks will also be required to have the same emission control malfunction detection software as passenger vehicles beginning in 2013.

Cars and heavy-duty diesel trucks currently produce about 50 percent of the total NOx emissions in both the South Coast and San Joaquin Valley. By 2023, that percentage will be cut almost in half. But cars and trucks still account for so much of the State's inventory of ozone and PM2.5 emissions, further reductions are essential if air quality standards are to be realized.

### Proposed New Passenger Vehicle and Heavy-Duty Truck Measures

#### *Passenger Vehicles*

Since California's passenger vehicle emissions standards have done their job to cut emissions to near-zero levels, the control focus must shift to keeping vehicles clean over their lifetimes. The State Strategy envisions an even stronger Smog Check program that would reduce an additional 40 tons per day of emissions statewide in 2014. Proposed new Smog Check measures include annual inspections for cars with high failure rates, such as vehicles over 15 years old and vehicles accumulating high annual miles of travel, and adding inspections of motorcycles and smaller diesel vehicles. More attention will be paid to evaporative emissions through the addition of a low-pressure evaporative test, even as exhaust emission cutpoints are tightened.

The State Strategy proposes to increase the number of vehicles that are voluntarily retired by implementing a scrappage program for vehicles that are off cycle from their Smog Check inspections. This strategy will depend upon funding and would be targeted primarily in the South Coast and San Joaquin Valley. We will also continue to ensure that the fuels used in California are the cleanest-burning available, and mitigate the additional evaporative emissions resulting from the addition of ethanol to gasoline.

These proposed passenger vehicle measures would reduce total NOx and ROG emissions in the South Coast by about 32 tons per day in 2014 and over 22 tons in 2020. Likewise, this measure will reduce total NOx and ROG emissions in the San Joaquin Valley by over 10 tons in 2014 and about 7 tons in 2020.

#### *Heavy-Duty Diesel Trucks*

Substantially reducing emissions from existing trucks is key to meeting federal air quality standards, as well as achieving diesel risk reduction and goods movement clean air goals. The State Strategy foresees an expansive in-use diesel truck emission reduction program that would reduce NOx emissions by 47 tons per day in the South Coast and 61 tons per day in the San Joaquin Valley

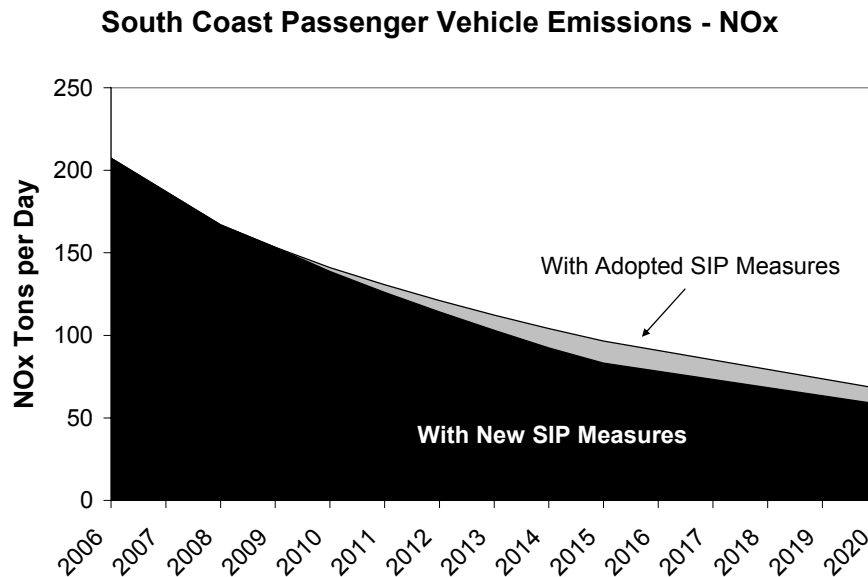
by 2014. Direct PM2.5 emissions would also be reduced 2-3 tons per day in both the South Coast and San Joaquin Valley during the same time period.

A comprehensive fleet modernization program beginning in 2010 would replace older trucks, repower trucks with cleaner engines, and retrofit trucks with devices to reduce both NOx and PM. The proposed modernization program would be equivalent to replacing approximately 30 percent of the oldest trucks by 2014 with 2010 model year or newer trucks, and will be accomplished through private truck fleet regulations. It is envisioned that the use of public incentive funds will be needed as well to facilitate fleet modernization on the scale necessary to attain PM2.5 and ozone standards within SIP deadlines.

The in-use diesel truck program also proposes to reduce emissions from trucks registered outside of California and to lessen the effects of emission control deterioration.

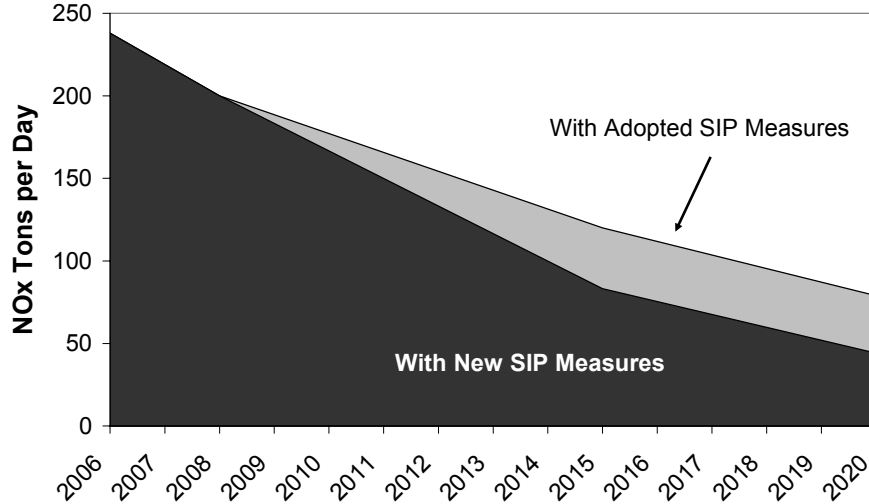
### Impact of Car and Truck SIP Measures

Adopted SIP measures would reduce passenger vehicle NOx emissions in the South Coast by 67 percent between 2006 and 2020. Proposed new SIP measures would reduce that by another 15 percent by 2020.



Heavy-duty truck NOx emissions would be reduced by adopted SIP measures 67 percent between 2006 and 2020. Proposed new SIP measures would reduce NOx emissions by another 45 percent by 2020.

### South Coast Truck Emissions - NOx



### Good Movement Sources

The goods movement sector includes the ships, trains, port trucks, and related sources that help move materials and goods from the grower or manufacturer to the consumer. The air quality impact of the goods movement sector is a major issue in areas that host ports, large rail facilities, and major truck routes. Many entities have developed or are developing plans to address the impacts of goods movement, including the California Environmental Protection Agency and the Business, Transportation & Housing Agency, the Air Resources Board, the South Coast Air Quality Management District, several California ports, and two major railroads.

Two factors increase the importance of addressing emissions from goods movement sources. First, international trade through California's ports is growing rapidly: the volume of goods moving through the Port of Los Angeles and the Port of Long Beach – the nation's busiest port complex – is expected to more than double by 2020. Second, the most prominent sources in this sector have historically not been regulated as aggressively as stationary sources or other mobile sources. Goods movement sources are also powered by diesel engines that last longer than their gasoline-powered counterparts, and are often rebuilt before being replaced with newer, cleaner equipment. As a result new engine standards alone will not provide emission reductions in the timeframe allowed to attain the federal PM2.5 and ozone standards.

New measures in the State Strategy focus on the following goods movement sources: ships, locomotives, harbor craft, and port trucks. They closely mirror the measures included in Emission Reduction Plan for Ports and Goods Movement in California, approved by ARB in April 2006, and summarized briefly in Chapter 1. It is estimated that these measures will reduce 20 tons per day of

SOx, 49 tons per day of NOx, and about 4 tons per day of direct PM2.5 in the South Coast by 2014.

### Ships

Emissions from ocean-going vessels, unlike most major pollution sources, are not projected to decrease in future years, since ships have little or no emission controls and run on high-emitting bunker fuel, and shipments of cargo containers are projected to grow significantly over the next two decades. Ships currently emit half the statewide SOx emissions, and it is estimated that ships will jump from the sixth to the second highest statewide NOx producer by 2023. It is essential to reduce ship emissions as they are entering our ports and when they are docked through application of demonstrated control technologies, use of cleaner fuels, and operational efficiencies. Since ARB does not have authority to set ship engine emission standards, we must work with national and international authorities, as well as the ports, to implement many of the control measures.

ARB took a big step in reducing emissions from ships in December 2005 by adopting a rule phasing in the use of cleaner low-sulfur fuel in ship auxiliary engines that will reduce SOx emissions from auxiliary engines by 96 percent and PM2.5 emissions by 83 percent beginning in 2010.

### *Proposed New Ship Measures*

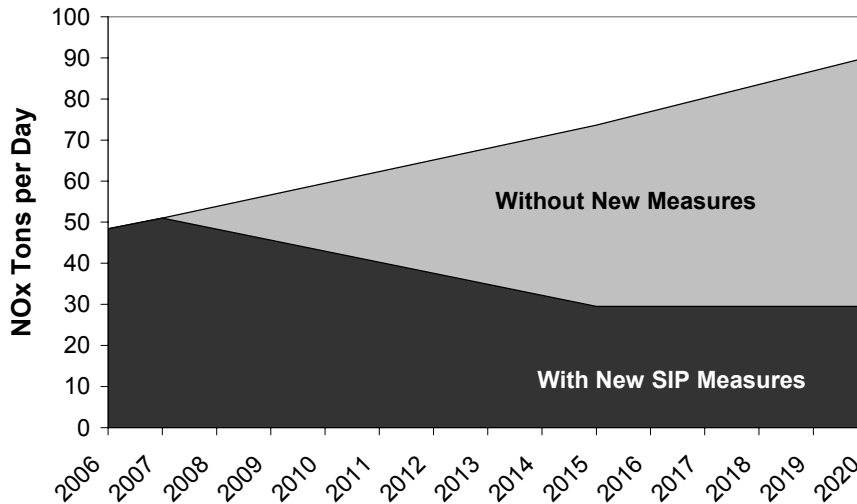
In addition to the 2005 auxiliary engine fuel rule, the State Strategy proposes to reduce emissions from ship auxiliary engines through cold ironing and other clean technology. Cold ironing allows ships to turn off their auxiliary engines and instead plug into an electrical system for power when they are docked at a port. This measure would phase in the number of ships capable of using cold ironing and other at-dock technologies such as the "hood", which fits onto a ship's exhaust stack and cleans the emissions, and is estimated to reduce NOx emissions about 19 tons per day in 2014 and 28 tons per day in 2020.

The State Strategy proposes to reduce emissions from ship main engines through a variety of measures. A main engine fuel rule, patterned after the auxiliary engine fuel rule, would help reduce emissions by introducing a cleaner, low-sulfur fuel beginning no later than 2010. Increasing the use of cleaner new engines or retrofitted engines beginning in 2010 could be implemented via regulation, incentives, voluntary agreements, or a combination of these approaches. Higher ship speeds cause much higher emissions. So a measure is proposed that would strengthen a current voluntary program by requiring ships to reduce their speeds to 12 knots within 40 nautical miles of the Ports of Los Angeles and Long Beach. The combination of ship main engine measures would reduce both NOx and SOx emissions by 20 tons per day and direct PM2.5 emissions by over 2 tons per day in 2014. These reductions would increase substantially through 2023.

## Impact of Ship SIP Measures

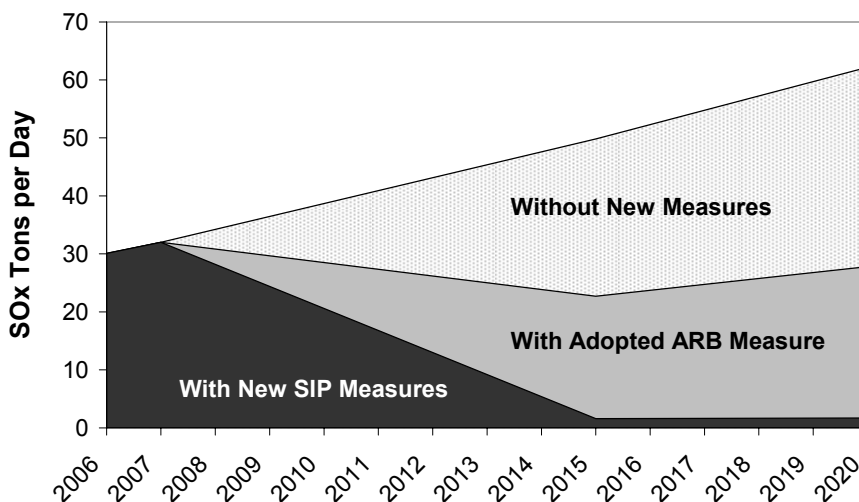
Without new SIP measures, ship NOx emissions are estimated to increase almost 90 percent between 2006 and 2020. With proposed new SIP measures, NOx emissions from ships would be 67 percent less than the projected 2020 levels and about 35 percent less than 2006 levels.

### South Coast Ship Emissions - NOx



It is estimated that SOx emissions from ships will double without the adopted and new SIP measures. The adopted SIP measure (auxiliary engine fuel rule) will help reduce SOx more than 50 percent from projected 2014 levels, but emissions would then begin increasing due to goods movement growth. With proposed new SIP measures, SOx emissions would be reduced to only 2 tons per day in the South Coast by 2014 and remain at that low level through 2020.

### South Coast Ship Emissions - SOx



## Locomotives

Locomotives pose a difficult challenge due to their long life, interstate operations, and California's reliance on U.S. EPA to adopt new engine standards. A rule adopted by ARB in 2004 now requires locomotives operating in California to use cleaner, low-sulfur fuel that will reduce SOx emissions 90 percent. Several strategies are underway to clean up locally-based switcher engines, reduce idling emissions at railyards, and concentrate the cleanest available line haul engines in the South Coast. These activities are important for community health and NOx emission reductions in the short term. But without the introduction of cleaner new locomotive engines into California operation, growth is expected to quickly catch up to these current actions and begin to steer the NOx emissions curve upward.

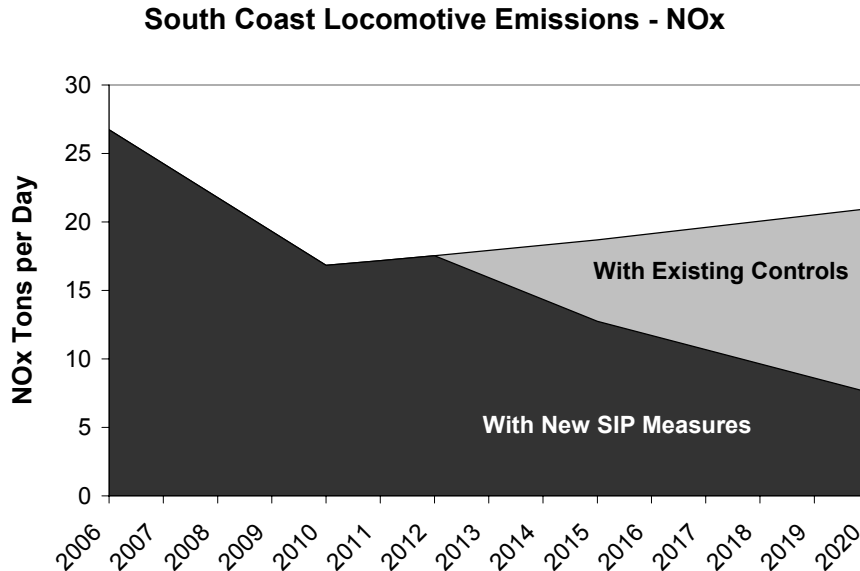
In 1998, ARB reached agreement with the rail industry to accelerate introduction of Tier 2 locomotives into the South Coast Air Basin to achieve a 67 percent reduction. However, as shown below, emissions are projected to begin increasing after 2010 due to growth. A similar agreement is needed to accelerate introduction of the next generation of cleaner locomotives once EPA adopts new standards.

### *Proposed New SIP Measures*

The State Strategy proposes U.S. EPA adoption of more stringent new engine standards and a new industry commitment to accelerate introduction of cleaner engines in California to meet the attainment needs of the South Coast and the San Joaquin Valley. It is anticipated that the new standards will reduce NOx and PM emissions by 90 percent. The proposed measure would call for replacement of existing locomotive engines with cleaner engines and rebuilds of older engines until 100 percent of the statewide locomotive fleet has been upgraded. ARB is pushing U.S. EPA to adopt the standards with earliest possible implementation, as this measure can only occur once U.S. EPA adopts new locomotive standards.

### *Impact of Locomotive SIP Measures*

The proposed new SIP measures would reduce NOx emissions from locomotives by 13 tons per day in the South Coast and 16 tons per day by from 2006 to 2020.



### Harbor Craft

Standards adopted by U.S. EPA provide for new harbor craft engines that have roughly 50 percent less NOx emissions than uncontrolled engines. The State Strategy proposes a new measure requiring harbor craft owners to replace older engines with the newer, cleaner engines and/or add control technologies that reduce emissions, reducing NOx emissions in the South Coast about 5 tons per day by 2014.

### Port trucks

Most port trucks start out as long-haul trucks and then are put into short-haul use as they get older and are no longer reliable enough for long-haul service. Because port trucks are purchased used, emission standards for new trucks will reduce emissions from trucks servicing the ports later than they will impact the long-haul fleet. The State Strategy proposes a port truck modernization program that would phase in beginning in 2008 and would include replacing older trucks with newer, cleaner trucks and retrofitting engines with emission-reducing control technology, reducing South Coast NOx emissions 2 tons per day by 2014 and 8 tons per day by 2020.



## Large Off-Road Equipment

Emission standards for new off-road diesel engines have become increasingly more stringent over the past decade, ensuring that new construction, mining, industrial and oil drilling equipment become progressively cleaner. By 2015, new large off-road equipment will produce 98 percent less ROG+NO<sub>x</sub> than their uncontrolled counterparts. However, large diesel off-road equipment with more than 25 horsepower remain in use for long periods of time, sometimes up to 60 years. This long life means that new, lower emitting engines are introduced into fleets relatively slowly with the result that the emission reductions and associated health benefits from these cleaner engines will also be fairly slow to materialize.

### Proposed New Large Off-Road Equipment Measure

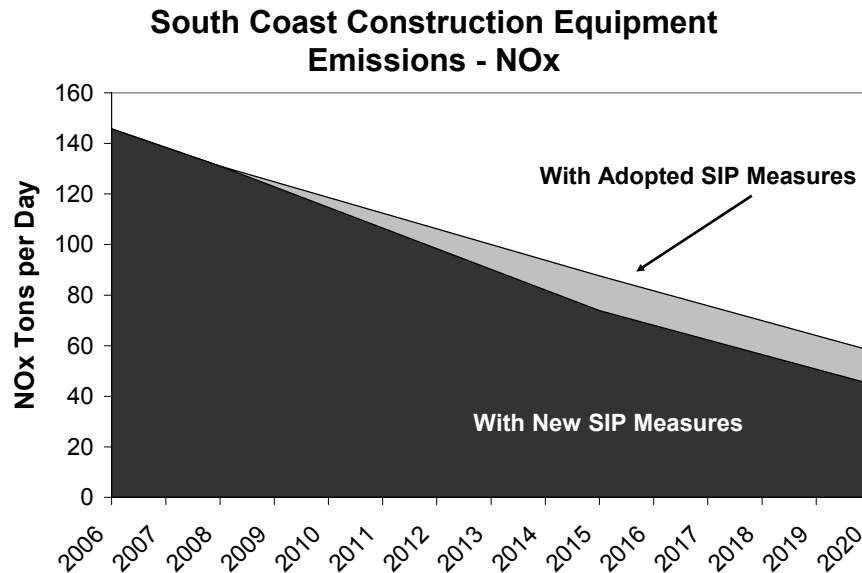
ARB staff is currently in the process of developing a statewide in-use off-road equipment regulation which could require initial NO<sub>x</sub> and PM emissions averages to be met, with increasingly lower emissions averages over time. Staff began work on the rule in 2004 as part of the Diesel Risk Reduction Program. During early SIP development work in 2006, staff identified the necessity for large NO<sub>x</sub> emission reductions from off-road equipment and other diesel sources to meet the health-based federal air quality standards. Consequently, staff revised the control concept extensively to meet California's clean air needs relative to diesel particulates, ozone, and PM<sub>2.5</sub>.

This proposed measure would require owners of equipment larger than 25 horsepower to meet a stringent average emissions level across all of their equipment. The fleet average approach provides equipment owners flexibility in how they will comply, including: swapping older, dirtier engines with newer, cleaner engines; purchasing newer equipment (with cleaner engines); and, adding emission control devices to older engines. Equipment owners could also restrict unnecessary equipment idling.

This measure would reduce 10.5 tons per day of NO<sub>x</sub> and about 3 tons per day of direct PM<sub>2.5</sub> in the South Coast and nearly 4 tons per day of NO<sub>x</sub> and a ton per day of direct PM<sub>2.5</sub> in the San Joaquin Valley by 2014. It would also cut direct PM<sub>2.5</sub> emissions by more than half in 2014 and by 70 percent in 2023.

## Impact of Large Off-Road Equipment SIP Measures

Adopted SIP measures would reduce large off-road equipment NOx emissions in the South Coast by almost 60 percent between 2006 and 2020. Proposed new SIP measures would reduce that by another 30 percent by 2020.



## Agricultural Equipment

The State Strategy will assess an equipment modernization program once modeling for the San Joaquin Valley's PM2.5 SIP shows to what extent accelerated fleet modernization may be needed.

## **Other Off-Road Sources**

For many gasoline-fueled off-road sources, evaporative emissions are a significant portion of total emissions. Leaky hoses, tanks, and other parts of an engine's fuel system and refueling infrastructure release hundreds of tons of ROG into the atmosphere a day. Success with low- to no-evaporative emission technology in on-road sources supports strategies to reduce evaporative emissions to similar low levels in off-road sources. Many newly-regulated sources have exhaust standards but do not yet have evaporative standards. The State Strategy proposes to set standards where there are none and make standards more stringent in sources that are not adequately controlled.

Off-road sources used mainly for recreational purposes are large emission contributors, especially during the summer ozone season. The main focus of the State Strategy on this wide array of smaller off-road sources is evaporative emissions. Recreational marine boat engines and off-road recreational vehicles are the biggest targets, with standards being implemented by 2010 and ROG emission reductions growing through 2023 as these newer, cleaner engines become a bigger part of the overall recreational fleet. Refueling tanks, portable

fuel tanks, and gas station fueling hoses, where emissions are the result of evaporation or permeation of ROG from gasoline, are also targeted. The proposed measures covering these off-road sources would reduce a combined 7 tons per day of ROG in the South Coast and about 4 tons per day in the San Joaquin Valley by 2014.

## **Areawide Sources**

### Consumer Products

Chemically formulated consumer products such as automotive care products, household care products, and personal care products have been regulated as a source of ROG emissions in five rulemakings since 1989. As a result of these measures, statewide emissions from consumer products will be reduced by over 170 tons per day in 2010, a 40 percent reduction. Despite this progress, population growth in the years ahead is expected to reverse the downward trend of emissions from consumer products, after the latest standards become effective. Therefore, additional controls for this sector will remain important. Indeed, consumer products are expected to become the largest source of ROG emissions in the South Coast, and the third largest source in the San Joaquin Valley by 2020.

The State Strategy will continue ARB's commitment to reduce ROG emissions from consumer products. Rulemakings are expected to be promulgated between 2007 and 2012, expanding beyond the current category-by-category standards and pursuing innovative approaches, reducing ROG emissions about 13 tons in the South Coast and almost 4 tons per day in the San Joaquin Valley by 2020.

### Pesticides

Pesticide emissions from agricultural and commercial uses fall under the Department of Pesticide Regulation's (DPR) authority. A measure to reduce pesticide emissions was included in the SIP adopted in 1994. The State Strategy includes an updated version of that measure. It is a strategy to reduce ROG emissions from pesticides through regulations that may include limitations on the use of products formulated as fumigants, registration standards requiring liquid products that contribute less to ozone formation, and incentives promoting pest management practices that use less pesticide.

## **Local Measures**

The proposed new local air district measures, coupled with the new State Strategy measures, must provide the necessary emission reductions to meet the federal standards. The new local measures for each nonattainment area are listed, described, and quantified in the attainment plans for each area.

## Need for Technology Development and Long-term Measures

In developing the proposed State Strategy, ARB staff analyzed whether current NOx technologies for mobile sources are clean enough to provide all the emission reductions needed for ozone attainment in the South Coast and San Joaquin Valley. ARB included in this analysis the phasing in of the cleanest new technology standards from 2007-2017 that ARB and U.S. EPA have already adopted for diesel engines: 0.2 g/bhp-hr on-road truck standards in 2010, full off-road Tier 4 standards in 2014, and the recent U.S. EPA-proposed low-NOx standards for locomotive engines starting in 2017. The table below summarizes this analysis. For both areas, the totals of remaining emissions after full clean-up of the legacy diesel fleets are still greater than the NOx carrying capacities.

The clear conclusion is that even cleaner emission standards are needed than are in place today. This demonstrates that it necessary for the South Coast and San Joaquin Valley SIPs to rely on cleaner – yet to be developed – technologies as allowed by federal Clean Air Act section 182(e)(5) for areas with the worst pollution.

### **All New Fleets Analysis -- Unconstrained by Cost**

Source	Remaining NOx 2020 Emissions (tpd) *	
	South Coast	San Joaquin Valley
<i>Passenger vehicles</i>	18	5
<i>Diesel trucks</i>	37	43
<i>Construction and other equipment</i>	14	5
<i>Farm equipment</i>	1	7
<i>Locomotive</i>	7	5
Ships and harbor craft	37	1
Aircraft	27	5
Stationary/area-wide sources	55	103
Subtotal of remaining emissions from above categories	195	173
All other NOx sources	52	22
Total of all remaining emissions	247	195
Carrying capacity	114	160

\* Numbers may not add exactly due to rounding

For this analysis, ARB staff assumed that in 2020 all passenger cars would be 10 years old or younger, all diesel trucks would meet the 2010 NOx standards, all diesel construction and farm equipment would meet the most stringent tier 4 standards, all locomotives would meet U.S. EPA's proposed 2017 NOx standards, and the new stationary sources measure in the district SIPs would be fully implemented.

The top five rows are italicized to indicate the categories for which we assume that all vehicles and equipment meet the cleanest adopted emission standards. Included in the category “all other NOx sources” are commercial gas trucks, motorcycles, buses, motor homes, off-road recreational vehicles, and gas powered off-road equipment.

ARB staff did the analysis starting with 2020 baseline emissions since that year corresponds to the last federal attainment deadline before the 2024 extreme-classification deadline under which the long-term measure provisions of federal law apply. The numbers would look nearly identical for an analysis for any year between now and 2020 as the starting point. (For example, ARB staff calculated the “total of remaining emission” for the San Joaquin Valley using a 2018 starting point. The resulting “total of remaining emission” was approximately 195 tons per day.) The carrying capacity is independent of the year. Therefore, the analysis and conclusion that it is necessary for the South Coast and San Joaquin Valley ozone SIPs to rely on cleaner, yet to be developed, technologies is general and does not change with year analyzed.

The results for the San Joaquin Valley demonstrate that the need for cleaner technologies includes cleaner technologies for industrial sources, not just vehicles. Close to half of the San Joaquin Valley remaining emissions, 103 tons per day compared to a carrying capacity of 160 tons per day, are from stationary and area-wide sources. Clearly, long-term reductions from new technologies for both mobile and stationary sources will be needed.

### **Process for Identifying Long-Term Emission Reductions**

ARB has a long-standing history of successfully adopting and implementing both technology-advancing regulations and innovative emission control techniques. By working closely with research scientists and the regulated industry, ARB staff have been able to craft regulations that are stringent enough to compel technology development, yet flexible enough to encourage industry innovations.

ARB staff believe a directed process is needed to ensure that future emission reduction opportunities are identified that are large enough and arrive in time to meet the attainment deadline.

To accomplish this, ARB staff proposes to take the lead in a coordinated government, private, and public effort to establish emission goals for critical emission source categories. Each category’s goal will serve as a general target for how much cleaner that emission source category will need to be for attainment purposes. The setting of the source category emission goals must be science-based in two ways. First, the goals must be tied to the State’s overall emission reduction needs. Although, estimated emission reduction needs will change as modeling and emission inventories are updated, a working estimate of how far technology needs to be pushed is critical to a successful outcome. Second, the goals must reflect a reasonable assessment of how far technology can progress over the time available for attainment.

This process of goal setting will give direction and distance to ARB and air district regulatory efforts to set the next generation of emission standards. As ARB and air districts identify future feasible emission reduction measures toward the goals, those measures will be incorporated into future SIPs. However, to keep near-term focus on the need to find more emission reductions, ARB staff proposes to periodically brief the Board on emerging emission reduction opportunities and promising technologies.

### **Potential Long-Term Concepts**

Although the identification of long-term emission reductions will begin with the emission goal setting for critical emission source categories, specific approaches that ARB will evaluate for possible inclusion in the next SIP update include the following:

*Passenger vehicles: look for further reductions from reduced deterioration of emission reduction components.* While new cars are very clean, it may be possible to improve the on-board diagnostic capability of passenger vehicles and heavy-duty trucks to better target sources of emissions and to improve and encourage higher rates of repair.

*Tighten emission standards wherever possible: review all categories of engines and vehicles to ensure that the cleanest cost-effective technologies are in place.* For example:

- Exhaust and evaporative standards for on-road motorcycles.
- Second generation catalyst-based emission standards for inboard/stern drive marine engines.
- Tighter exhaust emission limits for small off-road engines.

*Cleaner ground support equipment: push for increased electrification.* Captured vehicle and equipment fleets used at airports are cleaner today through natural turnover and accelerated turnover spurred through cooperative State and local government and air company efforts. However, additional opportunities for increased electrification remain.

*Air quality priority for federal transportation funding: work with local governments to prioritize federal transportation funding uses to better support air quality goals.* The federal Congestion and Air Quality Improvement (CMAQ) Program annually provides to county transportation agencies more than \$200 million in the South Coast and about \$50 million in the San Joaquin Valley through 2009. The purpose of the CMAQ Program, according to Federal Highway Administration 2006 guidance, is to fund transportation projects that will contribute to attainment of national ambient air quality standards.

## Ideas Requiring Further Exploration

Air quality control is an ever emerging field. At ARB, new ways to control air pollutants and improve public health are continually developed through research and other staff work. At any one time, there are always emission reduction ideas on the horizon that we have not fully explored or developed. Some of these approaches that are in various stages of development could turn out to be effective strategies at some point in the future.

The following approaches show promise as potential emission reduction strategies. However, because of technological constraints and uncertain authority, they are less defined and will require significant exploration prior to becoming concepts.

*Explore opportunities for cleaner fuels.* The near-term focus for fuels-related efforts in California will be to develop low carbon fuels in response to the Governor's 2007 Executive Order. Separate from that effort, ARB will continue to evaluate the opportunities for cost-effective reformulations to reduce criteria pollutant emissions.

*Pursue additional emission reductions from consumer products.* Despite the actions to date and the new measures proposed in this plan, consumer products continue to be an ever larger percentage of ROG emissions because of population growth. ARB will continue to look for even cleaner consumer product technologies and innovative approaches to reduce emissions such as reactivity-based and market-based strategies. This would continue the search for new approaches to achieve emission reductions initiated within the near-term consumer product measure.

*Explore approaches to further reduce volatile emissions from pesticides.* With the Department of Pesticide Regulation as the lead, work with interested stakeholders to determine how pesticide emissions could be further reduced.

*Continue and enhance current public education and outreach programs.* Public and private energy conservation and efficiency programs would continue and expand. The establishment of a statewide public education campaign to reduce air pollution could be considered, and might include ideas to engage the public through: (1) public education that more clearly connects voluntary clean air actions with public health benefits, and (2) increasing awareness of available low-emitting consumer products, paints, vehicles, lawn equipment, and recreational vehicles licensed to use clean air "green" labels.

*Advocate for efficient regional land use and transportation strategies.* In California, local governments have the authority over most transportation funding and land use decisions. The most effective way for regions to curb long-term growth of vehicle travel and lessen auto emissions is to build on and enhance current efforts to implement transportation and land use strategies proven to reduce vehicle trips and decrease average trip lengths.

## **State Implementation Plan Commitments**

This section sets forth the State's SIP commitments for the 2007 State Strategy for two of the areas that need the emission benefits from the proposed, new State measures to demonstrate attainment – South Coast and San Joaquin Valley. Specific commitments for emission reductions as needed for attainment in other nonattainment areas, such as the Antelope Valley and Western Mojave Desert, Sacramento, and Ventura County, will be developed later and brought for Board consideration with SIPs for these regions.

The State's SIP commitments consist of three components:

1. Commitment to achieve emission reductions by specific dates;
2. Commitment to propose defined new SIP measures; and
3. A long-term strategy commitment.

The total emission reductions and the obligation to propose specific measures for Board consideration would become enforceable upon approval by U.S. EPA of the State Strategy and each district's attainment plan. The commitments for emission reductions are calculated using the planning inventory described in Appendix A; progress will be tracked in the same inventory currency to assess compliance.

The total emission reductions from the new measures necessary to attain the federal standards are an enforceable State commitment in the SIP. While the proposed State Strategy includes estimates of the emission reductions from each of the individual new measures, it is important to note that the commitment of the State Strategy is to achieve the total emission reductions necessary to attain the federal standards, which would be the aggregate of all existing and proposed new measures combined. Therefore, if a particular measure does not get its expected emission reductions, the State still commits to achieving the total aggregate emission reductions, whether this is realized through additional reductions from the new measures, or from alternative control measures or incentive programs.

For informational purposes, the tables below show the expected emission reductions from the proposed new SIP measures in the South Coast and San Joaquin Valley in 2014, 2020, and 2023. The first table shows the expected NOx and ROG emission reductions for South Coast and San Joaquin Valley for 2023, the year in which the emission reduction target must be met for the expected ozone attainment date of 2024 for these areas. The second table shows the expected NOx and ROG emission reductions for the two areas for 2020 to help illustrate the progress that will be made prior to the proposed 2024 attainment deadlines for the South Coast and San Joaquin Valley. The third and fourth tables show the expected emissions reductions from NOx, ROG, SOx, and direct PM2.5 in the South Coast and San Joaquin Valley in 2014, the year in which emission reduction targets must be met for the federal PM2.5 standard.



**Expected Emission Reductions from Proposed New SIP Measures  
(tons per day)**

**South Coast and San Joaquin Valley -- 2023**

	South Coast		San Joaquin Valley	
<b>Proposed New SIP Measures</b>	<b>NOx</b>	<b>ROG</b>	<b>NOx</b>	<b>ROG</b>
<b>Passenger Vehicles</b>	<b>7.1</b>	<b>10.5</b>	<b>2.1</b>	<b>3.3</b>
Smog Check Improvements (BAR)	6.9	7.5	2.1	1.9
Expanded Vehicle Retirement	0.2	0.5	0.04	0.1
Modifications to Reformulated Gasoline Program	--	2.5	--	1.3
<b>Heavy-Duty Trucks</b>	<b>18.3</b>	<b>1.7</b>	<b>21.2</b>	<b>2.3</b>
Cleaner In-Use Heavy-Duty Trucks	18.3	1.7	21.2	2.3
<b>Goods Movement Sources</b>	<b>99.2</b>	<b>1.9</b>	<b>16.4</b>	<b>1.3</b>
Ship Auxiliary Engine Cold Ironing & Clean Technology	30.8	--	--	--
Cleaner Main Ship Engines and Fuel	39.9	--	--	--
Port Truck Modernization	7.0	--	--	--
Accelerated Intro. of Cleaner Line-Haul Locomotives	15.6	1.9	16.4	1.3
Clean Up Existing Harbor Craft	5.9	NYQ	--	NYQ
<b>Off-Road Equipment</b>	<b>13.9</b>	<b>1.9</b>	<b>5.4</b>	<b>0.6</b>
Cleaner In-Use Off-Road Equipment (over 25hp)	13.9	1.9	5.4	0.6
Cleaner In-Use Agricultural Equipment	NYQ	NYQ	NYQ	NYQ
<b>Other Off-Road Sources</b>	<b>2.4</b>	<b>24.0</b>	<b>0.6</b>	<b>11.4</b>
New Emission Standards for Recreational Boats	2.4	17.6	0.6	5.3
Expanded Off-Road Rec. Vehicle Emission Standards	--	6.4	--	6.1
Additional Evaporative Emission Standards	--	NYQ	--	NYQ
Vapor Recovery for Above Ground Storage Tanks	--	NYQ	--	NYQ
<b>Areawide Sources</b>	<b>--</b>	<b>13.7</b>	<b>--</b>	<b>6.3</b>
Consumer Products Program	--	13.7	--	3.8
Pesticides: DPR Regulation	--	NYQ	--	2.5
<b>Emission Reductions from Proposed New Measures</b>	<b>141</b>	<b>54</b>	<b>46</b>	<b>25</b>

NYQ = Not Yet Quantified. BAR = Bureau of Automotive Repair. DPR = Dept. of Pesticide Regulation.

Locomotives measure relies on U.S. EPA rulemaking and industry agreement to accelerate fleet turnover.

Note: Emission reductions reflect the combined impact of regulations and supportive incentive programs.

Emission reduction estimates for each proposed measure are shown for informational purposes only. Actual emission reductions from any particular measure may be greater than or less than the amounts shown.

**Expected Emission Reductions from Proposed New SIP Measures  
(tons per day)**

**South Coast and San Joaquin Valley -- 2020**

	South Coast		San Joaquin Valley	
<b>Proposed New SIP Measures</b>	<b>NOx</b>	<b>ROG</b>	<b>NOx</b>	<b>ROG</b>
<b>Passenger Vehicles</b>	<b>9.6</b>	<b>12.9</b>	<b>2.7</b>	<b>4.1</b>
Smog Check Improvements (BAR)	8.3	8.7	2.4	2.2
Expanded Vehicle Retirement	1.3	1.2	0.3	0.3
Modifications to Reformulated Gasoline Program	--	3.0	--	1.6
<b>Heavy-Duty Trucks</b>	<b>26.9</b>	<b>2.6</b>	<b>30.2</b>	<b>3.3</b>
Cleaner In-Use Heavy-Duty Trucks	26.9	2.6	30.2	3.3
<b>Goods Movement Sources</b>	<b>87.1</b>	<b>1.8</b>	<b>15.6</b>	<b>1.2</b>
Ship Auxiliary Engine Cold Ironing & Clean Technology	28.3	--	--	--
Cleaner Main Ship Engines and Fuel	32.3	--	--	--
Port Truck Modernization	8.0	--	--	--
Accelerated Intro. of Cleaner Line-Haul Locomotives	13.4	1.8	15.6	1.2
Clean Up Existing Harbor Craft	5.1	NYQ	--	NYQ
<b>Off-Road Equipment</b>	<b>18.7</b>	<b>2.9</b>	<b>7.0</b>	<b>1.0</b>
Cleaner In-Use Off-Road Equipment (over 25hp)	18.7	2.9	7.0	1.0
Cleaner In-Use Agricultural Equipment	NYQ	NYQ	NYQ	NYQ
<b>Other Off-Road Sources</b>	<b>1.6</b>	<b>17.9</b>	<b>0.4</b>	<b>8.7</b>
New Emission Standards for Recreational Boats	1.6	12.8	0.4	3.8
Expanded Off-Road Rec. Vehicle Emission Standards	--	5.1	--	4.9
Additional Evaporative Emission Standards	--	NYQ	--	NYQ
Vapor Recovery for Above Ground Storage Tanks	--	NYQ	--	NYQ
<b>Areawide Sources</b>	<b>--</b>	<b>13.5</b>	<b>--</b>	<b>6.1</b>
Consumer Products Program	--	13.5	--	3.6
Pesticides: DPR Regulation	--	NYQ	--	2.5
<b>Emission Reductions from Proposed New Measures</b>	<b>144</b>	<b>52</b>	<b>56</b>	<b>24</b>

NYQ = Not Yet Quantified. BAR = Bureau of Automotive Repair. DPR = Dept. of Pesticide Regulation.

Locomotives measure relies on U.S. EPA rulemaking and industry agreement to accelerate fleet turnover.

Note: Emission reductions reflect the combined impact of regulations and supportive incentive programs.

Emission reduction estimates for each proposed measure are shown for informational purposes only. Actual emission reductions from any particular measure may be greater than or less than the amounts shown.

**Expected Emission Reductions from Proposed New SIP Measures  
(tons per day)**

**South Coast -- 2014**

<b>Proposed New SIP Measures</b>	<b>NOx</b>	<b>ROG</b>	<b>Direct PM2.5</b>	<b>SOx</b>
<b>Passenger Vehicles</b>	<b>14.4</b>	<b>17.7</b>	<b>0.3</b>	<b>--</b>
Smog Check Improvements (BAR)	12.0	10.5	0.2	--
Expanded Vehicle Retirement	2.4	2.8	0.05	--
Modifications to Reformulated Gasoline Program	--	4.4	--	--
<b>Heavy-Duty Trucks</b>	<b>47.3</b>	<b>5.1</b>	<b>3.0</b>	<b>--</b>
Cleaner In-Use Heavy-Duty Trucks	47.3	5.1	3.0	--
<b>Goods Movement Sources</b>	<b>49.4</b>	<b>0.7</b>	<b>3.6</b>	<b>20.1</b>
Ship Auxiliary Engine Cold Ironing & Clean Technology	18.5	--	0.3	0.4
Cleaner Main Ship Engines and Fuel	20.0	--	2.4	19.7
Port Truck Modernization	2.0	--	0.5	--
Accelerated Intro. of Cleaner Line-Haul Locomotives	4.3	0.7	0.2	--
Clean Up Existing Harbor Craft	4.6	--	0.2	--
<b>Off-Road Equipment</b>	<b>10.5</b>	<b>2.7</b>	<b>2.6</b>	<b>--</b>
Cleaner In-Use Off-Road Equipment (over 25hp)	10.5	2.7	2.6	--
Cleaner In-Use Agricultural Equipment	NYQ	NYQ	NYQ	--
<b>Other Off-Road Sources</b>	<b>0.4</b>	<b>6.6</b>	<b>--</b>	<b>--</b>
New Emission Standards for Recreational Boats	0.4	4.2	--	--
Expanded Off-Road Rec. Vehicle Emission Standards	--	2.4	--	--
Additional Evaporative Emission Standards	--	NYQ	--	NYQ
Vapor Recovery for Above Ground Storage Tanks	--	NYQ	--	NYQ
<b>Areawide Sources</b>	<b>--</b>	<b>12.9</b>	<b>--</b>	<b>--</b>
Consumer Products Program	--	12.9	--	--
Pesticides: DPR Regulation	--	NYQ	--	--
<b>Emission Reductions from Proposed New Measures</b>	<b>122</b>	<b>46</b>	<b>9</b>	<b>20</b>

NYQ = Not Yet Quantified. BAR = Bureau of Automotive Repair. DPR = Dept. of Pesticide Regulation.  
 Locomotives measure relies on U.S. EPA rulemaking and industry agreement to accelerate fleet turnover.  
 Note: Emission reductions reflect the combined impact of regulations and supportive incentive programs.  
 Emission reduction estimates for each proposed measure are shown for informational purposes only.  
 Actual emission reductions from any particular measure may be greater than or less than the amounts shown.

**Expected Emission Reductions from Proposed New SIP Measures  
(tons per day)**

**San Joaquin Valley -- 2014**

<b>Proposed New SIP Measures</b>	<b>NOx</b>	<b>ROG</b>	<b>Direct PM2.5</b>	<b>SOx</b>
<b>Passenger Vehicles</b>	<b>3.8</b>	<b>6.5</b>	<b>0.1</b>	<b>--</b>
Smog Check Improvements (BAR)	3.3	2.9	0.05	--
Expanded Vehicle Retirement	0.5	0.7	0.01	--
Modifications to Reformulated Gasoline Program	--	2.9	--	--
<b>Heavy-Duty Trucks</b>	<b>61.4</b>	<b>6.4</b>	<b>3.6</b>	<b>--</b>
Cleaner In-Use Heavy-Duty Trucks	61.4	6.4	3.6	--
<b>Goods Movement Sources</b>	<b>7.2</b>	<b>0.5</b>	<b>0.2</b>	<b>--</b>
Ship Auxiliary Engine Cold Ironing & Clean Technology	--	--	--	--
Cleaner Main Ship Engines and Fuel	--	--	--	--
Port Truck Modernization	--	--	--	--
Accelerated Intro. of Cleaner Line-Haul Locomotives	7.2	0.5	0.2	--
Clean Up Existing Harbor Craft	--	NYQ	--	--
<b>Off-Road Equipment</b>	<b>3.7</b>	<b>0.9</b>	<b>0.8</b>	<b>--</b>
Cleaner In-Use Off-Road Equipment (over 25hp)	3.7	0.9	0.8	--
Cleaner In-Use Agricultural Equipment	NYQ	NYQ	NYQ	--
<b>Other Off-Road Sources</b>	<b>0.1</b>	<b>3.5</b>	<b>--</b>	<b>--</b>
New Emission Standards for Recreational Boats	0.1	1.3	--	--
Expanded Off-Road Rec. Vehicle Emission Standards	--	2.2	--	--
Additional Evaporative Emission Standards	--	NYQ	--	NYQ
Vapor Recovery for Above Ground Storage Tanks	--	NYQ	--	NYQ
<b>Areawide Sources</b>	<b>--</b>	<b>5.7</b>	<b>--</b>	<b>--</b>
Consumer Products Program	--	3.2	--	--
Pesticides: DPR Regulation	--	2.5	--	--
<b>Emission Reductions from Proposed New Measures</b>	<b>76</b>	<b>23</b>	<b>5</b>	<b>0</b>

NYQ = Not Yet Quantified. BAR = Bureau of Automotive Repair. DPR = Dept. of Pesticide Regulation.  
 Locomotives measure relies on U.S. EPA rulemaking and industry agreement to accelerate fleet turnover.  
 Note: Emission reductions reflect the combined impact of regulations and supportive incentive programs.  
 Emission reduction estimates for each proposed measure are shown for informational purposes only.  
 Actual emission reductions from any particular measure may be greater than or less than the amounts shown.

## **Commitments to Reduce Emissions**

The tables below describe the emission reduction commitment proposal for Board approval. ARB staff proposes to commit to achieve the emission reductions set forth in these tables, by the dates indicated in the table on Page 65 entitled, "Schedule for Board Consideration of Proposed ARB Rulemaking." The reductions may be achieved through a combination of actions, including regulations, incentives, and other enforceable mechanisms.

### **Summary of Emission Reduction Commitments – South Coast**

<b>Year</b>	<b>NOx</b>	<b>ROG</b>	<b>Direct PM2.5</b>	<b>SOx</b>
2014	122	46	9	20
2020 <sup>1</sup>	144	52	--	--
2023	141	54	--	--
2023 CAA 182(e)(5) measures	241 <sup>2</sup>	40 <sup>2</sup>	--	--

<sup>1</sup> The 2020 commitment in the South Coast is necessary to provide for attainment in the downwind nonattainment areas.

<sup>2</sup> The reductions of NOx and ROG from 182(e)(5) measures will be reassessed as new SIPs are developed and revised.

### **Summary of Emission Reduction Commitments – San Joaquin Valley**

<b>Year</b>	<b>NOx</b>	<b>ROG</b>	<b>Direct PM2.5</b>	<b>SOx</b>
2014	76	23	5	0
2020	56	24	--	--
2023	46	25	--	--
2023 CAA 182(e)(5) measures	81 <sup>1</sup>	-- <sup>1</sup>	--	--

<sup>1</sup> The reductions of NOx and ROG from 182(e)(5) measures will be reassessed as new SIPs are developed and revised.

### **Summary of Emission Reduction Commitments – Coachella Valley**

<b>Year</b>	<b>NOx</b>	<b>ROG</b>
2018	7	2

### **Commitment to Propose Defined New SIP Measures**

In addition to the commitment to reduce emissions by 2014, 2020 and 2023, ARB staff also proposes to commit to submit to the Board and propose for adoption the list of proposed new ARB control measures shown in the table below. The Board shall take action on or before the dates set forth in the following table. Such action by the Board may include any action within its discretion.

#### **Schedule for Board Consideration of Proposed ARB Rulemaking**

<b>Proposed New SIP Measures</b>	<b>Year</b>
Cleaner In-Use Off-Road Equipment	2007
Modifications to Reformulated Gasoline Program	
Cleaner Main Ship Fuel	
Clean Up Existing Harbor Craft	
Enhanced Vapor Recovery for Above Ground Storage Tanks	
Cleaner In-Use Heavy-Duty Trucks	2008
Port Truck Modernization	
Ship Auxiliary Engines	
Cleaner Line-Haul Locomotives (Enforceable Agreement)	
Consumer Products Program I	
Cleaner In-Use Agricultural Equipment	2009-2010
New Emission Standards for Recreational Boats	
Expanded Off-Road Recreational Vehicle Emission Standards	
Additional Evaporative Emission Standards	
Consumer Products Program II	2010-2012

**State Strategy  
Proposed New SIP Measures  
Implementing Agency – Expected Action – Expected Implementation**

<b>Proposed New SIP Measures</b>	<b>Implementing Agency</b>	<b>Expected Action</b>	<b>Expected Implementation</b>
<b>Passenger Vehicles</b>			
Smog Check Improvements	BAR	2007-2008	By 2010
Expanded Vehicle Retirement	ARB/BAR	2008-2014	2008-2014
Modifications to Reformulated Gasoline Program	ARB	2007	Phase-in starting 2010
<b>Trucks</b>			
Cleaner In-Use Heavy-Duty Trucks	ARB	2008	2010-2015
<b>Goods Movement Sources</b>			
Auxiliary Ship Engine Cold Ironing and Other Clean Technology	EPA/ARB/Local	2007-2008	Phase-in starting 2010
Cleaner Main Ship Engines and Fuel	EPA/ARB/Local	Fuel: 2007 Engines: 2009	2007-2010 Phase-in starting 2010
Port Truck Modernization	ARB/Local	2007-2008	2008-2020
Accelerated Introduction of Cleaner Line-Haul Locomotives	EPA/ARB	2007-2008	Starting in 2012
Clean Up Existing Harbor Craft	ARB	2007	2009-2018
<b>Off-Road Equipment</b>			
Cleaner In-Use Off-Road Equipment	ARB	2007	Phase-in starting 2008
Cleaner In-Use Agricultural Equipment	ARB	2009-2010	TBD
<b>Other Off-Road Sources</b>			
New Emission Standards for Recreational Boats	ARB	2009-2010	2012-2013
Expanded Off-Road Recreational Vehicle Emission Standards	ARB	By 2010	2012-2015
Enhanced Vapor Recovery for Above Ground Storage Tanks	ARB	2007	Phase-in starting 2008
Additional Evaporative Emission Standards	ARB	By 2010	2010-2012
<b>AREAWIDE SOURCES</b>			
Consumer Products Program	ARB	2007-2008 2010-2012	By 2010 By 2012-2014
DPR Pesticide Regulation	DPR	2008	2008

DPR = Department of Pesticide Regulation. BAR = Bureau of Automotive Repair  
TBD = To Be Determined

## **Commitment to Reduce Emissions via Long-Term Strategy**

Consistent with section 182(e)(5) of the federal Clean Air Act, this SIP includes long-term commitments to achieve the last increment of emission reductions necessary to meet attainment goals in the South Coast and San Joaquin Valley. As the State agency charged with ensuring California's SIP compliance, ARB is ultimately responsible for ensuring the necessary measures are identified no later than 2020 (three years prior to the attainment year) and the emission reductions achieved by 2023.

After adoption of the State Strategy, ARB staff proposes to initiate a coordinated government, private, and public effort to establish emission goals for critical mobile and stationary emission source categories. Following the setting of emission goals, ARB will start an ongoing public process to assess technology advancement opportunities for the critical categories. ARB staff will periodically brief the Board at public meetings on emerging emission reduction opportunities, promising technologies, and the progress made in developing long-term emission reduction measures. As ARB staff identifies feasible technology-forcing emission reduction measures, staff will propose those measures to the Board for inclusion into the SIP.

No later than 2020, ARB and the two air districts will prepare a revision to the 8-hour Ozone SIP that (1) reflects any modifications to the 2023 emission reduction target based on updated science, and (2) identifies any additional strategies, including the implementing agencies, needed to achieve the necessary emissions reductions by 2023. If the specific measures developed to satisfy the long-term obligation affect on-road motor vehicle emissions, we will work with the air districts and transportation planning agencies to revise the transportation conformity budgets accordingly.

**South Coast:** After accounting for the anticipated benefits of both adopted and new defined State and local measures, the 2003 SIP demonstrates a need for another 281 tpd ROG and NO<sub>x</sub> reductions from long-term measures. This represents 24 percent of the total reductions needed by 2023. We believe that this gap can be bridged through a cooperative effort by the local, State and federal agencies responsible for specific emission sources. This effort should focus on how to most effectively achieve the additional reductions, considering the availability and cost of potential controls.

**San Joaquin Valley:** After accounting for the anticipated benefits of both adopted and new defined State and local measures, the State Strategy demonstrates a need for another 81 tpd NO<sub>x</sub> reductions from long-term measures. This represents 13 percent of the total NO<sub>x</sub> and ROG reductions needed by 2023. We believe that this gap can be bridged through a cooperative effort by the local, State and federal agencies responsible for specific emission sources. This effort should focus on how to most effectively achieve the additional reductions, considering the availability and cost of potential controls.



## **Role of Funding and Incentive Programs**

Over the past 40 years, California has steadily improved air quality in the face of tremendous economic and population growth. The vast majority of that progress has come from effective regulations. Accordingly, ARB staff expects State and federal regulations to play the primary role in implementing the State Strategy. In the regulatory paradigm, polluting sources pay for the necessary emission controls as part of doing business. Regulated industries may pass these costs on to consumers in the form of higher prices, although competition and other factors may prevent some companies from recouping all of their control costs. Low-interest loans with extended payment periods are available to aid smaller businesses that need upfront capital to comply.

In recent years, regulatory programs have been supplemented with financial incentives to accelerate voluntary actions, such as replacing older equipment. Incentive programs like the Carl Moyer Program are both popular and effective. They also help to demonstrate emerging technologies that then can be used to set a tougher emissions benchmark for regulatory requirements. Most of the existing incentive programs are designed to pay for the incremental cost between what is required by regulation and advanced technology that exceeds that level. The incentive programs are publicly funded through fees paid by California vehicle owners as part of their annual registrations, smog inspections or new tire purchases. California is currently investing up to \$140 million per year to clean up older, higher emission sources.

The support for clean air incentive funding from Governor Schwarzenegger, the Legislature, and California's voting public is reflected in the passage on November 7, 2006, of the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006. The Bond Act includes \$1 billion to accelerate the cleanup of air pollution caused by goods movement activities in California. With appropriation by the Legislature, and subject to such conditions and criteria contained in a statute that it will enact, ARB will appropriate this money to fund emission reductions from activities related to the movement of freight along California's trade corridors.

## **Federal Actions Needed**

Measures in the State Strategy to reduce emissions from interstate and international sources rely on the federal government to develop more stringent emission standards and to ensure these standards go into effect as soon as possible. Emission reductions from locomotives, off-road equipment, marine auxiliary engines, and harbor craft are a significant part of the State Strategy. Proposed State measures would accelerate the introduction of cleaner engines and equipment, but the emission reductions rely on the availability of cleaner new engines.

ARB is proposing several measures to reduce ship emissions through a combination of regulations, incentives, and actions by ports and the private

sector. However, national and international action to clean up shipping fleets is also needed to fully realize our clean air goals. And aircraft emissions, which will become one of the South Coast's top five NOx sources by 2020, are unaddressed in the State Strategy due to the lack of effective international standards.

California must rely on U.S. EPA to represent its interests before foreign or international regulatory bodies that have the ability to reduce emissions from international goods movement sources. In this role, U.S. EPA should advocate for the adoption of cleaner ship emission standards and less polluting practices by the International Maritime Organization.

### **Possible Federal Actions**

*Adopt more stringent standards for sources under federal control.* U.S. EPA should move as fast as possible to lower standards for sources under its control, keeping in mind California's air quality challenge and attainment deadlines. There are categories of emission sources that we do not have the authority to regulate at the State level. We also do not have the ability to regulate sources in markets outside of California that then operate within California. Not only would federal action lower emissions for new sources, but it would allow State and local actions to lower emissions from existing sources by setting in-use rules that speed up the integration of the cleaner engines and technology into California fleets. These sources include: ships, locomotives, harbor craft, aircraft, and off-road equipment and vehicles.

*Federal incentives for cleaner technology.* Federal funding sources for clean air projects, as well as federal tax incentives promoting the manufacture, sale, and purchase of cleaner vehicles, equipment, and technology, could enhance California's aggressive incentive programs.

## **Ozone Attainment Demonstrations**

The table on the following page illustrates how the State Strategy will meet the emission reduction targets for ozone in the South Coast and San Joaquin Valley.

This document has presented ARB staff's assessment of the State Strategy for the San Joaquin Valley and the South Coast in detail. ARB staff has also evaluated the impact of the proposed State Strategy on all 15 ozone nonattainment areas. For the remaining areas, modeling results and air quality data analyses show that, with the continued reductions in emissions on track to occur in each area, all will be able to show attainment by 2021 or earlier with identified measures.

ARB staff expects the districts within the Sacramento nonattainment area will request a reclassification from serious to severe and will need additional reductions from ARB's proposed new measures to attain by 2019. San Diego is projected to attain by its deadline, while Ventura may consider a reclassification to either Serious or Severe. Transport impacted areas, especially downwind of the South Coast—the Antelope Valley, the Mojave Desert, and the Coachella Valley—will need to rely on new reductions that will occur upwind. We expect the local districts to request reclassification to get the needed time. Areas downwind of the Central Valley—Western Nevada, Amador, Calaveras, Tuolumne, Mariposa, and Kern Counties—are projected to attain by their 2014 deadline with already adopted measures. Air quality modeling for these areas is new and ARB staff is continuing to evaluate the results. Finally, three areas—the Bay Area, Butte County, and the Sutter Buttes—now attain the ozone standard.

Attainment demonstrations for these areas will be included in the individual ARB staff reports for each area.

## Setting the Ozone Emission Reduction Target (tons per day)

	Nonattainment Area			
	South Coast (2023)		San Joaquin Valley (2023)	
	NOx	ROG	NOx	ROG
2006 Emissions Inventory	972	732	650	454
Carrying Capacity	114	420	160	342
<b>Emission Reduction Target</b>	<b>858</b>	<b>312</b>	<b>490</b>	<b>112</b>

(2006 Emissions Inventory) – (Carrying Capacity) = (Emission Reduction Target)

*2006 Emissions Inventory* = Amount of ozone-forming emissions.

*Carrying Capacity* = Pollutant emissions limit that ensures air quality standards are met.

*Emission Reduction Target* = Amount of emissions that must be reduced to meet the standard.

## Meeting the Ozone Emission Reduction Target (tons per day)

	Nonattainment Area			
	South Coast (2023)		San Joaquin Valley (2023)	
	NOx	ROG	NOx	ROG
<b>Emission Reduction Target</b>	<b>858</b>	<b>312</b>	<b>490</b>	<b>112</b>
Emission Reductions from Adopted SIP Measures	467	199	355	43
Emission Reductions from New Local Measures	9	19	8	47
Emission Reductions from New State Measures	141	54	46	25
Long-Term Measures	241	40	81	--
<b>Total Reductions</b>	<b>858</b>	<b>312</b>	<b>490</b>	<b>115</b>

*Emission Reductions from Adopted SIP Measures* = Emissions reduced from measures adopted through 2006.

*Emission Reductions from New Measures* = Emissions reduced from measures in the State Strategy or new local measures adopted after 2006.

*Long-Term Measures* = Emissions reduced from measures adopted after 2020 that rely on new or evolving technology, as allowed in section 182(e)(5) of the Clean Air Act.

## **Tracking Progress**

The Clean Air Act requires that SIPs show there will be steady progress in reducing emissions during the years leading to the attainment date, called reasonable further progress, equal to about 3 percent per year. (Each nonattainment area's reasonable further progress is illustrated in the local plans and in Appendix D.) Along with tracking progress to meet the SIP requirements, ARB will have a stringent tracking process for strategies under its jurisdiction. There will be periodic updates to ARB's governing board on the SIP's New Strategies. In addition, other ARB programs vital to the SIP have their own deadlines and tracking schedules. The goal of ARB's Diesel Risk Reduction Plan is to reduce the health risk from diesel emissions 75 percent by 2010 and 85 percent by 2020. The Emission Reduction Plan for Ports and Goods Movement in California has specific emission reduction milestones in 2010, 2015 and 2020. ARB is committed to achieving all of its goals in these plans and the SIP and will be tracking progress on each.

## **Contingency Measures Requirement**

The federal Clean Air Act requires attainment plans to identify "contingency measures" to be implemented if nonattainment areas (except those designated "marginal") fail to meet reasonable further progress requirements or to attain the federal air quality standards on time. These contingency measures are to take effect without further ARB or air district action, and thus must be measures that have already been adopted when the SIP is submitted to U.S. EPA.

The bulk of emission reductions needed to attain the federal standards are achieved through the mobile source measures in the State Strategy's existing program. As we have noted previously, California's mobile source program has been very successful in reducing emissions in California and represents the foundation supporting attainment of the federal standards. ARB has a well established history of adopting and implementing mobile source control regulations on-time or early. As a result, we expect to achieve and even exceed reasonable further progress goals without the need for contingency measures. However, the Clean Air Act requirements necessitate that we provide contingency measures regardless of our expected progress in reducing emissions toward the attainment goals.

For areas designed basic, moderate, and serious, reasonable further progress can be demonstrated with already adopted measures and therefore contingency measures are not necessary. For areas designated severe and extreme, the emission reductions from adopted measures that go beyond the reasonable further progress requirements will constitute California's contingency measure commitment implemented in the unlikely event that the State does not meet the reasonable further progress goals.

A more detailed analysis of the contingency measure commitment is included in Appendix D.