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# PROPOSED
# 2003 STATE AND FEDERAL STRATEGY FOR THE CALIFORNIA STATE IMPLEMENTATION PLAN

## SECTION V

## POTENTIAL IMPACTS

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This chapter is unchanged from the Section V, Chapter A. Environmental Impact Analysis chapter that was released on May 12, 2003, except for the addition of one footnote.

## CHAPTER A. ENVIRONMENTAL IMPACT ANALYSIS

### 1. The California Environmental Quality Act

The California Environmental Quality Act (CEQA) and ARB policy require an analysis to determine the potential adverse environmental impacts of proposed projects. This chapter presents ARB's analysis of the potential adverse environmental impacts of the Proposed State and Federal Strategy (Strategy). This chapter also summarizes and discusses ARB's environmental justice policies and identifies the specific strategies in the Proposed Strategy that, if adopted, will reduce air pollution at the community level.

ARB's program involving adoption or approval of standards, rules, regulations, and plans has been certified by the Secretary of Resources as meeting certain environmental standards set forth in CEQA (see Public Resources Code section 21080.5). Hence, ARB need only prepare "functionally equivalent" environmental documents instead of Initial Studies, Negative Declarations, and Environmental Impact Reports. In addition, ARB will respond in writing to all significant environmental concerns raised by the public during the public review period or at the Board hearing.

In order to provide for meaningful public review and comment on this environmental analysis, it is important to first explain what this analysis is not. This chapter does not set forth in detail the beneficial environmental impacts that will result from the Proposed Strategy. ARB is proposing the measures contained in the Proposed Strategy because they will benefit air quality. The rest of this report discusses the measures and their intended benefits. This chapter focuses primarily on the potential adverse environmental impacts that may result from the State defined measures identified in the Strategy.

Furthermore, this chapter cannot and does not contain a detailed, quantitative impact analysis of the control strategies contained in the Proposed Strategy. Because the Proposed Strategy is a plan for future action to adopt measures and strategies for which specific regulatory language has not yet been developed, this analysis is necessarily general and qualitative. Each strategy will be developed over time. Some may be developed as incentive or voluntary programs. Most will be proposed in regulatory format with full public participation. The regulatory measures will undergo a detailed environmental analysis as required by CEQA, will be discussed at public workshops, and will go through the public hearing process as required by law (see the Administrative Procedure Act, Gov. Code section 11340 et seq.). When specific regulatory language is developed, it will be possible to analyze potential environmental impacts in detail. In this chapter of the Proposed Strategy, potential environmental impacts are estimated to the extent currently feasible.

## 2. Project Alternatives

CEQA requires an Environmental Impact Report (EIR) to describe and evaluate the comparative merits of a range of reasonable alternatives to a proposed project [CEQA Guidelines Section 15126 (d)]. Alternatives chosen for analysis should feasibly attain the basic objectives of the proposed project. The range of alternatives required in an EIR is governed by the "rule of reason" that the EIR set forth only those alternatives necessary to permit a reasoned choice. An EIR need not consider an alternative whose effect cannot be reasonably ascertained and whose implementation is remote and speculative [CEQA Guidelines Section 15126 (d)(5)(c)].

### a. Alternative 1 - 'No Project'

CEQA requires a specific alternative of 'no project' to be evaluated. CEQA documents typically assume that the adoption of a 'no project' alternative would result in no further action on the part of the project proponent or lead agency. For example, in the case of a proposed housing development project, adopting the 'no project' alternative terminates further consideration of that housing development or any housing development alternative identified in the associated CEQA document. In that case, the existing setting would remain unchanged.

One interpretation of the 'no project' alternative is that if the 'no project' alternative was selected, all the measures in the Proposed Strategy are rejected. Since the Proposed Strategy contains all currently known feasible State strategies or measures that ARB could potentially take to reduce ozone, this would mean that no additional measures on existing sources or measures on uncontrolled sources would be developed. The result would be the continual deterioration of California air quality as population increases. In addition, California would fail to meet SIP commitments and would be subject to federal sanctions. Water quality would suffer as acidic rain increases and toxic air contaminants are deposited on the ground. Public exposure to toxic materials would increase. Higher levels of air pollutants would deteriorate aesthetics by increasing haze and would damage crops. On the positive side, there might not be the small increases in solid and hazardous waste that could result from the measures.

### b. Additional Alternatives -Adopting Fewer Strategies or Measures, or Adopting Strategies or Measures with Different Emission Standards

As mentioned previously, the Proposed Strategy contains all feasible State strategies or measures to reduce ozone that ARB staff is currently aware of. Instead of adopting all of these measures, ARB could adopt only some of them. Numerous alternatives therefore exist to adopt various subsets of the measures identified in the Plan. In addition, for each individual measure there exists many alternatives for different possible emission standards or levels of control for the sources that are being regulated.

It is not possible to examine these many alternatives in detail without engaging in speculation, because the measures ultimately adopted by ARB will depend on the information that is learned in the future during the regulatory development process. In general, however, ARB staff believes that it will be necessary to adopt all Strategy measures and emission standards that are determined to be feasible, rather than a subset of feasible measures and standards. This is because to attain the federal ozone standard in the South Coast and San Joaquin Valley, significant additional emission reductions will be needed beyond the defined measures specifically identified in the Strategy. Therefore, failing to adopt all feasible measures and emission standards would result in failure to meet California's SIP commitments, and would subject the State to sanctions under the federal Clean Air Act.

## 3. Potential Adverse Environmental Impacts

The following environmental impact areas were considered for each proposed control measure.

- Water Resources
- Air Quality
- Energy Demand
- Hazards and Hazardous Materials
- Solid / Hazardous Waste
- Noise
- Transportation and Traffic
- Aesthetics
- Agricultural Resources
- Biological Resources
- Cultural Resources
- Geology and Soils
- Land Use and Planning
- Mineral Resources
- Population and Housing
- Public Services
- Recreation

Each environmental impact area is described below. Impacts considered potentially significant are noted in parenthesis at the end of each description. A detailed reference table identifying each measure in the Proposed Strategy, any potential adverse environmental impacts, and some potential mitigation measures is at the end of this section.

At this time, some measures have been developed more fully than others and more impacts have been identified. However, for those less developed strategies, we

have attempted to include any potential impact that reasonably could occur, given our present knowledge.

### a. Water Resources

This environmental analysis of water resources is divided into two major categories – water quality and water demand. Several potentially significant adverse water quality impacts are identified, including impacts from alternative transportation fuels, and reformulated low-VOC consumer products. However, the cumulative effect of the Proposed Strategy is expected to be beneficial to water quality. No significant water demand impacts have been identified.

Measures in the Proposed Strategy with potential water quality impacts are described further below.

#### *i. Water Quality*

Although rain can effectively scrub the air clean, air pollutants absorbed by rainwater can have an adverse impact when deposited into surface waters. NOx and SOx emissions can form acids that can lower the pH of sensitive mountain lakes and streams and adversely affect the flora and fauna. NOx emissions can oxidize to nitrate, a powerful fertilizer, and can spur algae growth contributing to lake water turbidity and algae blooms. Organic molecules can be deposited in surface waters and affect the aquatic plants and animals. Toxic air contaminants (TACs) can dissolve in rain and eventually stress or kill organisms.

**Cumulative Impact:** The Proposed Strategy would significantly reduce a number of air pollutants and the reductions in deposition will improve overall water quality in California, especially in sensitive lakes in the Sierra Nevada and other eastern mountains. Also, accelerated retirement of older equipment with potentially leaky gasoline or diesel engines will reduce fluid (oil and grease) drips, resulting in cleaner storm water runoff.

The use of alternative fuels is not expected to result in greater adverse water quality impacts than the use of regular petroleum-based fuels. A number of regulations are currently in place to minimize the potential impacts from leaks and spills. The reformulation of consumer products to reduce VOC emissions can be monitored to minimize any potential adverse impacts on water quality. The few measures with a potential for adverse water quality impacts would include mitigation strategies to minimize their limited impact. Cumulative impacts are expected to be less than significant.

#### *ii. State and Regional Water Boards*

California has an extensive regulatory program to control water pollution. The most important statute governing water quality is the Porter-Cologne Act, which gives

the State Water Resources Control Board (SWRCB) and the nine regional water quality control boards (RWQCB) broad powers to protect surface and groundwater supplies in California, regulate waste disposal, and require cleanup of hazardous conditions (California Water Code §§3000-13999.16). In particular, the SWRCB establishes water-related policies and approves water quality control plans, which are implemented and enforced by the RWQCBs. The nine regional boards include: North Coast, San Francisco Bay, Central Coast, Los Angeles, Central Valley, Lahontan, Colorado River Basin, Santa Ana, and San Diego.

It is the responsibility of each regional board to prepare water quality control plans to protect surface and groundwater supplies within its region. These plans must identify important regional water resources and their beneficial uses, such as domestic, navigational, agricultural, industrial, and recreational; establish water quality objectives, limits, or levels of water constituents or characteristics established for beneficial uses and to prevent nuisances; and present an implementation program necessary to achieve those water quality objectives. These plans also contain technical information for determining waste water discharge requirements and taking enforcement actions. The plans are typically reviewed and updated every three years (California Water Code §13241).

California dischargers of waste that "could affect the quality of the waters of the State" are required to file a report of waste discharge with the appropriate regional water board (California Water Code §13260). The report is essentially a permit application and must contain information required by the regional board. After receipt of a discharge report, the regional board will issue "waste discharge requirements" analogous to a permit with conditions prescribing the allowable nature of the proposed discharge (California Water Code §§3263, 13377, and 13378).

#### *iii. National Pollutant Discharge Elimination System Requirements*

Most discharges into California's waters are regulated by the National Pollutant Discharge Elimination System (NPDES), a regulatory program under the federal Clean Water Act. The NPDES is supervised by U.S. EPA, but administered by the SWRCB. NPDES requirements apply to discharges of pollutants into navigable waters from a point source, discharges of dredged or fill material into navigable waters, and the disposal of sewage sludge that could result in pollutants entering navigable waters. California has received U.S. EPA approval of its NPDES program. Pursuant to California's NPDES program, any waste discharger subject to the NPDES program must obtain an NPDES permit from the appropriate RWQCB. The permits typically include criteria and water quality objectives for a wide range of constituents. The NPDES program is self-monitoring, requiring periodic effluent sampling. Permit compliance is assessed monthly by the local RWQCB and any NPDES violations are then categorized and reported to U.S. EPA on a quarterly basis.

U.S. EPA has also published regulations that require certain industries, cities and counties to obtain NPDES permits for stormwater discharges [55 CFR (1990)]. The new regulations set forth permit application requirements for classes of stormwater discharges specifically identified in the federal Clean Water Act. The regulated stormwater discharges include those associated with industrial activity and from municipal storm sewer systems serving a population of 100,000 or more.

### *iv. Discharges to Publicly-Owned Treatment Works (POTWs)*

Water discharges to a public sewage system (referred to generically as a POTW), rather than directly to the environment, are not subject to the NPDES discharge requirements. Instead, such discharges are subject to federal pretreatment requirements under §§307(b) and (c) of the Clean Water Act [33 USC §1317(b)-(c)]. Although these pretreatment standards are enforced directly by U.S. EPA, they are implemented by local sanitation districts (Monahan *et al.*, 1993). The discharger, however, has the responsibility to ensure that the waste stream complies with the pretreatment requirements of the local system. Any facility using air pollution control equipment affecting water quality must receive a permit to operate from the local sanitation district. In cases where facilities modify their equipment or install air pollution controls that generate or alter existing wastewater streams, owner/operators must notify the local sanitation district and request that their existing permit be reviewed and modified.

To ensure compliance with wastewater pretreatment regulations, local sanitation districts sample and analyze the wastewater streams from facilities approximately two to four times per year. Persons who violate California's water quality laws are subject to a wide array of enforcement provisions. In 1990, U.S. EPA revised and extended existing regulations to further regulate hazardous waste dischargers and require effluent testing by POTWs. To comply with revised permit limits, POTWs may alter their operations or impose more stringent local limits on industrial user discharges of hazardous wastes (Monahan *et al*., 1993). POTWs in California are operated by sanitation districts that adopt ordinances establishing permit systems and fee structures. There are 630 POTWs in California.

***Alternative Diesel Fuels and Emulsified Diesel –*** The Proposed Strategies to reduce emissions from on-road, off-road, and stationary diesel-fueled engines could require or encourage the use of alternatively fueled engines and alternative fuel formulations. Because some alternative diesel fuel formulations and additives could more readily dissolve in water, these control measures have the potential to adversely impact local ground and surface waters.

Emulsified diesel fuel is diesel with a small amount of water mixed in and emulsified until stable. By lowering combustion temperatures, the water reduces NOx formation. Use of emulsified diesel may have some negative water quality impacts because spilled emulsified diesel is more soluble in water than spilled diesel. The chemicals in the alternative diesel fuels will be evaluated for toxic effects during the

health effects evaluation that is required before the fuel receives federal registration prior to approval.

The use of these alternative fuels is not expected to result in significantly greater adverse water quality impacts than the use of regular diesel fuels. A number of rules and regulations are currently in place to minimize the potential impacts from underground leaking storage tanks, and spills from fueling activities, including requirements for the construction of the storage tanks, requirements for double containment, and installation of leak detection systems. These regulations minimize the potential for additional leaks from the use of diesel fuels or alternative fuels.
(Not Significant)

***Consumer Products –*** Two TACs used in some consumer products, methylene chloride (MeCl) and perchloroethylene (Perc), are specifically exempted from the VOC definition in recognition of their very low ozone-forming capabilities. Some manufacturers could use MeCl or Perc in their formulations to reduce the VOC content to meet future limits, creating potential adverse environmental impacts for air, soil and water.

ARB staff has recognized the potential for increased use of MeCl and Perc in consumer products and has taken steps to mitigate and limit the use of these compounds in recent Board actions. These actions include: the toxics control measure for automotive maintenance and repair activities; aerosol adhesives limits in the consumer products regulation; and reactivity limits in the aerosol coating regulations. ARB also currently tracks the use of MeCl and Perc in regulated consumer products through yearly manufacturer reporting requirements. Further, ARB staff has proposed VOC limits in the past that were achievable without the increased use of TACs. Furthermore, Proposition 65 labeling requirements discourage manufacturers from reformulating consumer products with TACs.

In the future, if new products contain Perc and MeCl, ARB staff will monitor their use and, if necessary, limit or prohibit their use in additional consumer products. Mitigation measures will be implemented if a significant presence of consumer product-related Perc is detected in wastewater.

Under these control measures, petroleum-based products are expected to be reformulated to aqueous-based products to comply with specified VOC emission reduction requirements. Like petroleum-based materials, aqueous materials may lead to adverse impacts to water resources if contaminated products are not handled properly. However, the use of water to reformulate would generally lead to products that would be less toxic than petroleum based materials and generate fewer impacts to water quality.
(Not Significant)

#### *v. Water Demand*

No significant negative impacts on water demand were identified.

**Cumulative Impact**: None.

### b. Air Quality

**Cumulative Impacts**: ARB staff believes the cumulative impact of the Proposed Strategy is to substantially improve air quality. However, some strategies may involve trade-offs, where emissions of one pollutant may increase slightly in order to more effectively reduce overall emissions and protect public health. The initial environmental analysis has examined each measure for potential adverse air quality impacts. The impacts are divided into four major categories – criteria pollutants, air toxics, global warming, and stratospheric ozone depletion.

Potentially significant impacts on criteria pollutant emissions may occur due to: selective catalytic reduction processes; use of diesel particulate filters; and production of low-sulfur diesel fuel. However, the cumulative impact of the Proposed Strategy is to reduce emissions of every major criteria pollutant (ROG, NOx, SOx, PM10, PM2.5, and CO).

Potentially significant air toxics impacts could occur due to reformulation of consumer products and the use of new fuel or alternative fuel additives. However, any new formulations of these products and additives would be closely scrutinized to prevent the addition of toxic compounds. These potential impacts will be more than offset by the substantial reductions in toxics from diesel engines required by the Plan. The cumulative impact of the Proposed Strategy is to greatly reduce emissions of toxic compounds.

Potentially significant global warming impacts could result from measures that may reduce fuel efficiency or increase energy use, strategies that increase natural gas consumption, and consumer product rules. To offset these greenhouse gas increases, local transportation agencies are proposing transportation control measures and districts (like the South Coast Air Quality Management District) are proposing strategies that promote fuel efficiency and pollution prevention. In general, strategies that conserve energy and promote clean technologies usually also reduce greenhouse gas emissions. Other local agencies may also promote transportation measures, fuel efficient technologies and pollution prevention methods. With some of these mitigating strategies in effect, this Strategy is not expected to have a significant adverse impact on global warming.

No potentially significant stratospheric ozone depletion impacts were identified.

### *i. Criteria Pollutants*

The Proposed Strategy will achieve significant reductions of criteria pollutant emissions. Some individual strategies, however, may result in slight increases in one pollutant in order to more effectively reduce emissions of another.

**Cumulative Impact:** Potential adverse impacts on criteria pollutant emissions may occur due to: selective catalytic reduction processes; use of diesel particulate filters; and production of low-sulfur diesel fuel. However, the cumulative impact of the Proposed Strategy is to reduce emissions of every major criteria pollutant (ROG, NOx, SOx, PM10, PM2.5, and CO) and to benefit overall air quality.

***Diesel-Fueled Engines –*** Measures in the Proposed Strategy to reduce NOx from diesel-fueled engines may necessitate use of Selective Catalytic Reduction (SCR). SCR reduces NOx into molecular nitrogen and water by injecting ammonia into the exhaust upstream of a catalyst. If too much ammonia is used, the ammonia can slip past the catalyst unreacted (called "ammonia slip") and be emitted to the atmosphere. Ammonia slip can worsen as the catalyst ages and becomes less effective. In many SCR installations, ammonia slip must be continuously monitored and controlled. A limit on ammonia emissions is normally included in the Permit to Operate for the SCR. (Potentially Significant)

***Diesel Particulate Filters –*** A number of measures in the Proposed Strategy would require the use of diesel particulate filters, add-on devices that are mounted on the exhaust pipe. Certain types of these diesel particulate filters, referred to as passive filters, accelerate the conversion of nitrous oxide (NO) to nitrogen dioxide (NO2). As such, there is a potential for an adverse effect on the concentration and location of peak ozone levels in the State, especially near centers of diesel activity, as well as increases in levels of NO2, nitric acid, and secondary particulate matter formation.

Catalyst manufacturers are aware of the issue and preliminary analysis suggests that the impacts may be adequately mitigated by designing the system to limit the NO to NO2 conversion rates. In the near term, the advantages of getting diesel particulate filters into operation to reduce risk from diesel PM and allowing the technology to develop and mature should offset any limited adverse impacts.
(Potentially Significant)

***Low Sulfur Diesel Fuel –*** Low sulfur diesel fuel requirements may necessitate increased hydrotreating of fuel to remove sulfur, which would require increased hydrogen production. Hydrogen production, in turn, would require energy, which could increase criteria pollutant (particularly NOx), as well as produce an increase in CO2 emissions. The most acute impact of this process change and emissions increase could be in the communities near refineries. Air district permitting programs will evaluate and mitigate the air quality and environmental impacts to the extent feasible. (Potentially Significant)

***Electrification of Equipment –*** Electric forklifts, dockside electrical hookups for larger marine vessels, the addition of vapor recovery at marinas and other strategies may increase electricity demand from power plants. The increase in power production will increase emissions (primarily NOx) from power plants somewhat. Air district permitting programs are in place to limit these emission increases. Overall, emissions should decrease significantly as fuels such as diesel and propane are replaced by the much cleaner natural gas burned at power plants.
(Not Significant)

***Forklift Purchases –*** Requirements for zero-emission forklifts (currently electric technology) may cause users to buy and rent larger capacity forklifts fueled by propane or diesel or to delay purchases of new electric forklifts and use older and dirtier forklifts longer. Use of these larger or older forklifts would increase emissions. This regulation will be developed with full consideration of the limits of electric forklifts and the needs of forklift operators. Exemptions for specific applications may be included. This issue will be thoroughly studied to minimize unintended emissions increases.
(Potentially Significant)

### *ii. Air Toxics*

**Cumulative Impact:** ARB staff believes that the Proposed Strategy as a whole will substantially reduce emissions of TACs. However, some strategies may involve a slight increase in emissions of one pollutant in order to more effectively reduce overall emissions or health risk. Potentially significant air toxics impacts could occur due to reformulation of consumer products and the use of new fuel or alternative fuel additives. However, any new formulations of these products and additives would be closely scrutinized to prevent the addition of toxic compounds. The cumulative impact of the Proposed Strategy is to reduce emissions of toxic compounds.

A brief description of potential impacts of the strategies is provided below.

***Consumer Products –*** The consumer products measures would reduce organic gas emissions by requiring reformulation to reduce VOC content. A number of VOCs currently used in consumer product formulations, such as ethylene-based glycol ethers, trichloroethylene (TCE), and toluene, have also been identified as toxic air contaminants. When a product is reformulated to meet new VOC limits, however, a manufacturer could use small amounts of a chemical, not used before, that may be a toxic air contaminant. This potential impact will need to be evaluated and mitigated as reformulation options are reviewed during the development of new VOC limits.

Two particular TACs used in some consumer products, methylene chloride (MeCl) and perchloroethylene (Perc), are specifically exempted from the VOC definition because of their very low ozone-forming capabilities. As a result, some manufacturers may choose to use MeCl or Perc in their reformulations to reduce the VOC content in meeting future limits. In the future, if new products contain Perc and MeCl, ARB staff

will monitor their use and, if necessary, limit or prohibit their use in additional consumer products.

Under these control measures, petroleum-based products are expected to be reformulated to aqueous-based products to comply with specified VOC emission reduction requirements. The use of water to reformulate would generally lead to products that would be less toxic than petroleum based materials and generate fewer impacts to air quality.
(Not Significant)

***Fuel Additives –*** Before proposing rules requiring fuel additives, staff will evaluate the chemicals in the additives for their toxic effects. Since additives are federally regulated, they will undergo a health effects evaluation prior to approval.
(Not Significant)

### *iii. Global Warming*

In general, strategies that promote clean technologies usually also reduce greenhouse gas emissions. However, some of the individual measures in the Proposed Strategy may result in an increase in the release of greenhouse gases.

**Cumulative Impact:** Potentially significant global warming impacts may occur due to measures that may slightly reduce fuel efficiency or increase energy use. In addition, strategies that promote natural gas (methane) may increase the potential for methane leaks to the atmosphere. Finally, greenhouse gas emissions resulting from consumer product measures could be potentially significant. These potential impacts could be mitigated by local traffic control measures and by fuel conservation education. With these or other mitigating strategies in effect, this Strategy is not expected to have a significant adverse impact on global warming.

***Diesel-Fueled Engines –*** Proposed Strategy measures to reduce emissions from diesel-fueled engines could require the use of new diesel engines, engine modifications, alternatively fueled engines, add-on control devices such as particulate filters and catalysts, low-sulfur diesel fuel, alternative fuel formulations, or other strategies. These strategies have the potential to slightly reduce fuel economy and increase greenhouse gas emissions. These impacts may be mitigated as other engine features become more efficient to meet air pollution emission standards.
(Potentially Significant)

***Mandatory Chip Reflash*** – During the 1990s, some engine manufacturers programmed the computer chips in diesel engines to maximize power and fuel efficiency with result that NOx emissions were higher. This was in violation of federal and State air pollution regulations. A Proposed Strategy measure would accelerate correction of this problem by requiring computer chips to be reprogrammed to reduce NOx emissions before they are brought in for rebuild. Greenhouse gas emissions could

increase slightly due to a decrease in fuel efficiency.
(Potentially Significant)

***Natural Gas –*** Natural gas (methane) is a clean burning fuel but is also a potent greenhouse gas. Strategies that promote natural gas use (in place of diesel fuel, for example) may increase the risk of methane leaks to the atmosphere.
(Potentially Significant)

***Diesel Particulate Filters*** – A number of measures in the Proposed Strategy would require the use of diesel particulate filters. These particulate filters must be periodically regenerated by burning off excess hydrocarbons trapped on the filter. Active regeneration methods use external fuel or energy to heat the filter and regenerate it.
(Not Significant)

***Off-Road Spark Ignition Engines –*** Retrofit emission controls for off-road spark ignition vehicles and equipment could decrease fuel efficiency slightly and increase carbon dioxide emissions.
(Potentially Significant)

***Consumer Products –*** Alternative compounds used to meet lower VOC limits in the Proposed Strategy's consumer products measures could be greenhouse gases. For aerosol products to meet the VOC limits in the proposed regulations, manufacturers may choose to replace some or all of the typical hydrocarbon propellants with HFC-152a or CO2, both of which are greenhouse gasses. HFC-152a has no ozone depletion potential, does not contribute to the formation of ground-level ozone, is low in toxicity, and is only mildly flammable. In addition, HFC-152a has the lowest global warming potential of all the HFCs and an atmospheric lifetime of only 1.5 years. Due to the high cost of HFC-152a (as much as five to seven times greater than other hydrocarbon propellants), it is anticipated that manufacturers will use as little HFC-152a as possible when reformulating their aerosol products. Consequently, the impact on global warming from increased use of HFC-152a should be negligible. However, further analysis of the properties and effects of HFC-152a is needed. Should the analysis reveal significant impacts, ARB staff would reassess the control strategy. CO2 used as a replacement for hydrocarbon propellants would be a recycled byproduct from existing processes and would therefore not contribute to global warming.
(Not Significant)

### *iv. Stratospheric Ozone Depletion*

**Cumulative Impact**: One strategy had a potential impact on the stratospheric ozone layer, but the impact is not considered significant.

***Consumer Products –*** Some HCFCs are still used in consumer products as propellants and are exempt VOCs under the existing and proposed regulations. It is unknown if there will be an increased use of these compounds in meeting lower VOC

limits. However, all HCFCs are classified as group II ozone-depleting compounds by U.S. EPA and are scheduled for phase out between 2004 and 2030. Because of the phase out, manufacturers may prefer to use propellants other than HCFCs. We therefore anticipate that the impact on ozone depletion due to HCFCs will be negligible, or there may be an environmental benefit as manufacturers switch to more benign alternative propellants.
(Not Significant)

### c. Energy Demand

**Cumulative Impact:** ARB staff has identified some potentially significant adverse energy impacts for some individual measures. Potentially significant impacts include: reduced fuel economy due to some diesel engine strategies and increased electricity demand due to electrification of equipment and vehicles. Fuel economy impacts may be mitigated as other engine features become more efficient to meet air pollution emission standards. Electricity demands can be offset somewhat if equipment is charged at night when electricity demand is low. Alternative methods of generating electricity, such as solar panels or fuel cells, might also be incorporated. The cumulative impact of all of the State SIP measures could be a small but measurable increase in energy demand.

***Mobile, Stationary, and Portable Diesel-Fueled Engines –*** Proposed Strategy measures to reduce emissions from diesel-fueled engines could require the use of new diesel engines; engine modifications; alternatively fueled engines; add-on control devices such as particulate filters and catalysts; low-sulfur diesel fuel; alternative fuel formulations; or other strategies. These strategies have the potential to cause a small decrease in fuel economy. Fuel economy impacts may be mitigated as other engine features become more efficient to meet air pollution emission standards.
(Potentially Significant)

***Alternative Fuels: Emulsified Diesel*** – Emulsified diesel fuel is diesel with a small amount of water mixed in and emulsified until stable. By lowering combustion temperatures and affecting combustion chemistry, the water reduces NOx formation. Negative effects include a small fuel efficiency penalty and a decrease in available power.
(Potentially Significant)

***Low Sulfur Diesel Fuel –*** Low sulfur diesel fuel requirements may necessitate increased hydrotreating of fuel to remove sulfur, which would require additional energy consumption.
(Potentially Significant)

***Mandatory Chip Reflash*** – During the 1990s, some diesel engine manufacturers programmed the computer chips in diesel engines to maximize power and fuel efficiency with the result that NOx emissions were higher. A Proposed Strategy measure would accelerate correction of this problem by requiring computer chips to be

reprogrammed to reduce NOx emissions before they are brought in for rebuild. Diesel fuel usage could increase due to a slight decrease in fuel efficiency.
(Potentially Significant)

***Electrification*** – Measures in the Proposed Strategy for electrification of forklifts and other equipment can provide significant reductions of air pollutant emissions. However, these projects can create a greater demand for electricity to charge or operate the equipment. These demands can be offset somewhat if equipment is charged at night when electricity demand is low. Alternative methods of generating electricity, such as solar panels or fuel cells, might also be incorporated.
(Potentially Significant)

***Diesel Particulate Filters*** – A number of measures in the Proposed Strategy would require the use of diesel particulate filters, add-on devices that are mounted on the exhaust pipe. These particulate filters must be periodically regenerated by burning off excess hydrocarbons trapped on the filter. Active regeneration methods use external fuel or energy to heat the filter and regenerate it. However, the additional energy required should not be significant.
(Not Significant)

***Fuel Vapor Recovery*** – The addition of vapor recovery at marinas and improvements for aboveground tanks may increase electrical use slightly.
(Not Significant)

**d. Hazards/Human Health**

The purpose of the Proposed Strategy is to help California attain the federal one-hour ozone and PM10 standards. ARB's goal is to ensure that all individuals in California, especially children and the elderly, can live, work, and play in a healthy environment. Each of the measures in the Proposed Strategy is intended to reduce the health risks from air pollution. The measures would reduce the pollutants that contribute to adverse health impacts, including: ozone, inhalable particles (including soot and dust), carbon monoxide, and toxic emissions (like particles emitted from diesel engines and benzene).

**Cumulative Impact on Human Health:** The cumulative impact of the Proposed Strategy will be to reduce human health risk. However, measures in the Proposed Strategy to reduce emissions from consumer products could have local human health impacts.

**Cumulative Impact on Human Hazards:** Vapor recovery for marina fueling stations and use of selective catalytic reduction have known hazard impacts which can and will be mitigated. Reformulation of consumer products could increase the use of exempt but more flammable VOC solvents such as acetone and methyl acetate. With mitigation measures in effect, the cumulative impact of the Proposed Strategy on hazard risk is not projected be significant.

### *i. Hazardous Materials*

Hazards are related to the risks of fire, explosions, or releases of hazardous substances in the event of accident or upset conditions. Hazards are thus related to the production, use, storage, and transport of hazardous materials. Industrial production and processing facilities are potential sites for hazardous materials. Some facilities produce hazardous materials as their end product, while others use such materials as an input to their production processes. Examples of hazardous materials used by consumers include fuels, paints, paint thinner, nail polish, and solvents. Hazardous materials may be stored at facilities producing such materials and at facilities where hazardous materials are part of the production processes. Storage refers to the bulk handling of hazardous materials before and after they are transported to the general geographical area of use. Currently, hazardous materials are transported throughout California in great quantities via all modes of transportation including rail, highway, water, air, and pipeline.

State law requires detailed planning to ensure that hazardous materials are properly handled, used, stored, and disposed of to prevent or mitigate injury to health or the environment in the event that such materials are accidentally released. The Office of Emergency Services (OES) enforces these requirements. Federal laws, such as the Emergency Planning and Community-Right-to-Know Act of 1986 (also known as Title III of the Superfund Amendments and Reauthorization Act or SARA) impose similar requirements.

The U.S. Department of Transportation (U.S. DOT) has regulatory responsibility for the safe transport of hazardous materials between states and to foreign countries. U.S. DOT regulations govern all means of transportation, except for those packages shipped by mail. Hazardous materials sent by U.S. mail are covered by U.S. Postal Service (USPS) regulations. U.S. DOT regulations are contained in 49 CFR; USPS regulations are in 39 CFR. Common carriers are licensed by the California Highway Patrol (CHP), pursuant to the California Vehicle Code, §32000. This section requires licensing of every motor (common) carrier who transports, for a fee, in excess of 500 pounds of hazardous materials at one time and every carrier, if not for hire, who carries more than 1,000 pounds of hazardous material of the type requiring placards. Common carriers conduct a large portion of their business in the delivery of hazardous materials.

The CHP and Caltrans have primary responsibility for enforcing federal and State regulations and responding to hazardous materials transportation emergencies. The CHP enforces hazardous materials and hazardous waste labeling and packaging regulations that prevent leakage and spills of material in transit and provide detailed information to cleanup crews in the event of an accident. Vehicle and equipment inspection, shipment preparation, container identification, and shipping documentation are all part of the responsibility of the CHP. The CHP also conducts regular inspections

of licensed transporters to assure regulatory compliance. Caltrans has emergency chemical spill identification teams at 72 locations throughout California.

Pursuant to the Emergency Services Act, California has developed an Emergency Response Plan to coordinate emergency services provided by federal, State, and local government agencies and private persons. Response to hazardous materials incidents is one part of this plan. The plan is administered by OES, which coordinates the responses of other agencies including U.S. EPA, CHP, Department of Fish and Game, the applicable RWQCB, and local fire departments (see California Government Code, §8550).

In addition, pursuant to the Hazardous Materials Release Response Plans and Inventory Law of 1985 (the Business Plan Law), local agencies are required to develop "area plans" for response to releases of hazardous materials and wastes. These emergency response plans depend to a large extent on the business plans submitted by persons who handle hazardous materials. An area plan must include pre-emergency planning of procedures for emergency response, notification and coordination of affected government agencies and responsible parties, training, and follow-up. Hazardous materials incidents are reported to OES, which compiles and archives the information.

### *ii. Public Health*

The Toxic Air Contaminant Identification and Control Act (Health and Safety Code §§ 39650 *et seq*., Food and Agriculture Code Sections 14021 *et seq*.) established California's two-phased program to identify and control air toxics. In the first phase (risk assessment), ARB selects substances for review, considering criteria relating to "the risk of harm to public health, amount or potential amount of emissions, manner of, and exposure to, usage of the substance in California, persistence in the atmosphere, and ambient concentrations in the community" (Health and Safety Code § 39666(f)). One example of an identified TAC is particulate matter from diesel-fueled engines.

In the risk management phase of the program, ARB reviews the emission sources of an identified TAC to determine if any regulatory action is necessary to reduce the risk. The analysis includes a review of controls already in place, the available technologies and associated costs for reducing emissions, and the associated risk.

Also in the risk management phase, ARB, working closely with the air districts, is responsible for developing control measures for all identified toxic air contaminants except those used as pesticides. Pesticides are evaluated in a similar process by the Department of Pesticide Regulation. Following ARB adoption of measures to control a specific toxic compound, the districts must adopt equal or more stringent regulations for the stationary sources in their jurisdiction. Regulations to control airborne toxic emissions from mobile sources are the responsibility of ARB.

The Air Toxics Hot Spots Program (Health and Safety Code §§ 44300-44384) requires facilities to report their air toxics emissions, ascertain health risks, and to notify nearby residents of significant risks. Facilities that pose a significant health risk to the community are required to reduce their risk through a risk management plan.

### *iii. Worker Safety Requirements*

The California Occupational Safety and Health Administration (Cal/OSHA) and the Federal Occupational Safety and Health Administration (OSHA) are the agencies responsible for assuring worker safety in the handling and use of chemicals in the workplace. In California, Cal/OSHA assumes primary responsibility for developing and enforcing workplace safety regulations. Under the authority of the Occupational Safety and Health Act of 1970, OSHA has adopted numerous regulations pertaining to worker safety (contained in 29 CFR). These regulations set standards for safe workplaces and work practices, including the reporting of accidents and occupational injuries. Some OSHA regulations contain standards relating to hazardous materials handling, including workplace conditions, employee protection requirements, first aid, and fire protection, as well as material handling and storage. Because California has a federally approved OSHA program, it is required to adopt regulations that are at least as stringent as those found in 29 CFR.

Cal/OSHA regulations concerning the use of hazardous materials in the workplace (detailed in CCR, title 8) include requirements for employee safety training, availability of safety equipment, accident and illness prevention programs, hazardous substance exposure warnings, and emergency action and fire prevention plan preparation. Cal/OSHA enforces hazard communication program regulations containing training and information requirements, including procedures for identifying and labeling hazardous substances. The hazard communication program also requires that Material Safety Data Sheets (MSDSs) be available to employees and that employee information and training programs be documented. These regulations also require preparation of emergency action plans (escape and evacuation procedures, rescue and medical duties, alarm systems, and emergency evacuation training).

Both federal and State laws include special provisions for hazard communication to employees in research laboratories, including training in chemical work practices. The training must include instruction in methods for the safe handling of hazardous materials, an explanation of MSDSs, use of emergency response equipment and supplies, and an explanation of the building emergency response plan and procedures. Chemical safety information must also be available at the workplace. More detailed training and monitoring is required for the use of carcinogens, ethylene oxide, lead, asbestos, and certain other chemicals listed in 29 CFR. Emergency equipment and supplies, such as fire extinguishers, safety showers, and eye washes, must also be kept in accessible places. Compliance with these regulations reduces the risk of accidents and worker health effects.

The National Fire Code (NFC), Standard 45 (published by the National Fire Protection Association) contains standards for laboratories using chemicals that are not requirements, but are generally employed by organizations in order to protect workers. These standards provide basic protection of life and property in laboratory work areas through prevention and control of fires and explosions, and also serve to protect personnel from exposure to non-fire health hazards. While NFC Standard 45 is regarded as a nationally recognized standard, the California Fire Code (24 CCR) contains State standards for the use and storage of hazardous materials and special standards for buildings where hazardous materials are found. Some of these regulations consist of amendments to NFC Standard 45. California Fire Code regulations require emergency pre-fire plans to include training programs in first aid, the use of fire equipment, and methods of evacuation.

***Consumer Products –*** In meeting lower VOC limits, there is a slight potential that products may become more flammable if reformulation increases the use of highly flammable exempt VOC solvents such as acetone and methyl acetate. This could be of concern in the manufacture, storage, shipping and end use of the reformulated products. In many instances, however, manufacturers can use other, less flammable, exempt solvents and/or water borne formulations.
(Potentially Significant)

***Marina Vapor Recovery*** – Unlike vehicle service station fueling, gasoline vapors recovered during marina fueling operations are not easily transferred back to the marina gasoline storage tank. At vehicle service stations, the storage tank is in close proximity to the dispenser, while at marinas, the storage tank may be several hundred feet away at a higher elevation.

The marina vapor recovery measure may involve collection of vapors at the dispenser into a carbon canister system. These systems have been used in refinery operations to collect organic vapors. As with all gasoline vapor recovery systems, there is a potential to form an explosive gas mixture when the vapors mix with air. This is an especially critical concern with boats since the boat hull can collect leaking heavy gasoline vapors. The State Fire Marshall reviews all vapor recovery equipment designs and procedures to assure that they will not cause any undue risk. The U.S. Coast Guard would probably also have to approve the system. A more detailed analysis will be provided when regulations implementing this measure are proposed for adoption.
(Potentially Significant)

***Selective Catalytic Reduction (SCR) –*** Selective catalytic reduction may be used on large diesel engines to reduce NOx in the exhaust. Ammonia or urea is used to react with the NOx, in the presence of a catalyst, to form nitrogen gas and water. In some SCR installations, anhydrous ammonia is used. There are known safety hazards related to the storage and handling of this volatile and poisonous liquid. These hazards must be addressed in the initial system design and periodically in hazard assessments.
(Potentially Significant)

***Fuel Additives –*** Before proposing rules requiring fuel additives, staff will evaluate the chemicals in the additives for their toxic effects. Since additives are federally regulated, they will undergo a health effects evaluation prior to approval.
(Not Significant)

***Cargo Tank Vapor Recovery*** – Cargo tank vapor recovery measures in the Proposed Strategy will prevent the escape of gasoline vapors contained in cargo tanks and delivery hoses. Gasoline vapors can be explosive or flammable if not handled properly. Thus, vapor recovery systems must be designed to eliminate the risk of explosion or fire. The State Fire Marshal reviews all vapor recovery equipment designs and procedures to assure that they will not cause any undue risk.
(Not Significant)

***Diesel Particulate Filters –*** A number of measures in the Proposed Strategy would require the use of diesel particulate filters. Some safety concerns include reduced visibility from the driver's seat due to new equipment mounted near eye level, particularly on off-road equipment such as bulldozers, backhoes, and tractors. ARB staff believes that proper engineering design can mitigate or eliminate these potential problems.
(Not Significant)

Another property of diesel particulate filters is that they must be regenerated by burning off excess hydrocarbons trapped on the filter. Active regeneration methods use external fuel or energy to heat the filter and regenerate it. Some small potential exists for a runaway regeneration that could pose a fire hazard. Proper engineering design should mitigate or eliminate these potential risks. Diesel particulate filter measures will be written to assure that the design is proven effective.
(Not Significant)

***Alternative Fuels: Compressed Natural Gas (CNG)*** – Proposed Strategy incentive programs and in-use strategies may require or promote the use of alternative fuels, particularly compressed natural gas (CNG). This presents a potential safety issue due to the increased use and handling of gaseous fuels. While CNG is flammable, it has been demonstrated in recent years that the fire risks from CNG use are known, manageable, and reasonable. CNG is an increasingly common fuel which is developing a proven safety record.
(Not Significant)

**e. Solid / Hazardous Waste**

**Cumulative Impact**: The cumulative impact of all strategies in the Proposed Strategy would be to create a small but potentially significant increase of both solid and hazardous wastes. To mitigate these impacts, ARB will work with the California Department of Toxic Substances Control (DTSC) and the California Integrated Waste Management Board (CIWMB) to reduce waste production in these and other areas.

Several Proposed Strategy measures may produce small amounts of solid or hazardous wastes. The strategies with potential impacts are: controls for diesel-fueled engines and vehicles, use of particulate filters, a pilot program to replace emission controls on older light duty vehicles, electrification of forklifts and other equipment, and gasoline vapor recovery for marinas. The potential impacts of these and other measures on solid or hazardous waste are described below.

### *i. Solid Waste*

Solid waste consists of residential wastes (trash and garbage produced by households), construction wastes, commercial and industrial wastes, home appliances and abandoned vehicles, and sludge residues (waste remaining at the end of the sewage treatment process). CCR title 14, Division 7, provides the State standards for the management of facilities that handle and/or dispose of solid waste. CCR title 14, Division 7, is administered by the CIWMB and the designated Local Enforcement Agency (LEA). The designated LEA for each county is the County Department of Environmental Health.

CCR title 14, Division 7, establishes general standards to provide required levels of performance for facilities that handle and/or dispose of solid waste. Other title 14 requirements include operational plans, closure plans, and post-closure monitoring and maintenance plans. Title 14 covers various solid waste facilities including but not limited to landfills, material recovery facilities (MRFs), transfer stations, and composting facilities.

### *ii. Hazardous Waste*

Hazardous materials are substances with certain physical properties that could pose a substantial present or future hazard to human health or the environment when improperly handled, disposed, or otherwise managed. As defined in CCR title 22, Division 4.5, Chapter 11, Article 3, hazardous materials are grouped into the following four categories based on their properties: toxic (causes human health effects), ignitable (has the ability to burn), corrosive (causes severe burns or damage to materials) and reactive (causes explosions or generates toxic gases). A hazardous waste is any hazardous material that is discarded, abandoned, or to be recycled. The criteria that render a material hazardous also make a waste hazardous (Health and Safety Code, § 25151). If improperly handled, hazardous materials and wastes can result in public health hazards if released to the soil or groundwater or through airborne releases in vapors, fumes, or dust.

Under the Resource Conservation and Recovery Act (RCRA), U.S. EPA regulates the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA was amended in 1984 by the Hazardous and Solid Waste Act (HSWA), which affirmed and extended the concept of regulating hazardous wastes from generation through disposal. HSWA specifically prohibits the use of certain techniques for the disposal of some types of hazardous wastes. Under RCRA, individual states

may implement their own hazardous waste programs in lieu of RCRA as long as the state program is at least as stringent as the federal RCRA requirements. U.S. EPA approved California's program to implement federal regulations as of August 1, 1992.

DTSC administers the Hazardous Waste Control Law (HWCL). Under HWCL, DTSC has adopted extensive regulations governing the generation, transportation, and disposal of hazardous wastes. HWCL differs little from RCRA; both laws impose "cradle to grave" regulatory systems for handling hazardous wastes in a manner that protects human health and the environment. Regulations implementing HWCL are generally more stringent than regulations implementing RCRA. HWCL regulations list over 780 hazardous chemicals, as well as nearly 30 more common materials that may be hazardous, and establish criteria for identifying, packaging, and labeling hazardous wastes. They prescribe management practices for hazardous wastes; establish permit requirements for hazardous waste treatment, storage, disposal, and transportation; and identify hazardous wastes that cannot be disposed of in landfills.

Under both RCRA and HWCL, hazardous waste manifests must be retained by the generator for a minimum of three years. Hazardous waste manifests list a description of the waste, its intended destination, and regulatory information about the waste. A copy of each manifest must be filed with DTSC. The generator must match copies of hazardous waste manifests with certification notices from the treatment, disposal, or recycling facility. Hazardous waste as defined in the Code of Federal Regulations title 40 (40 CFR) 261.20 and CCR title 22, Article 9 (including listed substances, 40 CFR 261.30) is disposed of in Class I landfills. California has enacted strict legislation for regulating Class I landfills (Health and Safety Code, §§25209 - 25209.7). For example, the treatment zone of a Class I landfill must not extend more than five feet below the initial surface and the base of the zone must be a minimum of five feet above the highest anticipated elevation of underlying groundwater (Health and Safety Code, §25209.1(h)). The Health and Safety Code also requires Class I landfills to be equipped with liners, a leachate collection and removal system, and a groundwater monitoring system (Health and Safety Code, §25209.2(a)). Such systems must meet the requirements of DTSC and the SWRCB (Health and Safety Code, §25209.5).

Hazardous waste can also be transported to permitted facilities outside of California. The nearest out-of-state landfills are U.S. Ecology, Inc., located in Beatty, Nevada; USPCI, Inc., in Murray, Utah; and Envirosafe Services of Idaho, Inc., in Mountain Home, Idaho. Incineration is provided at the following out-of-state facilities: Aptus, in Aragonite, Utah and Coffeyville, Kansas; Rollins Environmental Services, Inc., in Deer Park, Texas and Baton Rouge, Louisiana; Chemical Waste Management, Inc., in Port Arthur, Texas; and Waste Research & Reclamation Co. in Eau Claire, Wisconsin (SCAQMD, 1996).

***Diesel-Fueled Engines and Vehicles –*** The recommended measures to reduce emissions from diesel-fueled engines and vehicles could require the use of new diesel engines or add-on control devices such as particulate filters and catalysts. Potential

adverse impacts include increased scrapping of diesel engines and vehicles, and impacts due to handling and disposal of collected particulate matter. The impact of accelerated vehicle scrapping can be largely mitigated by recycling.
(Potentially Significant)

***Diesel Particulate Filters*** – A number of measures in the Proposed Strategy would require use of diesel particulate filters. Diesel particulate filters will probably produce a small amount of waste ash for disposal. This waste is estimated at about 10 to 150 grams of ash per vehicle per year and is projected to be considered a hazardous material due to zinc content. While most larger maintenance facilities can be expected to handle, collect, and dispose of the material properly, as a hazardous waste, it is less certain how smaller facilities will handle waste ash. The filters themselves will eventually also be retired. Some filters contain a precious metal catalyst that is valuable for recycling and reclaiming. Other spent filters may not be worth recycling and may be disposed of at a proper landfill. We do not expect that the spent filters themselves will be considered a hazardous material.
(Potentially Significant)

***Motor Vehicles – Replacement of Old Emission Control Parts*** – Several strategies will evaluate the benefits of replacing key emission control parts with new parts on older vehicles which exceed their original certification standards. Parts to be replaced include catalysts, carbon canisters, fuel lines and oxygen sensors. Catalysts normally contain precious metals and are recycled. The other replaced components would probably be disposed of in landfills.
(Potentially Significant)

***Electrification –*** Electrification of forklifts and other equipment can provide significant reductions of air pollutant emissions. However, electrification strategies may result in the production and use of a significant number of batteries. These batteries are normally recycled and the recycle rate for lead-acid batteries is currently over 95%. However, the increase in the number of spent batteries to be processed would potentially have significant impacts on the recycling industry and on the disposal system for non-recyclable materials. Leasing, deposit, or rebate programs for electric batteries could be required to increase recycling. A spent battery exchange for battery replacement could also reduce waste impacts. With these mitigation measures in place, battery disposal impacts should not be significant.
(Not Significant)

***Forklift Scrapping –*** The recommended measure to reduce emissions from forklifts could require the replacement of older forklifts with new electrical equipment. Potential adverse impacts include increased scrapping of forklifts and engines. The impact of accelerated vehicle scrapping can be largely mitigated by recycling.
(Not Significant)

***Marina Vapor Recovery –*** A marina vapor recovery measure may involve collection of vapors at the dispenser into a carbon collection device (carbon bed). As

marinas have fairly low gasoline throughputs, vapors may be collected over a period of several days before the carbon is recycled. At this time, ARB believes that the carbon would be recycled rather than discarded as waste. A more detailed analysis will be provided when regulations implementing this program are proposed for adoption. (Potentially Significant)

***Small Off-Road Engines*** – Lower emission standards for new non-handheld lawn and garden equipment may require emission control parts, such as catalysts, that may ultimately be discarded into landfills. Recycling of catalysts could mitigate much of the impact.
(Not Significant)

### f. Noise

**Cumulative Impact**: The cumulative effect of the Proposed Strategy will not have a potentially significant impact on noise. Some air pollution strategies described in the Proposed Strategy, such as measures that promote the electrification of vehicles and forklifts, may reduce noise.

***Mobile, Stationary, and Portable Diesel-Fueled Engines –*** The recommended measures to reduce emissions from diesel-fueled engines could require the use of add-on control devices such as particulate filters and catalysts and engine modifications. This could result in a potential increase in noise levels due to exhaust system changes to accommodate add-on controls. However, testing of current add-on controls has shown no increase in noise and ARB staff does not expect future adverse noise impacts (Not Significant).

### g. Transportation and Traffic

No element of the Proposed Strategy is expected to have negative impacts on transportation or traffic. Although many control measures in the Proposed Strategy call for emission reductions from motor vehicles, these control measures rely on technological changes, which will not impact transportation or traffic.

### h. Aesthetics

No element of the Proposed Strategy is expected to degrade the natural beauty of California. Instead, the Proposed Strategy will have significant positive impacts on aesthetics. Regional haze will be reduced by Proposed Strategy elements that reduce hydrocarbon, nitrogen oxide, and particulate matter emissions. Acid rain (which damages trees, lakes, historic buildings and rock formations, etc.) will be reduced by measures that reduce NOx emissions.

### i. Agricultural Resources

The Proposed Strategy is not expected to cause any adverse impacts on the agricultural resources of California. Ozone pollution causes significant crop yield loss in California. The Proposed Strategy will help reduce ozone levels and consequently reduce crop loss resulting from ozone damage.

### j. Biological Resources

The Proposed Strategy is not expected to cause any adverse impacts on the biological resources of California. We believe that the proposed measures will improve air quality and consequently, will improve the habitat of our biological resources.

### k. Cultural Resources

The Proposed Strategy is not expected to cause any adverse impacts on the cultural resources of California. We believe that the proposed measures will reduce ozone and acidic compounds in the air. Ozone, which causes oxidation, and airborne acids are both known to cause deterioration of archaeological, paleontological, and geological features.

### l. Geology and Soils

The Proposed Strategy is not expected to cause any adverse impacts on geology or soils.

### m. Land Use and Planning

The Proposed Strategy is not expected to cause any adverse impacts on land use and planning.

### n. Mineral Resources

The Proposed Strategy is not expected to cause any adverse impacts on mineral resources.

### o. Population and Housing

The Proposed Strategy is not expected to cause any adverse impacts on population and housing.

### p. Public Services

The Proposed Strategy is not expected to cause any adverse impacts on public services.

### q. Recreation

The Proposed Strategy is not expected to cause any adverse impacts on recreation. By reducing the number of days with unhealthy air quality, ARB expects that our parks and outdoor recreational facilities could see increased usage by children, the elderly, asthmatics, and others with sensitive airways or chronic breathing problems.

## 4. Cumulative Impacts of State Measures and Local District Measures

For each environmental impact area, the cumulative environmental impacts of the State Strategy are discussed above. This section addresses the cumulative environmental impacts of the State Strategy combined with the impacts of the plans of the local air districts. To address these combined impacts, the cumulative impacts discussion contained in the South Coast Air Quality Management District's Draft Environmental Impact Report (EIR) for the 2003 Air Quality Management Plan (SCAQMD Plan), released in April 2003, is hereby incorporated by reference.

Because of the serious air quality problem in the South Coast Air Basin, the SCAQMD has defined the greatest present need for new emission reductions, and the SCAQMD Plan has outlined the most comprehensive set of measures to achieve these reductions. The measures set forth in the SCAQMD Plan therefore constitute a "worst case" scenario for cumulative impacts. While it is possible that future SIP revisions for other districts may contain measures that are not discussed in the SCAQMD Plan, at this time we do not know what such hypothetical future measures may be and it would be speculative to attempt to evaluate them. For the purposes of this analysis, therefore, the most reasonable approach is to utilize the SCAQMD Plan as a "worst case" scenario.

ARB staff has reviewed and considered the cumulative impacts analysis contained in the SCAQMD EIR and concurs with its approach and conclusions. This analysis considers the cumulative impacts of the measures contained in the State Strategy combined with the measures in the SCAQMD Plan. The SCAQMD analysis can be found in Chapter 4 of the SCAQMD EIR, entitled "Environmental Impacts and Mitigation Measures." To avoid redundancy, it is appropriate to incorporate this analysis by reference rather than repeat it here. The SCAQMD EIR can be found on the SCAQMD internet site at:
http://www.aqmd.gov/ceqa/documents/2003/aqmd/draftEA/AQMP/AQMP_DEIR.html.

## 5. Impacts of the Individual Defined Measures

The State and federal measures in the Proposed Strategy will help make progress toward our goal of healthy air for all Californians. Each of the defined State measures was evaluated to identify adverse environmental impacts. The following table lists each of the measures, any potentially significant environmental impacts, and possible mitigation methods.

**Table V-A-1: Potential Adverse Environmental Impacts of the Proposed 2003 State and Federal Strategy for the California SIP**

| Number | Description | Potential Adverse Environmental Impacts | Potential Mitigation Measures |
|---|---|---|---|
| ***MOBILE SOURCES*** | | | |
| | ***Light and Medium-Duty Vehicles*** | | |
| LT/MED-DUTY-1 | **Replace or Upgrade Emission Control Systems on Existing Passenger Vehicles -- Pilot Program.** | Waste: Some increased disposal of faulty emission control parts. | Recycle parts and/or catalyst when feasible. |
| LT/MED-DUTY-2 | **Improve Smog Check to Reduce Emissions from Existing Passenger and Cargo Vehicles.** | Waste: Some increased disposal of faulty emission control parts. | Recycle parts and/or catalyst when feasible. |
| | ***On-Road Heavy-Duty Diesel Engines and Vehicles*** | | |
| ON-RD HVY-DUTY-1 | **Augment Truck and Bus Highway Inspections with Community-Based Inspections.** | None Identified | None Required |
| ON-RD HVY-DUTY-2 | **Capture and Control Vapors from Gasoline Cargo Tankers.** | None Identified | None Required |

**Table V-A-1: Potential Adverse Environmental Impacts of the Proposed 2003 State and Federal Strategy for the California SIP**

| Number | Description | Potential Adverse Environmental Impacts | Potential Mitigation Measures |
|---|---|---|---|
| ON-RD HVY-DUTY-3 | **Pursue Approaches to Clean Up the Existing and New Truck/Bus Fleet – PM In-Use Emission Control, Engine Software Upgrade, On-Board Diagnostics, Manufacturers' In-Use Compliance.** | Air: Potential for passive particulate filters to emit higher levels of NO2 affecting ozone, NO2, nitric acid, and secondary particulate. | Limits on NO to NO2 conversion rates. |
| | | Energy: Potential fuel efficiency loss due to controls. | Design system to reduce back pressure and require back pressure monitoring. |
| | | Waste: Filter ash and spent filter may be a hazardous waste. | Promote safe handling, collection, and recycling. |
| | | Waste: Potential increase in engine and vehicle scrapping. | Promote recycling of engines and vehicles. |
| | | Waste: Some increased disposal of faulty emission control parts. | Recycle parts and/or catalysts when feasible. |
| | | Hazards/Human Health: Potential fuel additives could be hazardous. | Additives must be proven safe. |
| | | Water: Emulsified diesel may disperse into surface water easily. | Require spill prevention plan. |

**Table V-A-1: Potential Adverse Environmental Impacts of the Proposed 2003 State and Federal Strategy for the California SIP**

| Number | Description | Potential Adverse Environmental Impacts | Potential Mitigation Measures |
|---|---|---|---|
| | ***Off-Road Compression-Ignition Engines*** | | |
| OFF-RD CI-1 | **Pursue Approaches to Clean Up the Existing Off-Road Equipment Fleet (Compression-Ignition Engines) -- Retrofit Controls.** | Air: Potential for passive particulate filters to emit higher levels of NO2 affecting ozone, NO2, nitric acid, and secondary particulate.<br>Energy: Potential fuel efficiency loss due to controls.<br>Waste: Filter ash and spent filter may be a hazardous waste.<br>Hazards/Human Health: Potential fuel additives could be hazardous.<br>Water: Emulsified diesel may disperse into surface water easily. | Limits on NO to NO2 conversion rates.<br>Design system to reduce back pressure and require back pressure monitoring.<br>Promote safe handling, collection, and recycling.<br>Additives must be proven safe.<br>Require spill prevention plan. |
| OFF-RD CI-2 | **Implement Registration and Inspection Program for Existing Off-Road Equipment to Detect Excess Emissions [Compression-Ignition Engines].** | Waste: Some increased disposal of faulty emission control parts. | Recycle parts and/or catalyst when feasible. |
| | ***Off-Road Large Spark-Ignition Engines*** | | |
| OFF-RD LSI-1 | **Set Lower Emission Standards for New Off-Road Gas Engines [Spark-Ignition Engines 25 hp and Greater].** | None Identified | None Required |

**Table V-A-1: Potential Adverse Environmental Impacts of the Proposed 2003 State and Federal Strategy for the California SIP**

| Number | Description | Potential Adverse Environmental Impacts | Potential Mitigation Measures |
|---|---|---|---|
| OFF-RD LSI-2[1] | **Clean Up Existing Off-Road Gas Equipment Through Retrofit Controls [Spark-Ignition Engines 25 hp and Greater].** | Waste: Some increased disposal of faulty emission control parts.<br>Air: Potential decrease in fuel economy could increase carbon dioxide emissions.<br>Energy: Potential decrease in fuel economy. | Recycle parts and/or catalyst when feasible.<br>Design retrofit controls to minimize impact on fuel economy.<br><br>Design systems to minimize adverse impacts on fuel economy. |
| OFF-RD LSI-3[1] | **Require Zero Emission Forklifts Where Feasible -- Lift Capacity ≤8,000lbs.** | Air: Potential increase in purchases of larger and/or diesel forklifts to avoid electric could increase emissions.<br>Air: Increase in emissions from electrical power plants.<br>Air: Potential for older and dirtier forklifts to be kept longer.<br><br>Energy: Increase in demand for electrical power.<br>Waste: Potential increase in forklift scrapping.<br>Waste: Potential increase in battery waste. | Regulation will be written to consider and minimize unintended emission increases.<br>Air district permitting programs to limit emissions increases.<br>Regulation will be written to consider and minimize unintended emission increases.<br>Charge batteries at night.<br>Use solar panels or fuel cells.<br>Promote recycling of engines and vehicles.<br>Promote battery recycling. |

[1]OFF-RD LSI-2 and OFF-RD LSI-3 from the May draft have been consolidated into a new measure named OFF-RD LSI-2: Clean Up Off-Road Gas Equipment Fleet Through Retrofit Controls and New Emission Standards (Spark-Ignition Engines 25 hp and Greater). Please refer to Section II for more information.

**Table V-A-1: Potential Adverse Environmental Impacts of the Proposed 2003 State and Federal Strategy for the California SIP**

| Number | Description | Potential Adverse Environmental Impacts | Potential Mitigation Measures |
|---|---|---|---|
| | ***Small Off-Road Engines*** | | |
| SMALL OFF-RD-1 | **Set Lower Emission Standards for New Handheld Small Engines and Equipment -- Like Weed Trimmers, Leaf Blowers, and Chain Saws [Spark-Ignition Engines Under 25 hp].** | None Identified | None Required |
| SMALL OFF-RD-2 | **Set Lower Emission Standards for New Non-Handheld Small Engines and Equipment -- Like Lawnmowers [Spark-Ignition Engines Under 25 hp].** | Waste: Potential for catalyst systems to be sent to landfill. | Promote recycling of catalysts. |

## Table V-A-1: Potential Adverse Environmental Impacts of the Proposed 2003 State and Federal Strategy for the California SIP

| Number | Description | Potential Adverse Environmental Impacts | Potential Mitigation Measures |
|---|---|---|---|
| | ***Commercial Marine Vessels and Ports*** | | |
| MARINE-1 | **Pursue Approaches to Clean Up the Existing Harbor Craft Fleet -- Cleaner Engines and Fuels.** | Air: Potential for passive particulate filters to emit higher levels of NO2 affecting ozone, NO2, nitric acid, and secondary particulate. | Ensure systems are properly designed to minimize conversion of NO to NO2. Establish cap on NO2 emissions. |
| | | Air: Potential for ammonia emissions from NOx controls. | Monitor and control ammonia. |
| | | Air: Potential decrease in fuel economy (add on control devices, alternative fuels) could increase carbon dioxide emissions. | Promote increases in fuel efficiency. |
| | | Air: Expanded use of alternative fuels could increase emissions at refineries. | Air district permitting programs to limit emissions increases. |
| | | Energy: Potential fuel efficiency loss due to controls. | Design to reduce back pressure and require back pressure monitoring. |
| | | Waste: Filter ash and spent filter may be a hazardous waste. | Promote safe handling, collection, and recycling. |
| | | Waste: Potential increase in engine scrapping. | Promote recycling of engines. |
| | | Hazards/Human Health: Potential fuel additives could be hazardous. | Additives must be proven safe. |
| | | Water: Emulsified diesel fuel or additives may disperse into surface water easily. | Require spill prevention plan and safe storage practices. |
| | | Hazards/Human Health: Potential for ammonia storage hazards. | Require proper facility design with hazard assessment. |

**Table V-A-1: Potential Adverse Environmental Impacts of the Proposed 2003 State and Federal Strategy for the California SIP**

| Number | Description | Potential Adverse Environmental Impacts | Potential Mitigation Measures |
|---|---|---|---|
| MARINE-2 | **Pursue Approaches to Reduce Land-Based Port Emissions – Alternative Fuels, Cleaner Engines, Retrofit Controls, Electrification, Idling Restrictions.** | Air: Potential for passive particulate filters to emit higher levels of NO2 affecting ozone, NO2, nitric acid, and secondary particulate. | Ensure systems are properly designed to minimize conversion of NO to NO2. Establish cap on NO2 emissions. |
| | | Air: Potential decrease in fuel economy (add on control devices, alternative fuels) may increase emissions of carbon dioxide. | Promote increases in fuel efficiency. |
| | | Air: Expanded use of alternative fuels could increase emissions at refineries. | Air district permitting programs to limit emissions increases. |
| | | Energy: Potential decrease in fuel economy due to controls. | Design to reduce back pressure and require back pressure monitoring. |
| | | Energy: Potential increase in electricity use due to electrification. | Promote energy conservation. |
| | | Waste: Filter ash and spent filters may be a hazardous waste. | Promote safe handling, collection, and recycling. |
| | | Waste: Potential increase in engine scrapping. | Promote recycling of engines. |
| | | Hazards/Human Health: Potential fuel additives could be hazardous. | Additives must be proven safe. |
| | | Water: Emulsified diesel fuel or additives may disperse into surface water easily. | Require spill prevention plan and safe storage practices. |
| | ***Conventional and Alternative Fuels*** | | |
| FUEL-1 | **Set Additives Standards for Diesel Fuel to Control Engine Deposits.** | Hazards/Human Health: Potential fuel additives could be hazardous. | Additives must be proven safe. |

**Table V-A-1: Potential Adverse Environmental Impacts of the Proposed 2003 State and Federal Strategy for the California SIP**

| Number | Description | Potential Adverse Environmental Impacts | Potential Mitigation Measures |
|---|---|---|---|
| FUEL-2 | **Set Low-Sulfur Standards for Diesel Fuel for Trucks/Buses, Off-Road Equipment, and Stationary Engines.** | Energy: Increase in energy use for refining to remove sulfur.<br>Air: Production of cleaner fuels could increase emissions at refineries. | Promote energy conservation.<br><br>District to require NSR and BACT on all modifications. |
| ***CONSUMER PRODUCTS, VAPOR RECOVERY, AND PESTICIDES*** | | | |
| | ***Consumer Products*** | | |
| CONS-1 | **Set New Consumer Products Limits for 2006.** | Air: Potential use of TACs<br>Water: Potential use of TACs<br>Hazards: Potential flammability<br><br>Other: Potential global warming, ozone depletion | Air, Water, Hazards: Monitor usage and prohibit manufacturers from reformulating using paradichlorobenzene, MeCl and Perc or other TACs.<br>Global Warming: not yet identified<br>Ozone depletion: not yet identified |
| CONS-2 | **Set New Consumer Products Limits for 2008 – 2010.** | Air: Potential use of TACs<br>Water: Potential use of TACs<br>Hazards: Potential flammability<br><br>Other: Potential global warming, ozone depletion | Air, Water, Hazards: Monitor usage and prohibit manufacturers from reformulating using MeCl and Perc or other TACs.<br>Global Warming: not yet identified<br>Ozone depletion: not yet identified |

**Table V-A-1: Potential Adverse Environmental Impacts of the Proposed 2003 State and Federal Strategy for the California SIP**

| Number | Description | Potential Adverse Environmental Impacts | Potential Mitigation Measures |
|---|---|---|---|
| | ***Fueling and Vapor Recovery*** | | |
| FVR-1 | **Increase Recovery of Fuel Vapors from Aboveground Storage Tanks**. | Energy: Increase in electrical use. | Promote energy conservation. |
| FVR-2 | **Recover Fuel Vapors from Gasoline Dispensing at Marinas.** | Waste: generates gasoline vapor collection devices (carbon beds).<br>Energy: Increase in electrical use. | Develop recycling program to regenerate gasoline vapor collection devices.<br>Promote energy conservation. |
| FVR-3 | **Reduce Fuel Permeation Through Gasoline Dispenser Hoses.** | None Identified | None Required |
| | ***Pesticides*** | | |
| PEST-1 | **Implement Existing Pesticide Strategy** | None Identified | None Required |

## 6. Environmental Justice

In December 2001, ARB adopted a set of policies and associated actions that provide the framework for incorporating environmental justice into ARB's programs consistent with the directives of State law. The proposed policies and actions are based on State law, which describes "environmental justice" as "the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies." ARB's environmental justice policies will help ensure that we take into account neighborhood impacts as we prioritize and develop controls and pollution-prevention strategies.

The environmental justice policies touch virtually every ARB program, including motor vehicles, air-quality planning, toxics, research, enforcement, and air monitoring. They apply to all communities in California but recognize that extra efforts may be needed in some communities due to historical land-use patterns, limited participation in public processes in the past, and a greater concentration of air pollution sources in these communities.

The Proposed Strategy incorporates environmental justice policies in order to help prioritize our activities to reduce public exposure to air toxics as well as regional pollutants whose sources are concentrated in some communities. While all of the proposed State measures would result in better air quality for residents throughout California, we are making measures that cut exposure and risk in communities with high air pollution burdens a high priority for development. These include strategies to capture emissions from gas cargo tankers, retrofit trash trucks, restrict idling for trucks and buses, augment the truck inspection program in communities with high truck traffic, clean up port-related sources, and reduce fuel vapors from gasoline storage and refueling.

ARB has placed a high priority on controlling particulate emissions from diesel engines, the dominant source in California of known risk from air toxics. Several measures outlined in the Proposed Strategy have their origin in the Diesel Risk Reduction Plan, which lays out a three pronged approach to reduce emissions and the associated risk from diesel PM: (1) new regulatory standards for all diesel-fueled engines to reduce diesel PM emissions 90 percent from current levels; (2) retrofit of in-use engines; and (3) the use of low sulfur fuel to provide the quality of diesel fuel needed by the advanced diesel PM emission controls.

ARB staff is committed to working with districts, local governments and affected communities to improve statewide compliance for all air pollution sources, whether under ARB or district jurisdiction. ARB staff has already begun to incorporate environmental justice perspectives into our program activities. ARB staff is working with districts to assure that all air pollution complaints are promptly investigated and that feedback is provided to the public on the actions taken in response to those complaints. ARB staff is also working with the local air districts to improve accessibility of

information regarding enforcement activities, including notices of violations, monetary penalties, and other settlement of violations. ARB is also reviewing its own enforcement activities and redirecting efforts where we can achieve a more direct community benefit.

Another matter of concern in communities stems from historic land use patterns and practices that have led to siting of air pollution sources in close proximity to homes and schools. In addition to working to reduce air toxics, ARB staff is developing a handbook intended to provide more information to decision-makers at the local level.

In addition to the specific measures in the Proposed Strategy, ARB staff has identified ideas in the long-term strategy that will move the State toward zero and near-zero technologies. ARB will work with local governments to look for new opportunities to apply these far reaching technologies in communities -- for example, using converted electric or fuel-cell postal-delivery vehicles and public transit buses in affected neighborhoods.

This chapter is unchanged from the Section V, Chapter B. Economic Impact Analysis chapter that was released on June 25, 2003, except for the addition of two footnotes.

## CHAPTER B. ECONOMIC IMPACT ANALYSIS

ARB staff has estimated the statewide costs and economic impacts that could result in 2010 from implementation of the defined State measures in this Proposed Strategy. This analysis includes the costs and economic impacts of all proposed measures identified for sources under State jurisdiction, including mobile sources, fueling infrastructure, and consumer products.

Because the specific sources and approaches to achieve the reductions from the long-term strategy (also known as the black box) are not yet defined, we have no reasonable basis to estimate the potential cost of this element. When specific measures to implement this long-term strategy are identified in a subsequent SIP revision, we will evaluate the corresponding economic impacts.

The proposed SIP measures, when adopted, are likely to cause technological changes that may increase the production costs for regulated industries. Increased costs would have an initial contractionary effect on those industries, which in turn could affect other related industries, either negatively or positively. For example, industries that provide supplies and services to affected industries could experience a reduction in demand for their products and services. On the other hand, suppliers of environmental products and services could experience an increase in their sales. The net effect on the California economy of these activities hinges on the extent to which products and services are obtained locally. Using a dynamic model of the California economy (E-DRAM),[2] we estimated the net effects of these activities on affected industries and the overall economy. Based on this model, the California industries affected most by the planned control measures are those engaged in the production, distribution, sales, and use of on-road and off-road motor vehicle and mobile equipment, fueling infrastructure, and consumer products.

Annual direct costs of all defined State measures would be approximately $770 million statewide and $265 million in the South Coast in 2010. Increased costs that would result from the proposed measures are projected to reduce California's economic output by roughly $1.5 billion (0.06 percent) and California employment by less than 1,300 jobs (0.01 percent) in 2010. Personal income would also be projected to decline by roughly $1.3 billion (0.09 percent), implying that personal income of an average California household would fall by about 26 cents per day. The proposed measures, however, would also bring significant social benefits (including less illness and medical expense, and fewer lost work and school days) to Californians. In its report

[2] For a complete description of E-DRAM, see Peter Berck, "Developing a Methodology for Assessing the Economic Impacts of Large Scale Environmental Regulations", Prepared for California Air Resources Board, November 1999.

to Congress in 1999, the U.S. EPA found that the monetized benefits of the Clean Air Act exceed its compliance costs by a ratio of four to one.[3] Based on this report, ARB staff estimates that each dollar spent on clean air in California generates, on average, three dollars in social benefits that improve the quality of life.

## 1. Cost Of Defined State Measures

Most of the defined State measures rely on the application of current technologies to achieve additional emission reductions. Some measures, however, rely on the anticipated development of new technologies. The implementation of these control measures may change the ways many products are manufactured, distributed, and used. Whether these changes require the reformulation of a consumer product, retrofit of diesel trucks and buses, or clean-up of the existing harbor craft fleet, we assumed that they would impose costs on businesses. This analysis provides estimates of those direct costs.

ARB staff estimated the cost of each defined State measure using the most reliable information currently available. For those measures where data were available, staff developed control costs directly based on the application of current technologies. For most control measures, however, staff estimated control costs indirectly by multiplying the cost-effectiveness estimate by the emission reductions associated with the proposed measure.

The control costs in this report represent rough estimates of the costs of the proposed measures and may change when more specific regulatory language is developed. There is an extensive public process to develop each plan measure into a regulation or program - ARB staff gather detailed industry-specific information and assess the potential costs to business, government, and consumers. The measures will be discussed at public workshops, and proposed regulations will go through the public hearing process as required by law. When specific regulatory language is developed, it will be possible to analyze potential cost and economic impacts in more detail. This information will be presented with each regulatory proposal for Board consideration.

### a. Cost-Effectiveness Estimates

Cost-effectiveness is a measure of the unit cost of reducing a pollutant, and varies by pollutant and control strategy. The estimated cost-effectiveness of past ARB control measures to reduce volatile organic compounds (VOC) from consumer products has ranged from under $0.50 per pound ($1,000 per ton) to about $6 per pound ($12,000 per ton). To reduce NOx+HC from mobile sources, the range varied from less than $0.50 per pound ($1,000 per ton) to about $5.60 per pound ($11,000 per ton). These estimates are generated as part of regulatory development process and have typically turned out to be higher than the actual costs. Figures V-B-1 and V-B-2 show cost-effectiveness estimates for California consumer products and mobile source and

[3] U.S. EPA Report to Congress, “The Benefits and Costs of the Clean Air Act 1990 to 2010”, November 1999.

fuel measures approved by ARB since the late 1980s. Cost-effectiveness numbers are presented in historical dollars and therefore are not adjusted for inflation.

**Figure V-B-1**
**Cost-Effectiveness Values for Selected Consumer Products Regulations**

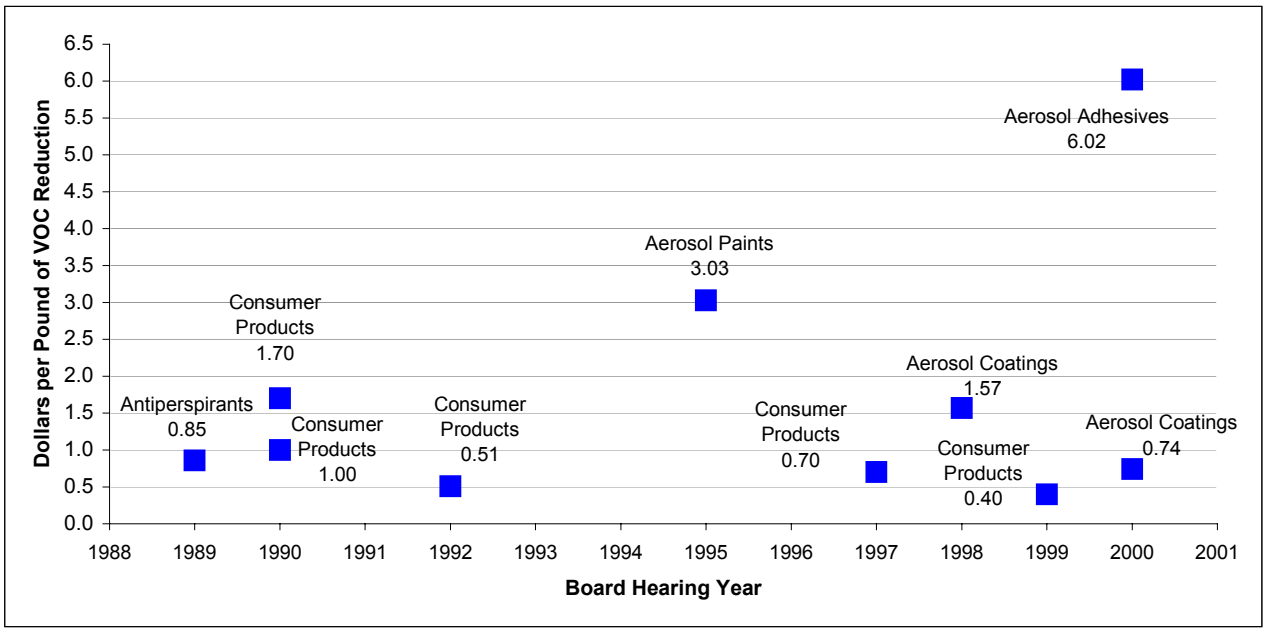
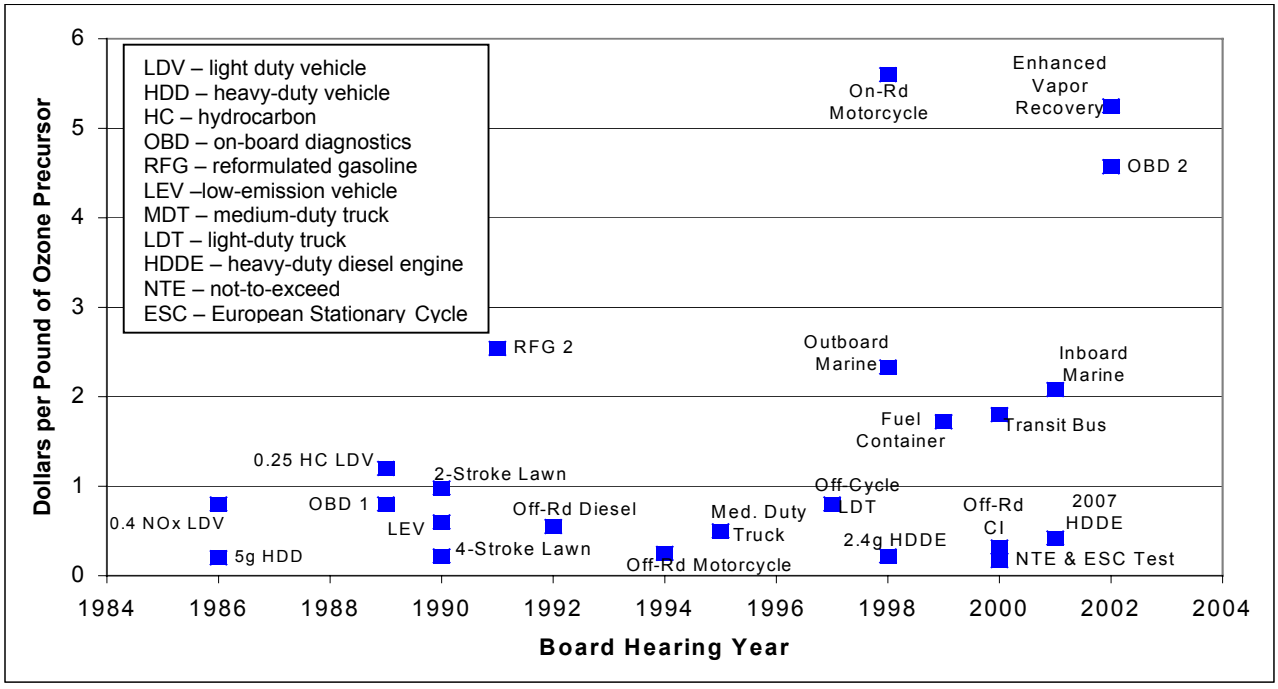



**Figure V-B-2**
**Cost-Effectiveness Values for Selected Mobile Source and Fuel Regulations**



For the purpose of this analysis, ARB staff makes a conservative assumption that future emission reductions will be more expensive to obtain than the past reductions. This is because firms are required to meet more stringent air quality standards or to control unregulated emission sources. In the past, however, businesses have always found innovative ways to meet standards at costs much lower than estimated by staff. We believe that this trend will continue in the future. For example, the South Coast District estimated the cost of NOx reduction from a natural gas-fired power plant to be about $25,000 per ton in 1988 compared to the industry estimate of $45,000 per ton. By 1995, when the rule requirements became effective, the actual cost of NOx control from power plants was about $12,000 per ton. Similarly, staff estimated the cost to control evaporative emissions from vehicles to be about $170 per vehicle in 1990 while the industry estimate was about $783 per vehicle. When the regulation was implemented, it became clear that the actual cost of the regulation was closer to the lower estimate.

The cost-effectiveness estimates used for the proposed State measures averaged about $9,200 (from $1,100 to $22,000) per ton of ROG emissions reduced, and about $8,300 (from $1,100 to $22,000) per ton of NOx emissions reduced. Tables V-B-1 and V-B-2 provide cost-effectiveness rankings of the defined State measures for both ROG and NOx reductions (see Table I-2 for the full name of each measure). All cost-effectiveness numbers are in constant 2002 dollars per ton.

**Table V-B-1**
**Cost-Effectiveness Ranking of the Defined Statewide Measures for ROG Reduction**

| Statewide Measures | Average C/E (2002 $/ton) | Rank | Estimated Statewide ROG Red. (TPD) | Estimated Statewide Cumulative ROG Red. (TPD) |
|---|---|---|---|---|
| SMALL OFF-RD-2 | $1,100 | 1 | 14.9 | 14.9 |
| SMALL OFF-RD-1 | $1,600 | 2 | 4.0 | 18.9 |
| ON-RD HVY-DUTY-3 | $2,200 | 3 | 8.1 | 27.0 |
| OFF-RD LSI-2** | $3,000 | 5 | 2.8 | 30.4 |
| ON-RD HVY-DUTY-1 | $3,000 | 6 | 0.3 | 30.7 |
| LT/MED-DUTY-2 | $3,200 | 7 | 16.1 | 46.8 |
| ON-RD HVY-DUTY-2 | $4,000 | 8 | 13.8 | 60.6 |
| FVR-3 | $4,000 | 9 | 1.1 | 61.7 |
| FVR-1 | $4,000 | 10 | 0.3 | 62.0 |
| CONS-2 | $4,480 | 11 | 28.1 | 90.1 |
| CONS-1 | $4,480 | 12 | 5.4 | 95.5 |
| OFF-RD LSI-3** | $7,500 | 13 | 1.3 | 96.8 |
| FVR-2 | $8,000 | 14 | 0.3 | 97.1 |
| MARINE-2 | $11,000 | 15 | 0.3 | 97.4 |
| OFF-RD CI-1* | $21,000 | 16 | 18.4 | 115.8 |
| LT/MED-DUTY-1 | $22,000 | 17 | 27.0 | 142.8 |

* The primary purpose of this measure is to reduce toxic diesel particulate; the ROG control is a secondary benefit.

** OFF-RD LSI-2 and OFF-RD LSI-3 from the May draft have been consolidated into a new measure named OFF-RD LSI-2: Clean Up Off-Road Gas Equipment Fleet Through Retrofit Controls and New Emission Standards (Spark-Ignition Engines 25 hp and Greater). Please refer to Section II for more information.

**Table V-B-2**
**Cost-Effectiveness Ranking of the Defined Statewide Measures for NOx Reduction**

| Statewide Measures | Average C/E (2002 $/ton) | Rank | Estimated Statewide NOx Red. (TPD) | Estimated Statewide Cumulative $NO_x$ Red. (TPD) |
|---|---|---|---|---|
| SMALL OFF-RD-2 | $1,100 | 1 | 2.4 | 2.4 |
| SMALL OFF-RD-1 | $1,600 | 2 | 0.4 | 2.8 |
| OFF-RD LSI-1 | $2,100 | 3 | 1.9 | 4.7 |
| ON-RD HVY-DUTY-3 | $2,200 | 4 | 21.9 | 26.6 |
| OFF-RD LSI-2* | $3,000 | 6 | 5.8 | 40.5 |
| LT/MED-DUTY-2 | $3,200 | 7 | 24.3 | 64.8 |
| OFF-RD LSI-3* | $7,500 | 8 | 4.9 | 69.7 |
| MARINE-2 | $11,000 | 9 | 0.3 | 70.0 |
| LT/MED-DUTY-1 | $22,000 | 10 | 26.9 | 96.9 |

*OFF-RD LSI-2 and OFF-RD LSI-3 from the May draft have been consolidated into a new measure named OFF-RD LSI-2: Clean Up Off-Road Gas Equipment Fleet Through Retrofit Controls and New Emission Standards (Spark-Ignition Engines 25 hp and Greater). Please refer to Section II for more information.

### b. Annual Costs

Annual direct costs of all near-term control measures are estimated to be approximately $770 million statewide and $265 million in the South Coast in 2010. Annual statewide costs represent about 0.03 percent of the California Gross State Product (GSP) in 2010. GSP measures the total economic activity in California.

ARB also recognizes that the defined State and local control measures are not sufficient to meet ozone attainment goals in the South Coast by 2010. ARB staff has proposed to lead a multi-agency (State, local, and federal) effort and public process beginning in 2004 to identify and adopt long-term strategies. Because of great uncertainty associated with the sources and approaches for potential long-term control strategies, this analysis does not include the costs of such control strategies. When those strategies are identified in a subsequent SIP revision by 2007, we will evaluate the corresponding economic impacts. This process will consider long-term strategies needed for ozone attainment in the San Joaquin Valley as well.

Table V-B-3 provides estimates of total annual costs of the proposed control measures by source categories for the State and South Coast in 2010. Stationary and

area sources account for about 7 percent of annual plan costs statewide. About 95 percent of the costs associated with stationary and area sources are due to new VOC limits for consumer products. All costs are stated in constant 2002 dollars.

Mobile source control measures account for 93 percent of annual control costs, of which about 68 percent stems from on-road mobile sources control measures. The control measure to replace or upgrade emission control systems on existing passenger vehicles accounts for the bulk of the cost increase.

**Table V-B-3**
**Statewide Estimates of Total Annual Costs of the Defined State Measures for 2010**
**(Millions of 2002 Dollars)**

| | South Coast Cost | Statewide Cost | % of Total |
|---|---|---|---|
| **Stationary and Area Sources:** | | | |
| Consumer Products | $23 | $55 | 7 |
| Fueling and Vapor Recovery | $ 1 | $ 3 | 0 |
| **Total for Stationary and Area Sources** | **$24** | **$58** | **7** |
| | | | |
| **Mobile Sources:** | | | |
| ***On-Road:*** | | | |
| Light- and Medium-Duty Vehicles | $165 | $480 | 62 |
| Heavy-Duty Vehicles | $ 16 | $ 44 | 6 |
| ***Subtotal for On-Road*** | ***$181*** | ***$524*** | ***68*** |
| ***Off-Road:*** | | | |
| Off-Road Compression Ignition Engines | $39 | $141 | 18 |
| Off-Road Large Spark-Ignited Engines | $11 | $ 28 | 4 |
| Small Engines | $ 5 | $ 9 | 1 |
| Marine Vessels and Ports | $ 4 | $ 12 | 2 |
| ***Subtotal for Off-Road*** | ***$59*** | ***$190*** | ***25*** |
| | | | |
| **Total for Mobile Sources** | **$240** | **$714** | **93** |
| | | | |
| **Total** | **$264** | **$772** | **100** |

In order to estimate the total impact of the statewide costs on the California economy, we reclassified these costs according to the E-DRAM's industrial sector classifications. The model has 30 industrial sectors.[4] Of these 30 sectors, five would be affected directly by the defined control measures. Table V-B-4 provides estimates of total annual costs by affected industries. About 70 percent of total annual costs would be borne by the motor vehicle industry. All off-road control measures, except Marine

[4] For complete definitions of industrial sectors in the E-DRAM model, see Peter Berck, E. Golan and B. Smith, "Dynamic Revenue Analysis for California", California Department of Finance, Summer 1996, pp. 16-25, and Peter Berck, "Developing a Methodology for Assessing the Economic Impacts of Large Scale Environmental Regulations", Prepared for California Air Resources Board, February 2000, p. 7.

Vessels and Ports, are reclassified under gasoline and diesel power engines industry in the E-DRAM model. This industry would account for 23 percent of the statewide SIP total annual costs.

**Table V-B-4**
**Statewide Estimates of Total Annual Costs of the Defined State Measures by Affected Industries for 2010**
**(Millions of 2002 Dollars)**

| Affected Industrial Sectors in E-DRAM | South Coast Annual Costs | Statewide Annual Costs | %Total |
|---|---|---|---|
| *Consumer Chemicals* | $ 23 | $ 55 | 7 |
| *Gasoline- and Diesel- Powered Engines* | $ 55 | $178 | 23 |
| *Motor Vehicles* | $181 | $524 | 69 |
| *Transportation* | $ 4 | $ 12 | 1 |
| *Other Services* | $ 1 | $ 3 | 0 |
| **Total** | **$264** | **$772** | **100** |

## 2. Economic Impacts

Control costs provide a means to estimate the direct expenditures that will be incurred by California businesses, governments, and individuals to meet the requirements of the proposed control measures. These costs would, in turn, bring about additional (indirect) changes in the California economy that may increase the overall costs of the defined measures to the economy. Increased control costs, for example, may result in higher product prices. California firms may respond by cutting back production and decreasing employment. On the other hand, the proposed measures may also increase demand for environmental products and services, thus inducing firms supplying those products and services to expand their production and increase their hiring of workers.

This change in costs will in turn affect other industries both negatively and positively. The net effect on the California economy of these activities hinges on the extent to which products and services are obtained locally. Using a macroeconomic model, staff estimated the net effects of these activities on affected industries and the overall economy. The California industries and individuals affected most by the proposed control measures are those engaged in the production, distribution, sales, and use of on-road and off-road motor vehicles and mobile equipment, fueling infrastructure, and consumer products.

The economic model, however, does not account for the enormous benefits to California businesses and citizens that air quality regulations will bring. We believe that actions to improve air quality reduce premature death from cardiopulmonary causes, hospitalizations from acute respiratory disease, aggravation of asthma, lost work days, as well as school absences, and increase natural resources and work force productivity. Control programs also induce significant advancement of clean technologies. Based on the U.S. EPA report to Congress, ARB staff estimated that the benefits to California of currently adopted air pollution control measures exceed their costs by a ratio of about 3

to 1. That is, each dollar spent on clean air generates on average three dollars in social benefits that improve the quality of life.

### a. Environmental-Dynamic Revenue Analysis Model (E-DRAM)

The overall impact of all direct and indirect economic effects associated with the proposed control measures are estimated using a computable general equilibrium (CGE) model of the California economy. A CGE model simulates various economic relationships in a market economy where prices and production adjust in response to changes caused by regulations to establish the equilibrium in markets for all goods and services and factor of production (i.e., labor and capital). The CGE model used for this analysis is a modified version of the California Department of Finance's Dynamic Revenue Analysis Model (DRAM).[5] The new modified model is called Environmental-DRAM (E-DRAM).[6] E-DRAM describes the relationships among California producers, California consumers, government, and the rest of the world. Changes to the model enable it to assess the economic impacts of large-scale environmental regulations. The economic impact results are estimated in terms of changes in the State output, personal income, and employment.

As stated above, E-DRAM is a CGE model that describes the relationship among California producers, California consumers, government, and the rest of the world. The model consists of over 1,000 equations designed to capture the interactions between 30 California sectors, 2 factor sectors (labor and capital), 7 household sectors (classified by income level), 1 investment sector, and 36 government sectors (8 federal, 21 State, and 8 local), and the rest of the world.

Data for the industrial sectors originated with the Bureau of Economic Analysis of the U.S. Department of Commerce, based on the Census of Business – a detailed survey of companies conducted in the U.S. every five years. The conversion of national data to updated California data is accomplished by Impact Analysis for Planning (IMPLAN), a program that primarily utilizes state-level employment data to scale national-level industrial data down to the size of a state.

In much the same way as firms, households are also aggregated. California households were divided into categories based upon their taxable income. There are seven such categories in the model, each one corresponding to a California personal income tax marginal tax rate (0, 1, 2, 4, 6, 8, and 9.3 percent). Thus, the income for the “one-percent” household is calculated by adding up the income from all households in the one-percent bracket.

Similarly, the expenditure of the one-percent household on agricultural goods is calculated by adding up all expenditures on agricultural goods for these households.

[5] For a complete description of DRAM, see Peter Berck, E. Golan and B. Smith, "Dynamic Revenue Analysis for California", California Department of Finance, Summer 1996.
[6] Berck, Peter, "Developing a Methodology for Assessing the Economic Impacts of Large Scale Environmental Regulations", Prepared for California Air Resources Board, February 2000.

The total expenditure on agricultural goods is found by adding the expenditure of all households together.

### b. Overall Economic Impact

Increased costs of the defined measures would affect the California economy through many complex interactions. E-DRAM was developed to simulate many of these complex interactions. Using the model, ARB staff in consultation with UC Berkeley researchers conducted an assessment of the economic impacts of the new State measures on the California economy.

Table V-B-5 summarizes the impacts of the defined State measures on the California economy for fiscal year 2010. Since the current E-DRAM model is built to reproduce the economic conditions of fiscal year 1998/99, we first extrapolated the model out to 2010 based on state population, personal income, and industry-specific forecasts.[7] Annual costs of the proposed measures were then adjusted to fiscal year 2010.

The results of the E-DRAM simulation show that the costs of the proposed State measures would reduce California economic output by roughly $1.5 billion (0.06 percent) and California employment by less than 1,300 jobs (0.01 percent) in 2010. Personal income would also decline by roughly $1.30 billion (0.09 percent), implying that personal income of an average California household would fall by less than $95 per year, which amounts to about 26 cents per day.

**Table V-B-5**
**Economic Impacts of the Defined State Measures on the California Economy in Fiscal Year 2010**

| California Economy | Without Statewide Measures | With Statewide Measures | Difference | % Total |
|---|---|---|---|---|
| Output (Billions) | $2,331.11 | $2,329.65 | $1.46 | 0.06 |
| Personal Income (Billions) | $1,513.95 | $1,512.64 | $1.31 | 0.09 |
| Employment (thousands) | 16,689 | 16,688 | 1.3 | 0.01 |

## 3. Conclusion

Total annual direct costs associated with all proposed defined State measures are estimated to be approximately $770 million in 2010. Accounting for indirect costs, these measures would be expected to reduce California economic output by about $1.5 billion, personal income by about $1.30 billion, and employment by less than 1,300. In the context of the State's economy, the economic impacts of the measures are small and are not expected to impose a noticeable impact on the California

[7] For a more detail description of the E-DRAM extrapolation to "out years", please see "Benefits of Reducing Demand for Gasoline and Diesel," a joint report to California Air Resources Board and California Energy Commission prepared by Arthur D. Little, Inc., March, 2002.

economy. The defined State measures would also bring about significant health, economic and social benefits to Californians. These benefits, which are difficult to express solely in economic terms, are not quantified in this analysis. Prior analyses have estimated that the benefits of California's air quality regulations exceed the costs by a ratio of about 3 to 1. Therefore, implementation of the proposed measures would be expected to improve the well-being of Californians.